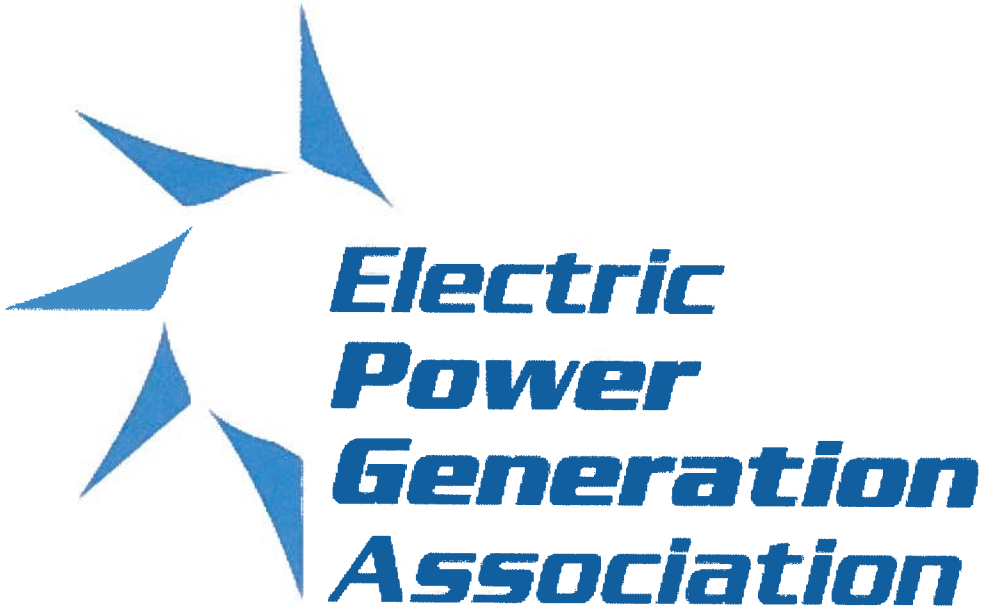

Remarks Before The House Republican Policy Committee Hearing Regarding Wind Energy and Alternative Energy Portfolio Standards

Douglas L. Biden, President

June 11, 2010

Electric Power Generation Association

- EPGA members:
  - AES Beaver Valley
  - Allegheny Energy
  - Cogentrix Energy, Inc.
  - Dynegy Inc.
  - Edison Mission Group
  - Exelon Generation
  - FirstEnergy Corporation
  - LS Power
  - PPL Generation Group
  - RRI Energy, Inc.
  - Sunbury Generation LP
  - Tenaska, Inc., and
  - UGI Development Company

- Members operate 140,000 MW of electric generating capacity in the U.S., half in PA and surrounding states. They have approximately 19,000 employees in PA.
- Comments today are my own and do not necessarily represent views of any particular EPGA member.

Summary of Main Points

- Wind now 55% of planned generating capacity in PJM.
- Existing mandates will require 200 billion KWH in PJM by 2025. Are higher mandates necessary?
- Higher levels of wind integration present a number of challenges: transmission, reliability, operations, costs.
- AEPS Mandates = significant additional costs over time, many not known to policymakers.
- Need energy storage and flexible non-variable resources to provide back-up to wind.
- Consider relying on the market rather than mandates for future renewables development.

PJM Supply Mix - 2009

	Installed Capacity	Generation
Coal	40.7%	50.5%
Nuclear	18.4%	36.0%
Natural Gas	29.2%	9.5%
Hydro	4.7%	2.0%
Wind	0.2%	0.8%
Oil	6.4%	0.2%
Waste, Solar, Other	0.4%	1.0%

- These statistics are very similar for Pennsylvania.
- In PJM 1,200+ power plants with capacity >167,000 MW compete for market share on basis of costs.
- These are the results of a least-cost dispatch market.
- PA is #2 in electricity production in the US, #1 in export.

New Capacity

- At end of 3/2009, there were 76,785 MW in PJM active or under construction queues.
- Breakdown:

» Wind	41,877 MW	(55%)
» Gas CC or CT	19,871 MW	(26%)
» Nuclear or Steam	12,968 MW	(16%)
» Hydro	485 MW	(1%)
» Solar, Battery & Other	1,584 MW	(2%)

- 14% of queued capacity in PA. 6% of wind capacity in PA.
- PA has no comparative economic advantage in wind.
- Takeaway: Generation a policy-driven industry planning to build what is being mandated by states in a slow growth, credit-constrained market.

Head"winds" For Thermal Plants

- Air:
  - Revised Ozone Standard
  - Revised SO2 Standard
  - Mercury MACT Rule (all HAPS)
  - Regional Haze
  - CAIR Replacement Rule
  - High Electric Demand Days (HEDD)
  - EPA Direct GHG Regulation (tailoring rule)
  - Federal GHG Legislation
- Water:
  - State Wastewater Regulations (TDS)
  - Federal Effluent Guidelines
  - Federal/State 316 (b) Implementation
- Solid Waste:
  - Federal Regulations of Coal Combustion Residuals

Wind and AEPS Mandates

- Wind has no NOx, SO2, PM, Hg, or CO2 emissions.
- It uses no water. Its fuel is free.
- It benefits from federal production tax credits of $21/MWH, AEPS/RPS credits, and special purchase agreements which enable it to run at $0/MWH (even negative prices) and still earn revenues.
- Together with environmental challenges for thermal plants, these sum to competitive advantages for wind.
- Given that 55% of planned PJM capacity is currently wind, are higher mandates necessary at this time?
- Are more state mandates for wind and other variable energy resources the best policy tool going forward?

Transmission Challenges of Integrating Wind

- Wind must locate where "fuel" is available, often great distances from where it is needed.
- Substantial investment required to upgrade existing transmission system and build new high voltage lines.
- DOE and other studies estimate transmission investments of $60-$158 billion needed for wind to reach 20% market share in Eastern Interconnection.
- Issue of who will pay is very contentious. Example of problems getting wind from Dakotas to load centers.
- Strong policy leadership + federal siting authority needed to build transmission needed to connect wind to load.

Reliability and Operations Challenges

- Fuel availability does not correlate with electricity demand.
- Limited value as a capacity resource – not available on peak summer days when needed most.
- Higher levels of wind generation greatly increases need for dispatchable ramping capability from other sources on the system.
- Contributes to "overgeneration" events. Baseload generation can be backed off at night to accommodate high winds then not available next day to meet demand.
- Places stresses on existing capacity for which it was not designed.
- Portfolio reconfiguration: longer term, changes desired operating characteristics of non-variable capacity - favors less baseload (especially coal) and more generation that can start up and shut down faster.

Cost and Environmental Challenges

- Due to variability, requires redundant capacity and more ancillary services (e.g., load following reserves, voltage support, etc.) - added costs that are often overlooked.
- Required flexibility means reduced reliance on baseload and increased reliance on thermal peaking units – significant additional cost over time.
- Greater investment in transmission per MW means higher cost of transmission per MWH delivered.
- Much greater amount of land consumed per MW compared to thermal capacity (see slide at end).
- More frequent ramping of thermal generation produces higher fossil fuel emissions per MWH.

The Issue of Wholesale Price Suppression

- Alleged: mandating more renewable resources like wind will lower wholesale energy market prices – partial analysis at best.
- PJM Independent Market Monitor net revenue analysis: new peaking, mid-merit and base load coal plants have covered only 43%, 59% and 59%, respectively, of fixed costs over last 11 years.
- Clearly, total revenues available to generators from energy, capacity and ancillary services markets have not been high enough to support new entry for these capacity resources.
- Q: If there is price suppression in the energy markets by variable energy resources, where will the "missing money" come from to support the capacity resources needed for reliability?
- A: Capacity and ancillary services market prices will have to rise – perhaps significantly, or there would be insufficient capacity.

Meeting the Challenges

- 9 of 13 PJM states and DC have RPS requirements.
- Will require 200 billion KWH by 2025 – most will be wind (cheapest of renewables). For reference, total PA generation = 225 bil KWH.
- Batteries, compressed air systems, flywheels, which can store energy, needed to smooth out production of wind.
- Will need more dependable wind forecasting and demand response.
- Flexible non-variable resources providing a back-up function to wind must be fairly compensated in the market for their opportunity costs (foregone sales) and the value of the service they provide.
- Compensation should reflect increasing risk to equipment from having to ramp up and down or cycle on and off quickly.
- New market constructs may be needed to compensate resources based on their ramping capability or other services provided.

Markets Best at Facilitating Wind Energy

- Approximately 80% of total US wind capacity is located within organized wholesale markets (like PJM).
- Dispatch of generation over large balancing area provides greater ability to accommodate output variations of intermittent resources – larger pool of non-variable resources to rely on.
- If generators perceive fair public policy and price signals, including reasonable ability to recover costs, they will invest efficiently and provide the right balance of renewable and conventional generation.
- Consider relying on "market pull" rather than "government push". Retailers offering 100% wind products to customers who want it.
- Mandates skew market risks and rewards in favor of some generation sources to detriment of others - do not reduce total electricity costs or increase net employment.
- Costs of AEPS mandates whether socialized (transmission) or assigned to "cost causer" will eventually be paid by customers.

Renewables Footprint Much Larger Than Other Generation Types

For 1000 MW plant

Solar: 40 sq. miles of land

Wind: 40 sq. miles of land

Nuclear: 1/3 sq. mile

Renewables Must Be Part of Energy Mix But ..... for Baseload?

Levelized Cost of New Generating Technologies, 2016

($2008 per megawatt hour)

Plant Type	Capacity Factor (%)	Levelized Capital Cost	Fixed O&M	Variable O&M (including fuel)	Transmission Investment	Total System Levelized Cost
Conventional Coal	85	69.2	3.8	23.9	3.6	100.4
Advanced Coal	85	81.2	5.3	20.4	3.6	110.5
Advanced Coal with CCS	85	92.6	6.3	26.4	3.9	129.3
Natural Gas-fired						
- Conventional Combined Cycle	87	22.9	1.7	54.9	3.6	83.1
- Advanced Combined Cycle	87	22.4	1.6	51.7	3.6	79.3
- Advanced CC with CCS	87	43.8	2.7	63.0	3.8	113.3
- Conventional Combustion Turbine	30	41.1	4.7	82.9	10.8	139.5
- Advanced Combustion Turbine	30	38.5	4.1	70.0	10.8	123.5
Advanced Nuclear	90	94.9	11.7	9.4	3.0	119.0
Wind	34.4	130.5	10.4	0.0	8.4	149.3
Wind-Offshore	39.3	159.9	23.8	0.0	7.4	191.1
Solar PV	21.7	376.8	6.4	0.0	13.0	396.1
Solar Thermal	31.2	224.4	21.8	0.0	10.4	256.6
Geothermal	90	88.0	22.9	0.0	4.8	115.7
Biomass	83	73.3	9.1	24.9	3.8	111.0
Hydro	51.4	103.7	3.5	7.1	5.7	119.9

Source: Energy Information Administration, Annual Energy Outlook 2010, http://www.eia.doe.gov/oiaf/aeo/electricity_generation.html