CIBO's 36th Annual Meeting

Energy 2014+
The Nexus of Energy, Air, Water, Fuel & Energy

Make and Bring ELECTRICITY to Consumers

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October 15-17, 2014 | Hotel Santa Fe | Santa Fe, New Mexico

Topics covered

- Where does your power come from?
- Existing electric utility business model
- Basics of utility operation to deliver power at lowest prudent cost with an acceptable level of reliability
- Drivers of future costs & reliability
- Future electric utility business model
- Conclusion for CIBO members

Where does your power come from?

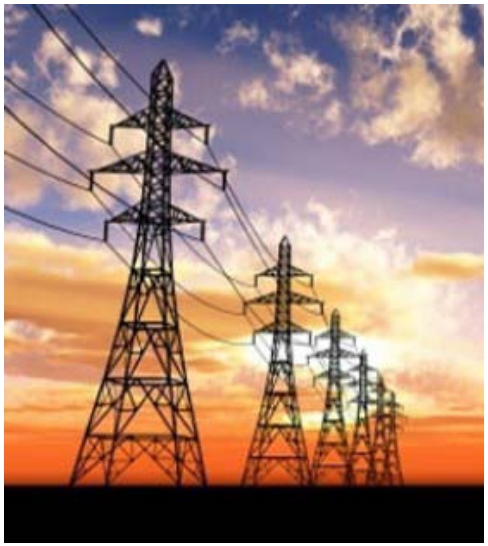
Residential Consumer

Commercial Consumer

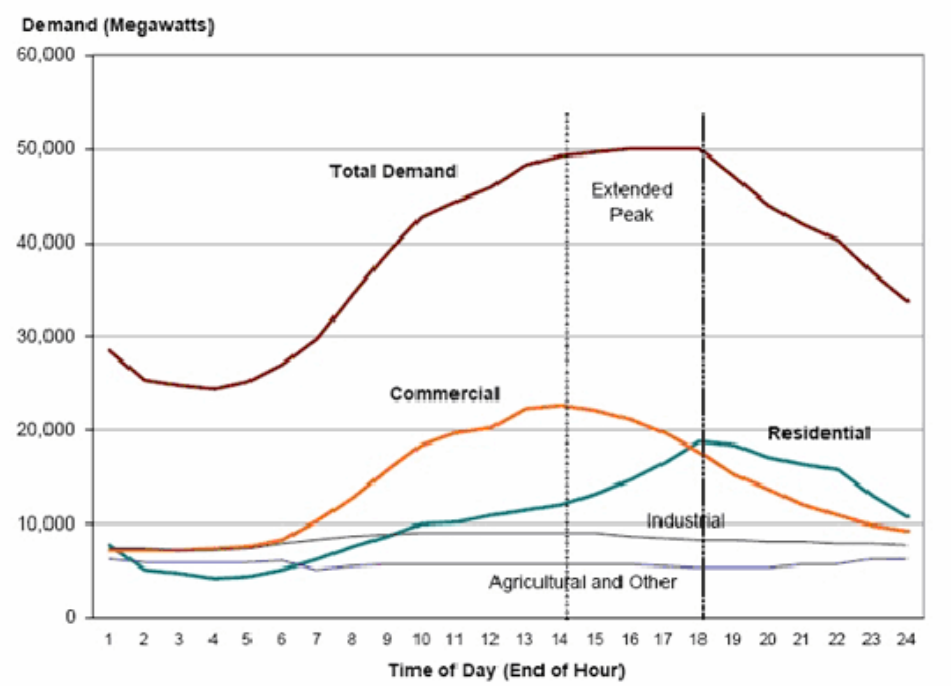
Industrial Consumer

ELCON

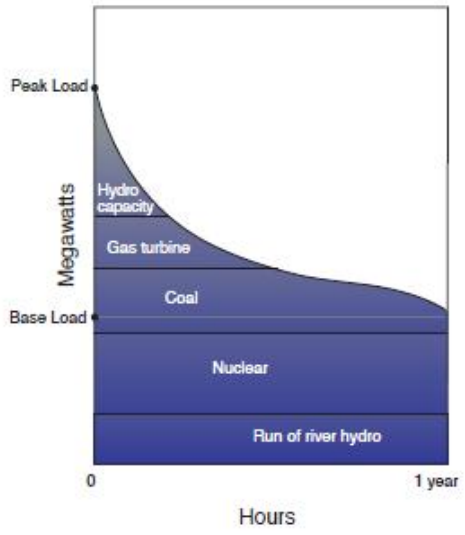
Where does it really come from?
Generation, transmission, distribution



A utility's daily demand



Least-cost resource mix (more or less)



- Generating units with lowest operating costs are generally dispatched first. They invariably have the highest capital cost.
- The system is not always planned to minimize costs to consumers because of siting issues (NIMBY), political pressure to use local resources (e.g., coal), or cost recovery of subsidies used to finance social programs (e.g., conservation and renewable portfolio standards).

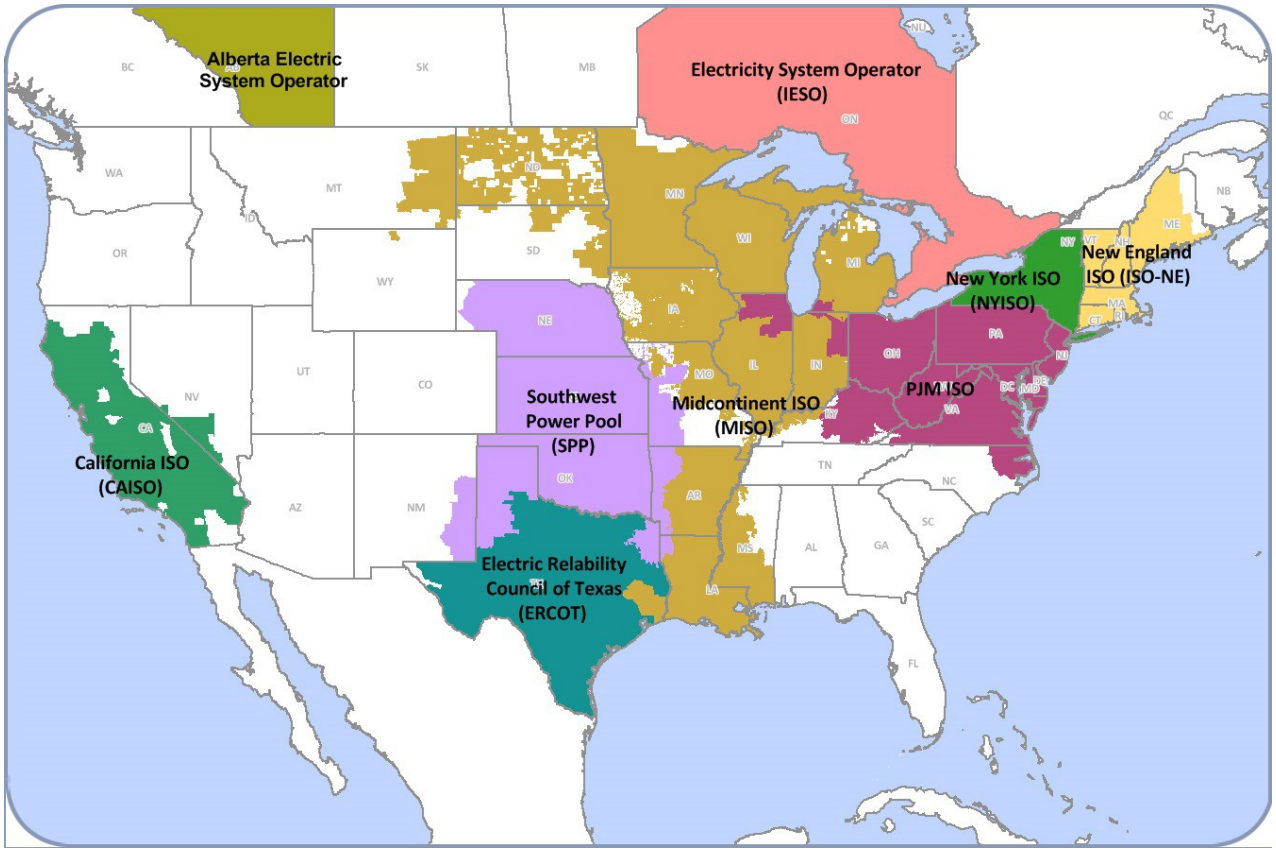
Operating practices

- Generation reliability is maintained with fuel diversity and reserve capacity of 15-20%.
- Transmission reliability is maintained by some degree of redundancy and AC network's inherent multiple paths for power flows.
- Distribution reliability is the more difficult, especially if the wires are not underground. Most customer outages are distribution related.

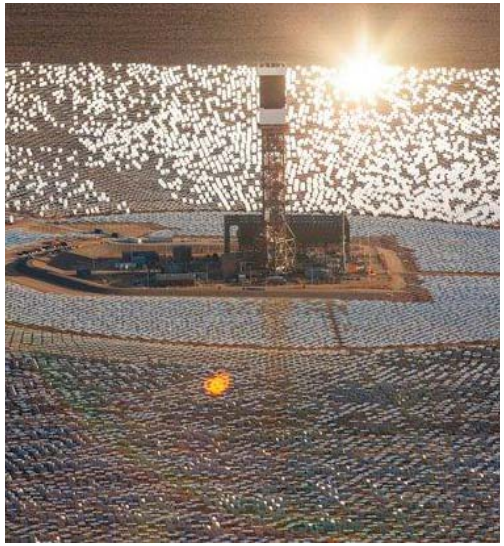
Two existing utility regulatory structures

- 1/3 US population in states with traditional state utility regulation
- 2/3 US population in states that “restructured” and opted into “organized markets,” which is a euphemism for lots of federal utility regulation.
- Organized markets remain a work in progress with no accountability for resource adequacy. They are markets in name only.
- Organized markets do not provide customers with mechanisms to arrange long-term price hedges that can be critical to investment in long-term capacity. Regulatory uncertainties (mostly related to EPA rules) in other regions has also stifled investment in new supply resources.

“Restructured” regions (ISOs & RTOs)



Drivers of future costs & reliability

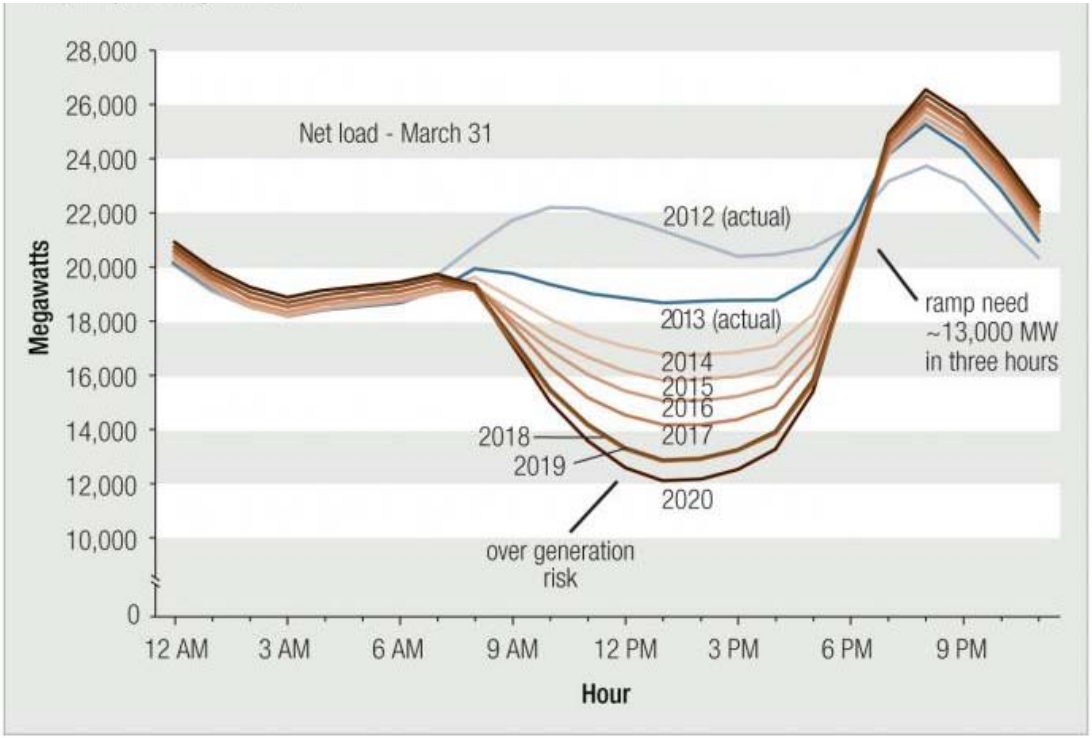


Drivers of future costs & reliability

- Public policy and environmental regulations are shifting baseload resource mix from coal and nuclear to wind, natural gas and demand side actions.
- Natural gas pipeline constraints may become a permanent feature of electric utility operation going forward. A utility system's "first contingency" is no longer a nuclear plant or major transmission intertie but a natural gas pipeline serving multiple generators.
- 111(d) promotes environmental dispatch, which aligns generation not on a least-cost basis but by the prejudices of the environmental regulators.

The new daily demand curve

California leads the nation



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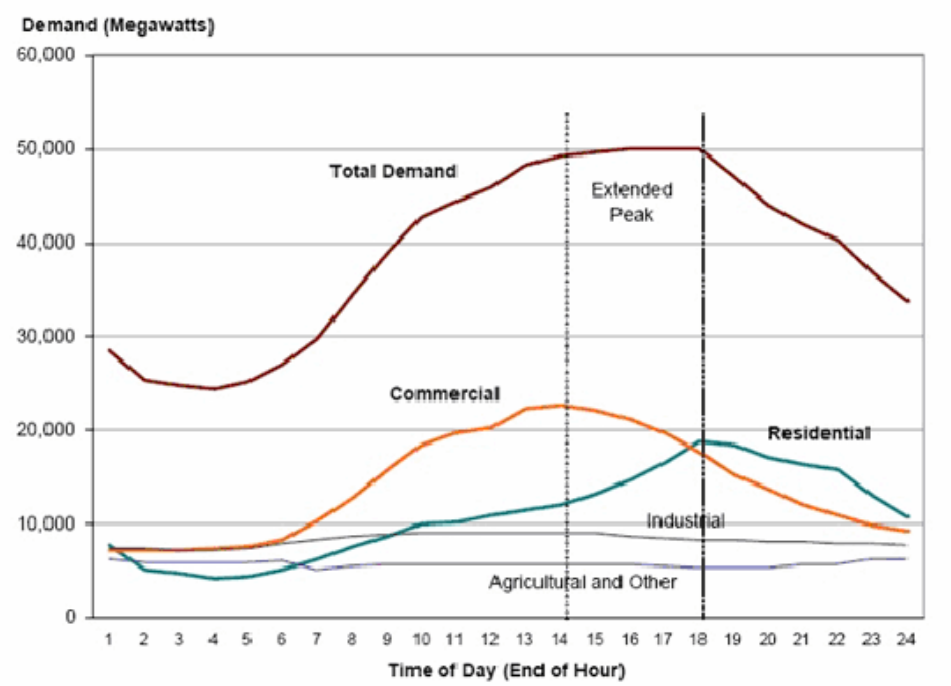

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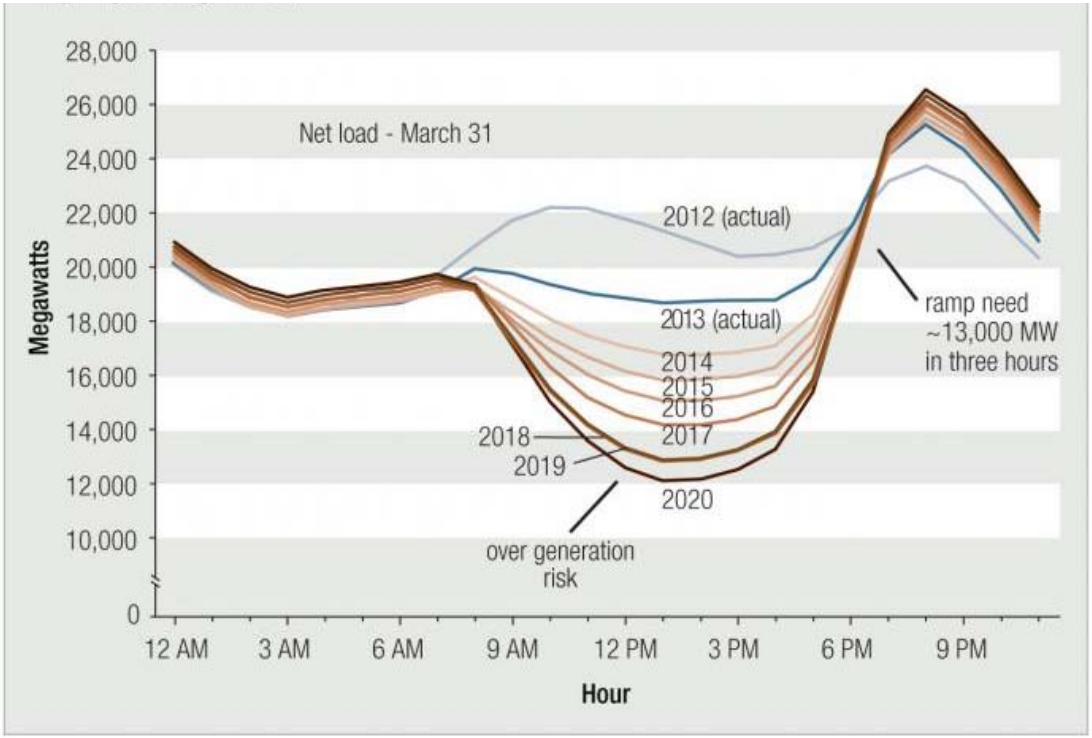

Operating practice changes

- Huge growth in the need for reserves to backup wind, solar (including DG). An "all wind/solar" system will theoretically require a 100% reserve margin.
- Explicit pricing of reliability-related reserves is on the horizon.
- The upshot is greatly reduced fuel diversity, which results in a much less robust system. The system operator's first priority will no longer be least-cost dispatch but "barely keeping the lights on."
- ISOs and RTOs are becoming the platform for implementing many federal regulatory policies driving the changes.

Implications

- The claim that the grid is underbuilt to meet the needs of future technologies is true. But an inefficiently planned resource base requires an overbuilt grid. There will be no free lunch.
- Demand-side actions will emphasize the use of prices for behavior modification (doing without). There will be attempts to place all utility customers on real-time rates (i.e., dynamic pricing) – the equivalent to throwing grandma into the spot market.
- Large customer generation and loads will be confiscated in the name of reliability with or without adequate compensation.

Conclusion for CIBO members

- The changes will impose greater risk to larger, non-residential customers – both supply risk (greater chance of electric/natural gas interruption) and cost risk.
- Best long-term electric supply solution may be on-site self-sufficiency with a dual-fuel capability.