



Synapse
Energy Economics, Inc.

Wholesale Capacity and Energy Price Suppression Benefits of Efficiency & Distributed Generation

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Pricing Solar Energy

- Today's electricity prices reflect neither the costly “externalities” of fossil and nuclear fueled generation, nor the real benefits of solar generation to ratepayers, local utilities and the grid. We'll look at wholesale market price suppression, fuel price risk mitigation, avoided transmission spending, long term contracting, grid reliability, power quality and mitigating utility investment risks. We'll explore current electricity pricing mechanisms, how solar should be appropriately valued, and the policy questions regarding how to get there.

Learning Objectives

- Retail customers who invest in distributed generation and/or energy efficiency reduce the quantity of wholesale / conventional utility electric capacity and energy that utilities or merchant suppliers acquire to supply them.
- The learning objective of this presentation is to explain how those reductions by that sub-set of retail customers will benefit all retail customers by suppressing the prices of the wholesale / conventional utility capacity and energy that all retail customers ultimately pay.

Benefits of Distributed Generation

1. Avoided Energy Costs due to avoided Wholesale Energy Purchases
2. Avoided Capacity Costs due to avoided Wholesale Generation Purchases, and avoided transmission and distribution capacity
3. **Lower energy and capacity costs due to suppression of wholesale energy and capacity prices**
4. Avoided Environmental costs
5. Net increases in jobs and local economic development
6. Reduced Security Risk
7. Avoided Grid Service costs

EXAMPLE - ACEEE/Synapse Ohio Study

- Ohio Energy Efficiency Resource Standard (EERS) requires electric utilities to attain annual target reductions from energy efficiency (adopted 2008, updated June 2012)
- Annual targets increase from 0.9% in 2013 to 2% by 2020
- Customers either pay for EERS costs through an energy efficiency rider or contribute EE projects to their utility

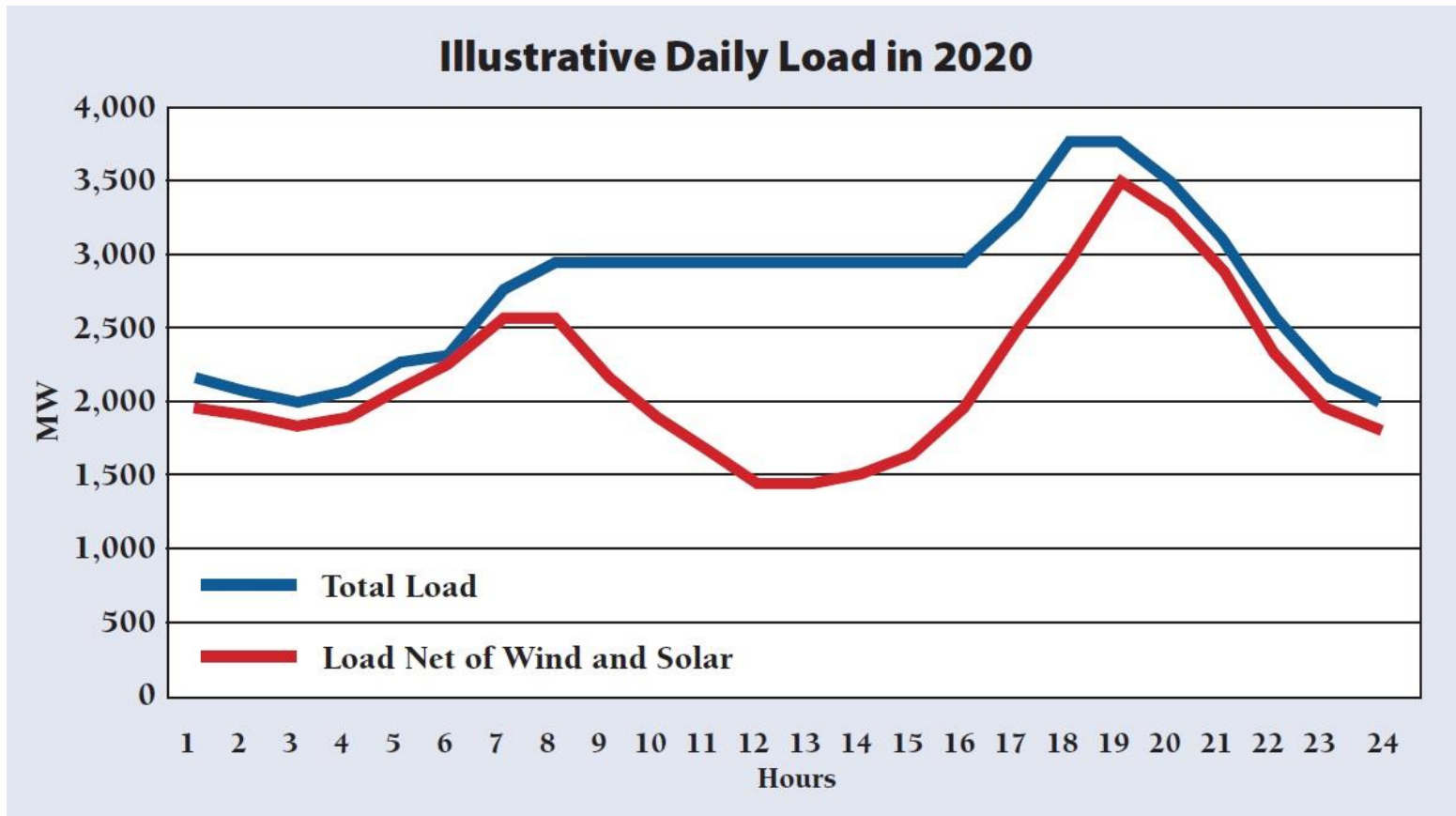
EXAMPLE of Study Results

	Savings 2010-2020 (Million \$2012)
Program participants – savings from lower energy use	\$3,370
All OH ratepayers – savings from lower prices for wholesale capacity and energy (Price Mitigation)	\$2,200
Gross Savings	\$5,570
Utility Program Administration Costs	(\$2,800)
Net Savings	\$2,770

Impact of EE and DG on Wholesale Generation Capacity & Energy Costs

- In retail markets where generating capacity and energy are acquired at the cost of each resource, reductions in load from EE and/or DG have some downward impact on retail rates by delaying cost of the **marginal** capacity resource and avoiding cost from the **marginal** energy resource.
- In retail markets where generating capacity and energy are acquired at wholesale market prices, reduction in load from EE and DG has a much larger downward impact on retail rates because:
 1. Reductions in market clearing prices apply to **all** capacity resources and to **all** energy resources;
 2. A small reduction in load during peak periods can have a large impact on prices depending on the shape of the supply and demand curves.

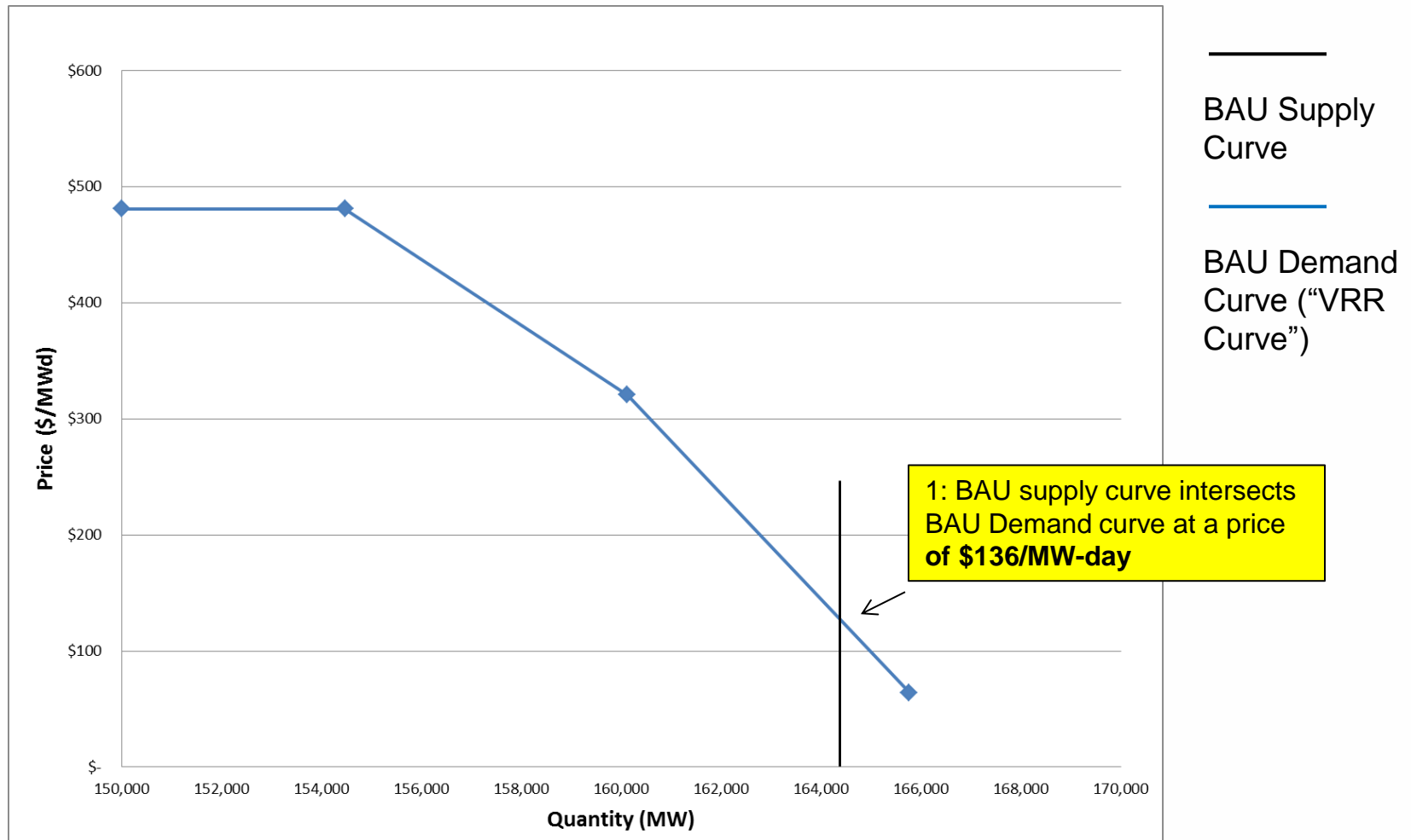
Illustrative Impact of DG on Hourly Load Profile Over a Day



Source: Lazar, Jim. *Teaching the "Duck" to Fly*. Regulatory Assistance Project, January 2010, page 1.

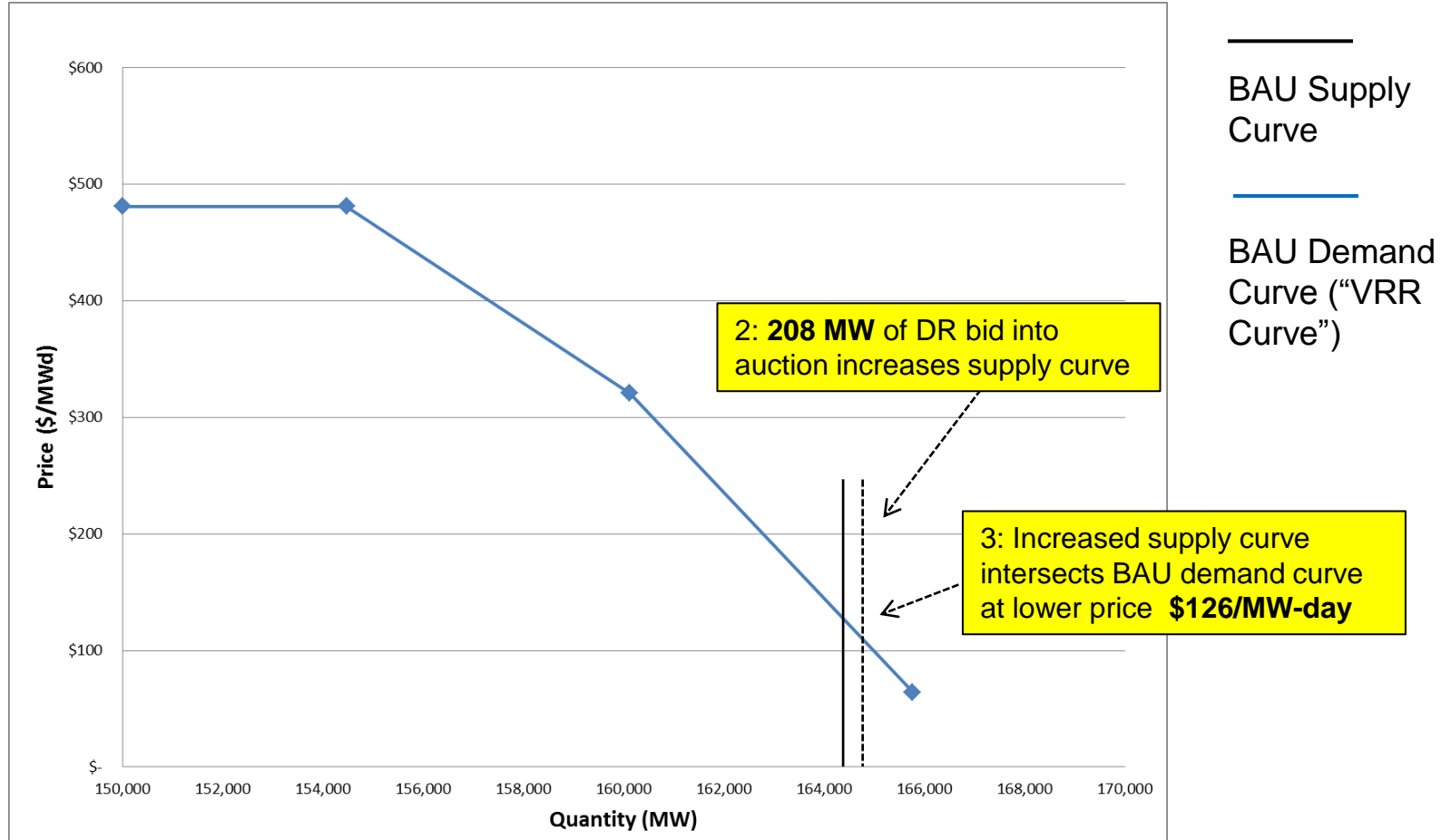
Wholesale Capacity Price Mitigation (annual)

Step 1 – Business as Usual (BAU) Demand; BAU Supply; BAU Price



Wholesale Capacity Price Mitigation (annual)

Step 2 – BAU Demand; Increased Supply; Lower Price



EXAMPLE – Ohio Wholesale Capacity Price Mitigation (annual)

Ohio fraction of PJM RTO excluding ATSI

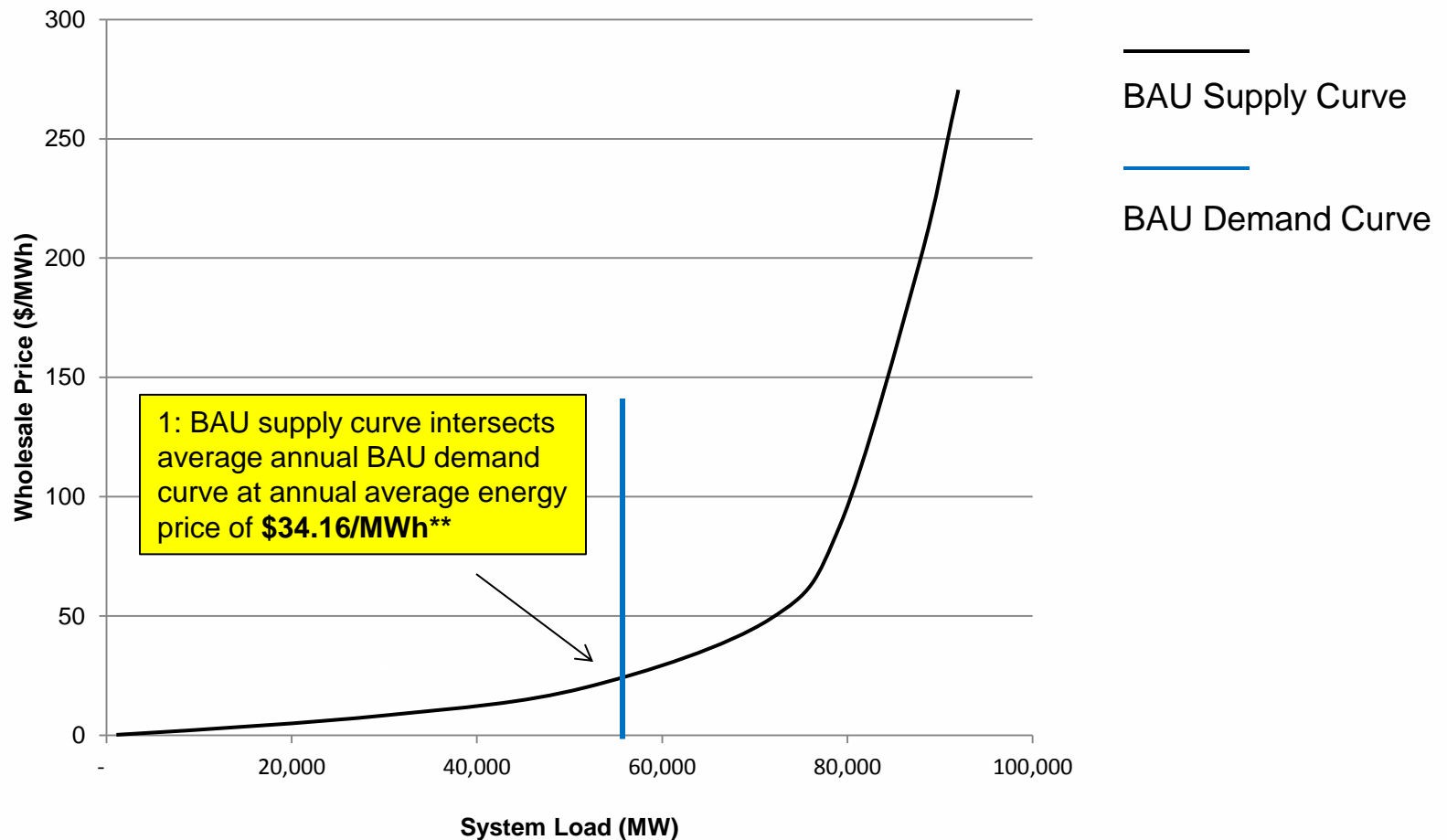
Scenario	Capacity (MW)	Price (\$/MW-day)	Cost (million \$)
BAU	14,439	\$136	\$716.7
BAU + EE	14,459	\$126.2	\$666
Change	20 **	(9.8)	(\$50.7)
	0.14%	(7.2%)	(7.1)%

0.14% increase in supply
reduces price by 7.2%

**20 MW is Ohio fraction of 208 MW bid into PJM RTO

Wholesale Energy Price Mitigation (annual)

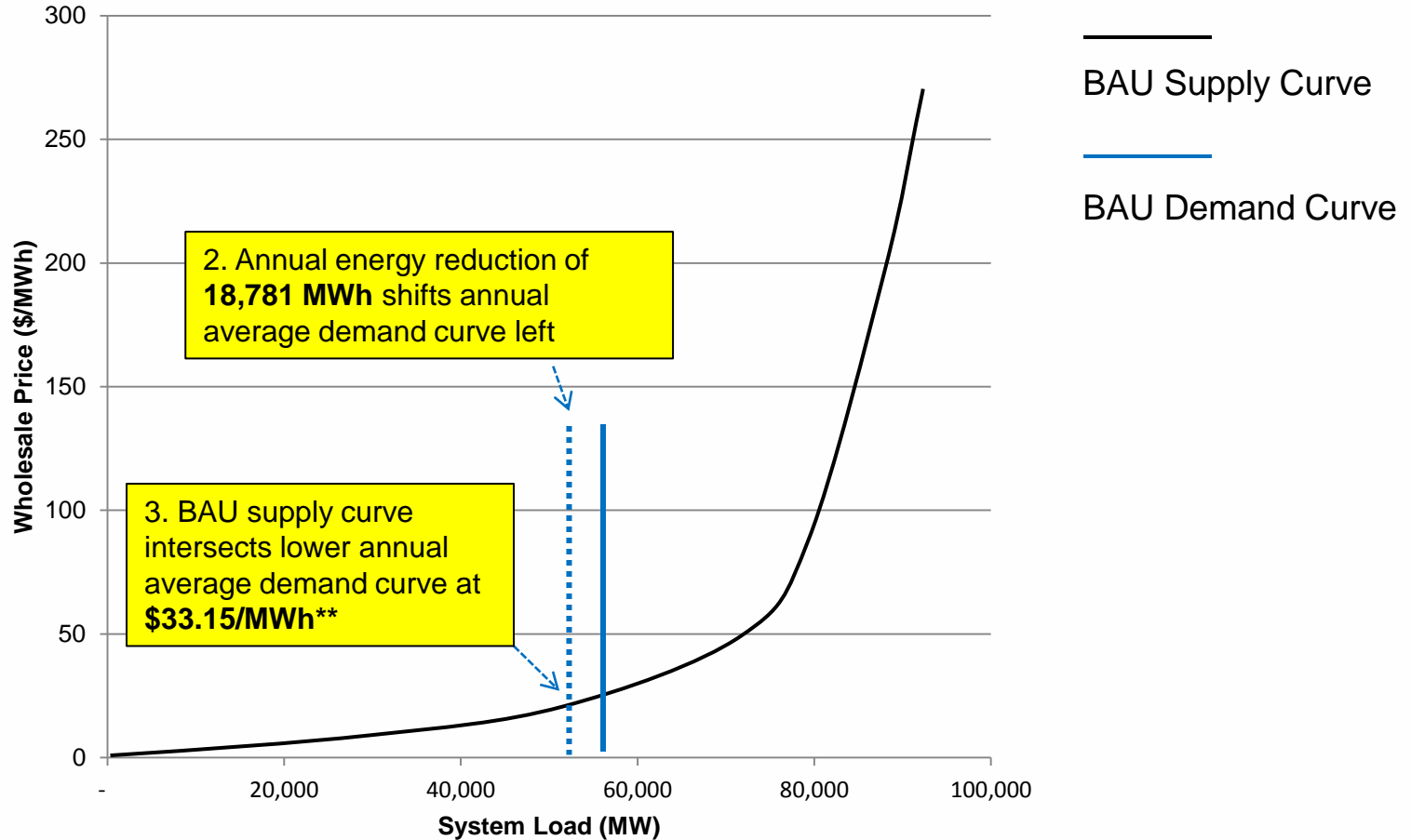
Step 1 – Business as Usual (BAU) Energy; BAU Supply, BAU Price



**annual load weighted effect from regression fitted to hourly loads and prices

Wholesale Energy Price Mitigation (annual)

Step 2 – Lower Energy; BAU Supply; Lower Price



**annual load weighted effect from regression fitted to hourly loads and prices

Example – Ohio Wholesale Energy Price Mitigation (annual)

Scenario	Load (GWh)	Price (\$/MWh)	Cost (million\$)
BAU	181,904	34.16	6,214
BAU + EE	163,124	33.15	5,408
Change	(18,781)	1.006	806
	(10%)	(3%)	(13%)
Lower Energy Use Savings	18,781 * \$34.16 /1,000		642
Price Mitigation Savings	163,124 * \$1.006 /1,000		164

Price Mitigation Impact of EE and/or DG on Retail Rates

- Estimating the downward impact of EE and/or DG on wholesale market clearing prices for capacity and for energy requires analyses of:
 - the Business-as-Usual operation of those markets
 - when, and for how long, those markets see these reductions
- Estimating the resulting impact on retail rates requires analyses of how wholesale capacity and energy costs flow into retail rates
- Estimating the persistence of these reductions requires analyses of how wholesale markets will respond to lower prices over time

Further Reading

- Neubauer, Max et al. *Ohio's Energy Efficiency Resource Standard: Impacts on the Ohio Wholesale Electricity Market and Benefits to the State*. ACEEE, April 2013.
- Hornby, Rick et al. *Avoided Energy Supply Costs in New England: 2013 Report*. Synapse Energy Economics, July 12, 2013. Chapter 7.

Synapse Energy Economics

- Analyzes economic and environmental issues in the electric and natural gas industries
- Founded in 1996
- Staff of 30 engineers, scientists, economists, and policy experts in Cambridge, MA
- Focuses on electric industry resource planning and ratemaking. Emphasis on environmental compliance costs, role of efficiency and renewables, design and operation of wholesale electricity markets. Experts in computer simulation modeling of long-term demand, supply, and prices.
- Provides reports, testimony, litigation, and regulatory support
- Clients include energy offices, utility regulators, consumer advocates, environmental organizations, and federal agencies



Questions?

This concludes the American Institute of Architects
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