



U.S. DEPARTMENT OF ENERGY
**DISTRIBUTED ENERGY
PEER REVIEW**



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Future Grid - Local Area Analysis of DE, EE, and RE Impacts

John Kelly

Executive Director, GTI Distributed and
Sustainable Energy Center

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Future Grid

- Many different names are used to describe utility programs for modernizing the electric system
 - ConEd: 3G for third generation grid
 - SCE: Grid of the Future
 - DOE: Gridwise and Gridworks
- Focus on improved controls, communications, and hardware
- GTI initiated a complimentary research program focused on developing a hybrid electric system one that accommodates and accelerates the integration of DE, EE, and RE to address several major issues facing the electric sector

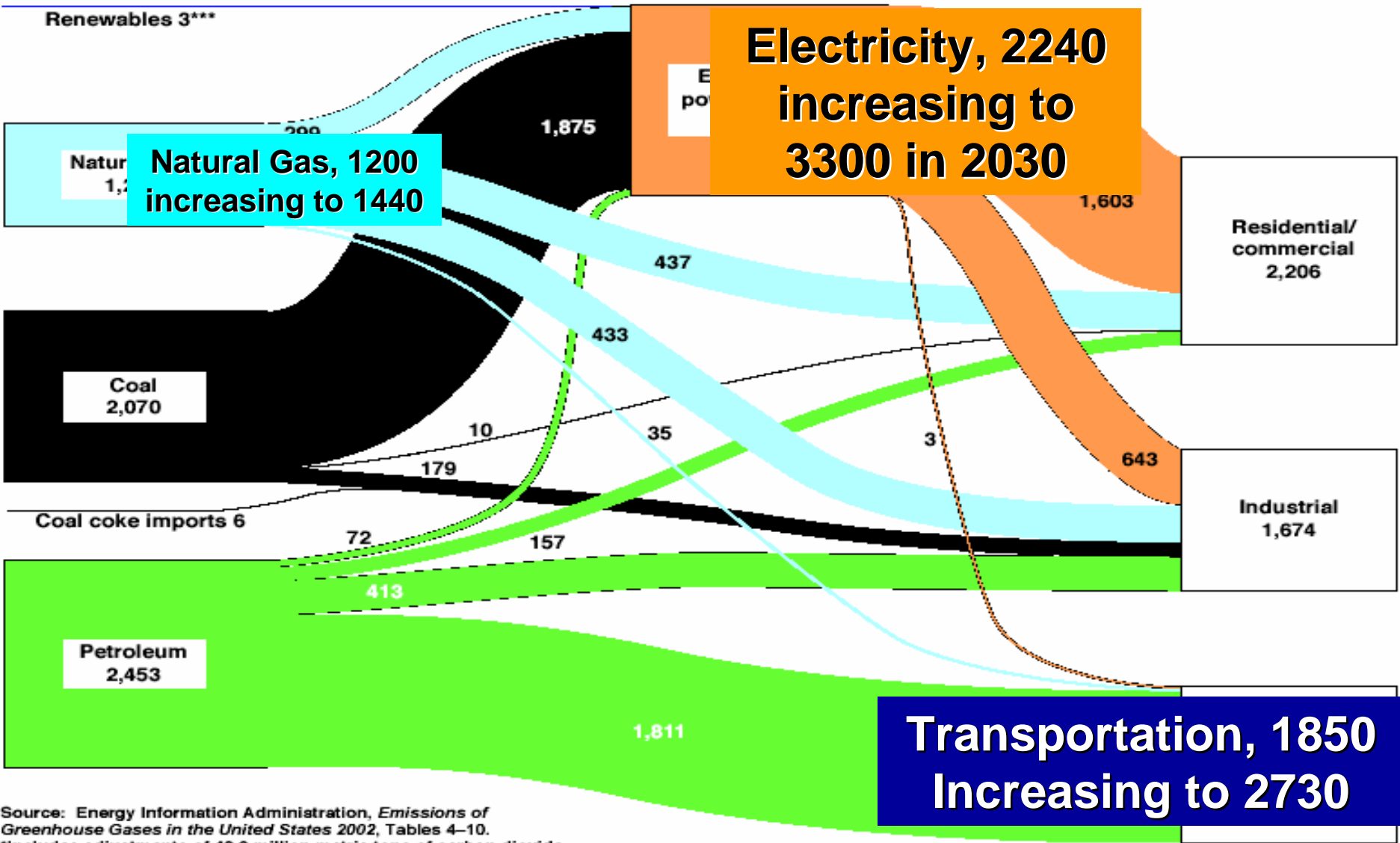


EIA Energy Consumption, Quads

Fuel	2004	2025
Oil	40	54
Coal	22	27
Natural Gas	23	35
Nuclear	8	9
Bio-fuels	2	4
Hydro	3	3
Solar/Wind	1	2
Total	99	134

Fossil fuels will supply 88% of our new energy demand

U.S. 2002 Carbon Dioxide Emissions from Energy Consumption — 5,682* Million Metric Tons of CO₂**

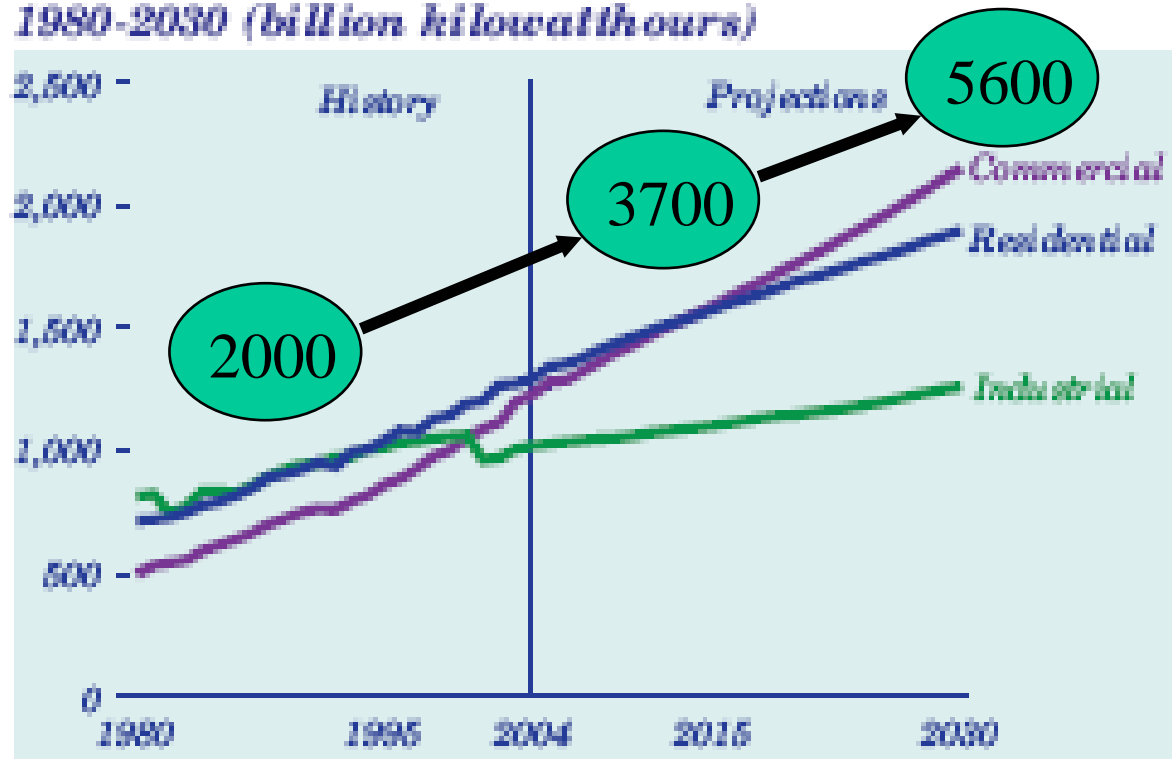


Source: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2002*, Tables 4–10.
 *Includes adjustments of 42.9 million metric tons of carbon dioxide from U.S. territories, less 90.2 MtCO₂ from international and military bunker fuels.
 **Previous versions of this chart showed emissions in metric tons of carbon, not of CO₂.
 ***Municipal solid waste and geothermal energy.
 Note: Numbers may not equal sum of components because of independent rounding.

Demand Surging

Continued Growth in Electricity Use Is Expected in All Sectors

Figure 55. Annual electricity sales by sector, 1980-2030 (billion kilowatthours)



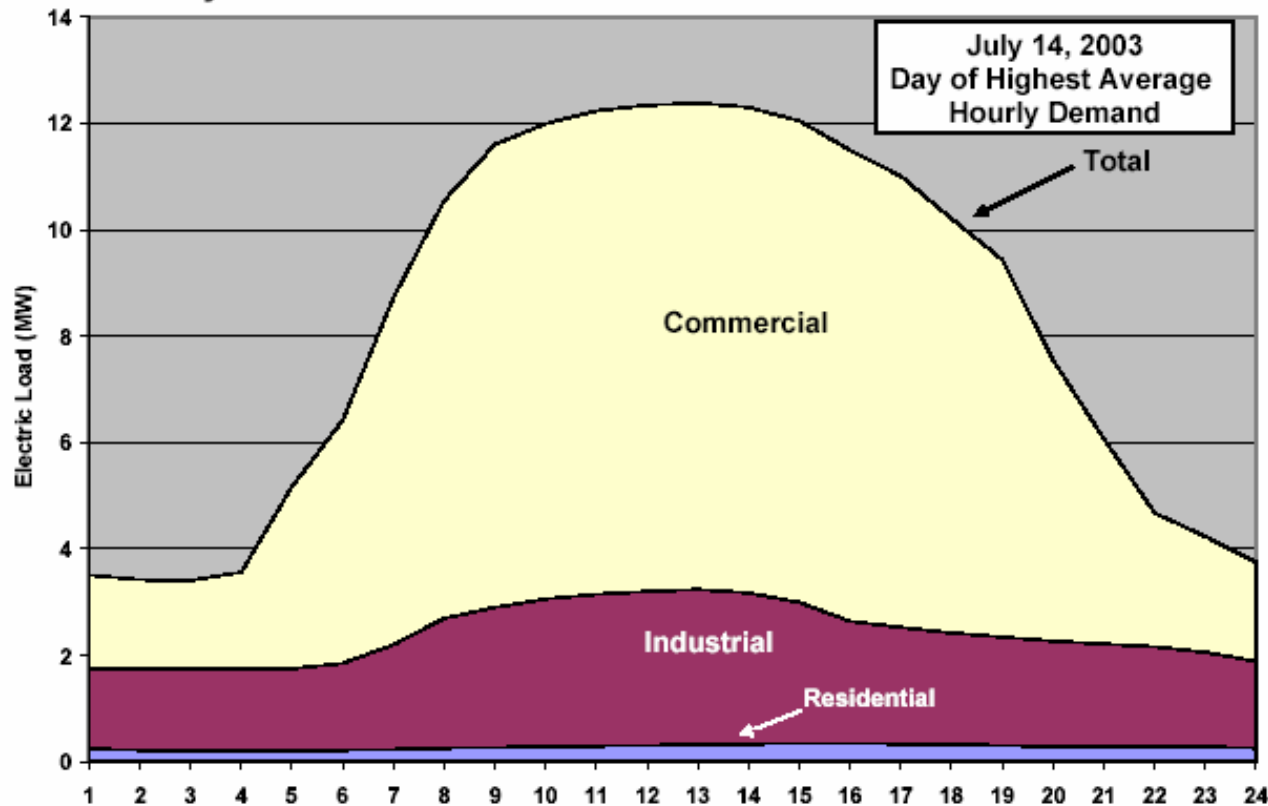
Commercial Buildings Strain Distribution and Supply

Description of Southpointe

NETL-Supplied Load Profiles

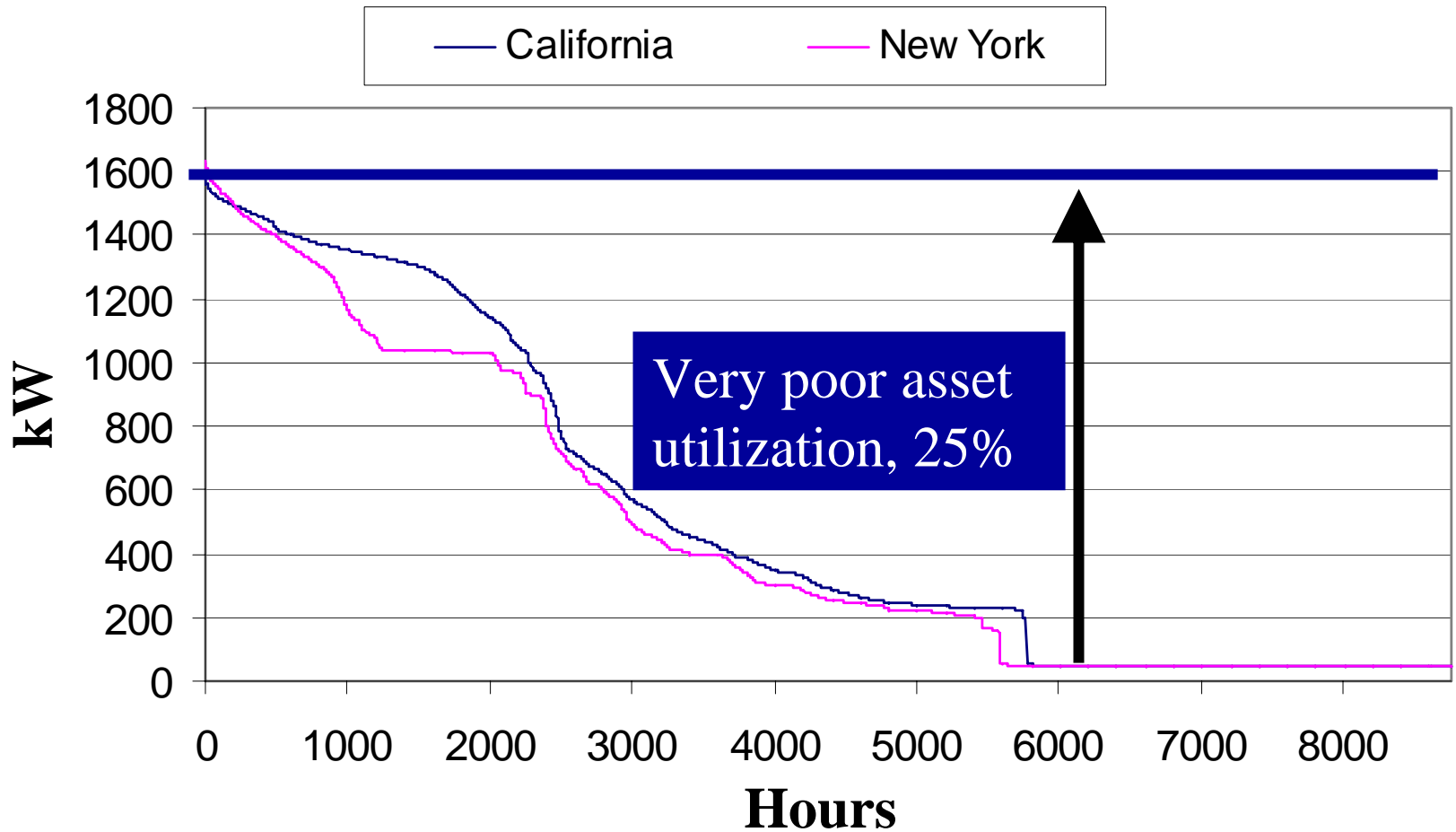
Summer Peak Day

Commercial office buildings drive peak-load requirements for the community.

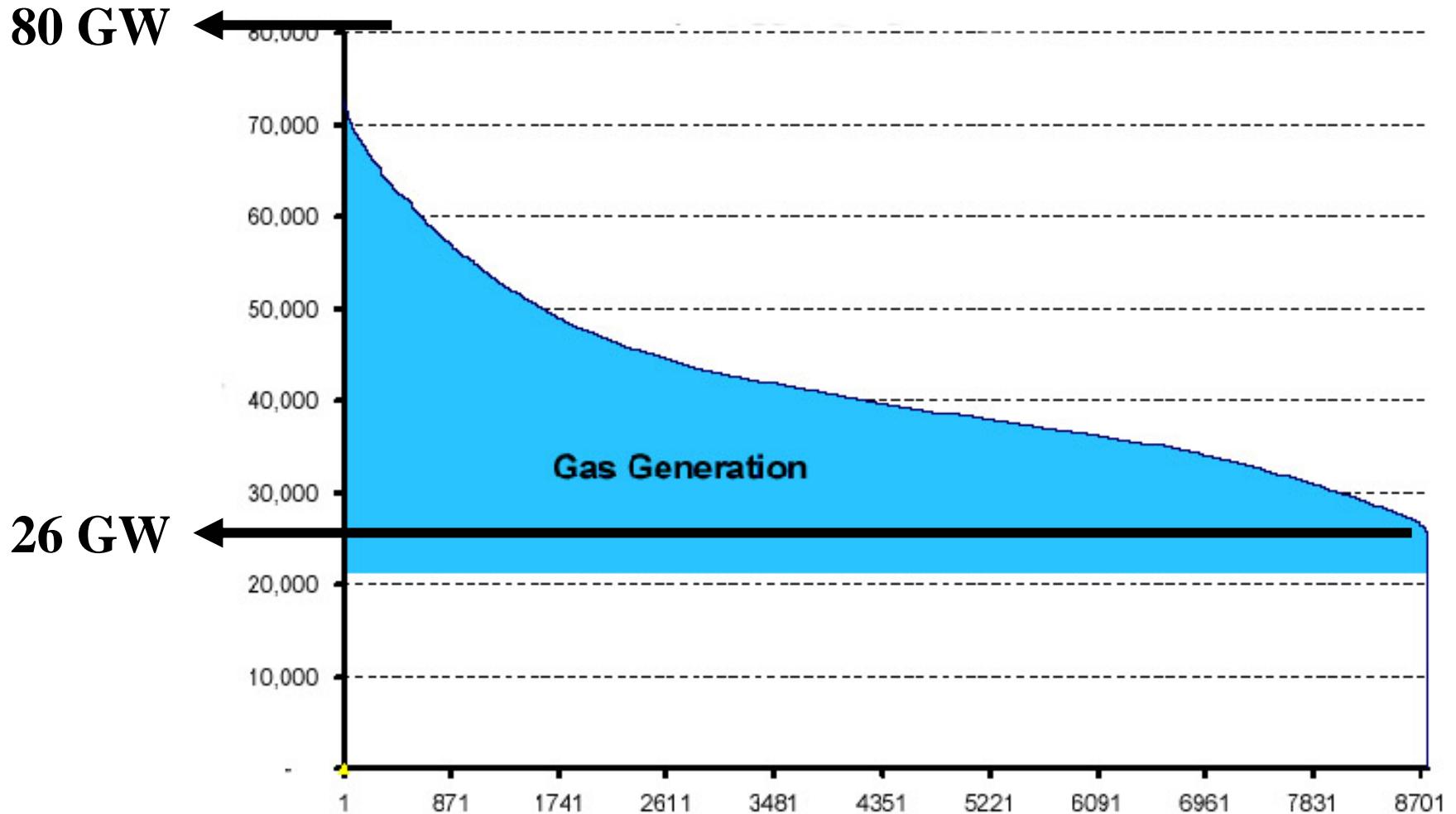


Congestion

Typical 9-Story Office Building Load Duration Curve



Asset Utilization



Data sources: FERC, EIA



Hours in a Year (8760)

On Peak vs. Off Peak

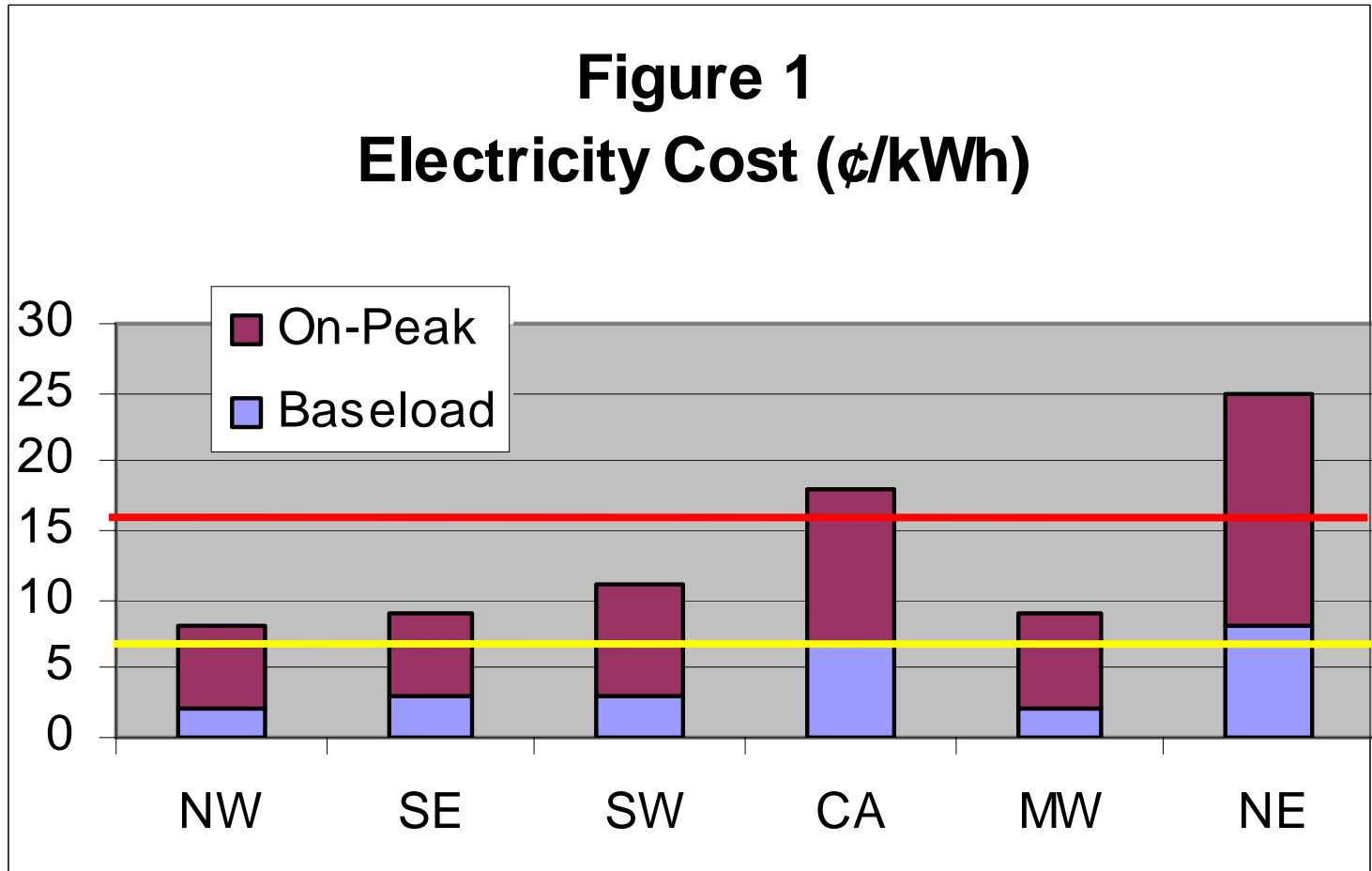
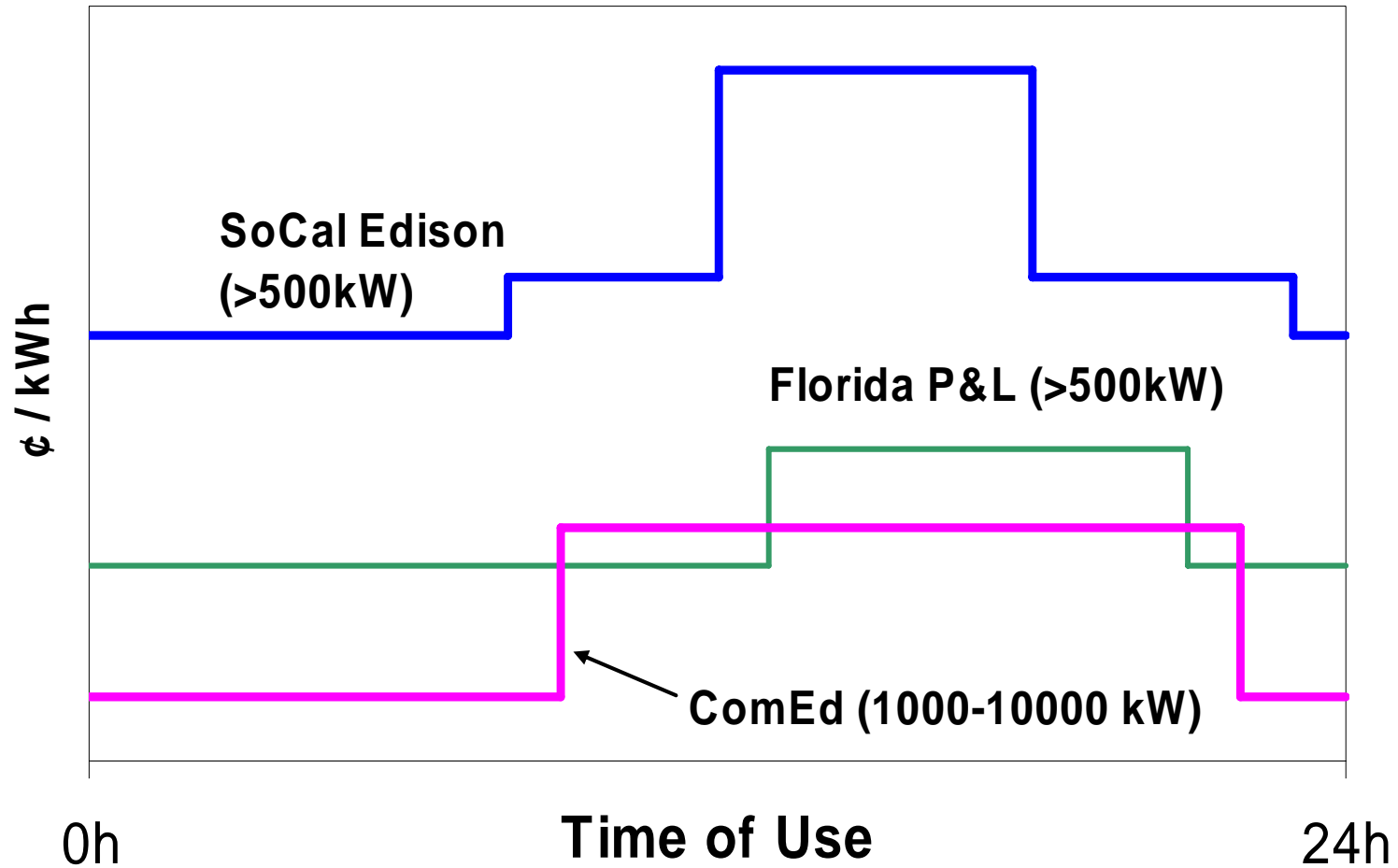


Figure Sample Utility Rates



Complimentary Approach

- Addressing these issues necessitates a coordinated effort
 - Integrate DE, EE and RE into community energy system designs
 - Demonstrate the benefit to utilities
 - Optimize integration strategies
 - Target peak load and grid utilization
 - Develop technology ready infrastructure

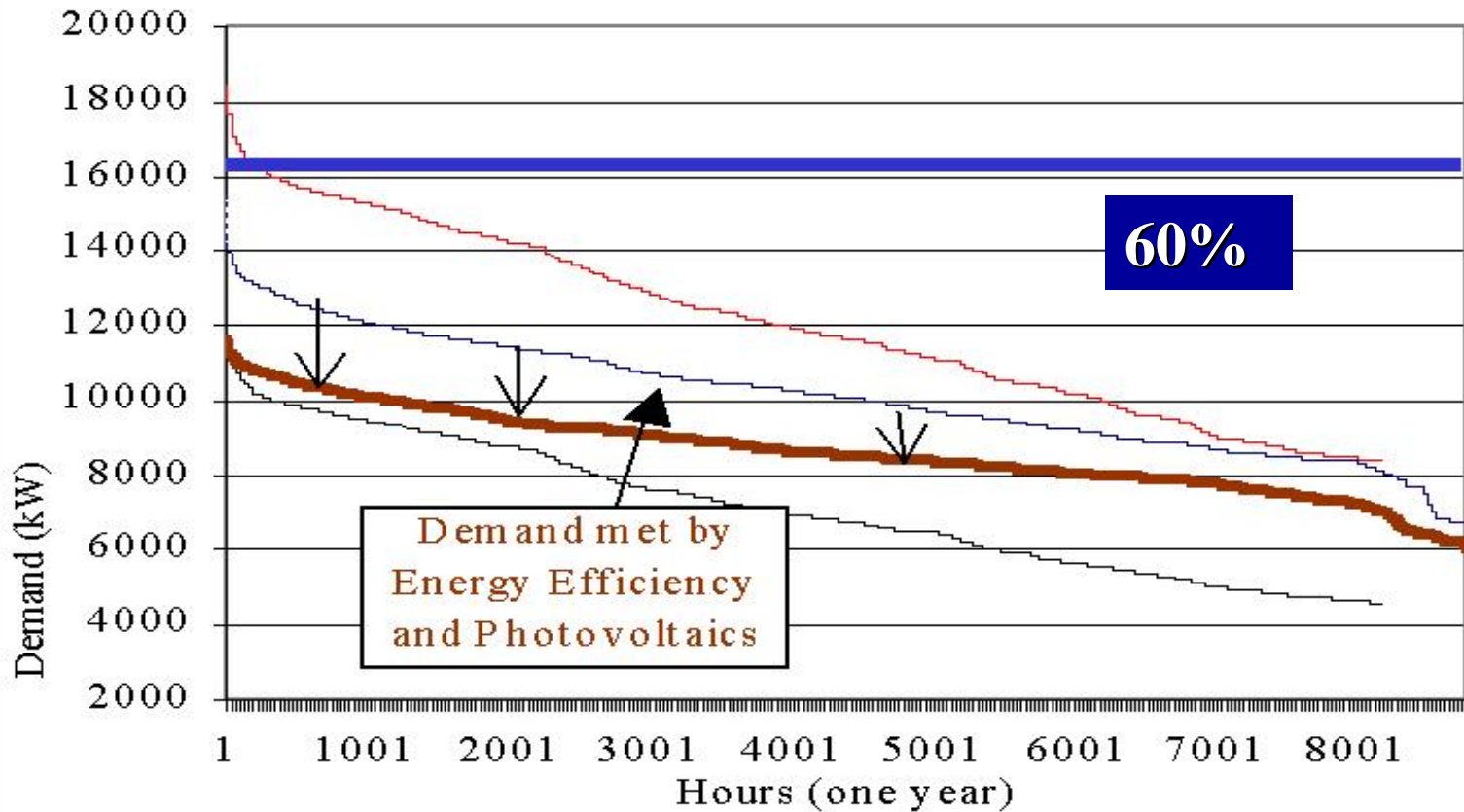
**Grid Support – Local Energy Networks
“Moving toward a hybrid electric system”**



DTE Circuit

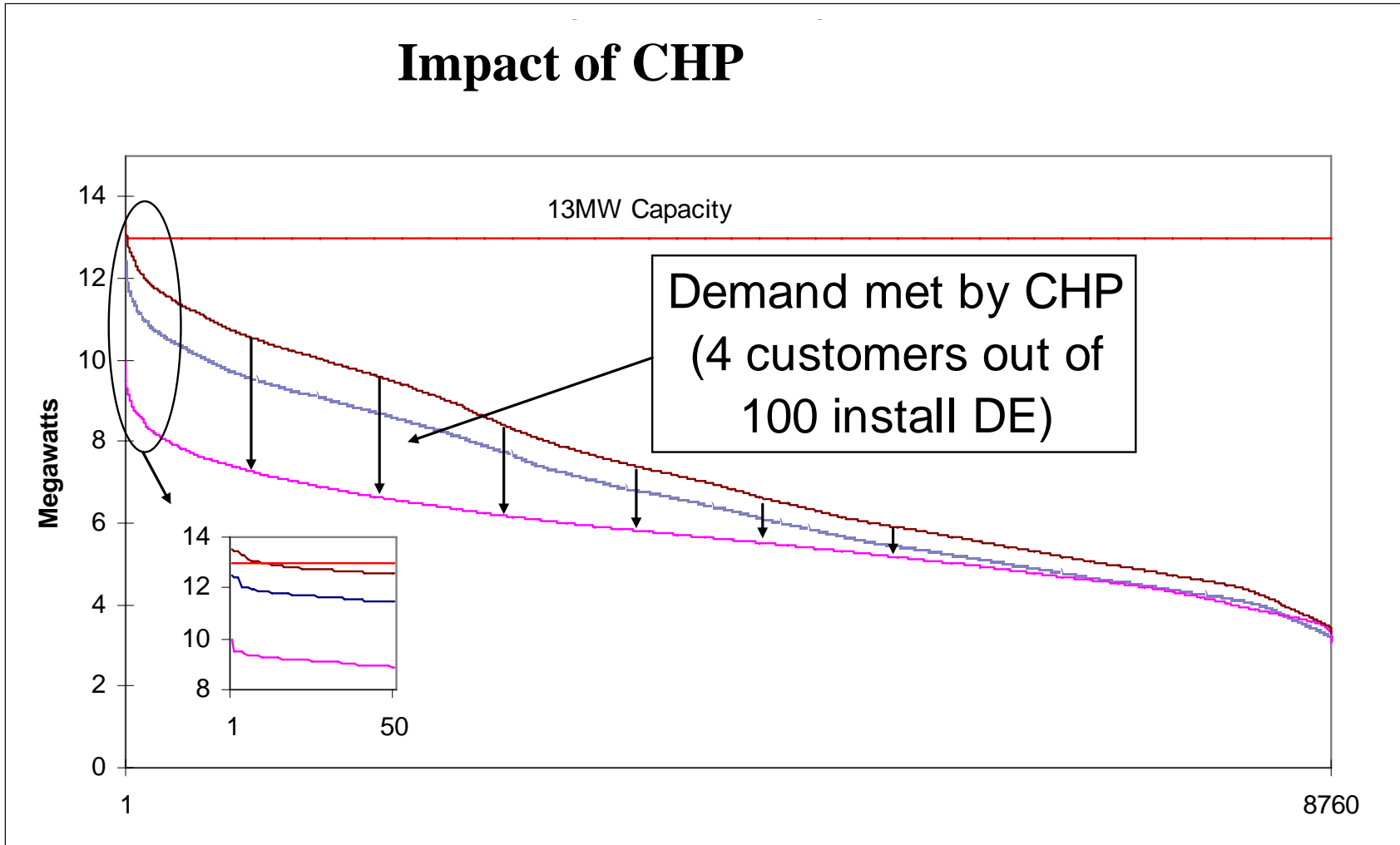
Improved Business Rules and Improved Technology

Impact of Energy Efficiency and PV on Sample LDC



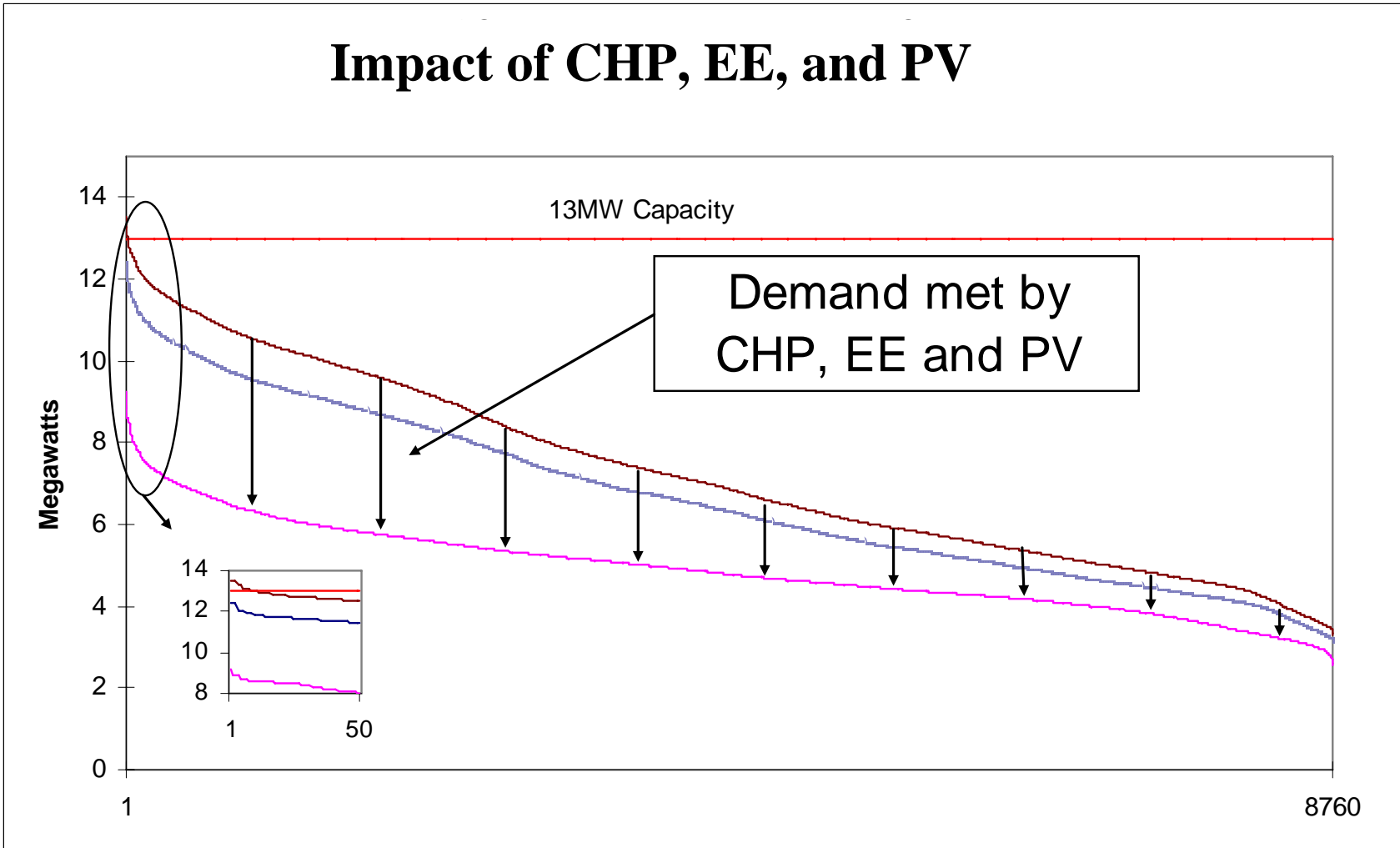
SCE Circuit #1 Results

Impact of CHP



SCE Circuit #1 Results

Impact of CHP, EE, and PV



John Rowe Quotes, Chicago Tribune, January 30, 2003

ComEd's capital spending budget was \$750 million. Some "\$350 million to \$400 million of that is spent meeting the needs of people who open new office buildings, new homes and new factories," Rowe said. "It seems like the capital expenditures are exceeding what we are getting from doing it. It suggests we ought to learn how to meet those requirements more intelligently," he added.