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KPSC CASE No. 2022-00402

INCREASE LGE-KU SOLAR TO 4,200MW CAPACITY THIS DECADE
Comments On LGE-KU Case 2022-00402 and PPL's Addendum

These comments propose to show that in this decade LGE-KU could generate five times the solar electricity it plans to generate in case 2022-00402, without curtailment or additional battery storage. Further, it suggests climate change is impacting Kentucky now, yet it is last among all states in solar/wind renewable generation.

1. KENTUCKY'S LARGEST ELECTRICITY SUPPLIERS LGE-KU, SUBSIDARARIES of PPL
   - 1.1. Produced one half of Kentucky's total electric generation in 2021.
   - 1.2. In 2022, Kentucky ranked last among the 50 states in renewable solar/wind generation with less than 1% (51GWh) of the state's total, ahead of only the District of Columbia. https://insideclimatenews.org/news/09032023/inside-clean-energy-texas-renewables/?utm_source=InsideClimate+News&utm_campaign=5d29429c3d-EMAIL_CAMPAIGN_2023_03_11_02_00&utm_medium=email&utm_term=0_29c928ffb5-5d29429c3d-328706794

2. LGE-KU PROPOSES IN CASE 2022-00402
   - 2.1. Six solar arrays (totaling 877MW capacity)
   - 2.2. Two new gas turbines (totaling 1,242MW capacity)
   - 2.3. One battery storage system 125MW capacity, 4-hour (500MWh).

3. PSC MUST WEIGH AN INCREASE IN SOLAR GENERATION BEFORE APPROVING THE GAS TURBINES
   - 3.1. Increase the 877MW to 4,200MW in this decade.
     - 3.1.1. Increases LGE-KU's proposed annual solar electric generation in Kentucky from 1.0TWh to 5.0TWh, respectively. (See chart below for comparisons)
     - 3.1.2. Increases LGE-KU's annual solar electric generation in Kentucky by 15%, and in Jefferson County by 41% of their respective 2021 totals.

Increasing LGE/KU Solar Capacity from 877MW to 4200MW				
	LGE/KU Solar Proposal			**Increase Solar Proposal**
Solar MW Capacity	877			4,200
Annual Sun hours/yr	1,200			1,200
Annual Generation (MWh)	1,052,400			5,040,000
Acres	5,262			25,200
EIA Data from 2021				**Solar % of Total MWh**
LGE Total Generation for Jeff. Co. was 12,400,000MWh (12.4TWh)			**12,400,000**	**41%**
LGE/KU Total Generation for KY. was 34,000,000MWh (34TWh)			**34,000,000**	**15%**
LGE/KU Total Generation of 34TWh was 1/2 of Kentucky Generation of 69TWh				

4. WHY THIS PROPOSAL IS VIABLE
   4.1. PPL's own data shows its subsidiaries, LGE-KU, can increase solar by 2027 to 4,200MW of renewable capacity with no increase in battery storage and little curtailment. See Fig. A4 below, yellow highlights, from PPL's "Generation Study 2022 – Addendum to 2021 Climate Assessment Report". The full Addendum is here: https://www.pplweb.com/wp-content/uploads/2022/12/PPL_Corp-2022-Generation-Study-FINAL.pdf
      4.1.1. Note 1: Fig. A4 uses Arizona's average daily solar hours (6.57) and not Kentucky's (3.3). Using 3.3 solar hours would decrease generation from 10TWh to 5TWh.
      4.1.2. Note 2: Wind capacity was listed as 706MW in the Addendum but is not used in this document. While acknowledging the possibility of wind in some specific sites, Kentucky generally has low wind speeds, thus limited wind energy potential with a cost-benefit. Eliminating the 706MW of wind capacity further lowers curtailment and "Unused Solar/Wind". https://eec.ky.gov/Energy/Documents/Wind%20Energy.pdf

Figure A4: LG&E and KU Generation Portfolio Transition Required to Achieve 80% Clean Energy by 2030

Year	2022A	2026		2027		2028		2029		2030	
Clean Energy Target	N/A	20%		35%		50%		65%		80%	
Capacity/Energy	MW	MW	TWh	MW	TWh	MW	TWh	MW	TWh	MW	TWh
Summer Peak Demand	6,187	6,282	32.9	6,376	33.7	6,382	33.7	6,385	33.6	6,397	33.4
Coal	4,889	4,589	21.1	4,292	17.2	3,416	13.2	1,571	6.9	0	0.0
Gas	2,716	2,698	5.3	2,698	4.7	2,698	3.7	2,698	4.8	3,211	6.7
Solar	12	2,602	6.2	4,207	10.0	4,207	10.0	6,636	15.8	9,343	22.3
Wind	0	0	0.0	706	1.8	3,286	8.7	3,771	9.8	4,372	11.4
Hydro	134	134	0.4	134	0.4	134	0.4	134	0.4	134	0.4
Battery Storage (8-hour)	0	0	0.0	0	0.0	29	0.1	1,749	5.0	3,735	11.8
Unused Solar/Wind			0.0		-0.5		-2.2		-3.5		-5.7
Battery/Inverter Losses			0.0		0.0		0.0		-0.7		-1.7

Figure A4 illustrates the aggressive and unprecedented growth in renewable energy that would need to be sited and built this decade to achieve an 80% clean energy target by 2030. In this scenario, all coal units would be forced to retire by 2030. Unused solar/wind represents curtailed energy as overbuild is required to meet 24/7 energy demands. Battery/inverter losses represents loss of energy in the charging and discharging process. PPL used a generation portfolio optimization model to estimate the least-cost generation portfolio for meeting an 80% clean energy standard by 2030.

   4.2. EIA's Real Time data from the LGEE Balancing Authority seems to support PPL's 4,200MW and no curtailment data. Minimum demand to a large degree matches peak solar generation in most months when considering transmission and distribution losses, and cloudy and partly cloudy days in the LGE-KU service area.
   4.3. Battery storage, not shown in the Addendum under the year 2027, would further decrease curtailment, and allow for an increase in solar capacity toward NREL's "goldilocks" range of 25%-40%. https://www.nrel.gov/news/program/2021/the-curtailment-paradox-in-a-high-solar-future.html
   4.4. While available acreage in Jefferson County is limited, adjacent counties, Bullitt, Oldham, Shelby, and Spencer, have the land and transmission lines to add utility scale solar. None of the 6 solar arrays proposed in the case filing are to be built in these counties.
   4.5. Of course, acquiring the land and building the solar sites, battery storage and distributed transmission infrastructure needed for the future is both complex and takes time. The sooner this process is started the sooner Kentuckians can be employed in this effort and live in a cleaner environment. https://www.solarpowerworldonline.com/2021/10/adding-storage-to-utility-scale-solar-where-to-start/
   4.6. There is not enough knowledge or first-hand information for costs comparisons to be part of these comments. But studies show there is good reason to believe, 4,200MW of solar in the LGE-KU service area is the least cost option, when considering the cost of 25 years of NGCC gas, maintenance, and the cost of the "short" gas line required at Mill Creek.

5. As these comments are being finalized, Kentuckians have experienced a windstorm, leaving over 400,000 customers – family homes, churches, and businesses - without power. This storm was

preceded two days earlier, March 1, by a temperature of 79F. This is the third major storm Kentucky has experienced in less than a year and a half. Kentucky has long been the meeting point for northwest and southwest winds. A warming climate is making these storms in our state more violent and frequent. While much credit must be given to Kentucky's utility workers for their hard work in restoring service, the utility executives who are deciding Kentucky's energy future, must take their share of responsibility for the increasing intensity of these storms.

5.1. A recent IPCC report, summarized here by NRDC, notes that more than a dozen natural systems—from ice sheets to the Amazon rainforest—are at risk of "tipping." https://www.nrdc.org/stories/climate-tipping-points-are-closer-once-thought

5.2. A more recent, March 20, IPCC report states, "There is a rapidly closing window of opportunity to secure a livable and sustainable future for all (*very high confidence*)."

CONCLUSION

There are very few alternatives for Kentucky to generate fossil fuel free electricity in this decade other than solar power, and LGE-KU can do better than building sites that produce just 877MW proposed in this case. Building solar sites to produce at least 4,200MW by the end of this decade can reduce greenhouse gases without curtailing solar generation or additional battery storage. Doing so would initiate the planning and developing of the distributed grid critical for the future. Of course, battery storage will allow additional increase in capacity and the existing gas turbines LGE-KU already operates can supplement nightly and cloudy demand. With increased solar generation there should be a decrease in gas turbine use and increase in their longevity.

If increasing solar is not feasible for LGE-KU, the PSC should reconsider the value of net metering before approving the 2 new NGCCs. The personal and financial costs of the recent Eastern KY flooding, Western Ky tornadoes, and this most recent windstorm, warrants a reevaluation of the net metering rules. The 1:1 rule should be restored to encourage more private solar development, and the 1% statewide limit on renewables should be removed. Kentucky needs to catch on and catch up with more renewables.

"***Renewable energy is poised to reach a milestone as a new government report projects that wind, solar and other renewable sources will exceed one-fourth of the country's electricity generation for the first time, in 2024.***" *Inside Climate News, January 2023*

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