
ERCOT Market Re-Design: Presentation to Legislative Staff

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Outline

- Transmission congestion.
- Why are we discussing a market re-design?
- What is economic dispatch?
- What savings are possible with economic dispatch across ERCOT?
- Environmental advantages of economic dispatch,
- How to achieve economic dispatch across ERCOT?
- Wholesale prices and new investment.

Transmission congestion.

- Transmission lines allow transport of power:
 - From where a generator is connected: “bus” or “node,”
 - To where a demand is connected: “bus” or “node.”
- When a line is operating at its capacity, we say that the line is “congested” or that “transmission congestion” is occurring:
 - Capacity of line then limits the ability to import cheap power into a region or to a bus or node,
 - Cost to meet demand is higher than it would have been in the absence of congestion,
 - Cost of delivered power varies by location or “nodally.”

Why are we discussing a market re-design?

- In 2001, the PUCT ordered that the ERCOT market should be re-designed when the increased costs due to “local” transmission congestion exceeded \$20 million in any 12 month period,
- This threshold was exceeded in March 2002:
 - After the ERCOT market had been operating for just seven months,
- Since then, hundreds of millions in local congestion costs annually.

Why are we discussing a market re-design?

- In 2003, the PUCT began a formal rulemaking process to re-design the market,
- The stakeholder process at ERCOT has adopted the name “Texas Nodal” to describe the Texas version of “Locational Marginal Pricing” (LMP),
- LMP, (or “nodal pricing”) first implemented in PJM, is the fastest growing and most proven market design in the United States:
 - Under LMP, price varies with location according to its locational cost.

Why are we discussing a market re-design?

- As part of the process, the PUCT commissioned a cost-benefit study,
- The “Backcast” analysis in the cost-benefit study showed:
 - Texas *wasted* over \$1 billion in fuel in 2003 alone because of poor dispatch of generation under the current ERCOT market design,
 - The current ERCOT market design falls far short of “economic dispatch,”
- Extrapolating, Texas wastes about \$3 million every day that we continue with the current ERCOT market design!

Why are we discussing a market re-design?

- High local congestion costs and the Backcast analysis point to the fact that the current ERCOT market is not working effectively,
- Band-aid revisions continue to be applied to the current ERCOT market design:
 - Over 250 revisions to the market approved since the market opened in 2001,
- After strong initial investment within Texas, developers are now unwilling to build new generation under the current ERCOT market.

What is economic dispatch?

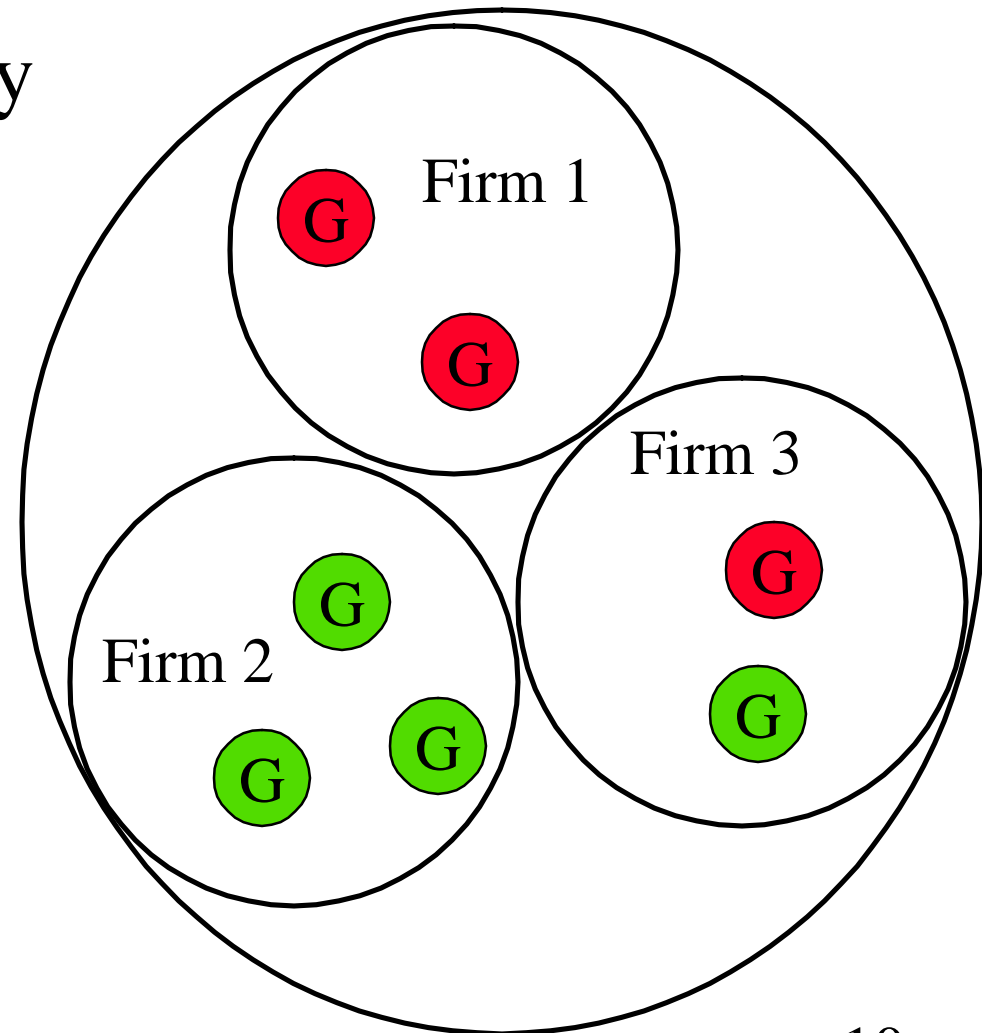
- Sharing generation between generators to minimize the total fuel costs,
- If two generators are running and one has higher production costs than the other:
 - Shift generation from the more expensive to the less expensive generator,
 - Possibly turn off the more expensive generator.

Economic dispatch.

- Basic idea is well over 50 years old.
- Refinements include considering effects of:
 - Transmission limits (“nodal prices”),
 - Cost to start-up generators (“unit commitment”),
 - Transmission losses,
- Technology for calculating optimal dispatch is well-established and continues to be refined,
- Economic dispatch would avoid the unnecessary costs that Texans continue to incur due to the current ERCOT market design.

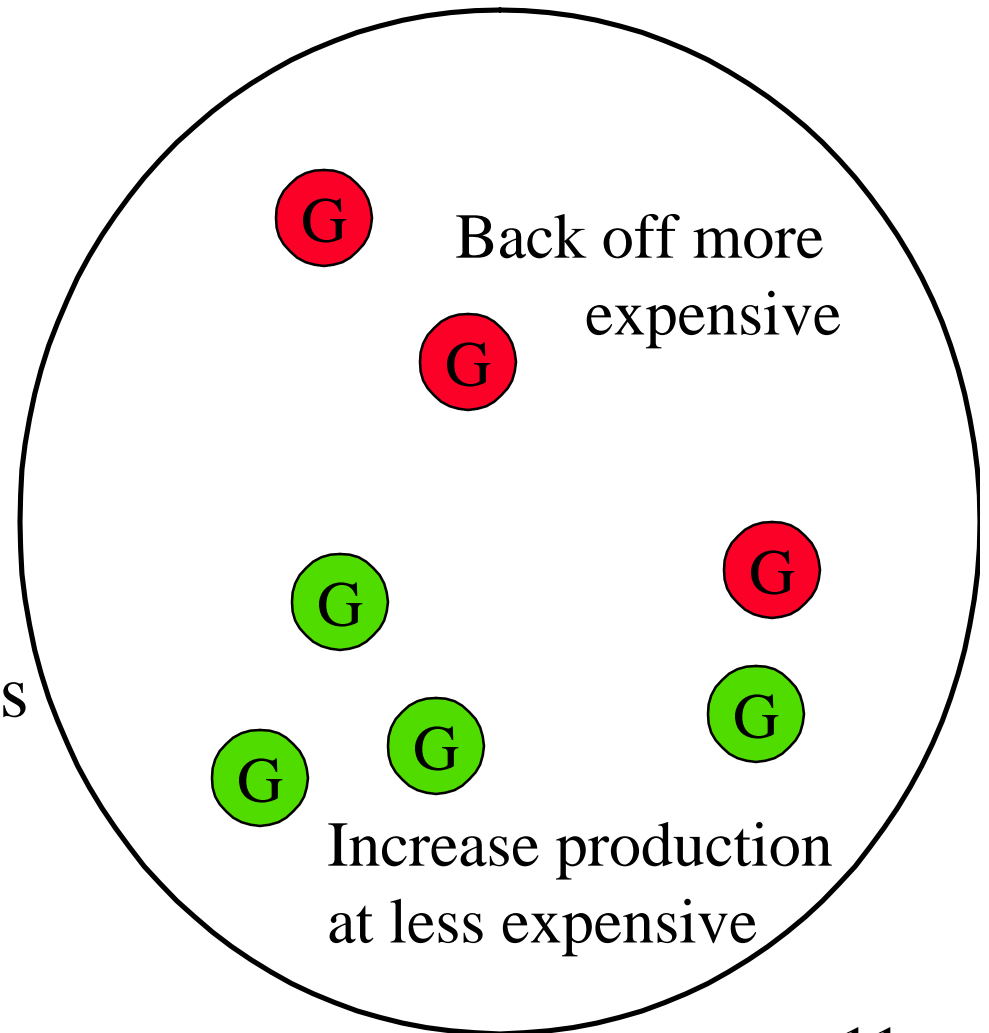
The current ERCOT market.

- Individual firms currently dispatch generation *within* their individual portfolios:
 - To meet their bilateral contract obligations,
 - Just as traditional utilities met their demand in ERCOT.



Improved dispatch in ERCOT.

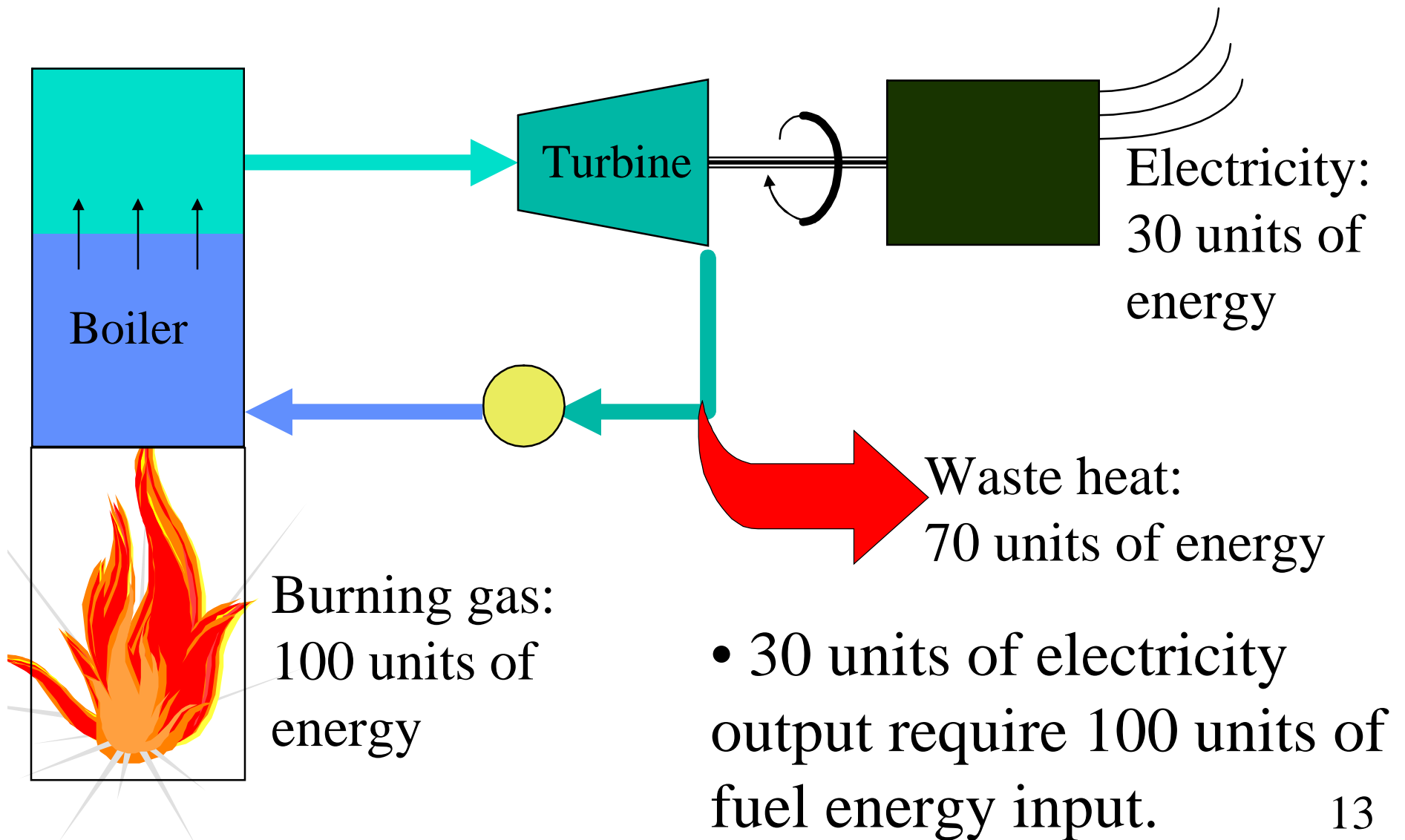
- But more savings are possible if generation is economically dispatched across *all* of ERCOT:
 - Back off generators that are more expensive,
 - Increase production at less expensive generators,
 - While satisfying transmission limits.



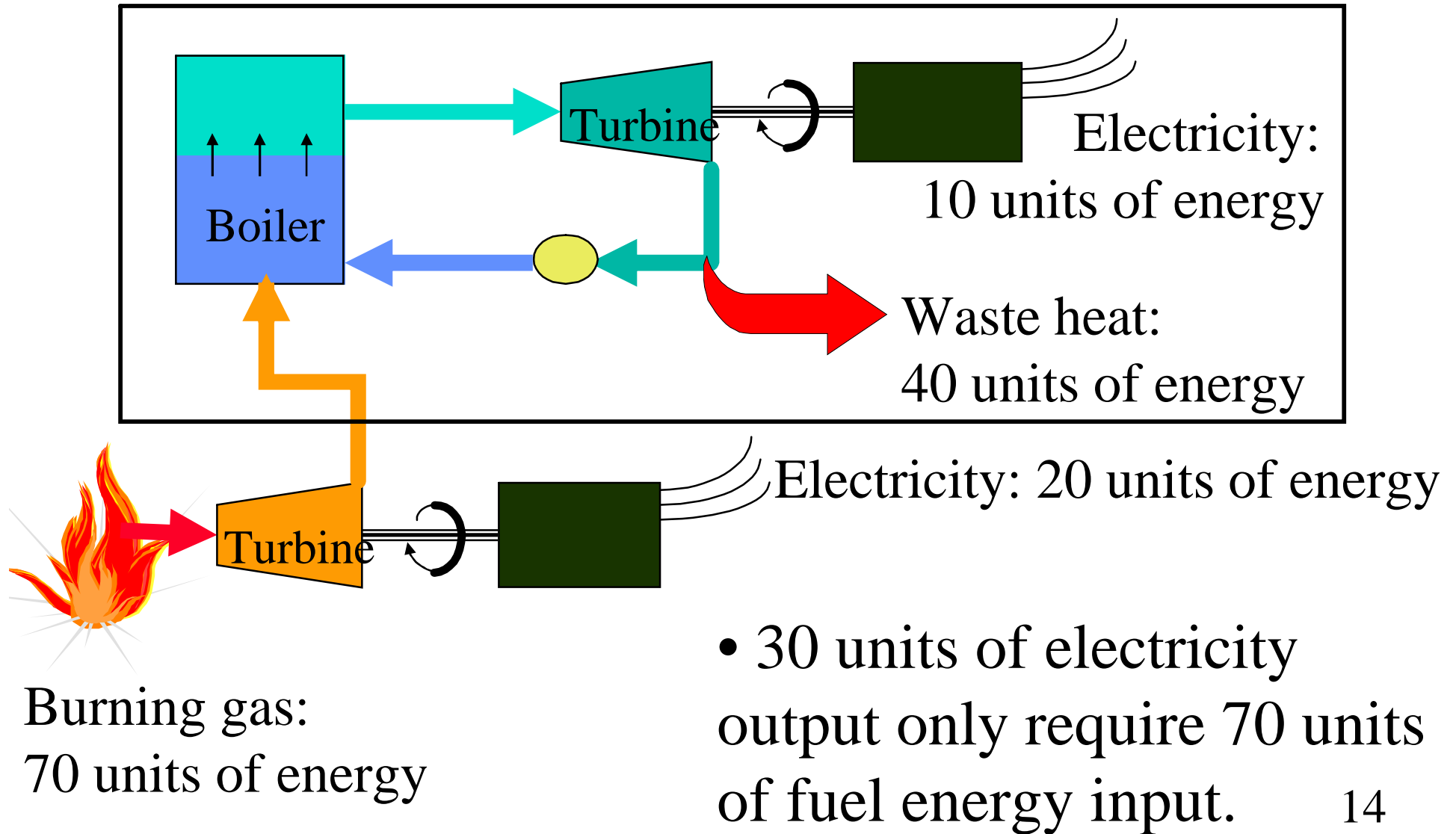
What savings are possible from economic dispatch?

- There are thousands of MW of efficient combined-cycle gas turbine plants installed in ERCOT:
 - Much of this capacity is not being fully utilized,
 - An example is the two-year old, American National Power plant in Hays County that has recently been shut down,
- To produce the same amount of electricity, combined-cycle gas turbines use *much less* fuel than gas-fired boilers.

Energy input and electricity output for a gas-fired boiler.



Energy input and output for combined-cycle gas turbine.



What savings are possible from economic dispatch?

- The “Backcast” analysis showed that, for 2003, ERCOT did not achieve economic dispatch:
 - Gas-fired boilers were over-utilized by companies dispatching their own portfolios, while
 - Combined-cycle gas turbines were under-utilized.
- Economic dispatch could have saved Texans over \$1 billion in 2003 by using more combined-cycle generation and less gas-fired:
 - These billion dollar *annual* savings dwarf the \$100 to \$150 million, *one-time*, cost of implementing the Texas Nodal market.

Environmental issues.

- As well as being more efficient than gas-fired boilers, new combined-cycle plants have very low emissions,
- Greater use of new combined-cycle plant will reduce emissions in Texas because:
 - Less fuel is burned (typically 30% less fuel),
 - Less emissions per unit fuel used (50% to 90% less emissions per unit fuel),
- Multiplicative effect means reduction in emissions by 65% or more!

Why don't we have economic dispatch today in ERCOT?

- The current market design lacks system-wide day-ahead coordination,
- The current market design doesn't start and run the cheapest units,
- The “zonal” price signals in the current ERCOT market are too “coarse:”
 - Do not include the effects of many detailed transmission limits,
 - Do not reflect the true locational variation in the cost to produce and deliver energy.

How to achieve the savings of economic dispatch?

- ERCOT needs a market with day-ahead offer-based economic dispatch:
 - Generator owners submit to ERCOT their unit-specific offers for their individual plants,
 - ERCOT finds the best commitment and dispatch decisions to minimize total offered costs,
 - Gets the right generation mix started-up day-ahead considering transmission constraints,
 - Energy sold at locational (“nodal”) prices that correctly reflect the offered costs and transmission congestion,
- ERCOT can choose the right generation mix overall rather than firm-by-firm.

Wholesale prices and new investment.

- The *zonal* wholesale prices in the current ERCOT market are too coarse:
 - Investors have built in ERCOT, only to find that local transmission constraints prevent them from selling their energy,
- *Nodal* wholesale prices in a day-ahead offer-based market show where energy is valuable:
 - Provides a useful signal for where to site new investment in transmission or generation.

Summary

- Coordinated ERCOT-wide day-ahead offer-based economic dispatch is the optimal solution:
 - Best economics,
 - Best environmental approach,
 - Best use of fuel,
 - Best signals for new investment.
- The Public Utility Commission is considering implementation of a nodal market.
- The nodal market is good for Texas because it includes day-ahead offer-based economic dispatch.