

## Reducing Electricity Supply Externalities and Costs

Are we better off with Electricity Generation Markets or Natural Monopoly Regulation?  
(At least a Monopolist with interacting generators will minimize its costs.)

Is there some in-between regulation, incentives, or framework?

The Baumol-Oates definition of a production externality: An externality is present whenever some firm's production relationships include real variables whose values are chosen by others.

Kirchhoff's laws for electrical circuits and Maxwell's equations for electro-magnetic fields are the physical laws which give rise to externalities among generators.

The Baumol-Oates definition of a production externality holds for generators in electricity markets, implying that externalities exist in electricity markets.

The implication of the existence of production externalities in markets is that there would exist changes to the "least short-run variable cost" (i.e., SRMC) market dispatch rule which would result in lower total costs, defined here as the present value of all expenditure outlays over a planning horizon (without increasing environmental impacts).

Our Electricity Supply and Investment Model (ESIM) represents:

- load-following impacts on older baseload nuclear and coal units.
- weekend off-on cycling of older coal units.

Using ESIM, the following are capable of providing lower cost-of-electricity.

- Curtailing Wind under some conditions.
- Eliminating the wind Production Tax Credit (PTC).
- Adding battery storage.
- Increase electricity demand, i.e., Electrification
- Investing in gas combustion turbines for peak-load capacity, instead of NGCC units which often reduce coal unit capacity factors.

Don Hanson, October 17, 2019