LG&ENERGY

February 9, 2004

Thomas M. Dorman
Executive Director
Kentucky Public Service Commission
211 Sower Blvd.
Frankfort, KY 40602—0615

Re: *Investigation into the Membership of Louisville Gas and Electric Company and Kentucky Utilities Company in the Midwest Independent Transmission System Operator, Inc., Case No. 2003-00266*

Dear Mr. Dorman:

Enclosed please find an original and ten (10) copies of Louisville Gas and Electric Company's and Kentucky Utilities Company's Rebuttal Testimony, filed in accordance with the procedural schedule established in the above-referenced docket. The notarized verification of Mathew J. Morey will be provided to this Commission and all parties immediately upon the Companies' receipt thereof this week. We apologize for the slight delay in this regard.

Should you have any questions concerning the enclosed, please do not hesitate to contact me directly at 502/627-2557.

Very truly yours,

Linda S. Portasik

Linda S. Portasik
Counsel for Louisville Gas and Electric Company and Kentucky Utilities Company

cc (w/enclosure): Parties of Record

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

INVESTIGATION INTO THE MEMBERSHIP OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY IN THE MIDWEST INDEPENDENT TRANSMISSION SYSTEM OPERATOR, INC.	)))))))	CASE NO. 2003-00266

REBUTTAL TESTIMONY OF
PAUL W. THOMPSON
SENIOR VICE PRESIDENT, ENERGY SERVICES
LG&E ENERGY L.L.C.

Filed: February 9, 2004

Q. Please state your name, position and business address.

A. My name is Paul W. Thompson. I am the Senior Vice President, Energy Services for LG&E Energy LLC. My business address is 220 West Main Street, Louisville, Kentucky 40202.

Q. Please summarize the rebuttal testimony of Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively, the "Companies") in this docket.

A: My testimony provides an overview of the Companies' response to the testimony filed by the Midwest Independent Transmission System Operator, Inc. ("MISO") on December 29, 2003. As expected, MISO supports the Companies' continued membership in MISO, based on the alleged "net benefits" of membership afforded to the Companies' customers over the next several years. My testimony identifies the major flaws in the underlying cost-benefit analysis presented by MISO in support of this claim. In addition, I discuss the fundamental deficiencies in MISO's explanation of its cost management efforts, provided in response to the Companies' concerns about MISO's increasingly large expenditure levels and the lack of any effective checks on such spending.

In addition to my rebuttal testimony, Michael S. Beer, Vice-President of Rates and Regulatory, discusses in greater detail one of the alleged benefits of membership cited by MISO, namely, the estimated cost savings resulting from the merger of LG&E and KU in 1998. MISO alleges that these estimated savings should be attributed to -- and apparently a major factor in considering the ongoing costs and benefits of -- MISO membership. Mr. Beer also responds to certain contentions by MISO regarding the exit fee payable by the Companies should they withdraw from MISO. Mark S. Johnson, Director of Transmission, addresses in greater detail certain claims raised by MISO regarding the operational benefits associated with ongoing MISO membership, as discussed in the testimony of MISO witnesses Roger C. Harszy and Jonathan Falk. Finally, Mathew J. Morey, Senior Consultant with Laurits R. Christensen Associates, Inc., rebuts in greater detail both the cost-benefit study presented by MISO witness Ronald R. McNamara, as well as the evidence presented by Michael L. Holstein and Jonathan Falk in support of MISO's overall "net benefits" assessment.

Q: Has MISO's testimony prompted the Companies to change their position regarding MISO membership?

A: No. Although LG&E and KU appreciate MISO's efforts to demonstrate why the Companies should retain their membership status, MISO's evidence does not alter the Companies' position.

As explained in my direct testimony, LG&E and KU have consistently pursued what, to the best of their ability, they believed to be in their customers' best interests in the face of fundamental changes to the industry's landscape reflective of changing regulatory policy and focus. LG&E and KU pursued these interests first by joining an independent transmission system operator that the Companies reasonably believed would provide customer benefits commensurate with the expected cost burden, and at the same time comport with the goals of both their federal and state regulators. The Companies continued their efforts on behalf of ratepayers by mounting vigorous challenges to those aspects of membership that appeared to upset significantly the cost-benefit balance of membership, *e.g.*, the imposition of MISO's administrative costs on retail customers and the expansion of MISO's functional responsibilities into energy markets, both contrary to the intent of MISO's charter membership.

Turning now to the present, the cost-benefit analysis presented by the Companies in this case confirms that, over the longer-term, LG&E's and KU's customers will fare better economically if the Companies withdraw from MISO and commence stand-alone operation of their transmission system. Importantly, however, this fundamental issue cannot be decided solely within the narrow context of, and in singular reliance on, the cost-benefit analyses presented by the Companies and MISO. Cost-benefit analyses, although serving as useful tools in guiding business and regulatory judgments, are only one factor in the decision-making process. In this case, there clearly are other crucial factors that must be considered and fully addressed.

Q: What are these factors?

A: Certainly, reliability is a factor that cannot be readily quantified, as is evident by both MISO's and our own cost-benefit analyses. As the Companies' testimony in this case makes clear, however, there is no meaningful evidence to suggest that reliability will suffer as a consequence of the Companies' withdrawal from MISO.

In addition, the Companies' federal regulatory obligations, although not part of any cost-benefit analysis, nonetheless must be considered in determining what outcome best serves the interests of the Companies' customers. As I emphasized in my direct testimony, LG&E and KU strongly believe that, even in the face of the Companies' cost-benefit analysis, the Commission must, as a matter of sound regulatory policy, recognize and respect the Companies' federal regulatory and legal obligations attendant to MISO membership: in short, the Commission must afford the Companies a reasonable and fair opportunity to obtain the requisite authority from FERC to exit MISO. Absent such allowance, the Companies believe that the only outcome the Commission and the Companies can expect from this case is continued uncertainty as the Companies attempt to reconcile their state and federal regulatory obligations through judicial intervention.

Q: Given this regulatory overlay, please reiterate the Companies' position in this proceeding.

A: If the Commission determines, based on the evidence in this case, that the costs of MISO membership exceed the benefits of MISO membership, LG&E and KU request that the Commission issue an order directing the Companies to pursue withdrawal from MISO by seeking the requisite authorization from FERC. LG&E and KU urge the Commission to acknowledge in such order the Companies' obligation to obtain FERC approval prior to exit, and afford the Companies ample opportunity to secure such approval on reasonable terms.

Further, consistent with this recognition, the Commission's order in this case must recognize the Companies' right to (i) full rate recovery of all ongoing MISO membership costs pending their receipt of a final FERC order approving withdrawal from MISO; and (ii) full recovery of any exit fee imposed on the Companies as a consequence of such withdrawal. As explained in my direct testimony and in responses to discovery, the Companies believe strongly that full rate recovery is essential to make the Companies whole for costs lawfully incurred in connection with their membership in MISO, which membership was recognized in Case Nos. 2000-095 and 2001-104. Allowing recovery of these FERC-approved MISO charges while the Companies seek the requisite authorization from FERC is a fair, just and reasonable outcome in this case. It is the right thing to do.

Q: Please summarize the Companies' overall assessment of MISO's quantitative cost-benefit analysis.

A: Through the testimony of primarily three witnesses, MISO presents a quantitative (near-term) analysis of the benefits associated solely with ongoing MISO membership. These alleged benefits are compared to the updated costs of membership as determined by MISO (*i.e.,* the charges assessed the Companies under MISO Schedules 10, 16 and 17) to derive a "net benefit" to the Companies' retail customers (nominal value) of more than $270 million from 2005 through 2010. Holstein Testimony at 14 (as amended by MISO's Response to KPSC Data Request No. 6(a)).

As illustrated by the table in Mr. Holstein's testimony (at 14), MISO's alleged benefits of MISO membership are separated into three categories: (i) "Net Energy Market Benefits", (ii) "Merger Surcredits" and (iii) "Reliability Benefits." The first category, which Mr. Holstein values at approximately $190 million through 2010 (*see* Holstein Testimony at 14, as amended by MISO's Response to KPSC Data Request No. 6(a)), apparently consists of the net benefits (or savings), attainable *only* through MISO membership, associated with MISO's implementation of centralized security-constrained economic dispatch services and regional energy markets (commonly referred to as the "Day 2" market). These net benefits purportedly include more efficient/precise congestion management, opportunities for additional off-system sales, and greater transmission revenue. (Mr. Holstein apparently includes the exit fee otherwise payable by the Companies (and thus avoided by ongoing membership) in his calculation of membership "net benefits.")

The Companies' revised cost-benefit analysis, based on updated information obtained from MISO, tells a very different story than that presented by MISO. In fact, the Companies' analysis projects a net savings to the Companies of approximately $65.3 million (from 2005 through 2010) should they withdraw from MISO, even taking into account an exit fee of approximately $24 million attendant to such withdrawal. In other words, the Companies continue to believe that MISO membership is significantly more costly than exit over the longer-term. Mr. Morey discusses in his rebuttal testimony both the errors in MISO's analysis and the updates to the Companies' cost-benefit analysis that result in the $65.3 million savings estimate.

Moreover, although MISO clearly perceives benefits associated with centralized security-constrained economic dispatch services and "Day 2" energy markets, it does not address meaningfully many of the Companies' concerns, as raised in earlier correspondence to MISO, regarding the very real risks associated with the implementation of these markets. In particular, in correspondence to MISO dated July 11, 2003, the Companies expressed the following misgivings about MISO's proposed "Day 2" operations:

> I must dispute the notion that LG&E/KU can achieve "the same degree of operational flexibility and coverage" in MISO's proposed Day 2 market that the Companies currently enjoy as recipients of network transmission service. Under the existing MISO Network Service Tariff, not only do LG&E/KU currently have the flexibility to change generation up to 12:00 noon the day prior to "real time" without penalty (as you note), LG&E/KU may also serve their network load on a firm basis from any of their "Designated Resources" in real time, again with no financial penalty. These Designated Resources include LG&E/KU's entire fleet of generation within the combined Companies' control area. By contrast, in

> MISO's proposed Day 2 market -- and under the most favorable Firm Transmission Rights ("FTR") allocation scenario -- LG&E/KU's FTR rights are tied to specific LG&E/KU generators, based on a snapshot of optimal generation dispatch taken as much as one year in advance. Whenever, and for whatever reason, real time dispatch differs from the prior year's optimal snapshot, LG&E/KU face exposure to as yet unknown congestion costs that could well accumulate on an annual basis into the several millions of dollars. LG&E/KU believe that MISO's Day 2 market can offer the same flexibility currently enjoyed by LG&E/KU only if FTR *options* are allocated from *all* current designated network resources, or, alternatively, if LSEs are permitted to retain their existing firm physical service rights. Contrary to MISO, LG&E/KU firmly believe the White Paper provides for the latter option.
>
> The risks associated with MISO's Day 2 Market Design are not limited to those described above. In particular, most of the allocated FTRs within MISO will likely be in the form of obligations. These obligations carry with them financial risk that does not exist today, and will likely result in LSEs opting for less than 100% of peak load FTR coverage as a means of reducing such financial exposure. . . .

Exhibit PWT-1, pages 8-10. The Companies believe that the above-stated risks -- which have yet to be addressed to the Companies' satisfaction -- significantly diminish any "net benefits" otherwise associated with MISO's proposed centralized economic dispatch/energy markets model.

As noted above, Mr. Beer will discuss in greater detail MISO's second category of benefits: the estimated dollar savings resulting from the merger of LG&E and KU in 1998. Suffice it to say, however, that such a claim is entirely misplaced, as these benefits (which are a credit not to any efforts by MISO, but rather to wise regulation and the efforts of the Companies' own employees and management initiatives) will not be affected by the Companies' withdrawal from MISO. In short, these savings are not a unique benefit of MISO membership that would evaporate in a stand-alone scenario. As a consequence, it is entirely inappropriate to consider them in comparing the benefits of ongoing MISO membership with the benefits of stand-alone operation going forward.

MISO's third category of benefits associated with MISO membership -- reliability benefits -- is similarly lacking in justification, as MISO fails to show that the Companies' customers would experience a decline in service reliability upon exiting MISO. To my knowledge, the Companies have never had to curtail load to protect the integrity of the transmission system, and MISO has presented no plausible evidence that withdrawing from MISO would weaken this track record, as measured by either an increase in the average probability of an outage, an increase in the average number of outages per year, or an increase in the average magnitude of an outage. Indeed, the Companies' proven track record compares very favorably against MISO's limited operational experience.

Further, MISO witnesses Harszy, Falk, and McNamara all err in presuming that upon withdrawing from MISO, the Companies would return to a pre-MISO world from a reliability perspective. Although, as noted, the Companies' pre-MISO experience demonstrates that they have historically operated their transmission system reliably, MISO's assumption of the role of reliability coordinator will necessarily alter the Companies' operations going-forward, even under the stand-alone alternative. In particular, the Companies may well be able to enter into a coordination agreement with MISO to purchase reliability and security coordination services at cost-based rates, similar to the arrangement currently in place between MISO and MAPPCOR (contractor to the Mid-Continent Area Power Pool). *See* MISO Response To LG&E/KU Initial Data Request No. 4. To date, MISO has not explained why the reliability services it provides to MAPPCOR, on behalf of MAPP members, is either not reliable enough, or otherwise unavailable to LG&E and KU should they exit MISO.

Q: Has MISO accurately estimated the charges it expects to impose on the Companies under Schedules 10, 16 and 17 should they remain in MISO?

A: No. As Mr. Morey points out, MISO's latest forecasts of the rates for Schedules 10, 16 and 17, released in December 2003, indicate that the Companies will pay approximately $93 million from 2005 through 2010 under Schedules 10, 16 and 17 should they remain in MISO, approximately $13 million more than the $80.5 million calculated by Mr. McNamara.

Q: Turning now to the issue of MISO's cost management, Mr. Holstein responds to the Companies' concern about the lack of effective checks on MISO's expenditures by elaborating on MISO's management structure. Does Mr. Holstein adequately address the Companies' concerns?

A: No. Mr. Holstein's response does not address the Companies' major concern, namely, that there is currently no practical means to minimize MISO's expenditures consistent with reasonable business and utility practice. This is largely a result of the existing MISO governance structure. It may well be true that MISO's nonprofit status affords MISO the ability to obtain lower financing costs. Likewise, the Companies do not necessarily dispute the fact that MISO must recover all of its costs because "it has no equity in the form of earnings to serve as a cushion to absorb expenses in excessive of revenues." Holstein at 17. These factual statements, however, miss the point: MISO can (and apparently does) spend whatever it thinks it needs to, with no risk to shareholders (because there are none) and with little or no meaningful review of the reasonableness of, or control over, these expenditures by those who ultimately bear the costs. Clearly, the sheer level and upward trend of MISO's expenditures calls for a more meaningful review procedure than that provided by the FERC's current "oversight process" cited by Mr. Holstein.

Q: Mr. Holstein appears to suggest that the Companies have no basis to complain about MISO's management structure because MISO's organizational status is "required under the controlling documents associated with the formation of the Midwest ISO, documents prepared by legal counsel for the Transmission Owners and executed individually by each of the transmission owning members" of MISO. Holstein at 16. Do you agree?

A: No. At the time MISO was formed, no entity -- including MISO -- envisioned the expanded functions (related to energy market development and operation) that MISO now embraces, and clearly did not envision the enormity of the costs MISO would be incurring in connection with its assumption of this expanded role. As noted, the enormity of these expenditures calls for a far more meaningful review process than that currently in place. In addition, the Companies never expected, in light of the very "accountability" obligations of MISO's management noted by Mr. Holstein, that they would ultimately be shouldering costs so clearly attributable to, and properly borne by, other entities.

Q: Please explain.

A: Apart from the ongoing "Schedule 10" cost allocation debate discussed at length in my direct testimony (*see* Thompson Direct Testimony at 7-9), LG&E and KU to date have objected to two proposals filed at FERC by MISO to recover significant sums from MISO members (through Schedule 10) to "reimburse" certain former members of the

Alliance Regional Transmission Organization ("RTO") for their share of costs incurred in the development of the now-defunct Alliance RTO. *See* Exhibit PWT-3.

In their protests, the Companies challenged not only the reasonableness of these expenditures (their level and appropriateness), but also the imposition of such costs on the Companies, which were unrelated to any service provided by MISO. In fact, a large portion of these charges appeared to consist of (i) costs incurred solely to meet the needs of customers within the "old" Alliance footprint; (ii) former Alliance members' stranded investment in the now defunct Alliance RTO; and (iii) legal and consulting fees incurred by former Alliance RTO members in their failed attempts to establish the Alliance RTO as an alternative to MISO membership. LG&E and KU believed (and continue to believe) that the imposition of these costs on the Companies through Schedule 10 was both inappropriate and fundamentally inequitable.

Q: In proposing to recover these costs from LG&E and KU, wasn't MISO simply complying with FERC's decision, in effect, to socialize these costs across the entire MISO footprint?

A: The Companies recognize that FERC's policy did favor such socialization. However, the FERC indicated on at least one occasion that its decision to permit recovery of these costs was based in part on the fact that "the independent Board of the Midwest [sic] has review and approval rights . . . ." *Ameren Services Co.*, 101 FERC ¶ 61,320 (2002), slip op. at 38. I am not aware that MISO's Board of Directors ever undertook a thorough review of these costs, or otherwise meaningfully addressed the payment issue with MISO's membership through the stakeholder process envisioned in MISO's Transmission Owners' Agreement.

Q: How were these cost recovery proposals eventually resolved?

A: Unfortunately, as alluded to above, the FERC ultimately allowed MISO to recover a large portion of these costs (one request remains pending), and the Companies were compelled to enter into a settlement to mitigate the cost exposure resulting from FERC's ruling. This settlement was executed in the fall of 2003.

Q. Does this conclude your rebuttal testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY	)	
	)	**SS:**
COUNTY OF JEFFERSON	)	

The undersigned, **Paul W. Thompson**, being duly sworn, deposes and says he is the Senior Vice President, Energy Services, for LG&E Energy LLC, that he has personal knowledge of the matters set forth in the foregoing testimony, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

Paul W. Thompson

PAUL W. THOMPSON

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 9th day of February 2004.

Victoria B. Harper (SEAL)

Notary Public

My Commission Expires:

9/20/2006

VICTORIA B. HARPER
NOTARY PUBLIC
GE
My Comm Sept. 20, 2006

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

The GridAmerica Participants	)	**Docket Nos. ER02-2233-000**
	)	**EC03-14-000**

**MOTION TO INTERVENE
AND JOINT PROTEST OF
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY**

Pursuant to Rules 214 and 211 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission ("FERC" or "Commission"), 18 C.F.R. § 385.214, § 385.211 (2002), and the Commission's "Notice of Filing" issued November 5, 2002, Louisville Gas and Electric Company and Kentucky Utilities Company (collectively referred to as "LG&E/KU" or "Companies") hereby move to intervene in the above-captioned proceedings, and protest the compliance filing submitted therein jointly by the Midwest Independent Transmission System Operator ("MISO") and the GridAmerica Participants[1] (collectively referred to as "Applicants"). In support, LG&E/KU state as follows:

MOTION TO INTERVENE

I.

Communications and correspondence related to this filing should be directed to the following representatives of LG&E/KU:

[1] The GridAmerica Participants are: Ameren Services Company, acting as agent for its electric utility affiliates Union Electric Company d/b/a AmerenUE and Central Illinois Public Service Company d/b/a AmerenCIPS; FirstEnergy Corp., acting on behalf of its subsidiary American Transmission Systems, Inc.; Northern Indiana Public Service Company; and National Grid USA ("National Grid").

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II.

LG&E/KU are vertically integrated utilities located principally in Kentucky that together serve approximately 850,000 customers throughout the state. The Companies, whose combined transmission and generating capacity exceeds 26,000 MVa and 8,800 MW, respectively, are among the original transmission-owning members of MISO. LG&E/KU, along with all other transmission-owning members of MISO, transferred control of their transmission facilities to MISO effective February 1, 2002.

III.

By their compliance filing, Applicants purport to comply with the Commission's order issued July 31, 2002, by submitting, *inter alia,* an executed "Appendix I" Independent Transmission Company ("ITC") Agreement between GridAmerica, L.L.C. ("GridAmerica") and MISO. The executed ITC Agreement is intended to govern the commercial relationship between GridAmerica and MISO -- defining the financial, operational and governance features of such relationship -- and "provide the means for launching GridAmerica within" MISO as a fully functional ITC. *See* Transmittal Letter at 3.

IV.

As transmission-owning members of MISO, LG&E/KU will be directly affected by and have a significant interest in this proceeding. That this interest is unique and cannot be represented adequately by other parties is a function of the Companies' status as exceptionally low-cost utilities: the dollar impact of Applicants' filing herein on LG&E/KU and their customers, viewed as a percentage of existing retail rates, is necessarily larger than that experienced by higher-cost energy providers.[2] LG&E/KU's interest is particularly significant given the millions of dollars MISO has committed to pay GridAmerica (and pass through to its membership) and the continued unwillingness of Applicants to cost-justify these payments, even after the FERC's express mandate in this regard. For these reasons, LG&E/KU respectfully request that they be granted intervention in this proceeding, with full rights attendant to party status.

PROTEST[3]

Among the conditions imposed by the FERC in conditionally accepting Applicants' earlier filing on July 31, 2002, was the requirement that Applicants "file an executed ITC Agreement, with the appropriate supporting documents that address" specific concerns raised by protestors regarding the ITC Agreement, including (i) the lack of cost support for payments MISO has committed to make to GridAmerica under the ITC Agreement (and collect from all loads); and (ii) the recovery from MISO loads of costs properly attributable to and borne solely by loads located inside the service territory of GridAmerica. *See* July 31 Order, *slip op.* at 12, ¶33. The instant filing is patently deficient, as it fails to address with supportive documentation either of these issues, as required by the Commission in this proceeding and by existing regulations. *See* 18 C.F.R. § 35.13. The compliance filing is also deficient in that it affords an

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[2] Enormous cost responsibility has already foisted on the Companies for amorphous "benefits" grounded more in rhetoric than fact. *See, e.g.,* Joint Brief of Petitioners and Intervenors in Support of Petitioners, Case Nos. 02-1121 and 02-1122, United States Court of Appeals for the District of Columbia Circuit), filed September 19, 2002, at pp. 52-60.

[3] LG&E/KU join and fully support the "Protest of the Midwest ISO Transmission Owners Regarding Compliance Filing" ("TO Protest"), filed concurrently herewith.

undue preference to GridAmerica, *vis a vis* MISO transmission owners, with regard to transmission-related functions performed by both GridAmerica and MISO transmission owners.

(i) Lack Of Cost Support

Applicants' filing references both an annual payment to GridAmerica of $12 million (purportedly for services to be performed by GridAmerica as an ITC), as well as a $36 million one-time fee to reimburse GridAmerica for certain costs previously incurred by the GridAmerica Participants. Nowhere, however, does the filing break down these payments to allow a meaningful examination of their reasonableness, from the perspective of either appropriateness (are the underlying services or assets needed?) or level (is the dollar amount correctly calculated and allocated?). With respect to the $36 million one-time fee, for example, the filing suggests that much of this amount is intended to compensate the "GridAmerica Three" (Grid America's transmission-owner participants) for the costs these entities incurred in developing the now-defunct Alliance RTO, and/or in structuring the Alliance/MISO settlement[4] and related "seams" agreements in 2001. *See* Transmittal Letter at 6. Even assuming that the $36 million represents the "GridAmerica Three's" properly allocated share of such costs, *vis a vis* the other former Alliance members (which has not been shown), a large portion of the $36 million almost certainly involves *the legal and consulting fees* the "GridAmerica Three" spent in these efforts, which many times ran counter to the MISO transmission owners' interests. Requiring MISO's transmission owners to now foot the legal expenses associated with the former Alliance Companies' failed attempts to establish another RTO (at the expense of MISO and its

[4] *See Illinois Power Co.*, 95 FERC ¶61,183, *reh'g denied* 96 FERC ¶61,026 (2001).

membership) would work a gross injustice on MISO's current transmission-owner membership, and must be rejected.[5]

GridAmerica's proposed $12 million annual payment is similarly suspect. Not only does the compliance filing fail to provide sufficient information to allow a full evaluation of the reasonableness of this annual charge, the information that is provided suggests that much, if not all, of this payment is properly payable by the loads located inside GridAmerica's service territory, and *not* MISO's existing loads, as discussed below.

(ii) Violation of Cost Causation Principles

As stated in the TO Protest, Schedule 5 of the ITC Agreement identifies certain functions to be performed by GridAmerica, through National Grid, for which GridAmerica will receive $12 million annually from MISO (and its transmission-owner loads) under the ITC Agreement. These functions appear to benefit not MISO's existing loads, but rather solely the loads internal to GridAmerica's service territory, *e.g.*, scheduling transmission *within GridAmerica*, settling billing issues for loads *within GridAmerica*. LG&E/KU urge the Commission, once again, to adhere to basic cost causation principles and require that such costs -- to the extent they can be justified -- be assigned solely to those loads for whose benefit they are incurred.

To the extent the Commission does not impose such a requirement, equity dictates that MISO transmission owners be permitted to recover from loads inside the GridAmerica footprint these loads' proportionate "share" of costs incurred by MISO transmission owners in performing these identical services within their own service areas. *See* below. There simply is no equitable or lawful basis to impose on MISO member loads costs incurred by GridAmerica to serve loads within its service territory, and at the same time refuse to impose on GridAmerica loads costs

[5] Notably, MISO's transmission owners bore all of their own legal and consulting costs in connection with these matters.

incurred by MISO members in providing the same services within their respective service territories.

(iii) Discriminatory Treatment As Regards Transmission-Related Functions

The ongoing functions to be performed by GridAmerica, as identified in Schedule 5 of the ITC Agreement, are comparable, if not identical, to the functions currently performed by MISO transmission owners on behalf of their own loads. Among others, these functions include (i) implementation of corrective action ordered by MISO, (ii) submission of maintenance outage information to MISO, (iii) assistance in congestion management, and (iv) the provision of ancillary services. *See* TO Protest at 9-11. Unlike GridAmerica, however, MISO's transmission owners receive no compensation from MISO for these services, instead collecting payment therefor directly from the recipients of such services, in accordance with cost causation principles. Applicants have offered nothing to justify this unduly discriminatory treatment of MISO's old and new members, because there is none.

In sum, any amounts due GridAmerica for the functions identified in Schedule 5 are properly recoverable solely from the loads inside GridAmerica's service territory, the beneficiaries of such services. Again, to the extent the Commission does not impose such a requirement on GridAmerica, MISO transmission owners must be permitted to recover from loads internal to GridAmerica a proportionate portion of the costs incurred by MISO transmission owners in performing these identical functions within their own service areas.

CONCLUSION

For the above-stated reasons, LG&E/KU request that the Commission summarily reject the compliance filing as patently deficient and contrary to Commission regulations and ratemaking policy. In addition, LG&E/KU request that the Commission direct MISO to conduct substantive discussions with its membership regarding MISO's payment obligations to GridAmerica. *See* TO Protest at 15.

Respectfully submitted,

/s/LSP
Linda S. Portasik
Attorney for
Louisville Gas and Electric Company and
Kentucky Utilities Company

Michael S. Beer
Vice President, Rates and Regulatory
Louisville Gas and Electric Company and
Kentucky Utilities Company

November 19, 2002

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Midwest Independent Transmission System Operator, Inc.	))	**Docket No. ER04-158-000**

MOTION TO INTERVENE
AND JOINT PROTEST OF
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY

Pursuant to Rules 214 and 211 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission ("FERC" or "Commission"), 18 C.F.R. § 385.214, § 385.211 (2002), and the Commission's "Notice of Filing" issued November 14, 2003, Louisville Gas and Electric Company and Kentucky Utilities Company (collectively referred to as "LG&E/KU" or "Companies") hereby move to intervene in the above-captioned proceeding, and protest the "Request for Authorization" submitted therein by the Midwest Independent Transmission System Operator ("MISO"). By its Request for Authorization, MISO seeks authority to reimburse Michigan Electric Transmission Company ("METC") (formerly "Michigan Transco") for approximately $8.4 million purportedly incurred by Consumers Energy Company ("Consumers Energy"), the former owner of METC's transmission facilities, in connection with the development of the now-defunct Alliance regional transmission organization ("RTO"). Such reimbursement would be funded largely by the Midwest ISO's current transmission-owner members via charges assessed under Schedule 10 of the Midwest ISO Open Access Transmission Tariff ("OATT"). Although the Midwest ISO is submitting the Request for Authorization in its capacity as OATT administrator, the Midwest ISO does not take a position as to whether the Commission should grant the request; as MISO points out, "METC has the burden of proof in this proceeding." Request at 2.

MOTION TO INTERVENE

I.

Communications and correspondence related to this filing should be directed to the following representatives of LG&E/KU:

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II.

LG&E/KU are vertically integrated utilities located principally in Kentucky that together serve approximately 850,000 customers throughout the state. The Companies, whose combined transmission and generating capacity exceeds 26,000 MVa and 8,800 MW, respectively, are among the original transmission-owning members of MISO. LG&E/KU, along with all other transmission-owning members of MISO, transferred control of their transmission facilities to MISO effective February 1, 2002.

III.

As transmission-owning members of MISO, LG&E/KU will be directly affected by and have a significant interest in this proceeding. That this interest is unique and cannot be represented adequately by other parties is a function of the Companies' status as exceptionally low-cost utilities: the dollar impact of the Request For Authorization herein on LG&E/KU and their customers, viewed as a percentage of existing retail rates, is necessarily larger than that experienced by higher-cost energy providers.[1] LG&E/KU's interest is particularly significant given the millions of dollars MISO has committed to pay METC (and pass through to its membership) and the inability or uwillingness of METC to cost-justify these payments. For these reasons, LG&E/KU respectfully request that they be granted intervention in this proceeding, with full rights attendant to party status.

Protest

A. As METC Cannot Show That It Incurred Or Otherwise "Inherited" Any Alliance RTO Development Costs, The Request For Authorization Should Be Summarily Denied.

The only basis METC presents to support its recovery of Alliance RTO development costs is its status as successor in interest to the transmission assets of Consumers Energy. METC presents nothing in this record to indicate that METC actually incurred or otherwise "inherited" from Consumers Energy any RTO development costs (*e.g.*, through book entries). To the contrary, the very fact that Consumers Energy sought to recover these costs after transferring its transmission facilities to METC demonstrates that neither Consumers Energy nor METC believed (or believe today) that any of the costs for which METC now seeks "reimbursement" were transferred to METC upon sale of the assets. Indeed, METC's witness in this case makes clear that the RTO development costs which it now seeks to recover from MISO's load "were specifically and explicitly excepted from the terms of the sale" of Consumer Energy's transmission assets to METC. Affidavit of Steven Gaarde, at 10. Far from supporting its position, this fact alone warrants rejection of METC's request. In short, METC cannot show that it has ever borne any RTO development costs.

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[1] Enormous cost responsibility has already foisted on the Companies for amorphous "benefits" grounded more in rhetoric than fact. *See, e.g.*, Joint Brief of Petitioners and Intervenors in Support of Petitioners, Case Nos. 02-1121 and 02-1122, United States Court of Appeals for the District of Columbia Circuit), filed September 19,

The Commission has made clear that only transmission-owning entities that incur RTO development costs can seek recovery of these costs. *See* Order Denying Authorization, Docket No. ER03-574-000 (May 22, 2003), slip op. at 5. Simply because Consumers Energy may have "missed [its] opportunity" to seek recovery of RTO development costs it allegedly incurred (*see id.*, slip op. at 5) does not somehow entitle METC to recover these very costs, either to fill its own coffers or to pass through to Consumers Energy in an effort to remedy the latter's "missed" opportunity.

B. <u>The Filing Is Deficient On Its Face And Should Be Rejected Because It Lacks Sufficient Cost Support.</u>

In evaluating the prudence or reasonableness of expenditures for which recovery from ratepayers is sought, the Commission has examined, among other things, whether the costs reflect "extravagance" or "necessity," and whether other, less costly alternatives were readily and practically available.[2] Although METC broadly categorizes the costs for which it seeks "reimbursement" and provides a brief explanation of each category through the testimony of Steven L. Gaarde, METC falls far short of demonstrating that any of these costs were prudently or reasonably incurred for the benefit of MISO members and customers.[3]

2002, at pp. 52-60.

[2] *New England Power Co.*, Opinion No. 231, 31 FERC ¶ 61,047 (explaining the standard for determining prudence and whether costs may be recovered; and noting that extravagance and necessity are appropriate criteria used in evaluating prudence), *reh'g denied*, Opinion No. 231-A, 32 FERC ¶ 61,112 (1985), *aff'd sub nom. Violet v. FERC*, 800 F.2d 280 (1st Cir. 1986). *See also Trunkline Gas Co.*, 64 FERC ¶ 61,142, at 62,147 (1993) (in demonstrating that it acted prudently in extending a lease for capacity on a pipeline, gas company must take into account the relative costs of alternative arrangements and the costs of constructing facilities itself); <u>Alamito Co.</u>, Opinion No. 325, 46 FERC ¶ 61,389, at 62,251-252 (1989) (explaining that a prudent utility should consider the costs of other alternatives before entering into a long-term contract).

[3] LG&E and KU continue to dispute strongly the FERC's decision to require the customers of MISO charter members to bear any costs associated with the devleopment of the now-defunct Alliance RTO. The inherent inequity of such a requirement is no where more apparent than with respect to legal fees: requiring MISO's transmission owners to foot the legal expenses associated with the former Alliance Companies' failed attempts to establish another RTO -- at the expense of MISO and its membership -- simply works a gross injustice on MISO's charter transmission-owner membership.

For example, nowhere does Mr. Gaarde break down the costs to a level sufficient to allow a meaningful examination of their reasonableness, from the perspective of either appropriateness (were the underlying services needed?) or level (is the dollar amount correctly calculated and allocated?). Indeed, with respect to outside (legal) services -- which total more than $1.3 million -- Mr. Gaarde simply notes that "the Alliance members went through a competitive and interview process before hiring the . . . legal services." Gaarde Affidavit at 6. This information is meaningless: it tells the Commission nothing about how this "competitive and interview" process was conducted or, importantly, the selection criteria; nor does the information provide any clue as to what services were provided and why, or how these services were charged and allocated among the various "Alliance members." METC's apparent attempt to "slide these costs through" without adequate explanation is all the more egregious given the fact that a least some of the $1.3 million may well have been incurred (the record does not show) in pursuit of efforts directly counter to the interests of the very MISO members now being asked to foot the bill.

Further, it appears that a substantial portion of the costs METC now seeks to recover relate to the preparation of Alliance RTO filings, as well as Alliance members' participation in various proceedings before the Commission. Much like the above-noted legal expenses, these types of costs obviously provided no benefit to the rest of the Midwest ISO, and indeed, were likely incurred to support positions counter to the interests of the Midwest ISO Transmission Owners and other Midwest ISO stakeholders and customers. Requiring the latter to bear these costs -- particularly when these entities bore their own costs in challenging the Alliance RTO or in negotiating with its members during and after its demise -- is so grossly inequitable the Commission simply could not have intended it.

C. <u>The Filing Should Be Rejected Because It Violates Fundamental Principles of Cost Causation</u>.

In addition to lacking the requisite cost support, the Request For Authorization is deficient on a more fundamental level, as it violates the basic tenet of ratemaking: cost causation. In short, the requested reimbursement, if granted, would require MISO's existing loads to bear (through Schedule 10) costs that were purportedly incurred *solely* on behalf of, and for the *sole* benefit of, METC's predecessor. If these costs are imposed on any customers, clearly only those customers internal to METC's service territory should assume such burden.

The Commission's long-standing cost causation policy requires that costs be allocated to those who benefit from or otherwise cause the incurrence of those costs: "[t]he <u>fundamental</u> theory of Commission ratemaking is that costs should be recovered in the rates of those customers who utilize the facilities and thus cause the costs to be incurred."[4] The Commission has reiterated this policy in recent orders, suggesting that "[c]osts should be allocated directly to those who benefit or to those who are willing to pay"[5] and that "[c]ost causation principles require that cost responsibility match as closely as practicable the cost of providing the service."[6] Similarly, the Commission has noted that it "will not allow users in one region to subsidize the other region."[7] Moreover, the United States Court of Appeals for the D.C. Circuit has endorsed this policy, pointing out that the Commission has a "long standing policy that rates must be cost supported. Properly designed rates should produce revenues from each class of customers <u>which match, as closely as practicable, the costs to serve each class or individual customer."</u>[8]

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[4] *Kentucky Utilities Co.*, Opinion No. 432, 85 FERC ¶ 61,274 at 62,111 (1998) (quoting *Northern States Power Co.*, Opinion No. 383, 64 FERC ¶ 61,324 at 63,379 (1993)).

[5] *ISO New England*, 95 FERC ¶ 61,384 at 62,433 (2001).

[6] *New York Indep. System Operator, Inc.*, 102 FERC ¶ 61,284, slip op. at 13 (2003) (finding unjust and unreasonable a proposal to allocate costs for thunderstorm alert procedures to the entire state because such procedures were solely to the benefit of New York City).

[7] *TRANSLink Transmission Co*, 101 FERC ¶ 61,140, slip op. at 50 (2002).

[8] *Alabama Elec. Coop., Inc. v. FERC*, 684 F.2d 20, 27 (D.C. Cir. 1982) (emphasis added).

In this case, as shown above, it is obvious that the costs METC now seeks to recover through MISO's Schedule 10 were (allegedly) incurred solely to benefit the entities that supported the Alliance RTO efforts. Indeed, METC has admitted as much, specifically describing these costs as associated with the Alliance RTO efforts. Accordingly, requiring all Midwest ISO members to shoulder these costs through the Schedule 10 charge amounts to a blatant violation of cost causation principles.

III.

Conclusion

For the reasons set forth above, the Commission should grant LG&E's/KU's Motion to Intervene and should deny the Request for Authorization for METC to recover the Midwest ISO's Schedule 10 costs allegedly incurred by the former owner of its transmission facilities.

Respectfully submitted,

/s/LSP
Linda S. Portasik
On Behalf of
Louisville Gas and Electric Company
And Kentucky Utilities Company

Rebuttal Testimony

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

INVESTIGATION INTO THE	)	
MEMBERSHIP OF LOUISVILLE	)	
GAS AND ELECTRIC COMPANY	)	
AND KENTUCKY UTILITIES	)	CASE NO. 2003-00266
COMPANY IN THE MIDWEST	)	
INDEPENDENT TRANSMISSION	)	
SYSTEM OPERATOR, INC.	)	

REBUTTAL TESTIMONY OF
MICHAEL S. BEER
VICE PRESIDENT, RATES AND REGULATORY
LG&E ENERGY L.L.C.

Filed: February 9, 2004

Q. Please state your name, position and business address.

A. My name is Michael S. Beer. I am Vice President of Rates and Regulatory for Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively referred at times as "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky.

Q. What is the purpose of your rebuttal testimony?

A. I will respond to MISO's claim that the estimated savings resulting from the merger of LG&E and KU in 1998 should be deemed "benefits" of MISO membership for purposes of comparing the costs and benefits of MISO membership relative to stand-alone operation. I will also respond to what I believe is an incorrect assumption on the part of Mr. Holstein regarding the Companies' withdrawal from MISO and the exit fee that would attend such withdrawal.

<u>Merger Surcredit Benefits</u>

Q: MISO discusses at length both the "benefits to date" and the "future benefits" resulting from the merger of LG&E and KU in 1998, asserting that all estimated future merger savings should be deemed a benefit of MISO membership in evaluating the benefits of MISO membership *vis-à-vis* stand-alone operation. *See, e.g.,* Holstein Testimony at 8-11. Do you agree?

A: Absolutely not. MISO's claim is misplaced for at least three reasons. First, as Mr. Thompson points out, the estimated benefits resulting from the merger of LG&E and KU will not evaporate upon the Companies' exit from MISO. Because these merger savings are not a unique benefit of MISO membership that the Companies would forfeit upon exit, it is wholly inappropriate to consider them in comparing the benefits of ongoing MISO membership with the benefits of a stand-alone operation going forward.

Second, and on a related front, MISO has done and will do nothing -- through the provision of services or otherwise -- to bring about these merger-related benefits. Rather, these benefits result from wise regulation, strong Company leadership and sound business initiatives designed to develop and optimize synergistic savings. Third, MISO's claim that the Companies' merger-related benefits are properly considered singular benefits of MISO membership is based on the assumption that the merger would not have occurred absent the Companies' membership in MISO exclusively. Logically, MISO's position must also assume that the merger's benefits would somehow vanish upon the Companies' exit from MISO. The second assumption is simply incorrect, as noted above; the first is entirely speculative. Indeed, Mr. Torgerson himself concedes that it is "impossible to know whether the FERC would have been willing to approve the merger" absent the Companies' willingness to join MISO. Torgerson Testimony at 10. So, too, the FERC itself, in approving the merger of LG&E and KU, indicated that MISO membership was in fact *not* dispositive, suggesting that it would entertain other market power mitigation measures should the Companies ever decide to exit MISO:

> If LG&E and KU seek permission to withdraw from the Midwest ISO proceeding or the ISO once it is operating, we will evaluate that request in light of its impact on competition in the KU destination markets, use our authority under section 203(b) of the FPA to address any concerns, and order further procedures as appropriate.

82 FERC ¶61,308 (1998), Docket No. EC98-2-000, Order issued March 27, 1998, slip op. at 37. In sum, MISO's claim that merger benefits equate to MISO membership benefits is based on speculative reasoning that lacks any factual or legal basis of support.

<u>Exit Fee Issues</u>

Q: Mr. Holstein's testimony indicates that the Companies believe they can lawfully withdraw from MISO within 30 days after an exit directive by this Commission, without FERC approval. Holstein Testimony at 12-13. Is that an accurate statement?

A: No. Contrary to Mr. Holstein's assertion, the Companies have never suggested that they need not obtain FERC authorization to exit MISO. In fact, the Companies' position in this case expressly contemplates receipt of FERC approval, consistent with the very FERC order cited by Mr. Holstein and Section VII. D of the Transmission Owners' Agreement. As the Companies stated in response to Question No. 8 of the Commission's Data Request dated October 6, 2003 in this proceeding:

> [I]f the Commission determines, based on the evidence of record in this case, that the costs of MISO membership exceed the benefits of membership, LG&E and KU request that the Commission direct the Companies to pursue such withdrawal, recognizing that the Companies cannot exit without having first obtained requisite FERC approval. In this regard, the order must acknowledge the Companies' obligation to obtain FERC approval prior to exit, and afford the Companies ample opportunity to secure such approval on reasonable terms.

Q: Do you agree with Mr. Holstein's position regarding the level of the exit fee payable by the Companies should they withdraw from MISO?

A: No. LG&E's and KU's reading of the MISO Transmission Owners' Agreement as it relates to the calculation of the Companies' exit fee differs from that presented by MISO, both in terms of (i) the proper "effective date of withdrawal" for purposes of establishing the Companies' financial obligation "cut off" date; and (ii) the level of Schedule 10 costs properly included in such exit fee, as discussed by Mr. Morey in his testimony. As a result, there exists a gap of approximately \$14 million between MISO's exit fee estimate (approximately \$38 million) and the Companies' estimate (approximately \$24 million).

Q: Does this conclude your rebuttal testimony?

A: Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Michael S. Beer**, being duly sworn, deposes and says he is the Vice President, Rates and Regulatory for LG&E Energy LLC, that he has personal knowledge of the matters set forth in the foregoing testimony, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

MICHAEL S. BEER

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 9th day of February 2004.

Victoria B. Harper (SEAL)
Notary Public

My Commission Expires:

9/20/2006

VICTORIA B. HARPER
NOTARY PUBLIC
STATE AT LARGE
KENTUCKY
My Commission Expires Sept. 20, 2006

Rebuttal Testimony

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the matter of:		
INVESTIGATION INTO THE	)	
MEMBERSHIP OF LOUISVILLE	)	
GAS AND ELECTRIC COMPANY	)	
AND KENTUCKY UTILITIES	)	**CASE NO. 2003-00266**
COMPANY IN THE MIDWEST	)	
INDEPENDENT TRANSMISSION	)	
SYSTEM OPERATOR, INC.	)	

REBUTTAL TESTIMONY OF
MARK S. JOHNSON
DIRECTOR OF TRANSMISSION
LG&E ENERGY L.L.C.

Filed: February 9, 2004

Q. Please state your name and business address.

A. My name is Mark S. Johnson. My business address is 119 N. Third Street, P.O. Box 32020, Louisville, Kentucky 40202.

Q. By whom and in what capacity are you employed?

A. I am the Director, Transmission for Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively, "LG&E/KU" or "Companies").

Q. Please describe your professional and educational background.

A. I have 23 years of experience in the utility industry. For the last 16 years I have held senior leadership positions at LG&E Energy Corp. (now LG&E Energy L.L.C.), the Tennessee Valley Authority and Entergy, respectively. Since January 2001, I have served as the Director, Transmission for LG&E Energy Corp., responsible for the design, engineering, planning, operations and maintenance of the Companies' transmission system. From November 1997 to January 2001, I was Director, Distribution Operations for LG&E Energy Corp. From February 1987 to November 1997, I was employed by the Tennessee Valley Authority. There I held a number of senior level positions related to power generation, transmission, customer service and marketing. Most notably, I was the Area Vice President, Transmission, Customer Service and Marketing for nearly four years. From January 1985 to February 1987, I was employed by Entergy at the Grand Gulf Nuclear Generation Station as Manager, Engineering Support. From May 1980 to January 1985, I was employed by the Tennessee Valley Authority at the

Watts Bar Nuclear Generating Station as the Manager, Document Control and Configuration Management. I received my Bachelor of Science degree in Civil Engineering Technology from Murray State University in 1980.

Q. Was this rebuttal testimony prepared by you or under your supervision?

A. Yes.

Q. What is the purpose of your testimony?

A. My testimony responds to particular assertions made in the pre-filed direct testimony of three of the witnesses representing the Midwest Independent Transmission System Operator, Inc. ("MISO") in this proceeding: Ronald R. McNamara, Jonathan Falk, and Roger C. Harszy. In particular, I will respond to these witnesses' assertions regarding the reliability benefits associated with MISO membership (the "MISO option"), relative to standalone operation (the "Standalone option"). I will also respond to MISO's assertion that the Companies will receive more transmission revenues under the MISO option relative to the Standalone option.

Q. Do you agree with MISO's assertion that MISO membership offers reliability benefits not otherwise available to the Companies under the Standalone option?

A. No. MISO's witnesses erroneously assume that the reliability of the LG&E/KU transmission system has become and will continue to be more reliable under the MISO option than it was historically and would be under the Standalone option. To my knowledge, however, the Companies have never had to shed load to prevent the occurrence of a single contingency event, *i.e.*, to protect the integrity of the transmission system. The only valid evidence that can be presented about the reliability of the Companies' portion of the regional grid is that it has operated well for a very long period of time. MISO's assumption of the role of reliability and security coordinator does not automatically translate into enhanced reliability "on that portion of the regional grid located in the State of Kentucky," as Mr. Harszy states (p.1), and MISO has provided no meaningful proof of such an increase. As Mr. Morey demonstrates in his testimony, the only evidence that MISO presents of a change in reliability consists of an arbitrarily derived estimate of expected annual outage costs – an estimate that neither corresponds to the Companies' experience or territory nor measures a difference between the two options.

The Companies have made clear that they are prepared to make the adjustments necessary to ensure the transmission system remains reliable, and have accounted for this commitment in their assessment of the costs of the Standalone option. In addition, the Companies expect to have opportunities to enter into coordination agreements with adjacent control areas, *e.g.*, TVA and MISO. For example, under an agreement reached when MISO purchased certain facilities from members of the MidAmerica Power Pool ("MAPP"), MISO provides a wide range of services, through a contract with MAPPCOR, to those MAPP members who are not within the MISO footprint. This agreement makes clear that "MISO will work with MAPPCOR and other entities to ensure MISO meets all it's [sic] contractual obligations and maintains the same commitment to reliability as it does throughout the MISO footprint." MISO Business Plan, January 16, 2004, at 2 (edits of Clair Moeller). The Companies do not believe that MISO would (or could) intentionally thwart this commitment to reliability – to MISO members and non-member entities alike – by refusing to negotiate a similar agreement with the Companies.

In addition, the possibility that an agreement similar to the Joint Operating Agreement ("JOA") between MISO and the Pennsylvania-New Jersey-Maryland RTO seems quite workable to me. That Agreement states (PJM-MISO "Managing Congestion to Address Seams," August 2, 2003, pp. 3-4):

> As PJM and MISO expand and implement their respective markets, one of the primary seams issues that must be resolved is how different congestion management methodologies (market-based and traditional) will interact to ensure that parallel flows and impacts are recognized and controlled in a manner that consistently ensures system reliability....
>
> * * *
>
> The complete proposal will allow Market-Based Operating Entities to address the reliability aspects of congestion management seams issues between all parties whether the seams are between market to non- market operations or market to market operations.

I have every reason to believe that the Companies and MISO could enter into a similar agreement that respects the differences in congestion management methods but nonetheless manages to maintain reliability of the MISO footprint and the Companies' own system to the benefit of MISO members and their customers as well as LG&E/KU's customers.

Q. Was Mr. Falk correct in stating that the Companies have not accounted for the cost of a higher level of grid scrutiny?

A. No. Mr. Falk (at p. 17, *ll.* 15-18) errs when he states: "…their proposal does not include the higher cost of the higher scrutiny. If they run the system as they ran it before, it is reasonable to assume that they will have similar costs. A higher level of attention to system security will perforce include more costs which have not been included in their testimony." Mr. Falk is incorrect and appears to disregard the Companies' testimony and the benefit-cost study on this point. The benefit-cost study discusses the additional costs of an increased level of grid scrutiny in Section 3.8.2 and again in Section 3.9.2. The report states (at p. 40): "In sum, LGE/KU estimates that it would need an additional $1 million per year in the transmission operations budget to assume the functions MISO is or would be performing for LGE/KU following the start of the Day Two market. Thus, the difference between the MISO member option and the standalone system option is $1.0 million for these system operations functions." The $2 million cost per year difference equals the sum of $1 million per year in savings that LG&E/KU would forego if it withdraws from MISO plus the $1 million per year it estimates it would need to spend to increase its level of grid scrutiny to match what MISO is performing today.

Q. What conclusions do you reach regarding the MISO's estimate of the benefit of increased transmission revenues under the MISO option?

A. MISO's estimate of the net benefits of the MISO option through an increase in transmission revenues significantly overstates the benefit by omitting transmission payments by the Companies under an Open Access Transmission Tariff ("OATT") in both options. MISO estimates the transmission revenues from Schedules 1, 7, 8 and 14 under the MISO OATT at $21.8 million. This appears to be a reasonable estimate of the revenues the Companies would expect to receive under the MISO membership option. However, the payments made by LG&E Energy Marketing for transmission service under the MISO OATT, for service LG&E/KU provides and for service provided by other MISO transmission owners to LG&E Energy Marketing, equals this amount. Thus, the difference is zero.

The same can be said for the transmission revenue estimate under the Standalone option. MISO estimates transmission revenues from Schedules 1, 7 and 8 under the Standalone option at about $9.1 million. While I don't accept MISO's estimate of revenues under the Standalone option, the point is that the transmission revenues LG&E/KU would expect to receive under the Standalone option would be payments made by Energy Marketing. Hence, the net again will be zero.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Mark S. Johnson**, being duly sworn, deposes and says he is the Director of Transmission for LG&E Energy LLC, that he has personal knowledge of the matters set forth in the foregoing testimony, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

MARK S. JOHNSON

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 9th day of February 2004.

Victoria B. Harper (SEAL)
Notary Public

My Commission Expires:
9/20/2006

VICTORIA B. HARPER
NOTARY PUBLIC
STATE AT LARGE
KENTUCKY
My Commission Expires Sept. 20, 2006

Rebuttal Testimony

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the matter of:

INVESTIGATION INTO THE	)	
MEMBERSHIP OF LOUISVILLE	)	
GAS AND ELECTRIC COMPANY	)	
AND KENTUCKY UTILITIES	)	CASE NO. 2003-00266
COMPANY IN THE MIDWEST	)	
INDEPENDENT TRANSMISSION	)	
SYSTEM OPERATOR, INC.	)	

REBUTTAL TESTIMONY OF
MATHEW J. MOREY
ON BEHALF OF LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY

February 9, 2004

Name *and Qualifications*

Q. Please state your name, current position and business address.

A. My name is Mathew J. Morey. I am Senior Consultant with Laurits R. Christensen Associates, Inc. My business address is 409 Cambridge Road, Alexandria, VA. Laurits R. Christensen Associates, Inc.'s principal business address is 4610 University Avenue, Madison, WI.

Q. Have you previously testified on behalf of Louisville Gas and Electric Company and Kentucky Utilities Company ("LG&E/KU" or "Companies") in this proceeding?

A. Yes, I prepared pre-filed direct testimony in this proceeding on the Companies' behalf.

Q. Were the rebuttal testimony and the exhibits prepared by you or under your supervision?

A. Yes.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. My testimony responds to particular assertions made in the pre-filed direct testimony of three of the witnesses representing the Midwest Independent Transmission System Operator, Inc. ("MISO") in this proceeding: Ronald R. McNamara, Jonathan Falk, and Michael P. Holstein. The testimony submitted by these three witnesses reports on the MISO's independent investigation into the question of the size of the net benefits to LG&E/KU and its retail customers of continued membership in MISO ("MISO option") relative to the option of LG&E/KU operating as a standalone system ("Standalone option").

Summary and Conclusions

Q. Please summarize your testimony and conclusions.

A. My testimony addresses the three legs of the quantitative stool that MISO's claim of positive net benefits associated with LG&E/KU's membership in MISO rests upon.. The first leg is the assertion that MISO can be given credit for the benefits that have flowed and will continue over the period 2005 to 2010 to flow to retail customers from the merger between LG&E and KU in 1998. The second leg is the assertion that reliability would decline under the Standalone option relative to the level of reliability that has been established under MISO's assumption of the role of reliability and security coordinator for the region. The third leg is the assertion of significant net benefits from MISO's administration of the energy markets, including centralized dispatch and congestion management, and the conversion from a system of physical rights to the use of Financial Transmission Rights ("FTRs") by transmission customers to hedge congestion cost risk. I will also comment on MISO's estimate of the exit fee and of the implementation and administration costs associated with the planned MISO Day Two market.

The evidence presented by the MISO witnesses that the net benefits of the MISO option were significantly greater than the net benefits of the Standalone option was in such stark contrast to the result that I obtained in my initial investigation of this question that the decision was made to reexamine those points where the initial LG&E/KU benefit-cost study and the MISO benefit-cost study differed. I felt compelled to determine whether there may have been an error in my calculations or in my assumptions . I could find no error in my calculations. With regard to my assumptions, I still believe that my assumptions were reasonable in light of the facts in the case. I have concluded that several of the assumptions that were made in MISO's analysis of the costs and benefits of the MISO membership option relative to the Standalone option are either inconsistent with the facts. I did not alter the assumptions I was making or the methods I used to calculate the costs and benefits that I believed could be quantified.

However, information that was made available to me by MISO in its filing of direct testimony and in its responses to the Companies' data requests and those of the Commission, led me to revise several numbers that appeared in our initial benefit-cost study. I revised upward an estimate of MISO's Schedule 10, 16 and 17 charges and I revised slightly my estimate of the exit fee. However, the revisions I made did not improve the net benefit of the MISO option relative to the Standalone option sufficiently to change the conclusion I reached as a result of the initial investigation. Consequently, after updating my study to account for changes in the Schedule charges and the exit fee and benefits associated with the "energy market," I reach the same conclusion today as I reached upon completion of the initial analysis. The net benefits of the MISO option relative to the Standalone option over the study period (i.e., 2005-2010) are negative; LG&E/KU and its retail customers would be better off economically if the Companies were to withdraw from MISO and operate as a standalone system.

Q. What conclusions do you reach regarding the evidence presented by the MISO witnesses about the benefits of the Standalone option relative to the MISO option?

A. My examination of the evidence presented by the MISO witnesses of the benefits and costs of the MISO option compared to the benefits and costs of the Standalone option does not lead me to alter my conclusion that the net benefits of the Standalone option are positive for Kentucky retail customers. The MISO evidence of the net benefits of membership is unconvincing for several important reasons:

1. MISO counts as a benefit of MISO membership merger savings flowing to retail customers in the future that would be realized regardless of the Companies' status as a member of MISO.
2. MISO's estimate of a reliability benefit under the MISO option does not represent a change from the Standalone option; MISO has failed to show that there is any increase in the probability of a transmission outage or an increase in the potential severity of such an outage under the Standalone option, or that there is difference between the Standalone option and the MISO option.
3. MISO overestimates the benefits of the MISO option in terms of the proposed energy market by:
    a. overestimating transmission revenues under the MISO option relative to the Standalone option.
    b. overestimating the difference in the net margin on off-system sales under the MISO option and the Standalone option.
    c. underestimating the congestion cost exposure for LG&E/KU under the MISO option.

In addition, I believe that MISO overestimates the exit fee as a cost of the Standalone option.

After examining each of these elements, reviewing my original benefit-cost analysis and making adjustments to MISO's benefit and cost estimates for both the MISO option and the Standalone option to correct for the flaws in the MISO analysis, the net benefits of the Standalone option are shown to be positive. The adjusted figures that I arrive at are summarized in the second column of Table 1. The line-by-line details of the adjustments I have made are provided in Exhibit MJM-2.

Mr. Holstein presented a table summarizing aggregated benefits of the MISO option (p. 14, *l.*14). Mr. Holstein made extensive corrections to the table appearing on p. 14 of his testimony. These corrections were made as part of MISO's response to the Commission's data request No. 6.a. One objective of the corrections was to ensure that Mr. Holstein's testimony was consistent with Mr. McNamara's testimony and the analysis MISO had conducted of the benefits and costs of the energy market. MISO presents so many numbers in so many different places throughout the testimonies of the witnesses, that it is difficult to know what set of numbers best represents the complete analysis of benefits and costs and to know how MISO's assessment compares to the Companies' analysis. So that the differences between the Companies' estimates of the costs and benefits of the Standalone option and MISO's estimates of that option are clearly understood, I prepared Table 1 that displays the two sets of estimates side by side – using MISO's numbers as revised by Holstein's response to Commission data request No. 6a.

Table 1 Total Costs and Benefits of the MISO Option (2005-2010)

($ Million – Nominal)	MISO Version	LG&E/KU Version
Schedule Costs	(80.1)	(93.1)
Exit Fee	38.3	23.8
Net Energy Market Benefits	152.1	27.8
Reliability Benefits	16.2	0
Merger Benefits	143.8	0
Total Benefits of the MISO Option	350.4	27.8
Net Benefits of MISO Membership (Total Benefits – Schedule Costs)	270.3	(65.3)

Thus, in Table 1, it can be seen that the Net Benefits of MISO Membership over the period 2005 to 2010 under MISO's analysis – the column entitled "MISO Version" – equals a positive $270.3 million, whereas my assessment, after examining the MISO analysis, along with updating my original analysis, leads me to an estimate of Net Benefits of MISO Membership of negative $65.3 million; the Standalone option would save the Companies $65.3 million over the period 2005-2010 even after paying an exit fee of $23.8 million.

A more detailed look at the estimates of benefit and cost categories is summarized in Table 2. This helps clarify the differences between MISO's analysis and the Companies' analysis of the MISO membership option compared to the Standalone option. Under the "Cost of MISO Option," the major differences between MISO's version and the Companies' version of the benefits and the costs of Membership appear under "System Operations and Transmission Costs," "Implementation & Administration Costs," and "Transmission Revenues." Under the "Cost of Standalone Option," the major differences between MISO's version and the Companies' version appear under the categories "System Operations and Transmission Costs," "Lost Revenues," and "Transmission Revenues." Overall, the MISO version shows a Net Cost Savings from

MISO Option of $110.3 million whereas the Companies' version shows a Net Cost Savings from MISO Option of negative $65.3 million; a difference of $175.6 million.

Table 2 Net Cost Savings of MISO Option Associated with the Proposed Energy Market

$ Millions Nominal	MISO Version	LG&E/KU Version
Cost of MISO Option		
System Operations and Transmission Costs	5.4	17.4
Implementation & Administration Costs	80.1	93.1
Ancillary Market Administration Cost	1.1	1.1
Legal, Regulatory & Transaction Costs	7.6	7.6
Less Transmission Revenues	(130.9)	-
Total Cost of MISO Option	(36.7)	109.5
Cost of Standalone Option		
Exit Fee	38.3	23.8
System Operations and Transmission Costs	28.1	18.1
Lost Revenues	62.1	12
Less Transmission Revenues	(54.9)	-
Total Cost of Standalone Option	73.6	53.9
Net Cost Savings of MISO Option (Total Cost of Standalone Option minus Total Cost of MISO Option)	110.3	(65.3)

As summarized in Table MJM_1-1, the average net savings of about $14.8 million per year over the period 2005 to 2010 from a move to the Standalone option is also comparable to the average net savings of $11 million per year for the Standalone option that I obtained in the initial investigation. The results I have obtained under this most recent examination of the quantifiable costs and benefits of the MISO and Standalone options still clearly favors the Standalone option.

Thus, the net benefit of the MISO option relative to the Standalone option is a negative $65.3 million (in nominal dollars). In other words, the Companies could save about $65 million by 2010 by withdrawing from MISO at the end of 2004 or sooner, and that includes paying an exit fee that I estimate at $23.8 million. On the basis of the quantification of those benefits and costs of both options that are quantifiable, the Standalone option remains the economically superior option.

Q. Why is the MISO Version estimate of the future benefits of the Companies' merger of $143.8 million been given a zero value in Table 1 under the LG&E/KU Version?

A. The merger benefit has been zeroed out in Table 1 for the simple reason that the merger benefit will flow to retail customers regardless of the Companies' RTO status in the future. Whatever the magnitude of the merger benefits will be in the future, that value will not change if LG&E/KU withdraws from MISO.

Thus, from the perspective of measuring the benefits and costs of the MISO option relative to the Standalone option, there is no change in the merger benefits number up or down if LG&E/KU withdraws from MISO. It is important to keep in mind when conducting a benefit-cost study that the objective is to measure the differences between the benchmark case, the MISO option here, and the change case, here the Standalone option.

Q. Why has the MISO Version estimate of future reliability benefits of the MISO option been given a zero value in the LG&E/KU Version in Table 1?

A. The reason that Mr. Falk's estimate of future reliability benefits has been zeroed out in Table 1 is that his estimate does not measure a change or difference in the level of reliability between the MISO option and the Standalone option. Mr. Falk's estimate of the expected annual cost of an outage provides no information regarding the difference between reliability under the MISO option and reliability under the Standalone option.

Again, the objective in quantifying benefits and costs in a study of this type is to identify the changes in benefits and costs from one option to the other. Instead, Mr. Falk estimates only the reliability costs of a version of the Standalone option; and he does that badly. He assumes that the Companies return to the pre-MISO world under the Standalone option, an assumption that does not square with the fact that LG&E/KU has already stated that the reliability functions and obligations would be treated differently in the future.

Mr. Falk's analysis of reliability is not based on any empirical information whatsoever. His single empirical observation is that, under MISO's new stewardship, there have been 75 Level 4 TLR events; but this numerical fact is irrelevant to his findings. His findings instead depend upon his arbitrary inference of the probability of customer outages occurring within the LGE/KU system in the absence of MISO providing reliability services. If one were to seriously examine the likely change in reliability that LGE/KU customers would enjoy as a result of LGE/KU's MISO membership, one would want to start with the historical facts that LGE/KU has not had to curtail load to prevent the occurrence of a single contingency event in several decades, while MISO has suffered the largest outage in U.S. history in the two years that it has been providing reliability services to its members. An objective appraisal of this history would raise at least a reasonable doubt that MISO membership can improve upon the record that LGE/KU has already achieved. Mr. Falk's prejudicial appraisal instead dismisses this history as mere "luck."

Introduction

Q. Why is the MISO benefit-cost analysis deficient?

A. The MISO benefit-cost study suffers from two fundamental flaws. The first is that the study does not measure the incremental change – gain or loss – attributable to the Standalone option relative to the MISO option. The MISO study attributes in several instances to the MISO option benefits that do not change between the two options. As I just mentioned, MISO's estimates of the merger benefits and of the reliability benefits of the MISO membership option are two large examples of this shortcoming.

The second flaw is that MISO's assessment of the benefits of the MISO option involves assumptions about benefits and costs attributable to the MISO option and to the Standalone option that are inconsistent with the facts. These assumptions result in:

1. overestimation of revenues and cost savings in the MISO option,
2. underestimation of participation costs in the MISO option,
3. underestimation of revenues and cost savings in the Standalone option, and
4. overestimation of the costs in the Standalone option.

A Benefit-Cost Analysis Must Measure Differences between Options

Q. Please elaborate on the first problem.

A. The MISO study violates the first principle of benefit-cost analysis: benefit changes and cost changes must be clearly identified and need to be counted once and only once. A key difficulty in conducting a cost-benefit analysis is finding a means of isolating the economic effects that are solely attributable to the change, which, in this proceeding, would be the economic effects attributable to LG&E/KU withdrawing from MISO and operating as a standalone system.

Q. What should be done to avoid making this kind of mistake?

A. To isolate the economic effects requires establishing a benchmark of LG&E/KU's revenues and costs as a MISO member during the study period (i.e., during the period 2005 – 2010). To measure the difference between the MISO option and the Standalone option, the analyst must make assumptions about what revenues, costs and other quantifiable factors it would be reasonable to expect LG&E/KU to have received, incurred and to have been affected by regardless of the option under consideration. These revenues, costs and other quantifiable factors should be removed from any estimate of the benefits and costs identified under either the MISO or Standalone options. The analyst then must estimate the change in revenues, costs and other quantifiable categories that are subject to change (e.g., changes in reliability that change expected outage costs) under the Standalone option relative to the benchmark MISO option. Furthermore, the assumptions made to estimate these changes in the Standalone option must be consistent with known facts.

Q. Does the MISO benefit-cost study adhere to this methodological approach?

A. No. MISO's benefit-cost study does not apply this method. The study does not establish an unambiguous benchmark for the MISO option. Examples of this problem in the MISO study include the estimates of expected future merger benefits attributed to the MISO option reported by Mr. Holstein and the estimate of the reliability benefits under the MISO option reported by Mr. Falk. Several of the estimated component benefits and costs of the MISO option and of the Standalone option as reported by Mr. McNamara also suffer from this problem. I will discuss each of these in turn.

Merger Benefits Accrue to Retail Customers Regardless of LG&E/KU's RTO Status

Q. Explain how the estimate of the merger benefits illustrates this mistake.

A. The MISO benefit-cost study assumes that the $143.8 million in expected future merger benefits for LG&E/KU's retail customers accrue only under the MISO option. But it would be reasonable to expect those benefits to accrue to retail customers under either option, since the merger has already occurred. These merger benefits will not vanish if LG&E/KU were to withdraw from MISO.

MISO's Reliability Benefit Estimate Does Not Measure Gain Under the MISO Option

Q. What is the correct way to estimate a change in the reliability benefit?

A. To correctly estimate a change in the reliability benefit under the MISO option, one would have to provide demonstrable evidence of an increase under the Standalone option of at least one of two of the variables used to estimate the annual expected outage cost: the average probability of an outage ("p") or the average magnitude of an outage ("MWh/outage"). That is, to show that the economic reliability benefit under the MISO option is positive, it must be shown that the expected annual cost of outages ("Cost/year") under the MISO option ("Cost/year-MISO") is less than the expected annual cost of outages under the Standalone option ("Cost/year-Standalone"). In other words, Mr. Falk needs to show the following:

Cost/year-Standalone – Cost/year-MISO > 0 .

Mr. Falk has not shown that this difference is positive. In fact, Mr. Falk has not shown that either of the two measures – the average probability of an outage or the average magnitude of an outage – would be smaller under the MISO option relative to the Standalone option.

Despite Mr. Falk's assertion, it is unclear what Mr. Falk's estimate of $2.7 million per year in expected outage costs represents. The estimate can be interpreted in two ways.

Neither interpretation enables me to conclude that a <u>change</u> in expected annual outage costs has been estimated by Mr. Falk. One interpretation is that the $2.7 million is an estimate of expected annual outage costs under the MISO option, since the period upon which the estimate is based is the post-MISO period – the period from December 16, 2001 to October 22, 2003. Under this interpretation, I conclude that in order to compute a difference between expected annual outage costs under the MISO and Standalone options, I would need an estimate of the expected outage costs under the Standalone option; none has been given under this interpretation. I cannot use a single estimate of expected outage costs under one option as the basis for judging benefits of the MISO option relative to the Standalone option.

The second interpretation of the $2.7 million per year outage cost estimate is that it does represent the difference between the MISO option and the Standalone option. Mr. Falk implies that the $2.7 million per year is what LG&E/KU would avoid in outage costs under the MISO option. However, by Mr. Falk's reasoning, in order for the $2.7 million figure to represent a reduction in the annual expected outage cost, the expected annual outage cost under the MISO option must be assumed equal to zero. In light of how that number would be computed, the expected annual outage cost under the MISO option could only be zero if at least one of two things is true: the average magnitude of an outage is zero or the average probability of an outage is zero.

Mr. Falk testified that it would not be reasonable to assume a value of zero for events that did not happen, and on this point I agree. No evidence has been presented in this case by the Companies or MISO to support an assumption that the probability of an outage under the MISO option is zero or that the average magnitude of an outage under the MISO option is zero. The August 14th blackout provides clear evidence that the average probability of an outage under MISO's stewardship is greater than zero.

Q. Given that MISO will continue as the security and reliability coordinator for a reliability area that would likely encompass LG&E/KU even if LG&E/KU were to withdraw from MISO, what comparison should be made in determining an estimate of the change in expected outage costs?

A. The correct comparison should be made between the MISO option and the Standalone option under an assumption that MISO will continue as a regional reliability and security coordinator throughout the study period (2005 to 2010) and that LG&E/KU, under NERC guidelines, will enter into an agreement with some entity, perhaps it would be MISO, to be the Reliability Authority for the Companies. The Companies have already stated that they would do what was necessary to meet reliability requirements in the new world and to spend additional dollars to achieve that goal. In other words, it is important to recognize what elements change and what elements do not change between the two options. Regardless of whether LG&E/KU remains a MISO member, MISO will perform its security and reliability functions and LG&E/KU would reside within a NERC reliability area overseen by a Reliability Authority at least as competent as MISO if not MISO itself.

Mr. Falk has assumed that the Companies under the Standalone option will return to a state of the world that is little different in terms of reliability functions from that which existed prior to MISO becoming the reliability and security coordinator. This assumption conflicts with known facts—namely that MISO will continue as NERC reliability coordinator for its footprint and that LG&E/KU will continue to do what is necessary to ensure reliability is maintained and that NERC policies are adhered to. Consequently, it is reasonable to assume that there will be virtually no difference between the MISO option and the Standalone option in terms of the average probability of outages occurring. This lack of difference is the reason why I did not attempt to estimate such a change in reliability between the two options when I conducted the initial benefit-cost study.

Q. Explain how Mr. Falk's estimate of the reliability benefits fails to measure a change from the MISO option to the Standalone option.

A. Mr. Falk's quantification of the reliability benefit under the MISO option, here defined as the expected annual outage cost, represented by "Cost/year," is based on estimates of four numbers. These estimated numbers are:

1. The average probability of an outage, represented by "p",
2. The average magnitude of an outage, represented by "MWh/outage,"
3. The average value of lost load , represented by "$/MWh," and
4. The average number of outages per year, represented by "Outages/year."

Given a value of p, however it has been obtained, one can estimate "Outages/year." And given an estimate of "Outages/year," an estimate of "Cost/year" can be obtained by multiplying "Outages/year" by "MWh/outage" and multiplying that product by "$/MWh," as expressed in the following formula:

Cost/year = (Outages/year) x (MWh/outage) x ($/MWh.).

For the purpose of comparing options, it is necessary to determine whether any of the foregoing factors will differ between the options. The probability of outage and the number of outages per year are the factors that are most likely to change. The magnitude of outages and the value of lost load could conceivably also change, but are less likely to do so. Yet Mr. Falk's "analysis" does not attempt to estimate the changes in any of these factors, but instead merely assigns values to the Standalone option while implicitly attaching a zero value to reliability costs under the MISO option.

The task of estimating expected annual outage costs in LG&E/KU's situation, under the MISO option or the Standalone option is difficult in light of the fact that the Companies have not had to curtail load to protect the integrity of their system in at least several decades. Consequently there is no empirical information immediately relevant to the Companies' service territory that can be used to narrow the range of possible values of p – all we can say is that the probability of an outage that results in a loss of load, given none has occurred, lies between zero and one. Mr. Falk acknowledges this when he states that "all possible values of p are consistent with the data" (Falk testimony at p. 11, *ll.*6-7). But to estimate "Cost/year," it is reasonable to restrict the range of values of p to values closer to zero than to one. However, given that the Companies have not had to shed load for reliability reasons in recent history, the restriction Mr. Falk places on the range of values of p is entirely arbitrary. Extending Mr. Falk's logic, any restriction of the range zero to one is also consistent with the data. The only other piece of information that Mr. Falk can rely on to create a distribution of values of p is the observation that there were 75 Level 4 TLRs called in the two-year post-MISO period. The number 75 becomes a conditioning parameter but not a significant determinant of anything; any number of events would have worked equally as well.

Thus, Mr. Falk arbitrarily restricts p to lie between zero and 0.0092. This restriction is unsupportable. It could well be that, given LG&E/KU's reliability record, the relevant range of values for p is zero to 0.00254; the upper endpoint of this arbitrary range being the value of p implied by the North American Electric Reliability Council's ("NERC's") "one day in ten year" reliability planning standard. So, whatever arbitrary range of values for p is selected, this range will be used as the basis for computing the value of the average number of outages per year – "Outages/year."

Next, for Mr. Falk to estimate "Cost/year," he must have an estimate of the average magnitude of an outage, "MWh/outage." For this he turns to the data collected by NERC's Disturbance Analysis Working Group ("DAWG"). Notwithstanding that the outages in the DAWG reports have no relationship to what might occur in the LG&E/KU service territory, Mr. Falk uses the empirical distribution on outages nationwide as the basis for his estimate "MWh/outage." He reports that the average magnitude was 2.6 million kWh, which is 2.6 thousand MWh.

Finally, Mr. Falk must have an estimate of the average value of lost load in dollars per kWh. Mr. Falk turns to the academic literature on the subject of the value of lost load. There he finds that the value of lost load lies plausibly between $4/kWh and $8/kWh, with a mean of $6/kWh. Furthermore, Mr. Falk assumes that the value of lost load is uniformly distributed on the range $4/kWh to $8/kWh. He provides no support for this assumption.

Armed with these empirical distributions for the three variables needed to estimate "Cost/year," Mr. Falk assumes the three variables are statistically independent. This assumption enables him to conduct a Monte Carlo simulation – a sampling experiment whereby a computer "draws" values from each of these three distributions many times and estimates "Cost/year" according to the formula given above. The end result of this sampling study is a distribution of estimates for "Cost/year." Mr. Falk reports that the average of this distribution is $2.7 million; the expected annual cost of an outage is $2.7 million.

Notwithstanding the fact that Mr. Falk's estimate of "Cost/year" is meaningless, the Monte Carlo simulation was totally unnecessary. The assumption that the three variables were independent means that all that was necessary to determine the average "Cost/year" was to know the average of each of these distributions. The average of Mr. Falk's restricted distribution of p is 0.0041. The average of the distribution of the value of lost load is $6/kWh, as reported by Mr. Falk (at p. 14, *ll.* 15-16). The average of the distribution of kWh lost in a disturbance is 2.6 million kWh (Falk at p. 12, *ll.*14-15). Given the average value of p equals 0.0041, the average of the distribution of "Outages/year" is 0.305—that is, the expected number of outages over 75 TLR events is 0.305 over two years, or about 0.15 outages per year. Given this value, I can easily and quickly obtain the estimate of the expected outage from knowledge of a rule in mathematical statistics that says the expected value of a product of independent random variables is the product of their expected values. Thus, "Cost/year" = (0.15 outages/year) x (2.6 million kWh/outage) x ($6/kWh) = $2,340,000 per year. This number is slightly smaller than the number Mr. Falk obtained from his Monte Carlo simulation, but it is exact. In theory at least, the Monte Carlo simulation should have produced the same number.

The paucity of data available on outages within the LG&E/KU system makes estimation of a trustworthy number difficult if not impossible. To construct an estimate using Mr. Falk's method requires a much more detailed analysis of other dimensions of the Companies' transmission system and grid operations to support his assumptions that Disturbance Analysis Working Group ("DAWG") reports could be used as the basis of an estimate of the magnitude of a single outage. Since Mr. Falk has asserted that the number he has derived is a reasonable estimate of the expected annual outage costs for LG&E/KU under the Standalone option, I believe that it is incumbent upon him to demonstrate that this is number has some basis in fact relevant to the Companies' experience. I have not found that Mr. Falk has provided that demonstration. But even if this were a reasonable estimate of the expected outage cost per year, there is a more fundamental problem with using it to assert that there is a reliability benefit associated with the MISO option. The estimated outage cost does not represent a change or difference between the two options, and measuring a change is what we need to do in this study of benefits and costs.

MISO's Estimation of the Net Benefits of the Energy Market Overstates Benefits and Understates Costs of the MISO Option

Q. What problems did you uncover in your examination of the MISO analysis of the net benefits of the various components of the energy market?

A. I recognized several major problems in my review of the MISO analysis of the benefits and costs of the MISO membership option relative to the Standalone option under a proposed Day Two Market. First, MISO overestimates:

1. transmission revenues that LG&E/KU would receive as a MISO member relative to the Standalone option,
2. the net margin on off-system sales that LG&E/KU would receive as a MISO member relative to the Standalone option, and
3. the exit fee that LG&E/KU would pay upon withdrawal.

Second, MISO underestimates:

1. Schedule 10, 16 and 17 charges that would be assessed LG&E/KU under the MISO option.
2. LG&E/KU's congestion cost exposure in the proposed Day Two Market under the MISO option,

MISO Overestimates the Transmission Revenue Benefit of the MISO Option

Q. What problems exist with MISO's estimation of the transmission revenues under the MISO option and the Standalone option?

A. Mr. McNamara's (p. 4, *l.*24 to 5 *l.* 3) discusses the benefits of the MISO option relative to the Standalone option that arise from transmission revenues that the Companies would receive. Mr. McNamara states: "By continuing its membership in the Midwest ISO, LG&E/KU will receive transmission revenues from Schedules 1, 7, 8 and 14 of the Midwest ISO OATT. These revenues are expected to be approximately $21.8 million. While a number of factors may influence this value, the analysis assumes a continuation of the revenues received in the past 12 months." Mr. McNamara goes on to say: "As a stand-alone entity, LG&E/KU would receive from Schedules 1, 7, and 8 of their own tariff approximately $9.1 million annually. The analysis is based on the most recent available sales information and reflects the impacts of LG&E as a stand-alone entity being surrounded by larger interconnected markets."

While the transmission revenue estimate presented under the MISO option has empirical support, the revenues that LG&E/KU may receive in the future under MISO administration of the OATT are only half of the story. To know whether there is a benefit associated with the MISO option relative to the Standalone option, LGE/KU's transmission payments under MISO's OATT must also be taken into account as a cost under the MISO option, and similarly LG&E/KU's transmission payments under the Standalone option also must be counted as a cost. The MISO option offers a benefit relative to the Standalone option only when LG&E/KU's transmission revenues relative to its transmission payments are expected to be higher under the MISO option than under the Standalone option.

Of the expected $21.8 million per year in transmission revenue under MISO's administration of the OATT in the MISO option, a nearly equal amount is expended by Energy Trading, LG&E/KU's power trading arm, for transmission service on its off-system sales under the OATT, for Schedules 1, 7, 8 and 14. Similarly, in the Standalone option, nearly 100% of the transmission revenues are expected to be accounted for in terms of the transmission payments by Energy Trading under the Companies' OATT. Consequently, I conclude that there is no net difference between transmission revenues under the MISO option relative to the Standalone option. The difference between revenues and payments is zero under either option, and hence there is no net benefit that arises under the MISO option with regards to transmission revenues.

Mr. McNamara (Table RRM_1-1) reports transmission revenues of $9.1 million in association with off-system sales under the Standalone option. While the magnitude of Mr. McNamara's estimate of the transmission revenue under the Standalone option is actually immaterial because it is offset by the payments made by Energy Trading for transmission service to the LG&E/KU border, the $9.1 million seemed at odds with Mr. McNamara's reported estimate of the Companies' off-system sales under the Standalone option – 8,048,477 MWh (Table RRM_1-5)– and the rates that Mr. McNamara assumes for non-firm point-to-point service -- $2.4329/MWh on-peak and $1.1585/MWh off-peak (Table RRM_1-3), or roughly $1.80/MWh. My calculation of the minimum transmission revenue the Companies would receive in conjunction with off-system sales, given MISO's numbers, would be roughly $14.5 million.

When all is said and done, there are no transmission revenues to credit under either option—there is no change between the MISO option and the Standalone option. MISO's assessment thus overstates significantly the benefit attributed to the MISO membership option.

MISO's Net Off-System Sales Benefit Estimate under the MISO Option is Based on an Apples to Oranges Comparison

Q. What are the problems in the MISO's analysis of the net margin on off-system sales?

A. Mr. McNamara reports (Exhibit RRM-1, p. 10) that the "analysis found that if the LGE / KU transmission system were included in MISO, LGE / KU could make more than 8.6 million MWh of off-system sales per year to parties outside its control area. This compares to 5.7 million MWh of non-requirements sales to such parties in 2002. Comparing the net margin on off-system sales for the case in which LGE / KU remain in MISO with Stand Alone margins scaled to actual 2002 non-requirements sales volumes, MISO participation increases LGE / KU net margins on off-system sales by $8.35 million per year. This calculation is presented in Table RRM_1-5."

The primary problem with using the 5.7 million MWh off-system sales number is that 2002 was an anomalous year for LG&E/KU with respect to OSS from its own generation units due to unexpected forced outages that reduced the MWh that could be sold off system. The other problem is that Mr. McNamara does not mention in his testimony that MISO's base estimate of the Companies' OSS was 8 million MWh and the net margin on OSS under the Standalone option was estimated to be $19 million (*See* Table RRM_1-5), computed under the effective transmission constraints and financial hurdle rate scenario. MISO scaled down the 8 million MWh estimate to match the 2002 MWh experience, even though this was an anomalous year for the Companies. However, MISO did not "scale down" the estimate of OSS MWh and hence the net margin on OSS under the MISO option to match the 2002 experience. For the estimates of net margin on OSS to be comparable under the two options, so that a determination of the net benefit can be made, they are either both "scaled down" to match the historical record or they are left unadjusted.

Q. What would be a reasonable estimate of the net margin on OSS for the Companies under the Standalone option?

A. A reasonable lower-bound estimate for the net margin on OSS under the Standalone option would be $21.8 million, the same value as estimated for the MISO option.. The estimate made by MISO of the net margin of $19 million on LG&E/KU's OSS under the Standalone option reflects assumptions that do not square with the facts. MISO estimate of $19 million for the Standalone option was derived using a financial hurdle rate that included a $3/MWh transaction cost adder. MISO has not provided any empirical support for this $3/MWh transaction cost figure. In response to LG&E Initial Data Request No. 33, Mr. McNamara stated that it was based on "professional experience and judgment." If the average market clearing price for spot power were around $30/MWh, a transaction cost equal to 10% of the power price seems unusually high. While the transaction cost may be a positive number, I believe that it would be a small number reflecting the fact that the incremental cost of transacting a bilateral power sale or selling into a day-ahead market at a border bus would be small for a trading or marketing group such as LG&E/KU's Energy Trading. And without any reasonable number to use, I will assume it is zero. This leaves the Companies' point-to-point tariff rate as the financial hurdle for Energy Trading, which means the financial hurdle is about half of what MISO assumes. Energy Trading may pay a point-to-point tariff even if LG&E/KU stays in MISO. Thus, I reason that the estimate of OSS under the Standalone option would likely be equal to the sales in the MISO option, roughly 8.6 million MWh, and the "lost margin on off-system sales" I estimate to be zero.

MISO's Exit Fee Is Overestimated

Q. Do you agree with MISO's estimate of the exit fee?

A. No.

Q. Please explain why you disagree with MISO's estimate.

A. If the Companies were ordered by the Commission to withdraw from MISO, they would be responsible for "[a]ll financial obligations incurred and payments applicable to time periods prior to" the date of withdrawal.[1] Based on MISO's financial statements and informational filings to FERC, MISO has incurred approximately $270 million in capital costs as of the close of 2003, and the 2004 budget increases that figure to approximately $320 million. Not included in this estimate is an additional capital cost outlay of at least $100 million associated with MISO's implementation of its Day Two Congestion Management program, and another $7 million for implementation of the MISO/PJM joint and common market, resulting in capital cost expenditures totaling approximately $427

[1] MISO TOA, Article V, Section II.

million. In addition, MISO's estimated on-going operating expenses according to the 2004 budget totals approximately $140 million.

In the event of a December 31, 2004 "effective" withdrawal, the Companies would be liable for their *pro rata* share of approximately $427 million in capital expenditures and a share of roughly $140 million/year in operating expenses applicable to periods prior to December 31, 2004. LG&E/KU's *pro rata* share as of December 31, 2004 would be based on the size of MISO's member load at that time. MISO's combined load is expected to total approximately 650 to 700 GWh, of which the Companies' *pro rata* share would be approximately 5.6%.[2] Applying this percentage to a total capital cost outlay of $420 million yields a total capital cost financial commitment of approximately $23.8 million as of December 31, 2004. Similarly, LG&E/KU's operating cost exposure would be 5.6% of $140 million or total approximately $7.8 million for the year 2004. However, by the end of 2004, I assume that the Companies would have already paid that portion related to the operating costs through Schedule 10 charges, and would no further obligation on that part. Consequently, my estimate of the Companies' total withdrawal fee is $23.8 million. See Exhibit MJM-3.

The major difference between my estimate of the exit fee and MISO's estimate appears to arise from a difference in what is assumed to be included in the withdrawal fee as of the effective date of withdrawal – December 31, 2004. I assumed that the Companies would have already paid their Schedule 10 obligation for 2004 because they would have remained a member of MISO until the close of the year. I estimate the Schedule 10 charges for 2004 to be $7.8 million. In contrast, MISO has assumed that the

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[2] LG&E/KU's *pro rata* share at the time it exits under this scenario is based on the ratio of its projections of the total MWh sales divided by the projected MWh sales for the entire MISO region for 2004.

Schedule 10 charges would be assessed at the end of 2004 at the time the Companies' withdrawal becomes effective. Thus they include the 2004 Schedule 10 charges in the exit fee. MISO estimates the 2004 Schedule 10 obligation for the Companies to be $7.5 million.

MISO has erred by including the $7.5 million in the exit fee. From the perspective of the MISO option, the exit fee could be avoided if the Companies remained an RTO member. But this $7.9 million is not avoided by the Companies remaining in MISO, it is paid during 2004 while they are a member. The 2004 Schedule 10 charge does not change between the two options, therefore it should not be counted as benefit or a cost under either option.

MISO Underestimates Schedule 10, 16 and 17 Charges

Q. Do you agree with MISO's estimates of the Schedule 10, 16 and 17 charges?

A. No, I do not agree with MISO's estimates of these charges.

Q. Please explain why.

A. Mr. Holstein provides estimates of future Schedule 10, 16 and 17 charges over the period 2004-2010 (Holstein Testimony, p. 14, *l.* 14). From the table provided in Mr. Holstein's testimony (p. 14) these charges are: Schedule 10: $50 million; Schedule 16: $9 million; Schedule 17: $29 million. The total equals $88 million or roughly $12.6 million per year. From Table RRM_1-1, the total Schedule 10, 16 and 17 charges for the period 2005 to 2010 totals $80.5 million; the average is $13.4 million per year. The difference between the number in Table RRM_1-1 and the $88 million number reported in the Holstein testimony I therefore presume to represent an estimate of the 2004 Schedule 10 charges, which would thus equal $7.5 million.

I disagree with the estimates contained in Table RRM_1-1. Based on MISO's own recent forecast of the rates for these schedules, the annual charges over the period 2005-2010 will be approximately $15.5 million per year, or $93.1 million in total (in nominal dollars). The details of my calculations are contained in Exhibit MJM-4.

MISO Underestimates LG&E/KU's Congestion Cost Exposure in the Day Two Market

Q. Do you agree with MISO's assessment of LG&E/KU's exposure to congestion cost risks in the proposed Day Two Market?

A. No. I believe MISO's assessment is deficient because it does not present a complete picture of the risks associated with financial transmission rights ("FTRs"). There are two big downside risks to the use of FTRs to hedge congestion cost risk exposure: the risk of being "under hedged" and the risk of being "over hedged." These risks are not present in the system based on physical transmission rights that exists now in MISO, although that is not to say that a system of physical transmission rights is without risk, the risk simply manifests itself differently than under a system using FTRs.

Q. Please discuss the risk of being under hedged.

A. One congestion cost risk can be characterized as "under hedged." That is, an FTR owner potentially would be under hedged if the load (in MW) scheduled on transmission paths from source to sink exceeds the FTRs held by the FTR owner for those paths. Should the price of power at the sink be greater than the price of power at the source, due to congestion on the grid, the FTR holder will be obligated to pay congestion costs on the MW that exceed the FTR coverage. The cost of this congestion to the FTR owner will be equal to the power price at the sink minus the power price at the source multiplied by the difference between the scheduled load (MW) and the FTR (MW) held. Mr. McNamara has estimated this risk exposure to be $70 per year.

I find it difficult to accept this estimate of the financial risk the Companies potentially would be exposed to for the under hedged position because of the likelihood that the actual payout on FTRs held by the owner may be less than their nominal value, a problem referred to as "cram down."

Mr. McNamara exaggerates when he asserts (Exhibit RRM-1, p. 11) that "a system of financial transmission rights is designed to provide compensation when not all economic power transfers can be accommodated. A financial right assures the holder of a net price that reflects the price of power at the designated source location." [emphasis added] On the contrary, when the FTRs are issued by an ISO, they are subject to a simultaneous feasibility test, which ensures that the total amount of FTRs can be provided under expected network conditions. When this test is conducted in real time, however, the value of the FTRs can be reduced when the power system is not physically capable of fully financing them. When the congestion, revenues are not sufficient to cover payments to FTR holders, FTR payments are reduced on a *pro rata* basis. In examining the FTR markets run by the ISOs in the U.S., Kristiansen[3] found that in PJM, FTR payouts, as a percentage of nominal FTR values, were about 90% in 2001 and 95% in 2002.

McNamara assumes that the FTR payouts will equal 100% of their nominal values. In other words, he assumes the cram down will be zero. Furthermore, in lauding the value of FTRs relative to physical rights, McNamara ignores the fact that FTRs are

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[3] *See*, Tarjei Kristiansen, "Markets for Financial Transmission Rights," Norwegian University of Science and Technology, Department of Electrical Power Engineering, October 2003, attached to the testimony.

obligations while physical rights are options. It is not unreasonable to assume that the MISO Day Two Market will experience the same issues with regard to FTR payouts as other RTO/ISO markets have witnessed. Therefore, the risk exposure to congestion under the MISO option may be significantly higher than portrayed by Mr. McNamara. A more complete analysis of the cost and benefits of MISO membership would have included this consideration.

Q. Please describe the risk of being over hedged?

The risk of being over hedged exists because the FTR type that has been proposed for allocation in the proposed Day Two Market is an obligation. Financial transmission rights are generally defined as rights to receive revenues that, in each hour, equal the quantity of the rights (MW) times the price difference between source and sink locations. The value of an FTR thus depends upon the differences between the power prices at the FTR's source and sink locations over the life of the FTR. But the way that the FTR depends upon power prices is determined by whether the FTR is an *obligation* or an *option*. An *FTR obligation* has the FTR owner receive money for congestion in one direction and pay money for congestion in the other direction. An FTR option is thus more valuable than an FTR obligation because the former allows the owner to escape payment when congestion is in the opposite direction from the obligation.

There are six basic scenarios that can occur under an obligation type FTR. These are illustrated in Table 3. Scenario 1 assumes that the FTR owner holds FTRs for 500 MW, schedules 500 MW in the day-ahead market and that the day-ahead LMP at the sink is $5 higher than the day-ahead LMP at the source. The FTR holder pays congestion cost of $5 times 500 MW or $2,500 and receives the value of the FTR that is also equal to $5 times 500 MW or $2,500. The FTR holder has been hedged perfectly against congestion cost. In Scenario 2, the FTR owner holds a 400 MW FTR and schedules 500 MW in the day-ahead market, with the congestion cost set at $5/MWh. This is the scenario addressed by Mr. McNamara in his analysis that shows only $70 in congestion cost risk per year. The day-ahead schedule exceeds the FTRs held, and the FTR owner pays $500 in congestion cost. In Scenario 3, the FTRs held exceed the FTRs scheduled and the FTR owner receives $500.

Table 3 Illustration of Congestion Cost Risk for Obligation Style FTRs for a 1-hour Transaction Scheduled in a Day-ahead Market

Scenario	FTR Held	Day Ahead Schedule	Day Ahead LMP Source	Day Ahead LMP Sink	Per MWh Cong cost = LMP Source minus LMP Sink	Cong Cost (- paid to MISO / + received from MISO)	FTR Value (- paid to MISO / + received from MISO)	Net (- paid to M / + received fr MISO)
1	500	500	$ 20.00	$ 25.00	$ 5.00	$ (2,500.00)	$ 2,500.00	$
2	400	500	$ 20.00	$ 25.00	$ 5.00	$ (2,500.00)	$ 2,000.00	$ (50(
3	500	400	$ 20.00	$ 25.00	$ 5.00	$ (2,000.00)	$ 2,500.00	$ 500
4	500	500	$ 25.00	$ 20.00	$ (5.00)	$ 2,500.00	$ (2,500.00)	$
5	400	500	$ 25.00	$ 20.00	$ (5.00)	$ 2,500.00	$ (2,000.00)	$ 500.
6	500	400	$ 25.00	$ 20.00	$ (5.00)	$ 2,000.00	$ (2,500.00)	$ (500.(

Scenarios 4, 5 and 6 differ from the first three scenarios in terms of the relationship of the source and sink power prices; the day-ahead power price at the sink is $5 lower than the day-ahead power price at the source. Thus, Scenario 6 becomes the flip side of Scenario 2. The congestion cost risk under Scenario 6 may well be of as much concern or greater concern to any FTR holder as the congestion cost risk under Scenario 2. Any market participant who anticipates holding or buying FTR of any capacity relative to a variable load must weigh both of these risks carefully. Thus, it would not be wise to have too small an FTR relative to peak load as that would expose the FTR owner to a Scenario 2 type of congestion cost risk—the under hedged risk. And by the same token, it would not be wise to have too high an FTR relative to peak load as that would expose the FTR owner to a Scenario 6 type of congestion cost risk—the over hedged risk.

To illustrate how serious this type of risk might be for FTR holders, I have estimated the over hedged risk that the Companies potentially could face based on information I received from MISO and the Companies hourly load data for 2001. MISO, in June 2003, produced an analysis of power prices at LG&E/KU's sources (i.e., their generation units) and their sink (i.e., the native load served by the Companies), which included estimates of the marginal congestion cost at LG&E/KU's sources and sink. In addition, MISO's benefit cost study assumes that the Companies would hold 6617 MW of FTRs to hedge the congestion cost risk of serving the Companies' native load from its own generation. This is the assumption Mr. McNamara uses in computing his estimate of $70 per year for the risk being under hedged.

An FTR allocation of 6617 MW would be expected to hedge all but a very small number of hours against the risk of being under hedged, but by doing so, it exposes the Companies to a very large number of hours in which there is the risk of being over hedged, that is Scenario 6 in Table 3. According to the June 2003 MISO analysis, the average power prices at LG&E/KU's sources are higher than the average power prices at the sink, both for off-peak period hours and peak-period hours for most of the months of the year. From this fact, I estimate that the risk to the Companies of being over hedged to be about $3.2 million. See Exhibit MJM-5.

MISO Claims of Intermediate and Long-term Benefits of RTOs and Day Two Style Markets Are Not Supported by the Evidence MISO Presents

Q. Mr. McNamara (RRM_1 (Details).pdf, at 14) suggests transparent energy and transmission capacity markets will provide efficiency benefits in the intermediate to long-term. He points to the PJM market to support his claim. Do you agree with his assertion that the PJM experience provides evidence that "suggests that such markets contribute to efficiency gains and reductions in consumer prices"?

A. No. While it is conceivable that transparent energy and transmission capacity markets will some day provide efficiency benefits. Where RTOs have evolved from tight power pools, as in the case of PJM, it is even conceivable that transparent energy and transmission capacity markets have already produced efficiency benefits. However, the evidence presented by Mr. McNamara does not support the assertion. The "evidence" as presented by Mr. McNamara grossly distorts the facts.

Mr. McNamara discusses his evidence in the following passage (RRM_1 at 14):

> While open and competitive LMP power markets are a comparatively recent development, available evidence suggests that such markets contribute to efficiency gains and reductions in consumer prices. For example, Figure RRM_1-1 compares trends in average retail prices for the PJM states, since the opening of the PJM LMP wholesale market in April 1998, and for Kentucky. While there are many factors that affect retail prices, the development of an efficient and transparent wholesale market has had a significant impact in the PJM region. It has created a liquid and transparent market that rewards suppliers for improving availability and holding down costs.

Figure RRM_1-1 compares trends in average retail prices for the PJM states since the opening of the PJM LMP wholesale market and for Kentucky. But it does so in a way that distorts the true relationship of those prices to one another.

However, percentage changes in average revenues in the PJM states relative to Kentucky does not constitute *prima facie* evidence of the effects of restructuring in wholesale and retail electric markets, or of efficiency gains resulting from transparent energy and transmission capacity markets. Without a more detailed examination of what took place in these PJM states, declines in average revenues during this period cannot be attributed directly to gains in efficiency or reductions in costs that result from incentives inherent in competitive wholesale electricity markets. Even if there were efficiency gains that resulted from the restructuring of the PJM wholesale market, they could not have been reflected in residential rates during this period because all of the retail prices were fixed during the transition periods, which in many cases extend beyond 2002.

When considered in historical context and in light of what took place in the PJM states there are two major effects at work in the average revenue declines during this period. With the sole exception of Maryland, average revenues in each of the PJM states are reverting toward the national mean. In other words, except for Maryland, each state's prices, which were higher than the national average in 1997, are closer to the national average in 2002. This implies that the initial differences among states are partly due to causes (e.g., one-time mistakes or windfalls) that are fading over time.

A second reason for the relatively large fall in retail rates in the PJM states is that those states mandated relatively large retail rate reductions. Another reason is that some of those states' utilities were able to rapidly recover some sunk costs through the successful sale of their generation assets. These mandated rate reductions and asset sales that permitted more rapid recovery of sunk costs are attributable to the political process pursued in these PJM states rather than to any real economic cost impacts. The mandated rate reductions are temporary, lasting for periods of years that vary with the agreed upon transition period. Thus, the comparison made between PJM and Kentucky tells us less than nothing about what to expect in the intermediate to longer term about the benefits of market reform of the type that has been proposed for the MISO footprint.

Conclusion

Q. Having reviewed the evidence provided by the MISO witnesses, what conclusion do you reach about the net benefit of the MISO membership option?

A. After reviewing the analyses presented by the MISO witnesses Holstein, Falk and McNamara, I conclude that the net benefits of the MISO membership option are still negative. The Companies and their customers are still better off under the Standalone option than the MISO option . In the near-term (2004 to 2010) the costs demonstrably outweigh the benefits. Furthermore, because the costs of MISO membership outweigh the benefits in later years of the analysis, these net costs would continue to grow as one looks farther into the future.

Q. Does this conclude your testimony?

A. Yes

VERIFICATION

COMMONWEALTH OF VIRGINIA)
) **SS:**
CITY OF ALEXANDRIA)

The undersigned, **Mathew J. Morey** , being duly sworn, deposes and says he is a Senior Consultant, Laurits R. Christensen Associates, Inc., that he has personal knowledge of the matters set forth in the foregoing testimony, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

Mathew J. Morey / LS

MATHEW J. MOREY

Subscribed and sworn to before me, a Notary Public in and before said County and State, this _____ day of February 2004.

(SEAL)

____

Notary Public

My Commission Expires:

____

Net Benefits of MISO Membership: MISO Version vs. LG&E/KU Version

Cost of MISO Membership	2004	2005	2006	2007	2008	2009	2010
System Operations & Transmission Costs							
MRMD Staffing, Training, Consulting		400,000	400,000	400,000	400,000	400,000	400,000
Miscellaneous Uplift Charges		500,000	500,000	500,000	500,000	500,000	500,000
Congestion Costs Not Covered by FTRs		73	73	73	73	73	73
Implementation and Administration Costs							
Total of Schedules 10, 16, 17 Charges		13,023,172	13,434,813	13,725,538	13,977,637	13,526,898	12,441,769
Ancillary Market Cost				280,000	280,000	280,000	280,000
Legal, Regulatory, & Transaction Costs							
Net Cost of Committee Participation, Contracts		400,000	400,000	400,000	400,000	400,000	400,000
Net FERC Attachment O Fees		860,000	860,000	860,000	860,000	860,000	860,000
Less: Transmission Revenues							
Less: MISO Schedule 1, 7, 8, and 14 Revenues		(21,824,753)	(21,824,753)	(21,824,753)	(21,824,753)	(21,824,753)	(21,824,753)
Total Cost of MISO Membership -		(6,641,508)	(6,229,867)	(5,659,142)	(5,407,043)	(5,857,782)	(6,942,911)
Cost of Stand Alone Operation							
MISO Exit Fee	38,300,000						
System Operation Costs							
Additional Staffing		300,000	300,000	300,000	300,000	300,000	300,000
Systems Related Costs		720,000	720,000	720,000	720,000	720,000	720,000
Congestion Management Costs		3,657,767	3,657,767	3,657,767	3,657,767	3,657,767	3,657,767
Lost Revenues							
Lost FTR Revenue		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Lost Margin on Wholesale Sales		8,348,007	8,348,007	8,348,007	8,348,007	8,348,007	8,348,007
Less: Transmission Revenues							
Less: LGE/KU Sch. 1,7, & 8 Transmission Revenue on Off-System Sales (		(9,148,532)	(9,148,532)	(9,148,532)	(9,148,532)	(9,148,532)	(9,148,532)
Total Cost of Stand Alone Operations	38,300,000	5,877,242	5,877,242	5,877,242	5,877,242	5,877,242	5,877,242
Net Cost Savings of MISO Membership	38,300,000	12,518,750	12,107,109	11,536,384	11,284,285	11,735,024	12,820,153
Cumulative Net Savings of MISO Membership	38,300,000	50,818,750	62,925,859	74,462,243	85,746,528	97,481,552	110,301,705
Net Present Value Savings from MISO Membership in 2004	38,300,000	11,699,766	10,574,818	9,417,126	8,608,727	8,366,910	8,542,609
Cumulative NPV Savings from MISO Membership	38,300,000	49,999,766	60,574,584	69,991,710	78,600,437	86,967,347	95,509,956

Implied Discount Rate
0.07

Cost of MISO Membership	2004	2005	2006	2007	2008	2009	2010
System Operations & Transmission Costs							
MRMD Staffing, Training, Consulting		400,000	400,000	400,000	400,000	400,000	400,000
Miscellaneous Uplift Charges		500,000	500,000	500,000	500,000	500,000	500,000
Congestion Management Costs		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Implementation and Administration Costs							
Total of Schedules 10, 16, 17 Charges		15,424,073	15,846,223	16,091,815	16,120,328	15,613,236	13,970,927
Ancillary Market Cost				280,000	280,000	280,000	280,000
Legal, Regulatory, & Transaction Costs							
Net Cost of Committee Participation, Contracts		400,000	400,000	400,000	400,000	400,000	400,000
Net FERC Attachment O Fees		860,000	860,000	860,000	860,000	860,000	860,000
Less: Transmission Revenues							
Less: MISO Schedule 1, 7, 8, and 14 Revenues		-	-	-	-	-	-
Total Cost of MISO Membership -	-	19,584,073	20,006,223	20,531,815	20,560,328	20,053,236	18,410,927
Cost of Stand Alone Operation							
MISO Exit Fee	23,767,857						
System Operation Costs							
Additional Staffing		300,000	300,000	300,000	300,000	300,000	300,000
Systems Related Costs		720,000	720,000	720,000	720,000	720,000	720,000
Congestion Management Costs		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Lost Revenues							
Lost FTR Revenue		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Lost Margin on Wholesale Sales		-	-	-	-	-	-
Less: Transmission Revenues							
Less: LGE/KU Sch. 1,7, & 8 Transmission Revenue on Off-System Sales (		-	-	-	-	-	-
Total Cost of Stand Alone Operations	23,767,857	5,020,000	5,020,000	5,020,000	5,020,000	5,020,000	5,020,000
Net Cost Savings of MISO Membership	23,767,857	(14,564,073)	(14,986,223)	(15,511,815)	(15,540,328)	(15,033,236)	(13,390,927)
Cumulative Net Savings of MISO Membership	23,767,857	9,203,784	(5,782,439)	(21,294,253)	(36,834,581)	(51,867,817)	(65,258,744)
Net Present Value Savings from MISO Membership in 2004	23,767,857	(13,611,283)	(13,089,548)	(12,662,261)	(11,855,642)	(10,718,489)	(8,922,940)
Cumulative NPV Savings from MISO Membership	23,767,857	10,156,574	(2,932,973)	(15,595,235)	(27,450,877)	(38,169,366)	(47,092,306)

Exhibit MJM-3

Estimation of LG&E/KU Exit Fee--Effective Exit 12/31/2004

Capital Expenditures 2002	$	270,000,000
Capital Addtn 2003	$	50,000,000
Day Two Implementation	$	100,000,000
MISO/PJM Joint Market	$	7,000,000
Total Capital	$	427,000,000
Operating Budget		
2004 Forecast Op Budget	$	140,000,000
LGE/KU GWh 2004		39
MISO GWh 2004		700
LGE Pro Rata Share		5.57%
LGE/KU pro rata share Capital	$	23,790,000
LGE/KU pro rata share operating		7,800,000
Total Exit Fee	$	31,590,000
Exit w/o Sch. 10		23,790,000

Estimation of Schedule 10, 16 and 17 Charges for the Period 2005-2010

Exhibit MJM-4

ENERGY (GWH)

	KU	LG&E	OSS
2005	22,904	13,231	8,600
2006	23,378	13,420	8,600
2007	23,885	13,647	8,600
2008	24,387	13,865	8,600
2009	24,899	14,087	8,600
2010	25,422	14,313	8,600
2004 Peak Peak Load	4337	2829	7166

New Projections (12/19/03)

MISO's Rates LGEKU#44 page 15

Year	Sch. 10	Sch. 16	Sch. 17
2005	0.1498	0.0495	0.0645
2006	0.1498	0.0515	0.0658
2007	0.1498	0.052	0.0659
2008	0.1549	0.049	0.0634
2009	0.1422	0.0486	0.0625
2010	0.1389	0.0387	0.0512

Schedule 10 Charges (in $1000s)

	Rate	KU	LG&E	OSS	COMBINED
2005	0.1498	$ 3,431	$ 1,982	$ 1,288	$ 6,701
2006	0.1498	$ 3,502	$ 2,010	$ 1,288	$ 6,801
2007	0.1498	$ 3,578	$ 2,044	$ 1,288	$ 6,911
2008	0.1549	$ 3,777	$ 2,148	$ 1,332	$ 7,257
2009	0.1422	$ 3,541	$ 2,003	$ 1,223	$ 6,767
2010	0.1389	$ 3,531	$ 1,988	$ 1,195	$ 6,714

Schedule 16 Charges 95% FTR Annual Peak

	Rate	KU	LG&E	OSS	COMBINED
2005	0.0495	$ 1,786,579	$ 1,165,375	0	$ 2,951,955
2006	0.0515	$ 1,858,764	$ 1,212,461		$ 3,071,226
2007	0.052	$ 1,876,811	$ 1,224,233		$ 3,101,044
2008	0.049	$ 1,768,533	$ 1,153,604		$ 2,922,137
2009	0.0486	$ 1,754,096	$ 1,144,187		$ 2,898,283
2010	0.0387	$ 1,396,780	$ 911,112		$ 2,307,892

Schedule 17 Charges

	Rate	KU	LG&E	OSS	COMBINED
2005	0.0645	$ 2,954,616	$ 1,706,799	$ 1,109,400	$ 5,770,815
2006	0.0658	$ 3,076,545	$ 1,766,072	$ 1,131,760	$ 5,974,377
2007	0.0659	$ 3,148,043	$ 1,798,675	$ 1,133,480	$ 6,080,198
2008	0.0634	$ 3,092,219	$ 1,758,127	$ 1,090,480	$ 5,940,826
2009	0.0625	$ 3,112,338	$ 1,760,900	$ 1,075,000	$ 5,948,238
2010	0.0512	$ 2,603,169	$ 1,465,610	$ 880,640	$ 4,949,419

Total	KU	LG&E	OSS	COMBINED
2005	8,172,215	4,854,178	2,397,680	15,424,073
2006	8,437,334	4,988,849	2,420,040	15,846,223
2007	8,602,827	5,067,228	2,421,760	16,091,815
2008	8,638,234	5,059,474	2,422,620	16,120,328
2009	8,407,030	4,908,286	2,297,920	15,613,236
2010	7,531,007	4,364,740	2,075,180	13,970,927
Totals	49,788,646	29,242,755	14,035,200	93,066,601

Exhibit MSW-5

Exhibit MJM-5

Congestion Cost Risk -- Risk of Being Over Hedged

FTR Allocation (MW) 6617

	sink marginal congestion cost (MCC)	source marginal congestion cost (MCC)	sink MCC minus source MCC	Average MW Scheduled	FTR MW minus Avg MW Scheduled	Potential Hours Exposed	Over Hedge Congestion Cost Risk
JAN	3.75	3.98	-0.23	4437.21	2179.79	368	$ (187,338)
JAN	2.73	2.90	-0.17	3861.96	2755.04	376	$ (178,907)
FEB	2.46	2.60	-0.14	4247.01	2369.99	336	$ (110,323)
FEB	1.49	1.58	-0.09	3667.20	2949.80	336	$ (84,866)
MAR	1.43	1.62	-0.19	3900.18	2716.82	368	$ (186,627)
MAR	1.5	1.58	-0.08	3397.60	3219.40	376	$ (100,370)
APR	1.46	1.63	-0.17	3749.42	2867.58	368	$ (181,154)
APR	1.77	1.94	-0.17	2985.66	3631.34	376	$ (229,271)
MAY	2.34	2.48	-0.14	4016.24	2600.76	368	$ (132,994)
MAY	1.84	2.03	-0.19	2997.06	3619.94	376	$ (254,072)
JUN	3.88	4.15	-0.27	4565.94	2051.06	368	$ (205,365)
JUN	2.92	3.02	-0.10	3340.45	3276.55	376	$ (124,482)
JUL	3.52	3.71	-0.19	4948.58	1668.42	368	$ (114,737)
JUL	3.27	3.50	-0.23	3659.47	2957.53	376	$ (255,999)
AUG	3.59	3.68	-0.09	5199.98	1417.02	368	$ (44,650)
AUG	4.17	4.28	-0.11	3855.45	2761.55	376	$ (113,569)
SEP	2.12	2.19	-0.07	4128.81	2488.19	368	$ (68,483)
SEP	2.55	2.65	-0.10	3116.15	3500.85	376	$ (133,003)
OCT	0.11	0.30	-0.19	3690.35	2926.65	368	$ (206,651)
OCT	1.58	1.48	0.10	2975.52	3641.48	376	$ 133,497
NOV	0.71	0.83	-0.12	3660.22	2956.78	368	$ (128,531)
NOV	1	1.07	-0.07	3047.28	3569.72	376	$ (88,642)
DEC	2.11	2.27	-0.16	3926.28	2690.72	368	$ (160,493)
DEC	1.71	1.78	-0.07	3369.56	3247.44	376	$ (88,016)
Total							$ (3,245,048)

Source LMP prices: MISO Congestion Study June 2003

Source of Avg. Peak/Off-peak MW: LGE Hourly Load Data 2001 grown at 2 percent per annum to 2004

		1	2	3	4	5	6	7	8	9	10	11
10101	3.22E+09	3657	3547	3475	3464	3479	3527	3594	3690	3727	3862	3921
10201	3.22E+09	3799	3768	3787	3801	3893	4115	4475	4781	4870	4897	4915
10301	3.22E+09	4405	4348	4361	4365	4470	4690	5098	5433	5449	5330	5101
10401	3.22E+09	3963	3819	3792	3734	3749	3929	4318	4636	4680	4662	4648
10501	3.22E+09	3845	3721	3638	3587	3613	3802	4186	4523	4519	4457	4396
10601	3.22E+09	3482	3375	3358	3337	3390	3481	3627	3808	3931	3982	3935
10701	3.22E+09	3264	3185	3146	3126	3135	3195	3290	3433	3537	3575	3464
10801	3.22E+09	3209	3152	3152	3175	3277	3493	3966	4342	4392	4454	4494
10901	3.22E+09	3863	3792	3751	3753	3820	4042	4510	4877	4914	4887	4831
11001	3.22E+09	4032	3965	3948	3954	4020	4263	4717	5084	5063	4867	4701
11101	3.22E+09	3813	3734	3721	3744	3812	4052	4541	4893	4862	4746	4610
11201	3.22E+09	3464	3371	3304	3317	3289	3521	3955	4324	4340	4318	4237
11301	3.22E+09	3439	3363	3331	3301	3339	3403	3580	3741	3874	3933	3856
11401	3.22E+09	3119	3020	2972	2950	2958	2967	3056	3177	3279	3390	3430
11501	3.22E+09	2911	2809	2787	2783	2859	3032	3347	3675	3798	3880	3939
11601	3.22E+09	3400	3293	3229	3227	3270	3502	3979	4336	4370	4355	4321
11701	3.22E+09	3571	3465	3430	3401	3449	3752	3984	4453	4470	4431	4354
11801	3.22E+09	3424	3320	3255	3253	3299	3502	3941	4271	4297	4288	4271
11901	3.22E+09	3300	3217	3150	3132	3181	3365	3826	4174	4231	4296	4281
12001	3.22E+09	3544	3428	3365	3343	3388	3469	3638	3825	3979	4129	4222
12101	3.22E+09	3815	3740	3689	3718	3790	3867	3976	4171	4296	4245	4074
12201	3.22E+09	3839	3780	3791	3808	3882	4102	4590	4927	4982	4838	4633
12301	3.22E+09	3877	3813	3790	3801	3870	4109	4575	4872	4818	4695	4511
12401	3.22E+09	3560	3469	3444	3440	3505	3761	4243	4546	4543	4462	4334
12501	3.22E+09	3702	3638	3613	3603	3669	3900	4383	4706	4712	4654	4575
12601	3.22E+09	3925	3866	3830	3828	3897	4110	4553	4790	4800	4725	4646
12701	3.22E+09	3350	3253	3196	3177	3219	3307	3458	3650	3822	3963	4024
12801	3.22E+09	3544	3500	3484	3537	3531	3580	3733	3836	3913	3957	3925
12901	3.22E+09	3298	3229	3205	3186	3257	3449	3907	4241	4239	4222	4148
13001	3.22E+09	3060	2938	2871	2840	2920	3114	3572	3925	3871	3865	3836
13101	3.22E+09	3104	3005	2974	2933	3006	3226	3705	4056	4080	4092	4103
20101	3.22E+09	3390	3289	3235	3220	3257	3469	3919	4278	4286	4273	4254
20201	3.22E+09	3524	3408	3349	3321	3363	3616	4086	4496	4582	4584	4559
20301	3.22E+09	3905	3807	3754	3745	3768	3845	3983	4136	4253	4243	4160
20401	3.22E+09	3261	3160	3109	3075	3083	3125	3215	3338	3464	3526	3436
20501	3.22E+09	3170	3115	3113	3097	3194	3435	3881	4276	4318	4330	4356

20601	3.22E+09	3616	3503	3466	3433	3478	3656	4100	4400	4354	4225	4119
20701	3.22E+09	3252	3162	3115	3083	3144	3374	3807	4145	4115	4066	4006
20801	3.22E+09	3110	3029	2991	2967	3008	3192	3629	3956	3910	3831	3773
20901	3.22E+09	2844	2732	2664	2643	2662	2848	3264	3604	3644	3647	3631
21001	3.22E+09	2967	2881	2847	2835	2872	2966	3126	3329	3528	3689	3736
21101	3.22E+09	3312	3260	3255	3259	3300	3365	3489	3604	3704	3715	3630
21201	3.22E+09	3193	3130	3104	3102	3163	3373	3794	4136	4162	4160	4140
21301	3.22E+09	3093	2976	2917	2890	2917	3133	3591	3890	3909	3914	3913
21401	3.22E+09	2976	2844	2774	2747	2765	2981	3398	3733	3748	3747	3767
21501	3.22E+09	2837	2701	2650	2602	2636	2854	3270	3624	3673	3740	3774
21601	3.22E+09	2958	2824	2750	2715	2779	2951	3359	3718	3744	3812	3907
21701	3.22E+09	3303	3206	3135	3144	3200	3287	3458	3612	3779	3896	3892
21801	3.22E+09	3508	3449	3415	3428	3442	3511	3619	3742	3829	3783	3690
21901	3.22E+09	3375	3318	3306	3334	3411	3605	3945	4229	4294	4258	4173
22001	3.22E+09	3153	3044	2991	2978	3040	3226	3681	3945	3954	3939	3916
-22101	3.22E+09	3030	2923	2888	2881	2955	3183	3670	3978	4038	4037	4024
22201	3.22E+09	3468	3360	3311	3337	3407	3636	4010	4302	4386	4414	4404
22301	3.22E+09	3535	3442	3396	3375	3425	3591	3995	4168	4429	4369	4168
22401	3.22E+09	3170	3033	2979	2921	2944	2985	3134	3243	3371	3438	3443
22501	3.22E+09	2504	2394	2357	2327	2339	2365	2445	2515	2662	2788	2814
22601	3.22E+09	2746	2708	2731	2799	2872	3164	3677	3974	3972	3880	3805
22701	3.22E+09	3076	3003	2970	2974	3035	3262	3738	4004	3959	3881	3870
22801	3.22E+09	3240	3144	3106	3087	3148	3360	3831	4108	4135	4064	4019
30101	3.22E+09	3407	3349	3315	3311	3387	3618	4085	4340	4329	4196	4064
30201	3.22E+09	3125	3014	2941	2922	2949	3129	3579	3835	3854	3876	3860
30301	3.22E+09	3054	2968	2873	2849	2854	2901	3050	3164	3333	3430	3450
30401	3.22E+09	2719	2637	2578	2568	2576	2640	2720	2846	3005	3165	3198
30501	3.22E+09	3139	3107	3093	3145	3237	3448	3937	4291	4324	4327	4311
30601	3.22E+09	3782	3705	3686	3691	3763	3956	4351	4580	4611	4594	4566
30701	3.22E+09	3613	3532	3487	3484	3523	3726	4164	4406	4434	4390	4306
30801	3.22E+09	3515	3435	3406	3414	3473	3696	4060	4379	4282	4185	4090
30901	3.22E+09	3392	3339	3307	3305	3401	3629	4043	4269	4274	4174	4100
31001	3.22E+09	3389	3302	3289	3335	3369	3474	3627	3687	3720	3656	3555
31101	3.22E+09	2940	2916	2872	2880	2907	2970	3049	3154	3195	3201	3082
31201	3.22E+09	2711	2663	2702	2739	2834	3030	3463	3712	3773	3774	3757
31301	3.22E+09	2847	2751	2691	2662	2706	2906	3375	3609	3611	3631	3575
31401	3.22E+09	2953	2870	2838	2829	2923	3175	3596	3833	3773	3700	3649

31501	3.22E+09	2902	2825	2770	2737	2773	2985	3422	3689	3740	3748	3782
31601	3.22E+09	2984	2890	2805	2762	2787	2973	3364	3594	3654	3679	3721
31701	3.22E+09	2999	2878	2836	2807	2821	2889	3037	3171	3376	3528	3592
31801	3.22E+09	3010	2888	2931	2914	2950	3020	3120	3175	3242	3239	3165
31901	3.22E+09	2965	2950	2966	3015	3113	3362	3812	4030	3989	3915	3845
32001	3.22E+09	2983	2890	2831	2799	2871	3092	3519	3769	3836	3884	3881
32101	3.22E+09	3288	3187	3151	3117	3187	3405	3763	4038	4082	4071	4088
32201	3.22E+09	3153	3072	3018	3017	3089	3311	3755	3935	3899	3813	3762
32301	3.22E+09	3100	3027	3010	3001	3085	3303	3727	3920	3854	3750	3669
32401	3.22E+09	2847	2692	2704	2685	2701	2771	2898	2968	3169	3312	3337
32501	3.22E+09	3037	2977	2957	2977	3018	3109	3196	3250	3334	3331	3256
32601	3.22E+09	3275	3226	3247	3293	3425	3647	4098	4333	4378	4244	4226
32701	3.22E+09	3609	3552	3546	3546	3633	3854	4247	4374	4403	4226	4110
32801	3.22E+09	3470	3418	3385	3438	3503	3751	4157	4348	4221	4067	3964
32901	3.22E+09	3062	2972	2923	2906	2919	3146	3527	3760	3836	3825	3847
33001	3.22E+09	3008	2936	2893	2867	2935	3151	3544	3726	3734	3695	3665
33101	3.22E+09	2855	2742	2658	2631	2625	2695	2794	2939	3103	3229	3255
40101	3.22E+09	2719	2630	2586	2622	2647	2765	2909	3047	3168	3228	3180
40201	3.22E+09	2875	2851	2869	2964	3166	3612	3952	3969	3930	3874	3789
40301	3.22E+09	2829	2755	2720	2769	2916	3328	3663	3691	3683	3674	3653
40401	3.22E+09	2819	2766	2742	2789	2976	3423	3746	3722	3686	3680	3561
40501	3.22E+09	2724	2669	2655	2688	2889	3323	3606	3605	3589	3579	3532
40601	3.22E+09	2690	2608	2549	2562	2721	3091	3404	3472	3524	3584	3649
40701	3.22E+09	2721	2583	2514	2482	2503	2641	2734	2892	3078	3186	3215
40801	3.22E+09	2651	2539	2477	2428	2441	2473	2520	2634	2831	2934	3047
40901	3.22E+09	2710	2672	2624	2638	2761	3089	3377	3531	3727	3892	4018
41001	3.22E+09	3041	2908	2807	2806	2913	3245	3500	3638	3818	4000	4149
41101	3.22E+09	2929	2831	2731	2755	2864	3184	3412	3575	3729	3945	4135
41201	3.22E+09	3084	2937	2847	2842	2942	3260	3485	3628	3773	3946	4040
41301	3.22E+09	2716	2607	2508	2497	2562	2775	2906	3066	3216	3326	3388
41401	3.22E+09	2347	2298	2241	2229	2220	2342	2429	2619	2786	2858	2906
41501	3.22E+09	2365	2245	2201	2159	2207	2273	2363	2525	2699	2727	2694
41601	3.22E+09	2359	2333	2318	2397	2609	3075	3383	3437	3485	3510	3479
41701	3.22E+09	2824	2791	2793	2853	3065	3545	3859	3946	4011	4018	3958
41801	3.22E+09	3168	3142	3115	3181	3386	3808	4057	4056	3974	3892	3770
41901	3.22E+09	3002	2962	2969	3056	3285	3716	3911	3912	3809	3743	3651
42001	3.22E+09	2744	2665	2623	2660	2834	3263	3522	3619	3665	3716	3672

42101	3.22E+09	2558	2461	2404	2395	2446	2557	2683	2830	2994	3063	3100
42201	3.22E+09	2464	2341	2297	2276	2287	2338	2380	2561	2737	2897	3001
42301	3.22E+09	2703	2610	2573	2598	2744	3162	3442	3618	3736	3916	4009
42401	3.22E+09	2830	2697	2597	2572	2704	3104	3353	3423	3493	3498	3513
42501	3.22E+09	2620	2596	2542	2595	2800	3304	3561	3569	3548	3568	3558
42601	3.22E+09	2720	2647	2639	2659	2865	3360	3595	3605	3586	3605	3573
42701	3.22E+09	2677	2607	2561	2600	2774	3212	3448	3498	3503	3565	3579
42801	3.22E+09	2593	2470	2384	2344	2380	2480	2563	2755	2910	3016	3048
42901	3.22E+09	2337	2272	2253	2230	2283	2343	2402	2574	2685	2736	2777
43001	3.22E+09	2510	2372	2385	2434	2624	3025	3269	3410	3539	3647	3707
50101	3.22E+09	2912	2762	2659	2659	2778	3169	3436	3561	3723	3855	3974
50201	3.22E+09	2866	2736	2638	2643	2776	3154	3412	3575	3654	3860	3998
50301	3.22E+09	2881	2775	2660	2647	2796	3160	3414	3563	3716	3885	4035
50401	3.22E+09	3017	2869	2753	2738	2841	3146	3394	3595	3783	3978	4152
50501	3.22E+09	2851	2676	2571	2497	2503	2552	2647	2857	3109	3364	3556
50601	3.22E+09	2765	2621	2530	2467	2451	2471	2494	2720	3001	3253	3484
50701	3.22E+09	2793	2694	2658	2677	2835	3202	3501	3693	3876	4023	4122
50801	3.22E+09	2729	2646	2570	2594	2746	3145	3424	3531	3662	3785	3869
50901	3.22E+09	2703	2590	2518	2531	2679	3059	3315	3455	3586	3702	3812
51001	3.22E+09	2778	2659	2574	2569	2729	3098	3371	3515	3643	3803	3916
51101	3.22E+09	2903	2759	2663	2629	2782	3127	3434	3612	3758	3938	4063
51201	3.22E+09	2789	2637	2515	2475	2504	2582	2648	2895	3067	3201	3263
51301	3.22E+09	2296	2203	2168	2147	2167	2184	2262	2462	2610	2673	2689
51401	3.22E+09	2408	2353	2345	2408	2581	2987	3255	3397	3479	3586	3656
51501	3.22E+09	2708	2588	2516	2538	2693	3062	3371	3530	3702	3889	4058
51601	3.22E+09	3209	3037	2871	2865	2937	3245	3629	3833	4067	4318	4489
51701	3.22E+09	3349	3203	3074	3038	3157	3512	3844	4029	4230	4478	4683
51801	3.22E+09	3238	3093	2968	2951	3074	3419	3702	3960	4165	4398	4591
51901	3.22E+09	3020	2899	2767	2725	2726	2800	2890	3111	3346	3538	3660
52001	3.22E+09	2700	2538	2479	2475	2445	2447	2546	2760	2981	3144	3327
52101	3.22E+09	3000	2870	2840	2845	3003	3374	3692	3869	3933	4014	4041
52201	3.22E+09	2929	2810	2728	2710	2825	3180	3457	3557	3662	3765	3746
52301	3.22E+09	2686	2599	2529	2541	2717	3086	3387	3486	3553	3613	3609
52401	3.22E+09	2674	2572	2517	2551	2685	3051	3342	3472	3552	3613	3615
52501	3.22E+09	2636	2536	2489	2500	2633	2953	3202	3364	3478	3547	3615
52601	3.22E+09	2398	2317	2271	2267	2304	2327	2417	2590	2725	2826	2888
52701	3.22E+09	2283	2205	2147	2128	2157	2153	2220	2408	2551	2648	2683

52801	3.22E+09	2244	2162	2141	2137	2137	2157	2221	2390	2570	2732	2838
52901	3.22E+09	2465	2398	2392	2398	2559	2844	3169	3415	3584	3761	3859
53001	3.22E+09	2757	2647	2581	2575	2720	3023	3299	3492	3695	3847	3974
53101	3.22E+09	2783	2674	2588	2580	2734	3000	3278	3442	3570	3643	3660
60101	3.22E+09	2857	2756	2680	2681	2799	3110	3381	3580	3699	3727	3754
60201	3.22E+09	2503	2376	2334	2314	2370	2446	2549	2730	2887	3030	3067
60301	3.22E+09	2342	2248	2215	2180	2211	2192	2267	2446	2605	2683	2748
60401	3.22E+09	2540	2458	2452	2486	2618	2944	3254	3487	3606	3743	3806
60501	3.22E+09	2877	2782	2686	2685	2837	3122	3417	3696	3904	4084	4230
60601	3.22E+09	3266	3102	2976	2961	3044	3309	3622	3943	4138	4388	4552
60701	3.22E+09	3264	3131	3016	2986	3115	3414	3708	3935	4109	4237	4341
60801	3.22E+09	3222	3040	2913	2884	2967	3193	3509	3761	3975	4206	4343
60901	3.22E+09	2871	2733	2601	2542	2552	2557	2679	2922	3177	3413	3578
61001	3.22E+09	2655	2506	2439	2385	2343	2324	2413	2648	2902	3124	3338
61101	3.22E+09	2945	2831	2737	2739	2851	3108	3440	3718	4017	4309	4506
61201	3.22E+09	3616	3383	3222	3157	3233	3459	3750	4057	4398	4692	4975
61301	3.22E+09	3813	3597	3401	3336	3411	3597	3909	4205	4499	4832	5127
61401	3.22E+09	3738	3540	3378	3317	3421	3651	3959	4296	4606	4876	5186
61501	3.22E+09	3991	3725	3537	3436	3536	3712	4063	4420	4779	5120	5318
61601	3.22E+09	3214	3047	2925	2840	2825	2857	2981	3288	3599	3864	4029
61701	3.22E+09	3013	2844	2723	2652	2633	2568	2675	2995	3341	3625	3871
61801	3.22E+09	3169	3014	2916	2884	2976	3196	3554	3881	4226	4513	4761
61901	3.22E+09	3470	3269	3120	3039	3139	3335	3677	4013	4362	4663	4990
62001	3.22E+09	3839	3613	3470	3343	3448	3656	3955	4159	4344	4524	4679
62101	3.22E+09	3437	3242	3123	3100	3213	3453	3790	4025	4274	4568	4769
62201	3.22E+09	3251	3085	2953	2921	3032	3280	3504	3696	3832	3915	3998
62301	3.22E+09	2770	2641	2545	2500	2514	2541	2628	2807	3026	3265	3408
62401	3.22E+09	2564	2459	2377	2337	2353	2307	2403	2566	2812	3025	3196
62501	3.22E+09	2868	2760	2663	2669	2777	3017	3303	3596	3800	4009	4145
62601	3.22E+09	3138	2975	2852	2817	2930	3151	3430	3681	3924	4174	4356
62701	3.22E+09	3206	3041	2908	2859	2964	3196	3450	3725	3965	4241	4458
62801	3.22E+09	3332	3160	3011	2966	3066	3280	3555	3815	4040	4275	4491
62901	3.22E+09	3291	3092	2986	2947	3036	3254	3536	3870	4161	4476	4670
63001	3.22E+09	3224	3032	2911	2848	2816	2837	2925	3250	3586	3863	4087
70101	3.22E+09	3023	2895	2789	2728	2708	2676	2741	2982	3286	3582	3818
70201	3.22E+09	3103	2896	2771	2725	2859	2900	3208	3429	3624	3766	3943
70301	3.22E+09	3000	2833	2726	2671	2770	2951	3234	3567	3850	4193	4509

70401	3.22E+09	3109	2948	2847	2758	2773	2770	2815	3010	3257	3554	3836
70501	3.22E+09	2989	2862	2768	2774	2894	3154	3391	3700	3942	4265	4514
70601	3.22E+09	3068	2869	2735	2652	2719	2886	3129	3410	3641	3873	4067
70701	3.22E+09	2918	2736	2586	2551	2549	2546	2651	2875	3151	3361	3566
70801	3.22E+09	3501	3396	3278	3211	3203	3153	3236	3563	3968	4315	4594
70901	3.22E+09	3410	3312	3221	3202	3297	3558	3840	4109	4273	4526	4803
71001	3.22E+09	3885	3691	3524	3465	3557	3751	4067	4394	4731	5077	5318
71101	3.22E+09	4023	3793	3626	3520	3603	3810	4105	4387	4658	4910	5109
71201	3.22E+09	3241	3063	2912	2852	2945	3164	3408	3666	3857	4063	4202
71301	3.22E+09	3097	2929	2804	2760	2878	3068	3338	3613	3853	4094	4257
71401	3.22E+09	2928	2767	2635	2572	2599	2591	2708	2949	3244	3493	3690
71501	3.22E+09	2830	2659	2544	2486	2472	2441	2500	2732	3042	3304	3539
71601	3.22E+09	3092	2927	2840	2807	2891	3101	3391	3725	4003	4283	4479
71701	3.22E+09	3599	3431	3311	3260	3345	3562	3822	4109	4369	4556	4729
71801	3.22E+09	3861	3703	3552	3478	3526	3731	3938	4123	4298	4484	4619
71901	3.22E+09	3662	3503	3397	3384	3460	3714	3976	4232	4440	4713	4949
72001	3.22E+09	3888	3711	3564	3526	3629	3866	4100	4335	4631	5005	5264
72101	3.22E+09	3576	3381	3245	3166	3155	3175	3257	3549	3907	4275	4569
72201	3.22E+09	3635	3452	3306	3256	3259	3229	3253	3514	3802	4049	4256
72301	3.22E+09	3503	3368	3276	3262	3401	3666	3941	4247	4570	4941	5288
72401	3.22E+09	3971	3794	3647	3568	3645	3866	4112	4406	4777	5160	5431
72501	3.22E+09	4142	3931	3779	3716	3796	4010	4275	4550	4903	5208	5474
72601	3.22E+09	3967	3762	3618	3557	3654	3963	4166	4358	4491	4677	4763
72701	3.22E+09	3496	3340	3210	3199	3284	3516	3778	4002	4213	4471	4618
72801	3.22E+09	3486	3334	3187	3132	3126	3211	3278	3493	3789	4093	4344
72901	3.22E+09	3381	3246	3162	3110	3098	3149	3172	3341	3561	3788	3961
73001	3.22E+09	3546	3397	3289	3257	3371	3618	3876	4217	4543	4897	5218
73101	3.22E+09	3923	3715	3538	3462	3548	3770	3987	4311	4663	5048	5317
80101	3.22E+09	4014	3802	3612	3549	3634	3859	4052	4427	4722	5104	5373
80201	3.22E+09	4122	3901	3718	3638	3730	3967	4184	4496	4836	5139	5452
80301	3.22E+09	4218	4038	3872	3795	3826	4094	4311	4515	4659	4785	4880
80401	3.22E+09	3600	3433	3274	3211	3199	3267	3312	3548	3848	4131	4363
80501	3.22E+09	3430	3256	3103	3014	2948	2925	2945	3147	3523	3881	4204
80601	3.22E+09	3821	3652	3548	3503	3602	3864	4123	4412	4756	5098	5397
80701	3.22E+09	4068	3879	3729	3653	3737	3986	4228	4541	4897	5253	5546
80801	3.22E+09	4180	3983	3833	3736	3836	4086	4323	4670	4987	5390	5595
80901	3.22E+09	4319	4128	3980	3901	3979	4263	4494	4769	5094	5428	5557

81001	3.22E+09	4037	3882	3783	3745	3859	4134	4369	4597	4820	5045	5252
81101	3.22E+09	3705	3511	3368	3292	3294	3382	3393	3626	3864	4124	4343
81201	3.22E+09	3300	3154	3051	3003	2994	3034	3046	3264	3515	3775	4043
81301	3.22E+09	3435	3301	3174	3134	3246	3519	3772	4062	4383	4692	4945
81401	3.22E+09	3588	3425	3268	3191	3288	3583	3795	3995	4245	4531	4765
81501	3.22E+09	3442	3253	3093	3055	3173	3496	3728	3916	4157	4477	4713
81601	3.22E+09	3559	3411	3272	3239	3347	3704	3984	4186	4464	4773	4954
81701	3.22E+09	3453	3274	3122	3062	3173	3471	3720	3937	4220	4475	4617
81801	3.22E+09	3259	3070	2940	2857	2850	2893	3006	3139	3365	3551	3657
81901	3.22E+09	3087	2928	2808	2756	2746	2783	2809	2956	3192	3404	3560
82001	3.22E+09	2942	2837	2783	2790	2939	3330	3565	3751	3973	4174	4302
82101	3.22E+09	3098	2958	2861	2826	2963	3329	3548	3719	3958	4174	4362
82201	3.22E+09	3301	3142	3036	2997	3132	3520	3783	3934	4137	4396	4652
82301	3.22E+09	4030	3883	3765	3723	3822	4210	4444	4665	4935	5245	5491
82401	3.22E+09	3760	3569	3409	3345	3449	3794	4037	4261	4518	4738	4899
82501	3.22E+09	3623	3440	3288	3225	3225	3303	3359	3563	3790	4234	4485
82601	3.22E+09	3455	3338	3232	3164	3144	3190	3195	3385	3680	3941	4248
82701	3.22E+09	3251	3146	3107	3120	3272	3684	4026	4176	4301	4445	4540
82801	3.22E+09	3442	3291	3161	3130	3262	3645	3896	4079	4284	4585	4735
82901	3.22E+09	3685	3513	3397	3368	3476	3845	4132	4254	4512	4739	4922
83001	3.22E+09	3655	3495	3358	3311	3433	3832	4071	4277	4529	4793	5013
83101	3.22E+09	3689	3510	3397	3374	3492	3869	4170	4284	4407	4470	4530
90101	3.22E+09	3084	2940	2856	2794	2775	2841	2853	3034	3293	3503	3654
90201	3.22E+09	2751	2625	2543	2489	2491	2518	2532	2703	2940	3172	3403
90301	3.22E+09	2933	2805	2715	2661	2690	2772	2789	2894	3132	3374	3539
90401	3.22E+09	3101	2999	2943	2959	3120	3575	3882	4063	4232	4456	4673
90501	3.22E+09	3581	3432	3293	3248	3368	3708	3970	4078	4258	4514	4740
90601	3.22E+09	3356	3183	3041	2989	3112	3493	3711	3866	4090	4362	4632
90701	3.22E+09	3783	3612	3472	3406	3515	3908	4181	4339	4576	4864	5128
90801	3.22E+09	3445	3265	3131	3044	3058	3140	3226	3414	3684	3970	4214
90901	3.22E+09	3351	3202	3071	3012	2983	3021	3029	3224	3550	3863	4040
91001	3.22E+09	3160	3005	2876	2868	3007	3356	3631	3705	3824	3909	3977
91101	3.22E+09	2857	2747	2652	2642	2785	3166	3427	3528	3677	3813	3967
91201	3.22E+09	2853	2712	2655	2653	2786	3166	3403	3518	3716	3919	4093
91301	3.22E+09	3060	2904	2788	2761	2888	3265	3533	3655	3859	4113	4303
91401	3.22E+09	3010	2835	2737	2707	2825	3201	3429	3489	3548	3620	3625
91501	3.22E+09	2516	2394	2342	2312	2345	2453	2532	2677	2828	2932	3002

91601	3.22E+09	2311	2241	2192	2175	2194	2256	2306	2432	2584	2656	2717
91701	3.22E+09	2507	2444	2417	2454	2640	3081	3326	3501	3527	3689	3815
91801	3.22E+09	2897	2805	2721	2718	2862	3278	3596	3690	3790	3896	3968
91901	3.22E+09	3002	2880	2825	2926	2978	3385	3723	3795	3874	3949	3987
92001	3.22E+09	2846	2757	2685	2685	2829	3231	3515	3593	3692	3816	3932
92101	3.22E+09	2826	2700	2640	2655	2807	3192	3472	3539	3682	3831	3925
92201	3.22E+09	2777	2661	2567	2521	2551	2620	2742	2852	3064	3179	3417
92301	3.22E+09	2577	2406	2344	2299	2327	2359	2411	2540	2752	2923	3086
92401	3.22E+09	2796	2686	2649	2699	2813	3194	3542	3598	3651	3698	3703
92501	3.22E+09	2572	2499	2467	2487	2624	3101	3398	3479	3508	3532	3531
92601	3.22E+09	2688	2615	2569	2604	2805	3265	3575	3576	3599	3581	3537
92701	3.22E+09	2610	2529	2483	2533	2751	3206	3488	3520	3541	3556	3541
92801	3.22E+09	2572	2496	2449	2493	2669	3111	3403	3437	3472	3493	3461
92901	3.22E+09	2533	2447	2386	2372	2441	2545	2682	2814	2915	2960	2961
93001	3.22E+09	2338	2275	2232	2223	2290	2374	2467	2575	2661	2727	2735
100101	3.22E+09	2409	2398	2387	2455	2649	3127	3451	3475	3517	3556	3585
100201	3.22E+09	2658	2570	2519	2529	2711	3139	3428	3460	3507	3613	3651
100301	3.22E+09	2740	2643	2545	2562	2730	3148	3483	3485	3553	3644	3722
100401	3.22E+09	2729	2636	2581	2571	2717	3120	3428	3461	3545	3651	3723
100501	3.22E+09	2704	2611	2537	2550	2696	3053	3372	3446	3562	3689	3753
100601	3.22E+09	2489	2401	2348	2321	2365	2477	2660	2782	2909	2958	2943
100701	3.22E+09	2406	2369	2379	2354	2426	2541	2674	2800	2860	2821	2748
100801	3.22E+09	2576	2537	2557	2661	2828	3266	3576	3627	3630	3630	3582
100901	3.22E+09	2719	2645	2624	2660	2858	3290	3594	3589	3569	3593	3588
101001	3.22E+09	2649	2590	2544	2592	2764	3193	3490	3508	3552	3590	3593
101101	3.22E+09	2717	2641	2587	2594	2749	3153	3490	3541	3615	3713	3695
101201	3.22E+09	2727	2642	2591	2588	2727	3106	3438	3534	3637	3706	3690
101301	3.22E+09	2656	2540	2472	2446	2465	2600	2742	2864	3031	3165	3244
101401	3.22E+09	2471	2398	2355	2319	2326	2390	2501	2569	2622	2735	2751
101501	3.22E+09	2433	2416	2394	2469	2668	3090	3471	3510	3540	3583	3555
101601	3.22E+09	2670	2616	2570	2593	2741	3205	3548	3631	3679	3722	3718
101701	3.22E+09	2955	2893	2861	2928	3108	3576	3897	3879	3824	3772	3695
101801	3.22E+09	3004	2971	2956	3020	3237	3691	4019	3998	3900	3818	3709
101901	3.22E+09	2785	2741	2688	2727	2934	3299	3629	3656	3651	3643	3582
102001	3.22E+09	2568	2496	2453	2444	2522	2635	2837	2924	3016	3044	2994
102101	3.22E+09	2314	2257	2231	2232	2268	2374	2485	2610	2702	2713	2715
102201	3.22E+09	2442	2403	2402	2465	2657	3121	3479	3509	3542	3630	3630

102301	3.22E+09	2728	2629	2589	2590	2769	3189	3564	3599	3648	3744	3779
102401	3.22E+09	2748	2630	2505	2670	2769	3194	3554	3617	3648	3736	3738
102501	3.22E+09	2618	2537	2473	2496	2682	3121	3491	3567	3547	3555	3555
102601	3.22E+09	2844	2789	2730	2780	2986	3439	3782	3813	3770	3767	3702
102701	3.22E+09	2951	2868	2830	2833	2934	3059	3240	3375	3475	3481	3390
102801	3.22E+09	2843	2817	2829	2856	2888	2979	3094	3201	3267	3193	3059
102901	3.22E+09	2919	2900	2902	2955	3054	3300	3765	3999	3968	3871	3772
103001	3.22E+09	2997	2900	2825	2820	2894	3071	3526	3752	3713	3695	3663
103101	3.22E+09	2863	2816	2773	2751	2843	3220	3384	3622	3736	3669	3686
110101	3.22E+09	2792	2702	2624	2649	2670	2876	3298	3505	3521	3533	3559
110201	3.22E+09	2747	2587	2549	2494	2521	2714	3064	3359	3417	3512	3561
110301	3.22E+09	2640	2504	2434	2359	2357	2430	2595	2730	2886	2994	3037
110401	3.22E+09	2568	2475	2431	2419	2443	2509	2627	2721	2844	2864	2812
110501	3.22E+09	2575	2513	2504	2533	2610	2840	3358	3627	3689	3643	3629
110601	3.22E+09	3064	2972	2939	2923	3008	3227	3677	3893	3891	3799	3774
110701	3.22E+09	3064	2992	2969	2954	3012	3250	3698	3936	3903	3788	3716
110801	3.22E+09	2972	2884	2839	2830	2905	3120	3595	3828	3792	3725	3683
110901	3.22E+09	2811	2727	2661	2649	2694	2930	3373	3654	3671	3651	3613
111001	3.22E+09	2966	2865	2823	2787	2835	2897	3023	3160	3251	3243	3191
111101	3.22E+09	2578	2503	2473	2461	2500	2577	2684	2801	2925	2934	2870
111201	3.22E+09	2876	2822	2826	2855	2982	3234	3680	3951	3956	3862	3778
111301	3.22E+09	3124	3044	3020	3018	3076	3297	3745	4015	3974	3863	3761
111401	3.22E+09	2995	2920	2867	2846	2917	3135	3580	3849	3835	3783	3709
111501	3.22E+09	3017	2928	2901	2891	2962	3170	3624	3891	3853	3789	3718
111601	3.22E+09	2965	2886	2852	2827	2881	3071	3515	3809	3809	3736	3653
111701	3.22E+09	2765	2668	2612	2570	2589	2658	2805	2954	3084	3135	3148
111801	3.22E+09	2536	2456	2409	2408	2425	2477	2581	2653	2790	2863	2816
111901	3.22E+09	2593	2543	2537	2532	2605	2807	3274	3582	3629	3657	3675
112001	3.22E+09	3008	2890	2878	2855	2942	3193	3681	3968	3974	3912	3875
112101	3.22E+09	3332	3237	3194	3180	3265	3483	3857	4160	4173	4092	4000
112201	3.22E+09	3013	2871	2812	2753	2766	2802	2904	2988	3109	3153	3135
112301	3.22E+09	2531	2481	2466	2456	2496	2558	2712	2830	2917	2903	2890
112401	3.22E+09	2377	2292	2228	2207	2211	2274	2366	2487	2640	2780	2882
112501	3.22E+09	2419	2298	2257	2214	2220	2284	2373	2478	2590	2723	2765
112601	3.22E+09	2729	2697	2693	2714	2808	3043	3524	3848	3808	3782	3690
112701	3.22E+09	2870	2763	2693	2645	2685	2843	3236	3580	3601	3659	3681
112801	3.22E+09	2872	2769	2700	2676	2704	2903	3381	3729	3798	3826	3873

112901	3.22E+09	2997	2883	2814	2769	2793	2978	3398	3715	3726	3745	3788
113001	3.22E+09	2866	2749	2666	2634	2670	2854	3299	3640	3695	3765	3776
120101	3.22E+09	3037	2899	2839	2786	2782	2841	2986	3173	3314	3377	3406
120201	3.22E+09	2884	2802	2743	2715	2735	2769	2857	2970	3084	3076	3001
120301	3.22E+09	2892	2849	2832	2851	2950	3186	3656	4038	3958	3913	3773
120401	3.22E+09	3010	2903	2826	2793	2833	3017	3480	3780	3777	3754	3734
120501	3.22E+09	2923	2792	2747	2688	2799	2954	3411	3713	3707	3649	3646
120601	3.22E+09	2863	2714	2650	2586	2639	2802	3256	3603	3641	3681	3715
120701	3.22E+09	2878	2743	2676	2629	2659	2828	3296	3634	3680	3664	3656
120801	3.22E+09	2861	2695	2578	2525	2516	2577	2710	2904	3052	3188	3258
120901	3.22E+09	2785	2677	2622	2625	2638	2686	2792	2939	3066	3170	3195
121001	3.22E+09	3106	3049	3027	3026	3106	3307	3753	4125	4129	4136	4085
121101	3.22E+09	3230	3123	3076	3050	3116	3322	3782	4106	4089	4025	3952
121201	3.22E+09	3095	2965	2894	2849	2886	3070	3490	3824	3827	3833	3813
121301	3.22E+09	2965	2813	2737	2670	2697	2850	3275	3636	3700	3704	3758
121401	3.22E+09	2924	2788	2719	2674	2697	2860	3254	3618	3659	3684	3684
121501	3.22E+09	3014	2874	2783	2739	2715	2768	2919	3087	3252	3319	3335
121601	3.22E+09	2836	2705	2656	2594	2586	2624	2710	2868	2987	3067	3049
121701	3.22E+09	2717	2633	2595	2581	2667	2828	3255	3616	3692	3729	3753
121801	3.22E+09	3031	2922	2869	2832	2886	3083	3541	3833	3887	3886	3877
121901	3.22E+09	3401	3259	3225	3160	3219	3432	3837	4202	4184	4074	3992
122001	3.22E+09	3481	3391	3351	3329	3416	3567	4005	4306	4385	4309	4191
122101	3.22E+09	3545	3418	3359	3335	3390	3573	3927	4239	4265	4192	4058
122201	3.22E+09	3256	3167	3109	3066	3100	3149	3312	3446	3534	3513	3409
122301	3.22E+09	2785	2647	2587	2561	2564	2584	2670	2843	3030	3157	3161
122401	3.22E+09	3122	3010	2959	2952	2985	3061	3230	3435	3545	3607	3603
122501	3.22E+09	3282	3185	3133	3145	3154	3226	3339	3478	3581	3615	3582
122601	3.22E+09	3444	3391	3407	3441	3520	3679	3969	4264	4372	4315	4204
122701	3.22E+09	3645	3523	3485	3488	3545	3690	3942	4177	4292	4397	4427
122801	3.22E+09	3527	3455	3399	3378	3395	3501	3748	3984	4083	4141	4122
122901	3.22E+09	3236	3132	3091	3092	3124	3196	3349	3509	3649	3815	3920
123001	3.22E+09	3698	3613	3589	3593	3647	3716	3852	4026	4080	4042	3922
123101	3.22E+09	3696	3653	3615	3659	3799	3900	4136	4357	4471	4438	4329

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4019	3998	3967	3965	4028	4109	4086	4016	3863	3815	3739	3527	3187
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4211	4348	4489	4570	4656	4663	4585	4389	4141	4018	3812	3466	3094
3684	3770	3861	3871	4087	4200	4243	4267	4206	4231	4136	3918	3635
4847	5035	5080	4928	4886	4805	4800	4768	4724	4451	4115	3873	3608
4986	5182	5357	5448	5500	5497	5458	5316	5205	5088	4871	4495	4089
5538	5707	5814	5898	5932	5960	5861	5724	5532	5440	5171	4734	4298
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4407	4517	4615	4684	4701	4680	4593	4415	4200	4096	3887	3526	3133
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4768	4939	5068	5088	5054	5027	4950	4801	4750	4742	4529	4252	3832
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4766	4927	5043	5145	5190	5198	5132	4943	4745	4735	4520	4218	3856
4491	4647	4783	4900	4888	4774	4586	4485	4385	4403	4237	3962	3664
5516	5706	5856	5877	5816	5716	5668	5506	5360	5300	5007	4608	4207
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4880	4920	4934	4917	4855	4754	4613	4489	4450	4473	4289	4001	3670
4766	4892	5013	5046	5038	5004	4840	4701	4588	4533	4316	4025	3660
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5441	5629	5775	5846	5880	5842	5791	5623	5436	5340	5042	4602	4178
5566	5755	5876	5952	5988	5938	5832	5659	5500	5439	5112	4672	4268
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5685	5831	5950	6028	6041	5963	5797	5606	5511	5483	5176	4798	4429
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5741	5907	5942	5872	5877	5768	5593	5425	5295	5183	4915	4528	4224

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4526	4679	4724	4644	4532	4455	4372	4255	4184	4183	4014	3720	3445
4303	4512	4654	4784	4885	4955	4938	4796	4681	4639	4357	3991	3684
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5722	5885	5999	5854	5698	5613	5506	5302	5266	5143	4764	4329	3937
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4747	4961	5112	5254	5278	5209	5077	4869	4788	4658	4327	4027	3719
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5017	5247	5378	5485	5524	5478	5378	5252	5212	5075	4661	4246	3888
5142	5363	5501	5605	5621	5512	5369	5204	5156	5015	4595	4240	3871
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3637	3824	3988	4102	4183	4213	4130	3986	3971	3864	3643	3392	3074
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4944	5248	5455	5609	5688	5648	5529	5356	5347	5140	4743	4357	3959
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4380	4537	4683	4817	4926	4928	4803	4637	4598	4437	4149	3878	3540
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3976	3975	3935	3876	3872	3902	3865	3808	3920	3794	3536	3247	2977
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