Considerations Relating to the Allocation of Electric Utility Production Plant and Resources

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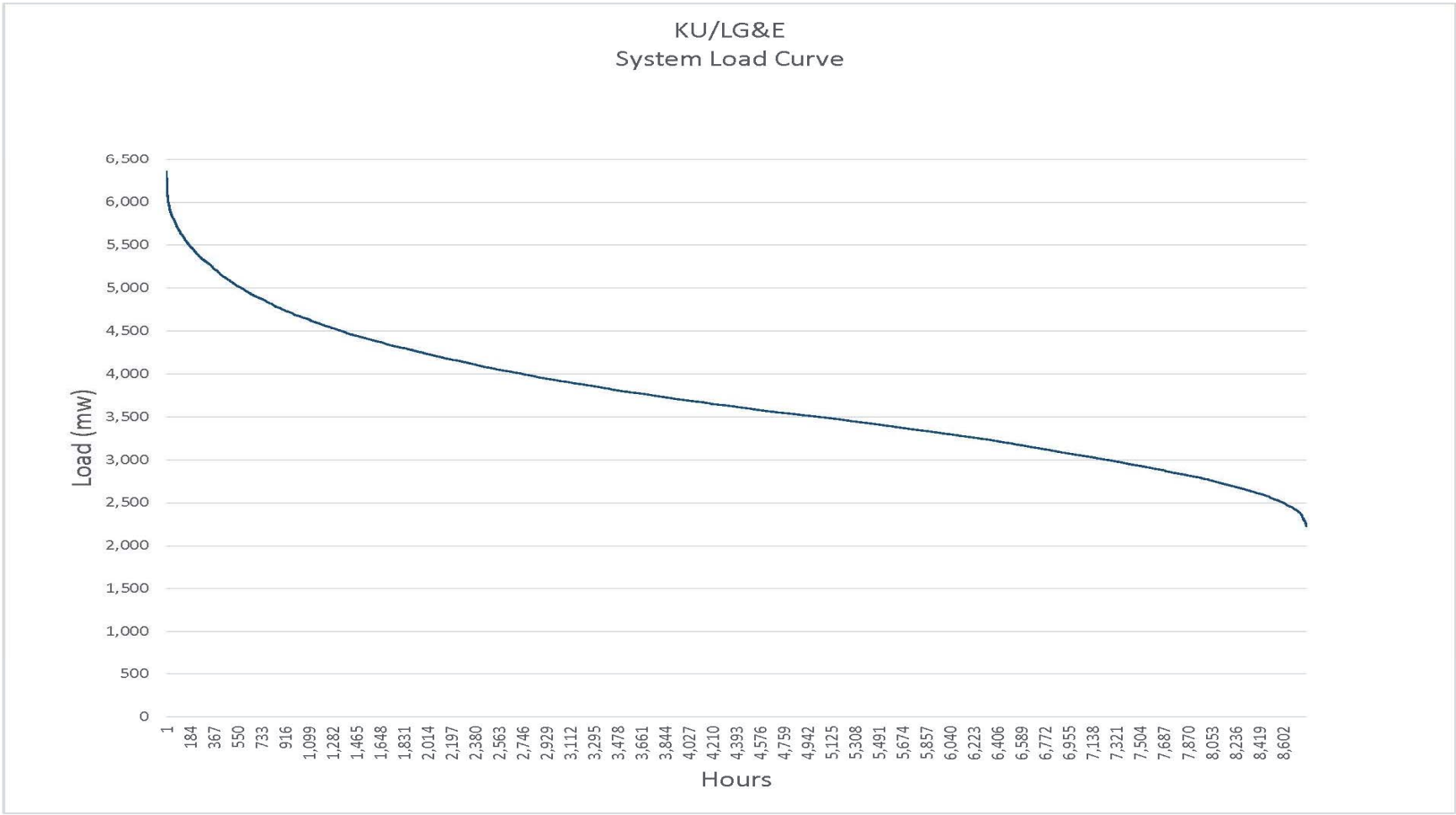
Utilities Plan Their Production Resources to Minimize Total Cost of Service

- Utilities must have enough capacity (owned or purchased) to meet peak load requirements.
- Historically, utilities were primarily concerned with meeting native load and energy requirements.
  - System planning and operation of production resources has become more complicated (and sophisticated) over the last two decades.
  - Evolution of RTOs and development of competitive wholesale markets.
  - Environmental and political policies to: reduce green house gas emissions; and, promote renewable energy.
  - With the development of competitive wholesale markets, some utilities are finding that it is less expensive to leave legacy baseload and/or intermediate generation resources idle and instead purchase energy in the wholesale market during low cost periods.
- In a traditional sense, utilities will invest in a portfolio of generation assets considering:
  - system load profile;
  - cost of capacity (per KW) of particular types of generation; and
  - variable running costs (primarily fuel) of different types of generation.

Embedded Cost Allocations Should Consider and Reflect the Characteristics and Constraints Outlined Previously

- Consider the generation characteristics of a traditionally vertically-integrated electric utility:
  - Kentucky Utilities/Louisville Gas & Electric
    - These companies are subsidiaries of a parent.
    - Generation resources are jointly-dispatched to meet both companies' requirements.
    - For generation purposes (demand and energy-related), these companies can be thought of as a single utility.
- Consider KU/LG&E's annual load profile (load duration curve) shown on the next slide.

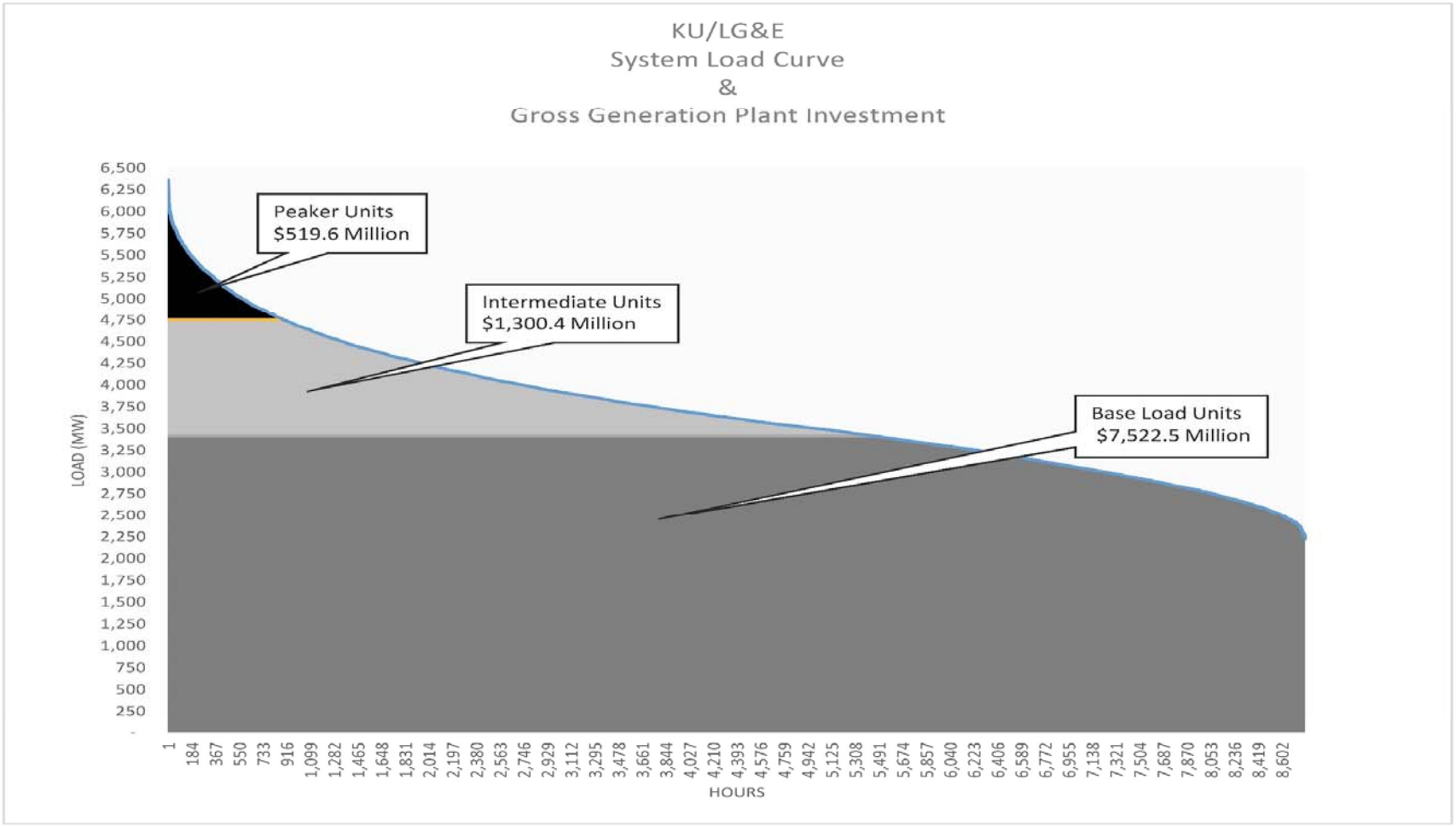

KU/LG&E
System Load Curve
Load (mw)
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1
184
367
550
733
916
1,099
1,282
1,465
1,648
1,831
2,014
2,197
2,380
2,563
2,746
2,929
3,112
3,295
3,478
3,661
3,844
4,027
4,210
4,393
4,576
4,759
4,942
5,125
5,308
5,491
5,674
5,857
6,040
6,223
6,406
6,589
6,772
6,955
7,138
7,321
7,504
7,687
7,870
8,053
8,236
8,419
8,602
Hours

Next, Consider KU/LG&E's Portfolio of Generation Assets

KU and LG&E Generating Unit Characteristics

Generating Unit (a)	Designation	Order of Dispatch 1/	Forecasted Fuel Cost/MWH 2/	KU/LG&E Capacity 3/	Capacity Factor	Gross Investment 10/31/18 ($000) 4/	Fuels 3/	Net Generation in Forecasted Test Year 3/
Trimble County 2	Base	3	$ 19.50	629	46.80%	$ 1,128,924.8	Coal	3,445,250,000
Cane Run 7	Base	4	$ 19.90	808	66.79%	$ 550,214.7	Gas	4,740,180,000
Ghent 2	Base	5	$ 20.20	556	58.65%	$ 434,348.3	Coal	2,866,140,000
Trimble County 1	Base	7	$ 20.90	425	46.62%	$ 648,331.0	Coal	2,318,340,000
Mill Creek 4	Base	6	$ 21.50	544	63.25%	$ 865,072.4	Coal	3,020,190,000
Ghent 1	Base	12	$ 21.70	557	54.41%	$ 702,479.6	Coal	2,661,540,000
Ghent 4	Base	13	$ 21.70	556	49.77%	$ 1,238,207.2	Coal	2,431,550,000
Mill Creek 1	Base	8	$ 22.00	356	58.11%	$ 320,319.5	Coal	1,814,490,000
Mill Creek 2	Base	9	$ 22.10	356	52.92%	$ 388,271.4	Coal	1,652,540,000
Mill Creek 3	Base	10	$ 22.30	463	49.78%	$ 547,177.4	Coal	2,022,930,000
Ghent 3	Base	15	$ 22.60	557	46.14%	$ 699,121.0	Coal	2,255,570,000
	Total Base			**5,807**		**$ 7,522,467.3**		
Brown 6	Intermediate	26	$ 29.60	177	10.26%	$ 66,454.8	Gas, Oil	159,530,000
Brown 7	Intermediate	27	$ 29.80	177	4.39%	$ 62,219.0	Gas, Oil	68,220,000
Brown 5	Intermediate	28	$ 37.30	123	14.97%	$ 55,080.1	Gas	161,770,000
Trimble County 5	Intermediate	18	$ 38.00	199	22.84%	$ 73,841.6	Gas	399,070,000
Brown 3	Intermediate	16	$ 40.00	464	16.44%	$ 976,435.3	Coal	669,990,000
Trimble County 6	Intermediate	19	$ 40.70	199	17.53%	$ 66,354.4	Gas	306,320,000
	Total Intermediate			**1,339**		**$ 1,300,385.2**		
Brown 8	Peak	31	$ 42.20	126	2.04%	$ 37,790.5	Gas, Oil	22,600,000
Brown 9	Peak	29	$ 42.30	126	2.29%	$ 56,667.4	Gas, Oil	25,370,000
Brown 11	Peak	32	$ 43.00	126	1.52%	$ 46,676.1	Gas, Oil	16,820,000
Brown 10	Peak	30	$ 43.70	126	3.24%	$ 36,732.0	Gas, Oil	35,890,000
Trimble County 7	Peak	20	$ 45.40	199	12.53%	$ 57,011.8	Gas	218,900,000
Paddys Run 13	Peak	24	$ 45.70	178	9.55%	$ 84,764.4	Gas	149,490,000
Zorn 1	Peak	36	$ 61.10	18	0.34%	$ 1,974.7	Gas	540,000
Trimble County 8	Peak	21	$ 64.70	199	5.68%	$ 56,457.7	Gas	99,300,000
Trimble County 9	Peak	22	$ 86.90	199	3.49%	$ 56,793.9	Gas	61,010,000
Haefling 1	Peak	37	$ 138.60	21	0.39%	$ 4,374.1	Gas, Oil	710,000
Haefling 2	Peak	37	$ 138.60	21	0.00%		Gas, Oil	
Trimble County 10	Peak	23	$ 152.40	199	1.64%	$ 70,160.8	Gas	28,660,000
Cane Run 11	Peak	33	$ 465.20	16	0.51%	$ 3,726.4	Gas, Oil	730,000
Paddy's Run 11	Peak	34	$ 1,026.30	16	0.22%	$ 2,151.1	Gas	310,000
Paddy's Run 12	Peak	35	$ 1,151.80	33	0.22%	$ 4,339.2	Gas	620,000
	Total Peak			**1,603**		**$ 519,620.1**		
Brown Solar	Solar & Hydro	1		10		$ 25,492.4	Solar	18,400,000
Dix Dam 1 (1)	Solar & Hydro	2		11		$ 43,422.8	Hydro	
Dix Dam 2	Solar & Hydro	2		11			Hydro	81,780,000 Total all Units
Dix Dam 3	Solar & Hydro	2		11			Hydro	
Ohio Falls 1 (1)	Solar & Hydro	2		13		$ 143,394.8	Hydro	
Ohio Falls 2	Solar & Hydro	2		13			Hydro	
Ohio Falls 3	Solar & Hydro	2		13			Hydro	
Ohio Falls 4	Solar & Hydro	2		13			Hydro	300,360,000 Total all Units
Ohio Falls 5	Solar & Hydro	2		13			Hydro	
Ohio Falls 6	Solar & Hydro	2		13			Hydro	
Ohio Falls 7	Solar & Hydro	2		13			Hydro	
Ohio Falls 8	Solar & Hydro	2		13			Hydro	
	Total Solar & Hydro			**146**		**$ 212,310.0**		
Business Solar						85	Solar	

Superimpose KU/LG&E's Generation Assets onto its Load Duration Curve


KU/LG&E
System Load Curve
&
Gross Generation Plant Investment
Peaker Units
$519.6 Million
Intermediate Units
$1,300.4 Million
Base Load Units
$7,522.5 Million
LOAD (MW)
HOURS

Conclusions
(Relating to KU/LG&E Generation)

- The majority of generation investment (rate base) is attributable to baseload generation plant with low operating costs per unit (KWH) of output.
  - These baseload units serve load and energy requirements during most hours of the year.

- Peaker units represent a small percentage of generation investment (rate base) with high operating costs per unit (KWH) of output.
- Intermediate units fall in between baseload and peaker units in terms of both capacity costs and variable running costs.
- Hydro, wind, and solar need to be considered on a case-by-case basis reflecting operational constraints.

The Allocation of Embedded Generation
Plant (Rate Base) Costs Should Consider the Planning and Operational Characteristics of a Utility's Portfolio of Generation Assets

- Examples of generation allocation methods:
  - 1-CP and 4-CP
  - Seasonal CP methods for utilities that may peak in Winter and Summer
  - 12-CP
  - Average & Excess (aka Base and Extra Capacity)
  - Peak & Average
  - Base-Intermediate-Peak
  - Probability of Dispatch
  - Loss of Load Probability
  - Equivalent Peaker (Peak Credit)