
Economic Dispatch and ERCOT:
Presentation to the
Texas House Regulated Industries
Committee

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Outline

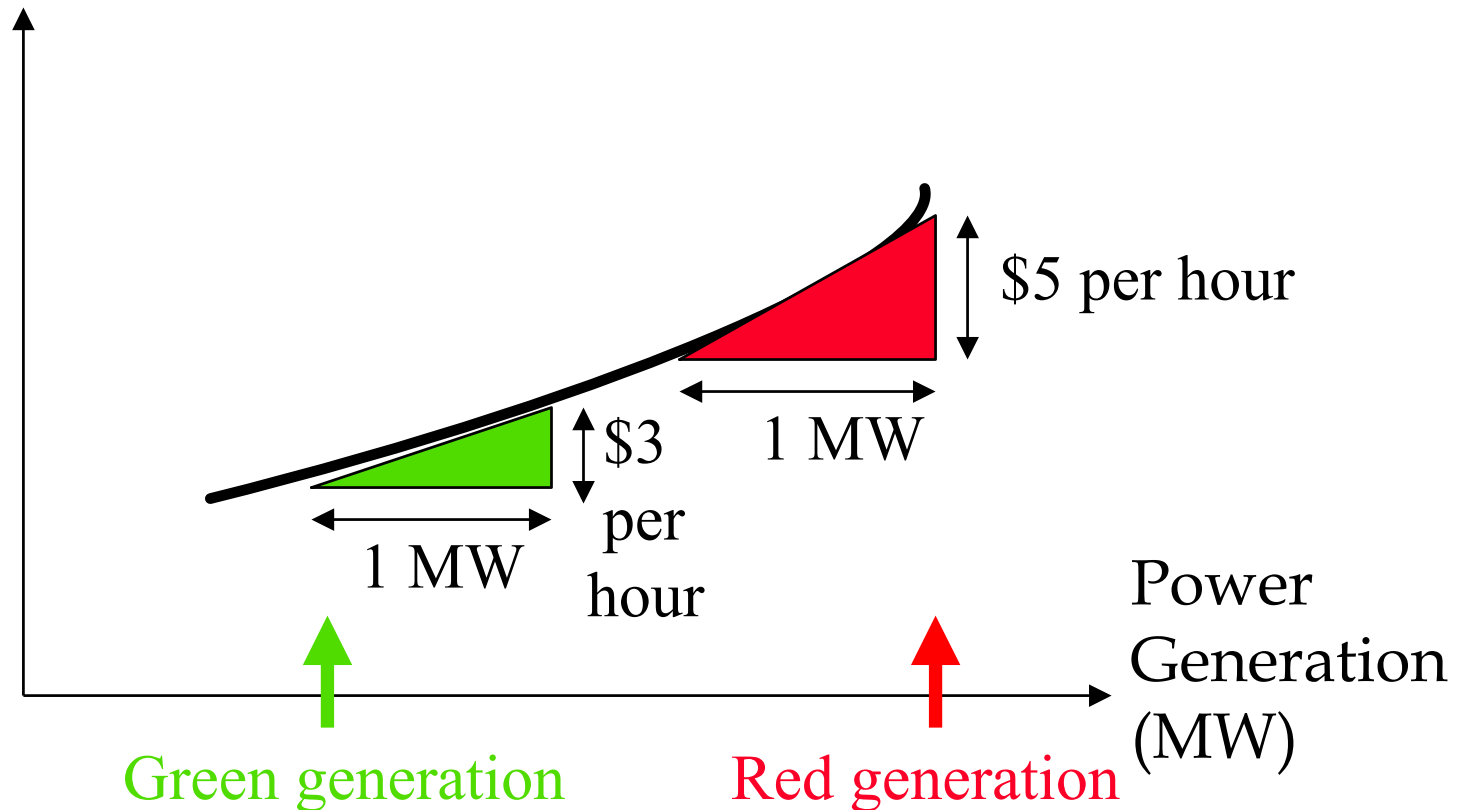
- What is economic dispatch?
- What savings are possible with economic dispatch across ERCOT?
- Environmental advantages of economic dispatch,
- How to achieve economic dispatch across ERCOT?
- Bilateral contracting and economic dispatch.

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.

Example with two generators.

Cost (\$ per hour)

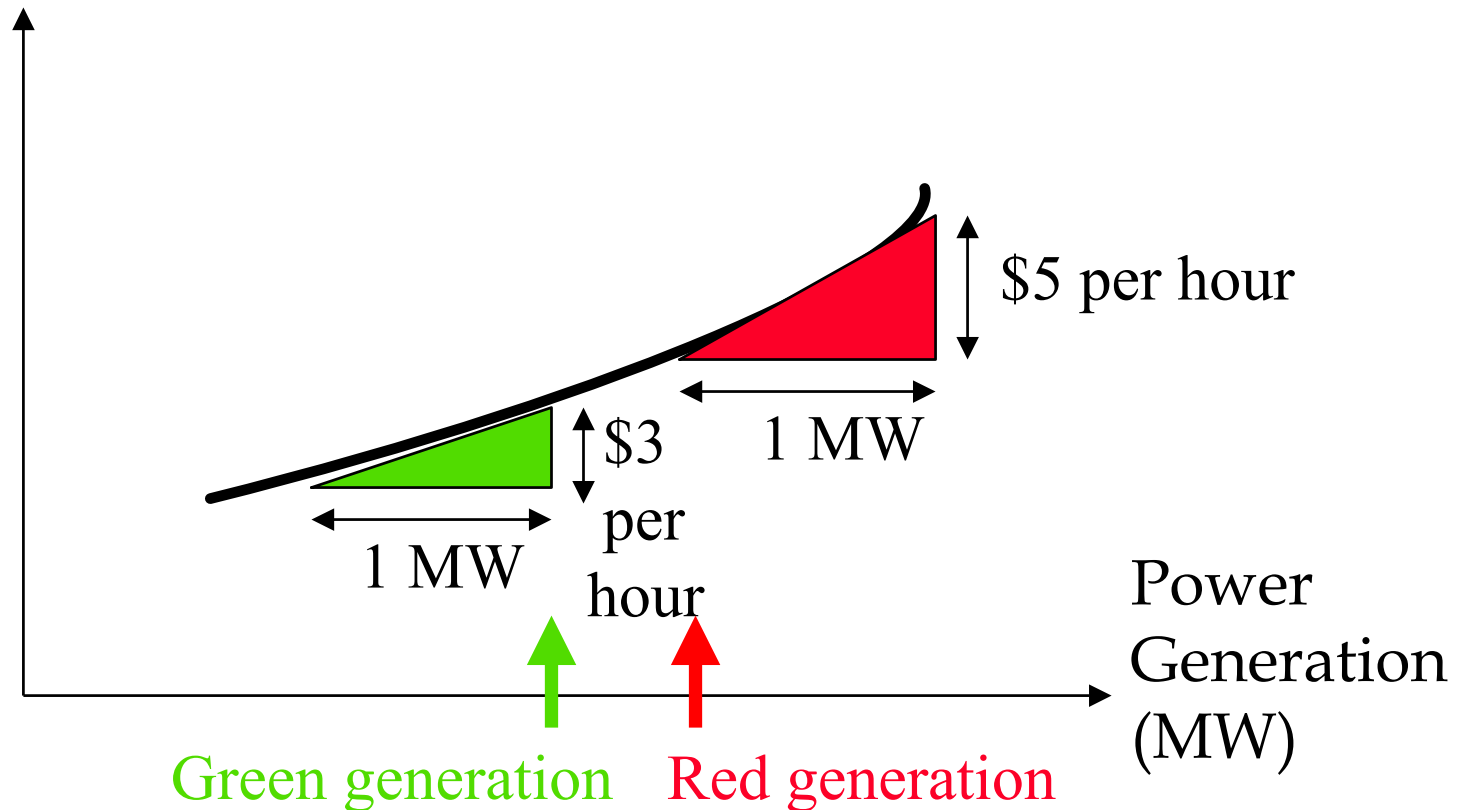


Sharing power generation between two generators.

- Back off higher cost generator:
 - reducing by 1 MW in red region saves \$5 per hour,
- Generator with lower cost should be run harder:
 - increasing by 1 MW in green region costs \$3 per hour,
- Net savings $\$5 - \$3 = \$2$ per hour for this shift:
 - keep shifting until (incremental) costs are all equal,
 - basis for economic dispatch.

Improved dispatch of two generators.

Cost (\$ per hour)



Other benefits of economic dispatch.

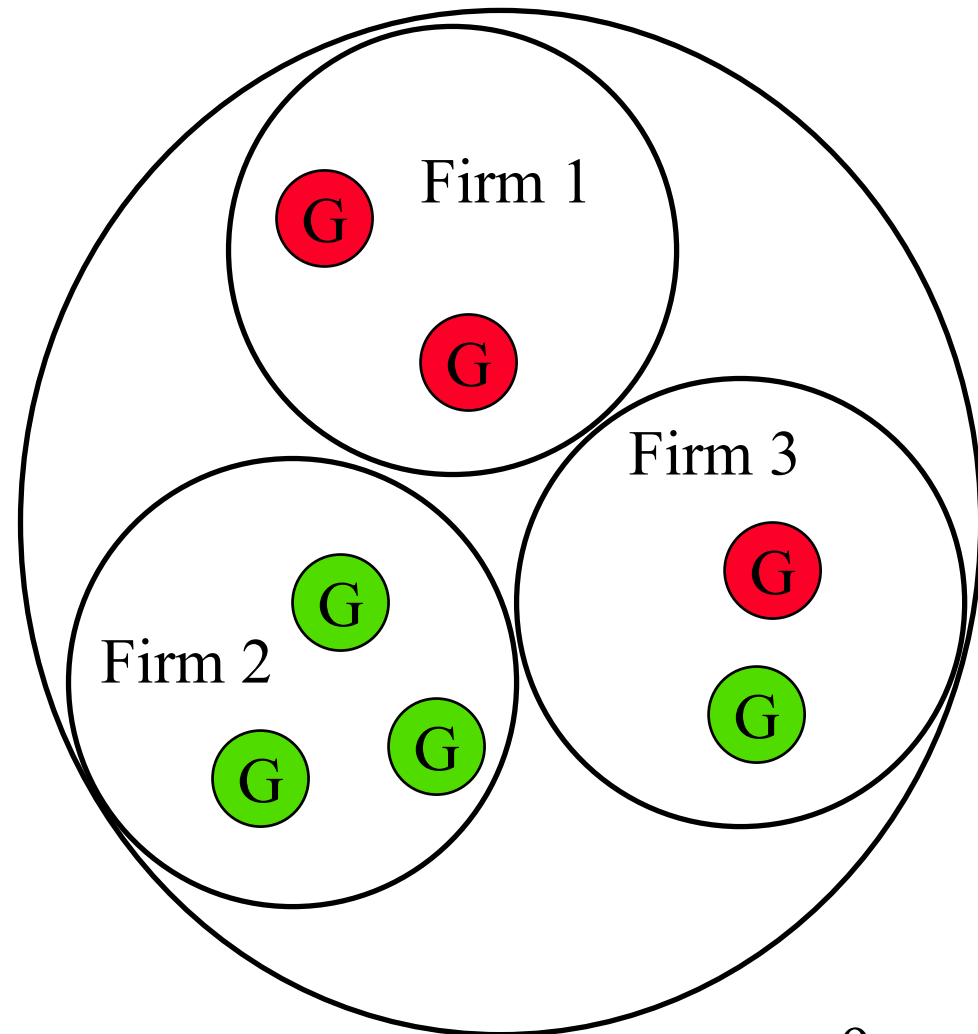
- Besides lowering costs,
- Newer, more efficient generators:
 - Produce less emissions,
 - Save natural resources.

Economic dispatch.

- Sharing generation between all generators to minimize overall operating costs.
- 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.

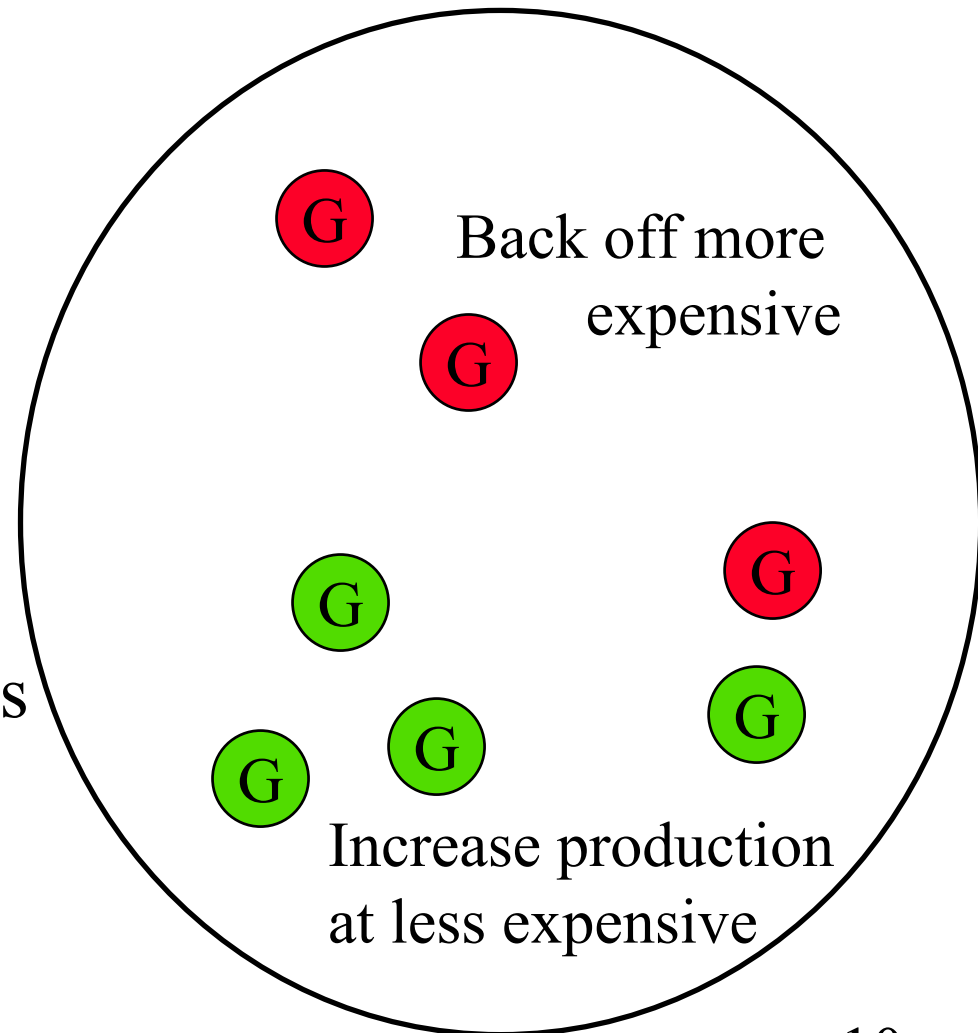
Do we have economic dispatch in ERCOT today?

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



Do we have economic dispatch in ERCOT today?

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



Why can't firms achieve ERCOT-wide economic dispatch today?

- Unlike other industries, transmission limits impose complicated, inter-related limitations on the deliverability of energy,
- Plans to start-up efficient generation must be made day-ahead,
- Hard for firms to coordinate their individual trades to minimize costs overall,
- Day-ahead economic dispatch by ERCOT would perform this coordination.

What savings might be possible?

- To get a full answer we need to represent transmission limits:
 - Cost/benefit study will address this in detail,
- However, the thousands of MW of combined-cycle gas turbine (CCGT) plant recently installed in ERCOT provide an example of the possible savings:
 - 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.

Combined-cycle versus gas-fired boilers.

- CCGT generators are operationally very efficient:
 - To generate one MWh of electric energy requires about 7 million British thermal units (Btus) of gas,
 - Assume a gas price of \$5 per million Btu,
 - Cost of production is \$35/MWh.
- Compare to a typical gas-fired boiler:
 - About 10 million, or more, Btus per MWh,
 - At the same gas price this is \$50/MWh,
- Savings is \$15/MWh by using the CCGT.

Combined-cycle versus gas-fired boilers.

- In ERCOT there are *thousands* of MW of gas-fired boiler capacity,
- Suppose that *some* CCGT generation could be used instead of gas-fired generation in ERCOT.
- Suppose that as little as 250 MW of gas-fired boiler production were backed off for 2000 hours per year (less than 3 months),
- Suppose that CCGT plant produced this power instead,
- The savings would be **\$7.5 million** per year!

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 (in example, 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!

How to achieve the savings of ERCOT-wide economic dispatch?

- ERCOT needs a day-ahead bid-based economic dispatch process:
 - Generator owners submit to ERCOT unit-specific bids for their individual plants,
 - ERCOT finds the best commitment and dispatch decisions to minimize total bids,
 - Gets the right generation mix started-up day-ahead,
 - Considering transmission constraints,
- ERCOT can choose the right generation mix overall rather than firm-by-firm.

Bid-based economic dispatch and bilateral contracting.

- Bid-based economic dispatch is completely consistent with bilateral contracting:
 - Bilateral contracts arrange longer-term financial positions between generators and retailers,
- If generator also bids its capacity into ERCOT then economic dispatch ensures that the most efficient plant is actually used day-by-day:
 - In previous example, if the generator bid \$50/MWh and there is \$35/MWh generation available then ERCOT uses the less expensive generation,
 - Saves \$15/MWh,
 - Everyone is better off.

Economic dispatch and bilateral contracting.

- If a firm prefers to not bid then it just schedules its bilateral transactions as it does now:
 - Informs ERCOT of transactions so that ERCOT can consider the transmission needed,
 - ERCOT will still calculate prices,
 - If the firm finds that, day after day, the ERCOT price is lower than its production cost then this is a signal that the firm should consider participating in the market,
 - Why wouldn't a firm choose to participate?

Why is it difficult for firms to achieve economic dispatch today?

- The “zonal” price signals available to generators today are coarse:
 - reflect only the small volume in the “balancing market,”
 - do not include the effects of many detailed transmission limits,
- The current market design doesn’t guarantee the starting of the correct units,
- Does not provide a transparent price signal reflective of a liquid market,
- Lacks system-wide coordination.

Summary

- Coordinated ERCOT-wide bid-based economic dispatch is the optimal solution:
 - Best economics,
 - Best environmental approach,
 - Best use of natural resources,
- Consistent with bilateral contracting,
- The Public Utility Commission's decision to support the nodal market is good for Texas because it includes bid-based economic dispatch.