

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC JOINT APPLICATION OF)	
KENTUCKY UTILITIES COMPANY AND)	
LOUISVILLE GAS AND ELECTRIC COMPANY)	
FOR CERTIFICATES OF PUBLIC CONVENIENCE)	CASE NO.
AND NECESSITY AND SITE COMPATIBILITY)	2022-00402
CERTIFICATES AND APPROVAL OF A DEMAND)	
SIDE MANAGEMENT PLAN AND APPROVAL OF)	
FOSSIL FUEL-FIRED GENERATING UNIT)	
RETIREMENTS)	

NOTICE OF FILING

Notice is given to all parties that the following materials have been filed into the record of this proceeding:

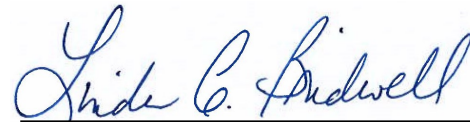
- The digital video recording of the evidentiary hearing conducted on August 22, 2023 in this proceeding;
- Certification of the accuracy and correctness of the digital video recording;
- All exhibits introduced at the evidentiary hearing conducted on August 22, 2023 in this proceeding;
- A written log listing, inter alia, the date and time of where each witness' testimony begins and ends on the digital video recording of the evidentiary hearing conducted on August 22, 2023.

A copy of this Notice, the certification of the digital video record, and hearing log have been served upon all persons listed at the end of this Notice. Parties

desiring to view the digital video recording of the hearing may do so at <https://youtu.be/svez4C-KDhg>.

Parties wishing an annotated digital video recording may submit a written request by electronic mail to pscfilings@ky.gov. A minimal fee will be assessed for a copy of this recording.

Done at Frankfort, Kentucky, this 4th day of October 2023.

A handwritten signature in blue ink that reads "Linda C. Bridwell". The signature is written in a cursive style and is positioned above a horizontal line.

Linda C. Bridwell

Executive Director

Public Service Commission of Kentucky

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC JOINT APPLICATION OF KENTUCKY)
UTILITIES COMPANY AND LOUISVILLE GAS AND)
ELECTRIC COMPANY FOR CERTIFICATES OF)
PUBLIC CONVENIENCE AND NECESSITY AND SITE)
COMPATIBILITY CERTIFICATES AND APPROVAL)
OF A DEMAND SIDE MANAGEMENT PLAN AND)
APPROVAL OF FOSSIL FUEL-FIRED GENERATING)
UNIT RETIREMENTS)

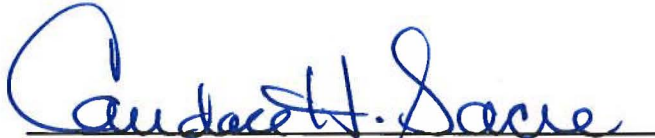
CASE NO.
2022-00402


CERTIFICATION

I, Candace H. Sacre, hereby certify that:

1. The attached flash drive contains a digital recording of the Formal Hearing conducted in the above-styled proceeding on August 22, 2023. The Formal Hearing Log, Exhibits, and Exhibit List are included with the recording on August 22, 2023;
2. I am responsible for the preparation of the digital recording;
3. The digital recording accurately and correctly depicts the Formal Hearing of August 22, 2023; and
4. The Formal Hearing Log attached to this Certificate accurately and correctly states the events that occurred at the Formal Hearing of August 22, 2023, and the time at which each occurred.

Signed this 2nd day of October, 2023.


Candace H. Sacre
Administrative Specialist III


Stephanie Schweighardt
Kentucky State at Large ID# KYNP 64180
Commission Expires: January 14, 2027



Session Report - Detail

2022-00402 22Aug2023

Kentucky Utilities Company and Louisville Gas and Electric Company (KU/LG&E)

Date:	Type:	Location:	Department:
8/22/2023	Public Hearing\Public Comments	Hearing Room 1	Hearing Room 1 (HR 1)

Witness: Lonnie Bellar; John Crockett
 Judge: Kent Chandler; Angie Hatton; Mary Pat Regan
 Clerk: Candace H Sacre

Event Time	Log Event	
9:05:49 AM	Session Started	
9:05:59 AM	Chairman Chandler Note: Sacre, Candace	On the record in Case No. 2022-00402
9:06:21 AM	Chairman Chandler Note: Sacre, Candace	Opening remarks.
9:06:29 AM	Chairman Chandler Note: Sacre, Candace	Hearing and videoconference recommendations.
9:06:42 AM	Chairman Chandler Note: Sacre, Candace	Purpose of hearing.
9:06:49 AM	Chairman Chandler Note: Sacre, Candace	Entry of appearance.
9:07:01 AM	Atty Riggs KU/LG&E Note: Sacre, Candace	Kendrick Riggs, Lindsey Ingram, Mary Ellen Wimberly, and Duncan Crosby, Duncan Crosby; in-house counsel Allison Sturgeon, Vice President and Deputy General Counsel, and Sara Judd, Senior Counsel.
9:07:25 AM	Atty Riggs KU/LG&E Note: Sacre, Candace	Witnesses are ten, John Crockett, Lonnie Bellar, Stuart Wilson, Tim Jones, Charles Schram, Philip Imber, David Sinclair, John Bevington, Lana Isaacson, Robert Conroy, Christopher Garret not file testimony, submitted data requests.
9:07:49 AM	Asst Atty General Cook Note: Sacre, Candace	Lawrence Cook, no witnesses.
9:08:04 AM	Atty Kurtz KIUC Note: Sacre, Candace	Mike Kurtz, Jody Kyler Cohn. one witness Lane Kollen.
9:08:22 AM	Atty Malone KCA Note: Sacre, Candace	Matt Malone, and Emily Medine is here as witness.
9:08:46 AM	Atty Gary Joint Intervenors Note: Sacre, Candace	Byron Gary, Tom Fitzgerald, Cassandra McCrae, Thomas Cmar, and Gilbert Zelaya, one witness Andy McDonald.
9:09:25 AM	Atty Childers Sierra Club Note: Sacre, Candace	Joe Childers, Kate Huddleston, Tony Mendoza, Joshua Smith, two witnesses Andrew Levitt and Michael Goggin.
9:09:45 AM	Atty Osterloh LFUCG/Metro Louisville Note: Sacre, Candace	Todd Osterloh, Jim Gardner, Quang Nguyen, Dave Barbieri.
9:10:18 AM	Atty Howard Mercer County Note: Sacre, Candace	Dennis Howard, witness Sarah Steele.
9:10:36 AM	Atty Mullins Walmart Note: Sacre, Candace	Megan Mullins and Carrie Grundmann, no witnesses.
9:10:52 AM	Gen Counsel Vinsel PSC Note: Sacre, Candace	Nancy Vinsel, Ben Bellamy, and Jurgens van Zyl.

9:11:22 AM	Chairman Chandler Note: Sacre, Candace	Public notice.
9:11:58 AM	Chairman Chandler Note: Sacre, Candace	Outstanding motions.
9:12:49 AM	Chairman Chandler Note: Sacre, Candace	Public comments. (Click on link for further comments.)
9:43:17 AM	Chairman Chandler Note: Sacre, Candace	Providing public comments.
9:44:07 AM	Chairman Chandler Note: Sacre, Candace	Tendered stipulation.
9:46:13 AM	Camera Lock PTZ Activated	
9:46:43 AM	Camera Lock Deactivated	
9:47:36 AM	Chairman Chandler Note: Sacre, Candace	Procedural discussions.
9:55:15 AM	Chairman Chandler Note: Sacre, Candace	Witness order.
9:56:38 AM	Chairman Chandler Note: Sacre, Candace	Confidential issues.
9:57:28 AM	Chairman Chandler Note: Sacre, Candace	First witness?
9:57:30 AM	Atty Riggs KU/LG&E Note: Sacre, Candace	John Crockett.
9:57:45 AM	Chairman Chandler Note: Sacre, Candace	Witness is sworn.
9:57:51 AM	Chairman Chandler - witness Crockett Note: Sacre, Candace	Examination. Name and address?
9:58:03 AM	Atty Riggs KU/LG&E - witness Crockett Note: Sacre, Candace	Direct Examination. Address?
9:58:09 AM	Atty Riggs KU/LG&E - witness Crockett Note: Sacre, Candace	Cause be prepared and filed testimony?
9:58:18 AM	Atty Riggs KU/LG&E - witness Crockett Note: Sacre, Candace	Further cause be prepared rebuttal?
9:58:27 AM	Atty Riggs KU/LG&E - witness Crockett Note: Sacre, Candace	Were to ask questions today, answers be same?
9:58:34 AM	Atty Riggs KU/LG&E - witness Crockett Note: Sacre, Candace	Adopt and affirm as testimony?
9:58:42 AM	Chairman Chandler Note: Sacre, Candace	Questions?
10:01:46 AM	Chairman Chandler Note: Sacre, Candace	Mr. Riggs, explain KU/LG&E laptop. (Click on link for further comments.)
10:04:20 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Cross Examination. Have rebuttal testimony?
10:04:37 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Page 3, Lines 10-13, reading (click on link for further comments), best interest of ratepayers?
10:05:18 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Why not perform rate analysis?
10:05:30 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How know cost ratepayers afford?
10:05:44 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Agree also involves SB 4?
10:06:00 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Did net present value?

10:06:13 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Agree SB 4 standards require companies shutting down plant not hurt ratepayers, how determine no harm to ratepayers?
10:07:00 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	For residential customers, agree rates higher?
10:07:18 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Response, 3-29, increased costs, agree impact ratepayers from price standpoint?
10:08:17 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	SB 4, rebuttal presumption against retirement fossil fuel generating unit, what mean?
10:08:34 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	What presumption mean?
10:08:38 AM	Atty Riggs KU/LG&E Note: Sacre, Candace	Calls for legal opinion. (Click on link for further comments.)
10:08:57 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Incur costs shut down plants?
10:09:14 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Requesting shut down?
10:09:30 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	If happen, incur costs?
10:09:36 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Who pay?
10:09:46 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Also approve gas plants, customers pay for both?
10:10:18 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Undepreciated costs?
10:10:29 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Know what are?
10:10:40 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	SB 4, ratepayers paying both stranded costs and cost of new plants, how demonstrate cost savings to customers?
10:11:26 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Agree first ten years result in higher costs to customers?
10:11:44 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How demonstrate cost savings next ten years?
10:11:57 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How help someone on fixed income?
10:12:18 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	If companies continue operate coal plants, could avoid most if not all stranded costs shutting down coal plants?
10:13:03 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Tell me about Good Neighbor Plan, where at with that?
10:13:18 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Right now, stayed?
10:13:25 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Not know what will happen?
10:13:33 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Based on what?
10:13:55 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Extent plants continue run, less sunk costs/stranded costs shutting down?
10:14:24 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Less undepreciated capital?

10:14:34 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace SCRs lots more economical as opposed to gas plants?

10:14:50 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Cost of SCR less than cost of gas plant?

10:15:01 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Review letter by Stivers?

10:15:11 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Agree valid concerns?

10:15:19 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace But agree has valid concerns?

10:15:38 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Concerns about reliability, not agree?

10:15:55 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace One of requirements company identify indirect costs, where companies done that?

10:16:22 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Had not been Good Neighbor rule not look same?

10:16:37 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace How changed?

10:16:38 AM Atty Riggs KU/LG&E
Note: Sacre, Candace Calls for speculation. (Click on link for further comments.)

10:16:52 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace CPCN consistent with net zero policy?

10:17:24 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace How depreciation schedules match up?

10:17:37 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Go way beyond 2050?

10:18:01 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace How reconcile issues?

10:18:09 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Recall 2021 IRP?

10:18:19 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Agree carbon capture analysis part?

10:18:23 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace 2022 resource assessment came forth, why no mention carbon capture analysis anymore?

10:18:44 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Ask resource assessment questions of Sinclair?

10:20:28 AM Chairman Chandler
Note: Sacre, Candace Recess until 10:35.

10:20:50 AM Session Paused

10:39:01 AM Session Resumed

10:39:10 AM Chairman Chandler
Note: Sacre, Candace Back on record.

10:39:15 AM Chairman Chandler
Note: Sacre, Candace Mr. Malone, continue?

10:39:16 AM MARKED - KCA HEARING EXHIBIT 1
Note: Sacre, Candace ATTY MALONE KCA - WITNESS CROCKETT
Note: Sacre, Candace NEWS RELEASE AUGUST 16 2023 AEP COMPLETES SALE OF UNREGULATED RENEWABLE ASSETS

10:39:51 AM Atty Malone KCA - witness Crockett
Note: Sacre, Candace Cross Examination (cont'd). KCA 1, why spinning off unregulated renewable assets?

10:40:21 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Streamline and derisk business and focus on regulated, what mean?
10:40:46 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Make rate of return on regulated assets?
10:40:57 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	By spinning off, looking to focus on guaranteed rate of return?
10:41:05 AM	Atty Riggs KU/LG&E Note: Sacre, Candace	Objection. (Click on link for further comments.)
10:41:12 AM	Atty Malone KCA Note: Sacre, Candace	Move admit KCA Exhibit 1.
10:41:31 AM	Chairman Chandler Note: Sacre, Candace	So entered.
10:41:32 AM	KCA HEARING EXHIBIT 1 Note: Sacre, Candace Note: Sacre, Candace	ATTY MALONE KCA - WITNESS CROCKETT NEWS RELEASE AUGUST 16 2023 AEP COMPLETES SALE OF UNREGULATED RENEWABLE ASSETS
10:41:36 AM	Atty Malone KCA Note: Sacre, Candace	Marked as KCA Exhibit 2.
10:41:43 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Familiar with document?
10:42:02 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Executives receiving performance units based on TSR EG and ESG, what mean to you?
10:42:15 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	What getting compensated for?
10:42:24 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	What ESG stand for?
10:42:30 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	80 percent long-term equity incentives include closure of Mill Creek 1?
10:43:18 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Compensate for closure of coal plants listed in CPCN?
10:43:39 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Why compensated for Mill Creek 1 and not others?
10:43:58 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	When reviewed proxy statements, compensation changed in 2022?
10:44:09 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Such as?
10:44:25 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	What were target changes?
10:44:33 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Compensation 72 percent performance based such as ESG, climate related measures, why compensated for closing Mill Creek 1 but not if get what asking for in case?
10:45:32 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How achieve earnings growth other than investing in capital?
10:46:46 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How earnings growth not through capital?
10:46:58 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	PPL have any generating assets outside Kentucky?
10:47:21 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Otherwise purely transmission?
10:47:53 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Also not be in companies' best interests?

10:48:32 AM	Atty Malone KCA Note: Sacre, Candace	Move admission of KCA Exhibit 2.
10:48:48 AM	Chairman Chandler Note: Sacre, Candace	So admitted.
10:48:49 AM	KCA HEARING EXHIBIT 2 Note: Sacre, Candace Note: Sacre, Candace	ATTY MALONE KCA - WITNESS CROCKETT PPL CORPORATION PROXY SUMMARY EXECUTIVE COMPENSATION PROGRAM
10:48:54 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How much compensation increase based on closing Mill Creek 1?
10:49:13 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Why PPL shift targets incentive compensation 2022?
10:49:40 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	What ESG goals of PPL?
10:50:05 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	If gas plant comes on line 2028 and 40-year depreciation, push out to 2068, how reconcile?
10:50:42 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	If get what asking for, no way get to net zero?
10:51:01 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How?
10:51:11 AM	Atty Malone KCA Note: Sacre, Candace	Introduce KCA Exhibit 3.
10:51:18 AM	KCA HEARING EXHIBIT 3 Note: Sacre, Candace Note: Sacre, Candace	ATTY MALONE KCA -WITNESS CROCKETT PPL CORPORATION EXECUTIVE COMPENSATION EXECUTIVE COMPENSATION TABLES
10:51:20 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Premarked as KCA Exhibit 4, page 5, SB 4 capacity matches, how reconcile closing that much in coal-fired power and not replacing with capacity meets those amounts?
10:52:24 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Objection, calls for legal conclusion. (Click on link for further comments.)
10:52:38 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How reconcile green versus black?
10:53:33 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Black is more than gray?
10:53:42 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Go to page 13, PPL Investment Highlights, reading (click on link for further comments), how create earnings growth?
10:54:33 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Come out of new capitalization?
10:54:43 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Does not require
10:54:48 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Create their own
10:55:10 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Kentucky only one with generating assets?
10:55:19 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Page 14, what sheet mean to you?
10:55:30 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	Projected earnings per share, increase six to eight percent?

10:55:43 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	How happen?
10:55:52 AM	Atty Malone KCA - witness Crockett Note: Sacre, Candace	PPL expecting money come from ratepayers?
10:56:12 AM	Chairman Chandler Note: Sacre, Candace	Admit Exhibit 4.
10:56:14 AM	Chairman Chandler Note: Sacre, Candace	So admitted.
10:56:45 AM	KCA HEARING EXHIBIT 4 Note: Sacre, Candace Note: Sacre, Candace	ATTY MALONE KCA - WITNESS CROCKETT PPL 2ND QUARTER INVESTOR UPDATE AUGUST 4 2023 PPL CORPORATION
10:57:17 AM	Atty Osterloh LFUCG/Metro Louisville - witness Crockett Note: Sacre, Candace	Cross Examination. Responding to question from KCA about ESG goals?
10:57:24 AM	Atty Osterloh LFUCG/Metro Louisville - witness Crockett Note: Sacre, Candace	Describe why PPL has ESG goals?
10:58:01 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Cross Examination. LG&E/KU companies subsidiaries of PPL?
10:58:53 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Related to AEP?
10:59:04 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Page 1, providing overview of demand and supply side proposal, reading, (click on link for further comments), see it there?
10:59:39 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Reading, (click on link for further comments), see that?
10:59:55 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Consistent with corporate reduction goals, PPL, service company, or all three?
11:00:16 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Any other generating assets?
11:00:24 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Any reductions come from LG&E/KU?
11:00:38 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Other things?
11:00:44 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Lion's share reductions 2050 goal changes in generation mix?
11:00:57 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Supply side proposals, retiring Brown 3. Mill Creek 2, and Ghent 2 and replacing with two 621-megawatt-rated natural gas combined cycle units?
11:01:48 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Because LG&E/KU source for achieving goals, not get you to goals more quickly look at non-fossil fuel replacement?
11:03:09 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Mention rebuttal page 2 lines 6-9, reading (click on link for further comments), represent amalgam of interests focused on meeting needs of ratepayers fixed and low incomes, pages 2 & 3, principles of affordability, reliability, and safety, how confident company two gas units represent lowest cost option?
11:04:32 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Current estimates in AACE Class 3, potential underestimating 30 percent?
11:05:01 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Assuming be case, who bears risk those wrong?

11:05:21 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	What commitment companies willing to make risk sharing?
11:06:49 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Risk shared, aware off-system sales from assets those revenues shared 75 percent ratepayers 25 percent to shareholders?
11:07:15 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Companies willing to commit to percentage of risk sharing for unanticipated costs?
11:07:43 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Mentioned pages 5 and 6 proposal, reading (click on link for further comments), assuming retirement coal units and construction natural gas units, what percentage remain coal powered?
11:08:41 AM	Chairman Chandler - witness Crockett Note: Sacre, Candace	Examination. Megawatt basis or energy basis?
11:08:56 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Cross Examination (cont'd). 91 percent portfolio remain fossil fuel fired?
11:09:17 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	How much remaining nine percent be renewable solar?
11:09:38 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	140 megawatts hydro, any expansions?
11:09:52 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	RFPs for hydro projects?
11:10:04 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Nine percent expect met through energy efficiency or DSM?
11:10:23 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	91 percent fossil fuels, company not have bias against coal and natural gas?
11:10:41 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Suggest room for more diversity in fuel mix?
11:11:07 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	PPL not have operations in Arizona?
11:11:23 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Part of 8 or 9 percent represented by PPA?
11:11:46 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Not come to fruition replace like basis other renewables?
11:12:10 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Assuming comparably priced?
11:12:25 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Assuming full approval, what percentage investments that represent relative other investments?
11:12:47 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Who think address that?
11:12:54 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	What percentage energy sales
11:13:16 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Reading, (click on link for further comments), how far in future project energy needs of customers?
11:13:35 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	2021 IRP neither gas plant included?
11:13:54 AM	Atty Fitzgerald Joint Intervenor - witness Crockett Note: Sacre, Candace	Not project sort of growth contained in direct testimony?

11:14:18 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	End with mention of workforce during transition from coal fired plant, at appropriate time work with employees and unions, proposals considering assuring workforce management of plants retained, retrained, what plans proposed and back to Commission for review?
11:16:02 AM	Atty Fitzgerald Joint Intervenors - witness Crockett Note: Sacre, Candace	Companies have preference regarding deconstruction coal plants and construction of gas plants in labor commitments in Commonwealth?
11:17:09 AM	Chairman Chandler Note: Sacre, Candace	Questions?
11:17:31 AM	General Counsel Vinsel PSC - witness Crockett Note: Sacre, Candace	Cross Examination. Risk, what other risk shareholders bear in cost of NGCC?
11:18:46 AM	General Counsel Vinsel PSC - witness Crockett Note: Sacre, Candace	When construction begin if NGCC units approved?
11:19:17 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	Examination. Why current plan different from IRP, full explanation of that?
11:20:31 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	What is current ratio of coal and gas?
11:21:02 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	By end of 40 years?
11:21:09 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	What percentage is Kentucky coal?
11:21:16 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	Who know?
11:21:28 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	Robust public comments, biofuel come up, use existing coal, cleaner emissions, available now?
11:23:29 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	Testimony from customers, not hear anybody loves gas?
11:23:55 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	Concerned about liability especially in cold weather?
11:24:29 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	This plan will cause companies lose employees, total number?
11:25:03 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	Know how many need reduce?
11:25:16 AM	Vice Chairman Hatton - witness Crockett Note: Sacre, Candace	Who best person answer?
11:25:34 AM	Commissioner Regan - witness Crockett Note: Sacre, Candace	Examination. Employees retrained?
11:26:00 AM	Commissioner Regan - witness Crockett Note: Sacre, Candace	Do that?
11:26:06 AM	Commissioner Regan - witness Crockett Note: Sacre, Candace	Anything in goals based on customer satisfaction?
11:26:25 AM	Commissioner Regan - witness Crockett Note: Sacre, Candace	From your perspective, believe natural gas replacement safe investment or believe safe for environment or both?
11:27:14 AM	Commissioner Regan - witness Crockett Note: Sacre, Candace	What felt best alternative?
11:27:18 AM	Commissioner Regan - witness Crockett Note: Sacre, Candace	Believe that?

11:27:48 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Examination. Why chose one by one natural gas combined cycles?

11:28:16 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Mean other side submitted one by twos in response to RFPs?

11:28:41 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Utilities filed IRP in 2021?

11:28:52 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Aware hearing?

11:28:56 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Hearing in 2021 rate cases?

11:29:05 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace ECR cases?

11:29:12 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Put out RFP?

11:29:22 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Timing of RFP in relation to interconnection by

11:29:40 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Submission made to independent operator day before publication RFP?

11:30:04 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Aware of timing not concerned?

11:30:31 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Submitted in response to RFP not issued?

11:30:45 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace General counsel before?

11:30:55 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Walls between certain parts of business?

11:31:09 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Folks send out and folks submitted separated?

11:31:28 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Why confident of that given circumstances discussed?

11:31:56 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Keep procurement group discussing with planning group going to market for generation?

11:32:18 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Why so confident everything fine even though situation?

11:32:52 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Procedures are great but why confident procedures followed?

11:33:07 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Inquired to issue?

11:33:16 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Directed anybody inquire?

11:33:25 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Anybody reported to you about timing issue?

11:33:49 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Who had conversation with?

11:34:01 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Think bad look?

11:34:19 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace If you were Hitachi wanted build combined cycle, think be competitive if

11:35:15 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Two submissions withdrawn, submitted response with two combined cycles prior RFP, know system well, land control, eminent domain, facts?

11:35:54 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Intermittent renewable resources dispatchable?

11:36:09 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Supported by direct testimony?

11:36:45 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Application discusses addressing change, page 6 discusses, reading (click on link for further comments), as CEO where see threshold between possible/probable and reasonably foreseeable?

11:38:47 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace When filed plan, Good Neighbor pending rule?

11:39:02 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Same stage when filed application as 111 rule is now?

11:39:28 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Was it post-comment when filed application?

11:39:37 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace And now are post-comment the 111 or GHG Rule?

11:40:11 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Comment about Good Neighbor Rule and your confidence, have independent basis for position or conversations with Imber?

11:40:22 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Explain why independent expectation Good Neighbor rule as finalized or implemented by FIP stick around in that form or another?

11:41:39 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Had chance review Sinclair rebuttal in this case?

11:41:56 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Had chance review Imber testimony?

11:42:35 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Have available?

11:42:47 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Page 5 references testimony at US Court of Appeals Sixth Circuit, includes Kentucky?

11:43:07 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Page 5, see first bullet point line 12?

11:43:17 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Tell me if quote incorrect, reading, (click on link for further comments), understand argument be not require NAQS controls?

11:44:47 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Imber testimony one way or another some rule requires Mill Creek 1 Mill Creek 2 and Ghent

11:45:27 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace NAQS?

11:45:33 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Aware company modeled for Good Neighbor rule NAQS controls at Mill Creek 2 and Ghent 2?

11:46:01 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace Personal knowledge company modeled EPA approved SIP for Good Neighbor had required SCR at Mill Creek 2 and Ghent 2?

11:46:30 AM Chairman Chandler - witness Crockett
Note: Sacre, Candace If EPA approved SIP, not seem expectation NCRs not installed?

11:47:02 AM	Chairman Chandler - witness Crockett	
	Note: Sacre, Candace	Expectation Imber knows?
11:47:25 AM	Chairman Chandler - witness Crockett	
	Note: Sacre, Candace	Think that important consideration?
11:47:53 AM	Chairman Chandler - witness Crockett	
	Note: Sacre, Candace	Still think EPA take some action require SCRs on Mill Creek 2 and Ghent 2?
11:49:35 AM	Chairman Chandler - witness Crockett	
	Note: Sacre, Candace	111 rule reasonably foreseeable?
11:50:49 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Redirect Examination. Recall KCA examination?
11:51:09 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Proxy statements and recommendations in document?
11:51:25 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Done for purpose of providing safe reliable
11:51:54 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Driven by profitability goals of PPL?
11:52:18 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Examination. How long with LG&E/KU?
11:52:31 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Worked with companies many years before that?
11:52:40 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Make rates recoverable in rates?
11:52:45 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Aware past instances where Commission denied recovery from customers long-term incentive plans?
11:53:05 AM	Atty Riggs KU/LG&E - witness Crockett	
	Note: Sacre, Candace	Rarely means Commission takes at face value and allows 100 percent recovery in rates?
11:53:52 AM	Atty Malone KCA - witness Crockett	
	Note: Sacre, Candace	Recross Examination. PPL 2023 Proxy Statement, reading (click on link for further comments), sound familiar?
11:54:20 AM	Atty Malone KCA - witness Crockett	
	Note: Sacre, Candace	Reading (click on link for further comments), be incentive to shutter coal plants?
11:54:48 AM	Atty Malone KCA - witness Crockett	
	Note: Sacre, Candace	Changed this year to 80 percent for LTI, incentivized from ESG standard?
11:55:04 AM	Chairman Chandler	
	Note: Sacre, Candace	Mr. Riggs?
11:55:17 AM	Chairman Chandler	
	Note: Sacre, Candace	Lunch until 12:55.
11:55:49 AM	Session Paused	
1:02:59 PM	Session Resumed	
1:03:06 PM	Chairman Chandler	
	Note: Sacre, Candace	Back on the record.
1:03:21 PM	Chairman Chandler	
	Note: Sacre, Candace	Next witness?
1:03:31 PM	Atty Ingram KU/LG&E	
	Note: Sacre, Candace	Lonnie Bellar.
1:03:35 PM	Chairman Chandler	
	Note: Sacre, Candace	Witness is sworn.
1:03:41 PM	Chairman Chandler - witness Bellar	
	Note: Sacre, Candace	Examination. Name and address?

1:03:51 PM	Atty Ingram KU/LG&E - witness Bellar Note: Sacre, Candace	Direct Examination. Title?
1:04:06 PM	Atty Ingram KU/LG&E - witness Bellar Note: Sacre, Candace	File testimony and rebuttal?
1:04:17 PM	Atty Ingram KU/LG&E - witness Bellar Note: Sacre, Candace	Also file SB 4 case?
1:04:28 PM	Atty Ingram KU/LG&E - witness Bellar Note: Sacre, Candace	Incorporated into 402 case?
1:04:36 PM	Atty Ingram KU/LG&E - witness Bellar Note: Sacre, Candace	Also file responses?
1:04:42 PM	Atty Ingram KU/LG&E - witness Bellar Note: Sacre, Candace	Corrections?
1:04:48 PM	Atty Ingram KU/LG&E - witness Bellar Note: Sacre, Candace	Adopt today?
1:04:50 PM	Chairman Chandler Note: Sacre, Candace	Questions?
1:06:16 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Cross Examination. Asking for delay as opposed shutting down plants?
1:06:51 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Good Neighbor Rule, absent having occurred, would have filed CPCN?
1:07:14 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	What hinders ability SCRs on Mill Creek 1 and 2 and Ghent?
1:07:35 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Both?
1:07:47 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Response, no undisclosed obstacles to retrofit with new SCRs?
1:08:31 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Referenced fuel oil, when filed CPCN, looked into issue or not, dual fuel issue with natural gas plans?
1:09:36 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Not talking about hydrogen?
1:09:52 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Reason issued IRP reliability concerns and make sure had answer to weather scenario, why?
1:10:44 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Relative to dual fuel issue?
1:11:30 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	What costs associated with that?
1:12:50 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Why not do that when filed CPCN?
1:13:09 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Walk me through that?
1:13:47 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Not part of original bid?
1:15:06 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Not know what dual fuel cost wise?
1:15:18 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Storage, built that in?
1:15:47 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Not built into cost structure?

1:15:55 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	GSG NSPS, what cost impacts complying and switching to intermediate load?
1:17:04 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Talk about SB 4, point to where company addressed indirect costs shutting down coal plants, Subsection 3?
1:18:09 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Been looking at it, reading, (click on link for further comments), curious about indirect costs and where in record?
1:19:16 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Indirect costs, job loss, people supply industry, where in record gotten into that?
1:20:35 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	How determine harm to ratepayers without rate analysis?
1:22:01 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Also have inclusion of SB 4 not harm ratepayers?
1:22:43 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Capital costs levelized in analysis?
1:23:23 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Increase in the next ten years?
1:24:03 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Why not do residential rate analysis?
1:25:22 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	EPA does rate analysis when putting regulations together?
1:25:45 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Dual fuel, how much supply need to address reliability issue?
1:27:30 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Replacement generation for Mill Creek 1 in 2025?
1:27:55 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	How reconcile with SB 4?
1:29:24 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Chart showed green and black, requested close 1500 megawatts only replacing with 1250 megawatts?
1:30:08 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Happen see Tennessee pipeline explosion in news?
1:30:32 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Just curious if seen it?
1:30:38 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Consider repurposing coal plants for biofuels?
1:31:25 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	What did you do?
1:32:05 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Why Mill Creek 1 close at end of 2024?
1:33:10 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Why SCR be installed Mill Creek 2?
1:34:12 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	What happens Mill Creek 1 closes?
1:34:34 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	If Mill Creek 1 closes, where put with Mill Creek 2?
1:35:04 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	What if SCR on Mill Creek 2?
1:35:26 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Put SCR on Mill Creek 2 reduce potential stranded costs by not shutting down?

1:35:56 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	If not shut down, not stranded cost associated?
1:36:15 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	If not gas plant, not double dip on customers?
1:36:48 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	No nonattainment issues on Ghent?
1:37:25 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	What about air permits on Mill Creek 5 and Brown 12 associated?
1:38:07 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	If Commission decides not best interests get gas plants and determines companies not met burden, anything stopping putting SCRs on Mill Creek 1 or 2 and proceeding?
1:39:00 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Brown 3, delay in maintenance contributed to performance?
1:40:00 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	What caused decline in performance?
1:40:15 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Examination. Coal delivered by truck to Brown?
1:40:55 PM	Chairman Chandler Note: Sacre, Candace	Testimony duopoly fuel, providers/producers not confidential? (Click on link for further comments.)
1:41:25 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Aware Sinclair testimony, his concern duopoly of fuel producers of coal?
1:41:36 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	70 percent number provided by two producers?
1:41:43 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Producers able provide Brown 3 coal on rail?
1:42:00 PM	Chairman Chandler Note: Sacre, Candace	Mr. Malone?
1:42:10 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Cross Examination (cont'd). If final performance standard not include compliance switching from base to intermediate load, what do?
1:43:01 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Assuming get what want, combined cycles 2028, how net zero by 2050?
1:43:54 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Seek recovery stranded costs?
1:44:52 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Familiar with North American Standards Board?
1:45:11 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Concerns for reliability regarding natural gas?
1:46:51 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Eliot created significant issue in PJM?
1:47:17 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Happen to read Stivers letter?
1:47:29 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Agreed happen as well?
1:47:40 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Outage related to severe weather event?
1:47:55 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Fair say RFP request dual fuel related to reliability/enhancement issue?

1:48:27 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Solar PPAs, agree not dispatchable?
1:48:59 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	PPAs not included for replacement capacity SB4?
1:49:11 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Why different viewpoint company owned solar and solar PPAs?
1:49:44 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Turn it off?
1:49:52 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	When turn off?
1:50:15 PM	Atty Malone KCA - witness Bellar Note: Sacre, Candace	Not work at night?
1:50:23 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Examination. Turn off, actually throttle or curtail?
1:50:47 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Inverter based resources generally or two owned solar?
1:51:22 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	When left MISO became own balancing authority?
1:51:32 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Synonymous with balancing area?
1:51:35 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Sinclair referenced balancing area, used that sense synonymous with balancing authority?
1:51:50 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	As balancing authority, option curtail any generator due to safety or reliability or voltage issues?
1:52:06 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Be case for any generator owned or nonowned?
1:52:29 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Have authority to do that?
1:52:35 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Under FERC approval?
1:52:38 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	When distinction between dispatchable and nondispatchable?
1:53:29 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Distinction companies drawing between PPAs and (?) in terms of dispatchability, PJM balancing authority?
1:53:43 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Self-scheduling opposed economic commitments?
1:54:00 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Difference running own power plant in RTO as opposed being economically dispatched by market?
1:54:04 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Dispatches on own, unit may be dispatchable but choosing output?
1:54:20 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Market requirement, markets require inverters can throttle output, balancing authority as well, why not able have open access transmission tariff apply to any generators have same requirement?
1:55:35 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Implicit reading into SB 4 dispatchability economic basis?
1:56:04 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Dispatchable, ability be dispatched or expectation be dispatched?

1:57:03 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Free to dispatch system regarding surrounding balancing authorities?
1:57:48 PM	Chairman Chandler Note: Sacre, Candace	Mr. Malone?
1:57:50 PM	Atty Malone KCA Note: Sacre, Candace	Move introduce Exhibit 5.
1:59:05 PM	Chairman Chandler Note: Sacre, Candace	Objection? (Click on link for further comments.)
1:59:15 PM	Chairman Chandler Note: Sacre, Candace	Include as KCA Exhibit 5.
1:59:31 PM	KCA HEARING EXHIBIT 5 Note: Sacre, Candace Note: Sacre, Candace	ATTY MALONE KCA - WITNESS BOLLAR NORTH AMERICAN ENERGY STANDARDS BOARD GAS ELECTRIC HARMONIZATION FORUM REPORT JULY 28 2023
1:59:38 PM	Chairman Chandler Note: Sacre, Candace	Recess until 2:10.
2:13:45 PM	Session Paused	
2:15:28 PM	Session Resumed	
2:15:37 PM	Chairman Chandler Note: Sacre, Candace	Back on the record.
2:15:51 PM	Chairman Chandler Note: Sacre, Candace	Procedural discussion.
2:16:02 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Cross Examination. Have in front of you initial responses to AG?
2:16:30 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Response, Question 13?
2:16:38 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Lonnie Bellar, is that you?
2:16:45 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Responsible for response?
2:16:49 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Response, A-13(p), about winter storm Elliott?
2:17:23 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Reading, (click on link for further comments), correct?
2:17:36 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	What is derate?
2:17:43 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	What unit on forced outage?
2:18:15 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Derate on coal units?
2:18:28 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Have Attachment 1, Question 13(I), reading (click on link for further comments)?
2:19:50 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Sponsoring witness?
2:19:55 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Seen document before?
2:20:23 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Analysis what went wrong?
2:20:42 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Focused of KU/LG&E
2:21:10 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Individuals employed by LG&E/KU?

2:21:15 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Document analyzes BAA and issues during Winter Storm Elliott?

2:21:23 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Only discusses LG&E/KU generation?

2:21:40 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Does not discuss other companies?

2:22:12 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Explain why chose entire BAA but talking exclusively about KU/LG&E balancing authority?

2:22:59 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Examination. Bluegrass within balancing authority?

2:23:10 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). Generation events, page 3, see that?

2:23:21 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Document states, reading (click on link for further comments), correct?

2:23:35 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace What generation units described and what happened, setting stage at midnight?

2:24:02 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Trimble County 1 in outage?

2:24:12 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Is 370 MW net unit?

2:24:32 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace How many megawatts partners have?

2:24:47 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Also in outage?

2:25:06 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Why did that fail?

2:25:42 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace What was cause of failure?

2:25:58 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Coal fired unit?

2:26:08 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Says unit available up to 75 megawatts?

2:27:00 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace 295 megawatts attributable to coal mills off-line?

2:27:39 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Had that lower gas pressure already begun?

2:28:00 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace There was 75 megawatts could have been available?

2:28:32 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Any other coal units unavailable Dec 23 at midnight?

2:28:53 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Page 2, sentence says, reading, (click on link for further comments), correct?

2:29:34 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace 285 megawatts off-line?

2:29:51 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Coal fired unit if not off-line would have been available duration of event or when become unavailable?

2:30:24 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Means LG&E/KU would not have cut load?

2:30:42 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace And unit is coal unit?

2:30:50 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace 370 megawatts off-line, Dec 23 at 1:28 am Brown 5, Brown 8, Brown 9, and Brown 11 all tripped off line?

2:31:27 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace All gas fired?

2:31:44 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Around 10 outage 110 megawatts?

2:32:04 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Also gas fired CT?

2:32:15 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Trimble County 2

2:32:25 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Coal or gas?

2:32:31 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Reading, (click on link for further comments), correct?

2:32:47 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Continued until Dec 27?

2:32:52 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Army Corps took 45 megawatts off-line?

2:33:01 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace OF unit, what is that?

2:33:28 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Patty's Run?

2:33:33 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Gas CT?

2:33:37 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Offline?

2:33:41 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Manual valve and cooling valve extreme coolant?

2:33:57 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace CT peakers coming on line?

2:34:01 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Hafling units requested at 6:15?

2:34:07 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Each 14 megawatts?

2:34:12 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Hafling Unit 1 running 10:33 on Dec 23 to 2:57 pm on Dec 24?

2:34:20 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Hafling Unit 2 not available?

2:34:44 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Seems coincidence Hafling Unit 1 10:33 on Dec 23 and 2:57 on Dec 24, typo?

2:35:30 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Brown Unit 3 listed 400 megawatts?

2:35:40 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Brown Unit 3 burns coal?

2:35:47 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Dec 23 to Dec 25 Brown Unit 3 plagued by derate issues?

2:35:56 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Derate issues ranged 62 to 76 megawatts?

2:36:02 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Due to problems with combustion process instrumentation?

2:36:07 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace What that mean?

2:36:38 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Examination. Explain to us what excess slagging is?

2:37:18 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). Dec 25 Brown 3 off line completely?

2:37:48 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Examination. Derate there 76 megawatts or two 76 megawatts?

2:38:09 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Derated by 76 megawatts?

2:38:13 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). So 324 megawatts available?

2:38:20 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Issues talked about, pressure issues at Cane Run and Trimble?

2:38:30 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace At 1:08 pm on Dec 23 Trimble Co 5 has 179 megawatts off-line?

2:38:40 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Gas generation?

2:38:42 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Due to drop in pressure?

2:39:06 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Weather related?

2:39:17 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace 1:47 pm Cane Run 7 derate of 253 megawatts?

2:39:23 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Also gas generation?

2:39:33 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Due to drop in gas pressure?

2:40:06 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace At 1:48 pm Trimble Co 439 megawatt derate?

2:40:17 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Loss of 439 megawatts?

2:40:22 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Also gas generation?

2:40:30 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Again due to drop in gas pressure?

2:40:34 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace In addition to 179 for Trimble Co 5 or does that include those?

2:40:56 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace It says, reading (click on link for further comments), correct?

2:41:07 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Trimble County available up to 75 megawatts?

2:41:37 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Trimble County 1 coal fired unit?

2:41:56 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Had never tripped off line chugged along its way?

2:42:18 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Two failures, both gas supply not there also unit not function as coal unit?

2:42:31 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace 3:48 pm Trimble County 2 experienced derate 269 megawatts frozen boiler feed pump transmitter, caused unit run back?

2:42:48 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Explain this?

2:44:19 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Mechanical failure due to weather?

2:44:33 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Mill Creek 4 lost coal feeder?

2:44:46 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Differences between?

2:45:30 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Mill Creek 4 coal fired?

2:45:35 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Derate lasted until 6:44 pm Dec 23?

2:45:47 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Any other instances off line not documented?

2:46:06 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace LG&E/KU Response to AG, Answer 13(o), 5:59 pm to 10:11 pm on Dec 23 2022?

2:46:37 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Max load shed 317 megawatts?

2:46:44 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace During time period, Trimble Co 1 unavailable?

2:47:00 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Brown 3 derated, 62 to 76 megawatts mechanical failure?

2:47:15 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Already 432 megawatts of coal fired power off line at time of peak need?

2:47:28 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace More than 317 megawatts needed by customers?

2:47:36 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Just due to mechanical issues?

2:47:50 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Including Brown Unit 3?

2:48:00 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace If power available, not need for rolling blackouts Dec 23?

2:48:25 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace 432 megawatts, weather related coal fired outages, talked about Trimble Co 2 derated?

2:48:44 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Initial part of period, Mill Creek 4 derated 121 megawatts?

2:48:51 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Most critical time in terms of customers impacted?

2:48:57 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Additional 390 megawatts off-line due to reliability failures?

2:49:41 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace 432 plus 390 is 822 megawatts off line?

2:49:57 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Greater than 317 megawatts load shed?

2:50:09 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Mill Creek 4 back on line still at 701 megawatts offline?

2:50:24 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace If megawatts offline 701 on line not seen rolling blackouts?

2:50:45 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Idea gas unreliable, not entire story?

2:51:20 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Forecast percentage of coal fired expect offline any given time?

2:52:15 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Longer range planning, what percentage predict be offline?

2:53:00 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Remember total up all coal units what percentage offline be?

2:53:16 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Have percentage expect unavailable coal units during winter weather?

2:54:15 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Able describe other occasions coal related outages winter?

2:54:35 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Back to Elliott, mechanical failures also account for needed megawatts?

2:54:57 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Not count on coal units when called upon?

2:55:53 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace When say planning probabilistic, estimating likelihood unit available any given time?

2:56:33 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace During Elliott, OVEC contributions fell 150 megawatts short?

2:57:07 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace OVEC contributions from coal fired generation?

2:57:23 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Part of automated reserve sharing group?

2:57:42 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace What is automated reserve sharing group?

2:58:05 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace During Elliott, TVA Cumberland Fossil Plant experienced issues?

2:58:13 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Coal fired unit?

2:58:20 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace External impacts, page 5, timeline details interaction LG&E/KU BAA and external entities impacted LG&E/KU system?

2:59:03 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Receiving exports from PJM?

2:59:09 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Dec 23 PJM curtailed export for 400 megawatts?

2:59:26 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Above what normally purchase?

3:00:18 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Examination. This 400 megawatts buying from TVA, but for that 400 megawatts are EEA 3?

3:00:30 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Desperate for power?

3:00:50 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). How long 400 megawatts unavailable?

3:01:52 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Explain what EEA 3 means?

3:02:20 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Extraordinary emergency situation?

3:02:29 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Unable purchase 400 megawatts from PJM?

3:02:50 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Because LG&E/KU not part of regional transmission organization?

3:03:22 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Could have been in same situation, case LG&E/KU last on list after all utilities within MISO?

3:04:04 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Lower on the list than utilities within RTO?

3:04:18 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace If had access to 400 megawatts requesting not have to shed load?

3:04:36 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Automated sharing group called for 400 megawatts, explain what that is?

3:05:05 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Sequence of events, automated reserve sharing called for 400 megawatts or attempted to purchase and unavailable and led to call?

3:05:46 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace What happened between 4:29 pm and 4:45 pm?

3:06:34 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Saw at 18:05 curtailment, what means?

3:07:10 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Did TVA curtail exports or power sharing any point during Elliott?

3:07:39 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace And why TVA have EEA designation?

3:07:56 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Again for both coal and natural gas?

3:08:07 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Sum up what happened, Texas Gas derates?

3:08:25 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace At Dec 23, in that gas shortfall?

3:08:37 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Lacked all coal fired generation otherwise could have been available?

3:08:54 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace PJM curtailed 400 megawatts?

3:09:06 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Lights stayed on for PJM?

3:09:17 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Member utilities in Kentucky?

3:09:22 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Talked about 844 megawatts missing LG&E/KU own coal generation, 150 megawatts from OVEC coal generation, and 400 megawatts curtailed PJM chose hold back for members?

3:10:07 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace 1372 megawatts unavailable?

3:10:43 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Other thing more load shed if Brown 3 going off line Dec 25?

3:11:09 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Means variety of causes of 317 megawatt load shed on Dec 23?

3:11:26 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace In this instance not case coal generation 100 percent available when needed it?

3:11:43 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace If coal generation 100 percent available, not had rolling blackouts?

3:12:04 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Familiar with correlated outages?

3:12:11 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace What is?

3:12:25 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Example of correlated outages?

3:12:48 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Also say Elliott extreme caused plants go offline or derated?

3:13:00 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Another example correlated outages?

3:13:08 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Companies seeking four-hour 125-megawatt battery at Brown site?

3:13:16 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace If battery been available during Elliott, what impact period of peak need?

3:13:44 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Refer to rebuttal page 17 lines 12-13, discussing proposed battery?

3:14:58 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Describe, quote, reading (click on link for further comments), correct?

3:15:03 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace One of advantages, extreme weather, idea have additional backup power available?

3:15:34 PM Chairman Chandler
Note: Sacre, Candace Recess until 3:30.

3:15:53 PM Session Paused

3:35:19 PM Session Resumed

3:35:32 PM Session Paused

3:35:49 PM Session Resumed

3:36:06 PM Chairman Chandler
Note: Sacre, Candace Back on record.

3:36:08 PM Chairman Chandler
Note: Sacre, Candace Ms. Huddleston, continue cross examination?

3:36:17 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). Every unit different, what values of issues in this case?

3:37:00 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Page 27, line 18, rebuttal, state, reading (click on link for further comments), correct?

3:37:38 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace These units in RTO membership scenario need to comply with EPA regulations?

3:37:47 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace RTO membership will not increase economic life of units or change lack of cost effectiveness, correct?

3:37:59 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Joining RTO not prevent Ghent 2 engage in environmental compliance, what mean by that?

3:38:27 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace When say not increase economic life Ghent 2 or change lack cost effectiveness, what mean by that?

3:39:01 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Utility in RTO, utility owns own generation?

3:39:15 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Utility part of market bidding into broader system?

3:39:35 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Have essentially bidding stack, least cost bid into centralized market?
3:40:10 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Utility purchasing least cost generation from central market?
3:40:56 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	In RTO, Ghent 2 not able compete in marketplace?
3:41:56 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Examination. Why be case, why position calculation for vertically integrated utility member RTO makes determination about own resources differently than same utility not part of RTO?
3:42:54 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Would be net revenues?
3:43:00 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	If in PJM and in capacity market, required buy back entirety of demand, be paid clearing price and pay clearing price but net dollar difference be zero?
3:44:36 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Load and generator LMP usually not very different?
3:45:08 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	If you had generator next to node, generation in area at LMP paid what customers paying in area?
3:46:25 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Saying do entire process differently whether member or not?
3:47:35 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	What expect is do effectively resource planning and layer on top this will be market?
3:48:16 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Cross Examination (cont'd). Creating mini-RTO member market?
3:48:28 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Aware power from Ghent 2 to Kentucky Power?
3:48:40 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Similar to creating mini-RTO energy market?
3:49:11 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Not have protections find in RTO?
3:49:28 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Not expect Ghent 2 economic for LG&E/KU ratepayers?
3:49:55 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Not expect Ghent 2 cost effective in RTO?
3:50:39 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Have associated environmental costs?
3:50:52 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Not want to keep Ghent 2 for LG&E/KU customers, selling Ghent 2 power to Kentucky Power mean Kentucky Power customers losing out on better deal or LG&E/KU selling power at price creating loss?
3:52:23 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	If to benefit of customer not necessarily detriment to Ky Power customers?
3:52:47 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Direct, page 4, lines 6-9, you state, reading (click on link for further comments)?
3:54:38 PM	Atty Huddleston Sierra Club - witness Bellar Note: Sacre, Candace	Page 3, direct, lines 6-9, Good Neighbor Plan, state, reading, (click on link for further comments), correct?

3:55:22 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Since beginning of case, retirements Ghent 2 and Mill Creek 2 is environmental compliance makes unit uneconomic?

3:55:36 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Remains underlying reason for requested retirements?

3:55:42 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Concerned placing SCR on units at issue could lead to stranded asset costs?

3:56:43 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Concerned not receive retirement order, situation install SCRs on units, make asset recovery more different?

3:57:41 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Not receive order retirement, install SCRs on units, at some point retire, more difficult retire?

3:59:12 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Direct, page 26, question states, reading, (click on link for further comments), and you stated yes?

4:00:01 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Was 2022 RTO membership analysis?

4:00:16 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace May 23, 2023, as corrected?

4:00:36 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace In May 2023, not aware of updated RTO membership analysis?

4:00:58 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Not aware of error?

4:01:11 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Know which other witness?

4:01:21 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Taken position environment too uncertain join PJM at this time?

4:02:12 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Commission could order reappear following announcement of market reforms?

4:03:27 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Not aware \$200 million difference in outside consultants assessment economics of joining RTO changed November to May?

4:03:49 PM Atty Ingram KU/LG&E
Note: Sacre, Candace Object, asked and answered. (Click on link for further comments.)

4:03:57 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Are aware another witness in case filed testimony contradicts RTO study?

4:04:22 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Asking those questions go to heart of recommendation making to Commission about timing, best person Sinclair?

4:05:00 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Limited amount of geological storage near Brown?

4:05:27 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Know capital cost of carbon capture storage?

4:06:09 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Operational challenges, your or Imber?

4:06:26 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Please describe operational challenges at Mill Creek 1?

4:07:52 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Know NAQS requirement for Mill Creek 1 or 2?

4:08:20 PM Atty Huddleston Sierra Club - witness Bellar
Note: Sacre, Candace Better for Imber?

4:08:59 PM Chairman Chandler
Note: Sacre, Candace Mr. Cmar?

4:09:07 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Cross Examination. One benefit RTO broader pool of resources?

4:09:46 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Being member of PJM reduce liability risk?

4:10:37 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Agree being member provide easier access resources outside territory?

4:11:19 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Last Christmastime with Elliott, PJM members not suffer curtailments?

4:11:56 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Cost of demand side management issues, in room?

4:12:18 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Assuming approval of demand side management energy efficiency measures

4:13:44 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Able say percentage reduction energy sales implementation DSM in this case?

4:14:41 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Know if developed DSM develop target percentage of savings?

4:15:12 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Not aware target percentage?

4:15:18 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace How compares to national average?

4:15:30 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Not aware how compares top performing utilities on energy efficiency?

4:15:41 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Getting responses by Sept 11, RFPs from EPC contractors?

4:16:27 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Only entertaining bids from original equipment manufacturers who be EPC contractors?

4:17:29 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Aware three particular manufacturers partnering with EPC contractors combined bids?

4:17:53 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Potential for particular changes in bids?

4:18:19 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Lump sum contract?

4:18:27 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Pricing risk of cost-over runs?

4:18:52 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Incentive conservative about cost of two EGCs?

4:19:08 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Conservative in sense put in bid lump sum contract and as moves forward significantly more expensive than bid?

4:19:41 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Current cost based off study HDR?

4:19:54 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Request by engineering group?

4:20:01 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace No other bids for gas fired units?

4:20:14 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace One major reason why no bids because June '22 RFP not seek use own sites?

4:21:07 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Include list of reasons provide advantages?

4:21:26 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Responses to EPC contractor RFP Dec11 first time outside companies weighing in on how much two new NGCs cost?

4:22:18 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Lump sum contract have provisions cost increases pass on to companies and ultimately ratepayers?

4:22:45 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Sense of what provisions might look like?

4:23:33 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Be issues likely addressed in RFP responses?

4:24:07 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Reason not able provide RFP responses in post-hearing data request?

4:24:25 PM Atty Cmar Joint Intervenors
Note: Sacre, Candace Request post-hearing data request on topic.

4:24:26 PM POST-HEARING DATA REQUEST
Note: Sacre, Candace ATTY CMAR JOINT INTERVENORS - WITNESS BELLAR
Note: Sacre, Candace PROVISIONS OF EPC CONTRACT

4:25:00 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Response to Data Request 5-2, fair to say EPA greenhouse gas rules finalized NGCs choose among three pathways?

4:26:52 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Three compliance pathways, new NGCC reduce capacity factor below 50 percent?

4:27:14 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Another pathway be meet 90 percent CCS standard by 2035?

4:27:24 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Third one low greenhouse gas hydrogen co-firing standard 30 percent co-firing by 2032 increasing to 96 percent 2038?

4:27:59 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Not know which choose?

4:28:12 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Not currently know how much cost meet requirements?

4:28:44 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Fair to say uncertainties how comply?

4:29:16 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace New NGCCs, not know where greenhouse hydrogen come from?

4:29:51 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Not know where come from not know how much cost?

4:30:20 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Not know how much modifications would cost?

4:31:02 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Included in EPC responses?

4:31:10 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace 2032 standard, 2038 standard, or both?

4:31:35 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Not thing 96 percent part?

4:31:48 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Know carbon capture and sequestration feasible?

4:32:31 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Not know how much cost?

4:33:06 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Discussion about build miles of pipeline build carbon capture?

4:33:38 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Developed cost estimate?

4:33:50 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Mentioned requirements for coal units under greenhouse gas rules, what understanding options be for those units?

4:35:26 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Page 4 of 22, state stress test modeling showed operate existing coal units rather than retire would be free while constraining

4:36:46 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Reason believe compliance be free for existing coal units?

4:37:20 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Think reasonable assumption?

4:38:33 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Examination. Cost of abatement same as tax credit?

4:38:55 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Saying remaining units?

4:39:06 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). Rebuttal, page 16, Kollen testimony Ghent 2, reading, (click on link for further comments), see that?

4:40:15 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Other than Good Neighbor plan?

4:40:29 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Other requirements for Ghent 2?

4:40:51 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Brown battery storage, said rationale seeking approval operational experience?

4:41:13 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Operational experience, unpack what mean by that?

4:43:08 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Also include experience constructing battery?

4:43:37 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Also include experience how battery operates once put into service?

4:44:12 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Need for gain experience physical management?

4:44:41 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Also include specific personnel trained in operating?

4:45:02 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Also include effecting how dispatch resources to meet demand?

4:45:32 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Sense at this point how decide in real time which units to dispatch?

4:46:20 PM Atty Cmar Joint Intervenors - witness Bellar
Note: Sacre, Candace Addition also contribute resilience in system?

4:46:49 PM Chairman Chandler
Note: Sacre, Candace Questions?

4:47:01 PM Atty Kurtz KIUC - witness Bellar
Note: Sacre, Candace Cross Examination. Read from SB 4, reading, (click on link for further comments), familiar with that?

4:47:28 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Reliability capacity and energy concept?
4:47:42 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Resilience quickly and effectively respond, how distinguish resilience and reliability?
4:48:48 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	What type generation has best quality of reserve on system?
4:49:33 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Plan meets SB 4, doing on system wide not individual power plant look?
4:50:08 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Think analysis under SB 4 differ by utility?
4:50:55 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Explain how coal powered plant works compared to natural gas combined cycle?
4:53:20 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Looking at fuel, true coal unit store 30-60 days fuel on site, more reliable?
4:54:53 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	True coal store fuel 30-60 days on ground, natural gas firm transportation real time and energy usage no matter hedge price?
4:55:13 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Equivalent forced outage/forced outage rate better for new gas combined cycles versus coal units proposing retire?
4:55:34 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Planned outages, which have longer, coal or combined cycle?
4:56:33 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Ramping and load following, combined cycle is superior technology versus coal ability to follow load and up and down quickly?
4:56:45 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Heat rate, combined cycle much lower?
4:57:15 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Low heat rate good converts fuel to energy more quickly?
4:57:28 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Mill Creek 1 300-megawatt unit?
4:57:33 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Retire 2024?
4:57:37 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Only operating five months year?
4:58:05 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Mill Creek 1 or 2 sit idle seven months year?
4:58:25 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Mutually exclusive, build Mill Creek natural gas and keep 1 and 2 operational?
4:59:40 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Not technically mutually exclusive continue operate 1 and 2 and get permit for CC plant?
5:00:13 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Had Mill Creek 1 and 2 and combined cycle need upgrades?
5:00:30 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Mill Creek units operated at 50 percent capacity factor?
5:00:56 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Brown 416 megawatt coal plant?

5:00:58 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Low 20s capacity factor?
5:01:13 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Not economic why not run as much?
5:01:23 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Coal transportation differential?
5:01:32 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Brown 3 supplied with Kentucky coal?
5:01:39 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Build second combined cycle at Brown site?
5:01:46 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	No air permit issue CC plant if were to keep Brown 3 and build combined cycle?
5:02:15 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Might be mutually exclusive?
5:02:28 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Examination. What hear broader question, take from response yes except for permits?
5:03:01 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Is there enough room, what not say except for permit, yes, don't understand except as to air quality permit?
5:04:02 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Know incremental cost of those items?
5:04:23 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	And then Brown?
5:05:51 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Also done studies with determination around East Kentucky Cooper units?
5:06:37 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Cross Examination (cont'd). PJM have need for capacity?
5:07:15 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	PJM desperate for thermal resources, Brown 3 something PJM might want?
5:07:30 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Ghent 2, 495-megawatt coal unit?
5:07:37 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	No permit issues Ghent 2 not proposing build gas plant there?
5:07:46 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Retirement moved up to 2028?
5:08:10 PM	Chairman Chandler Note: Sacre, Candace	Take recess until 5:48.
5:08:38 PM	Session Paused	
5:55:35 PM	Session Resumed	
5:55:55 PM	Chairman Chandler Note: Sacre, Candace	Back on the record.
5:56:08 PM	Chairman Chandler Note: Sacre, Candace	Hearing recommendations. (Click on link for further comments.)
5:57:02 PM	Chairman Chandler Note: Sacre, Candace	Mr. Kurtz, continue?
5:57:05 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Cross Examination (cont'd). Original retirement Ghent 2 was 2034 before Good Neighbor Plan moved it up to 2028?

5:57:25 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	In order comply with Good Neighbor Plan have to spend \$126 million on SCR?
5:57:34 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	About \$250 kW?
5:57:43 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Operate 12 months of year?
5:57:55 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	If not Good Neighbor plan, operate seven months out of year?
5:58:24 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Agree of coal units Mill Creek 1 Mill Creek 2 Brown 3 and Ghent 2, Ghent 2 biggest and best?
5:59:08 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Ghent 2 on river?
5:59:12 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Not tear down anything?
5:59:34 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Very good fuel rate?
5:59:51 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Compare Brown 3 and Ghent 2?
6:00:38 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Assume Commission granted two CPCN and denied Ghent 2, what company do?
6:02:28 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Two new natural combined cycle and continuation Ghent on system, sell that energy?
6:03:13 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Assumption was two new gas plants and denied retirement for Ghent?
6:03:31 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Under scenario, willing offer energy under unit power agreement or similar structure?
6:05:04 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Examination. Along scenario, considering SB 4, if retired Mill Creek 1 Mill Creek 2 Brown 3, left Ghent 2 open, varied amount of solar, both combined cycles, expectation LLOE lower than three and a half?
6:06:35 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Proposal without PPAs, with or without, and adding Ghent back in nonozone season, would be even lower than one proposed?
6:07:41 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Taking snapshot of current system, meet or exceed?
6:08:17 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Taking SB 4 on face, if did scenario asked about, raise bar from three and a half LLOE to whatever resulting LLOE this case be new reliability bar going forward?
6:10:10 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	In 2029, conversation with Kurtz, LLOE way modeling it assume LLOE lower than three and a half?
6:10:56 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Come back and retire Ghent 2 at that point, proposal for replacement generation have to beat now even higher bar of lower than three and a half?
6:12:25 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Like new demand ratchet, ratchets up but cannot come down?

6:13:41 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Only mitigating factor keeping or exceeding it generation gets less reliable and next time propose to replace it?
6:15:01 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Company proposing PPA not necessarily approved by Commission?
6:15:29 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Add PPAs in intervening, PPAs taken into account determining system LLOE?
6:16:15 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Moral hazard making system more reliable, have to meet that status quo?
6:17:23 PM	Atty Ingram KU/LG&E Note: Sacre, Candace	Not necessarily interpretation of SB 4. (Click on link for further comments.)
6:19:27 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Moves the bar for reliability?
6:20:54 PM	Chairman Chandler Note: Sacre, Candace	Exclusively LLOE perspective, begs the question does it raise the hurdle?
6:21:25 PM	Atty Kurtz KIUC - witness Bellar Note: Sacre, Candace	Cross Examination (cont'd). Saying very reliable increasing reliability replacing old plant with one more reliable?
6:22:16 PM	Chairman Chandler Note: Sacre, Candace	Mr. Bellamy?
6:22:22 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Cross Examination. Looking at KU Response, Staff First, Q 100, talked about calculating equivalent forced outage rate, explain what done with this chart?
6:24:25 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Each of units unavailable due to forced outage?
6:24:40 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Equivalent forced outage rate, how calculate that?
6:25:01 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Weighted average?
6:25:15 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	When companies looked at forced outage rates determine what rates to use reliability, used forced outage rate or that plus equivalent forced outage rate?
6:26:00 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Ask for post-hearing data request same as this but providing equivalent forced outage rates?
6:26:01 PM	POST-HEARING DATA REQUEST Note: Sacre, Candace Note: Sacre, Candace	ASST GEN COUNSEL BELLAMY PSC - WITNESS BELLAR RESULTING RATES FOR RELIABILITY PROVIDED BY USING EQUIVALENT FORCED OUTAGE RATE
6:26:16 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Cane Run 7 natural gas combined cycle unit?
6:26:23 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	What caused uptick in 2022?
6:26:58 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Out for maintenance and could not come back on line?
6:27:15 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Ghent 4, similar forced outage rates as Cane Run 7 through 2021, 2022 forced outage rate of 5.25?

6:27:45 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	What happened Cane Run 7 during Elliott, derate four or five hours, how affect forced outage rate for year?
6:29:39 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	If asking for equivalent forced outage rate for Cane Run 7, derating from Elliott not reflected in any way?
6:30:13 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Trying to see how event like that translate into forced outage rate, but if saying not show up, is there any mechanism used to track deratings of that nature?
6:31:21 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Familiar certain RTOs and some utilities use effective load carrying capability measure of reliability?
6:31:40 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Capture type of derating occurred at Cane Run 7?
6:31:59 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Witness who have better idea?
6:32:19 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Rebuttal, page 18, responding to Goggin testimony, line 5, disagree companies overstated reliability of gas fired generation, correlated outage with Elliott, companies not take into account, disagree was correlated outage?
6:35:10 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Testimony on to page 18, three fixes companies identified, with improvements eliminated issue that caused Elliott?
6:37:29 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Explain No. 2, what exactly that is?
6:39:13 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Put in place to protect unit or why there originally?
6:39:40 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Removing it damage unit or affect future reliability?
6:39:53 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Software fix would have eliminated 90 percent of load shed?
6:40:21 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Adding fuel oil to natural gas units or compression device?
6:40:59 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Indicated when requesting bids asked also asked add fuel oil, asking add compression devices?
6:41:51 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	RFPs require bidders respond with compression control device or fuel oil or ask respond with both or neither?
6:42:20 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Indicates what want?
6:42:46 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	No. 1 upgrades made on Texas Gas pipeline, confident prevent future issues with loss of pressure or gas itself?
6:45:13 PM	Chairman Chandler Note: Sacre, Candace	Recess.
6:45:16 PM	Session Paused	
6:50:14 PM	Session Resumed	
6:50:36 PM	Chairman Chandler Note: Sacre, Candace	Back on record.

6:50:45 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). Response, Staff Second, Item 73, reading (click on link for further comments), confirm Texas Transmission and Tennessee Pipeline sufficient, no information other utilities, what was nature of confirmation received?

6:52:26 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Sinclair have more information?

6:52:41 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Reserve share agreement with TVA?

6:52:50 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Any other entities in agreement?

6:52:57 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Examination. Say spending reserves referring to contingency reserves?

6:53:33 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Your portion biggest unit on system?

6:53:53 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace CRSG, operating reserves?

6:54:14 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). Coordinate with TVA?

6:54:43 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Inform their plans?

6:55:02 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Any idea whether TVA build new natural gas cycle or combined cycle?

6:55:26 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Know extent of capacity as far as gas?

6:55:42 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Expect them sourcing gas from pipeline?

6:56:00 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Response to Staff Fifth, Item 2, responding party, page 16, natural gas units under new GSG rules?

6:57:01 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace LG&E balancing area?

6:57:12 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Not area outside balancing area in Eastern Kentucky?

6:57:27 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Discussion about whether new pipeline necessary serve that load?

6:58:36 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace If building amount within balancing area, probably issues with supply given pipeline infrastructure?

6:59:30 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Indicate extent have capacity to serve?

6:59:49 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Response, Staff Second, Item 55, transmission projects necessary, asked about voltage support, indicate report discusses upgrades necessary avoid voltage issues?

7:01:51 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Avoid thermal overloads and voltage issues?

7:02:07 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Cooper Unit 2 and Cooper Unit 2, contingency?

7:02:18 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Loss of one but not both?

7:03:08 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Item 53, asks about costs, provide costs as in Table 35, indicated cost be \$988,700, assuming no natural gas combined cycle?

7:05:20 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace \$900,000 what be necessary operate Ghent 2 year round and Brown 3 retired and Mill Creek 1 and 2 retired?

7:06:12 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Subpart b, reading, (click on link for further comments), have to spend \$39 to \$52 million?

7:07:21 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Companies say looked primarily combined cycle at Mill Creek, why do that if can save \$50 million putting it at Brown?

7:08:21 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Decision to put at Mill Creek associated with continuing operate Brown 3?

7:09:16 PM Chairman Chandler
Note: Sacre, Candace Examination. Still not understand why Mill Creek preferable as opposed to Brown, read all responses sounds like only given CPCN one CC want put it at Mill Creek?

7:10:56 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace All scenarios looked at, assume Brown BESS?

7:11:18 PM Chairman Chandler - witness Bellar
Note: Sacre, Candace Not just about combined cycles?

7:11:32 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Cross Examination (cont'd). Scenarios discussed here referring to confidential document include solar additions?

7:12:22 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Anticipate retirement of three single cycle units looking to retire?

7:13:22 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Asked by Kurtz possibility building Mill Creek ?? Brown 1 and 2 being decommissioned, natural gas combined cycle?

7:14:26 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Nameplate capacity for two units?

7:14:32 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Not sure whether could add?

7:14:45 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Possible with transmission study provided look at what kind of additional capacity required operate natural gas combined cycle unit at Brown with Brown 3 operational?

7:14:46 PM POST-HEARING DATA REQUEST
Note: Sacre, Candace ASST GEN COUNSEL BELLAMY PSC - WITNESS BELLAR
Note: Sacre, Candace ADDITIONAL CAPACITY REQUIRED OPERATE NATURAL GAS COMBINED CYCLE AT BROWN WITH BROWN 3 OPERATIONAL

7:15:24 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Able do same thing with Mill Creek?

7:15:55 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Reliability and resiliency, looking at baseline, when looking at reliability and calculating LLOE, looking at 2028T for baseline such that existing units may need improvements continue operating?

7:17:47 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Talked about looking at baseline and comparing how new system operate, consider baseline Mill Creek 2 without SCR?

7:19:01 PM Asst Gen Counsel Bellamy PSC - witness Bellar
Note: Sacre, Candace Talking about what did in Exhibit SB 4-1?

7:19:27 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	No retirements, assume units have all environmental units added to them?
7:19:44 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Have position whether CPCN required for SCR on Mill Creek 2 or Ghent 2?
7:20:11 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Baseline be from reliability Mill Creek 2 and Ghent 2 look at Mill Creek and Ghent 2 without SCR and operating under environmental regulations in place at that time?
7:22:31 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	With respect retirement Mill Creek 1 in 2024, testimony in 2023-00123 environmental plan at that time?
7:23:23 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Need cooling tower and water treatment facilities?
7:23:38 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Not operated simultaneously with Mill Creek 2, not cost effective add units?
7:24:00 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Not situation add environmental units, not operating full capacity already, not cost effective add?
7:24:29 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Explain what agreed order requires specifically?
7:25:26 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	No trading, hard limit, prevents from operating both at same time?
7:25:43 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Good Neighbor Plan in effect in 2030?
7:25:57 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Correct hard limit require any unit have SCR to continue operating?
7:26:30 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Not accumulated amount, in any instant not produce that much and only way do that with SCR?
7:27:03 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Talking about PPL carbon plan, taking natural gas combined cycles out of service in 2050, if made sense continue operate from least cost perspective?
7:28:49 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Does EPA look at new and existing source performance standards every eight years?
7:29:04 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Next time expect them look at them?
7:29:19 PM	Asst Gen Counsel Bellamy PSC - witness Bellar Note: Sacre, Candace	Carbon plan envision risk further carbon regulation, carbon plan reflecting where expect market go?
7:31:25 PM	Chairman Chandler Note: Sacre, Candace	Questions?
7:31:38 PM	Chairman Chandler Note: Sacre, Candace	Ms. Huddleston, move introduce? (Click on link for further comments.)
7:31:39 PM	SIERRA CLUB HEARING EXHIBIT 1 Note: Sacre, Candace Note: Sacre, Candace	ATTY HUDDLESTON SIERRA CLUB - WITNESS BELLAR WINTER STORM ELLIOTT EVENTS IN THE LG&E AND KU BALANCING AUTHORITY AREA (BAA) DECEMBER 23-24, 2022

7:32:01 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Examination. In 2017 aware companies filed application with Commission get rid of DSM programs?
7:32:47 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Not provide testimony in that case?
7:32:59 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Huff, now retired?
7:33:08 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Lawson and Lovekamp?
7:33:12 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Remember companies' proposal primary reason for proposal, reading (click on link for further comments), sound familiar?
7:33:52 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Where company felt like was in 2017?
7:34:18 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	DSM programs not pencil out?
7:34:32 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	In 2020-00061, Mill Creek 1 discussed?
7:34:59 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	In 2020-00061 expected Mill Creek 1 retire before 2025 prospect of nonattainment?
7:35:31 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Chose not to propose CPCN intervening issues caused unit retire?
7:36:13 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Expected be able retire Mill Creek 1 without additional generation?
7:36:33 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Discussed fate of Mill Creek 2?
7:37:19 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Asked you to watch that discussion?
7:37:29 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Other than Mill Creek 1 retiring, anything different from Lawson testimony in 2017-00441?
7:40:05 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	URL at top, PSC website, Lovekamp uploaded it, 2019-2025 demand side management plant Exhibit GSL-1, avoided capacity benefits?
7:42:12 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	After having read, does level of questions had in 2020 environmental case and 2020 rate case retirement scenario and IRP juxtapose what company saying in 2017?
7:43:04 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Thirty years from 2017 be 2047?
7:44:01 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	2020-00061 case Table 3 page 6 of 41, depreciation retirement year, year depreciating assuming economic life?
7:44:40 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Predate LEB-2 did in 2020 rate cases?
7:44:47 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Mill Creek 1 retirement date of 2032, Mill Creek 2 retirement date 2034, 2038, 2042, 2034, 2034, 2037, 2038, 2050, 2066, other than two Trimble Co units, agree all units expected retire within next 30 years from 2017?
7:45:29 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Have any reason believe company expected retire any of units without need for replacement generation?

7:46:16 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Replaced entirety of Mill Creek and entirety Ghent
7:46:33 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Ever envision that?
7:47:03 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	In rate cases provided LEB-2?
7:47:19 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Proposed update retirement dates?
7:47:33 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	What trying to do with updated retirement dates?
7:47:57 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Fifteen years, time for IRP?
7:48:02 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	GLS-1, 15 years from 2017 be 2032?
7:48:16 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	How many units update for retirements before 2032?
7:48:26 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Which updated dates within 15 years of 2017?
7:48:51 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Ghent not in this?
7:48:54 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Ghent not updated as part of LEB-2?
7:49:22 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	When did you know Ghent needed be something earlier than currently being depreciated rates?
7:50:10 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Immediate anticipation filing this case?
7:50:14 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	IRP in 2021?
7:50:32 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Model pick economic retirement dates of generation retirements in IRP or hard coded or currently depreciating units?
7:51:18 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Understanding within 15 years anything planned be retired hard coded those years?
7:51:50 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Why wait until CPCN economic suggest retirement?
7:53:45 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	From positions in case, surprise to find out Good Neighbor rule being updated?
7:54:08 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Previous CCR cases discussions about three units across system not have SCRs, determine which upgrades make?
7:54:40 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Future compliance costs existed, CPCN analyses?
7:55:14 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Risk taking into account, a lot of money, modeling risks future environment costs, none of risks taken into account?
7:56:40 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Doing it that way, knowing risk exists not taking into account holistic planning, runs risk of created stranded costs?
7:57:17 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Make investment depreciate over long period of time, not last as long as thought, reality not line up with expectations?

8:00:16 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Agree not reasonable assume no cost of abatement two proposed combined cycles with relation NSPS?
8:01:05 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Clear from record think reasonable assume cost of compliance even if reduction of capacity factor, some sort of risk?
8:01:42 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Next step, reasonable assume not be higher abatement cost eight years from implementation?
8:02:39 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Qualitative determination, advocate or believe assume no cost of abatement for two proposed combined cycles eight years from 2024?
8:03:54 PM	Chairman Chandler - witness Bellar Note: Sacre, Candace	Not think get any worse for combined cycle than 90 percent?
8:04:40 PM	Chairman Chandler Note: Sacre, Candace	Objection 8:30 in the morning?
8:05:00 PM	Chairman Chandler Note: Sacre, Candace	Any questions?
8:05:12 PM	Chairman Chandler Note: Sacre, Candace	Procedural discussions.
8:05:28 PM	Chairman Chandler Note: Sacre, Candace	Recess until 8:30.
8:05:53 PM	Session Ended	



Exhibit List Report

2022-00402 22Aug2023

**Kentucky Utilities Company and
Louisville Gas and Electric
Company (KU/LG&E)**

Name:	Description:
KCA HEARING EXHIBIT 1	NEWS RELEASE AUGUST 16 2023 AEP COMPLETES SALE OF UNREGULATED RENEWABLES ASSETS
KCA HEARING EXHIBIT 2	PPL CORPORATION PROXY SUMMARY EXECUTIVE COMPENSATION PROGRAM
KCA HEARING EXHIBIT 3	PPL CORPORATION EXECUTIVE COMPENSATION TABLES
KCA HEARING EXHIBIT 4	PPL CORPORATION 2ND QUARTER INVESTOR UPDATE AUGUST 4 2023
KCA HEARING EXHIBIT 5	NORTH AMERICAN ENERGY STANDARDS BOARD GAS ELECTRIC HARMONIZATION FORUM REPORT JULY 28 2023
SIERRA CLUB HEARING EXHIBIT 1	WINTER STORM ELLIOTT EVENTS IN THE LG&E AND KU BALANCING AUTHORITY AREA (BAA) DECEMBER 23-24 2022

NEWS RELEASE

August 16, 2023

AEP COMPLETES SALE OF UNREGULATED RENEWABLES ASSETS

SHARE:

COLUMBUS, Ohio, Aug. 16, 2023 – American Electric Power (Nasdaq: AEP) has completed the sale of its 1,365-megawatt (MW) unregulated, contracted renewables portfolio to IRG Acquisition Holdings, a partnership owned by Invenery, CDPQ and funds managed by Blackstone Infrastructure, at an enterprise value of \$1.5 billion including project debt. AEP nets approximately \$1.2 billion in cash after taxes, transaction fees and other customary adjustments.

"This sale is part of our strategy to streamline and de-risk the business and focus on our regulated operations," said Julie Sloat, AEP president and chief executive officer. "Over the next five years, we plan to invest nearly \$40 billion primarily in our regulated wires and generation businesses. The proceeds from this sale will be used to continue to modernize the energy grid, shift to a more balanced generation portfolio and enhance service for our customers while strengthening our balance sheet."

AEP signed an agreement to sell the assets in February 2023 and obtained approval from the Federal Energy Regulatory Commission, clearance from the Committee on Foreign Investment in the United States and approvals under applicable competition laws.

The sale portfolio includes 14 projects, representing 1,200 MW of wind and 165 MW of solar in 11 states. The renewable power from the projects is contracted under long-term agreements with other utilities, corporations and municipalities.

J.P. Morgan served as lead financial advisor and Citigroup Global Markets served as financial advisor to AEP for this transaction. Hunton Andrews Kurth LLP served as legal counsel to AEP.

American Electric Power, based in Columbus, Ohio, is powering a cleaner, brighter energy future for its customers and communities. AEP's approximately 17,000 employees operate and maintain the nation's largest electricity transmission system and more than 225,000 miles of distribution lines to safely deliver reliable and affordable power to 5.6 million regulated customers in 11 states. AEP also is one of the nation's largest electricity producers with nearly 29,000 megawatts of diverse generating capacity, including approximately 5,800 megawatts of renewable energy. The company's plans include growing its regulated renewable generation portfolio to approximately 50% of total capacity by 2032. AEP is on track to reach an 80% reduction in carbon dioxide emissions from 2005 levels by 2030 and has committed to achieving net zero by 2045. AEP is recognized consistently for its focus on sustainability, community engagement, and diversity, equity and inclusion. AEP's family of companies includes utilities AEP Ohio, AEP Texas, Appalachian Power (in Virginia and West Virginia), AEP Appalachian Power (in Tennessee), Indiana Michigan Power, Kentucky Power, Public Service Company of Oklahoma, and Southwestern Electric Power Company (in Arkansas, Louisiana, east Texas and the Texas Panhandle). AEP also owns AEP Energy, which provides innovative competitive energy solutions nationwide. For more information, visit aep.com.

OTHER NEWS RELEASES

August 21, 2023

AEP Board Elects Sloat Chair, Names Stoddard Board Member

The Board of Directors of American Electric Power has elected Julie Sloat chair of the Board, effective Oct. 2. Sloat is AEP's president and chief executive officer. In addition, Daniel G. "Dan" Stoddard, retired senior vice president, chief nuclear officer and president of Contracted Assets for Dominion Energy, has been elected to the Board.

[Read more](#)

August 01, 2023

AEP RECOGNIZED AS ONE OF THE BEST COMPANIES TO WORK FOR

[Read more](#)

July 31, 2023

AEP TO REDEEM SENIOR NOTES

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B2B & SUPPLIERS

RECREATION

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ENVIRONMENT

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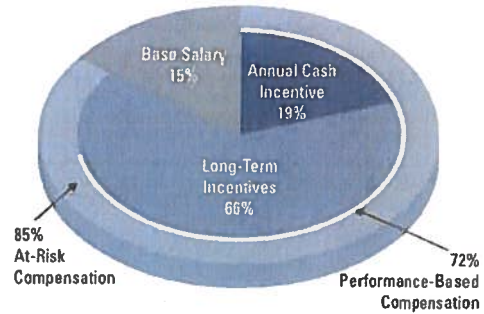
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Executive Compensation Program

Overview

Our executive compensation program reflects the company's ongoing commitment to pay for performance. The compensation of our named executive officers, or NEOs, is aligned with our corporate strategic framework, which links executive compensation with the interests of our shareowners. In 2022, 85% of the CEO's target compensation opportunity was "at-risk" and 72% was performance-based.

CEO's 2022 Target Total Direct Compensation Mix



Compensation Element	Features for 2022
Base Salary	<ul style="list-style-type: none"> Reviewed annually Compensation Committee applies judgment in setting salary to reflect performance, experience and responsibility, and also considers market data
Annual Cash Incentive	<ul style="list-style-type: none"> Paid in cash Combination of corporate and business segment financial and operational performance, as well as individual performance Capped at two times target payout for top performance
Long-term Equity Incentives (LTI)	
Performance Units Based on TSR, EG and ESG	<ul style="list-style-type: none"> Payable in shares of PPL common stock Payout range from 0% to 200% of target, subject to certification of performance at the end of the three-year performance period Dividends accrue quarterly in the form of additional performance units, and vest according to the applicable level of achievement of the performance goal, if any
80% of LTI	<p>TSR-based Performance Units (50% of Performance Units)</p> <ul style="list-style-type: none"> Based on three-year total shareowner return (TSR) performance relative to the PHLX Utility Sector Index (UTY) <p>EG-based Performance Units (25% of Performance Units)</p> <ul style="list-style-type: none"> Based on three-year cumulative earnings growth (EG) from the pro forma ongoing earnings guidance for the full year assuming RIE ownership <p>ESG-based Performance Units (25% of Performance Units)</p> <ul style="list-style-type: none"> Based on three-year performance of three climate-related measures, consisting of reductions in company vehicle emissions, reductions in building energy usage, and closure of Mill Creek Unit 1, a coal-fired generating facility in Kentucky
Restricted Stock Units	<ul style="list-style-type: none"> Payable in shares of PPL common stock Restricted for three years following grant Dividends accrue quarterly in the form of additional restricted stock units, but are not paid unless and until underlying award vests
20% of LTI	
Other Elements	<ul style="list-style-type: none"> Limited perquisites Retirement plans Deferred compensation plans

EXECUTIVE COMPENSATION

EXECUTIVE COMPENSATION TABLES

The following table summarizes all compensation for our chief executive officer, our chief financial officer, our next three most highly compensated executives for 2022, known as our named executive officers, or NEOs, for service to PPL and its subsidiaries.

SUMMARY COMPENSATION TABLE

Name and Principal Position ⁽¹⁾	Year	Salary ⁽²⁾	Bonus	Stock Awards ⁽³⁾	Option Awards	Non-Equity Incentive Plan Compensation ⁽⁴⁾	Change in Pension Value and Nonqualified Deferred Compensation Earnings ⁽⁵⁾	All Other Compensation ⁽⁶⁾	Total	Total Without Change in Pension Value ⁽⁷⁾
Vincent Sorgi President and Chief Executive Officer (CEO)	2022	\$1,166,336	—	\$5,926,933	—	\$1,918,678	—	\$134,628	\$ 9,146,575	\$9,146,575
	2021	1,132,492	—	5,111,866	—	2,654,619	\$2,361,092	96,412	11,356,481	8,995,389
	2020	987,569	—	3,514,187	—	1,238,050	1,940,207	94,430	7,774,443	5,834,236
Joseph P. Bergstein, Jr. Executive Vice President and Chief Financial Officer (CFO)	2022	651,110	—	1,671,799	—	698,538	—	47,379	3,068,826	3,068,826
	2021	631,615	—	1,477,271	—	928,206	868,741	32,936	3,938,769	3,070,028
	2020	604,711	—	1,177,243	—	431,250	1,283,165	38,638	3,535,007	2,251,842
Gregory N. Dudkin Executive Vice President and Chief Operating Officer (COO)	2022	761,773	—	2,037,424	—	786,773	—	20,150	3,606,120	3,606,120
	2021	706,834	—	1,595,364	—	1,067,062	652,524	19,700	4,041,484	3,388,960
	2020	641,943	—	1,119,749	—	560,251	723,866	16,284	3,062,093	2,338,227
Wendy E. Stark Senior Vice President, General Counsel, Corporate Secretary and Chief Legal Officer (CLO)	2022	550,745	—	1,178,835	—	586,662	—	104,478	2,420,720	2,420,720
	2021	373,558	\$250,000	647,967	—	722,295	—	166,582	2,160,402	2,160,402
John R. Crockett III President - LG&E and KU	2022	488,976	—	837,059	—	370,108	—	56,100	1,752,243	1,752,243

(1) This column reflects the title of each NEO as of December 31, 2022.

Effective January 1, 2023, Mr. Dudkin's title changed to Executive Vice President from Executive Vice President and COO. Mr. Dudkin was on extended medical leave since mid-October 2022 and passed away on February 14, 2023.

Effective January 1, 2023, Ms. Stark's title changed to Executive Vice President, CLO and Corporate Secretary from Senior Vice President, General Counsel, Corporate Secretary and CLO.

(2) Salary includes cash compensation deferred to the PPL Executive Deferred Compensation Plan or, for Mr. Crockett, to the LG&E and KU Nonqualified Savings Plan. The following NEOs deferred salary in 2022 in the amounts indicated: Mr. Sorgi (\$34,990); Mr. Bergstein (\$45,578); Ms. Stark (\$44,060) and Mr. Crockett (\$34,877). These amounts are included in the "Nonqualified Deferred Compensation in 2022" table on page 75 as executive contributions for the last fiscal year.

(3) This column represents the aggregate grant date fair value of restricted stock units and performance units as calculated under ASC Topic 718, without taking into account estimated forfeitures. The grant date fair value of restricted stock units is calculated using the closing price of PPL common stock on the NYSE on the date of grant. The grant date fair value of the performance units reflected in this column are the target payouts based on the probable outcome of the performance condition, determined as of the grant date, and are disclosed in the "Grants of Plan-Based Awards During 2022" table on page 66. The maximum potential values as of the grant date of the TSR-based performance units granted in 2022 assuming the highest level of performance are as follows: Mr. Sorgi — \$5,201,864; Mr. Bergstein — \$1,467,253; Mr. Dudkin — \$1,788,190; Ms. Stark — \$1,034,630; and Mr. Crockett — \$734,625. The maximum potential values as of the grant date of the EG-based performance units granted in 2022 assuming the highest level of performance are as follows: Mr. Sorgi — \$2,217,334; Mr. Bergstein — \$625,449; Mr. Dudkin — \$762,220; Ms. Stark — \$441,013; and Mr. Crockett — \$313,165. The maximum potential values as of the grant date of the ESG-based performance units granted in 2022 assuming the highest level of performance are as follows: Mr. Sorgi — \$2,217,334; Mr. Bergstein — \$625,449; Mr. Dudkin — \$762,220; Ms. Stark — \$441,013; and Mr. Crockett — \$313,165. For additional information on the assumptions made in the valuation of performance units, refer to Note 11 to the PPL financial statements in the Annual Report on Form 10-K for the fiscal year ended December 31, 2022, as filed with the SEC. Further information regarding the 2022 awards is included in the "Grants of Plan-Based Awards During 2022" and "Outstanding Equity Awards at Fiscal Year-End 2022" tables elsewhere in this proxy statement.

EXECUTIVE COMPENSATION

- (4) Amounts represent cash awards paid in March 2023 for performance under the company's annual cash incentive award program for 2022. These amounts include amounts the NEOs have elected to defer to the PPL Executive Deferred Compensation Plan or, for Mr. Crockett, to the LG&E and KU Nonqualified Savings Plan. The following NEOs deferred cash awards in the amounts indicated: Mr. Sorgi — \$115,121; Mr. Bergstein — \$139,708; Ms. Stark — \$87,999 and Mr. Crockett — \$22,206. These amounts will be included in the "Nonqualified Deferred Compensation in 2023" table as executive contributions in next year's proxy statement if the executive is an NEO for 2023.
- (5) This column represents the sum of the changes during 2022 in the actuarial present value of accumulated benefit in the PPL Retirement Plan and PPL Supplemental Executive Retirement Plan, or PPL SERP, for Messrs. Sorgi and Dudkin, and the PPL Retirement Plan and PPL Supplemental Compensation Pension Plan for Mr. Bergstein. No above-market or preferential earnings under the PPL Executive Deferred Compensation Plan or the LG&E and KU Nonqualified Savings Plan were reportable for 2022. No amounts are shown for 2022 for Messrs. Sorgi, Bergstein or Dudkin because their change in pension value during 2022 was a negative amount. Mr. Sorgi's net decrease in pension value for 2022 was (\$1,679,475) and consisted of a decrease in the value of his accumulated benefit under the PPL Retirement Plan of (\$368,817) and a decrease in the value of his accumulated benefit under the PPL SERP of (\$1,310,658). Mr. Bergstein's net decrease in pension value for 2022 was (\$595,981) and consisted of a decrease in the value of his accumulated benefit under the PPL Retirement Plan of (\$413,589) and a decrease in the value of his accumulated benefit under the PPL Excess Plan of (\$182,392). Mr. Dudkin's net decrease in pension value for 2022 was (\$623,725) and consisted of a decrease in the value of his accumulated benefit under the PPL Retirement Plan of (\$161,158) and a decrease in the value of his accumulated benefit under the PPL SERP of (\$462,567).
- See "Nonqualified Deferred Compensation in 2022" beginning on page 74 for additional information.
- (6) The table below reflects the components of this column for 2022, which include (i) the company's matching contribution for each individual's 401(k) plan contributions; (ii) the company's fixed contribution for any individual participating in the PPL RSP; (iii) the company's contributions under nonqualified deferred compensation plans, or NQDC; (iv) certain perquisites including financial planning and tax preparation services, and executive physicals; and (v) other benefits or payments as noted.

Name	401(k) Match	401(k) Fixed Contribution	NQDC Employer Contributions	Financial Planning and Tax Preparation	Other	Total
Sorgi	\$9,150	N/A	\$104,478	\$11,000	\$10,000 ^(a)	\$134,628
Bergstein	9,150	N/A	38,229	—	—	47,379
Dudkin	9,150	N/A	—	11,000	—	20,150
Stark	13,725	\$9,150	72,603	9,000	—	104,478
Crockett	3,297	9,150	32,653	11,000	—	56,100

- (a) For Mr. Sorgi includes contributions made by the company under our charitable matching gift program, pursuant to which we will contribute, on a 100% matching basis, up to \$10,000 per year per person to specified charitable institutions.
- (7) In order to show the effect that the year-over-year change in pension value had on total compensation, as determined under applicable SEC rules, we have included an additional column to show total compensation minus the change in pension value. The amounts reported in the Total Without Change in Pension Value column may differ substantially from the amounts reported in the Total column required under SEC rules and are not a substitute for total compensation. Total Without Change in Pension Value represents total compensation, as determined under applicable SEC rules, minus the change in pension value reported in the Change in Pension Value and Nonqualified Deferred Compensation Earnings column. The change in pension value is subject to many external variables, such as interest rates, assumptions about life expectancy and changes in the discount rate determined at each year end, which are functions of economic factors and actuarial calculations that are not related to the company's performance and are outside of the control of the Compensation Committee.



2nd Quarter Investor Update

August 4, 2023

PPL Corporation

Cautionary Statements and Factors That May Affect Future Results



Statements made in this presentation about future operating results or other future events are forward-looking statements under the Safe Harbor provisions of the Private Securities Litigation Reform Act of 1995. Actual results may differ materially from the forward-looking statements. A discussion of some of the factors that could cause actual results or events to vary is contained in the Appendix of this presentation and in PPL's SEC filings.

Management utilizes non-GAAP financial measures such as, "earnings from ongoing operations," in this presentation. For additional information on non-GAAP financial measures and reconciliations to the appropriate GAAP measure, refer to the Appendix of this presentation and PPL's SEC filings.



Business Update

Vince Sorgi

President & Chief Executive Officer

2nd Quarter Investor Update

August 4, 2023

PPL Corporation

2nd Quarter Highlights



- **Reported Q2 2023 GAAP results of \$0.15 per share and ongoing earnings of \$0.29 per share**
- **Reaffirmed 2023 ongoing earnings forecast range of \$1.50 to \$1.65 per share and midpoint of \$1.58 per share**
 - Identified several areas to offset unfavorable impact of weather and storms experienced year-to-date
 - Tracking slightly ahead of our 2023 O&M forecast year-to-date
- **Reaffirmed long-term financial targets**
 - 6% - 8% annual earnings per share and dividend growth through at least 2026⁽¹⁾
 - \$12 billion capital investment plan through 2026
 - O&M savings of at least \$175 million by 2026
- **Utility operations performed well and continue to demonstrate benefits of technology**
 - Delivered excellent reliability performance across all our jurisdictions, despite increased storm activity in PA and KY
 - Remain on track with integration of Rhode Island Energy
 - Progressed on Advanced Metering Functionality (AMF) filing in Rhode Island – decision from RIPUC expected in Fall 2023
 - Advanced CPCN filing in Kentucky to replace retiring coal generation – decision from KPSC expected by November 6th
 - PPL Electric received two industry awards for innovative and first-of-its-kind use of Dynamic Line Rating (DLR) technology⁽²⁾

Note: See Appendix for the reconciliation of reported earnings to earnings from ongoing operations.

(1) Refers to PPL's projected earnings per share growth from 2023 to 2026 and targeted dividend per share growth in line with EPS.

(2) Awarded the 2023 Edison Award, by Edison Electric Institute (EEI), and the Industry Excellence Award, by S.E.E. (Southeastern Electric Exchange) for use of DLR technology.

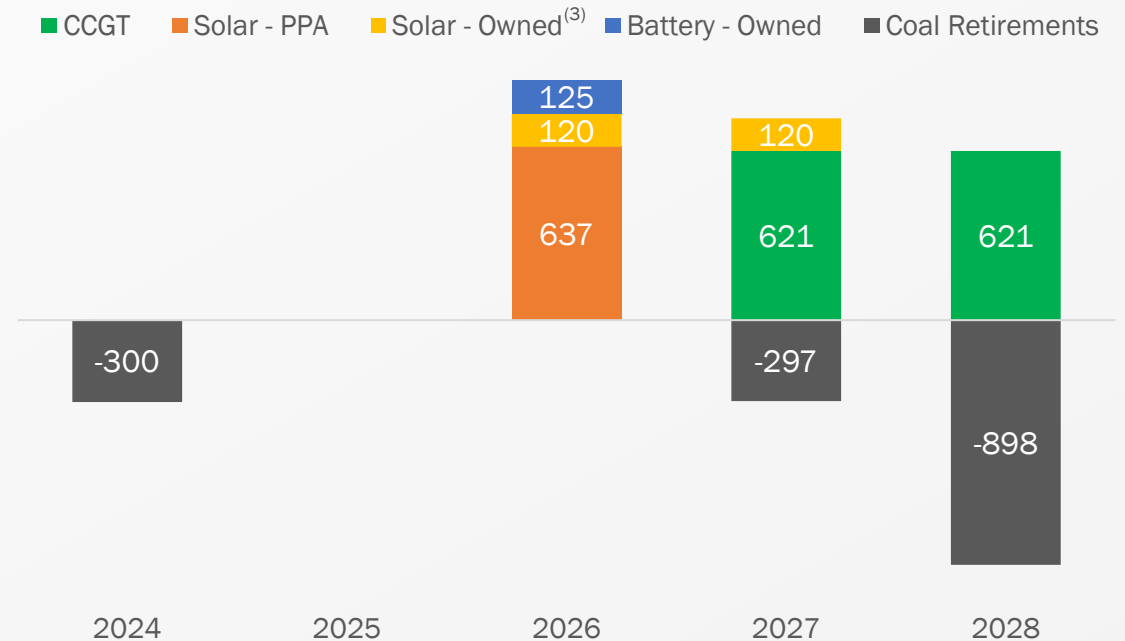
Kentucky CPCN Filing Update ⁽¹⁾⁽²⁾



Advancing our plan to invest in Kentucky’s future and the best path forward for our Kentucky customers

- **KPSC approved the consolidation of generation investment CPCN, DSM plan, and fossil fuel generation retirement request dockets in May**
- **Intervenor testimony filed July 14th – no surprises**
- **Scheduled informal conference with the KPSC on Aug. 15th for the purpose of discussing the issues in the filing and the possibility of a settlement**
- **Public hearings are scheduled to begin Aug. 22nd with an expected decision no later than Nov. 6th**
- **Remain confident our plan is more affordable, maintains reliability, and represents significantly cleaner sources of generation than continuing to operate coal-fired units proposed to be retired**

Generation Capacity Additions and Retirements per CPCN Filing ⁽¹⁾
(Capacity in MW)



(1) Certificate of Public Convenience and Necessity (CPCN) and Demand Side Management (DSM) filing with Kentucky Public Service Commission (KPSC), Case No. 2022-00402. Subject to KPSC approval.

(2) Planned retirements include Ghent 2 and the anticipated impact of the proposed Good Neighbor Rule as discussed in LG&E and KU’s CPCN filing.

(3) Includes 120MW self-build solar project with planned COD in 2026 and purchase of 120MW solar facility to be constructed by a 3rd party with a planned COD in 2027.



Financial Update

Joe Bergstein

Executive Vice President & Chief Financial Officer

2nd Quarter Investor Update

August 4, 2023

PPL Corporation

2nd Quarter Financial Overview



Overview of 2nd Quarter Financial Results

(Earnings per share)

	Q2 2023	Q2 2022
Reported Earnings (GAAP)	\$0.15	\$0.16
Less: Special Items	(\$0.14)	(\$0.14)
Ongoing Earnings	\$0.29	\$0.30
PA Regulated	\$0.16	\$0.17
KY Regulated ⁽¹⁾	\$0.13	\$0.16
RI Regulated	\$0.03	\$0.01
Corp. and Other ⁽¹⁾	(\$0.03)	(\$0.04)

- **Q2 2023 GAAP earnings of \$0.15 per share**
 - Q2 2023 special items of \$0.14 per share, primarily related to RI integration and related costs
- **Q2 2023 ongoing earnings of \$0.29 per share, a \$0.01 per share decrease from the prior year**
 - Lower sales volumes in KY and PA and higher expected interest costs were partially offset by lower O&M costs and a full quarter of RI Regulated segment results
- **Mild weather unfavorably impacted results by \$0.03 per share compared to normalized forecast**
 - KY sales volumes were 4% lower vs. normal as degree days were down by more than 20% for Q2 2023
 - PA sales volumes were 8% lower vs. normal as degree days were down by more than 35% for Q2 2023

Note: See Appendix for the reconciliation of reported earnings to earnings from ongoing operations.

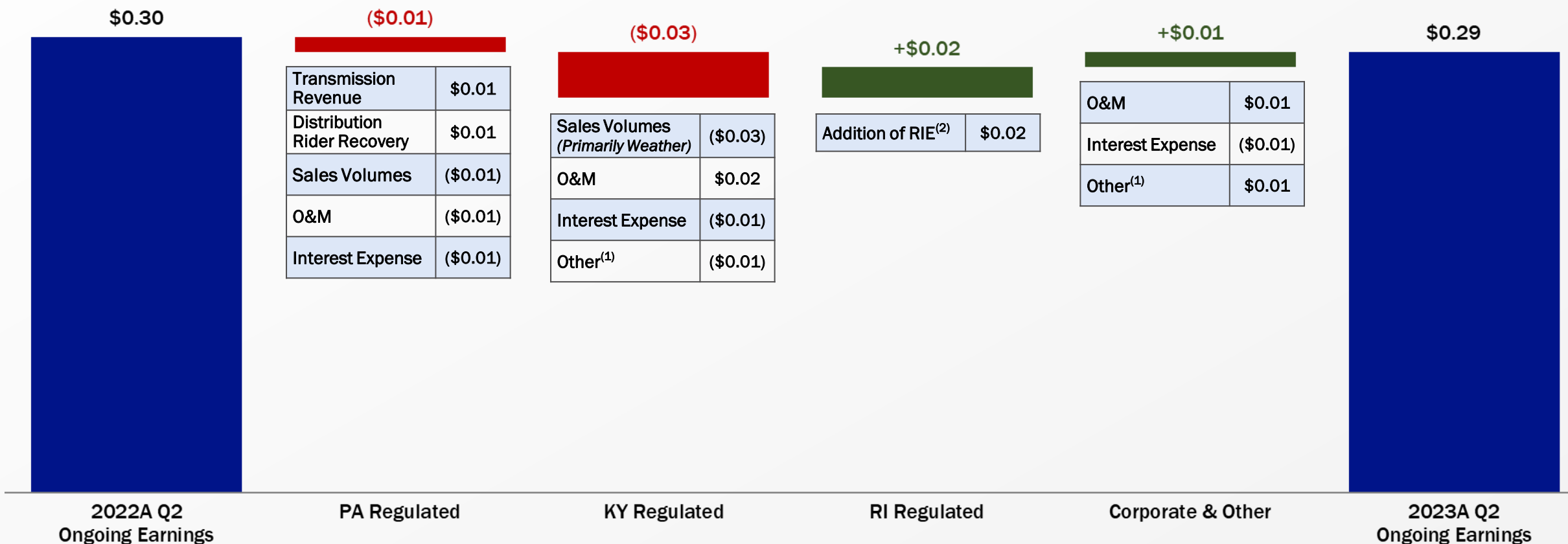
(1) Kentucky holding company costs for intercompany financing activity are now presented in Corporate and Other beginning on January 1, 2023. Prior periods have been adjusted to reflect this change.

Review of 2nd Quarter Financial Results



Ongoing Earnings Walk: Q2 2023 vs. Q2 2022

(Earnings per share)



Note: See Appendix for the reconciliation of reported earnings to earnings from ongoing operations.

(1) Reflects factors that were not individually significant.

(2) RIE - Rhode Island Energy.

YTD Financial Overview and Outlook



Overview of YTD Financial Results Through June 30th

(Earnings per share)

	YTD 2023	YTD 2022
Reported Earnings (GAAP)	\$0.54	\$0.53
Less: Special Items	(\$0.23)	(\$0.18)
Ongoing Earnings	\$0.77	\$0.71
PA Regulated	\$0.34	\$0.36
KY Regulated ⁽¹⁾	\$0.36	\$0.42
RI Regulated	\$0.13	\$0.01
Corp. and Other ⁽¹⁾	(\$0.06)	(\$0.08)

- **YTD 2023 GAAP earnings of \$0.54 per share**
- **YTD 2023 ongoing earnings of \$0.77 per share**
 - Mild weather unfavorably impacted results by (\$0.08) per share YTD compared to the normalized forecast⁽²⁾
 - O&M savings ahead of 2023 forecast despite increased storm-related O&M of (\$0.01) per share
- **Expect to offset mild weather impacts to achieve full year 2023 EPS forecast through several areas:**
 - DSIC Mechanism in PA
 - RI integration outperformance
 - Financing activity interest savings
 - Effective O&M management

Note: See Appendix for the reconciliation of reported earnings to earnings from ongoing operations.

(1) Kentucky holding company costs for intercompany financing activity are now presented in Corporate and Other beginning on January 1, 2023. Prior periods have been adjusted to reflect this change.

(2) Reflects estimated YTD impact of mild weather relative to PPL's 2023 ongoing earnings forecast, which projects normal weather. YTD 2023 earnings are estimated to be \$0.09 per share lower than YTD 2022 earnings due to the impacts of mild weather.



Closing Remarks

Vince Sorgi

President & Chief Executive Officer

2nd Quarter Investor Update

August 4, 2023

PPL Corporation



Advancing 2023 Outlook and Priorities

Remain Confident in Achieving PPL's 2023 Goals

- Identified offsets to weather and storm cost headwinds YTD to deliver the midpoint of our 2023 earnings forecast range of \$1.58 per share ⁽¹⁾
- On target to complete \$2.5 billion capex plan to provide safe, reliable and affordable energy to our customers
- Integration of Rhode Island Energy is progressing as expected
- Advancing key regulatory filings in Kentucky and Rhode Island
- On track to deliver at least \$50 - \$60 million in O&M savings through our utility of the future playbook, centralization efforts, and asset optimization

(1) Midpoint of PPL's 2023 ongoing earnings forecast range of \$1.50 - \$1.65 per share.





Investment Overview

August 4, 2023

PPL Corporation – 2nd Quarter Investor Update

PPL Investment Highlights



A large-cap, regulated U.S. utility in constructive regulatory jurisdictions



Visible and predictable 6% - 8% annual EPS and dividend growth⁽¹⁾



Robust \$12B regulated capital investment plan from 2023 to 2026



One of the strongest balance sheets in the U.S. utility sector – no equity issuances



Compelling opportunity to transition existing coal fleet to cleaner energy resources⁽²⁾



Proven, scalable operations playbook that maintains affordable rates while executing investment plans



9% - 11% total return proposition – de-risked plan does not require base rate cases to achieve⁽³⁾

(1) Refers to PPL's projected earnings per share growth from 2023 to 2026 and targeted dividend per share growth in line with EPS.

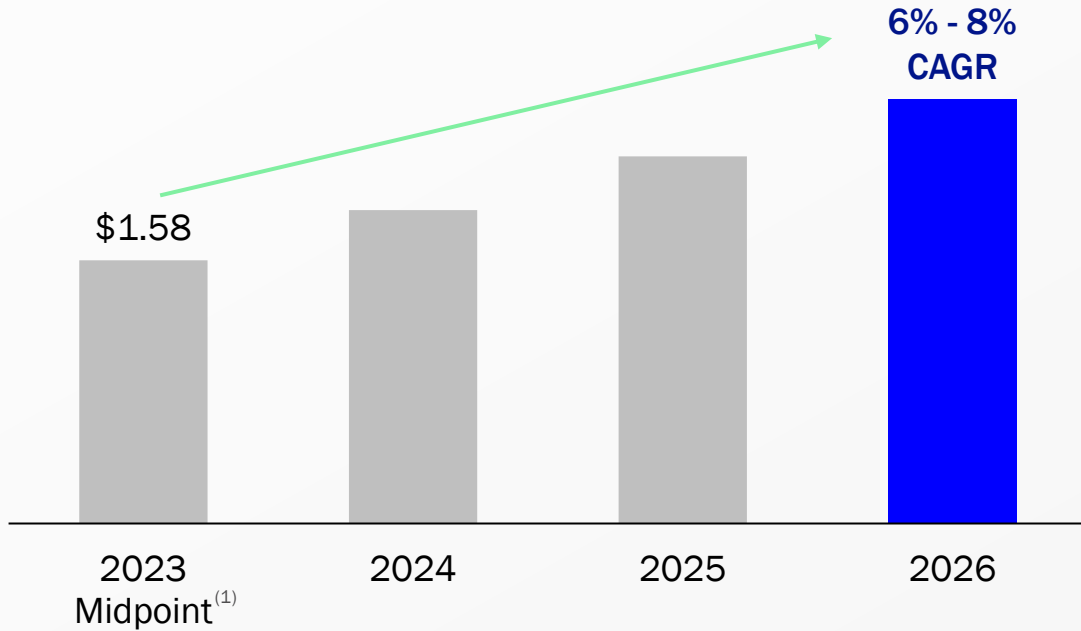
(2) PPL is economically transitioning coal-fired generation and has committed to not burn coal by 2050 unless it can be mitigated with carbon dioxide removal technologies.

(3) Total return reflects PPL's targeted EPS growth rate plus dividend yield based on targeted annualized dividend and PPL's closing share price as of July 31, 2023.

Projecting 6% to 8% Earnings and Dividend Growth Through at Least 2026

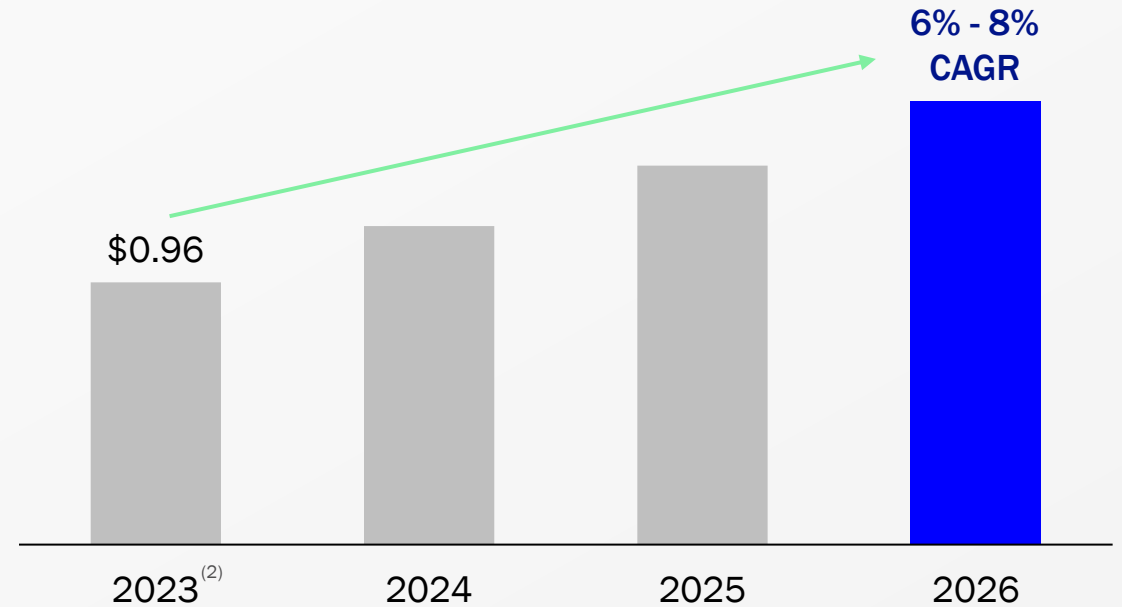


Projected Earnings Per Share



Projecting predictable, stable annual EPS growth

Projected Annualized Dividends Per Share⁽²⁾



Dividend growth in line with EPS growth

(1) Represents the midpoint of PPL's 2023 ongoing earnings forecast range of \$1.50 - \$1.65 per share.

(2) Actual dividends to be determined by Board of Directors. Annualized 2023 dividend based on February 17, 2023 dividend declaration by Board of Directors.

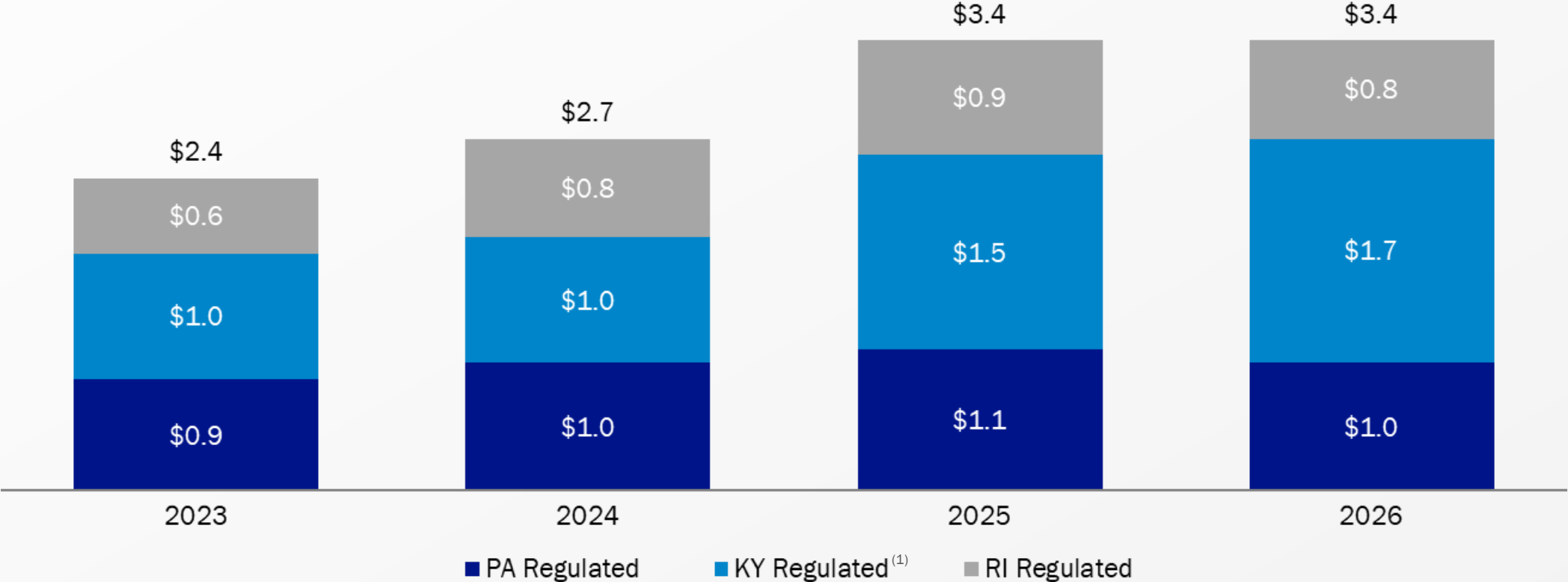
A Robust Capital Plan



Significant investment opportunities across all utilities

2023-2026 Plan: \$11.9 billion

(\$ in billions)



Note: Totals may not sum due to rounding.

(1) Includes projected capital expenditures related to replacement generation in Kentucky based upon LG&E's and KU's CPCN filing subject to KPSC approval.

Rate Base CAGR of Over 5.5% Through 2026

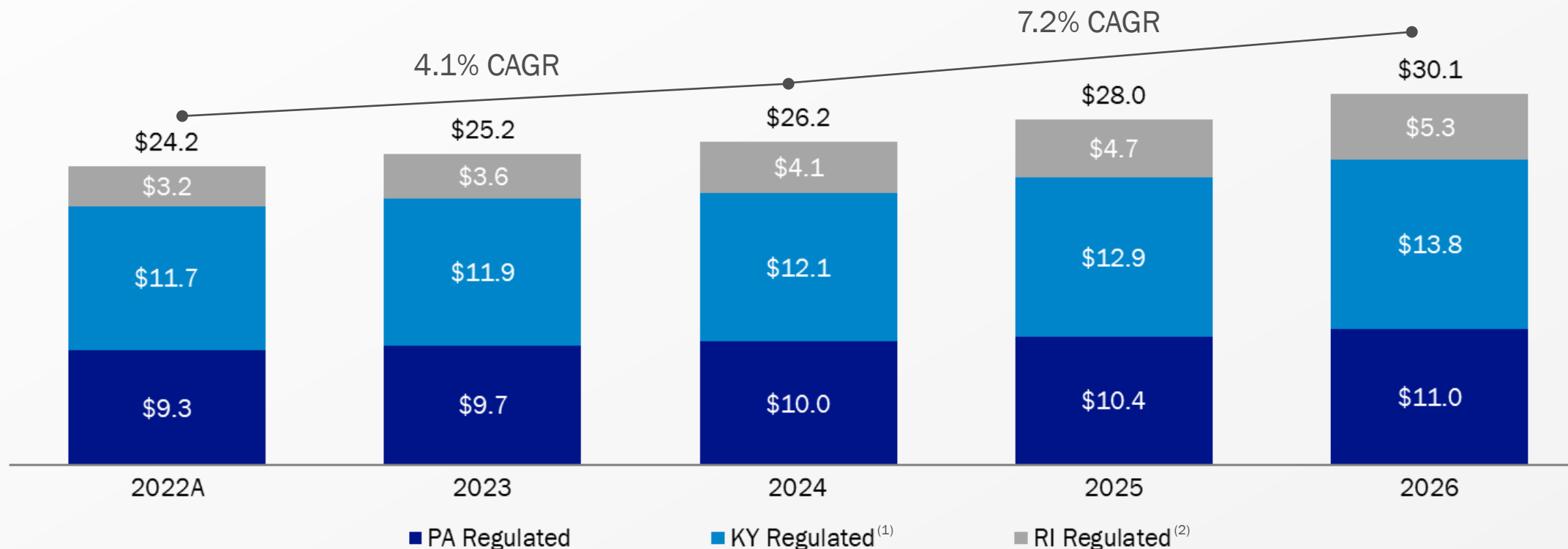


Projected Annual Rate Base Growth (2022 – 2026)

Plan CAGR (2022-2026): 5.6%

(Year-end rate base, \$ in billions)

Rate Base Growth Improving from 4% To >7% in Back Half of Plan



Note: Totals may not sum due to rounding.

(1) Reflects impact of projected capital expenditures related to replacement generation in Kentucky based upon LG&E's and KU's CPCN filing subject to KPSC approval.

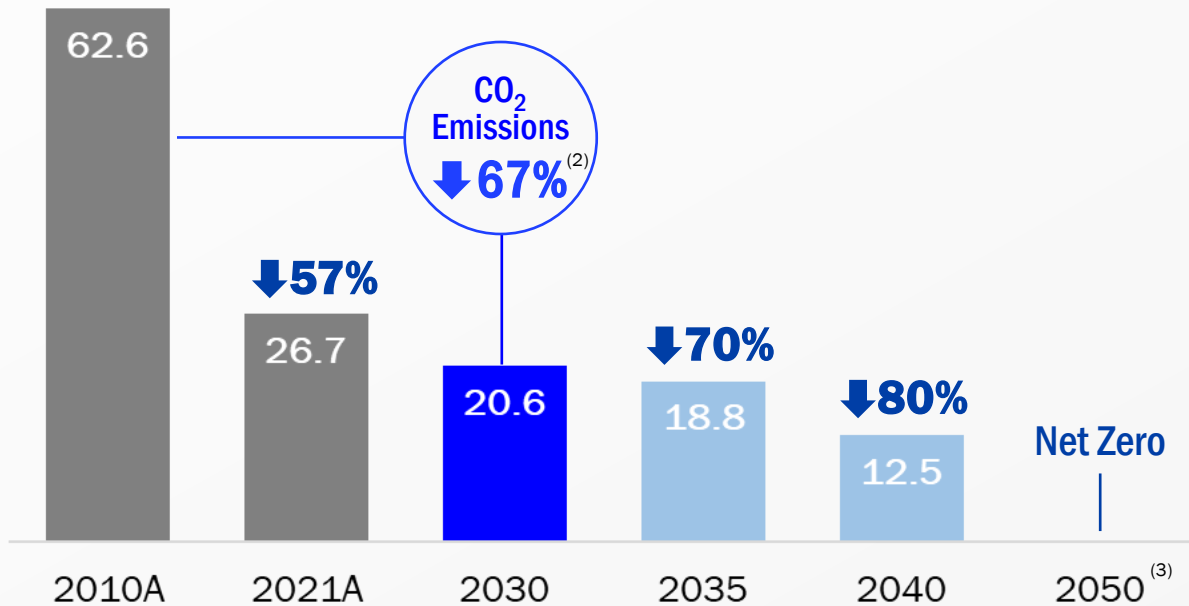
(2) Rhode Island rate base excludes acquisition-related adjustments for non-earning assets.

Significantly Improving PPL's Carbon Footprint

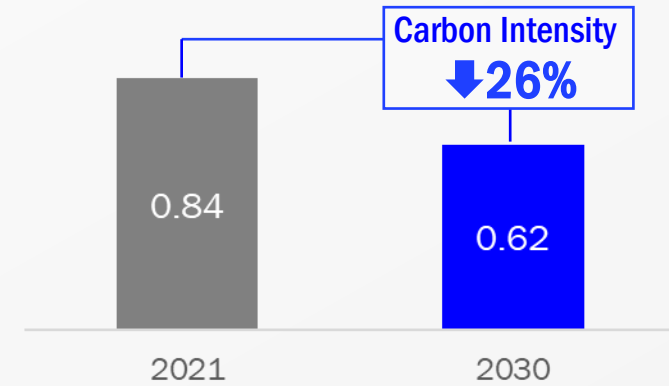


Plan is consistent with PPL's long-term emission reduction targets with near-term tangible progress

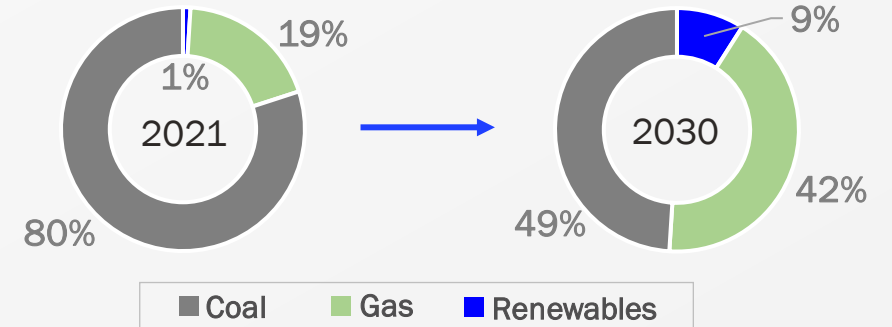
Plan Aligns with Pathway to Net Zero Emissions by 2050⁽¹⁾
(Metric tons, in millions)



Reduces Carbon Intensity by More Than 25%⁽²⁾
(Metric tons per MWh)



Meaningful Transition to Lower Carbon Generation
(% of MWh)



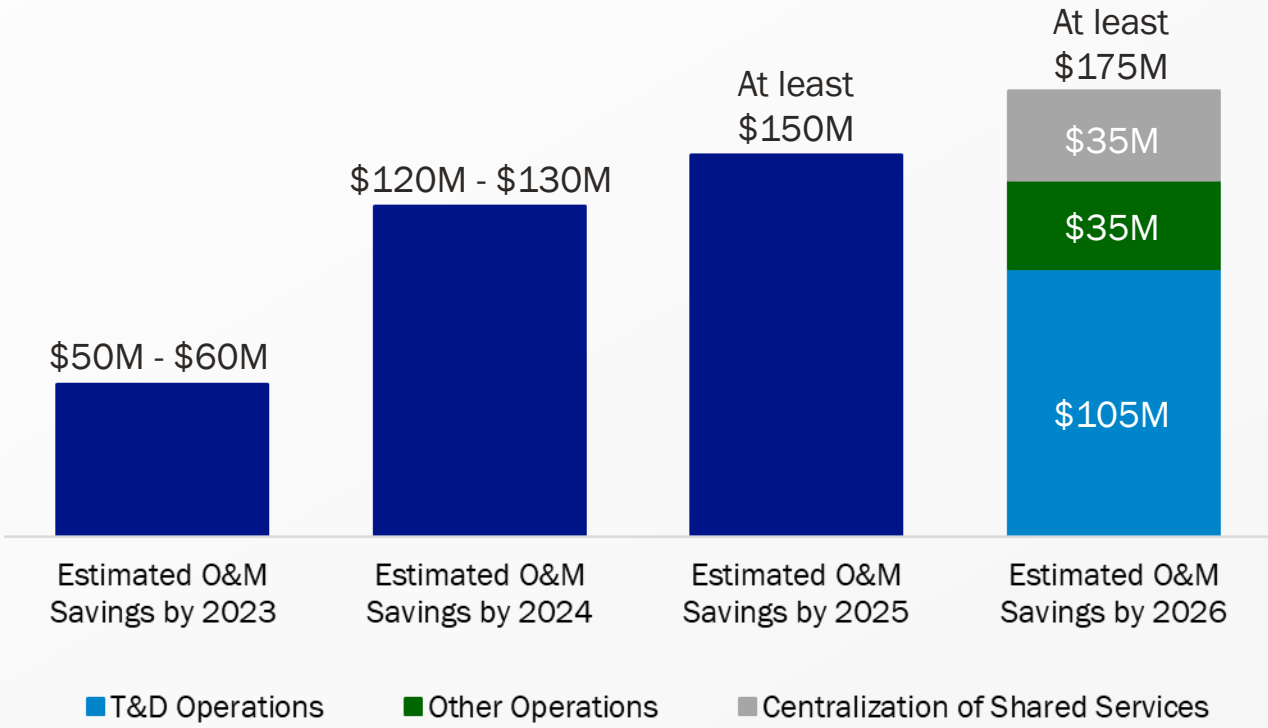
(1) Net zero goal covers more than 95% of greenhouse gas emissions from Scopes 1 and 2 and Scope 3 purchased power for Kentucky.
 (2) Projected absolute emissions reduction and carbon intensity reflect resource mix as submitted in CPCN filing.
 (3) PPL is economically transitioning coal generation and has committed to not burn coal by 2050 unless it can be mitigated with carbon dioxide removal technologies.

Business Transformation Prioritizes Efficiency and Affordability While Staying Out of Rate Cases



A clear path to deliver at least \$175M of savings through 2026 from 2021 baseline

(O&M savings, \$ in millions)



✓ T&D Operations

- Smart Grid Technology – more efficient and condition-based maintenance for substation and line assets
- Enhanced vegetation management modeling lowers maintenance costs
- Customer service technology investments improve self-service and reduce calls handled by agents

✓ Other Operations (Generation & Gas LDCs)

- Optimization of planned outage schedules and non-outage maintenance

✓ Centralization of Shared Services

- Consolidation of IT platforms reducing maintenance footprint and lower licensing costs
- Economies of scale from centralized service functions, including supply chain

Additional Opportunities to Scale and Drive Incremental Savings Longer Term

Premier Balance Sheet Supports Organic Growth and Provides Financial Flexibility



One of the sector's best credit profiles supports higher relative valuation

✓ Premier credit ratings among peers

- Baa1 rating at Moody's
- A- rating at S&P

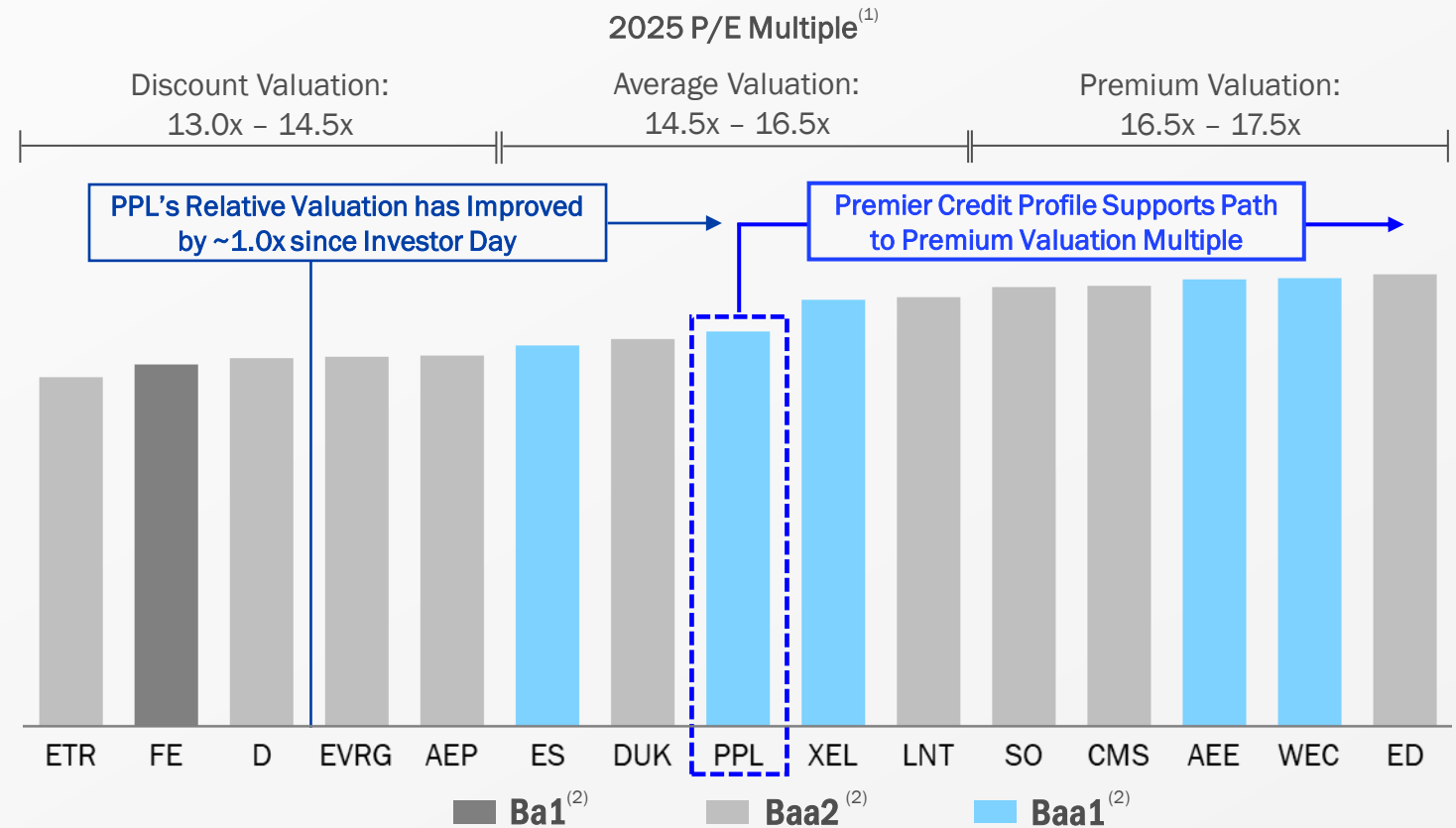
✓ 16% - 18% FFO/CFO to debt

- Peer average is ~15%

✓ HoldCo debt to total debt at <25%

- Peer average is ~25%

✓ No planned equity issuances



(1) Source: FactSet, represents closing share price and 2025 consensus estimates as of July 31, 2023.

(2) Moody's long-term issuer rating per FactSet.



Quarterly Supplemental Info.

August 4, 2023

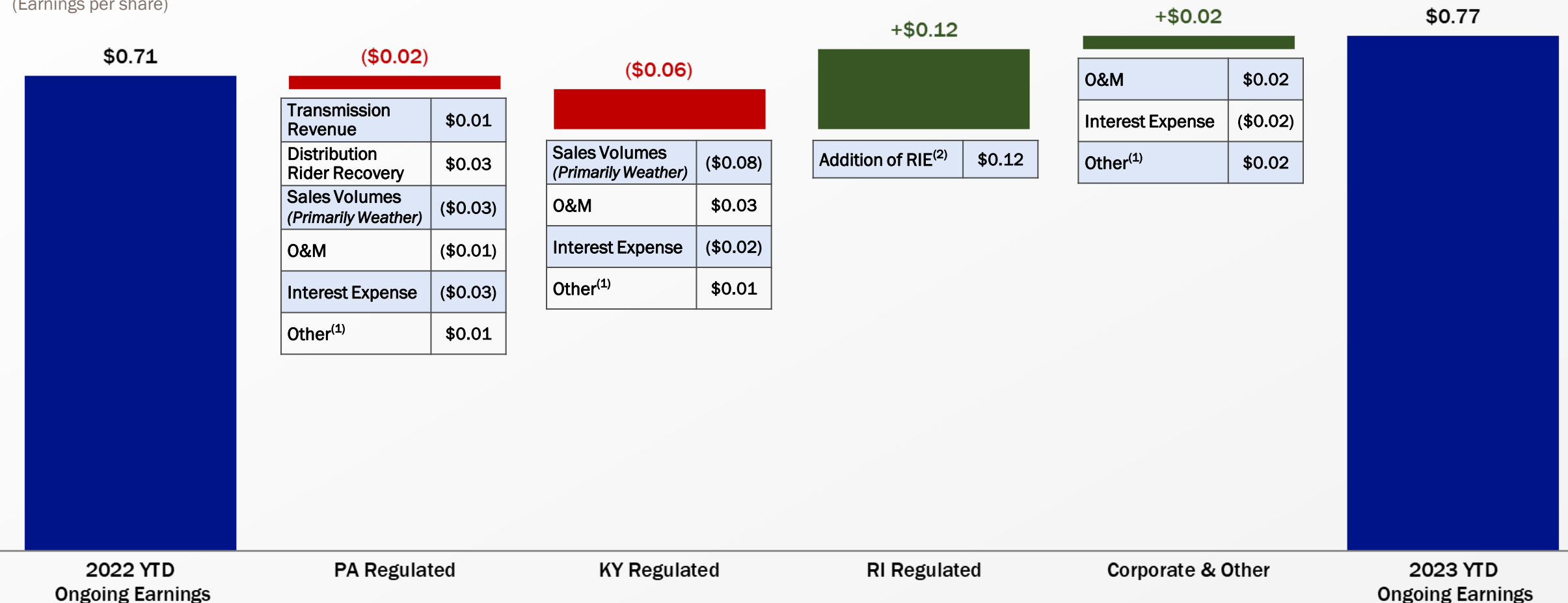
PPL Corporation – 2nd Quarter Investor Update

Review of YTD Financial Results Through June 30th



Ongoing Earnings Walk: YTD 2023 vs. YTD 2022

(Earnings per share)



Note: See Appendix for the reconciliation of reported earnings to earnings from ongoing operations.

(1) Reflects factors that were not individually significant.

(2) RIE – Rhode Island Energy.

Electricity Sales Volumes



Quarterly and trailing twelve-month retail sales comparison by operating segment ⁽¹⁾

(GWh)	Weather-Normalized Electricity Sales Volume						Actual Electricity Sales Volume			Annual EPS Sensitivity
	Three Months Ended June 30,			Trailing Twelve Months Ended June 30,			Three Months Ended June 30,			Per 1% Change In Total Load
	2023	2022	% Change	2023	2022	% Change	2023	2022	% Change	
Pennsylvania										+/- \$0.005 - \$0.01
Residential	2,882	3,028	(4.8%)	14,543	14,911	(2.5%)	2,751	3,027	(9.1%)	
Commercial	3,287	3,335	(1.4%)	13,772	13,916	(1.0%)	3,244	3,345	(3.0%)	
Industrial	2,081	2,152 ⁽²⁾	(3.3%)	8,503	8,446 ⁽²⁾	0.7%	2,081	2,152 ⁽²⁾	(3.3%)	
Other	12	14	NM*	78	77	NM*	12	14	NM*	
Total	8,263	8,529	(3.1%)	36,897	37,349	(1.2%)	8,089	8,538	(5.3%)	
Kentucky										+/- \$0.01 - \$0.02
Residential	2,263	2,280	(0.7%)	10,578	10,547	0.3%	2,076	2,381	(12.8%)	
Commercial	1,847	1,870	(1.2%)	7,614	7,635	(0.3%)	1,780	1,902	(6.4%)	
Industrial	2,145	2,205	(2.7%)	8,520	8,768	(2.8%)	2,145	2,205	(2.7%)	
Other	631	656	NM*	2,644	2,665	(0.8%)	618	662	(6.6%)	
Total	6,886	7,010	(1.8%)	29,356	29,615	(0.9%)	6,620	7,150	(7.4%)	

Note: Totals may not sum due to rounding.

*NM: Not Meaningful

(1) Excludes Rhode Island Energy's electricity sales as revenues are decoupled from volumes delivered.

(2) Adjusted 2022 Sales Volumes to account for a correction to a customer account.

Summary of CPCN Filing in Kentucky⁽¹⁾



<p>Filing Overview</p>	<ul style="list-style-type: none"> ▪ In December 2022, LG&E and KU filed a joint application with the Kentucky Public Service Commission (KPSC) seeking CPCNs to construct several generation facilities and approval of their proposed 2024-2030 Demand-Side Management and Energy Efficiency Program Plan. ▪ The CPCNs request included plans to replace four coal-fired generation units expected to retire with the combination of: <ul style="list-style-type: none"> • Two new 621 MW natural gas combined cycle units • Two 120 MW solar electric generating facilities (one PPL will construct, one to be acquired) • A new 125 MW, 4-hour battery energy storage system facility • Four new solar PPA's for a combined capacity of 637 MW ▪ The total estimated capital investment cost of the generation replacement plan is \$2.1 billion (2023 – 2028) ▪ As part of the filing, investments made in new generation facilities were requested to be recorded as Construction Work in Progress and accrue AFUDC on those investments.⁽²⁾
<p>Docket Number</p>	<p>2022-00402</p>
<p>Latest Update</p>	<ul style="list-style-type: none"> ▪ Intervenor testimony on the CPCN filing and coal-fired generation units was filed on July 14, 2023 ▪ Multiple parties filed their direct testimony, including the Kentucky Industrial Utility Consumers (KIUC), Kentucky Coal Association, Sierra Club, Kentucky Solar Energy Society, and others ▪ Parties that did not file direct testimony include the Attorney General and Walmart
<p>Next Steps</p>	<ul style="list-style-type: none"> ▪ Rebuttal testimony from LG&E/KU is due August 9, 2023 ▪ The KPSC has granted LG&E and KU's request to have an informal information conference to be held on August 15, 2023 ▪ Evidentiary hearings are scheduled to begin August 22, 2023 <ul style="list-style-type: none"> • The KPSC has scheduled five public meetings, four in-person and one virtual, across the state to receive public comments. ▪ A decision is expected by the KPSC by November 6, 2023

(1) CPCN: Certificate of Public Convenience and Necessity.

(2) AFUDC: Allowance for Funds Used During Construction.

Summary of Advanced Metering Filing in Rhode Island



Filing Overview	<ul style="list-style-type: none">▪ In November 2022, RIE submitted an Advanced Metering Functionality (AMF) Business Case proposal to the Rhode Island Public Utilities Commission (RIPUC).▪ The proposed program is estimated to cost \$188 million on a net present value (NPV) basis and would provide benefits of \$729 million NPV over the 20-year project life, yielding a benefit-cost ratio of 3.9.▪ The estimated nominal cost of the project is \$289 million and is expected to be 60% capital expenditures and 40% O&M.
Docket Number	22-49-EL
Latest Update	<ul style="list-style-type: none">▪ On July 13, 2023, RIE filed a supplement to its original proposal with alternative positions that it would support and address certain issues and concerns from the RIPUC and other parties in the docket. This filing does not replace any positions previously filed by RIE, it only provides alternative positions for consideration by the RIPUC.▪ Public hearings were held from July 20, 2023 – July 31, 2023
Next Steps	<ul style="list-style-type: none">▪ A decision from the RIPUC is expected in Fall 2023

Capital Expenditure Plan



(\$ in millions)

	2023	2024	2025	2026	4-Year Total
Pennsylvania					
Electric Distribution	\$300	\$300	\$300	\$325	\$1,225
Electric Transmission	550	675	775	650	2,650
Pennsylvania Total	\$850	\$975	\$1,075	\$975	\$3,875
Kentucky⁽¹⁾					
Electric Distribution	\$375	\$325	\$300	\$400	\$1,400
Electric Transmission	175	125	100	200	600
Gas Operations	50	50	100	100	300
Generation (non-coal)	50	225	775	800	1,850
Coal-Fired Generation	200	125	100	100	525
Other	100	100	100	100	400
Kentucky Total	\$950	\$950	\$1,475	\$1,700	\$5,075
Rhode Island					
Electric Distribution	\$250	\$275	\$300	\$225	\$1,050
Electric Transmission	100	225	250	225	800
Gas Operations	225	250	325	300	1,100
Rhode Island Total	\$575	\$750	\$875	\$750	\$2,950
Total Utility Capex	\$2,375	\$2,675	\$3,425	\$3,425	\$11,900

(1) Includes projected capital expenditures related to replacement generation in Kentucky based upon LG&E's and KU's CPCN filing subject to KPSC approval.

Projected Rate Base (Year-End)



(Year-end rate base, \$ in billions)

	2022A	2023	2024	2025	2026
Pennsylvania					
Electric Distribution	\$4.1	\$4.2	\$4.3	\$4.3	\$4.4
Electric Transmission	5.2	5.5	5.7	6.1	6.6
Pennsylvania Total	\$9.3	\$9.7	\$10.0	\$10.4	\$11.0
Kentucky ⁽¹⁾					
Electric Distribution	\$2.7	\$3.0	\$3.2	\$3.3	\$3.6
Electric Transmission	1.5	1.6	1.7	1.8	1.9
Gas Operations	1.2	1.2	1.2	1.3	1.4
Coal-Fired Generation	4.8	4.6	4.3	4.1	3.9
Other Generation	1.5	1.5	1.7	2.4	3.0
Kentucky Total	\$11.7	\$11.9	\$12.1	\$12.9	\$13.8
Rhode Island ⁽²⁾					
Electric Distribution	\$1.1	\$1.2	\$1.4	\$1.6	\$1.8
Electric Transmission	0.9	1.0	1.1	1.3	1.5
Gas Operations	1.2	1.4	1.6	1.8	2.0
Rhode Island Total	\$3.2	\$3.6	\$4.1	\$4.7	\$5.3
Total Rate Base	\$24.2	\$25.2	\$26.2	\$28.0	\$30.1

(1) Reflects impact of projected capital expenditures related to replacement generation in Kentucky based upon LG&E's and KU's CPCN filing subject to KPSC approval.

(2) Rhode Island rate base excludes acquisition-related adjustments for non-earning assets.

Debt Maturities



(\$ in millions)

	2023	2024	2025	2026	2027	2028+	Total
PPL Capital Funding	\$0	\$0	\$0	\$650	\$0	\$2,396	\$3,046
PPL Electric Utilities	\$90	\$0	\$0	\$0	\$108	\$4,541	\$4,739
Louisville Gas & Electric ⁽¹⁾	\$0	\$0	\$300	\$90	\$195	\$1,839	\$2,424
Kentucky Utilities ⁽¹⁾	\$0	\$0	\$250	\$164	\$0	\$2,615	\$3,029
Rhode Island Energy ⁽²⁾	\$1	\$1	\$1	\$0	\$0	\$1,500	\$1,502
Total Debt Maturities⁽³⁾	\$91	\$1	\$551	\$904	\$303	\$12,891	\$14,740

Note: As of June 30, 2023. Totals may not sum due to rounding.

(1) Amounts reflect the timing of any put option on municipal bonds that may be put by the holders before the bonds' final maturities.

(2) Amounts reflect sinking fund payments that are due annually until the bond's final maturity.

(3) Does not reflect unamortized debt issuance costs and unamortized premiums (discounts) totaling (\$168 million).

Liquidity Profile



(\$ in millions)

Entity	Facility	Expiration Date	Capacity	Borrowed	LCs & CP Issued ⁽¹⁾⁽²⁾	Unused Capacity
PPL Capital Funding	Syndicated Credit Facility ⁽³⁾	Dec-2027	\$1,250	\$0	\$0	\$1,250
	Bilateral Credit Facility	Mar-2024	\$100	\$0	\$0	\$100
	Uncommitted Credit Facility	Mar-2024	\$100	\$0	\$58	\$42
	Subtotal		\$1,450	\$0	\$58	\$1,392
PPL Electric Utilities	Syndicated Credit Facility	Dec-2027	\$650	\$0	\$131	\$519
Louisville Gas & Electric	Syndicated Credit Facility	Dec-2027	\$500	\$0	\$21	\$479
Kentucky Utilities	Syndicated Credit Facility	Dec-2027	\$400	\$0	\$92	\$308
Total PPL Credit Facilities			\$3,000	\$0	\$302	\$2,698

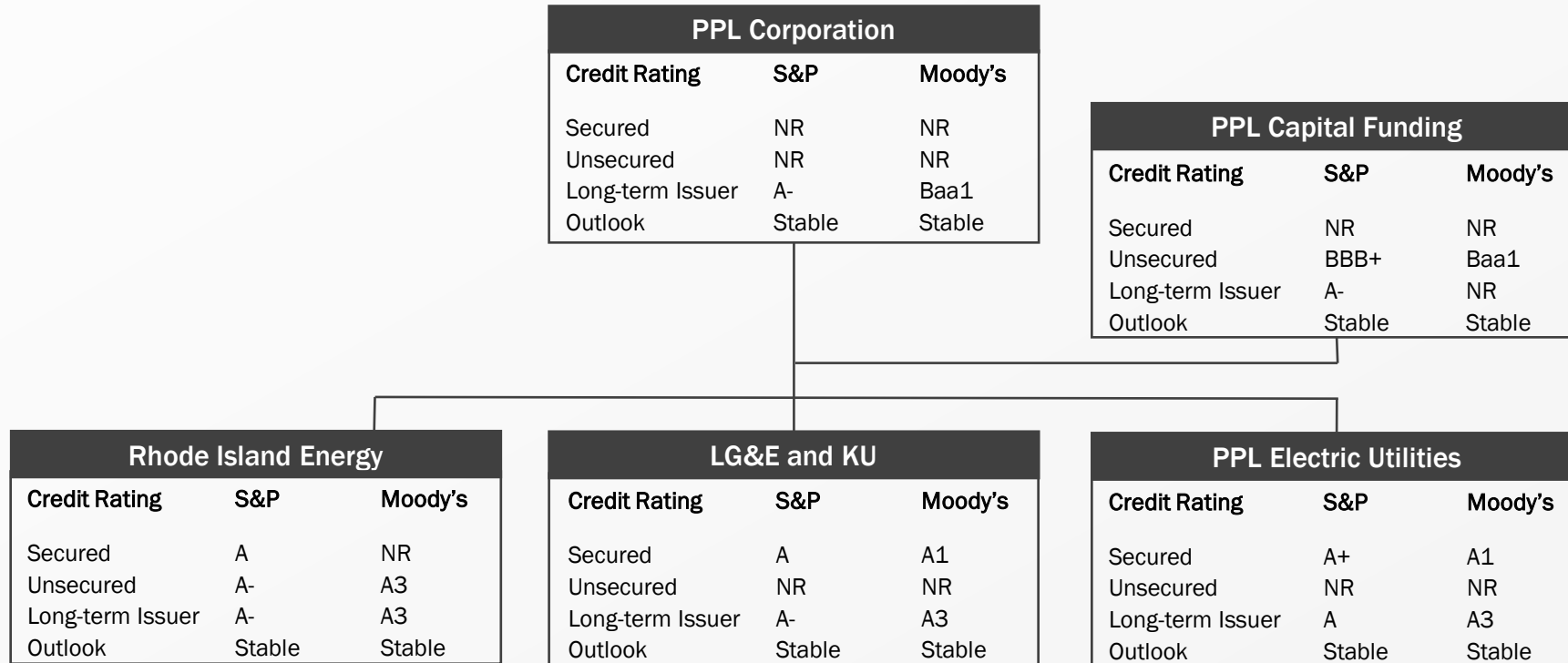
Note: As of June 30, 2023. Totals may not sum due to rounding.

(1) Letters of Credit (LCs) and Commercial Paper (CP).

(2) Commercial paper issued reflects the undiscounted face value of the issuance.

(3) Includes a \$250 million borrowing sublimit for RIE and a \$1 billion sublimit for PPL Capital Funding.

PPL's Credit Ratings





Appendix

August 4, 2023

PPL Corporation – 2nd Quarter Investor Update

Reconciliation of Segment Reported Earnings to Earnings From Ongoing Operations: Current Year



After-Tax (Unaudited) (\$ in millions)	Three Months Ended June 30, 2023					Six Months Ended June 30, 2023				
	KY Reg.	PA Reg.	RI Reg.	Corp. & Other	Total	KY Reg.	PA Reg.	RI Reg.	Corp. & Other	Total
Reported Earnings⁽¹⁾	\$ 91	\$ 110	\$ 10	\$ (99)	\$ 112	\$ 257	\$ 248	\$ 64	\$ (172)	\$ 397
Less: Special Items (expense) benefit:										
Talen litigation costs, net of tax of \$1, \$1	-	-	-	(2)	(2)	-	-	-	(3)	(3)
Strategic corporate initiatives, net of tax of \$1, \$0, \$1 ⁽²⁾	-	-	-	(3)	(3)	(1)	-	-	(4)	(5)
Acquisition integration, net of tax of \$3, \$15, \$8, \$27 ⁽³⁾	-	-	(13)	(60)	(73)	-	-	(30)	(104)	(134)
PA tax rate change	-	-	-	-	-	-	1	-	-	1
Sale of Safari Holdings, net of tax of \$2 ⁽⁴⁾	-	-	-	-	-	-	-	-	(4)	(4)
PPL Electric billing issue, net of tax of \$2, \$2 ⁽⁵⁾	-	(7)	-	-	(7)	-	(7)	-	-	(7)
FERC transmission credit refund, net of tax of \$2, \$2 ⁽⁶⁾	(5)	-	-	-	(5)	(5)	-	-	-	(5)
Other non-recurring charges, net of tax of \$0, \$0 ⁽⁷⁾	-	-	-	(13)	(13)	-	-	-	(13)	(13)
Total Special Items	(5)	(7)	(13)	(78)	(103)	(6)	(6)	(30)	(128)	(170)
Earnings from Ongoing Operations	\$ 96	\$ 117	\$ 23	\$ (21)	\$ 215	\$ 263	\$ 254	\$ 94	\$ (44)	\$ 567

After-Tax (Unaudited) (per share – diluted)	Three Months Ended June 30, 2023					Six Months Ended June 30, 2023				
	KY Reg.	PA Reg.	RI Reg.	Corp. & Other	Total	KY Reg.	PA Reg.	RI Reg.	Corp. & Other	Total
Reported Earnings⁽¹⁾	\$ 0.12	\$ 0.15	\$ 0.01	\$ (0.13)	\$ 0.15	\$ 0.35	\$ 0.33	\$ 0.09	\$ (0.23)	\$ 0.54
Less: Special Items (expense) benefit:										
Acquisition integration ⁽³⁾	-	-	(0.02)	(0.08)	(0.10)	-	-	(0.04)	(0.14)	(0.18)
Sale of Safari Holdings ⁽⁴⁾	-	-	-	-	-	-	-	-	(0.01)	(0.01)
PPL Electric billing issue ⁽⁵⁾	-	(0.01)	-	-	(0.01)	-	(0.01)	-	-	(0.01)
FERC transmission credit refund ⁽⁶⁾	(0.01)	-	-	-	(0.01)	(0.01)	-	-	-	(0.01)
Other non-recurring charges ⁽⁷⁾	-	-	-	(0.02)	(0.02)	-	-	-	(0.02)	(0.02)
Total Special Items	(0.01)	(0.01)	(0.02)	(0.10)	(0.14)	(0.01)	(0.01)	(0.04)	(0.17)	(0.23)
Earnings from Ongoing Operations	\$ 0.13	\$ 0.16	\$ 0.03	\$ (0.03)	\$ 0.29	\$ 0.36	\$ 0.34	\$ 0.13	\$ (0.06)	\$ 0.77

(1) Reported Earnings represents Net Income.

(2) Represents costs related to PPL's corporate centralization and other strategic efforts.

(3) Primarily integration and related costs associated with the acquisition of Rhode Island Energy.

(4) Final closing adjustments related to the sale of Safari Holdings.

(5) Certain costs related to billing issues.

(6) Prior period impact related to a FERC refund order.

(7) Certain expenses related to distributed energy investments.

Reconciliation of Segment Reported Earnings to Earnings From Ongoing Operations: Prior Year



After-Tax (Unaudited) (\$ in millions)	Three Months Ended June 30, 2022					Six Months Ended June 30, 2022				
	KY Reg.	PA Reg.	RI Reg.	Corp. & Other	Total	KY Reg.	PA Reg.	RI Reg.	Corp. & Other	Total
Reported Earnings⁽¹⁾	\$ 112	\$ 124	\$ (29)	\$ (88)	\$ 119	\$ 301	\$ 267	\$ (29)	\$ (147)	\$ 392
Less: Special Items (expense) benefit:										
Talen litigation costs, net of tax of (\$2), (\$1)	-	-	-	9	9	-	-	-	5	5
Strategic corporate initiatives, net of tax of \$1, \$3, \$2, \$4 ⁽²⁾	(2)	-	-	(11)	(13)	(6)	-	-	(15)	(21)
Acquisition integration, net of tax of \$10, \$16, \$10, \$22 ⁽³⁾	-	-	(38)	(61)	(99)	-	-	(38)	(82)	(120)
Solar panel impairment, net of tax of \$0	-	-	-	-	-	-	-	-	1	1
Total Special Items	(2)	-	(38)	(63)	(103)	(6)	-	(38)	(91)	(135)
Earnings from Ongoing Operations	\$ 114	\$ 124	\$ 9	\$ (25)	\$ 222	\$ 307	\$ 267	\$ 9	\$ (56)	\$ 527

After-Tax (Unaudited) (per share – diluted)	Three Months Ended June 30, 2022					Six Months Ended June 30, 2022				
	KY Reg.	PA Reg.	RI Reg.	Corp. & Other	Total	KY Reg.	PA Reg.	RI Reg.	Corp. & Other	Total
Reported Earnings⁽¹⁾	\$ 0.16	\$ 0.17	\$ (0.04)	\$ (0.13)	\$ 0.16	\$ 0.41	\$ 0.36	\$ (0.04)	\$ (0.20)	\$ 0.53
Less: Special Items (expense) benefit:										
Talen litigation costs	-	-	-	0.01	0.01	-	-	-	0.01	0.01
Strategic corporate initiatives ⁽²⁾	-	-	-	(0.02)	(0.02)	(0.01)	-	-	(0.02)	(0.03)
Acquisition integration ⁽³⁾	-	-	(0.05)	(0.08)	(0.13)	-	-	(0.05)	(0.11)	(0.16)
Total Special Items	-	-	(0.05)	(0.09)	(0.14)	(0.01)	-	(0.05)	(0.12)	(0.18)
Earnings from Ongoing Operations	\$ 0.16	\$ 0.17	\$ 0.01	\$ (0.04)	\$ 0.30	\$ 0.42	\$ 0.36	\$ 0.01	\$ (0.08)	\$ 0.71

(1) Reported Earnings represents Net Income.

(2) Represents costs primarily related to the acquisition of Rhode Island Energy and PPL's corporate centralization efforts.

(3) Primarily includes integration and related costs associated with the acquisition of Rhode Island Energy, along with costs for certain commitments made during the acquisition process.

Reconciliation of PPL's Earnings Forecast



After-Tax (Unaudited) (per-share diluted)	2023 Forecast Range		
	Midpoint	High	Low
Estimate of Reported Earnings	\$ 1.35	\$ 1.42	\$ 1.27
Less: Special Items (expense) benefit: ⁽¹⁾			
Acquisition integration ⁽²⁾	(0.18)	(0.18)	(0.18)
Sale of Safari Holdings ⁽³⁾	(0.01)	(0.01)	(0.01)
PPL Electric billing issue ⁽⁴⁾	(0.01)	(0.01)	(0.01)
FERC transmission credit refund ⁽⁵⁾	(0.01)	(0.01)	(0.01)
Other non-recurring charges ⁽⁶⁾	(0.02)	(0.02)	(0.02)
Total Special Items	(0.23)	(0.23)	(0.23)
Forecast of Earnings from Ongoing Operations	\$ 1.58	\$ 1.65	\$ 1.50

(1) Reflects only special items recorded through June 30, 2023. PPL is not able to forecast special items for future periods.

(2) Primarily integration and related costs associated with the acquisition of Rhode Island Energy.

(3) Final closing adjustments related to the sale of Safari Holdings.

(4) Certain costs related to billing issues.

(5) Prior period impact related to a FERC refund order.

(6) Certain expenses related to distributed energy investments.

Forward-Looking Information Statement



Statements contained in this presentation, including statements with respect to future earnings, cash flows, dividends, financing, regulation and corporate strategy, including the anticipated acquisition of Narragansett from National Grid, and its impact on PPL Corporation, are “forward-looking statements” within the meaning of the federal securities laws. Although PPL Corporation believes that the expectations and assumptions reflected in these forward-looking statements are reasonable, these statements are subject to a number of risks and uncertainties, and actual results may differ materially from the results discussed in the statements. The following are among the important factors that could cause actual results to differ materially from the forward-looking statements: asset or business acquisitions and dispositions, including the expected acquisition of Narragansett Electric, and our ability to realize expected benefits from them; pandemic health events or other catastrophic events, including severe weather, and their effect on financial markets, economic conditions, supply chains and our businesses; the outcome of rate cases or other cost recovery or revenue proceedings; the direct and indirect effects on PPL or its subsidiaries or business systems of cyber-based intrusion or threat of cyberattacks; capital market and economic conditions, including interest rates and inflation, and decisions regarding capital structure; market demand for energy in our service territories; weather conditions affecting customer energy usage and operating costs; the effect of any business or industry restructuring; the profitability and liquidity of PPL Corporation and its subsidiaries; new accounting requirements or new interpretations or applications of existing requirements; operating performance of our facilities; the length of scheduled and unscheduled outages at our generating plants; environmental conditions and requirements, and the related costs of compliance; system conditions and operating costs; development of new projects, markets and technologies; performance of new ventures; receipt of necessary government permits and approvals; the impact of state, federal or foreign investigations applicable to PPL Corporation and its subsidiaries; the outcome of litigation involving PPL Corporation and its subsidiaries; stock price performance; the market prices of debt and equity securities and the impact on pension income and resultant cash funding requirements for defined benefit pension plans; the securities and credit ratings of PPL Corporation and its subsidiaries; changes in political, regulatory or economic conditions in states, regions or countries where PPL Corporation or its subsidiaries conduct business, including any potential effects of threatened or actual cyberattack, terrorism, or war or other hostilities; new state, federal or applicable foreign legislation or regulatory developments, including new tax legislation; and the commitments and liabilities of PPL Corporation and its subsidiaries. Any such forward-looking statements should be considered in light of such important factors and in conjunction with factors and other matters discussed in PPL Corporation's Form 10-K and other reports on file with the Securities and Exchange Commission.

Definitions of Non-GAAP Financial Measures



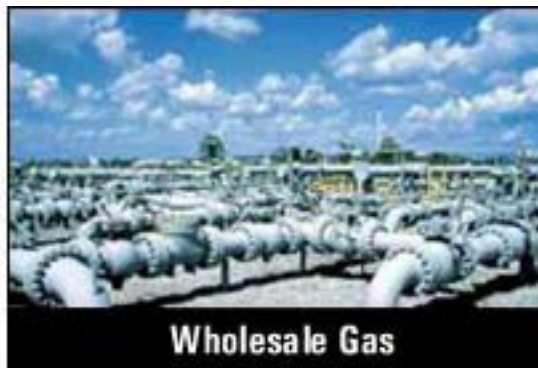
Management utilizes "Earnings from Ongoing Operations" as a non-GAAP financial measure that should not be considered as an alternative to net income, an indicator of operating performance determined in accordance with GAAP. PPL believes that Earnings from Ongoing Operations is useful and meaningful to investors because it provides management's view of PPL's earnings performance as another criterion in making investment decisions. In addition, PPL's management uses Earnings from Ongoing Operations in measuring achievement of certain corporate performance goals, including targets for certain executive incentive compensation. Other companies may use different measures to present financial performance.

Earnings from Ongoing Operations is adjusted for the impact of special items. Special items are presented in the financial tables on an after-tax basis with the related income taxes on special items separately disclosed. Income taxes on special items, when applicable, are calculated based on the statutory tax rate of the entity where the activity is recorded. Special items may include items such as:

- Gains and losses on sales of assets not in the ordinary course of business.
- Impairment charges.
- Significant workforce reduction and other restructuring effects.
- Acquisition and divestiture-related adjustments.
- Significant losses on early extinguishment of debt.
- Other charges or credits that are, in management's view, non-recurring or otherwise not reflective of the company's ongoing operations.



North American Energy Standards Board
Gas Electric Harmonization Forum Report
July 28, 2023



North American Energy Standards Board

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William P. Boswell, *General Counsel*

NAESB Gas-Electric Harmonization Forum

Robert Gee, *Chair*
Dr. Sue Tierney, *Chair*
Pat Wood, III, *Chair*

The participants of the NAESB Gas-Electric Harmonization Forum comprise a broad cross section of natural gas and electric markets – state and federal regulators, pipelines, generators, producers, distribution, marketing, transmission, end users, independent system operators and technology experts. Any interested party was welcome to participate in the NAESB Gas-Electric Harmonization Forum.

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I. Foreword from the Chairs of the NAESB GEH Forum

The following represents the views exclusively of the Chairs of this Forum in their individual capacities, and should not be attributed to the North American Energy Standards Board, its leadership, or its members.

“HOUSTON, WE HAVE A PROBLEM.”

-- Astronaut Jack Swigert to Mission Control at the Johnson Space Center in Houston in reporting that Apollo 13 had experienced a near catastrophic explosion on the spacecraft. (April 19, 1970)

Paraphrasing Astronaut Jack Swigert, and with the same sense of understated urgency, we believe our country has a problem.

Over the last century, two great industries have arisen – electricity networks and natural gas production and delivery – and together have become an absolutely critical foundation for our dependence upon an uninterrupted supply of reliable, safe, and affordable energy. We simply cannot keep the lights on or heat our buildings if both systems do not operate synchronously.

At one time, it was believed that the United States was on the verge of depleting most of its proven reserves of natural gas, so much so that its use for power generation was federally restricted by law in 1978. This sentiment persisted for three decades, with the US Secretary of Energy even attesting in 2006 that “using natural gas to generate electricity is like washing your dishes in fine scotch.”

However, today the electricity industry’s need for and reliance on natural gas is vastly different. Owing to historic breakthroughs in turbine technology, seismic imagery for exploration, and horizontal drilling and hydraulic fracturing, domestic natural gas supply has grown exponentially, along with the power sector’s reliance on it. In the last two decades, natural gas’ fuel share for power generation has doubled: today it represents almost 40 percent of total resources. Both sectors of the American energy system have become highly interdependent economically and technically: natural gas represents the largest fuel resource for power generation, while power generation is the largest consumer of natural gas.

From a physical and operational standpoint, the electric utility network is highly dependent upon the uninterrupted performance of the gas production and delivery network. Without the latter, the former cannot meet its own performance requirements. Customers of both gas and electricity systems can suffer when this happens, as demonstrated by the natural gas sector’s failure to perform for power generation during the most recent two winters (2021’s Winter Storm Uri and 2022’s Winter Storm Elliott). Because both systems were not designed originally to function as an integrated whole, risk of failure is asymmetrical and not equally shared. During Uri, gas needed for power generation vanished during periods of peak winter demand for both gas and electricity, tragically resulting in excess of 240 lives lost and economic damage estimated as high as \$130 billion. Although some producers suffered from not being able to sell their production, because shortages caused natural gas spot prices to skyrocket, gas purchasers – primarily electric generators and gas utilities – were handed bills in the magnitude of a thousand times greater than customary, resulting in financial insolvency or ratepayer subsidization for decades to come. During Elliott, gas accounted for 72 percent of outages attributable to fuel.

We were asked to co-chair this forum, and we assumed our responsibilities with an open mind, weighing seriously the questions directed by the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC). We endeavored to find solutions to address the systemic weaknesses now made evident in the natural gas/electric network nexus. We listened to stakeholders. We used our experience in regulating both industries, and our knowledge of how they interact. This eventually resulted in our setting forth 20 Proposed Recommendations that we solicited for comment, followed by a vote of the Forum participants to gauge support. All of these Recommendations involve technical issues; some involve policy considerations. Some involved short-term solutions; others will require longer to remedy.



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After having reviewed the voting on the 20 Recommendations, we draw the following conclusions contrasting and comparing the perspectives of the natural gas and electric industries on the critical path forward:

- Several of our recommendations received strong support from both industry sectors, such as:
 - **Recommendation 8** (alignment of the timelines between the Power Day and/or the day-ahead scheduling timelines with the gas day) – high 80 percent support.
 - **Recommendation 9** (adoption of multiday unit commitment processes) – 90 percent support.
 - **Recommendation 10** (state PUCs encouragement of natural gas and electricity demand response programs) – 90 percent support.
 - **Recommendation 11** (state PUCs encouragement of voluntary conservation public service announcements) – 90 percent support.

- However, on many critical recommendations, the natural gas and electric industries hold widely divergent opinions:
 - **Recommendation 1** (FERC’s directing NAESB to revise its business practice standards related to the timely reporting of natural gas pipeline informational website posting data) – 85 percent support by electric wholesale, versus 46 percent support by gas wholesale.
 - **Recommendation 3** (expanding the Argonne National Laboratory NGInsight tool to improve situational awareness and communication between (a) owners and operators of natural gas production and processing facilities and (b) Bulk Electric System operators) -- 80 percent support by electric wholesale, versus 57 percent support by gas wholesale.
 - **Recommendation 7** (encouraging State public utility commissions and applicable state authorities in states with competitive energy markets to engage with producers, marketers and intrastate pipelines to ensure that such parties’ operations are fully functioning on a 24/7 basis in preparation for and during events in which extreme weather is forecasted) -- 87 percent support by electric wholesale, versus 41 percent support by gas wholesale.
 - **Recommendation 15** (encouraging state authorities to consider establishing informational posting requirements for intrastate natural gas pipelines regarding operational capacity data, similar to the reporting and posting requirements mandated by the FERC for interstate natural gas pipelines) – 91 percent support by electric wholesale, versus 57.5 percent support by gas wholesale.
 - **Recommendation 16** (encouraging state authorities to consider the development of weatherization guidelines appropriate for their region/jurisdiction) – 92 percent support by electric wholesale, versus 55 percent support by gas wholesale.

As much as we are heartened by the strong support for some recommendations, the divergence of support between the two sectors on others is profoundly disturbing: it reflects a fundamental lack of agreement regarding the lessons learned from these past two winters and the challenges ahead in ensuring that outages no longer occur owing to a failure between these two systems.

At the time we closed our live Forum meetings, we urged stakeholders to take control of their destiny as failure to do so could result ultimately in less favorable outcomes dictated by others in the event that we experience another weather event with deadly and far-reaching consequences. We did not regard any of our 20 recommendations to be so burdensome or so profoundly altering that they would engender strong opposition. Rather, a close reading demonstrates that they were couched in terms of simply requesting entities such as federal or state authorities to consider taking remedial steps. Yet they still drew stout opposition from some.

Specifically, activity on the pending NAESB standards development request to consider modifications to the *force majeure* language of the NAESB Base Contract to encourage weatherization actions underscores the difficulty in relying on consensual solutions. This standards request, made on May 3, 2023, was singled out as significant in our **Recommendation 4** where we stated the following: “The NAESB Gas-Electric Harmonization (GEH) Forum endorses this evaluation and encourages the NAESB Wholesale Gas Quadrant to act with utmost expediency to address this request on a timely basis.” This recommendation was supported by 91 percent of the Wholesale Electric



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Quadrant, but only by 51 percent in the Wholesale Gas Quadrant. Some commenters opined that it was inappropriate for the GEH Forum to even mention this pending standards modification matter in our recommendations.

Just this week, at the kick-off meeting for the Wholesale Gas Quadrant to consider this standards modification request, gas producers unanimously urged summary dismissal of this request, effectively negating further consideration and discussion. This is illustrative of the difficulty of relying on a voluntary, consensual process to find solutions for the issues we endeavored to address. We regard an act like this to be both disappointing and counterproductive.

The last serious endeavor to address the failure to harmonize or coordinate the relationship between these two industries occurred in 2012 following a winter storm outage in 2011. At that time, FERC was asked to take curative steps to synchronize the electric and gas markets. Except for modest changes, it declined to do so. The consequences of that decision continue to linger in the face of the crises that emerged these past two winters.

Excuses can no longer substitute for sound planning and judgment. If voluntary measures fall short owing to staunch opposition by some, it is time for the national regulator to consider more direct measures to ensure that both industries under its purview perform in tandem to ensure energy reliability and assurance for our country. Through our workshops, market participants worked with us to address the discrete issues identified by NERC and FERC. Twenty recommendations that follow were identified because we thought them achievable most readily either through a consensual process or through federal or state regulatory action, without need for legislative recourse. However, the sharp differences in opinion between the electric and gas sectors expressed in response to those recommendations, and the discord experienced during the opening discussion of **Recommendation 4** in the standards setting process, have prompted our rethinking of that more limited course. We have thus pivoted to a measure that, although discussed during the Forum but not included among our recommendations, requires Congressional enactment, recognizing that this represents an even more challenging pathway.

After a year of work through this process, combined with our own extensive experience, we recommend a more significant, structural solution that, if enacted, would accelerate the harmonization of the natural gas and electric power industries to the benefit of the country: **a natural gas reliability organization akin to the one currently responsible for electric reliability, NERC**. We know that others – including the National Academies of Sciences, Engineering and Medicine’s Committee on the Future of Electric Power in the U.S. (2021) – have concluded that the close interdependencies of the gas and electric industries and their importance to the nation’s economy necessitate stronger reliability standards in the gas industry, along the lines of those that Congress determined (in 2005) were needed in the electric industry. With such an organization in place, we believe the balanced solutions discussed in this report would find home at an institutional forum empowered to more timely address these and other related matters on an ongoing basis. Pending its creation, however, the following GEH recommendations should be expeditiously addressed on an individual basis, as set forth below. Although our work on this project is completed, resolution of these issues is only beginning.

We indeed have a problem, and it’s time to get it fixed.

Robert W. Gee

Dr. Susan Tierney

Pat Wood, III



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II. Executive Summary & Recommendations

The North American Energy Standards Board (NAESB) has a long history of convening energy industry participants to collaborate on measures that can be taken to improve coordination between the natural gas and electric markets. Since its transition from the Gas Industry Standards Board (GISB) to NAESB in 2002, the organization has been actively developing standards intended to improve the efficiency and reliability of the interactions between the two markets. These endeavors have become more critical over the last twenty years as reliance on natural gas as a fuel source for electric generation has intensified and the interdependencies of the two markets have continued to grow. As part of its latest efforts, NAESB reconvened its Gas Electric Harmonization (GEH) Forum to address the July 29, 2022 request¹ of Richard Glick, Chairman of the FERC, and Jim Robb, President of the North American Electric Reliability Corporation (NERC), to establish a forum to address the activities described in Key Recommendation 7 of the FERC, NERC, and Regional Entity Staff Report on the February 2021 Cold Weather Outages in Texas and the South Central United States (November 2021 Report).² Specifically, Key Recommendation 7 purposed that the forum “identify concrete actions (consistent with forum participants’ jurisdiction) to improve the reliability of the natural gas infrastructure system necessary to support the Bulk Electric System.” Specific topic areas for consideration by the forum were provided through the November 2021 Report and were further defined by FERC and NERC staff at the onset of the effort; however, FERC and NERC staff encouraged the forum to explore other areas and actions that could be taken to achieve the goals articulated in the report.

This report describes the activities of the NAESB GEH Forum from August 30, 2022 to July 20, 2023 to respond to the request and provides twenty recommendations for action that the industry, the FERC, the National Association of Regulatory Utility Commissioners (NARUC), state public utility commissions, and/or applicable state authorities, and the U.S. Department of Energy (DoE) could take to address the recurring challenges stemming from natural gas-electric infrastructure interdependency. The virtual meetings held by the NAESB GEH Forum to develop the recommendations were open to the public and included the participation of seven-hundred and forty-one individuals representing more than three-hundred and seventy companies from all segments of the wholesale and retail natural gas and electric markets. Additionally, those that were unable to attend the virtual meetings, were given an opportunity to provide comments for consideration by GEH Forum participants through several open comment periods, which resulted in the submission of one-hundred and forty-five sets of comments from sixty-eight different entities.

As with all NAESB activities, a full and transparent record has been created that should aid the parties identified in the recommendations to initiate actions as they evaluate any next steps. Although a process was not established to define consensus positions of the GEH Forum, each recommendation included in this report was distributed for vote to the GEH Forum participants and all votes have been tallied utilizing the Balanced Voting Procedure developed under the NAESB American National Standards Institute (ANSI) accredited consensus-based process, which ensures that all interests are equally balanced across market sectors.³ Ideally, utilizing NAESB’s Balanced Voting Procedure will provide the reader with a deeper understanding of the various industry segments perspectives regarding the action proposed in each recommendation and illustrate the industry’s overall support or opposition to a particular recommendation, as represented through the GEH Forum.

The following twenty recommendations were formulated through an evaluation of the GEH Forum record, encompassing the written and oral comments that were offered during and between the fourteen meetings held by NAESB over the last eleven months. A summary of the record supporting each recommendation and the above described voting results of the GEH Forum participants can be found in Section V of this report.

Recommendation 1: The FERC should direct NAESB to revise its business practice standards related to the timely reporting of natural gas pipeline informational website posting data (such as operationally available capacity, total scheduled quantity, and any other data necessary to assist regional operators in maintaining system reliability) to

¹ July 29, 2022 - Joint FERC-NERC Letter to NAESB: https://naesb.org/pdf4/FERC_NERC_Letter_072922_to_NAESB.pdf

² November 16, 2021 - FERC, NERC, and Regional Entity Staff Report - The February 2021 Cold Weather Outages in Texas and the South Central United States: https://naesb.org/pdf4/ferc_nerc_regional_entity_staff_report_Feb2021_cold_weather_outages_111621.pdf

³ A description of the NAESB quadrants and segments and the NAESB balanced voting procedure can be found through the following hyperlink: https://www.naesb.org/pdf4/geh_balanced_voting_quadrant_segment_descriptions.doc



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enable the data and any subsequent amendments to become routinely accessible to Bulk Electric System operators as soon as such data are reported and available.

Recommendation 2: The FERC should take steps to facilitate the expansion of the Argonne National Laboratory NGInsight tool, with funding from a federal governmental agency, such as the Department of Energy, to improve situational awareness and communication between the natural gas pipeline system and Bulk Electric System operators. Access to and use of this tool should include appropriate security protocols and market protections.

Recommendation 3: The FERC should take steps to facilitate the expansion of the Argonne National Laboratory NGInsight tool, with funding from a federal governmental agency, such as the Department of Energy, to improve situational awareness and communication between owners and operators of natural gas production and processing facilities and Bulk Electric System operators. Such communication could include aggregated volume data or confirmed scheduled quantities for key upstream receipt points. Access to and use of the tool should include appropriate security protocols and market protections.

Recommendation 4: On May 3, 2023, a request for standards development was submitted to NAESB to consider modifications to the force majeure language of the NAESB Base Contract for Sale and Purchase of Natural Gas to, among other things, encourage weatherization actions. The NAESB Gas-Electric Harmonization (GEH) Forum endorses this evaluation and encourages the NAESB Wholesale Gas Quadrant to act with utmost expediency to address this request on a timely basis.

Recommendation 5: The FERC should direct the natural gas and electric industries to find ways to encourage more frequent use of capacity release or asset management arrangements (AMAs) and more timely release of unutilized interstate pipeline capacity that does not impact the reliability of the firm capacity holder. Further, the FERC should direct NAESB to revise its business practice standards to standardize the necessary transactional informational posting, timeliness and transparency requirements for these capacity releases.

Recommendation 6: The FERC should consider policy modifications necessary to better facilitate advanced agreements between end users and remove barriers to the release of capacity, similar to those adopted as part of FERC Order No. 712 (to support the use of asset management agreements).

Recommendation 7: State public utility commissions and applicable state authorities in states with competitive energy markets should engage with producers, marketers and intrastate pipelines to ensure that such parties' operations are fully functioning on a 24/7 basis in preparation for and during events in which extreme weather is forecasted to cause demand to rise sharply for both electricity and natural gas, including during weekends and holidays. (States could consider the approaches adopted in FERC regulations affecting the interstate pipelines.) In instances where state authorities lack enabling authority to take such actions, the FERC should adopt regulations to achieve identical outcomes within its authority.

Recommendation 8: The FERC should direct Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) or electric transmission owners/operators, where no ISO or RTO exists, to conduct and report to FERC the results of analyses of actions that better align the timelines of the Power Day and/or the day-ahead scheduling timelines with the gas day, including earlier notification of successful bids, to ensure that schedules are known and made available to allow natural gas-fired generators to procure natural gas and pipeline capacity in periods when the market is most liquid.

Recommendation 9: If not already under consideration through stakeholder processes, ISOs and RTOs or the FERC should conduct proceedings and adopt multiday unit commitment processes to better enable the industry to prepare for and provide reliable service during events in which weather is forecasted to cause demand to rise sharply for both electricity and natural gas.

Recommendation 10: State public utility commissions should encourage local distribution companies within their jurisdictions to structure incentives for the development of natural gas and electric demand-response programs in preparation for and during events in which demand is expected to rise sharply for both electricity and natural gas.

Recommendation 11: State public utility commissions should encourage local distribution companies within their jurisdictions to provide voluntary conservation public service announcements for residential, commercial and industrial customers in preparation for and during events in which demand is expected to rise sharply for both electricity and natural gas.



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Recommendation 12: Joint and cross-market, long-term planning should be expanded by relevant gas and electric market parties with an increased focus on fuel adequacy. FERC should encourage this planning coordination using its oversight roles for interstate pipelines, regulated RTO/ISO interstate transmission, and Electric Reliability Organization (ERO)-related Planning Authorities and collaborate with state public utility commissions and applicable state authorities.

Recommendation 13: The FERC, state public utility commissions, and applicable state authorities in states with competitive energy markets should consider whether market mechanisms are adequate to ensure that jurisdictional generators have the necessary arrangements for secure firm transportation and supply service and/or storage to avoid and/or mitigate natural gas supply shortfalls during extreme cold weather events, and if not, (a) determine whether non-market solutions are warranted, including funding mechanisms borne or shared by customers and (b) if warranted, adopt such non-market solutions.

Recommendation 14: Applicable state authorities should consider the adoption of legislation or regulations or other actions to create a secondary market for unutilized intrastate natural gas pipeline capacity, including a requirement for intrastate pipelines to offer some minimum level of firm service and/or support bilateral agreements between end users. In instances where state authorities lack enabling authority to take such actions, the FERC should adopt regulations to achieve identical outcomes within its authority.

Recommendation 15: Applicable state authorities should consider establishing informational posting requirements for intrastate natural gas pipelines to enhance transparency for intrastate natural gas market participants regarding operational capacity data, similar to the reporting and posting requirements mandated by the FERC for interstate natural gas pipelines as part of 18 CFR §284.13. In instances where state authorities lack enabling authority to take such actions, the FERC should adopt regulations to achieve identical outcomes within its authority.

Recommendation 16: Applicable state authorities should consider the development of weatherization guidelines appropriate for their region/jurisdiction to support the protection and continued operation of natural gas production and processing and gathering system facilities during extreme weather events, and require public disclosure concerning weatherization efforts of jurisdictional entities.

Recommendation 17: Many generalized recommendations for resource adequacy and accreditation and market reforms to bolster reliability were offered throughout the NAESB GEH Forum activities; we understand, however, based upon information provided by representatives from the ISO and RTO segment, that steps are being taken within the organized markets to consider such reforms through their stakeholder processes. The GEH Forum endorses this evaluation of resource adequacy and accreditation requirements by all ISOs and RTOs and encourages the review of the Forum record.

Recommendation 18: FERC and NARUC should collaborate to conduct, fund, and/or direct efforts to study whether market-incentivized investments in strategic natural gas storage facilities are sufficient to address natural gas supply shortfalls during extreme cold weather events, and if the level of investment is sufficient to preserve such facilities for use during extreme cold weather events. The study should also explore whether public sources of funding are needed for investment to secure sufficient storage.

Recommendation 19: FERC and NARUC should collaborate to conduct, fund, and/or direct efforts to study whether additional financial incentives for the natural gas infrastructure system, including infrastructure to provide additional firm transportation capacity, would help to address natural gas supply shortfalls during such events, and further support the Bulk Electric System's performance during extreme cold weather events.

Recommendation 20: The U.S. Department of Energy or FERC should conduct, fund, and/or direct efforts to study, by region, whether there is adequate natural gas infrastructure in place to support new gas usage patterns affected by flexible gas generation resource requirements as the latter resources are increasingly called upon for more frequent and/or steeper ramping to balance the increased use of variable energy resources. This study should be conducted in conjunction with an industry advisory group made up of diverse interests to ensure broad engagement and support for study results that are credible and unbiased. Currently, there are no comprehensive regional assessments that examine whether regions have sufficient natural gas infrastructure to support new usage patterns of gas generators, yet this information is essential for policymakers to have so that they can make informed policy decisions and take steps to avoid any potential reliability and resilience risks that accompany the transition to a lower emissions energy future.



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III. Background & NAESB GEH Forum Activities

NAESB is an ANSI accredited, non-profit 501(c)(6) corporation formed with the support of the U.S. DoE for the purpose of developing voluntary business practice standards designed to promote more competitive and efficient natural gas and electric markets. The organization's history of successful standards development has been made possible with the strong support of the DoE, FERC, NERC, NARUC, and state utility commissions, among many other governmental agencies at both the federal and state level. NAESB has developed over four thousand business practice standards through its process and maintains a membership of over three hundred corporations representing the wholesale gas, wholesale electric, retail gas and retail electric markets. Work products developed by the industry include business practices, interpretations, transactional information requirements, data layouts, schemas, and standardized contracts, all of which are adopted through the NAESB process and supported through the maintenance of related industry tools and certification programs. With very few exceptions, all NAESB wholesale market standards have been adopted by the FERC and mandated as federal regulation for federally jurisdictional entities through the incorporation by reference process, and many of the NAESB retail market standards have served as a basis for regulations adopted by various state commissions.

Activities to support improved coordination between the gas and electric markets began almost immediately after GISB transitioned to NAESB with a 2003 directive from FERC Chairman Wood to work to resolve the timeline differences between the gas and electric markets, particularly with respect to intraday gas nominations. In response, NAESB went through the process of soliciting proposals to address the issue and, similarly to the present effort, discussed a wide range of solutions from simply coordinating industry terms and definitions to creating an Energy Day by combining the two markets. At the end of the process, NAESB adopted its first set of standards coordinated between the natural gas and electric markets requiring jurisdictional pipelines and gas-fired generators to establish protocols for communicating operational information and requiring balancing authorities and regional coordinators to receive operational flow orders and other critical notices from pipelines. These standards were adopted by the FERC in June of 2007 through FERC Order No. 698, and subsequent NAESB standards to support improved market coordination have been adopted by the FERC through FERC Order Nos. 587-U and 809.

NAESB has also undertaken efforts to consider identified market coordination issues that did not result in the adoption of standards. In 2011, following the National Petroleum Council's publication of the *Prudent Development Report: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources* study,⁴ the NAESB Board of Directors initiated an effort to respond to recommendations included in the study, including "...developing policies, regulations, and standardized business practices that improve the coordinated operations of the two industries and reduce barriers that hamper the operation of a well-functioning market standards." While the organization did not pursue standards in response to the study, NAESB did produce a report that identified areas where standards could be developed if specific policy issues were resolved by regulators. Subsequently, through FERC Order No. 809 issued in April 2015, the FERC requested that the industry work through NAESB to "...explore the potential for faster, computerized scheduling when shippers and confirming parties all submit electronic nominations and confirmations, including a streamlined confirmation process if necessary," in an effort to provide greater scheduling flexibility. NAESB initiated activities to consider the request, and although draft standards were developed that proposed standards related to confirmation methods and special services, the NAESB membership was unable to come to consensus on adoption. Additionally, in 2022, NAESB considered the development of standards in response to an industry submitted request proposing the "development of standards to support coordinated commercial practices between the natural gas and electric markets during impending extreme weather-related emergency operating conditions." NAESB held a series of joint meetings between natural gas and electric market participants with a focus on cross-market education before a determination was made to not continue with the development of standards.

These experiences over the last twenty years, as well as NAESB's membership consisting of both natural gas and electric market companies, makes the organization well qualified to address cross-market issues and support coordination in the energy industry.

⁴ The Executive Summary of the National Petroleum Council study can be found through the following hyperlink: <https://www.npc.org/NARD-ExecSummVol.pdf>



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FERC & NERC Request

As noted, on July 29, 2022, FERC Chairman Glick and Mr. Robb sent a letter to the Chairman of the NAESB Board of Directors, Michael Desselle and NAESB Executive Vice President & Chief Operating Officer, Jonathan Booe, encouraging NAESB to take steps to “expeditiously convene” the forum identified in Key Recommendation 7 of the November 2021 Report. In the letter, Chairman Glick and Mr. Robb stated that NAESB is uniquely positioned to facilitate the forum contemplated by the November 21 Report and specifically cited NAESB’s ANSI-accredited, consensus-based process and history of convening participants from all segments of the supply chain to address difficult coordination issues and formulate solutions that result in more efficient and effective markets.

As described in the November 2021 Report, the creation of a forum was purposed to facilitate collaboration among electric and natural gas market participants and applicable regulatory bodies to provide a venue, “...in which representatives of state legislatures and/or regulators with jurisdiction over natural gas infrastructure, in cooperation with FERC, NERC and the Regional Entities (which collectively oversee the reliability of the Bulk Electric System), and with input from the Balancing Authorities (which are responsible for balancing load and available generation) and natural gas infrastructure entities, [can] identify concrete actions (consistent with the forum participants’ jurisdiction) to improve the reliability of the natural gas infrastructure system necessary to support the Bulk Electric System.” Key Recommendation 7 highlighted thirteen specific topics the forum should consider, but noted that other topics of the forum’s choosing which “...address the natural gas-electric infrastructure interdependency problem...” could be considered. To support the organizational efforts of the forum, members of FERC and NERC staffs that participated on the team to draft the November 2021 Report, provided a presentation to the NAESB GEH Forum participants that overviewed key findings from the November 2021 Report regarding the events that led to the outages during Winter Storm Uri, the effect on the natural gas system, and the causes of electric generation shortfalls. As part of the presentation, FERC staff and NERC staff overviewed the topics identified for the forum to address as part of Key Recommendation 7 and requested the forum also consider topics from Key Recommendation 24 as well as encouraged the NAESB GEH Forum to consider other topics that may be determined relevant through the course of the GEH Forum process.

As identified by FERC staff and NERC staff, the discussion topics fell into one of three categories: (1) measures to improve gas-electric information sharing for improved system performance during extreme cold weather emergencies; (2) measures to improve reliability of natural gas facilities during cold weather with examples such as freeze protection and protection of the electric supply; and (3) measures to improve the ability of generators to obtain fuel during extreme cold weather events when natural gas heating load and natural gas-fired generators are both in high demand for natural gas, at the same time that natural gas production may have decreased. FERC staff and NERC staff indicated that the goal of the forum should be to identify concrete actions, including the parties responsible for taking the action, that will improve the reliability of the natural gas infrastructure system necessary to support bulk-power system reliability and to develop plans for implementing those actions with associated deadlines.

NAESB Process & GEH Forum Record Development

On August 1, 2022, Mr. Desselle and Mr. Booe provided correspondence⁵ to FERC Chairman Glick and Mr. Robb to inform them that NAESB had initiated actions to address the request and would coordinate with FERC staff, NERC staff, and NARUC regarding forum activities. Mr. Desselle took action to reconvene the NAESB GEH Forum, originally created in March 2014 to respond to the FERC Notice of Proposed Rulemaking (NOPR) on *Coordination of the Scheduling Processes of Interstate Natural Gas Pipelines and Public Utilities*, which, among other things, gave the industry an opportunity to work through NAESB to develop a consensus based alternative to the proposed revisions offered through the NOPR to the operating day and scheduling practices used by interstate pipelines to schedule natural gas transportation service. In preparation for the meeting, NAESB asked Advisory Council members Robert Gee, a former Assistant Secretary at the DoE, a former Chairman of the Public Utility Commission of Texas, and former Chair of the NARUC Electricity Committee, Dr. Susan Tierney, a former Assistant Secretary at the DoE and former Commissioner of the Massachusetts Department of Public Utilities, and Pat Wood, III, a former Chairman of the FERC and the Public Utility Commission of Texas to serve as GEH Forum Chairs. All three graciously accepted the role and have served as the leadership team throughout this process.

⁵ August 1, 2022 – NAESB Correspondence to FERC and NERC:
https://naesb.org/pdf4/naesb_correspondence_to_FERC_NERC_080122.pdf



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While the GEH Forum was not tasked with the development of standards, NAESB utilized its ANSI-accredited process to facilitate the meetings which were held virtually using the Zoom platform. Participation in the meetings was open to any interested party, regardless of NAESB membership status. As with all NAESB efforts, a full and transparent record has been created that includes meeting recordings and meeting chats provided through the Zoom platform, staff meeting notes, work papers, agendas, voting records, and all comments submitted as part of the GEH Forum process spanning from August 30, 2022 to July 20, 2023. To provide ample opportunity for the consideration of all viewpoints and develop a record, prior to and following each meeting, interested parties were given an opportunity to submit written comments and to respond to a series of surveys intended to solicit feedback on specific topics based on the meeting agenda. In submitting comments or survey responses, each participant was asked to identify his or her company affiliation as well as make a market/segment or non-voting observer designation consistent with the NAESB membership structure. All comments and survey submissions have been made public and are compiled and posted for each relevant meeting. The record also includes an initial work plan,⁶ a schedule of meetings,⁷ the GEH Forum distribution list,⁸ and a reference and educational materials document⁹ that provides access to all presentations or educational materials GEH Forum participants submitted as part of the process.

In the two instances in which votes were requested of the GEH Forum participants, NAESB utilized its Balanced Voting Procedure which not only provides an opportunity to view market positions at a more granular level but also safeguards against undue influence by active market segments and protects minority interests. Per the voting procedure, votes are taken on a per company basis and each respondent must identify with an appropriate NAESB quadrant and segment, or as an observer. Each company may only cast one vote in the quadrant and segment in which they participate; however, companies that participate in multiple market segments (i.e. multiple NAESB quadrants and segments), such as a vertically integrated organizations, may cast multiple votes as long as each individual from the company is representing a different market segment. All NAESB segments are allotted two votes in total that are weighted proportionally by the total number of votes in support or opposition across a single segment.

NAESB GEH Forum Meetings

In total, fourteen meetings of the GEH Forum were held between August 2022 and July 2023. As a result of the significant interest in the GEH Forum meetings, many of which had nearly two-hundred registrants, those wishing to participate were encouraged to submit written comments prior to the meetings. Attendees that provided written comments ahead of the meeting were given the opportunity to explain, elaborate or supplement any written submitted comments, and attendees that did not provide written comments were given an opportunity to provide oral comments when time allowed. Additionally, in order to maximize the opportunities for attendees to interact with one another and help further facilitate meeting discussions, the Zoom platform chat function was enabled for all meetings beginning with the one held on September 23, 2022. The chat log for each meeting included in the record identifies both the commenter and the comment with a timestamp. In addition to making recordings of each meeting available, NAESB staff provided a set of staff notes that summarized the meeting discussions. All artifacts from the GEH Forum meetings have been posted and are provided in the Meeting Appendix to this report. Included below is a brief summary of each of the GEH Forum meetings.

August 30, 2022: To initiate the effort, remarks were provided by FERC Chairman Glick, Mr. Robb and Greg White, Executive Director of NARUC, noting the importance of the industry's response to the call to action and encouraging collaboration and creativity from the participants. FERC and NERC staff provided the presentation previously described to set the context for the topic areas identified in the November 2021 Report and NAESB leadership discussed the steps that would be taken to develop a response to the request. Following the meeting, on September 7, 2022, NAESB made available a GEH Forum Work Plan.

⁶ The NAESB GEH Forum Work Plan can be viewed through the following hyperlink:

https://naesb.org/pdf4/geh_work_plan.docx

⁷ The NAESB GEH Forum Schedule of Meetings can be found through the following hyperlink:

https://naesb.org/pdf4/geh_schedule.docx

⁸ The NAESB GEH Forum Distribution List identifies every individual who requested to receive announcements, agendas, and other distributions over the course of the process and can be found through the following hyperlink:

https://naesb.org/pdf4/naesb_geh_forum_distlist_2022.doc

⁹ The NAESB GEH Reference and Educational Documentation List can be found through the following hyperlink:

https://naesb.org/pdf4/geh_reference_documentation_list.docx



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September 23, 2022: During the meeting, the participants reviewed comments submitted in response to the September 7, 2022 survey concerning several measures to improve the ability of generators to obtain fuel during extreme cold weather events as well as discussed whether requirements for firm supply and/or transportation or dual fuel capability should be established and how emergency actions are/could be taken to give critical electric generating units pipeline transportation priority.

October 21, 2022: During the meeting, the participants continued discussions concerning the comments submitted in response to the previous survey and reviewed the comments submitted in response to the October 3, 2022 survey. The October 3, 2022 survey asked respondents to provide input on how to synchronize the electric and natural gas market timelines, how information sharing could be improved and whether there are any practical solutions for access to existing pipeline capacity during times when demand is high.

November 8, 2022: During the meeting, the participants began reviewing the comments submitted in response to the October 24, 2022 survey concerning the barriers to the expansion of natural gas infrastructure, the state of current cross-market information sharing, existing forecasting processes, how costs associated with reliability enhancements could be addressed, the nomination and confirmation process during holidays and weekends, and the policy or contractual terms that present issues with pipeline capacity during situations of unanticipated demand.

December 5, 2022: During the meeting, participants continued discussions on the survey topics reviewed during the previous meeting.

January 12, 2023: In preparation for the meeting, the Chairs of the GEH Forum developed a work paper that contained an overview of the background and progress of the efforts and a high-level description of the categories of recommendations and proposals that had been offered by forum participants to date. During the meeting, Chairs reviewed the document with the participants and noted that GEH Forum meeting participants had provided over three-hundred recommendations or proposals through written comments, meeting discussions, and the meeting chats that could be categorized into one of ten general topics: (1) electric market design; (2) gas market design; (3) information sharing; (4) infrastructure; (5) intrastate gas market; (6) Jones Act waivers; (7) improved planning; (8) service prioritization; (9) resiliency requirements; and (10) weatherization. During the meeting, in addition to reviewing the Chairs' work paper, Craig Glazer, Vice President-Federal Government Policy of PJM Interconnections, provided a presentation regarding the impacts of Winter Storm Elliott within the PJM footprint, which had occurred just weeks before the meeting.

February 2, 2023: Prior to the meeting, the NAESB office distributed a work paper that provided a summary of over one-hundred proposals and recommendations that had been offered through the process and categorized them within the framework provided by FERC staff and NERC staff at the onset of the process. A survey was distributed on January 31, 2023 requesting comments on the work paper and if there were additional proposals or recommendations that should be considered by the GEH Forum. During the meeting, the participants reviewed the work paper and discussed the comments submitted in response to the survey.

March 3, 2023: On February 8, 2023 a survey, based upon the work paper reviewed during the previous meeting, was distributed to the GEH Forum participants. The intent of this survey was to solicit preliminary feedback and gauge initial interest from the industry regarding the proposals and recommendations summarized in the work paper prepared for the prior meeting. Specifically, the survey asked respondents to indicate their support or opposition for considering action on each of the one-hundred and twelve proposals and recommendations identified through the process, to rank the proposals and recommendations in each category based on the priority they should be given, and provide comments on action that could be taken in support of their top three items within each category. The results of the survey were tabulated utilizing the NAESB Balanced Voting Procedure and made available the week of the meeting on February 27, 2023. During the meeting, the results were reviewed by the Chairs, and the participants were provided an opportunity to offer additional comments regarding the survey and survey responses. The Chairs thanked the participants for their responses and quick turnaround of the survey and noted that the results would inform the areas that the GEH Forum should further explore.

April 4, 2023: During the meeting, the participants reviewed comments submitted in response to the March 15, 2023 survey and discussed the Key Recommendation 7 topic areas that had been identified by FERC staff and NERC staff as measures to improve gas-electric information sharing for improved system performance during extreme cold weather emergencies.



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April 27, 2023: During the meeting, the participants reviewed comments submitted in response to the April 6, 2023 survey and discussed the Key Recommendation 7 topic areas that had been identified by FERC staff and NERC staff as measures to improve reliability of natural gas facilities during cold weather (freeze protection, electric supply).

May 17, 2023: During the meeting, the participants reviewed comments submitted in response to the April 28, 2023 survey and discussed the Key Recommendation 7 topic areas that had been identified by FERC staff and NERC staff as measures to improve the ability of generators to obtain fuel during extreme cold weather events when natural gas heating load and natural gas-fired generators are both in high demand for natural gas, at the same time that natural gas production may have decreased.

June 16, 2023: Prior to the meeting, on June 9, 2023, the NAESB office distributed the NAESB GEH Forum Chairs' Strawman Recommendations Work Paper. The work paper identified nineteen potential recommendations for action based on the GEH Forum record. The work paper included a summary of the record on twenty-six topic areas that were compiled at the request of the Chairs to assist in the consideration of potential recommendations to provide to the GEH Forum participants for discussion. The recommendations in the work paper were formulated by the Chairs after review of the record and resulted from significant discussion prior to the meeting. During the meeting, the participants discussed recommendations four through eleven. The Chairs encouraged participants to submit written comments prior to the next meeting on the recommendations.

June 29, 2023: During the meeting, a presentation was made by Argonne National Laboratory regarding the NGinsight tool, and the participants discussed each of the remaining recommendations in the NAESB GEH Forum Chairs' Strawman Recommendations Work Paper as well as the comments received prior to the meeting. The Chairs, once again, encouraged the participants to submit written comments that they would consider prior to finalizing the recommendations that would be distributed for consideration and vote by the GEH Forum participants after the last scheduled meeting.

July 13, 2023: During the final GEH Forum meeting, NAESB staff reviewed the NAESB Balanced Voting Procedures and the process by which it would be used to conduct a vote on the finalized GEH Forum recommendations, noting that all individuals that participated in a GEH Forum meeting were eligible to vote, consistent with the NAESB Balanced Voting Procedure. A voting period was opened following the meeting via the Mometric platform and closed at 5:00 pm Central on July 20, 2023.

IV. FERC & NERC Staff Report Key Recommendations 7 & 24 Identified Topics

As part of the November 2021 Report, Key Recommendations 7 identified thirteen different topics to serve as a basis for discussion in the forum. FERC staff and NERC staff requested the GEH Forum also consider four areas included as part of Key Recommendation 24 and encouraged the forum to explore any additional issues or considerations that may arise as part of the process. A number of the topics identified by FERC staff and NERC staff have resulted in recommendations included in this report. The following summaries note some of the discussion that took place regarding the identified areas; however, the GEH Forum record can be reviewed to obtain more detailed information. The GEH Forum meetings held on April 4, 2023, April 27, 2023, and May 17, 2023 were specifically dedicated to reviewing the following topics.

Measures to Improve Gas-Electric Information-Sharing for Improved System Performance during Extreme Cold Weather Emergencies

Whether and how natural gas information could be aggregated on a regional basis for sharing with Bulk Electric System operators in preparation for and during events in which demand is expected to rise sharply for both electricity and natural gas, including whether creation of a voluntary natural gas coordinator would be feasible

As identified in Key Recommendation 7, the GEH Forum discussed natural gas system operational information sharing as well as the creation of a voluntary natural gas coordinator. There were a number of proposals in these areas offered throughout the process, including several that identified the potential roles and responsibilities of a voluntary natural gas coordinator. Some of the proposals suggested that a coordinating entity could better facilitate the aggregation and dissemination of operational information for natural gas pipelines¹⁰ or operate as a regional

¹⁰ Updated GEH Forum Survey Responses – March 31, 2023 (Page 14, MISO and Pages 27 – 28, AF&PA and Gas Consumers Group)



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clearinghouse to assimilate and assess data needed to maintain reliable natural gas and Bulk Electric System operations.¹¹ Other participants suggested more substantive roles, including an organization to coordinate industry development of voluntary minimum reliability objectives and performance expectations for the natural gas system¹² or perform functions for the natural gas market similar to those undertaken by ISOs and RTOs.¹³ However, it was noted that differences in the structure of the natural gas and electric market may limit the feasibility of either of these types of roles for a voluntary natural gas coordinator¹⁴ and could be duplicative of existing programs and regulatory requirements.¹⁵ Additionally, as identified by GEH Forum participants, establishing a regional or national voluntary natural gas coordinator will likely require state and/or federal regulatory or legislative action¹⁶ and guidance from policymakers may help inform future discussions.¹⁷ While a specific recommendation in this area was not endorsed as part of the process, the report includes recommendations for action to streamline processes for aggregating natural gas operational information and improve the situational awareness of the natural gas system for Bulk Electric System operators.

Expanding/revising natural gas demand response/interruptible customer programs to better coordinate the increasing frequency of coinciding electric and natural gas peak load demands and better inform natural gas consumers about real-time pricing

The GEH Forum discussed the use of natural gas demand response and interruptible customer programs as a means to better coordinate the increasing frequency of coinciding electric and natural gas peak load demands, and several related proposals were made by GEH Forum participants. It was recognized that there are a number of natural gas utilities that offer interruptible customer programs¹⁸ but that safety considerations and the time and resource requirements to restart the flow of gas may limit the number of end users that can participate.¹⁹ Additionally, participants suggested that while there are third-party platforms that provide daily pricing indexes,²⁰ greater transparency regarding price formation may increase participation in natural gas demand response programs or facilitate more voluntary reductions in supply usage by end users during critical events,²¹ and proposals suggested evaluation of the development of intraday or hourly Gas Day reporting requirements in this area.²² While a recommendation related to this specific topic was not endorsed as part of the process, the report includes recommendations for action to incentivize natural gas demand response programs and promote voluntary conservation during times in which there is high demand for both natural gas and electricity.

Electric and natural gas industry interdependencies (communications, contracts, constraints, scheduling)

Participants identified a number of considerations related to market interdependencies, many of which focused on how to promote greater coordination between the electric and natural gas industry to prepare for critical events in which demand for both electricity and natural gas are expected to sharply rise, several of which resulted in recommendations for action. There were several of proposals that identified actions to improve the ability to obtain natural gas during critical events, especially those occurring over holidays and weekends. It was noted that regulators and industry have established a number of mandatory rules and regulations as well as voluntary standards and processes that support coordination in this area but that there may be opportunities to evaluate if modifications or changes to these rules, regulations, and practices can increase natural gas market liquidity and more closely align natural gas and electric market scheduling practices to better enable the procurement of natural gas by generators. Additionally, many participants stated the importance of robust communication protocols to ensure the availability of natural gas and

¹¹ GEH Forum Survey Responses – April 24, 2023 (Pages 59 – 60, NGSA)

¹² GEH Forum Survey Responses – April 24, 2023 (Page 63, MISO)

¹³ GEH Forum Survey Responses – April 24, 2023 (Pages 67 – 68, SPP)

¹⁴ GEH Forum Survey Responses – April 24, 2023 (Page 61, AGA and Page 68, New England LDC Group)

¹⁵ Updated GEH Forum Survey Responses – March 31, 2023 (Page 28, AGA and Pages 29 – 30, NGSA)

¹⁶ GEH Forum Survey Responses – April 24, 2023 (Page 61, NGSA and Page 61, AGA)

¹⁷ GEH Forum Survey Responses – April 24, 2023 (Pages 67 – 68, SPP)

¹⁸ Updated GEH Forum Survey Responses – March 31, 2023 (Page 45, APGA)

¹⁹ Updated GEH Forum Survey Responses – March 31, 2023 (Page 41, New England LDC Group and Page 45, APGA)

²⁰ GEH Survey Response Comment Submissions – February 27, 2023 (Page 80, NGSA)

²¹ December 5, 2022 GEH Forum Meeting Staff Notes (Page 2, SoCalGas) and GEH Survey Response Comment Submissions – February 27, 2023 (Page 39, PJM)

²² December 5, 2022 GEH Forum Meeting Staff Notes (Page 2, SoCalGas) and GEH Survey Response Comment Submissions – February 27, 2023 (Page 39, PJM)



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electric system information that is needed both prior to and during critical events to help ensure reliability and made proposals intended to improve upon the accessibility and accuracy of data, including several that addressed a more collaborative load forecasting process. While a specific recommendation on collaborative load casting is not included, the report contains recommendations for action related scheduling practices, contracts, and other coordination processes.

Measures to improve reliability of natural gas facilities during cold weather (freeze protection, electric supply)

Additional state actions (including possibly establishing an organization to set standards, as NERC does for Bulk Electric System entities) to enhance the reliability of intrastate natural gas pipelines and other intrastate natural gas facilities

In discussing the topics identified in Key Recommendation 7, the forum considered if there are state actions that could enhance the reliability of intrastate natural gas pipelines and other intrastate natural gas facilities, including the development natural gas reliability standards. While there were proposals in this area, a related recommendation for action was not endorsed as part of the process. Participants explained that standards can provide greater consistency across markets²³ and may be helpful to address areas with gaps in regulatory jurisdiction.²⁴ Some participants suggested the development of natural gas reliability standards in a manner similar to the process used by NERC²⁵ if standards development cannot be facilitated by an existing standards development organization,²⁶ but it was noted congressional or state legislative and/or regulatory action may be a prerequisite to establishing an organization that could develop national or regional standards²⁷ and there should first be a determination as to if standards in this area would be beneficial.²⁸ While a specific recommendation regarding the development of natural gas reliability standards was not included as part of the recommendations offered in this report, the forum record includes the potential benefits and cautions identified by GEH Forum participants, and there are several recommendations for action endorsed by the GEH Forum intended to enhance the reliability of intrastate natural gas pipelines and other intrastate natural gas facilities.

Programs to encourage and provide compensation opportunities for natural gas infrastructure facility winterization

During the forum process, participants discussed mechanisms and programs that could encourage and provide compensation opportunities for natural gas facility weatherization and made several proposals in this area, including the development of weatherization guidance for natural gas production and processing and gathering system facilities. While participants noted that regulatory requirements in this area could impact investments in new infrastructure and that owners and operators of upstream facilities are economically motivated to ensure their facilities can perform,²⁹ others advocated for mandatory requirements that will help to ensure a reliable natural gas supply during critical weather events.³⁰ The report includes recommendations for related action in this area by state authorities as well as market mechanisms that can provide incentives for weatherization.

Methods to streamline the process for, and eliminate barriers to, identifying, protecting, and prioritizing critical natural gas infrastructure load

GEH forum participants discussed and evaluated proposals to streamline the process for identifying, protecting, and prioritizing critical natural gas infrastructure. While the creation of national or regional guidance in this area was discussed, a related recommendation was not endorsed through the process. Participants stated that there are many existing rules and regulations that specify various criteria for identifying critical natural gas load designations,³¹ such as those developed by the Railroad Commission of Texas, and noted that any evaluation of existing procedures to

²³ GEH Forum Survey Responses – April 24, 2023 (Page 7, SPP)

²⁴ GEH Forum Survey Responses – April 24, 2023 (Pages 3 – 4, MISO)

²⁵ GEH Forum Survey Responses – April 24, 2023 (Page 2, AEP and Pages 6 – 7, Xcel Energy)

²⁶ GEH Forum Survey Responses – April 24, 2023 (Page 4, Gas & Oil Association of West Virginia and Page 8, Ohio Oil and Gas Association)

²⁷ GEH Forum Survey Responses – April 24, 2023 (Page 3, AGA)

²⁸ GEH Forum Survey Responses – April 24, 2023 (Page 3, MISO)

²⁹ GEH Forum Survey Responses – April 24, 2023 (Page 18, NGSA)

³⁰ GEH Forum Survey Responses – April 24, 2023 (Page 24, AGA)

³¹ GEH Forum Survey Responses – April 24, 2023 (Page 31, NGSA) and Updated GEH Forum Survey Responses – May 22, 2023 (Pages 33 – 35, INGAA)



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determine if there is an opportunity to establish greater consistency between the various jurisdictional requirements should account for regional factors or market differences that impact considerations in this area.³² Additionally, participants stated that any effort to streamline related processes should not interfere with private contracting rights and ensure that disclosures regarding critical infrastructure do not create security risks.³³ While the record may be helpful in explaining some of the benefits and cautions identified by participants when establishing rules for prioritizing natural gas infrastructure, no specific action in the area was recommended.

Measures to improve the ability of generators to obtain fuel during extreme cold weather events when natural gas heating load and natural gas-fired generators are both in high demand for natural gas, at the same time that natural gas production may have decreased

Which entity has authority to require certain natural gas-fired generating units to obtain either firm supply and/or transportation or dual fuel capability, under what circumstances such requirements would be cost-effective, and how such requirements could be structured, including associated compensation mechanisms, whether additional infrastructure buildout would be needed, and the consumer cost impacts of such a buildout

The GEH Forum process included discussions regarding firm supply and/or transportation or dual fuel capability requirements. While a specific proposal was not endorsed, some participants recommended establishing mandatory requirements. It was noted that differences in market structure and stakeholder needs could make decision-making processes by regulators and bulk electric system operators challenging³⁴ and that the practicality and effectiveness of mandatory requirements is dependent upon the existence of sufficient infrastructure to supply and transport fuel as well as the availability of cost-recovery mechanisms for generators.³⁵ While the forum process did not result in recommendations identifying specific cost-effective scenarios, the record contains considerations identified by GEH Forum participants in this area, and the report includes related recommendations regarding compensation mechanisms to incent firm services.

Possible options to increase regasification of liquid natural gas, including possible Jones Act waivers

Participants discussed ways to increase regasification of liquefied natural gas (LNG), among other requests related to the fuel source. These discussions included the use of Jones Act waivers but did not result in any recommended actions. Jones Act waivers are reviewed by the Department of Homeland Security, and the department has established a process to expeditiously review waiver requests which includes consulting with the Department of Energy regarding any energy related requests.³⁶ Proposals were made to consider the use of blanket waivers³⁷ but current laws prevent pre-authorization of such requests, and participants noted that there may be infrastructure,³⁸ supply acquisition,³⁹ and gas quality⁴⁰ considerations to regasification of LNG that prevent wider usage. While the forum record may be useful to explain the benefits and concerns noted by participants, there were no specific recommendations for action in this area.

Which entity has authority, and under what circumstances, to take emergency actions to give critical generators pipeline transportation priority second only to residential heating load, during cold weather events when natural gas supply and transportation is limited but demand is high

In evaluating Key Recommendation 7, GEH Forum participants discussed natural gas transportation priority for critical generation resources during specific emergency situations, and proposals for the creation of regional or national guidance in this area were considered; however, a specific recommendation for action was not articulated

³² GEH Forum Survey Responses – April 24, 2023 (Page 31, NGSA) and Updated GEH Forum Survey Responses – May 22, 2023 (Pages 37 – 38, Texas Pipeline Association)

³³ GEH Forum Survey Responses – April 24, 2023 (Page 31, NGSA) and Updated GEH Forum Survey Responses – May 22, 2023 (Pages 37 – 38, Texas Pipeline Association)

³⁴ Updated GEH Forum Survey Responses – May 22, 2023 (Page 8, PJM and Pages 9 – 10, MISO)

³⁵ Updated GEH Forum Survey Responses – May 22, 2023 (Pages 1 – 3, NGSA and Pages 3 – 4, AEP)

³⁶ Updated GEH Forum Survey Responses – September 14, 2022 (Page 20, NGSA) (quoting Granholm, Jennifer. The Secretary of Energy. August 18, 2022. Letter to the Honorable Charles D. Baker, Governor of the Commonwealth of Massachusetts.)

³⁷ GEH Forum Survey Responses – April 24, 2023 (Page 38, Evergy)

³⁸ April 27, 2023 GEH Forum Meeting Staff Notes (Page 6, Kinder Morgan, Intrastate Pipeline Group)

³⁹ GEH Forum Survey Responses – April 24, 2023 (Page 38, New England LDC Group)

⁴⁰ GEH Forum Survey Responses – April 24, 2023 (Page 36, AGA; Page 37, INGAA; Page 38, New England LDC Group)



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through the GEH Forum process. Participants noted that in states where procedures to reallocate capacity have been established,⁴¹ prior to invoking such actions, applicable authorities should determine that the reallocation of capacity will not further stress or constrain the natural gas transportation system,⁴² and use discretion in the decision-making process as the ultimate end use of natural gas may not be easily ascertained.⁴³ Additionally, participants noted that existing federal regulatory rules and policies may limit the applicability of this concept for interstate natural gas pipeline capacity.⁴⁴ A recommendation for action was not endorsed as part of the process, but the record may be helpful to identify the considerations and concerns articulated by the industry in this area.

Whether resource accreditation requirements for certain natural gas generating units should factor in the firmness of a unit's gas commodity and transportation arrangements as well as the potential for correlated outages for units served by the same pipeline(s)

During the GEH Forum process, several participants indicated that there are ongoing efforts by industry to consider new and modified resource accreditation requirements, some of which include consideration of the availability and reliability of a natural gas-fired generation's fuel supply. Participants noted that while there may be broadly applicable considerations to determine if changes to resource accreditation requirements should be evaluated, the identification of specific solutions to strengthen reliability will be dependent upon a number of factors, some of which may be unique to a given region or market, like underlying infrastructure framework and the applicability of state regulatory requirements.⁴⁵ The report includes a recommendation of support for ongoing ISO and RTO stakeholder processes to consider reforms to resource accreditation requirements.

Whether there are barriers to the use of dual fuel capability that could be addressed by changes in state or federal rules or regulations as well as considering the use of other resources which could help mitigate the risk of loss of natural gas fuel supply

GEH Forum participants considered if actions by state or federal regulators could remove barriers that may be inhibiting the use of dual fuel capabilities and if there are other resources that may help to mitigate the risk natural gas fuel supply loss. While no specific recommendations resulted from these discussions, participants did identify some considerations that may factor into the decision-making process for the use of dual fuel, including emission rules and regulations and the ability of a generator to recover costs associated with acquiring a secondary fuel source. It was noted that ensuring compensation mechanisms properly incentivize dual fuel could encourage wider usage, if desired,⁴⁶ and that actions to streamline the process for obtaining emission limit waivers during critical events could enable quicker deployment of such resources.⁴⁷ Participants also suggested that regular testing of fuel-switching capabilities can help to detect any operational or mechanical issues and ensure the resource is prepared to perform during critical events.⁴⁸ Additionally, it was stated that some generators may have access to other types of resources, such as electric storage, that can inject electricity onto the grid during high load periods and serve a similar function as generators with dual fuel.⁴⁹ A review of the GEH Forum record could be helpful in determining if further considerations in this area would be beneficial for reliability.

Increasing access to/utilization of market-area and behind-the-city-gate natural gas storage

In discussing Key Recommendation 7, the GEH Forum evaluated how the industry currently uses natural gas storage and ways to increase access and utilization, including the creation of strategically located storage facilities. Several proposals in this area were discussed but related recommendations were not endorsed through the process. Participants noted that during Winter Storm Elliott, some regions of the country were able to successfully use storage resources to meet demand⁵⁰ and that there are some jurisdictions, such as Texas, that have created market services to incentivize to the use of natural gas storage and/or obtain and reserve storage to maintain reliability in the event of fuel supply

⁴¹ Updated GEH Forum Survey Responses – May 22, 2023 (Page 30, AGA and Page 34, INGAA)

⁴² Updated GEH Forum Survey Responses – May 22, 2023 (Page 30, Xcel Energy and Pages 33 – 34, INGAA)

⁴³ Updated GEH Forum Survey Responses – May 22, 2023 (Page 29, NGSA)

⁴⁴ Updated GEH Forum Survey Responses – May 22, 2023 (Page 30, Xcel Energy and Pages 33 – 34, INGAA)

⁴⁵ Updated GEH Forum Survey Responses – May 22, 2023 (Page 43, SPP)

⁴⁶ Updated GEH Forum Survey Responses – May 22, 2023 (Page 54, Evergy)

⁴⁷ Updated GEH Forum Survey Responses – May 22, 2023 (Page 51, NGSA; Page 53, PJM; and Page 54, Evergy)

⁴⁸ Updated GEH Forum Survey Responses – May 22, 2023 (Page 51, NGSA and Page 52, NYISO)

⁴⁹ Updated GEH Forum Survey Responses – May 22, 2023 (Pages 23 and 56, SPP)

⁵⁰ GEH Forum Survey Responses – April 24, 2023 (Page 14, AF&PA and Gas Consumers Group)



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disruptions.⁵¹ Participants explained that effective use of natural gas storage is typically dependent on the availability of sufficient capacity to transport the fuel⁵² and that while greater access to storage for generators located behind-the-city-gate may be particularly helpful,⁵³ local distribution companies are often heavily reliant upon these types of facilities, and participants cautioned that any actions to incentivize storage use by generators should ensure that the ability of other resources to access storage facilities is not diminished.⁵⁴ No specific action in this area was recommended, but a review of the record can explain the considerations identified by participants regarding expansion of natural gas storage.

Whether or how to increase the number of “peak-shaver” gas-fired generating units that have on-site LNG storage

GEH Forum participants discussed the expansion of on-site LNG storage for natural gas-fired generators, and several proposals were made but no recommendation for action was endorsed through the process. Participants stated that on-site LNG storage may not be a practical solution for the majority of natural-gas fired generators⁵⁵ except for in a few regions of the country, such as New England.⁵⁶ It was recommended that before pursuing on-site LNG, a case-by-case analysis be carried out to confirm that this is the most cost-effective proposal to ensure reliability.⁵⁷ While no specific actions in this area are recommended, the record may provide insight into the factors identified by participants to consider as part of any related decision making process.

Recommendations for Further Study

As requested by FERC staff and NERC staff, the GEH Forum discussed Recommendation 24 which identifies four potential areas of study by federal and state entities with jurisdiction over natural gas infrastructure, and several recommendations in this area were endorsed by the GEH Forum. Two of the identified areas included in the recommendations for study developed as a part of the GEH Forum process address evaluation of the use of (1) market-incentivized investments in strategic natural gas storage facilities and (2) additional financial incentives for natural gas infrastructure to address natural gas supply shortfalls during critical events. Additionally, a third identified area in Recommendation 24, the use of market or public funding for generators to have firm transportation and supply and invest in storage contracts is the subject of a recommendation for action endorsed by the GEH Forum. Discussion on the fourth area, possible options for increased regasification of liquid natural gas, is referenced in section III.C.2 of this report and included as part of the record. The GEH Forum also endorsed a recommendation for study based on participant proposals to evaluate regional needs regarding regional evaluations of whether there is adequate natural gas infrastructure in place to support new gas usage patterns.

⁵¹ Updated GEH Forum Survey Responses – May 22, 2023 (Page 60, TPA)

⁵² Updated GEH Forum Survey Responses – May 22, 2023 (Page 57, AEP)

⁵³ Updated GEH Forum Survey Responses – May 22, 2023 (Page 61, NGSA)

⁵⁴ Updated GEH Forum Survey Responses – May 22, 2023 (Page 61, AGA)

⁵⁵ Updated GEH Forum Survey Responses – May 22, 2023 (Page 24, NGSA)

⁵⁶ Updated GEH Forum Survey Responses – May 22, 2023 (Page 24, NGSA and Page 25, PJM)

⁵⁷ Updated GEH Forum Survey Responses – May 22, 2023 (Page 25, PJM and Page 26, MISO)



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V. NAESB GEH Forum Recommendations & Voting Results

The following twenty recommendations purpose specific actions that can be undertaken to address challenges presented by the increasingly interdependent nature of the natural gas and electric market and lead to enhanced market coordination. The recommendations were voted on during a one-week voting period opened to all participants in the GEH Forum process following the final GEH Forum meeting on July 13, 2023 and have been tallied utilizing the NAESB Balanced Voting Procedure⁵⁸ to show the support or opposition to the purposed action by market and market segment. Although a process for determining consensus by the industry on each recommendation was not defined by the GEH Forum, the purpose of tallying the votes in this manner is to provide the parties responsible for considering the actions described in the recommendations with insight into the perspectives of the industry through the lens of the balanced, consensus-based process utilized by NAESB to adopt its standards. A summary of the rationale for the recommendations taken from the record and identified by the Chairs of the GEH Forum, along with tables illustrating the aggregated votes, can be found following each recommendation. While participants in the GEH Forum nearly universally agreed that actions to improve coordination and mitigate the reliability risks should be undertaken expeditiously by the industry and specific implementations, priorities and deadlines for the actions described in the recommendations were offered and discussed during the GEH Forum process, it was determined that decisions regarding timing and balancing of interests are best left to the parties responsible for taking the actions described in the recommendations. In addition to the full record of all GEH Forum activities, including the meeting recordings, meeting chat, presentations, work papers and written comments cited throughout the report, a full voting record of all votes cast and supplemental comments concerning the votes submitted by interested parties are provided as an appendix to this report.

Recommendation 1: *The FERC should direct NAESB to revise its business practice standards related to the timely reporting of natural gas pipeline informational website posting data (such as operationally available capacity, total scheduled quantity, and any other data necessary to assist regional operators in maintaining system reliability) to enable the data and any subsequent amendments to become routinely accessible to Bulk Electric System operators as soon as such data are reported and available.*

The GEH Forum participants engaged in considerable discussions regarding how information sharing between the natural gas and electric markets could be improved upon, including changes to information sharing practices. Under FERC regulations in 18 C.F.R § 284.13, interstate natural gas pipelines are required, in an equal and timely manner, to provide certain transactional and operational information via informational posting websites, such as the availability of capacity on the mainline, at receipt and delivery points, and in storage fields as well as the amount of natural gas scheduled at each point and pipeline segment.⁵⁹ This information must also be made available in downloadable file formats and, per 18 C.F.R § 284.12, these postings must conform with the NAESB WGQ Business Practice Standards.⁶⁰ However, a number of GEH Forum participants noted that quicker access to this data could enhance situational awareness and provide greater understanding of natural gas systems, better informing processes of electric system operators to ensure reliability, especially during critical events.⁶¹ There was substantial support from both electric and natural gas participants to explore ways to streamline and add efficiencies to the reporting, posting, and data sharing processes of natural gas pipelines.⁶²

GEH Forum participants stated that improvements to the speed, depth, and quality of data included in informational postings by interstate natural gas pipelines, could help to provide near-real time information, expanding visibility

⁵⁸ A description of the NAESB quadrants and segments and the NAESB balanced voting procedure can be found through the following hyperlink: https://www.naesb.org/pdf4/geh_balanced_voting_quadrant_segment_descriptions.doc

⁵⁹ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 14, INGAA); Updated GEH Forum Survey Responses – March 31, 2023 (Pages 2 – 3 and 18, INGAA)

⁶⁰ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 2 – 3 and 18, INGAA)

⁶¹ See February 27, 2023 GEH Forum Survey, Recommendation 1.c.24; GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 23, LS Power); GEH Forum Survey Responses – November 1, 2022 – Compiled (Pages 14 – 15, LS Power); November 8, 2022 GEH Forum Meeting Staff Notes (Page 6, SPP); GEH Forum Survey Responses for March 3, 2023 (Page 123, Electric Power Supply Association); Updated GEH Forum Survey Response – March 31, 2023 (Page 21, 44 Farris); April 4, 2023 GEH Forum Meeting Staff Notes (Page 2, AGA and Page 3, 44 Farris)

⁶² GEH Survey Response Tabulation – February 27, 2023 (Page 47, Recommendation 1.c.24)



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regarding scheduled capacity and increasing overall transparency of the operational status of natural gas pipelines.⁶³ While it was explained that natural gas pipelines are obligated to publicly post information such as operationally available capacity, maintenance activities, and critical notices as soon as such information becomes available,⁶⁴ some participants noted that there are inconsistencies when comparing the detail and availability of data.⁶⁵ For instance, GEH Forum participants stated that there can be differences in both the formatting and timing of postings by natural gas pipelines⁶⁶ and suggested that more detailed, standardized information could give natural gas market participants a better understanding of possible system constraints, leading to more informed decision making by natural gas end users.⁶⁷

Several ISOs and RTOs participating in the GEH Forum noted the importance of a wide-area view of natural gas system operations to help ensure reliability and the value of being able to access timely data to assist in operational planning, particularly during critical events or anticipated critical events.⁶⁸ This type of information sharing is supported by FERC Order No. 787 that permits the communication between certain parties of operational information to support reliability of natural gas and electric systems as well as the NAESB WEQ and WGQ Business Practice Standards, incorporated by reference as part of 18 C.F.R § 38.1(a) and 18 C.F.R § 284.12, respectively, that require written operational communication procedures between natural gas pipelines and balancing authorities/reliability coordinators during critical events.⁶⁹ While some ISOs and RTOs have been able to establish regional coordination processes that result in relatively quick information exchanges regarding relevant natural gas operations data,⁷⁰ other ISOs and RTOs stated that there are challenges in accessing and analyzing such information.⁷¹ The lack of consistency and variances in data availability, as noted by some participants, can cause delays for ISOs and RTOs in interpreting the impact of natural gas system changes on electric reliability and often necessitates additional action by the ISO or RTO to obtain further information.⁷² Depending on the number of natural gas pipelines within an ISO's or RTO's footprint, this outreach can require significant time resources.⁷³ A suggestion was made that additional transparency requirements could help create greater consistency and uniformity in the timing and availability of data provided by natural gas pipelines.⁷⁴ Participants explained that more timely, relevant information can increase the speed of decision making processes by system operators, noting that greater detail in and timeliness of informational postings would be of particular benefit.⁷⁵ Additionally, as proposed by GEH Forum participants, streamlining informational postings could provide for easier assimilation of natural gas data and better facilitate the development of automatable data exchanges that simultaneously access and process data from multiple natural gas pipelines, increasing overall efficiency.⁷⁶

Beyond streamlining informational postings, it was noted that being able to identify, in real-time, available natural gas pipeline capacity, especially during critical events, would be beneficial. A suggestion was made that if interstate natural gas pipelines release actual flow data, this could provide real-time information regarding capacity availability,

⁶³ GEH Forum Survey Responses – October 10, 2022 (Page 24, Process Gas Consumers Group, Industrial Energy Consumers of America, and American Forest and Paper Association); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 17, PGC & AF&PA); GEH Forum Survey Responses – February 2, 2023 (Page 13, TCPA); GEH Forum Survey Response Comment Submission – February 27, 2023 (Page 94, Southern Company)

⁶⁴ GEH Forum Survey Responses for November 8, 2022 (INGAA, Page 14)

⁶⁵ Updated GEH Forum Survey Responses – March 31, 2023 (Page 15, SPP)

⁶⁶ Updated GEH Forum Survey Responses – March 31, 2023 (Page 89, New England LDC Group)

⁶⁷ GEH Forum Survey Response Comment Submissions – February 27, 2023 (Page 123, Electric Power Supply Association)

⁶⁸ November 8, 2022 GEH Forum Meeting Staff Notes (Page 7, PJM, MISO, SPP & NYISO)

⁶⁹ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 13, INGAA)

⁷⁰ GEH Forum Survey Responses – November 1, 2022 – Compiled (Pages 15 – 16, CAISO); November 8, 2022 GEH Forum Meeting Staff Notes (Page 8, CAISO); Updated GEH Forum Survey Responses – March 31, 2023 (Pages 10 – 11, ISONE)

⁷¹ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 13 – 14, MISO; Page 15, SPP)

⁷² Updated GEH Forum Survey Responses – March 31, 2023 (Pages 13 – 14, MISO; Page 15, SPP)

⁷³ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 13 – 14, MISO; Pages 15 – 17, SPP)

⁷⁴ November 8, 2022 GEH Forum Meeting Staff Notes (Page 6, SPP)

⁷⁵ GEH Forum Survey Response Comment Submission – February 27, 2023 (Page 4 and Page 314, Southern Company)

⁷⁶ December 5, 2022 GEH Forum Meeting Staff Notes (Page 2, Eversource Energy); GEH Forum Survey Response Comment Submissions – February 27, 2023 (Pages 3, 27-28, and 44 Farris); and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 13 – 14, MISO; Pages 15 – 17, SPP)



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increase transparency, and facilitate greater intraday coordination between LDCs and the electric market.⁷⁷ Others stated that actual flow data can be considered commercially sensitive and that as such information is not necessarily reflective of operationally available capacity, any potential benefits may be disproportionate to cost.⁷⁸ Participants noted that commercially sensitive data would need to be anonymized and aggregated prior to release and that while actual flow data can be used to calculate the difference between the quantity of flowing gas and a natural gas pipeline’s design capacity, this value is only indicative of if there is available capacity at a given receipt or delivery point.⁷⁹ It was explained that the amount of actual operationally available capacity may differ for reasons such as contractual commitments to provide no-notice service and manage line pack or system pressure.⁸⁰ Additionally, as noted in comments provided as part of the GEH Forum record, the modifications needed to provide actual flow data to third parties, including the deployment of cybersecurity upgrades across the natural gas pipeline network, would likely require a significant investment by interstate natural gas pipelines and that such costs may not be justified using a cost-benefit analysis.⁸¹

In consideration of the GEH Forum record, the Chairs of the GEH recommended that coordination by the natural gas and electric industries, through NAESB, to facilitate the development of business practices that support the timing of informational website posting data required by FERC will improve reliability through greater insights into natural gas system operations as well as better enable the development of industry tools that can further improve situational awareness.

NAESB Balanced Voting Results – Recommendation 1						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	4	1	1.6	0.4	80%	20%
Pipelines	1	19	0.1	1.9	5%	95%
Local Distribution Companies	5	5	1	1	50%	50%
End Users	5	5	1	1	50%	50%
Services	3	4	0.86	1.14	43%	57%
Total:	18	34	4.56	5.44	46%	54%
Wholesale Electric Market						
Transmission	1	0	1	0	100%	0%
Generation	9	3	1.5	0.5	75%	25%
Marketers/Brokers	2	0	2	0	100%	0%
Distributor/Load Serving Entities	3	1	1.5	0.5	75%	25%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	6	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%

⁷⁷ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 23, LS Power); GEH Forum Survey Responses – November 1, 2022 – Compiled (Pages 14 – 15, LS Power)

⁷⁸ GEH Forum Survey Response Comment Submissions – February 27, 2023 (Page 114, NGSA) and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 18 – 19, INGAA)

⁷⁹ GEH Forum Survey Response Comment Submissions – February 27, 2023 (Page 114, NGSA) and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 18 – 19, INGAA)

⁸⁰ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 18 – 19, INGAA)

⁸¹ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 18 – 19, INGAA)



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Total:	26	5	11	2	85%	15%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	1	0	1	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	0	6	0	2	0%	100%
Total:	2	6	2	2	50%	50%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	7	1	1.75	0.25	87.5%	12.5%



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Recommendation 2: *The FERC should take steps to facilitate the expansion of the Argonne National Laboratory NGInsight tool, with funding from a federal governmental agency, such as the Department of Energy, to improve situational awareness and communication between the natural gas pipeline system and Bulk Electric System operators. Access to and use of this tool should include appropriate security protocols and market protections.*

As requested in the November 2021 Report, the GEH Forum discussed how natural gas system information could be aggregated for sharing with Bulk Electric System operators in preparation for and during critical events, including the feasibility of establishing a voluntary natural gas coordinator to assist in these efforts. Many different roles and functionalities for a voluntary natural gas coordinator were discussed by GEH Forum participants, such as data compilation via a clearinghouse funded by ISOs and RTOs to aggregate and assess relevant operational information on a regional basis.⁸² Others proposed a more substantial role for a natural gas coordinator, including the creation of an organization, potentially structured like NERC prior to becoming the Electric Reliability Organization, that could facilitate the development of voluntary practices and operational protocols to support natural gas system reliability⁸³ or an entity that could function similar to ISOs and RTOs and coordinate natural gas system planning and reliability on a regional basis.⁸⁴ Some GEH Forum participants expressed opposition, explaining that a voluntary natural gas coordinator may create an unnecessary burden and increase the cost of service without providing sufficient benefits.⁸⁵ Additionally, it was noted that if a more substantive role were envisioned, a singular entity would currently lack jurisdiction to take meaningful actions and providing such authority would be complex, likely requiring input and decisions from a multitude of state legislative bodies and regulatory authorities.⁸⁶ Although there was not a clear consensus regarding the creation and role of a voluntary natural gas coordinator, GEH Forum participants substantially supported considering actions or mechanisms that could improve situational awareness and communications between the natural gas pipeline system and Bulk Electric System operators, including a tool to disseminate regionally or nationally aggregated information regarding the operational status of natural gas pipelines.⁸⁷ In discussions, GEH Forum participants stated that there may be existing tools, such as the NGInsight tool developed by Argonne National Laboratory, that could provide much of the functionality identified as important to market participants.

GEH Forum participants proposed the consideration of tools that could aggregate and analyze available natural gas pipeline electronic bulletin board (EBB) data as well as facilitate timelier access to such information through a singular portal.⁸⁸ Participants suggested that such a tool would provide entities with a better understanding of operational information, such as available capacity and scheduled quantity⁸⁹ and may improve upon the ability of system operators to make decisions during critical events.⁹⁰ Additionally, it was explained that given the volume of critical notices and the range of events these notices cover, from scheduled maintenance to curtailments and OFOs, market participants may expend significant time and resources to sort and analyze this information which may cause delays in decision-making processes by system operators during critical events.⁹¹ Participants suggested that a mechanism which could better assimilate locational information, such as through the use of visual mappings,⁹² as well as more efficiently filter

⁸² GEH Forum Survey Responses – April 24, 2023 (Pages 58 – 59, NGSA)

⁸³ April 27, 2023 GEH Forum Meeting Staff Notes (Page 7, MISO)

⁸⁴ GEH Forum Survey Responses – April 24, 2023 (Pages 66 – 68, SPP)

⁸⁵ Updated GEH Forum Survey Responses – March 31, 2023 (Page 28, AGA) and GEH Forum Survey Responses – April 24, 2023 (Page 61, AGA; Page 68, New England LDC Group)

⁸⁶ GEH Forum Survey Responses – April 24, 2023 (Page 61, AGA; Page 68, New England LDC Group) and April 27, 2023 GEH Forum Meeting Staff Notes (Page 2, AGA)

⁸⁷ GEH Survey Response Tabulation – February 27, 2023 (Page 3, Recommendation 1.a.1)

⁸⁸ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 24, Process Gas Consumers Group, Industrial Energy Consumers of America, and American Forest and Paper Association); GEH Forum Survey Response Comment Submissions – February 27, 2023 (Page 4, Southern Company); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 23, 44 Farris)

⁸⁹ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 24, Process Gas Consumers Group, Industrial Energy Consumers of America, and American Forest and Paper Association)

⁹⁰ GEH Forum Survey Response Comment Submission – February 27, 2023 (Page 314, Southern Company) and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 13 – 14, MISO; Pages 15 – 17, SPP)

⁹¹ Updated GEH Forum Survey Responses – March 31, 2023 (Page 92, MISO)

⁹² GEH Survey Response Comment Submissions – February 27, 2023 (Page 122, Aspen Environmental Group and Page 123, EPSA) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 92 and Page 94, SPP)



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critical notices⁹³ could expedite evaluation of these notices and provide greater understanding of operational conditions and system constraints.⁹⁴

While there was wide, cross-market support for aggregation tools, several participants noted tool development and maintenance can be a costly endeavor.⁹⁵ Participants stated that prior to making a determination to pursue a new tool or technology, the costs need to be weighed against potential benefits to ensure the price is proportional to value and that the tool beneficiaries are responsible for bearing such costs.⁹⁶ In order to maximize efficiency, and prevent duplicative endeavors, it was suggested that the GEH Forum evaluate existing industry tools.⁹⁷ In these discussions, GEH Forum participants identified that there are third-party tools from commercial developers that offer data aggregation and analytical services for natural gas pipeline informational postings⁹⁸ and that some ISOs and RTOs have developed similar aggregation and dashboard style tools for internal use.⁹⁹ In evaluating the availability of the tools, including those developed by ISOs and RTOs, participants suggested that the NGInsights tool developed by Argonne National Laboratories may meet the needs of the ISO and RTO community and avoid redundancies.¹⁰⁰

In a presentation made to the GEH Forum, Argonne National Laboratory stated that the NGInsight tool collects EBB data and provides near real-time assimilation of information from approximately 75% of interstate and offshore natural gas pipelines, creating a national-level view of natural gas system situational awareness.¹⁰¹ The data collected and displayed by the tool includes information that identifies unsubscribed capacity, total scheduled quantity as a function of state, county, and/or pipeline as well as critical and non-critical notices, and the tool has the ability to layer other relevant datasets, such as utility service territories and weather alerts.¹⁰² While the tool cannot predict if a specific shipper is capable of providing natural gas, it can perform data analyses that connect natural gas pipelines to applicable natural gas processing plants and categorize receipt points (e.g. gathering system interconnection, LNG terminal, compressor, etc.), making it possible to identify the potential impact of weather or other critical events on overall natural gas supply.¹⁰³ Additionally, through machine learning informed by ISO and RTO market participant input, the tool is able to rank natural gas pipeline notifications provided through EBBs on a scale of 1 – 5, with level 5 being reserved for major unexpected outages and force majeure.¹⁰⁴

As indicated by Argonne National Laboratory, additional funding could enhance the benefits that are provided by the tool. Future functionality could include aggregating information from all interstate natural gas pipelines, providing more granular locational data to help identify the areas and facilities that may be impacted by a critical notice, and implementing security protections and tool access protocols.¹⁰⁵ Argonne National Laboratories confirmed that there is currently limited access to the tool and, if there is to be wider utilization of the tool, expressed support for controlled access through a user vetting process and cybersecurity protections.¹⁰⁶ Additionally, Argonne National Laboratories indicated that with greater funding, the tool could potentially incorporate data collected from intrastate natural gas pipelines with EBBs and other market participants, such as LDCs, that provide EBB data. GEH Forum participants stated that the data aggregation and analyses provided by the tool, as well as several of the enhanced functionalities

⁹³ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 27, MISO, PJM, & SPP); October 21, 2022 GEH Forum Meeting Staff Notes (Pages 8 – 9, MISO, PJM and SPP); and April 4, 2023 GEH Forum Meeting Staff Notes (Page 3, New Jersey Natural Gas)

⁹⁴ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 27, MISO, PJM, & SPP) and October 21, 2022 GEH Forum Meeting Staff Notes (Pages 8 – 9, MISO, PJM and SPP)

⁹⁵ Updated GEH Forum Survey Responses – March 31, 2023 (Page 18, INGAA and Page 20, AGA)

⁹⁶ Updated GEH Forum Survey Responses – March 31, 2023 (Page 18, INGAA and Page 20, AGA)

⁹⁷ Updated GEH Forum Survey Responses – March 31, 2023 (Page 20, AGA)

⁹⁸ Updated GEH Forum Survey Responses – March 31, 2023 (Page 23, 44 Farris and Xcel Energy)

⁹⁹ Updated GEH Forum Survey Responses – March 31, 2023 (Page 8, CAISO and Pages 10 and 22, ISONE)

¹⁰⁰ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 19 and 22, ISONE and Page 20, NYISO) and May 17, 2023 GEH Forum Meeting Staff Notes (Pages 2 – 3, ISONE and PJM)

¹⁰¹ Argonne National Laboratory Presentation – June 29, 2023 (Page 3, Argonne National Laboratory)

¹⁰² Argonne National Laboratory Presentation – June 29, 2023 (Pages 3 – 4, Argonne National Laboratory)

¹⁰³ Argonne National Laboratory Presentation – June 29, 2023 (Pages 3 – 6, Argonne National Laboratory)

¹⁰⁴ Argonne National Laboratory Presentation – June 29, 2023 (Page 5, Argonne National Laboratory)

¹⁰⁵ Argonne National Laboratory Presentation – June 29, 2023 (Page 5, Argonne National Laboratory)

¹⁰⁶ June 29, 2023 GEH Forum Meeting Staff Notes (Page 2, Argonne National Laboratory)



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discussed as part of the GEH Forum record, could improve reliability but noted that if there are any concerns regarding a commercial advantage that could be created from use of the tool, these would need to be addressed by FERC.¹⁰⁷

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended that the natural gas system data aggregations and analyses that can be provided through expanding the NGinsight tool by Argonne National Laboratory will provide additional transparency regarding natural gas system operational information that can improve upon reliability during critical events when demand for both natural gas and electricity is expected to increase and encouraged the consideration of actions that could support further tool development and ongoing maintenance.

NAESB Balanced Voting Results – Recommendation 2						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	4	1	1.6	0.4	80%	20%
Pipelines	13	6	1.37	0.63	68%	32%
Local Distribution Companies	5	1	1.67	0.33	83.5%	16.5%
End Users	5	5	1	1	50%	50%
Services	4	4	1	1	50%	50%
Total:	31	17	6.64	3.36	66%	34%
Wholesale Electric Market						
Transmission	1	0	1	0	100%	0%
Generation	7	3	1.4	0.6	70%	30%
Marketers/Brokers	3	0	2	0	100%	0%
Distributor/Load Serving Entities	3	1	1.5	0.5	75%	25%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	5	1	1.67	0.33	83.5%	16.5%
Technology and Services	4	0	2	0	100%	0%
Total:	24	6	10.57	2.43	81%	19%
Retail Energy Market						
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	0	6	0	2	0%	100%
Total:	3	6	3	2	60%	40%
Other Mkt Participant/Observer						
Total:	7	1	1.75	0.25	87.5%	12.5%

¹⁰⁷ June 29, 2023 GEH Forum Meeting Staff Notes (Page 2)



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Recommendation 3: *The FERC should take steps to facilitate the expansion of the Argonne National Laboratory NGInsight tool, with funding from a federal governmental agency, such as the Department of Energy, to improve situational awareness and communication between owners and operators of natural gas production and processing facilities and Bulk Electric System operators. Such communication could include aggregated volume data or confirmed scheduled quantities for key upstream receipt points. Access to and use of the tool should include appropriate security protocols and market protections.*

The November 2021 Report states that during Winter Storm Uri, natural gas supply outages that initiated at the wellhead created a cascading effect that led to reductions in natural gas processing, declarations of operational flow orders and force majeure, and derates and outages of natural gas-fired generators.¹⁰⁸ GEH Forum participants noted that similar production issues encountered during Winter Storm Elliott also led to a loss in fuel supply by natural gas-fired generators and suggested that the lack of visibility regarding upstream facilities may be impacting reliable operations of the Bulk Electric System during critical weather events.¹⁰⁹ There was significant support among natural gas and electric market participants for wellhead and midstream facility operators to make available information regarding any encountered operational challenges that could provide a better understanding of potential downstream impacts,¹¹⁰ including improved communications regarding wellhead issues that may affect the flow of natural gas.¹¹¹

Several ISOs and RTOs stated that the lack of coordination between owners and operators of natural gas production facilities and natural gas-fired generators or system operators often means that supply issues are not known until near real-time with the issuance of a force majeure.¹¹² It was explained that direct sight into the status of natural gas production would provide broader situational awareness and likely give ISOs and RTOs added time to plan for potential drops in fuel supply and dispatch different generation resources.¹¹³ Additionally, participants suggested that greater transparency regarding production issues could better position natural gas end-users to prepare for extreme weather events by providing more time to seek alternative supply or fuel arrangements.¹¹⁴ GEH Forum participants also noted that the availability of information regarding weather-related production issues could assist purchasers in evaluating the reliability of a natural gas supplier¹¹⁵ as well as incentivize wellhead and production facility weatherization.¹¹⁶

To facilitate the provision of information related to operational issues encountered by production facility operators, some GEH Forum participants suggested the consideration of posting requirements in a manner similar to how interstate natural gas pipelines make available critical notices.¹¹⁷ This information could be shared via email or through a centralized posting website¹¹⁸ or made available to impacted downstream entities through an interstate natural gas pipeline's EBB,¹¹⁹ which participants explained would help to ensure timely awareness of changes in operating conditions that impact natural gas supply.¹²⁰ While there were proposals for FERC or state action to facilitate

¹⁰⁸ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 13)

¹⁰⁹ GEH Survey Response Comment Submissions – February 27, 2023 (Page 328, IESO, ISONE, NYISO, PJM, and SPP) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 76, MISO)

¹¹⁰ GEH Survey Response Tabulation – February 27, 2023 (Page 49, Recommendation 1.c.26)

¹¹¹ GEH Survey Response Comment Submissions – February 27, 2023 (Page 303, New England LDC Group and Page 328, IESO, ISONE, NYISO, PJM, and SPP)

¹¹² GEH Survey Response Comment Submissions – February 27, 2023 (Page 118, PJM and SPP)

¹¹³ GEH Survey Response Comment Submissions – February 27, 2023 (Page 118, PJM and SPP) and January 12, 2023 GEH Forum Meeting Staff Notes (Pages 2 – 3, PJM)

¹¹⁴ GEH Forum Survey Responses – November 1, 2022 – Compiled (Pages 16 – 17, PGC & AF&PA); GEH Survey Response Comment Submissions – February 27, 2023 (Page 118, PJM and SPP); and GEH Forum Survey Responses – April 24, 2023 (Page 22, Xcel Energy)

¹¹⁵ GEH Survey Response Comment Submissions – February 27, 2023 (Page 165, Xcel Energy) and GEH Forum Survey Responses – April 24, 2023 (Page 22, Xcel Energy)

¹¹⁶ GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 4, Xcel Energy) and GEH Forum Survey Responses – April 24, 2023 (Pages 18 – 19, AEP and Page 22, Evergy)

¹¹⁷ Updated GEH Forum Survey Responses – March 31, 2023 (Page 73, New England LDC Group and Page 75, ISONE)

¹¹⁸ Updated GEH Forum Survey Responses – March 31, 2023 (Page 73, New England LDC Group)

¹¹⁹ Updated GEH Forum Survey Responses – March 31, 2023 (Page 75, Xcel Energy; Page 76, MISO; and Page 81, Dominion Energy)

¹²⁰ Updated GEH Forum Survey Responses – March 31, 2023 (Page 73, New England LDC Group and Page 75, ISONE)



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such posting requirements,¹²¹ suggestions to encourage voluntary data posting or coordination communications between natural gas producers and pipelines and electric system operators were made as well.¹²² As an alternative, there was also a suggestion that supply reductions could be better captured by receipt and delivery points data from natural gas pipelines.¹²³ However, it was noted that interstate natural gas pipelines already post critical notices regarding pipeline operational issues that impact supply and there was a suggestion that there may be a lack of support to expand such requirements as well as opposition to any requirements that could involve speculation as to the actions of natural gas shippers.¹²⁴

Some GEH Forum participants stated that more formalized information sharing processes may not be needed and identified potential barriers that could prevent information sharing by natural gas production owners and operators. GEH Forum participants noted that bilateral information exchanges already occur between appropriate counterparties regarding applicable wellhead information¹²⁵ and that natural gas suppliers have an innate incentive to honor contractual commitments by seeking alternative arrangements or, if supply issues hamper this ability, providing prompt notice to customers.¹²⁶ Additionally, it was provided that some states, such as Texas, may already have coordination procedures that include identification of wellhead and midstream operational issues.¹²⁷ Regarding potential barriers, comments provided as part of the GEH Forum record stated that natural gas production data contains proprietary and commercially sensitive information that would need to be aggregated prior to posting but that there may not be an efficient mechanism to do so, given the number of producers and production facilities.¹²⁸ While some information could likely be made available in a manner that would protect confidentiality,¹²⁹ it was noted that there also may be regulatory considerations that would need to be addressed prior to releasing the data.¹³⁰

As discussed by GEH Forum participants, leveraging the NGinsights tool developed by Argonne National Laboratory could resolve some of the identified concerns regarding information sharing while also improving the situational awareness provided by the tool.¹³¹ In a presentation provided to the GEH Forum, Argonne National Laboratory stated that with additional funding, the tool functionality could be expanded to incorporate and aggregate operational data from additional categories of market participants.¹³² The NGinsights tool currently uses interstate natural gas pipeline nomination and scheduled quantity data to identify potential impacts to overall natural gas supply levels from weather events,¹³³ and information regarding the operational status of natural gas production facilities could provide more granularity to the analyses, making it easier to identify regions that could be impacted by supply shortfalls. The use of the NGinsights tool also could address confidentiality concerns as the tool data is aggregated, and Argonne National Laboratory supports controlled user access if the tool is to become more widely utilized.¹³⁴

In consideration of the GEH Forum record, the Chairs of the GEH Forum supported the development of voluntary information sharing practices for natural gas producers, including through the use of industry tools, to provide additional data to market participants regarding production facility operations as a way to create greater natural gas system awareness and improve reliability of the bulk electric system.

¹²¹ GEH Survey Response Comment Submissions – February 27, 2023 (Page 305, AF&PA/PGC) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 82, MISO)

¹²² GEH Forum Survey Responses – November 1, 2022 – Compiled (Pages 16 – 17, PGC & AF&PA) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 75, NGSA)

¹²³ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 74 – 75, NGSA)

¹²⁴ November 8, 2022 GEH Forum Meeting Staff Notes (Page 7, INGAA) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 73, INGAA)

¹²⁵ GEH Survey Response Comment Submissions – February 27, 2023 (Page 117, AGA)

¹²⁶ Updated GEH Forum Survey Responses – March 31, 2023 (Page 74, NGSA)

¹²⁷ Updated GEH Forum Survey Responses – March 31, 2023 (Page 76, Kinder Morgan)

¹²⁸ Updated GEH Forum Survey Responses – March 31, 2023 (Page 74, NGSA)

¹²⁹ Updated GEH Forum Survey Responses – March 31, 2023 (Page 75, ISONE)

¹³⁰ Updated GEH Forum Survey Responses – March 31, 2023 (Page 74, NGSA)

¹³¹ June 29, 2023 GEH Forum Meeting Staff Notes (Page 2, Argonne National Laboratory)

¹³² Argonne National Laboratory Presentation – June 29, 2023 (Page 8, Argonne National Laboratory)

¹³³ Argonne National Laboratory Presentation – June 29, 2023 (Pages 3 – 6, Argonne National Laboratory)

¹³⁴ June 29, 2023 GEH Forum Meeting Staff Notes (Page 2, Argonne National Laboratory)



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NAESB Balanced Voting Results – Recommendation 3						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market	Support	Oppose	Support	Oppose	Support	Oppose
Producers	4	3	1.14	0.86	57%	43%
Pipelines	12	7	1.26	0.74	68%	32%
Local Distribution Companies	6	1	1.71	0.29	86%	14%
End Users	5	5	1	1	50%	50%
Services	2	5	0.57	1.43	29%	71%
Total:	29	21	5.68	4.32	57%	43%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	1	0	1	0	100%	0%
Generation	7	3	1.4	0.6	70%	30%
Marketers/Brokers	3	0	2	0	100%	0%
Distributor/Load Serving Entities	2	1	1.33	0.67	66.5%	33.5%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	5	1	1.67	0.33	83.5%	16.5%
Technology and Services	4	0	2	0	100%	0%
Total:	23	6	10.4	2.6	80%	20%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	0	5	0	2	0%	100%
Total:	3	5	3	2	60%	40%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	7	1	1.75	0.25	87.5%	12.5%



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Recommendation 4: *On May 3, 2023, a request for standards development was submitted to NAESB to consider modifications to the force majeure language of the NAESB Base Contract for Sale and Purchase of Natural Gas to, among other things, encourage weatherization actions. The NAESB Gas-Electric Harmonization (GEH) Forum endorses this evaluation and encourages the NAESB Wholesale Gas Quadrant to act with utmost expediency to address this request on a timely basis.*

In discussing programs that could encourage and provide compensation opportunities for natural gas infrastructure facility winterization, as requested by the November 2021 Report,¹³⁵ several participants proposed that modifications to the NAESB Base Contract for the Sale and Purchase of Natural Gas (NAESB Base Contract) could create market incentives for weatherization.¹³⁶ The NAESB Base Contract, in use by the industry since 1996, and its addendums support transactions for natural gas as well as certified and renewable natural gas and is widely utilized by parties in the United States to streamline the contracting process. Participants suggested that modifications to the force majeure provisions within the terms and conditions established by the NAESB Base Contract could add a greater level of transparency regarding the conditions under which a party may invoke force majeure as well as create financial accountability for parties that do not adequately weatherize their facilities.¹³⁷

During GEH Forum discussions, while several participants proposed specific changes to the force majeure provisions,¹³⁸ some concern was expressed that removing or modifying the language could increase costs for natural gas consumers and result in undue risk, as not all conditions that could contribute to force majeure are within the control of a natural gas supplier.¹³⁹ Additionally, some participants explained that in a competitive market, natural gas end users have a number of natural gas suppliers to choose from and, as part of contract negotiations, are able to specify their own terms and conditions such as customized force majeure provisions.¹⁴⁰ However, others noted that it has been a number of years since the force majeure provisions in the NAESB Base Contract were substantively revised¹⁴¹ and that over the past few winter seasons, there appears to have been an increase in the number of force majeure claims attributable to cold weather events.¹⁴² A majority of GEH Forum participants supported actions to incent natural gas infrastructure weatherization,¹⁴³ including prioritizing contract language modifications.¹⁴⁴

On May 3, 2023, outside of the GEH Forum process, Southwest Power Pool, PJM Interconnection, MISO Energy, Texas Competitive Power Association, UGI Utilities, and CenterPoint Energy jointly submitted a request for standards development (Standards Request R23001) to NAESB proposing revisions to the NAESB Base Contract to improve the clarity associated with the force majeure provisions in the contract. Currently, the WGQ Contracts Subcommittee is meeting to address this request.

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended it would be prudent to explore modifications to model contract language that could better incent weatherization of natural gas infrastructure and supports posthaste consideration of any such proposals.

¹³⁵ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 196)

¹³⁶ February 2, 2023 GEH Forum Meeting Staff Notes (Page 2, Xcel Energy); GEH Survey Response Comment Submissions – February 27, 2023 (Page 165, AGA; Page 166, TCPA; and Page 166, Aspen Environmental Group); and GEH Forum Survey Responses – April 24, 2023 (Page 25, MISO and Page 28, New England LDC Group)

¹³⁷ GEH Survey Response Comment Submissions – February 27, 2023 (Page 165, Xcel Energy) and GEH Forum Survey Responses – April 24, 2023 (Page 28, SPP)

¹³⁸ GEH Forum Survey Responses – April 24, 2023 (Page 26, Xcel Energy; Page 27, CenterPoint Energy; and Page 27, Southwest Gas Corporation)

¹³⁹ GEH Forum Survey Responses – April 24, 2023 (Page 24, NGSA and Page 24, Kinder Morgan Intrastate Pipeline Group)

¹⁴⁰ GEH Forum Survey Responses – April 24, 2023 (Page 24, NGSA and Page 24, Kinder Morgan Intrastate Pipeline Group)

¹⁴¹ GEH Survey Response Comment Submissions – February 27, 2023 (Page 143, Southern Company)

¹⁴² GEH Survey Response Comment Submissions – February 27, 2023 (Page 96, SPP)

¹⁴³ GEH Survey Response Tabulation – February 27, 2023 (Page 70, Recommendation 2.b.2)

¹⁴⁴ GEH Survey Response Comment Submissions – February 27, 2023 (Page 165, AGA)



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NAESB Balanced Voting Results – Recommendation 4						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market	Support	Oppose	Support	Oppose	Support	Oppose
Producers	0	9	0	2	0%	100%
Pipelines	2	8	0.4	1.6	20%	80%
Local Distribution Companies	10	0	2	0	100%	0%
End Users	9	1	1.8	0.2	90%	10%
Services	4	5	0.89	1.11	44.5%	55.5%
Total:	25	23	5.09	4.91	51%	49%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	1	0	1	0	100%	0%
Generation	11	0	2	0	100%	0%
Marketers/Brokers	3	0	2	0	100%	0%
Distributor/Load Serving Entities	3	1	1.5	0.5	75%	25%
End Users	2	1	1.33	0.67	66.5%	33.5%
Independent Grid Operators/Planners	6	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	30	2	11.83	1.17	91%	9%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	5	1	1.67	0.33	83.5%	16.5%
Total:	8	1	4.67	0.33	93%	7%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	7	1	1.75	0.25	87.5%	12.5%



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Recommendation 5: *The FERC should direct the natural gas and electric industries to find ways to encourage more frequent use of capacity release or asset management arrangements (AMAs) and more timely release of unutilized interstate pipeline capacity that does not impact the reliability of the firm capacity holder. Further, the FERC should direct NAESB to revise its business practice standards to standardize the necessary transactional informational posting, timeliness and transparency requirements for these capacity releases.*

Several GEH Forum electric market participants recommended that more efficient interstate capacity reallocation would be beneficial during critical events when demand is high and there is limited capacity. It was explained that although capacity may not always be available for release, especially during times of peak demand,¹⁴⁵ capacity release programs are one tool utilized by natural gas-fired generators to obtain needed capacity once dispatched.¹⁴⁶ Additionally, as stated by comments made as part of the GEH Forum record, capacity can also be obtained through products and services offered by marketers that have entered into asset management agreements (AMAs) with parties to optimize the utilization of unused firm capacity.¹⁴⁷ While GEH Forum participants made recommendations that would substantively modify the existing secondary capacity market, there was significant support among both natural gas and electric market participants to consider proposals that would improve upon the transparency and efficiency of the current market.¹⁴⁸

One area of consideration recommended by GEH Forum participants was for the industry, utilizing the NAESB process, to evaluate revisions to the standards that define the business processes for communicating capacity release information. FERC regulations 18 C.F.R § 284.13 require interstate pipelines to make available, through internet website postings, certain information related to the release or purchase of capacity and these postings must conform to the NAESB WGQ Business Practice Standards, incorporated by reference as part of 18 C.F.R § 284.12.¹⁴⁹ As noted by GEH Forum participants, these informational postings provide transparency to the capacity release process and allow buyers and sellers to obtain the necessary information to participate in these transactions.¹⁵⁰ GEH Forum participants explained that, typically, interstate natural gas pipelines will post offers to release or purchase capacity to password-protected customer activities websites, and, once capacity is awarded, post information regarding the released capacity, including the identification of the releasing and replacement shipper and contract terms and conditions, to publicly available informational postings websites.¹⁵¹ In addition to this information, it was stated that natural gas pipelines are required to maintain and post an index of customers which can be used to identify firm shippers that may be releasing capacity during periods of peak demand.¹⁵²

Although some participants suggested that there is a sufficient level of information available,¹⁵³ other proposals made by both natural gas end users and natural gas pipelines proposed that slight modifications to the NAESB Business Practice Standards regarding the posting and availability of capacity release information could provide additional transparency that would be of material benefit to market participants.¹⁵⁴ It was stated that because offers for capacity release are commonly only posted to an interstate pipeline's password protected customer activities website, a party seeking to view open offers must first contact the interstate pipeline to obtain a username and password and then login to the website.¹⁵⁵ To make obtaining and subscribing to capacity more efficient as well as reduce barriers to accessing information, it was suggested that interstate natural gas pipelines duplicate postings for open offers of capacity to their

¹⁴⁵ December 5, 2022 Supplemental Comments (Pages 2 and 5, NGSA)

¹⁴⁶ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 22, PJM, MISO, SPP & NYISO); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 56, AF&PA and Gas Consumers Group)

¹⁴⁷ Updated GEH Forum Survey Responses – March 31, 2023 (Page 57, NGSA)

¹⁴⁸ GEH Survey Response Tabulation – February 27, 2023 (Recommendations 1.b.5 and 1.b.9)

¹⁴⁹ October 21, 2022 GEH Forum Meeting Staff Notes (Page 5, INGAA) and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 39 – 41 and 53 – 55, INGAA)

¹⁵⁰ November 8, 2022 GEH Forum Meeting Chat (Page 4, Kinder Morgan) and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 53 – 55, INGAA; Page 55, New England LDC Group; and Pages 56 – 57, AGA)

¹⁵¹ November 8, 2022 GEH Forum Meeting Chat (Page 4, Kinder Morgan) and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 53 – 55, INGAA; Page 55, New England LDC Group; and Pages 56 – 57, AGA)

¹⁵² Updated GEH Forum Survey Responses – March 31, 2023 (Pages 40 – 41, INGAA)

¹⁵³ Updated GEH Forum Survey Response – March 31, 2023 (Pages 39 – 41, INGAA; Page 55, New England LDC Group; and Pages 56 – 57, AGA)

¹⁵⁴ GEH Survey Response Comment Submissions – February 27, 2023 (Pages 42 – 43, Kinder Morgan) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 56, AF&PA and Gas Consumers Group)

¹⁵⁵ GEH Survey Response Comment Submissions – February 27, 2023 (Pages 42 – 43, Kinder Morgan)



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publicly available informational postings website.¹⁵⁶ GEH participants explained that the duplication of open offer postings could also improve the ability to aggregate capacity release information, which some GEH Forum participants indicated would be beneficial.¹⁵⁷ Additionally, it was proposed that interstate natural gas pipelines make available information regarding losing bids for capacity as such information could provide additional assurances that the capacity release market remains competitive and non-discriminatory.¹⁵⁸

Several of the proposals related to the secondary market for capacity made by GEH Forum participants included actions that may require policy changes or direction from regulators. FERC rules and regulations contained in 18 C.F.R § 284.8 establish the interstate capacity release program by requiring interstate natural gas pipelines offering firm transportation services to have tariff provisions that facilitate the ability of shippers to release firm capacity for resale and include requirements related to timing and notifications.¹⁵⁹ Participants suggested that natural gas-fired generator planning processes could be assisted if there was advanced notice regarding potential availability of capacity for the next day be provided and real-time information was incorporated into the capacity release process for informational postings.¹⁶⁰ It was also noted that some local distribution companies may inadvertently retain unused capacity, which could be addressed through the development of real-time reforecasting methodologies.¹⁶¹ However, other participants explained that as firm capacity is tied to contractual agreements, parties may not have knowledge regarding the amount of capacity that could be available prior to the start of the Gas Day, especially local distribution companies with regulatory obligations to serve, meaning that shippers are likely already providing close to real-time information regarding released capacity.¹⁶² Additionally, GEH Forum participants explained that in posting capacity release information, such as offers to release and purchase, interstate natural gas pipelines are reliant upon third parties and the timing of postings is dependent upon the necessary information being made available.¹⁶³

While there were some suggestions that it may be beneficial to evaluate if the capacity release timeline is sufficient for parties to conduct transactions,¹⁶⁴ others stated that modifications are not needed as the current process allows parties to trade and schedule capacity in a timely manner. Participants noted that parties have multiple opportunities to make offers to purchase capacity as well as adequate time to conduct negotiations prior to natural gas nomination cycle deadlines.¹⁶⁵ GEH Forum participants suggested that, rather than altering the timeline for capacity release, greater participation by natural gas-fired generators may be realized through modifications that better align the scheduling and award process timeline for the wholesale electric market with the timing of the Gas Day.¹⁶⁶

¹⁵⁶ GEH Survey Response Comment Submissions – February 27, 2023 (Pages 42 – 43, Kinder Morgan)

¹⁵⁷ December 5, 2022 Supplemental Comments (Page 5, NGSA); GEH Survey Response Tabulation – February 27, 2023 (Recommendation 1.b.6); and GEH Forum GEH Survey Response Comment Submissions – February 27, 2023 (Pages 42 – 43, Kinder Morgan)

¹⁵⁸ Updated GEH Forum Survey Responses – March 31, 2023 (Page 56, AF&PA and Gas Consumers Group)

¹⁵⁹ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 53 – 55, INGAA)

¹⁶⁰ October 21, 2022 GEH Forum Meeting Staff Notes (Page 8, LS Power); GEH Survey Responses – November 1, 2022 – Compiled (Pages 14 – 15, and 35 LS Power); and November 8, 2022 GEH Forum Staff Notes (Page 5, PJM, MISO, SPP & NYISO)

¹⁶¹ October 21, 2022 GEH Forum Meeting Staff Notes (Page 8, LS Power); GEH Survey Responses – November 1, 2022 – Compiled (Pages 14 – 15, and 35 LS Power); and November 8, 2022 GEH Forum Staff Notes (Page 5, PJM, MISO, SPP & NYISO)

¹⁶² Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Pages 32 – 33, AGA); October 21, 2022 GEH Forum Meeting Staff Notes (Page 8, AGA); and GEH Forum GEH Survey Response Comment Submissions – February 27, 2023 (Pages 51 – 52, NGSA, 44 Farris, and Xcel Energy)

¹⁶³ GEH Survey Response Comment Submissions – February 27, 2023 (Page 51, 44 Farris) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 46, INGAA)

¹⁶⁴ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 40, Southern California Generation Coalition) and November 8, 2022 GEH Forum Meeting Chat (Page 3, Aspen Environmental)

¹⁶⁵ Updated GEH Forum Survey Responses – March 31, 2023 (Page 53, INGAA; Page 55, New England LDC Group; and Page 59, New Jersey Natural Gas)

¹⁶⁶ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 54 – 55, INGAA; Page 56, AF&PA and Gas Consumers Group; Page 57, NGSA and Page 59, Xcel Energy)



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Beyond these proposals, there was a suggestion that consideration be given to a twenty-four-hour interstate capacity release marketplace.¹⁶⁷ Other participants stated that there are adequate existing mechanisms to reallocate capacity¹⁶⁸ and that prior to considering new platforms or tools, there be an evaluation as to if there are actions that could encourage greater use of the current processes.¹⁶⁹ It was also noted that that additional trading platforms or marketplaces may diminish or dilute the availability of released capacity rather than increase opportunities for transactions.¹⁷⁰ Additionally, while some GEH Forum participants suggested a need to develop standardized posting and transacting requirements to better facilitate bilateral exchanges of capacity on the secondary market,¹⁷¹ others stated that there are existing FERC rules and regulations, such as those promulgated through Orders No 712 and 809, that are applicable to bilateral transactions for the release of capacity.¹⁷²

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended action to direct the development of additional or modified business practice standards to improve transparency and improve upon the efficiencies of the secondary market for capacity would be beneficial in ensuring meaningful access to the natural gas pipeline transportation grid and promoting effective use of firm capacity.

NAESB Balanced Voting Results – Recommendation 5						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
Wholesale Gas Market	Support	Oppose	Support	Oppose	Support	Oppose
Producers	4	1	1.6	0.4	80%	20%
Pipelines	14	5	1.47	0.53	73.5%	26.5%
Local Distribution Companies	4	4	1	1	50%	50%
End Users	9	1	1.8	0.2	90%	10%
Services	4	4	1	1	50%	50%
Total:	35	15	6.87	3.13	69%	31%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	1	0	1	0	100%	0%
Generation	10	1	1.82	0.18	91%	9%
Marketers/Brokers	2	0	2	0	100%	0%
Distributor/Load Serving Entities	3	1	1.5	0.5	75%	25%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	5	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	26	3	11.32	1.68	87%	13%

¹⁶⁷ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 40, Southern California Generation Coalition)

¹⁶⁸ GEH Survey Response Comment Submissions – February 27, 2023 (Page 40, NGSA) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 46, INGAA)

¹⁶⁹ Updated GEH Forum Survey Responses – March 31, 2023 (Page 51, NGSA)

¹⁷⁰ GEH Survey Response Comment Submissions – February 27, 2023 (Page 40, NGSA) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 46, INGAA)

¹⁷¹ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 22, MISO, PJM & SPP) and October 21, 2022 GEH Forum Staff Notes (Pages 5 – 6, MISO, PJM & SPP) GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 40, Southern California Generation Coalition)

¹⁷² Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 3, NGSA); December 5, 2022 GEH Forum Supplemental Comments (Page 2, NGSA)



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Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	1	0	1	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	0	6	0	2	0%	100%
Total:	2	6	2	2	50%	50%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	6	1	1.71	0.29	85.5%	14.5%



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Recommendation 6: *The FERC should consider policy modifications necessary to better facilitate advanced agreements between end users and remove barriers to the release of capacity, similar to those adopted as part of FERC Order No. 712 (to support the use of asset management agreements).*

While discussing the release of available capacity, GEH Forum participants noted that during times of critical demand, there are often non-critical end users of natural gas, such as commercial and industrial (C&I) market participants, that can voluntarily curtail or shut-down operations and sell back firm capacity and supply rights but that new mechanisms may be needed to better facilitate these types of transactions.¹⁷³ While different proposals were discussed, several participants expressed support for the utilization of market-driven solutions.¹⁷⁴ It was suggested that advanced exchange agreements could more efficiently enable transactions for available capacity directly between geographically close natural gas end users but that FERC action may be necessary to remove any barriers to executing these agreements.¹⁷⁵

GEH Forum participants emphasized the importance of limiting these types of transactions to times when extreme events are causing spikes in demand for natural gas and electricity.¹⁷⁶ It was noted that the success of advanced exchange agreements will, in part, rely upon the ability of natural gas end users to pre-arrange transport in order to ensure that the natural gas can be delivered as specified by the terms and conditions of the contract.¹⁷⁷ Additionally, as parties will likely be entering into these agreements so that the natural gas-fired generator can quickly obtain the needed capacity and supply when dispatched, it was suggested that the effectiveness of advanced exchange agreement will be dependent on the proximity of the trading partners and the speed at which the other end user can curtail or shut-down operations.¹⁷⁸ While comments noted that marketers, with their network of natural gas producers and end users, can play a role in matching parties, the ability to curtail is largely dependent upon the nature of the end user's business and if the end user can shut-down operations while ensuring the safety of people and the protection of equipment.¹⁷⁹ It was stated though that there may be some areas of the country with a heavy concentration of C&I end users that provide critical services who could not forgo natural gas supply.¹⁸⁰

As noted in the GEH Forum record, current policies applicable to the release of capacity could make it difficult to execute advanced exchange agreements.¹⁸¹ It was suggested that parties seeking to enter into an advanced exchange agreement may need to obtain waivers from FERC for rules that require the shipper have title to natural gas while being transported and at the time of delivery as well as requirements that prohibit buy/sell transactions and the tying of capacity release to extraneous conditions.¹⁸² Participants noted that FERC granted waivers of a similar nature in the past to parties seeking to enter into AMAs, and eventually modified its capacity release policies through Order No.

¹⁷³ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 23, Process Gas Consumers Group & American Forest Paper Association) and GEH Forum Survey Responses – October 10, 2022 – Compiled (Pages 13 and 22, MISO, PJM & SPP)

¹⁷⁴ GEH Forum Survey Responses – October 10, 2022 – Compiled (Pages 13 and 22, MISO, PJM & SPP and Page 28, Process Gas Consumers Group, Industrial Energy Consumers of America, and American Forest and Paper Association); October 21, 2022 GEH Forum Meeting Staff Notes (Page 3, Process Gas Consumers Group, Industrial Energy Consumers of America, and American Forest and Paper Association); GEH Survey Response Comment Submissions – February 27, 2023 (Page 34, NGSA); Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 3, NGSA); and December 5, 2022 GEH Forum Supplemental Comments (Page 2, NGSA)

¹⁷⁵ Updated GEH Forum Survey Responses – March 31, 2023 (Page 50, NGSA)

¹⁷⁶ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 28, Process Gas Consumers Group, Industrial Energy Consumers of America, and American Forest and Paper Association); GEH Survey Response Comment Submissions – February 27, 2023 (Page 34, NGSA); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 50, NGSA)

¹⁷⁷ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 13, MISO, PJM & SPP and Page 28, Process Gas Consumers Group, Industrial Energy Consumers of America, and American Forest and Paper Association); GEH Survey Response Comment Submissions – February 27, 2023 (Page 34, NGSA); and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 49 – 50, NGSA)

¹⁷⁸ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 49 – 51, NGSA)

¹⁷⁹ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 16, PGC & AF&PA); GEH Survey Response Comment Submissions – February 27, 2023 (Page 38, AF&PA and PGC); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 49, NGSA)

¹⁸⁰ April 4, 2023 GEH Forum Meeting Staff Notes (Page 5, Kinder Morgan Intrastate Pipeline Group)

¹⁸¹ Updated GEH Forum Survey Responses – March 31, 2023 (Page 50, NGSA)

¹⁸² Updated GEH Forum Survey Responses – March 31, 2023 (Pages 47 – 49, AF&PA and Gas Consumers Group and Pages 49 – 51, NGSA)



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712 to facilitate the use of AMAs in the most effective manner.¹⁸³ In the alternative, GEH Forum participants explained that there are existing mechanisms that provide natural gas-fired generators with the ability to obtain capacity, like working with natural gas marketers and executing other types of contracts such as AMAs and multi-party agreements for sharing pipeline capacity.¹⁸⁴

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended advanced exchange agreements directly between end users can add efficiencies to the reallocation of capacity during critical events, and as such, there should be consideration as to if there are any policy changes by FERC that may better facilitate such agreements.

NAESB Balanced Voting Results – Recommendation 6						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	0	5	0	2	0%	100%
Pipelines	10	7	1.18	0.82	59%	41%
Local Distribution Companies	6	1	1.71	0.29	85.5%	13.5%
End Users	9	1	1.8	0.2	90%	10%
Services	5	3	1.25	0.75	62.5%	37.5%
Total:	30	17	5.94	4.06	59%	41%
Wholesale Electric Market						
Transmission	1	0	1	0	100%	0%
Generation	10	1	1.82	0.18	91%	9%
Marketers/Brokers	2	0	2	0	100%	0%
Distributor/Load Serving Entities	3	1	1.5	0.5	75%	25%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	5	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	26	3	11.32	1.68	87%	13%
Retail Energy Market						
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	1	0	1	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	0	6	0	2	0%	100%
Total:	2	6	2	2	50%	50%
Other Mkt Participant/Observer						
Total:	6	1	1.71	0.29	85.5%	14.5%

¹⁸³ December 5, 2022 GEH Forum Supplemental Comments (Pages 2 – 3, NGSA) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 50, NGSA)

¹⁸⁴ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 47 – 49, AF&PA and Gas Consumers Group and Pages 49 – 51, NGSA)



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Recommendation 7: *State public utility commissions and applicable state authorities in states with competitive energy markets should engage with producers, marketers and intrastate pipelines to ensure that such parties' operations are fully functioning on a 24/7 basis in preparation for and during events in which extreme weather is forecasted to cause demand to rise sharply for both electricity and natural gas, including during weekends and holidays. (States could consider the approaches adopted in FERC regulations affecting the interstate pipelines.) In instances where state authorities lack enabling authority to take such actions, the FERC should adopt regulations to achieve identical outcomes within its authority.*

The GEH Forum record reflects extensive discussion from participants on the ability to schedule and procure natural gas, especially over weekends and holidays, prior to and during critical events when demand is expected to rise sharply for both electricity and natural gas. A number of GEH Forum participants from the wholesale electric market stated that during these periods, there can be both a lack of scheduling opportunities as well as difficulties in obtaining natural gas.¹⁸⁵ While GEH Forum participants discussed varying causes that may contribute to these difficulties, several participants noted the lack of an effective marketplace that provides the needed flexibilities to efficiently procure natural gas over weekends and holidays.¹⁸⁶

GEH Forum participants stated that while market participants have the ability to acquire natural gas over weekends and holidays, the current marketplace only supports a limited number of transactions, meaning that, in practical terms, on the Friday before, market participants must obtain sufficient natural gas for the entirety of the weekend or holiday period.¹⁸⁷ It was explained that this practice can result in over procurement, which may artificially increase demand, reduce liquidity, and impact customer costs.¹⁸⁸ Participants also noted that the impact from the lack of an effective marketplace over weekends and holidays can be particularly problematic for natural gas-fired generators attempting to procure capacity and supply after being dispatched.¹⁸⁹ As noted in comments submitted as part of the GEH Forum record, a successful weekend and holiday natural gas marketplace is dependent upon a number of factors, including sufficient market engagement, price signals to incentivize sellers to reserve natural gas supplies, and the availability of sufficient resources to meet just-in-time procurement needs, all of which can be supported through increased interactions and coordination between natural gas suppliers, marketers, and natural-gas fired generators.¹⁹⁰ Additionally, GEH participants stated that there is a significant difference between the level of liquidity in the natural gas commodity market during weekdays versus weekends and holidays,¹⁹¹ and it was suggested that additional market transparency as well as market products and services that better support acquisition of natural gas over weekends and holidays would be beneficial during critical events.¹⁹²

Some participants proposed that additional intraday nomination cycles could provide greater scheduling flexibility for natural gas-fired generators and would be particularly beneficial during periods when there is an unexpected change

¹⁸⁵ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 21, MISO, PJM, and SPP); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 40, Southern California Generation Coalition; Page 40, PJM, MISO, SPP & NYISO); January 12, 2023 GEH Forum Meeting Staff Notes (Page 3, Nebraska Public Power District); GEH Forum Survey Responses – January 31, 2023 – Compiled (Pages 4 – 5, Xcel Energy); GEH Survey Response Comment Submissions – February 27, 2023 (Pages 299 – 300, EPSA); GEH Survey Response Comment Submissions – February 27, 2023 (Page 325, NYISO); GEH Survey Response Comment Submissions – February 27, 2023 (Page 328, IESO, NEISO, NYISO, PJM, and SPP)

¹⁸⁶ Updated GEH Forum Responses – September 14, 2022 (Pages 28 – 29, Dominion); September 23, 2022 GEH Forum Meeting Notes (Page 5, Dominion Energy); September 23, GEH Forum Meeting Chat (Page 2, Reliable Energy Analytics); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 40, Southern California Generation Coalition) GEH Forum Survey Responses – January 31, 2023 – Compiled (Pages 4 – 5, Xcel Energy); and GEH Survey Response Comment Submissions – February 27, 2023 (Page 29, PJM and Pages 328 – 329 IESO, ISONE, NYISO, PJM, and SPP)

¹⁸⁷ GEH Forum Survey Responses – January 31, 2023 – Compiled (Pages 4 – 5, Xcel Energy)

¹⁸⁸ GEH Forum Survey Responses – January 31, 2023 – Compiled (Pages 4 – 5, Xcel Energy)

¹⁸⁹ GEH Survey Response Comment Submissions – February 27, 2023 (Page 119, PJM) and January 12, 2023 GEH Forum Meeting Staff Notes (Page 3, MidAmerican and Nebraska Public Power District)

¹⁹⁰ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 39, NGSAs) and Updated GEH Forum Survey Responses – May 22, 2023 (Page 12, NGSAs)

¹⁹¹ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 40, Southern California Generation Coalition)

¹⁹² GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 40, Southern California Generation Coalition and GEH Survey Response Comment Submissions – February 27, 2023 (Page 84, AGA; Page 91, PJM; Page 267, SPP; and Pages 328 – 329, IESO, ISONE, NYISO, PJM, and SPP)



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in demand for natural gas.¹⁹³ Participants explained that additional nomination cycles could increase efficiencies for natural gas-fired generators by truncating the time between nominations and gas flow, allowing for the acquisition of fuel supplies closer to real-time supply need when forecasts are more accurate and there are typically less system variances.¹⁹⁴ Other GEH Forum participants stated that the NAESB WGQ Business Practice Standard 1.3.4, incorporated by reference under 18 C.F.R § 284.12, require interstate natural gas pipelines to support the nominations process twenty-four hours a day, seven days a week¹⁹⁵ and suggested that changes to the nomination cycle may not substantially improve upon the ability of wholesale electric natural gas end users to schedule and procure natural gas.¹⁹⁶ Participants explained that during times of critical peak demand, firm shippers are likely to submit nominations for their full capacity rights, meaning that entities who do not have firm transportation and supply rights would likely face the same issues in obtaining capacity as they do today.¹⁹⁷ It was also stated that while past industry action to add the third intraday nomination cycle created some additional scheduling flexibility, it is primarily used for timely nomination balancing adjustments.¹⁹⁸ Additionally, there were suggestions that changes to the natural gas nominations process may have limited impact on weekend and holiday scheduling as customary practice among a number of natural gas buyers and sellers is to engage in advanced transactions that span the entirety of such time periods.¹⁹⁹

Several GEH Forum participants stated that adequate opportunities to schedule natural gas are important but that the increased demand for natural gas also highlights the need for a reliably available supply chain.²⁰⁰ It was noted that during both Winter Storm Uri and Winter Storm Elliott, natural gas-fired generators encountered supply issues that could, in part, be attributed to a drop in production.²⁰¹ Per the GEH Forum record, a key element to ensuring a natural gas supply sufficient to meet electric reliability needs is the mitigation and management of physical and operational disruptions along all parts of the supply line,²⁰² but as both Winter Storm Uri and Winter Storm Elliott appear to demonstrate, wellhead and mid-stream facilities in particular are not adequately performing during stressed system conditions, indicating the importance of state regulators in ensuring the reliability of natural gas supply.²⁰³

In consideration of the GEH Forum record, the Chairs of the GEH Forum noted making modifications to the existing interstate natural gas pipeline nomination, scheduling, and confirmation process may be less impactful, and recommended that actions by regulators that can ensure continuous availability of a natural gas marketplace, such as

¹⁹³ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 21, MISO, PJM, and SPP)

¹⁹⁴ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 21, MISO, PJM, and SPP); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 40, PJM, MISO, SPP & NYISO); GEH Survey Response Comment Submissions – February 27, 2023 (Page 325, NYISO); Updated GEH Forum Survey Responses – March 31, 2023 (Pages 64 – 65, NYISO and Page 66, NGSA)

¹⁹⁵ GEH Forum Survey Responses – October 10, 2022 – Compiled (page 15, INGAA)

¹⁹⁶ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 62 – 63, INGAA; Page 64, New England LDC Group; Page 65, AF&PA and Gas Consumers Group; Page 65, AGA; and Pages 66 – 69, NGSA)

¹⁹⁷ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 62 – 63, INGAA and Pages 66 – 69, NGSA)

¹⁹⁸ GEH Survey Response Comment Submissions – February 27, 2023 (Page 59, Southern Company) and Updated GEH Forum Survey Responses – March 31, 2023 (Page 67, NGSA)

¹⁹⁹ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 62 – 63, INGAA; Page 65, AGA; and Pages 66 – 69, NGSA)

²⁰⁰ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 17, Kansas Corporation Commission); GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 2, INGAA); January 12, 2023 GEH Forum Meeting Staff Notes (Page 4, ConocoPhillips); GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 3, Xcel Energy); GEH Survey Response Comment Submissions – February 27, 2023 (Page 65, Southern Company); Updated GEH Forum Survey Responses – March 31, 2023 (Page 60, 44 Farris; Page 65, AF&PA and Gas Consumers Group; Pages 66 – 67, NGSA; and Page 73, New England LDC Group); GEH Forum Survey Responses – April 24, 2023 (Page 16, AEP and Pages 20 – 21, INGAA)

²⁰¹ GEH Forum Responses – October 10, 2022 – Compiled (Page 11, MISO, PJM & SPP); PJM Presentation re Winter Storm Elliott (Page 9, PJM); Updated GEH Forum Survey Responses – March 31, 2023 (Page 105, SPP Market Monitoring Unit)

²⁰² Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 28, NGSA); GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 3, Xcel Energy and Page 36, SPP)

²⁰³ GEH Forum Survey Response Comment Submissions – February 27, 2023 (Page 155, 44 Farris and Page 202, Southern Company); Updated GEH Forum Survey Responses – March 31, 2023 (Pages 29 and 66 – 69, NGSA; Page 71, Kinder Morgan and Page 80, NYISO); GEH Forum Survey Responses – April 24, 2023 (Pages 1 – 2 and 60 – 61, Kinder Morgan Intrastate Group; Pages 2 – 3, MISO; Pages 6 – 7, Xcel Energy; Page 8, New England LDC Group; Pages 61 – 62, AGA; and Page 75, TPA); Updated GEH Forum Survey Responses – May 22, 2023 (Page 69, Marcellus Shale Coalition); and June 16, 2023 GEH Forum Staff Notes (Page 4, PJM)



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increasing engagement by market participants, would be of greater benefit during events in which demand is expected to rise sharply for both electricity and natural gas.

NAESB Balanced Voting Results – Recommendation 7						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	0	3	0	2	0%	100%
Pipelines	1	16	0.12	1.88	6%	94%
Local Distribution Companies	4	3	1.14	0.86	57%	43%
End Users	9	1	1.8	0.2	90%	10%
Services	3	3	1	1	50%	50%
Total:	17	26	4.06	5.94	41%	59%
Wholesale Electric Market						
Transmission	1	0	1	0	100%	0%
Generation	9	0	2	0	100%	0%
Marketers/Brokers	3	0	2	0	100%	0%
Distributor/Load Serving Entities	2	1	1.33	0.67	66.5%	33.5%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	6	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	26	2	11.33	1.67	87%	13%
Retail Energy Market						
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	5	1	1.67	0.33	83.5%	16.5%
Total:	8	1	4.67	0.33	93%	7%
Other Mkt Participant/Observer						
Total:	7	1	1.75	0.25	87.5%	12.5%



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Recommendation 8: FERC should direct Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) or electric transmission owners/operators, where no ISO or RTO exists, to conduct and report to FERC the results of analyses of actions that better align the timelines of the Power Day and/or the day-ahead scheduling timelines with the gas day, including earlier notification of successful bids, to ensure that schedules are known and made available to allow natural gas-fired generators to procure natural gas and pipeline capacity in periods when the market is most liquid.

During the GEH Forum process, several participants offered proposals to more closely align electric market scheduling practices with those of the natural gas market to help improve efficiencies for generators procuring natural gas supply and transport.²⁰⁴ The Gas Day begins at 9:00 AM CCT, with GEH Forum participants stating that this is when the natural gas market is most liquid and that, typically, a significant amount of the available capacity and supply is sold and purchased in the early morning.²⁰⁵ GEH Forum participants explained that although past FERC proceedings under section 205 of the Federal Power Act resulted in most ISOs and RTOs issuing awards for day-ahead commitments and successful bid notices prior to the close of the timely nomination cycle, the current timing still may result in natural gas-fired generators entering the market after peak liquidity.²⁰⁶ In order to provide natural gas-fired generators with sufficient lead time to effectively participate in the timely nomination cycle, GEH Forum participants expressed high levels of support to consider changes to the timing and scheduling practices within organized electric markets.²⁰⁷

As described by GEH Forum participants, the current timelines for the day-ahead market create issues in procuring natural gas not only during critical events but also under normal operating conditions.²⁰⁸ It was stated that generators may be receiving dispatch instructions later in the morning, after peak natural gas market liquidity has passed and the majority of natural gas supply has been sold.²⁰⁹ Participants described the paradox that can be faced by natural gas-fired generators, as there are inherent risks to procuring natural gas capacity and supply prior to confirmation as well as at times other than peak market liquidity.²¹⁰ It was noted this risk can be exacerbated on days with high peak natural gas demand as prices are typically higher and natural gas-fired generators may encounter greater capacity and supply shortfalls.²¹¹

GEH Forum participants suggested that modifying scheduling practices so that electric generators are provided with earlier notification of successful bids will increase the ability of natural gas-fired generators to acquire natural gas supply as well as obtain capacity.²¹² These proposals included a specific recommendation that it may be beneficial to consider scheduling changes that would result in successful bid notifications made prior to the start of the Gas Day, between 7:00 AM CCT and 9:00 AM CCT.²¹³ Some participants also recommended the consideration of changes to the Power Day to better align with the Gas Day,²¹⁴ noting that the Power Day is the equivalent of one calendar day

²⁰⁴ February 2, 2023 GEH Forum Staff Notes (Page 2, Xcel Energy) and GEH Survey Response Comment Submissions – February 27, 2023 (Pages 299 – 301, EPSA)

²⁰⁵ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 7, NGSA); September 23, 2023 GEH Forum Meeting Staff Notes (Page 3, NGSA); September 23, 2023 GEH Forum Meeting Chat (Page 5, MidAmerican Energy Company); and GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 16, INGAA)

²⁰⁶ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 7, NGSA); September 23, 2023 GEH Forum Meeting Staff Notes (Page 3, NGSA); September 23, 2023 GEH Forum Meeting Chat (Page 5, MidAmerican Energy Company and Page 7, Nebraska Public Power District); GEH Forum Survey Responses – November 1, 2022 (Page 32, INGAA)

²⁰⁷ GEH Forum Survey Responses – November 1, 2022 (Page 32, INGAA) and GEH Survey Response Compiled Data – February 27, 2023 (Page 29, Recommendation 1.c.6)

²⁰⁸ October 23, 2022 GEH Forum Meeting Chat (Page 6, Hoosier Energy REC); GEH Forum Survey Responses – November 1, 2022 (Page 38, INGAA); and GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 6, Xcel Energy)

²⁰⁹ GEH Forum Survey Responses – November 1, 2022 (Page 32, INGAA)

²¹⁰ October 23, 2022 GEH Forum Meeting Chat (Page 6, Hoosier Energy REC); GEH Forum Survey Responses – November 1, 2022 (Page 38, INGAA); and GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 6, Xcel Energy)

²¹¹ GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 6 – 7, Xcel Energy)

²¹² GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 16, INGAA); Updated GEH Forum Survey Responses – March 31, 2023 (Page 74, NGSA and Page 75, ISO New England)

²¹³ Updated GEH Forum Survey Responses – March 31, 2023 (Page 74, NGSA)

²¹⁴ September 23, 2023 GEH Forum Meeting Chat (Page 5, Nebraska Public Power District); GEH Survey Response Comment Submissions – February 27, 2023 (Page 74, Electric Power Supply Association); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 74, NGSA)



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local time and spans two Gas Days.²¹⁵

In discussing the recommendations, GEH Forum participants stated that the electric market scheduling process is a multi-faceted, regional issue that may not have a singular solution and suggested that proposals may be best considered as part of stakeholder processes.²¹⁶ Additionally, some participants indicated that there may be other gas-electric coordination issues that would be more beneficial to address and could diminish the importance of or need for electric market scheduling changes.²¹⁷

In consideration of the GEH Forum record, the Chairs of GEH Forum recommended it may be of the most benefit for ISOs and RTOs or, where applicable, transmission operators, to evaluate if changes to the day-ahead electric scheduling and/or the power day or gas day timelines could provide greater flexibility to natural gas-fired generators in obtaining capacity and supply at the times of greatest market liquidity.

NAESB Balanced Voting Results – Recommendation 8						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	6	0	2	0	100%	0%
Pipelines	13	2	1.73	0.27	86.5%	13.5%
Local Distribution Companies	4	1	1.6	0.4	80%	20%
End Users	9	1	1.8	0.2	90%	10%
Services	6	1	1.71	0.29	85.5%	14.5%
Total:	38	5	8.84	1.16	88%	12%
Wholesale Electric Market						
Transmission	1	0	1	0	100%	0%
Generation	9	1	1.8	0.2	90%	10%
Marketers/Brokers	2	0	2	0	100%	0%
Distributor/Load Serving Entities	1	1	1	1	50%	50%
End Users	3	0	2	0	100%	0%
Independent Grid Operators/Planners	3	1	1.5	0.5	75%	25%
Technology and Services	4	0	2	0	100%	0%
Total:	23	3	11.3	1.7	87%	13%
Retail Energy Market						
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	1	1	1	1	50%	50%

²¹⁵ September 23, 2023 GEH Forum Meeting Chat (Page 5, Nebraska Public Power District); GEH Survey Response Comment Submissions – February 27, 2023 (Pages 74 and 300, Electric Power Supply Association); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 74, NGSA)

²¹⁶ GEH Survey Response Comment Submissions – February 27, 2023 (Page 74, SPP and Page 74, EPSA)

²¹⁷ September 23, 2022 GEH Forum Meeting Staff Notes (Page 4, LS Power); January 12, 2023 GEH Forum Meeting Chat (Page 1, MidAmerican Energy Company); and GEH Survey Response Comment Submissions – February 27, 2023 (Page 74, PJM)



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Total:	4	1	4	1	80%	20%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	8	0	2	0	100%	0%



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Recommendation 9: *If not already under consideration through stakeholder processes, ISOs and RTOs or the FERC should conduct proceedings and adopt multiday unit commitment processes to better enable the industry to prepare for and provide reliable service during events in which weather is forecasted to cause demand to rise sharply for both electricity and natural gas.*

Another potential area related to electric scheduling identified by GEH Forum participants that may improve reliability during critical events is the use of multiday unit commitment processes, which, as noted in the November 2021 Report, were successfully used during Winter Storm Uri.²¹⁸ As explained by GEH Forum participants, electric generators undertake an economic risk in executing purchases for fuel and capacity without a guarantee that the generator will be dispatched, and generator uncertainty regarding dispatch can act to discourage participation in the natural gas marketplace during times of greatest liquidity.²¹⁹ This may also be a limiting factor, preventing natural gas-fired generators securing supply ahead of anticipated critical events.²²⁰ GEH Forum participants suggested that advanced notice of unit commitments would increase flexibility for natural gas-fired generators to obtain fuel and better situate the electric industry to adequately plan and prepare to deliver reliable service during extreme events.

There was support from both natural gas and electric market participants to consider the use of multiday clearing processes during and in advance of extreme weather events but some concerns were raised.²²¹ It was stated that multiday unit commitment processes will require ISOs and RTOs to rely more heavily on advanced forecasts which are typically less precise and subject to greater volatility.²²² Others suggested that steps can be taken to improve forecasting methodologies and noted that even use of the most accurate forecasts can be ineffective if generators are not provided with sufficient time to make adequate preparations.²²³ It was explained that while multiday unit commitments may require the use of less accurate forecasting, any mechanisms that can better enable the procurement of fuel supply prior to the start of extreme weather events would likely be an improvement over current processes.²²⁴ GEH Forum participants stated that there are some ISOs and RTOs currently considering the use of multiday commitment processes ahead of extreme weather events and/or as part of resource adequacy requirements but noted the use of multiday commitment processes have been previously considered in some organized markets but were not pursued due to either a lack of identified benefit or participation.²²⁵ Additionally, some participants suggested that rather than revisions to the commitment process, greater improvements to supply procurement might be realized through wider availability of market products and mechanisms to better enable just-in-time procurement.²²⁶

GEH Forum participants stated utilization of multiday unit commitment processes will likely also need to be accompanied by compensation mechanisms that provide financial assurances to generators acquiring fuel, such as make whole payments.²²⁷ Participants explained that this will be especially important in instances where real-time outcomes do not align with forecast expectations and fuel supplies may go unused.²²⁸ It was suggested that

²¹⁸ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Pages 62 – 63 and 96)

²¹⁹ October 23, 2022 GEH Forum Meeting Chat (Page 6, Hoosier Energy REC); GEH Forum Survey Responses – November 1, 2022 (Page 38, INGAA); and GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 6 – 7, Xcel Energy)

²²⁰ October 23, 2022 GEH Forum Meeting Chat (Page 6, Hoosier Energy REC); GEH Forum Survey Responses – November 1, 2022 (Page 38, INGAA); and GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 6 – 7, Xcel Energy)

²²¹ GEH Survey Response Tabulation – February 27, 2023 (Page 30, Recommendation 1.c.7)

²²² September 23, 2022 GEH Forum Meeting Chat (Page 3, CAISO); GEH Forum Survey Responses – October 10, 2022 – Compiled (Pages 20 – 21, MISO, PJM & SPP); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 73, NYISO)

²²³ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 26, PGC & AF&PA); January 12, 2023 GEH Forum Meeting Staff Notes (Page 5, Southern Company); and Updated GEH Forum Survey Responses – May 22, 2023 (Pages 65 – 66, Xcel and Page 67, INGAA)

²²⁴ Updated GEH Forum Survey Responses – May 22, 2023 (Page 65, NGSA)

²²⁵ Updated GEH Forum Survey Responses – March 31, 2023 (Page 76, MISO and Page 77, SPP) and April 4, 2023 GEH Forum Meeting Chat (Page 7, PJM and Page 7, LS Power)

²²⁶ September 23, 2022 GEH Forum Meeting Staff Notes (Page 4, LS Power)

²²⁷ GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 7, Xcel Energy and Page 15, TCPA) and GEH Survey Response Comment Submissions – February 27, 2023 (Pages 181 and 279, EPSA and Page 229, Xcel Energy)

²²⁸ GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 7, Xcel Energy and Page 15, TCPA); GEH Survey Response Comment Submissions – February 27, 2023 (Pages 181 and 279, EPSA); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 75, Xcel Energy)



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compensation mechanisms for these scenarios should better reflect the reliability benefit such preparations provide for all market participants within a given footprint or region,²²⁹ though some participants noted that over-procurement and cost recovery mechanisms that compensate generators for acquiring fuel regardless of if it is used may ultimately result in increased costs for customers.²³⁰

In consideration of the GEH Forum record, the Chairs of the GEH recommended it would be beneficial for ISOs and RTOs to evaluate multiday commitment processes with consideration given to appropriate compensation and cost recovery mechanisms.

NAESB Balanced Voting Results – Recommendation 9						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market	Support	Oppose	Support	Oppose	Support	Oppose
Producers	4	0	2	0	100%	0%
Pipelines	15	2	1.76	0.24	88%	12%
Local Distribution Companies	9	0	2	0	100%	0%
End Users	9	1	1.8	0.2	90%	10%
Services	7	1	1.75	0.25	87.5%	12.5%
Total:	44	4	9.31	0.69	93%	7%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	1	0	1	0	100%	0%
Generation	10	0	2	0	100%	0%
Marketers/Brokers	3	0	2	0	100%	0%
Distributor/Load Serving Entities	4	0	2	0	100%	0%
End Users	2	0	2	0	100%	0%
Independent Grid Operators/Planners	2	4	0.67	1.33	33.5%	66.5%
Technology and Services	4	0	2	0	100%	0%
Total:	26	4	11.67	1.33	90%	10%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	6	0	2	0	100%	0%
Total:	9	0	5	0	100%	0%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose

²²⁹ February 2, 2023 GEH Forum Staff Notes (Page 2, Xcel Energy) and GEH Survey Response Comment Submissions – February 27, 2023 (Page 215, NGSA and Page 215, Xcel Energy)

²³⁰ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 2, LS Power); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 30, LS Power); GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 15, TCPA); and GEH Survey Response Comment Submissions – February 27, 2023 (Page 299, EPSA); and Updated GEH Forum Survey Responses – May 22, 2023 (Page 4, AEP; Page 17, Reliable Energy Analytics; Page 18, AGA



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Total:	8	0	2	0	100%	0%
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Recommendation 10: *State public utility commissions should encourage local distribution companies within their jurisdictions to structure incentives for the development of natural gas and electric demand-response programs in preparation for and during events in which demand is expected to rise sharply for both electricity and natural gas.*

Recommendation 11: *State public utility commissions should encourage local distribution companies within their jurisdictions to provide voluntary conservation public service announcements for residential, commercial and industrial customers in preparation for and during events in which demand is expected to rise sharply for both electricity and natural gas.*

As requested in the November 2021 report,²³¹ the GEH Forum discussed the potential expansion of demand response programs and, subsequently, the utilization of voluntary public service announcements for conservation of natural gas. GEH Forum participants identified the potential benefits that could be realized from robust retail natural gas demand response programs as well as the costs²³² and there was a suggestion that electric demand response programs may provide helpful baseline concepts that could be built upon for natural gas.²³³ While it was stated that natural gas demand response programs may not be practical for some consumers,²³⁴ other participants suggested that C&I natural gas end users may be particularly interested in such programs if offered compensation economically justify participation.²³⁵ As part of the record, it was noted that some local distribution companies within New England have implemented demand response programs to various degrees of effectiveness, dependent upon the nature of the customer’s operations and needs.²³⁶ Additionally, there was a recommendation that public service announcements could be used prior to and during critical events to encourage customers to reduce consumption.²³⁷

One potential identified barrier that may prevent wider participation in natural gas demand response programs is the lack of available telemetry for customers to effectively reduce usage.²³⁸ However, this can be remedied by demand response programs that supply customers with smart meters that deliver real-time usage information, as demonstrated by the pilot program initiated by National Grid.²³⁹ As stated in comments provided as part of the GEH Forum record, during one recent winter storm, National Grid’s natural gas demand response pilot resulted in a demand reduction of eighteen percent.²⁴⁰ In 2022, National Grid received a grant from the U.S. Department of Energy to develop a residential natural gas demand response pilot program, and a similar grant was awarded to Southern California Gas to support pilot programs for both residential and commercial consumers.²⁴¹

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended more wide-spread implementation of demand response programs as well as the use of public service announcements for conservation when they reduce supply constraints during critical events.

NAESB Balanced Voting Results – Recommendation 10						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	5	0	2	0	100%	0%
Pipelines	13	3	1.63	0.37	81.5%	18.5%

²³¹ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 197)

²³² Updated GEH Forum Survey Responses – March 31, 2023 (Pages 41 – 42, New England LDC Group; Page 42, AF&PA and Gas Consumers Group; Page 43, NGSA; Page 43, Reliable Energy Analytics; Page 43, ISONE; and Page 45, SPP)

²³³ Updated GEH Forum Survey Responses – March 31, 2023 (Page 43, Reliable Energy Analytics)

²³⁴ Updated GEH Forum Survey Responses – March 31, 2023 (Page 45, APGA)

²³⁵ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 17, PGC & AF&PA) and GEH Survey Response Comment Submissions – February 27, 2023 (Page 58, Aspen Environmental Group)

²³⁶ Updated GEH Forum Survey Responses – March 31, 2023 (Page 42, New England LDC Group and)

²³⁷ Updated GEH Forum Survey Responses – March 31, 2023 (Page 42, AGA)

²³⁸ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 18, PGC & AF&PA)

²³⁹ Updated GEH Forum Survey Responses – March 31, 2023 (Page 42, AF&PA and Gas Consumers Group)

²⁴⁰ Updated GEH Forum Survey Responses – March 31, 2023 (Page 42, AF&PA and Gas Consumers Group)

²⁴¹ April 19, 2022 DOE Invests \$3.5 Million for Programs to Improve Natural Gas Infrastructure and Lower Greenhouse Gas Emissions.



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Local Distribution Companies	9	1	1.8	0.2	90%	10%
End Users	10	0	2	0	100%	0%
Services	5	1	1.67	0.33	82.5%	16.5%
Total:	42	5	9.1	0.9	91%	9%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	1	0	1	0	100%	0%
Generation	9	1	1.8	0.2	90%	10%
Marketers/Brokers	2	0	2	0	100%	0%
Distributor/Load Serving Entities	2	2	1	1	50%	50%
End Users	2	0	2	0	100%	0%
Independent Grid Operators/Planners	5	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	25	3	11.8	1.2	91%	9%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	5	0	2	0	100%	0%
Total:	8	0	5	0	100%	0%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	8	0	2	0	100%	0%

NAESB Balanced Voting Results – Recommendation 11						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market	Support	Oppose	Support	Oppose	Support	Oppose
Producers	5	0	2	0	100%	0%
Pipelines	15	2	1.76	0.24	88%	12%
Local Distribution Companies	8	2	1.6	0.4	80%	20%
End Users	10	0	2	0	100%	0%
Services	5	1	1.67	0.33	83.5%	16.5%
Total:	43	5	9.03	0.97	90%	10%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	1	0	1	0	100%	0%
Generation	9	1	1.8	0.2	90%	10%



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Marketers/Brokers	2	0	2	0	100%	0%
Distributor/Load Serving Entities	2	1	1.33	0.67	66.5%	33.5%
End Users	2	0	2	0	100%	0%
Independent Grid Operators/Planners	5	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	25	2	12.13	0.87	93%	7%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	1	0	1	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	5	0	2	0	100%	0%
Total:	7	0	4	0	100%	0%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	7	1	1.75	0.25	87.5%	12.5%



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Recommendation 12: *Joint and cross-market, long-term planning should be expanded by relevant gas and electric market parties with an increased focus on fuel adequacy. FERC should encourage this planning coordination using its oversight roles for interstate pipelines, regulated RTO/ISO interstate transmission, and Electric Reliability Organization (ERO)-related Planning Authorities and collaborate with state public utility commissions and applicable state authorities.*

The GEH Forum record includes significant discussion on the importance of planning and the current processes utilized by both the electric and natural gas industries. Recently, FERC initiated a rulemaking proceeding proposing improvements to transmission planning, including the use of long-term scenarios that incorporate, among other factors, considerations related to shifts in demand due to increased electrification and trends in fuel costs.²⁴² GEH Forum participants noted that transmission planning could be assisted by coordination with natural gas pipelines and that greater cross-market collaboration on long-term planning will likely be needed as the gas and electric industries become more interconnected to help ensure continued reliability.²⁴³ There was significant support by participants for increased coordination activities in this area between natural gas and electric market participants as well as for state and federal regulators to consider actions that can encourage cross-market planning.²⁴⁴

While both the wholesale gas and wholesale electric markets have extensive long-term planning processes that are documented as part of the GEH Forum record, there were suggestions that stronger coordination practices could increase transparency. For instance, several ISOs and RTOs stated that their processes would be improved by greater insight into the long-term reliability and contingency planning by the natural gas market.²⁴⁵ In particular, participants noted that cross-market coordination could be especially helpful in ensuring future fuel adequacy given the increased reliance upon the ability of natural gas-fired generators to meet peak demand.²⁴⁶ To best address this issue, participants proposed using energy assessments heavily coordinated with natural gas participants as part of transmission planning processes²⁴⁷ as well as expanding seasonal assessments to better incorporate forecasted natural gas system conditions.²⁴⁸

As proposed by GEH Forum participants, cross-market planning could also support the trend towards electrification by helping to realize a cost-effective transition that enables continued electric reliability through adequate access to natural gas supplies.²⁴⁹ To achieve this, participants noted the importance of siting natural gas-fired generators in locations where the resource can meet electric needs for reliability while also easily obtaining fuel from the natural gas system.²⁵⁰ Cross-market planning practices could allow electric market and natural gas participants to more easily coordinate regarding future expansion of infrastructure and advantageous siting locations and may provide greater insight into which facilities would be the most cost-effective to upgrade.²⁵¹ GEH Forum participants recognized the

²⁴² GEH Forum Survey Responses – November 1, 2022 (Page 21, PJM, MISO, SPP & NYISO)

²⁴³ GEH Forum Survey Responses – November 1, 2022 (Page 21, PJM, MISO, SPP & NYISO)

²⁴⁴ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 2, Aspen Environmental Group); GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 10, Bureau of Economic Geology, University of Texas at Austin); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 7, Industrial Energy Consumers of America); GEH Survey Response Compiled Data – February 27, 2023 (Page 56, Recommendation 1.c.33); Updated GEH Forum Survey Responses – March 31, 2023 (Page 101, Kinder Morgan)

²⁴⁵ GEH Forum Survey Responses – November 1, 2022 (Page 27, PJM, MISO, SPP & NYISO) and December 5, 2022 GEH Forum Meeting Staff Notes (Page 4, PJM, MISO, SPP & NYISO)

²⁴⁶ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 10, Bureau of Economic Geology, University of Texas at Austin); Updated GEH Forum Survey Responses – March 31, 2023 (Page 96, New York ISO); and Updated GEH Forum Survey Responses – May 22, 2023 (Page 16, NGSA)

²⁴⁷ Updated GEH Forum Survey Responses – March 31, 2023 (Page 96, New York ISO)

²⁴⁸ December 5, 2022 GEH Forum Meeting Chat (Page 4, SPP)

²⁴⁹ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 2, Aspen Environmental Group); GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 11, Bureau of Economic Geology, University of Texas at Austin); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 7, Industrial Energy Consumers of America); December 5, 2022 GEH Forum Meeting Staff Notes (Page 6, NGSA); January 12, 2023 GEH Forum Meeting Staff Notes (Page 5, NAESB GEH Forum Leadership); GEH Survey Response Comment Submissions – February 27, 2023 (Page 136, PJM; Page 160, Southern Company); Updated GEH Forum Survey Responses – March 31, 2023 (Page 99, NGSA; Page 100, NGSA)

²⁵⁰ November 8, 2022 GEH Forum Meeting Staff Notes (Page 5, PJM, MISO, SPP & NYISO); Updated GEH Forum Survey Responses – March 31, 2023 (Page 99, NGSA; Page 100, NGSA)

²⁵¹ GEH Forum Survey Responses – November 1, 2022 (Page 11, SoCal Gas and Page 21, PJM, MISO, SPP & NYISO); Updated GEH Forum Survey Responses – March 31, 2023 (Page 99, NGSA; Page 100, NGSA)



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impact state and federal regulators can have in developing stronger cross-market planning practices as both are involved in decision making processes related to resource permitting and siting.²⁵² Additionally, participants stated that integrated resource planning and other state or federal policies, such as those to meet climate or emission goals, are important drivers in long-term planning considerations by the electric and natural gas industries.²⁵³ It was suggested that increased cross-market coordination could better support policy goals while helping to ensure the continued reliability of the natural gas and electric systems.²⁵⁴

GEH Forum participants also noted that it may be beneficial for long-term planning processes to evaluate the impact that more frequently occurring critical events will have on future resource and fuel availability.²⁵⁵ Specific recommendations included evaluating the effect of extreme weather on congestion, reserve and ramping requirements, and system voltage performance.²⁵⁶ It was stated that a recent report issued by the Western Electricity Coordinating Council, *The Year 2030 Extreme Natural Event Study Report*, contains recommendations that may be beneficial to consider in other regions of the country.²⁵⁷

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended that increased coordination between natural gas and electric market participants, especially in regards to fuel adequacy, as part of long-term planning will improve the reliability of both natural gas and electric systems and supported actions by state and federal regulators that could encourage greater collaboration by market participants.

NAESB Balanced Voting Results – Recommendation 12						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	4	0	2	0	100%	0%
Pipelines	13	4	1.53	0.47	76.5%	23.5%
Local Distribution Companies	9	0	2	0	100%	0%
End Users	9	1	1.8	0.2	90%	10%
Services	5	1	1.67	0.33	83.5%	16.5%
Total:	40	6	9	1	90%	10%
Wholesale Electric Market						
Transmission	0	1	0	1	0%	100%
Generation	6	3	1.33	0.67	66.5%	33.5%
Marketers/Brokers	2	0	2	0	100%	0%
Distributor/Load Serving Entities	2	1	1.33	0.67	66.5%	33.5%
End Users	1	1	1	1	50%	50%

²⁵² GEH Forum Survey Responses – November 1, 2022 – Compiled (Pages 9 – 10, NGS&A; Page 12, PJM, MISO, SPP & NYISO; and Page 42, AGA); November 8 GEH Forum Meeting Staff Notes (Page 3, INGAA); and Updated GEH Forum Survey Responses – May 22, 2023 (Pages 20 – 21, INGAA)

²⁵³ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 2, Aspen Environmental Group); GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 10, Bureau of Economic Geology, University of Texas at Austin); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 7, Industrial Energy Consumers of America and NGS&A, Page 30); GEH Forum Survey Responses – May 12, 2023 (Pages 15 – 16, NGS&A)

²⁵⁴ Updated GEH Forum Survey Responses – May 22, 2023 (Pages 20 – 21, INGAA)

²⁵⁵ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 20, Process Gas Consumers Group & American Forest Paper Association); November 8, 2022 GEH Forum Meeting Chat (Page 3, Black Hills Energy); and GEH Survey Response Comment Submissions – February 27, 2023 (Page 299, EPSA)

²⁵⁶ GEH Forum Survey Responses – November 1, 2022 (Page 26, SoCal Gas)

²⁵⁷ GEH Forum Survey Responses – November 1, 2022 (Page 26, SoCal Gas)



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Independent Grid Operators/Planners	7	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	22	6	9.66	3.34	74%	26%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	5	0	2	0	100%	0%
Total:	8	0	5	0	100%	0%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	5	3	1.25	0.75	62.5%	37.5%



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Recommendation 13: *The FERC, state public utility commissions, and applicable state authorities in states with competitive energy markets should consider whether market mechanisms are adequate to ensure that jurisdictional generators have the necessary arrangements for secure firm transportation and supply service and/or storage to avoid and/or mitigate natural gas supply shortfalls during extreme cold weather events, and if not, (a) determine whether non-market solutions are warranted, including funding mechanisms borne or shared by customers and (b) if warranted, adopt such non-market solutions.*

As part of the request made by FERC and NERC staff, the forum was asked to consider a study²⁵⁸ concerning whether federal and state entities should enact measures to address natural gas supply shortfalls during extreme cold weather events by requiring market/public funding for firm transportation and supply and/or investment in storage contracts.²⁵⁹ As part of these discussions, it was stated that natural gas-fired generators utilize non-firm services and products to meet just-in-time procurement needs but that growing constraints and increases in natural gas pipeline capacity usage may impact the flexibility of the natural gas system to reliably provide these types of services in the future.²⁶⁰ It was suggested that reliance on these services by generators operating in organized markets could be contributing to higher levels of reliability volatility²⁶¹ which may only increase given the trends towards electrification and the utilization of variable generation resources.²⁶² GEH Forum participants explained that economic barriers may be hindering natural gas-fired generators from utilizing firm service and storage options²⁶³ and both natural gas and electric market participants supported consideration of steps to better facilitate cost recovery for firm fuel procurement and transportation costs, particularly through market-based solutions.²⁶⁴

In evaluating mechanisms to encourage firm fuel procurement and transportation, GEH Forum participants noted that economic incentives and non-performance penalties²⁶⁵ must be balanced and suggested that as market needs and conditions continue to evolve, it may be necessary to re-assess traditional cost-benefit and risk-reward structures to help ensure continued reliability.²⁶⁶ Participants explained that regional differences and the various market structures will likely require tailored solutions that may be best developed through individual market or regional processes coordinated between system operators, stakeholders, and the appropriate state and federal regulators.²⁶⁷ It was noted that some ISOs and RTOs are currently undertaking stakeholder processes to evaluate mechanisms that could better support and incentivize firm transportation and fuel acquisition, such as resource adequacy or capacity accreditation requirements.²⁶⁸ GEH Forum participants stated that ISO and RTO markets also may benefit from considering new or modified compensation frameworks and/or the creation of new market services or products.

Several participants noted that greater mitigation of the financial risks that are faced by generators operating in organized markets could encourage procurement of firm fuel supply and transportation services ahead of critical

²⁵⁸ FERC/NERC Presentation – August 30, 2022 (Page 16)

²⁵⁹ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 234)

²⁶⁰ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 6, NGSA)

²⁶¹ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Pages 4 – 6, NGSA)

²⁶² GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 6, NGSA)

²⁶³ Updated GEH Forum Survey Responses – September 14, 2022 (Page 3, Aspen Environmental Group ; Page 4 and 15, NGSA; Page 10, Process Gas Consumers Group & American Forest Paper Association; Page 11, Enchanted Rock; and Page 12, INGAA); GEH Forum Survey Response Comment Submissions – February 27, 2023 (Page 250-251, Kinder Morgan); and Updated GEH Forum Survey Responses – May 22, 2023 (Page 6, Reliable Energy Analytics; Page 7, Xcel Energy and Page 9, MISO)

²⁶⁴ GEH Forum Survey Response Tabulations – February 27, 2023 (Page 75, Recommendation 3.a.1; Page 76, Recommendation 3.a.2; and Page 104, Recommendation 3.f.2)

²⁶⁵ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 2, LS Power)

²⁶⁶ GEH Survey Responses Comment Submissions – February 27, 2023 (Page 182, EPSA) and Updated GEH Forum Survey Responses – May 22, 2023 (Pages 2 – 3, NGSA)

²⁶⁷ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 23, LS Power); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 30, LS Power); and Updated GEH Forum Survey Responses – May 22, 2023 (Page 43, SPP)

²⁶⁸ Updated GEH Forum Survey Responses – May 22, 2023 (Page 7, NYISO and Page 8, PJM)



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events.²⁶⁹ One potential solution identified by some of these participants was to couple advanced unit commitment processes with a guaranteed level of cost recovery for reliability, even if the generator is not dispatched.²⁷⁰ While these types of compensation mechanism may increase costs for consumers, it was suggested that there is a net benefit when evaluated against the potential loss of human life and economic damages that can result from a grid failure.²⁷¹ Several participants proposed that the additional costs that would be incurred to implement the mechanisms described above should be absorbed or spread equally within a given region or footprint.²⁷² Cautions were expressed by others that this approach may present current market design and discrimination concerns.²⁷³

As part of discussions in this area, several ISOs and RTOs indicated that there are existing compensation mechanisms within organized markets to encourage the procurement of firm natural gas supply and transport and storage, either through indirect incentives or terms contained in Open Access Transmission Tariffs.²⁷⁴ Some participants suggested that rather than the ability to adequately recover costs, the reason generators may not engage in long-term firm contracting practices is likely more attributable to the types of natural gas services that are offered.²⁷⁵ For resources dispatched just a few times a year or with inconsistent fuel needs, it was suggested that long-term firm service offerings may not be practical or efficient. Recommendations were made by these participants to explore the creation of new types of natural gas products and services that better support the needs of natural gas-fired generators.²⁷⁶ Further, in organized markets with state regulated rate caps and/or spending ceilings, wholesale electric market solutions alone may not be sufficient to provide adequate cost recovery.²⁷⁷

Several participants proposed that new market products or services should focus on reliability and preparation for critical events.²⁷⁸ Some participants identified the Firm Fuel Supply Service developed by ERCOT and the Public Utilities Commission of Texas at the direction of the Texas Legislature to enhance reliability during extreme weather events as an example of a new service that could be beneficial for other markets to consider.²⁷⁹ As explained by these participants, resources providing the Firm Fuel Supply Service receive compensation to acquire and retain access to firm natural gas transportation and supply as well as storage specifically for use during a weather emergency.²⁸⁰

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended the consideration of actions that could be taken at both the federal and state level to evaluate the need for market mechanisms or non-market solutions to improve reliability by ensuring adequate arrangements are in place to obtain firm natural gas supply and

²⁶⁹ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 6, NGSA); GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 7, Xcel Energy); and February 2, 2023 GEH Forum Meeting Staff Notes (Page 2, Xcel Energy)

²⁷⁰ GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 7, Xcel Energy); February 2, 2023 GEH Forum Meeting Staff Notes (Page 2, Xcel Energy); GEH Survey Responses Comment Submissions – February 27, 2023 (Page 181, EPSA); and Updated GEH Forum Survey Responses – May 22, 2023 (Page 13, INGAA)

²⁷¹ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 5-6, NGSA) (quoting PJM Markets & Reliability Committee Meeting, Aug. 25, 2021. <https://pjm.com/-/media/committees-groups/committees/mrc/2021/20210825/20210825-item-05-2-natural-gas-and-electric-markets-problem-statement.ashx>.)

²⁷² Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 3, Aspen Environmental Group); GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 7, Xcel Energy) and February 2, 2023 GEH Forum Meeting Staff Notes (Page 2, Xcel Energy)

²⁷³ GEH Survey Responses Comment Submissions – February 27, 2023 (Page 187, SPP); Updated GEH Forum Survey Responses – May 22, 2023 (Page 3, NGSA)

²⁷⁴ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 12, MISO, PJM, SPP); October 21, 2022 GEH Forum Meeting Staff Notes (Page 6, MISO, PJM & SPP); Updated GEH Forum Survey Responses – May 22, 2023 (Page 10, MISO)

²⁷⁵ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 6, MISO, PJM & SPP)

²⁷⁶ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 6, MISO, PJM & SPP) and October 21, 2022 GEH Forum Meeting Staff Notes (Page 6, MISO, PJM, and SPP)

²⁷⁷ Updated GEH Forum Survey Responses – May 22, 2023 (Pages 48 – 49, MISO)

²⁷⁸ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 12, INGAA); September 23, 2022 GEH Forum Meeting Staff Notes (Page 2, NGSA); and GEH Survey Response Comment Submissions – February 27, 2023 (Page 229, EPSA)

²⁷⁹ Supplemental Comments – December 5, 2023 (Pages 10 – 11, TPA) and GEH Forum Survey Responses – April 24, 2023 (Page 13, Kinder Morgan, Intrastate Pipeline Group and Page 78, TPA)

²⁸⁰ GEH Forum Survey Responses – April 24, 2023 (Page 13, Kinder Morgan, Intrastate Pipeline Group)



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transportation and/or storage prior to and during critical weather events when demand is expected to rise sharply for both natural gas and electricity.

NAESB Balanced Voting Results – Recommendation 13						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
Wholesale Gas Market	Support	Oppose	Support	Oppose	Support	Oppose
Producers	4	0	2	0	100%	0%
Pipelines	15	4	1.58	0.42	79%	21%
Local Distribution Companies	5	0	2	0	100%	0%
End Users	5	5	1	1	50%	50%
Services	3	2	1.2	0.8	60%	40%
Total:	32	11	7.78	2.22	78%	22%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	0	1	0	1	0%	100%
Generation	5	4	1.11	0.89	55.5%	44.5%
Marketers/Brokers	2	1	1.33	0.67	66.5%	33.5%
Distributor/Load Serving Entities	3	0	2	0	100%	0%
End Users	2	0	2	0	100%	0%
Independent Grid Operators/Planners	5	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	21	6	10.44	2.56	80%	20%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	1	0	1	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	0	0	0	0	0%	0%
Total:	2	0	2	0	100%	0%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	6	1	1.71	0.29	85.5%	14.5%



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Recommendation 14: *Applicable state authorities should consider the adoption of legislation or regulations or other actions to create a secondary market for unutilized intrastate natural gas pipeline capacity, including a requirement for intrastate pipelines to offer some minimum level of firm service and/or support bilateral agreements between end users. In instances where state authorities lack enabling authority to take such actions, the FERC should adopt regulations to achieve identical outcomes within its authority.*

As requested in the February 2021 Report, the GEH Forum spent significant time discussing potential state actions that could enhance reliability.²⁸¹ Participants stated that electric reliability is often dependent upon access to natural gas transportation and supply services as well as efficient management of firm natural gas pipeline capacity²⁸² but that unlike the interstate natural gas market, intrastate markets often lack a mechanism to facilitate the sale and purchase of unutilized capacity.²⁸³ Participants proposed that the increased flexibility and liquidity a secondary market for capacity can create will enhance the reliability of intrastate natural gas systems and could have been of benefit to natural gas-fired generators during Winter Storm Uri.²⁸⁴ Both natural gas and electric market participants supported the consideration of actions to create intrastate-specific secondary markets for capacity or better facilitate bilateral agreements between end users.²⁸⁵

Several GEH Forum participants stated that the interstate capacity release program established by FERC in 18 C.F.R § 284.8, along with the accompanying posting requirements in 18 C.F.R § 284.13, have created a level of transparency that helps to ensure effective use of capacity by providing a way for all market participants to transact for unused capacity.²⁸⁶ GEH Forum participants also noted that wholesale natural gas market participants have the ability to engage in contractual arrangements to share or acquire capacity when needed, such as through multi-party capacity contracts or AMAs.²⁸⁷ As suggested by GEH Forum participants, an intrastate secondary capacity market or capacity release program would provide natural gas-fired generators access to the same tools utilized by their wholesale market counterparts to help ensure performance when dispatched²⁸⁸ while also incentivizing firm contracting practices by improving the economic feasibility of such transactions, especially for peaking units.²⁸⁹ Additionally, the availability of a secondary market for capacity may encourage greater participation by natural gas marketers who can help provide additional market options to meet just-in-time procurement needs.²⁹⁰

Although there was general support by GEH Forum participants, some suggested that secondary intrastate capacity markets may be of minimal value. These participants explained that variations in market structure and design will impact the effectiveness and practicality of such a market,²⁹¹ especially in intrastate markets where a large number of

²⁸¹ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 196)

²⁸² October 21, 2022 GEH Forum Meeting Notes (Page 3, TCPA) and GEH Survey Response Comment Submissions – February 27, 2023 (Pages 49-50, TCPA)

²⁸³ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 13, MISO, PJM & SPP; Page 25, NGSAs; and Page 26, Bureau of Economic Geology, University of Texas at Austin); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 36, TCPA); December 5, 2022 GEH Forum Meeting Chat (Page 3, Process Gas Consumers Group & American Forest and Paper Association); February 27 Comments – EPSA

²⁸⁴ GEH Forum Survey Responses – October 10, 2022 – Compiled (Pages 13 and 21 – 22, MISO, PJM & SPP; Page 25, NGSAs; and Page 28, Process Gas Consumers Group, Industrial Energy Consumers of America, and American Forest and Paper Association)

²⁸⁵ GEH Forum Survey Responses Tabulation – February 27, 2023 Recommendation (Page 19, 1.b.7 and Page 61, 2.a.2)

²⁸⁶ October 21, 2022 GEH Forum Meeting Staff Notes (Page 5, INGAA); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 33, INGAA); and Updated GEH Forum Survey Responses – March 31, 2023 (Pages 39 – 41 and 53 – 55, INGAA; Page 55, New England LDC Group; and Pages 56 – 57, AGA)

²⁸⁷ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 47 – 48, AF&PA and Gas Consumers Group and Pages 49 – 51, NGSAs)

²⁸⁸ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 22, PJM, MISO, SPP & NYISO and Page 36, TCPA); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 56, AF&PA and Gas Consumers Group)

²⁸⁹ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 36, TCPA); GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 15, TCPA); and Updated GEH Forum Survey Responses – March 31, 2023 (Page 39, INGAA)

²⁹⁰ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 19, NGSAs); GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 36, TCPA); and Supplemental Comments – December 5, 2022 (Page 5, NGSAs)

²⁹¹ April 4, 2023 GEH Forum Meeting Staff Notes (Page 5, Kinder Morgan) and GEH Forum Survey Responses – April 24, 2023 (Pages 1 and 9 – 10, Kinder Morgan Intrastate Pipeline Group; Page 10, AGA; and Pages 75 – 76, TPA)



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natural gas end users already engage in transactions for bundled firm transportation and supply services.²⁹² Additionally, it was noted lack of participation in such markets could be an issue as intrastate natural gas customers are typically smaller entities that may not have the resources needed to manage their own natural gas transportation and supply needs.²⁹³ Others stated that secondary capacity markets could be of particular benefit for states with customer choice regulatory frameworks as a mechanism to further foster competition and reduce consumer costs.²⁹⁴

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended that applicable state authorities should consider programs or actions that would better enable the creation of a secondary market for unutilized natural gas and support enhanced reliability through improved market transparency and competition.

NAESB Balanced Voting Results – Recommendation 14						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	4	2	1.33	0.67	66.5%	33.5%
Pipelines	1	16	0.12	1.88	6%	94%
Local Distribution Companies	3	5	0.75	1.25	37.5%	62.5%
End Users	9	1	1.8	0.2	90%	10%
Services	3	5	0.75	1.25	37.5%	62.5%
Total:	20	29	4.75	5.25	47.5%	52.5%
Wholesale Electric Market						
Transmission	1	0	1	0	100%	0%
Generation	8	1	1.78	0.22	89%	11%
Marketers/Brokers	2	1	1.33	0.67	66.5%	33.5%
Distributor/Load Serving Entities	1	2	0.67	1.33	33.5%	66.5%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	4	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	21	5	9.78	3.22	75%	25%
Retail Energy Market						
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	1	0	1	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	0	6	0	2	0%	100%
Total:	2	0	2	2	50%	50%
Other Mkt Participant/Observer						
Total:	5	1	1.67	0.33	83.5%	16.5%

²⁹² GEH Forum Survey Responses – April 24, 2023 (Pages 9 – 10, Kinder Morgan Intrastate Pipeline Group)

²⁹³ GEH Forum Survey Responses – April 24, 2023 (Pages 9 – 10, Kinder Morgan Intrastate Pipeline Group)

²⁹⁴ GEH Survey Response Comment Submissions – February 27, 2023 (Page 149, 44 Farris and Page 149, TCPA)



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Recommendation 15: *Applicable state authorities should consider establishing informational posting requirements for intrastate natural gas pipelines to enhance transparency for intrastate natural gas market participants regarding operational capacity data, similar to the reporting and posting requirements mandated by the FERC for interstate natural gas pipelines as part of 18 CFR §284.13. In instances where state authorities lack enabling authority to take such actions, the FERC should adopt regulations to achieve identical outcomes within its authority.*

Per the November 2021 Report, the forum considered possible state actions that could enhance the reliability of intrastate natural gas pipelines and other facilities.²⁹⁵ The November 2021 Report noted that during Winter Storm Uri, wholesale electric market participants did not have the same level of visibility into the operations of intrastate pipeline operations as those of the interstate natural gas pipelines.²⁹⁶ As part of discussions concerning intrastate markets, participants stated that high priority should be given to actions that could enhance transparency²⁹⁷ and suggested reliability could be improved through the availability of increased information regarding intrastate natural gas pipeline operations.²⁹⁸ There was support among some GEH Forum participants for the development of information sharing and reporting requirements by state regulatory bodies²⁹⁹ similar to those required in the interstate market by the federal regulations adopted by FERC in 18 CFR 284.13.³⁰⁰

As identified by GEH Forum participants, greater transparency can facilitate improved coordination between natural gas and electric market participants as well as provide a better understanding of market dynamics and system operations.³⁰¹ Several participants suggested the use of EBBs by intrastate natural gas pipeline or similar types of information sharing requirements,³⁰² explaining it could provide better accessibility to operational information that may be needed by bulk electric system operators to help manage reliability during critical events.³⁰³ There was also a suggestion that states may want to evaluate if there would be a benefit to adopting the NAESB WGQ Business Practice Standards supportive of the FERC regulations.³⁰⁴ Additionally, some participants proposed expanding the applicability of FERC transparency requirements to Hinshaw pipelines and intrastate natural gas pipelines that are subject to FERC jurisdiction under section 311(a)(2) of the Natural Gas Policy Act.³⁰⁵ Others noted that there may be limited statutory authority for FERC action in this area.³⁰⁶

A few participants stated that some intrastate markets have sufficient levels of transparency and further action in this area may not be necessary. As explained by these participants, there are states with existing transparency requirements for intrastate natural gas pipelines and that since Winter Storm Uri, some jurisdictions such as Texas, have taken action to further improve upon transparency through new legislative and regulatory requirements.³⁰⁷ It also was noted that parties contracting with intrastate natural gas pipelines have the ability to specify information sharing requirements as

²⁹⁵ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 196)

²⁹⁶ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 67)

²⁹⁷ GEH Survey Response Comment Submissions – February 27, 2023 (Pages 144-145, EPSA)

²⁹⁸ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 39, TCPA); GEH Survey Response Comment Submissions – February 27, 2023 (Page 23, Xcel Energy; Page 109, SPP; and Pages 144-145, EPSA); and GEH Forum Survey Responses – April 24, 2023 (Page 12, New England LDC Group)

²⁹⁹ GEH Survey Response Tabulation – February 27, 2023 (Page 60, Recommendation 2.a.1)

³⁰⁰ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 39, TCPA); GEH Survey Response Comment Submissions – February 27, 2023 (Page 51, Xcel Energy); and GEH Forum Survey Responses – April 24, 2023 (Page 12, New England LDC Group)

³⁰¹ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 39, TCPA) and GEH Forum Survey Responses – October 21, 2022 – Compiled (Page 26, Bureau of Economic Geology, University of Texas at Austin)

³⁰² Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 39, TCPA); GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 25, NGSa); and GEH Survey Response Comment Submissions – February 27, 2023 (Page 93, EPSA)

³⁰³ GEH Survey Response Comment Submissions – February 27, 2023 (Pages 7 and 81, TCPA); Updated GEH Forum Survey Responses – March 31, 2023 (Page 7, AF&PA and Gas Consumers Group and Page 23, Xcel Energy) and GEH Forum Survey Responses – April 24, 2023 (Page 12, SPP)

³⁰⁴ GEH Forum Survey Responses – April 24, 2023 (Page 12, SPP)

³⁰⁵ GEH Survey Response Tabulation – February 27, 2023 (Page 64, Recommendation 2.a.5)

³⁰⁶ June 16, 2023 GEH Forum Meeting Staff Notes (Page 4, Kinder Morgan Intrastate Pipeline Group)

³⁰⁷ November 8, 2022 GEH Forum Meeting Staff Notes (Page 8, TPA); December 5, 2022 GEH Forum Supplemental Comments, (Page 5, TPA); and April 4, 2023 GRH Forum Meeting Staff Notes (Page 3, Kinder Morgan)



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part of terms and conditions and that some intrastate natural gas pipelines have voluntarily implemented additional transparency practices, such as the use of EBBs and information sharing protocols that utilize informational postings and/or direct communications with customers to provide notice of operating condition changes.³⁰⁸ Additionally, some participants stated that the use of EBBs could introduce concerns regarding confidentiality.³⁰⁹ Others noted that greater uniformity in reporting and posting requirements will provide consistency and improve efficiencies for those that interact with multiple intrastate markets and that increased access to commercial information will better enable contract negotiations between trading partners.³¹⁰

In consideration of the GEH Forum record, the Chairs of the GEH Forum identified that the reliability of intrastate natural gas systems can be improved through greater market transparency provided by the availability of operational information from intrastate natural gas pipelines and supported state action to consider adoption of informational posting requirements similar to those applicable to interstate natural gas pipelines. Additionally, GEH Forum leadership supported FERC consideration regarding its authority to take regulatory action in this area.

NAESB Balanced Voting Results – Recommendation 15						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	4	2	1.33	0.67	66.5%	33.5%
Pipelines	1	16	0.12	1.88	6%	94%
Local Distribution Companies	5	3	1.25	0.75	62.5%	37.5%
End Users	9	1	1.8	0.2	90%	10%
Services	5	3	1.25	0.75	62.5%	37.5%
Total:	24	25	5.75	4.25	57.5%	42.5%
Wholesale Electric Market						
Transmission	1	0	1	0	100%	0%
Generation	9	0	2	0	100%	0%
Marketers/Brokers	3	0	2	0	100%	0%
Distributor/Load Serving Entities	2	1	1.33	0.67	66.5%	33.5%
End Users	3	1	1.5	0.5	75%	25%
Independent Grid Operators/Planners	4	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	26	2	11.83	1.17	91%	9%
Retail Energy Market						
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--

³⁰⁸ Updated GEH Forum Survey Responses – March 31, 2023 (Pages 12 – 13, Kinder Morgan)

³⁰⁹ December 5, 2022 GEH Forum Supplemental Comments, (Page 5, TPA) and December 5, 2022 GEH Forum Meeting Staff Notes (Page 3, TPA)

³¹⁰ December 5, 2022 GEH Forum Meeting Staff Notes (Page 4, TCPA) and GEH Survey Response Comment Submissions – February 27, 2023 (Pages 7 and 81, TCPA and Page 144, SPP);



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Gas Market Interests	4	2	1.33	0.67	66.5%	33.5%
Total:	7	2	4.33	0.67	87%	13%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	5	1	1.67	0.33	83%	17%



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Recommendation 16: *Applicable state authorities should consider the development of weatherization guidelines appropriate for their region/jurisdiction to support the protection and continued operation of natural gas production and processing and gathering system facilities during extreme weather events, and require public disclosure concerning weatherization efforts of jurisdictional entities.*

As identified in the November 2021 Report, a majority of the natural gas production issues during the events of Winter Storm Uri, were attributable to weather and freeze-related issues³¹¹ and included a recommendation that the forum consider programs that could encourage and provide compensation opportunities for natural gas infrastructure facility winterization.³¹² The importance of these discussions within the forum were reinforced by the events surrounding Winter Storm Elliott, which GEH Forum participants stated highlighted the need to ensure adequate cold weather protections are in place for upstream facilities, even in regions with historically colder climates.³¹³ As noted by many forum participants, weatherization protections are foundational in ensuring reliability of the natural gas and electric systems as well as human safety,³¹⁴ and both electric and natural gas participants supported the consideration of strategies or requirements to weatherize natural gas infrastructure, including wellhead and processing and gathering systems.³¹⁵

While some participants suggested that there may be mechanisms for FERC action to promote weatherization requirements for processing and gathering system facilities,³¹⁶ it was noted that state authorities may be better positioned to take action in this area.³¹⁷ In considering action regarding winterization guidance, participants stated that producing states may find it helpful to coordinate with federal regulators³¹⁸ and to evaluate the efforts undertaken by various state jurisdictional entities in surrounding areas.³¹⁹ The activities of the Texas Legislature to enact laws requiring weatherization of electric generation, natural gas, and transmission facilities as well as the subsequent action of the Railroad Commission of Texas to adopt weatherization rules for natural gas facilities intended to protect gas flow during critical weather events were specifically cited by several participants,³²⁰ and it was noted that these requirements were in place during Winter Storm Elliott, which had a minimal impact on natural gas supply within the state during the event.³²¹ As an alternative to broadly applicable weatherization requirements or guidance, some participants proposed that it may be beneficial to consider a targeted approach that focused on critically important facilities or those located in key supply basins.³²² Additionally, it was suggested that transparency regarding the weatherization and performance of natural gas production facilities, such as through annual reporting, would be of benefit to natural gas purchasers.³²³

In discussing upstream weatherization protections, some participants stated that legislation or regulatory requirements may not be needed as owners and operators have incentive to take reasonable steps to weatherize facilities to protect revenue streams.³²⁴ It was also noted that the costs of weatherization requirements may factor into business decisions regarding investments in new facilities and continued operation of existing facilities, especially if requirements would go beyond the actions deemed reasonably prudent by owners and operators.³²⁵ Although some supported the consideration of economic incentives or cost recovery mechanisms for state actions to implement weatherization

³¹¹ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Pages 174 – 175)

³¹² FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 196)

³¹³ GEH Forum Survey Responses – January 31, 2023 – Compiled (Xcel Energy, Page 3)

³¹⁴ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 10, MISO, PJM & SPP) and GEH Forum Survey Responses – April 24, 2023 (Page 25, AGA)

³¹⁵ GEH Survey Response Comment Submissions – February 27, 2023 (Page 297, SAFE)

³¹⁶ GEH Forum Survey Responses – April 24, 2023 (Page 19, AGA and Page 22, New England LDC Group)

³¹⁷ GEH Forum Survey Responses – April 24, 2023 (Page 3 – 4, MISO)

³¹⁸ GEH Survey Response Comment Submissions – February 27, 2023 (Page 166, AF&PA and Process Gas Consumers Group)

³¹⁹ April 27, 2023 GEH Forum Meeting Staff Notes (Page 4, NGSA)

³²⁰ April 27, 2023 GEH Forum Meeting Staff Notes (Page 4, NGSA)

³²¹ April 27, 2023 GEH Forum Meeting Chat (Page 2, Kinder Morgan)

³²² October 21, 2022 GEH Forum Meeting Chat (Page 2, Aspen Environmental and Page 2, Bureau of Economic Geology, University of Texas at Austin)

³²³ GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 4, Xcel Energy)

³²⁴ GEH Forum Survey Responses – April 24, 2023 (Page 18, NGSA and Page 20, Gas & Oil Association of West Virginia)

³²⁵ GEH Forum Survey Responses – April 24, 2023 (Page 18, NGSA)



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requirements,³²⁶ others expressed support for allowing the competitive markets to provide the necessary compensation.³²⁷ Another concept proposed by some participants was the creation of a voluntary weatherization certification program.³²⁸ Comments submitted as part of the GEH Forum record recommended that an independent entity facilitate the program and develop weatherization standards or best practices to easily identify natural gas suppliers that have proactively taken steps to help ensure a reliably available fuel supply during critical weather events.³²⁹ It was noted that a certified winterized gas product would establish a market compensation mechanism for weatherization and could increase confidence in delivery to natural gas purchasers when obtaining fuel supplies.³³⁰

In consideration of the GEH Forum record, the Chairs of the GEH Forum identified that the reliability of natural gas and electric systems will be improved through greater transparency and weatherization protections that can help to ensure the availability of natural gas supply during extreme cold weather events and recommended state actions to confirm natural gas production and processing and gathering system operators and owners are taking appropriate steps.

NAESB Balanced Voting Results – Recommendation 16						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	0	9	0	2	0%	100%
Pipelines	2	4	0.67	1.33	33.5%	66.5%
Local Distribution Companies	8	0	2	0	100%	0%
End Users	9	1	1.8	0.2	90%	10%
Services	3	3	1	1	50%	50%
Total:	22	17	5.47	4.53	55%	45%
Wholesale Electric Market						
Transmission	1	0	1	0	100%	0%
Generation	10	0	2	0	100%	0%
Marketers/Brokers	3	0	2	0	100%	0%
Distributor/Load Serving Entities	3	0	2	0	100%	0%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	6	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	28	1	12	1	92%	8%
Retail Energy Market						
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%

³²⁶ GEH Forum Survey Responses – April 24, 2023 (Page 18, NGSA) and April 27, 2023 GEH Forum Meeting Staff Notes (Page 3, AF&PA and Gas Consumers Group and Page 4, NGSA)

³²⁷ GEH Forum Survey Responses – April 24, 2023 (Page 19, AGA)

³²⁸ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Pages 17 – 18, Kansas Corporation Commission) and GEH Forum Survey Responses – April 24, 2023 (Page 22, SPP)

³²⁹ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Pages 17 – 18, Kansas Corporation Commission) and GEH Forum Survey Responses – April 24, 2023 (Page 22, SPP)

³³⁰ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Pages 17 – 18, Kansas Corporation Commission) and GEH Forum Survey Responses – April 24, 2023 (Page 22, SPP)



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Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	0	1	0	1	0%	100%
Total:	3	1	3	1	75%	25%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	6	1	1.71	0.29	85.5%	14.5%



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Recommendation 17: *Many generalized recommendations concerning resource adequacy and accreditation and market reforms to bolster reliability were offered throughout the NAESB GEH Forum activities; we understand, however, based upon information provided by representatives from the ISO and RTO segment, that steps are being taken within the organized markets to consider such reforms through their stakeholder processes. The GEH Forum endorses this evaluation of resource adequacy and accreditation requirements by all ISOs and RTOs and encourages the review of the Forum record*

The November 2021 Report asked the forum to consider if new factors should be incorporated into resource accreditation requirements such as the firmness of a generator's transportation and supply arrangements and/or the potential to create correlated outages.³³¹ Throughout the GEH Forum process, participants discussed potential improvements to the processes system operators utilize to ensure sufficient levels of capacity and reserves as well as efforts that are already underway by ISOs and RTOs to consider some of these proposals. In general, participants suggested that modifications that better assure generator performance during times of peak electric demand, including critical events³³² such as fuel procurement practices that encourage fuel firmness and fuel redundancy would be beneficial.³³³ Proposals were also made to evaluate mechanisms that could foster greater competition in the procurement of generation resources³³⁴ and to consider wider application of regional solutions like the Western Resource Adequacy Program.³³⁵

A number of specific recommendations were made that received various levels of support, such as consideration of fuel security as a capacity attribute,³³⁶ enhancing capacity performance/pay-for-performance programs,³³⁷ consideration of alternative service options that better value reliability, fast-ramping, and frequency attributes,³³⁸ re-examining the duration of commitments in capacity auctions,³³⁹ and developing accreditation requirements that better account for a generation resource's expected generation availability.³⁴⁰ As part of GEH Forum discussions, several participants indicated that many of the proposed requirements that were made during the process may already exist or are being considered by ISOs and RTOs.³⁴¹ For example, as part of the GEH Forum process, NYISO provided that it is pursuing capacity accreditation efforts that emphasize firm natural gas fuel supply and transport and/or dual fuel capabilities,³⁴² and PJM provided that it is working with stakeholders to identify potential reforms that include accreditation changes for natural gas-fired generators that focus on dual fuel capability, transportation and supply contractual arrangements, and historical unit performance.³⁴³ Additionally, MISO noted that it is considering changes to accreditation processes to better reflect the capabilities and fuel security of a resource and recently implemented the use of seasonal resource adequacy requirements that factor for a generator's availability during extreme weather events using past performance.³⁴⁴

In consideration of the GEH Forum record, the Chairs of the GEH Forum recommended it would be beneficial to consider modifications to resource adequacy and accreditation requirements that could enhance electric reliability, and

³³¹ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Page 197)

³³² Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 7, NGSA) and GEH Survey Response Comment Submissions – February 27, 2023 (Page 226, Kinder Morgan)

³³³ GEH Forum Survey Responses – January 31, 2023 – Compiled (Page 8, Xcel Energy)

³³⁴ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 11, Bureau of Economic Geology, University of Texas at Austin)

³³⁵ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 2, Aspen Environmental)

³³⁶ GEH Survey Response Tabulation – February 27, 2023 (Page 93, Recommendation 3.d.1)

³³⁷ GEH Survey Response Tabulation – February 27, 2023 (Page 94, Recommendation 3.d.2)

³³⁸ GEH Survey Response Tabulation – February 27, 2023 (Page 95, Recommendation 3.d.3)

³³⁹ GEH Survey Response Tabulation – February 27, 2023 (Page 96, Recommendation 3.d.4)

³⁴⁰ GEH Survey Response Tabulation – February 27, 2023 (Page 97, Recommendation 3.d.5)

³⁴¹ GEH Survey Response Comment Submissions – February 27, 2023 (Page 227, PJM; Page 227, Xcel Energy; Page 227, EPSA; Page 229, PJM; Page 230, Xcel Energy; Page 230, SPP; Page 231, Xcel Energy; Page 234, EPSA; and Page 234, SPP); Updated GEH Forum Survey Responses – May 22, 2023 (Page 41, NYISO; Page 41, PJM, Pages 41 – 42, MISO; and Page 42, Energy) and May 17 GEH Forum Meeting Staff Notes (Page 5, SPP)

³⁴² Updated GEH Forum Survey Responses – May 22, 2023 (Page 41, NYISO)

³⁴³ Updated GEH Forum Survey Responses – May 22, 2023 (Page 41, PJM)

³⁴⁴ Updated GEH Forum Survey Responses – May 22, 2023 (Pages 41 – 42, MISO)



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encouraged all ISOs and RTOs to consider the comments made as part of the record as well as continue to engage with stakeholders to evaluate specific proposals.

NAESB Balanced Voting Results – Recommendation 17						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
Wholesale Gas Market	Support	Oppose	Support	Oppose	Support	Oppose
Producers	5	0	2	0	100%	0%
Pipelines	14	1	1.87	0.13	93.5%	6.5%
Local Distribution Companies	9	0	2	0	100%	0%
End Users	9	0	2	0	100%	0%
Services	6	0	2	0	100%	0%
Total:	43	1	9.87	0.13	99%	1%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	1	0	1	0	100%	0%
Generation	10	1	1.82	0.18	91%	9%
Marketers/Brokers	3	0	2	0	100%	0%
Distributor/Load Serving Entities	3	0	2	0	100%	0%
End Users	1	0	1	0	100%	0%
Independent Grid Operators/Planners	6	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	28	1	11.82	0.18	98.5%	1.5%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	6	0	2	0	100%	0%
Total:	9	0	5	0	100%	0%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	6	0	2	0	100%	0%



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Recommendations for Studies

Recommendation 18: FERC and NARUC should collaborate to conduct, fund, and/or direct efforts to study whether market-incentivized investments in strategic natural gas storage facilities are sufficient to address natural gas supply shortfalls during extreme cold weather events, and if the level of investment is sufficient to preserve such facilities for use during extreme cold weather events. The study should also explore whether public sources of funding are needed for investment to secure sufficient storage.

Recommendation 19: FERC and NARUC should collaborate to conduct, fund, and/or direct efforts to study whether additional financial incentives for the natural gas infrastructure system, including infrastructure to provide additional firm transportation capacity, would help to address natural gas supply shortfalls during such events, and further support the Bulk Electric System's performance during extreme cold weather events.

Recommendation 20: The U.S. Department of Energy or FERC should conduct, fund, and/or direct efforts to study, by region, whether there is adequate natural gas infrastructure in place to support new gas usage patterns affected by flexible gas generation resource requirements as the latter resources are increasingly called upon for more frequent and/or steeper ramping to balance the increased use of variable energy resources. This study should be conducted in conjunction with an industry advisory group made up of diverse interests to ensure broad engagement and support for study results that are credible and unbiased. Currently, there are no comprehensive regional assessments that examine whether regions have sufficient natural gas infrastructure to support new usage patterns of gas generators, yet this information is essential for policymakers to have so that they can make informed policy decisions and take steps to avoid any potential reliability and resilience risks that accompany the transition to a lower emissions energy future.

In addition to the topics identified for forum consideration as part of Key Recommendation 7, FERC staff and NERC staff also requested the forum consider the recommendations for studies included as part of Key Recommendation 24.³⁴⁵ The November 2021 Report identified several areas of potential study, two of which are addressed as part of the above noted recommendations. The first is the consideration of possible investments in strategic natural gas storage facilities, which could be located to serve the majority of pipelines supplying natural gas-fired generating units, and preserved for use during extreme cold weather events. The second is the consideration of possible financial incentives for the natural gas infrastructure system necessary to support the Bulk Electric System to winterize or otherwise prepare to perform during extreme cold weather events.³⁴⁶

Throughout these discussions, there was broad consensus on the need for improvements to natural gas infrastructure. Several participants stated that the availability of natural gas storage coupled with availability of firm transportation can be of particular importance during critical events³⁴⁷ and there were suggestions that it may be beneficial to add new natural gas storage facilities located along transmission and distribution systems³⁴⁸ as well as increase firm natural gas pipeline capacity.³⁴⁹ Additionally, participants explained that weatherization of natural gas infrastructure is of crucial importance to ensuring a safe and reliable supply of natural gas.³⁵⁰ It was noted though that there may not be sufficient incentives to support the level of investment necessary to expand, modernize, and winterize natural gas infrastructure.³⁵¹ While some participants expressed a preference for market mechanisms,³⁵² there was strong support among all participants to evaluate any actions that could provide greater financial incentives in these areas.³⁵³ A

³⁴⁵ FERC/NERC Presentation – August 30, 2022 (Page 16)

³⁴⁶ FERC-NERC-Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States (Pages 234 – 235)

³⁴⁷ September 23, 2022 GEH Forum Meeting Staff Notes (Page 5, Dominion Energy) and GEH Forum Survey Response Comment Submissions – February 27, 2023 (Page 257, PJM)

³⁴⁸ October 21, 2022 GEH Forum Meeting Chat (Pages 1 and 3 – 4, Southern Company Gas) and December 5, 2022 Supplemental Comments (Page 6, AGA)

³⁴⁹ GEH Forum Survey Responses – October 10, 2022 (Page 2, INGAA) and October 21, 2022 GEH Forum Meeting Chat (Page 3, Southern Company)

³⁵⁰ GEH Forum Survey Responses – April 24, 2023 (Pages 18 – 19, AEP and Page 19, AGA)

³⁵¹ Updated GEH Forum Survey Responses – September 14, 2022 (Page 15, NGSA); GEH Forum Survey Responses – October 10, 2022 (Page 2, INGAA); and Updated GEH Forum Survey Responses – May 22, 2023 (Page 2, NGSA)

³⁵² GEH Forum Survey Response Comment Submissions – February 27, 2023 (Page 200-201, AGA) and Updated GEH Forum Survey Responses – May 22, 2023 (Page 58, Xcel Energy and Page 63, Kinder Morgan, Intrastate Pipeline Group)

³⁵³ GEH Survey Response Tabulation – February 27, 2023 (Page 81, Recommendation 3.a.7; Page 84, Recommendation 3.a.10; and Page 104, Recommendation 3.f.2)



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specific suggestion stated that it may be beneficial to evaluate the recommendations included in the American Gas Foundation Study *Enhancing and Maintaining Gas and Energy System Resiliency – Areas of Focus and Change* that identify specific considerations for upstream and downstream investments to enhance the reliability of the natural gas system.³⁵⁴

Beyond the considerations in Recommendation 24, a preliminary survey conducted in February 2023 demonstrated widespread support from both natural gas and electric market participants³⁵⁵ for a study that could evaluate regional needs regarding the level of natural gas infrastructure required to support new usage patterns for natural gas-fired generators.³⁵⁶ As proposed by a GEH Forum participant, conducting an unbiased, data-driven assessment, potentially through U.S. DoE funding, to identify any natural gas infrastructure shortfalls could be useful for policymakers in determinations regarding investments and incentives for infrastructure buildout and to help ensure a smooth energy transition.³⁵⁷ It was suggested that the study be conducted under the purview of an independent third-party such as the U.S. DoE, a National Laboratory, or NERC and involve a diverse group of industry participants to act in an advisory role to help ensure the integrity and credibility of the study.³⁵⁸

As decisions would need to be made by the parties responsible for directing, funding, and/or conducting these studies, the Chairs of the GEH Forum suggested that the proposals be voted on to gain insight into the potential level of industry support for action on the noted studies.

NAESB Balanced Voting Results – Recommendation 18						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	5	0	2	0	100%	0%
Pipelines	14	3	1.65	0.35	82.5%	17.5%
Local Distribution Companies	9	0	2	0	100%	0%
End Users	9	1	1.8	0.2	90%	10%
Services	5	1	1.67	0.33	83.5%	16.5%
Total:	42	5	9.12	0.88	91%	9%
Wholesale Electric Market						
Transmission	0	1	0	1	0%	100%
Generation	7	4	1.27	0.73	63.5%	36.5%
Marketers/Brokers	2	1	1.33	0.67	66.5%	33.5%
Distributor/Load Serving Entities	3	0	2	0	100%	0%
End Users	1	1	1	1	50%	50%
Independent Grid Operators/Planners	5	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	22	7	9.6	3.4	74%	26%

³⁵⁴ December 5, 2022 Supplemental Comments (Page 44, AGA) and GEH Survey Response Comment Submissions – February 27, 2023 (Page 267, AGA)

³⁵⁵ GEH Survey Response Tabulation – February 27, 2023 (Page 112, Recommendation 4.3 and Page 114, Recommendation 4.5)

³⁵⁶ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 4, NGSA)

³⁵⁷ GEH Forum Survey Responses – April 24, 2023 (Pages 50 – 52, NGSA)

³⁵⁸ December 5 GEH Forum Meeting Staff Notes (Page 6, NGSA) and GEH Forum Survey Responses – April 24, 2023 (Pages 51 – 52, NGSA)



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Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	5	0	2	0	100%	0%
Total:	8	0	5	0	100%	0%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose
Total:	5	2	1.43	0.57	71.5%	28.5%

NAESB Balanced Voting Results – Recommendation 19						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
Wholesale Gas Market	Support	Oppose	Support	Oppose	Support	Oppose
Producers	6	0	2	0	100%	0%
Pipelines	17	2	1.79	0.21	89.5%	10.5%
Local Distribution Companies	9	0	2	0	100%	0%
End Users	9	1	1.8	0.2	90%	10%
Services	7	0	2	0	100%	0%
Total:	48	3	9.59	0.41	96%	4%
Wholesale Electric Market	Support	Oppose	Support	Oppose	Support	Oppose
Transmission	1	0	1	0	100%	0%
Generation	9	1	1.8	0.2	90%	10%
Marketers/Brokers	2	1	1.33	0.67	66.5%	33.5%
Distributor/Load Serving Entities	3	1	1.5	0.5	75%	25%
End Users	2	0	2	0	100%	0%
Independent Grid Operators/Planners	5	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	26	3	11.63	1.37	89%	11%
Retail Energy Market	Support	Oppose	Support	Oppose	Support	Oppose
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	6	0	2	0	100%	0%
Total:	9	0	5	0	100%	0%
Other Mkt Participant/Observer	Support	Oppose	Support	Oppose	Support	Oppose



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Total:	6	0	2	0	100%	0%
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NAESB Balanced Voting Results – Recommendation 20						
Quadrant and Segment	Response Total		Response Balanced		Balanced Percentage	
	Support	Oppose	Support	Oppose	Support	Oppose
Wholesale Gas Market						
Producers	6	0	2	0	100%	0%
Pipelines	16	1	1.88	0.12	94%	6%
Local Distribution Companies	10	0	2	0	100%	0%
End Users	9	0	2	0	100%	0%
Services	7	0	2	0	100%	0%
Total:	48	1	9.88	0.12	99%	1%
Wholesale Electric Market						
Transmission	1	0	2	0	100%	0%
Generation	10	1	1.82	0.18	91%	9%
Marketers/Brokers	2	0	2	0	100%	0%
Distributor/Load Serving Entities	3	1	1.5	0.5	75%	25%
End Users	1	0	1	0	100%	0%
Independent Grid Operators/Planners	4	0	2	0	100%	0%
Technology and Services	4	0	2	0	100%	0%
Total:	25	2	11.32	0.68	94%	6%
Retail Energy Market						
Electric Service Providers/Supplier	1	0	1	0	100%	0%
Electric Utilities	2	0	2	0	100%	0%
Electric End Users/Public Agency	--	--	--	--	--	--
Gas Market Interests	6	0	2	0	100%	0%
Total:	9	0	5	0	100%	0%
Other Mkt Participant/Observer						
Total:	5	0	2	0	100%	0%



VI. Long Term Considerations

Throughout GEH Forum discussions, participants stated that any recommendations or proposals to better support the ability of generators to obtain natural gas fuel supplies may have limited long-term impact without additional infrastructure.³⁵⁹ As explained by GEH Forum participants, trends in electrification coupled with the growth in renewable resources³⁶⁰ and the retirement of coal-fired generation,³⁶¹ likely mean there will be a greater reliance upon electricity produced by natural gas as a balancing resource.³⁶² In support, participants noted two recent studies, one conducted by the U.S. Energy Information Administration and another from an ISO/RTO that identified a continuing demand for natural-gas fired generation in the coming decades.³⁶³ GEH Forum participants explained that a reliable, future natural gas supply is dependent upon sufficient infrastructure,³⁶⁴ and it was noted that several factors may influence new buildout decisions, including securing adequate investment,³⁶⁵ which can be influenced by federal and state policies.³⁶⁶ Participants stated that given the growing constraints on the natural gas system and the timeline for infrastructure development and construction,³⁶⁷ there is a need to consider actions that can better facilitate these processes.³⁶⁸ A number of proposals were offered and there was considerable support to evaluate if there are opportunities to streamline the permitting and certificate process to help entities better manage any federal, state, and local procedures.³⁶⁹ Comments from GEH Forum participants indicated that a number of the recommended considerations are currently being addressed through regulatory proceedings or as part of potential legislation.

Among GEH Forum participants, there was strong support to consider construction of additional natural gas storage.³⁷⁰ Participants explained that utilization of storage often requires access to firm capacity which may also require new natural gas pipeline infrastructure.³⁷¹ Although there was high initial support from GEH Forum participants to consider expanding the integration of alternative fuels or LNG produced and stored behind the city gate,³⁷² as part of subsequent comments submitted as part of the GEH Forum record, participants noted that construction of LNG facilities may not be the most economically feasible option for many regions of the country.³⁷³ It was also stated that additional LNG facilities may require new transportation infrastructure. While natural gas pipelines can deliver LNG, they may not be configured to receive and transport fuel from LNG facilities to end users.³⁷⁴ Several GEH Forum participants stated that the financial risk in constructing new infrastructure often means that parties rely on market indicators of future revenue to signal the need for investment, such as advanced contractual commitments for natural gas transportation and supply.³⁷⁵ As explained by participants, for a variety of reasons, natural gas-fired generators may not be entering into long-term contracts for firm natural gas supply and transportation.³⁷⁶ Participants proposed

³⁵⁹ GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 8, Bureau of Economic Geology, University of Texas at Austin); October 21 GEH Forum Meeting Staff Notes (Page 5, INGAA); and Updated GEH Forum Survey Responses – May 22, 2023 (Page 2, NGSA)

³⁶⁰ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Pages 15 – 16, INGAA)

³⁶¹ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 5, Industrial Energy Consumers of America)

³⁶² Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 4, NGSA)

³⁶³ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 16, INGAA) and Updated GEH Forum Survey Responses – May 22, 2023 (Page 16, NGSA)

³⁶⁴ GEH Forum Survey Responses – February 27, 2023 (Page 2, Securing America’s Future Energy)

³⁶⁵ GEH Forum Survey Responses – November 1, 2022 – Compiled (Pages 9 – 10, NGSA)

³⁶⁶ GEH Forum Survey Responses – November 1, 2022 – Compiled (Page 2, LS Power and Page 10, PGC & AF&PA)

³⁶⁷ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 27, NGSA) and GEH Forum Survey Responses – October 10, 2022 (Page 2, INGAA);

³⁶⁸ Updated GEH Forum Responses – May 12, 2023 (Page 2, INGAA)

³⁶⁹ GEH Survey Response Tabulation – February 27, 2023 (Page 85, Recommendation 3.a.11)

³⁷⁰ GEH Survey Response Tabulation – February 27, 2023 (Page 86, Recommendation 3.a.12; Page 87, Recommendation 3.a.13; and Page 106, Recommendation 3.f.4)

³⁷¹ September 23, 2022 GEH Forum Meeting Staff Notes (Page 5, Dominion Energy)

³⁷² GEH Survey Response Tabulation – February 27, 2023 (Page 105, Recommendation 3.f.3)

³⁷³ Updated GEH Forum Survey Responses – May 22, 2023 (Page 24, NGSA)

³⁷⁴ April 27 GEH Forum Meeting Staff Notes (Page 6, Kinder Morgan Intrastate Pipeline Group)

³⁷⁵ September 23 GEH Forum Meeting Staff Notes (Page 2, NGSA) and GEH Survey Response Comment Submissions – February 27, 2023 (Pages 208 – 209, INGAA)

³⁷⁶ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 15, NGSA) and GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 6, MISO, PJM & SPP)



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that there may be a need to evaluate alternative methods that could spur new investment,³⁷⁷ such as legislation directing infrastructure buildout³⁷⁸ or that otherwise ensures the existence of sufficient natural gas infrastructure to meet peak demand needs.³⁷⁹ Additionally, some participants noted that wider recognition of the continued importance of natural gas as a bridge fuel could also signify the need for infrastructure buildout and help ensure adequate investments.³⁸⁰ There was a suggestion that there may be a benefit in greater collaboration between stakeholders, regulators, and legislatures to ensure continued alignment of policies that are supportive of state and federal goals and reflective of the natural gas and electric system reliability needs.³⁸¹

Participants also noted the pending legislation before the U.S. Congress that could provide greater certainty to the permitting and certification process for infrastructure, including reforms to the Clean Water Act and the National Environmental Policy Act.³⁸² Several participants suggested that this legislative action could help to promote greater efficiency by eliminating any inconsistencies that may exist and clarifying the intent of the legislation.³⁸³ Additionally, participants noted that pending legislation may strengthen FERC's role in the permitting and certification process³⁸⁴ which could facilitate greater interagency coordination or support regulatory guidance to streamline any overlapping state or federal processes.³⁸⁵

As part of the GEH Forum record, participants also stated that there are ongoing FERC proceedings regarding draft policy statements that could impact the permitting and certification process by modifying how the Commission makes determinations as to if new interstate natural gas transportation projects meet public convenience and necessity requirements under section 7 of the Natural Gas Act.³⁸⁶ While there was support for the continued use of precedent agreements,³⁸⁷ others noted that feedback from electric market participants regarding the types of resource capabilities that may be necessary to ensure electric reliability could demonstrate if there is a need for natural gas as a balancing resource.³⁸⁸ Both natural gas and electric market participants supported the consideration of input from Bulk Electric System operators if FERC determines to broaden the criteria that will be considered in its evaluations.³⁸⁹

In consideration of GEH Forum record, the Chairs of the GEH Forum recommended actions to streamline infrastructure development and encourage investment are better addressed through other forums and encouraged the review of the comments made by GEH Forum participants by the applicable parties participating in these forums.

³⁷⁷ GEH Forum Survey Responses – April 24, 2023 (Page 14, AF&PA and Gas Consumers Group); Updated GEH Survey Responses – May 22, 2023 (Page 61, AGA); and Updated GEH Survey Responses – May 22, 2023 (Page 58, Tallgrass)

³⁷⁸ GEH Survey Response Comment Submissions – February 27, 2023 (Page 204, 44 Farris)

³⁷⁹ GEH Forum Survey Responses – February 27, 2023 (Page 2, Security America's Future Energy)

³⁸⁰ Updated GEH Forum Survey Responses – September 14, 2022 – Compiled (Page 4, NGSA); GEH Forum Survey Responses – October 10, 2022 – Compiled (Page 10, Bureau of Economic Geology, University of Texas at Austin); and Updated GEH Forum Survey Responses – May 12, 2023 (Page 22, Reliable Energy Analytics)

³⁸¹ November 8, 2022 GEH Forum Meeting Staff Notes (Page 4, LS Power); January 12, 2023 GEH Forum Meeting Staff Notes (Pages 5 – 6, SoCal Gas) and Updated GEH Forum Survey Responses – May 12, 2023 (Page 22, Reliable Energy Analytics)

³⁸² Updated GEH Forum Survey Responses – May 22, 2023 (Pages 15 – 16, NGSA and Page 21, INGAA)

³⁸³ Updated GEH Forum Survey Responses – May 22, 2023 (Pages 15 – 16, NGSA; Page 18, AGA; and Pages 20 – 21, INGAA)

³⁸⁴ Updated GEH Forum Survey Responses – May 22, 2023 (Pages 15 – 16, NGSA and Page 21, INGAA)

³⁸⁵ GEH Forum Survey Responses – November 1, 2022 – Compiled (Pages 41 – 42, AGA)

³⁸⁶ November 8 GEH Forum Meeting Staff Notes (Page 3, INGAA)

³⁸⁷ November 8, 2022 GEH Forum Meeting Staff Notes (Pages 2 – 3, INGAA)

³⁸⁸ November 8, 2022 GEH Forum Meeting Staff Notes (Pages 2 – 3, INGAA and SPP) and Updated GEH Forum Survey Responses – May 22, 2023 (Page 15, NGSA)

³⁸⁹ GEH Survey Response Tabulation – February 27, 2023 (Page 82, Recommendation 3.a.8)



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VII. Conclusion

The twenty recommendations included in this report are intended to identify possible actions for consideration by specific entities that could be taken to improve coordination and/or strengthen the overall reliability of the natural gas and bulk electric systems as they work interdependently. NAESB would like to express thanks to Chairman Glick, and subsequently Chairman Phillips, and Mr. Robb for providing NAESB with the opportunity to support the industry by addressing Key Recommendation 7 of the November 2021 Report. Additionally, NAESB is extremely grateful for the time and expertise that the Chairs of the GEH Forum volunteered to shepherd the GEH Forum effort as well as the hundreds of individuals across the natural gas and electric markets that provided their perspectives and contributed to the process. NAESB has a long-standing, successful history of facilitating collaboration between the natural gas and electric markets to address complex coordination issues, and the organization will continue to be supportive of future related industry endeavors in any way that is determined helpful.



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NAESB Gas Electric Harmonization Forum Report Appendices

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A. Voting Appendix

GEH Forum Recommendations and
Voting Instructions:

https://naesb.org/pdf4/geh071323recommendations_voting.docx

GEH Forum Eligible Voters:

https://naesb.org/pdf4/geh071323eligible_voters.docx

GEH Forum Full Voting Record:

https://www.naesb.org/misc/geh_FullVotingRecord_072723.xlsx

GEH Forum Supplemental Comments
on Votes:

https://www.naesb.org/misc/geh_supplemental_comments_072723.docx



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B. Meeting Appendix		
<u>Meeting Date</u>	<u>Meeting Notes, Meeting Recordings, Meeting Chats & Work Papers</u>	<u>GEH Forum Surveys, Survey Responses & Submitted Written Comments</u>
Aug. 30, 2022	Staff Notes: https://naesb.org/pdf4/geh083022staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh083022recording.mp4 FERC NERC Presentation: https://naesb.org/pdf4/geh083022a1.pdf	
Sept. 23, 2022	Staff Notes: https://naesb.org/pdf4/geh092322staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh092322recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh092322chat.docx	GEH Forum Survey: https://naesb.org/pdf4/geh092322w1.docx GEH Forum Survey Responses – September 14, 2022 – Compiled: https://naesb.org/pdf4/geh092322w2.docx Updated GEH Forum Survey Responses – September 14, 2022 – Compiled: https://naesb.org/pdf4/geh092322a2.docx
Oct. 21, 2022	Staff Notes: https://naesb.org/pdf4/geh102122staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh102122recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh102122chat.docx	GEH Forum Survey: https://naesb.org/pdf4/geh102122w1.docx GEH Forum Survey Responses – October 10, 2022 – Compiled: https://naesb.org/pdf4/geh102122w3.docx
Nov. 8, 2022	Staff Notes: https://naesb.org/pdf4/geh110822staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh110822recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh110822chat.docx	GEH Forum Survey: https://naesb.org/pdf4/geh110822w1.docx GEH Forum Survey Responses – November 1, 2022 – Compiled: https://naesb.org/pdf4/geh110822w2.docx
Dec. 5, 2022	Staff Notes: https://naesb.org/pdf4/geh120522staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh120522recording.mp4	Nov. 8 Survey Supplemental Comments Submitted by TCPA: https://naesb.org/pdf4/geh120522w2.docx Nov. 8 Survey Supplemental Comments Submitted by NGS: https://naesb.org/pdf4/geh120522w3.docx



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	Meeting Chat: https://naesb.org/pdf4/geh120522chat.docx	Nov. 8 Survey Supplemental Comments Submitted by AGA: https://naesb.org/pdf4/geh120522w4.pdf Nov. 8 Survey Supplemental Comments Submitted by TPA: https://naesb.org/pdf4/geh120522w5.pdf
Jan. 12, 2023	Staff Notes: https://naesb.org/pdf4/geh011223staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh011223recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh011223chat.docx GEH Forum Work Paper: https://naesb.org/pdf4/geh011223w1.pdf PJM Presentation re Winter Storm Elliott: https://naesb.org/pdf4/geh011223a1.pdf	
Feb. 2, 2023	Staff Notes: https://naesb.org/pdf4/geh020223staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh020223recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh020223chat.docx GEH Forum Record – January 23, 2023: https://naesb.org/pdf4/geh020223w2.xlsx Summary of Comments by Topic Areas Identified by FERC and NERC Staff – January 23, 2023: https://naesb.org/pdf4/geh020223w1.docx Summary of Comments by Topic Areas Identified by FERC and NERC Staff – Revised February 2, 2023: https://naesb.org/pdf4/geh020223a1.docx	GEH Forum Survey: https://naesb.org/pdf4/geh020223w3.docx GEH Forum Survey Responses – January 31, 2023 – Compiled: https://naesb.org/pdf4/geh020223w5.docx
Mar. 3, 2023	Staff Notes: https://naesb.org/pdf4/geh030323staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh030323recording.mp4	GEH Forum Survey: https://naesb.org/pdf4/geh030323w1.docx GEH Forum Survey Responses – February 27, 2023: https://naesb.org/pdf4/geh030323w2.docx



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B. Meeting Appendix		
<u>Meeting Date</u>	<u>Meeting Notes, Meeting Recordings, Meeting Chats & Work Papers</u>	<u>GEH Forum Surveys, Survey Responses & Submitted Written Comments</u>
	Meeting Chat: https://naesb.org/pdf4/geh030323chat.docx	GEH Survey Response Compiled Data – February 27, 2023: https://naesb.org/pdf4/geh030323w3.xlsx GEH Survey Response Tabulation – February 27, 2023: https://naesb.org/pdf4/geh030323w4.docx GEH Survey Response Comment Submissions – February 27, 2023: https://naesb.org/pdf4/geh030323w5.docx
Apr. 4, 2023	Staff Notes: https://naesb.org/pdf4/geh040423staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh040423recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh040423chat.docx Correspondence from Michael Desselle, NAESB Board Chairman: https://naesb.org/pdf4/geh040423w2.docx	GEH Forum Survey: https://naesb.org/pdf4/geh040423w1.docx GEH Forum Survey Responses – March 31, 2023: https://naesb.org/pdf4/geh040423w3.docx Updated GEH Forum Survey Responses – March 31, 2023: https://naesb.org/pdf4/geh040423a1.docx
Apr. 27, 2023	Staff Notes: https://naesb.org/pdf4/geh042723staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh042723recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh042723chat.docx	GEH Forum Survey: https://naesb.org/pdf4/geh042723w1.docx GEH Forum Survey Responses – April 24, 2023: https://naesb.org/pdf4/geh042723w2.docx
May 17, 2023	Staff Notes: https://naesb.org/pdf4/geh051723staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh051723recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh051723chat.docx	GEH Forum Survey: https://naesb.org/pdf4/geh051723w1.docx GEH Forum Survey Responses – May 12, 2023: https://naesb.org/pdf4/geh051723w2.docx Updated GEH Forum Survey Responses – May 22, 2023: https://naesb.org/pdf4/geh051723a3.docx
June 16, 2023	Staff Notes: https://naesb.org/pdf4/geh061623staffnotes.docx	



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June 29, 2023	Staff Notes: https://naesb.org/pdf4/geh062923staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh062923recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh062923chat.docx NAESB GEH Forum Chairs' Strawman Recommendations: https://naesb.org/pdf4/geh062923w1.doc Argonne National Laboratory Presentation: https://naesb.org/pdf4/geh062923w2.pdf	Comments Submitted by P. Jagtiani, NGSA: https://naesb.org/pdf4/geh062923w3.pdf Comments Submitted by C. Glazer, PJM: https://naesb.org/pdf4/geh062923w4.docx Comments Submitted by J. Namazi, EQT Energy, LLC: https://naesb.org/pdf4/geh062923w5.pdf
July 13, 2023	Staff Notes: https://www.naesb.org/pdf4/geh071323staffnotes.docx Meeting Recording: https://naesb.org/recordings/geh071323recording.mp4 Meeting Chat: https://naesb.org/pdf4/geh071323chat.docx NAESB GEH Forum Chairs' Strawman Recommendations: https://naesb.org/pdf4/geh071323w1.doc	Comments Submitted by C. Burks, Big Data Energy Services: https://naesb.org/pdf4/geh071323w2.pdf Comments Submitted by A. Bradbury, American Exploration & Production Council (AXPC): https://naesb.org/pdf4/geh071323w3.pdf Comments Submitted by B. Welch, MISO: https://naesb.org/pdf4/geh071323w4.pdf Comments Submitted by N. Bagot, Electric Power Supply Association (EPSA): https://naesb.org/pdf4/geh071323w5.pdf Comments Submitted by C. Smith: Interstate Natural Gas Association of American (INGAA): https://naesb.org/pdf4/geh071323w6.pdf



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		<p>Comments Submitted by C. Tipton, Range Resources – Appalachia, LLC: https://naesb.org/pdf4/geh071323w7.pdf</p> <p>Comments Submitted by D. Schryver, American Public Gas Association (APGA): https://naesb.org/pdf4/geh071323w8.pdf</p> <p>Comments Submitted by P. Henderson, Marcellus Shale Coalition: https://naesb.org/pdf4/geh071323w9.pdf</p>



Winter Storm Elliott Events in the LG&E and KU Balancing Authority Area (BAA) December 23-24, 2022

Executive Summary

Winter Storm Elliott hit the Eastern Interconnect December 23-25, straining the grid, and resulting in load shedding events across the region. As the storm moved across Kentucky, it transitioned from rain to ice then snow. Elliott's conditions included:

- Temperatures as low as -8 degrees, the lowest in the Louisville area since 1994.
- Windchills exceeding 30 degrees below zero and wind gusts of 30-40 miles per hour.
- Snowfall of 1-5 inches.

The storm set new all-time December electric peaks within the LG&E and KU BAA on Friday, Dec. 23rd.

- Total Daily Energy Usage was 141,613 MWh, breaking the prior record of 134,600 MWh set on Dec. 14, 2010.
- Over half-a-billion cubic feet of gas was delivered to customers on December 23. This was the second highest amount of gas delivered to customers on record for December. 42% of that gas came from LG&E gas storage fields.

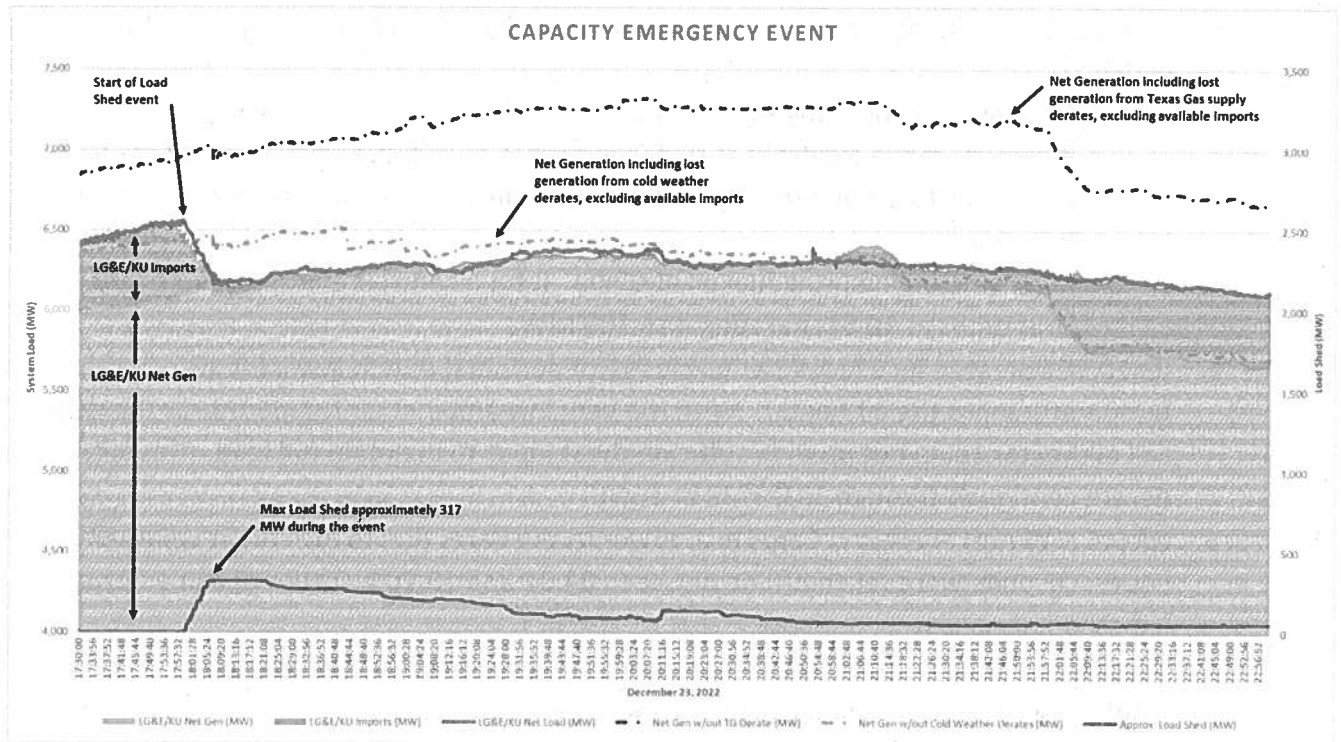
On the evening of December 22 temperatures began to drop rapidly across the state. In Louisville the temperatures dropped from the mid-40s at 16:00 to single digits by midnight and below zero by 04:00. Over the course of the next two days, the LG&E and KU BAA experienced significant challenges including interstate gas pipeline pressure limitations, mechanical and other cold weather issues.

This narrative is intended to provide a high-level overview with real time event history as it impacted the LG&E and KU BAA.

On the morning of December 22, the 14-day projected net peak was forecasted to be 5,899 MW on December 23 at 20:00. On December 23 at 00:00 there was 4,761 MW of generation in service and 7,239 MW available capacity (excluding contingency reserves). The actual peak was 6,559 MW on December 23 at 17:58, well within the projected available capacity. TC1, BR10 and Dix1 (444 MW net total) were offline to address pre-existing mechanical issues and were not expected to be needed.

EW Brown Station's fuel gas was supplied by Texas Eastern Transmission Pipeline ("TETCO") throughout the event and was unaffected by external supply issues.

Cane Run and Trimble County plants are supplied by the Texas Gas Transmission Pipeline ("Texas Gas"). The companies' transportation contracts with Texas Gas specify minimum



Generation Events

This narrative details the events across the LG&E and KU Generation Fleet over the course of the cold weather event. It does not directly reflect customer impact. Starting Friday, 12/23 the following generating issues developed:

- 12/23/22 at 00:00 the generation fleet condition was as follows:
 - Per Generation Dispatch there was 4,761 MW of generation in service and 7,239 MW available capacity.
 - **TC1** (370 MW net exclusive of partners) had been in outage since 12/22/22 at 15:35 due to failure of submerged drag chain conveyor hydraulic gearbox. Repairs were in progress at the time of this event, but the unit was available for up to 75 MW (exclusive of partners) firing gas only.
 - **BR10** (138 MW net) had been in an outage since 12/3/22 when a borescopic inspection identified issues with turbine seals. Repairs were in progress at the time of this event.
 - **Dix 1** (11 MW net) had been in a planned outage since 11/14/22. The unit could not be commissioned at the available lake level.
- 01:28 **BR5** (130 MW net) and **BR8** (128 MW net) tripped offline due to an interruption in fuel gas. This same failure rendered **BR9** (138 MW net) and **BR11** (128 MW net) unavailable. A pilot light that preheats fuel gas to act as control gas for fuel gas supply regulators blew out, making the regulators to the BR CT's inoperable and stopping fuel gas supply to the units. Station Maintenance built enclosures, installed heat trace, and

13:48 the operating gas turbines at TC collectively took a 439 MW derate to manage dropping gas pressure. As previously noted, TC1 was available for 100 MW firing gas had supply been available.

- 15:48 TC2 experienced a derate of 269 MW net due to a frozen boiler feed pump transmitter. This caused a unit runback that tripped a coal mill. The mill needed to be manually purged before returning to service. This lasted until 22:26 when the unit returned to its previous 37 MW derate due to inlet air temperature.
- At 16:13 MC4 lost a coal feeder due to cold weather-related bunker issues (coal tripper froze up) and took a 121 MW derate. This was resolved as of 18:44 and the unit returned to full load.

External Impacts

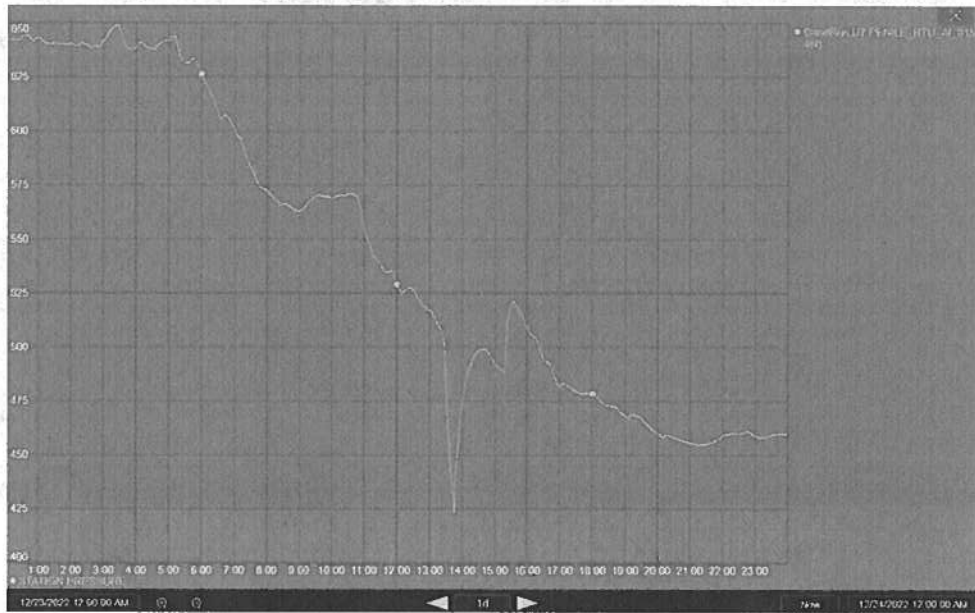
The timeline below details the interaction between LG&E/KU BA and the external entities whose actions impacted the LG&E/KU system including times when customers were impacted. For simplicity and readability, it excludes real time LG&E/KU generation status information.

- 12/23/22
 - 05:07 TVA declared EEA-1
 - 05:38 TVA declared EEA-2
 - 06:12 TVA declared EEA-3
 - 06:26 LG&E/KU Out of CRSG - carrying 700 MW reserves for CR7 (at current time MSSC)
 - 09:00 LKE Curtailable Service Rider (CSR) customers - directed to reduce load consistent with their contract and tariff.
 - 10:15-11:45, 11:50-13:30 requested CSR assistance, LKE supplied 243 MW contingency reserves
 - 11:09-11:15 Texas Gas supply pressure to TC and CR dropped below the contract limit
 - 13:08 Generation derates due to Texas Gas supply pressure issues begin
 - 13:36 LG&E/KU BA declared EEA 3, pulled reserves from the CRSG
 - 13:51 TVA declared EEA-2
 - 14:48 TVA supplied extra 243 MW to CRSG
 - 14:52 LG&E/KU BA changes from EEA 3 to EEA 2 and supplied our 243 MW to CRSG
 - 16:29 PJM curtailed import to LG&E/KU for 400 MW
 - 16:29 ARS called for 400 MW
 - 16:45 LG&E/KU BA declares EEA 3
 - 17:18 TVA declares EEA-3
 - 17:58 LG&E/KU BA starts Load Shed process. The peak system load of 6,552 MW with a system capacity of 6,129 MW was achieved at this point
 - 18:05 End of TVA curtailment tag

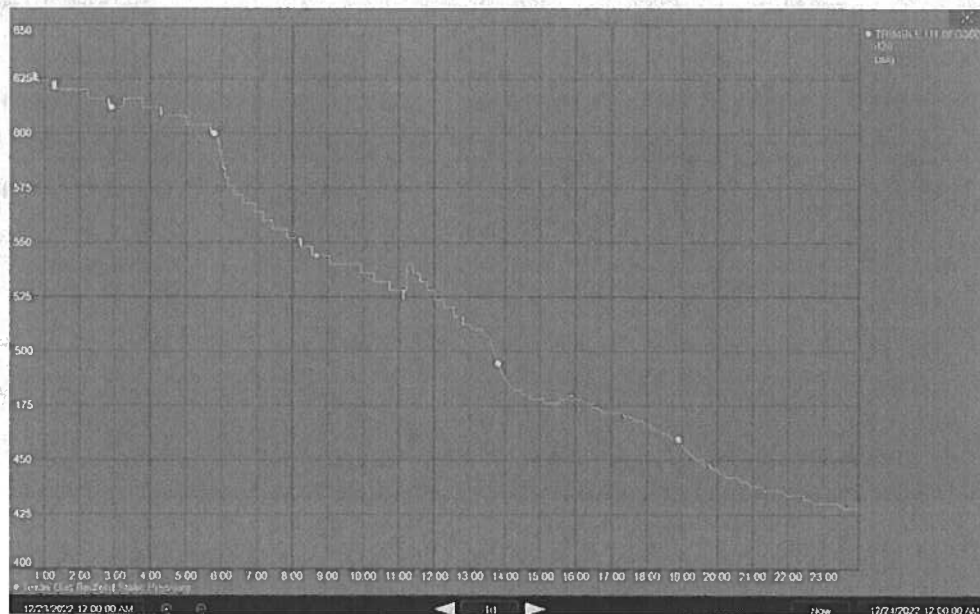
Appendix A:

Supplied Gas Pressure from Texas Gas on 12/23/22 at 00:00 through 23:59

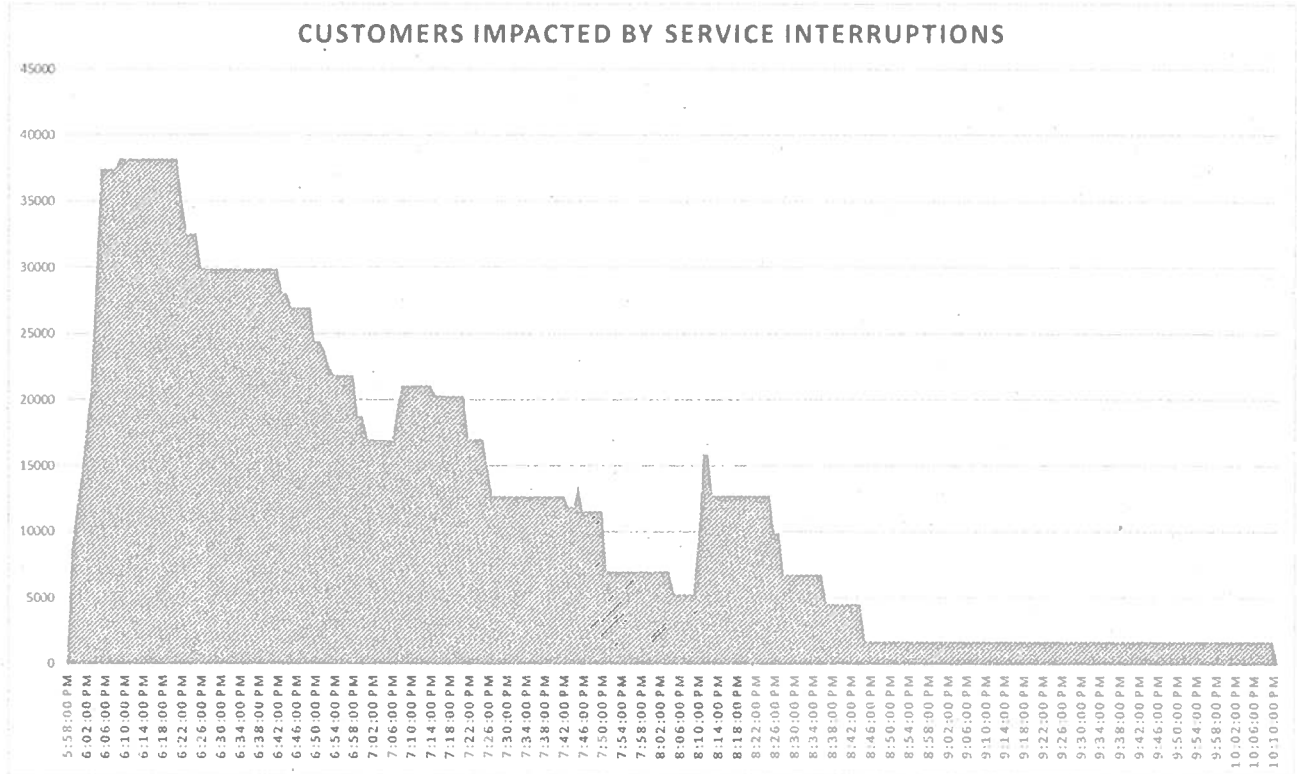
Cane Run



Trimble County



Appendix B:
LG&E/KU Customer Outages



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