



Connecticut Generation: Repowering issues and options

CEAB 2010 IRP Stakeholder Working Group
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The IRP Statute...

Conn. Gen. Stat. § 16a-3a(d)(3) requires energy resource procurement plans to:

- *"...develop a comprehensive plan for the procurement of energy resources... in a manner that minimizes the cost of such resources to customers over time and maximizes consumer benefits consistent with the state's environmental goals and standards."*
- *"consider . . . the optimization of the use of generation sites and generation portfolio existing within the state . . ."*
- *"assess... the impact of current and projected environmental standards, including, but not limited to, those related to greenhouse gas emissions and the federal Clean Air Act goals... energy security and economic risks associated with potential energy resources, and the estimated lifetime cost and availability of potential energy resources."*

Practical Considerations

- As called for in PA 07-242, procurement planning needs to fully recognize the economic and societal benefits to Connecticut ratepayers of repowering existing generation on existing, permitted sites, with extensive infrastructure and interconnections to the region's electrical system.
- Absent the significant investments needed for repowering, it will become increasingly difficult to justify the continued operation of these less efficient, higher emitting units over the planning period.
- Converting existing sites to more efficient and lower-emitting generating sources provides economic and environmental benefits, while minimizing the need for difficult permitting processes associated with siting new generation on green field properties.
- Modernizing Connecticut's generation fleet with new or repowered generation will require several years to complete.

Integrated Resource Planning ...

- Should establish a vision for Connecticut's energy future
 - Maximize efficiency of energy usage *and* of energy production
 - Minimize environmental impacts of power generation
 - Maximize reliability
 - All consistent with reasonable cost
 - Use competitive mechanisms to ensure greatest efficiency and lowest possible cost

Why Repower?

- Provide smooth capacity resource transition
- Moderate market clearing prices for energy and reserves, reducing overall consumer costs
- Maintain jobs and renew local tax base
- Maximize use of existing generation sites and transmission infrastructure
- Minimize need for new greenfield generation sites and transmission rights-of-way
- Improve generation efficiency (heat rate) at these stations by 30-40% or more
- Minimize congestion and transmission losses by siting efficient and economical base-load generation in close proximity to load pockets
- Reduce emission rates relative to the existing plants
- Increase the operational flexibility of the plants and the system overall, resulting in lower costs and a greater ability to integrate intermittent and other renewable resources
- Retain the use of highly-assimilated generation sites

Repowering in Regional Policy

- New England Governors' Energy Blueprint
 - ISO's study in support of the Blueprint included consideration of replacement and repowering of older fossil steam generation
 - In addition to findings with regard to renewables, the study found that repowering or replacing older units with new, efficient, local generation is the most effective strategy for reducing air emissions and among the most effective for reducing costs

Sources: New England Governors' Energy Blueprint, September 15, 2009.

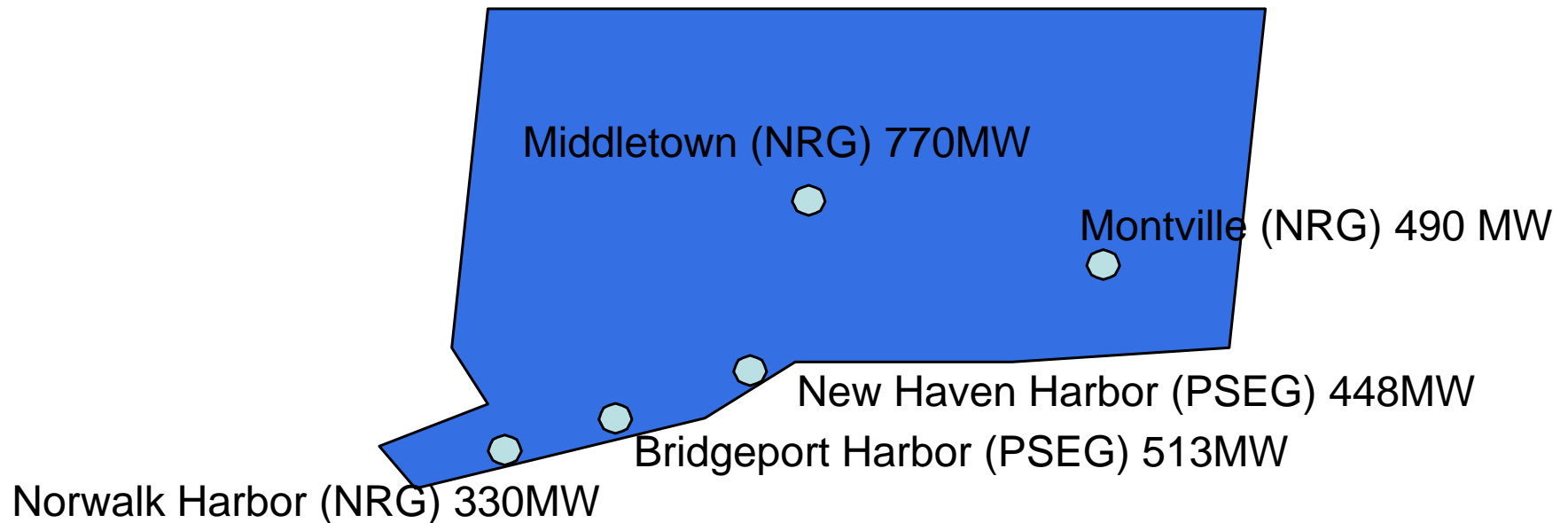
http://www.nescoe.com/uploads/September_Blueprint_9.14.09_for_release.pdf

ISO New England Draft New England 2030 Power System Study, September 8, 2009 ("ISO")

http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/reports/2009/eco_study_report_draft.pdf

Repowering Potential

Connecticut's fossil steam units more than 30 years old

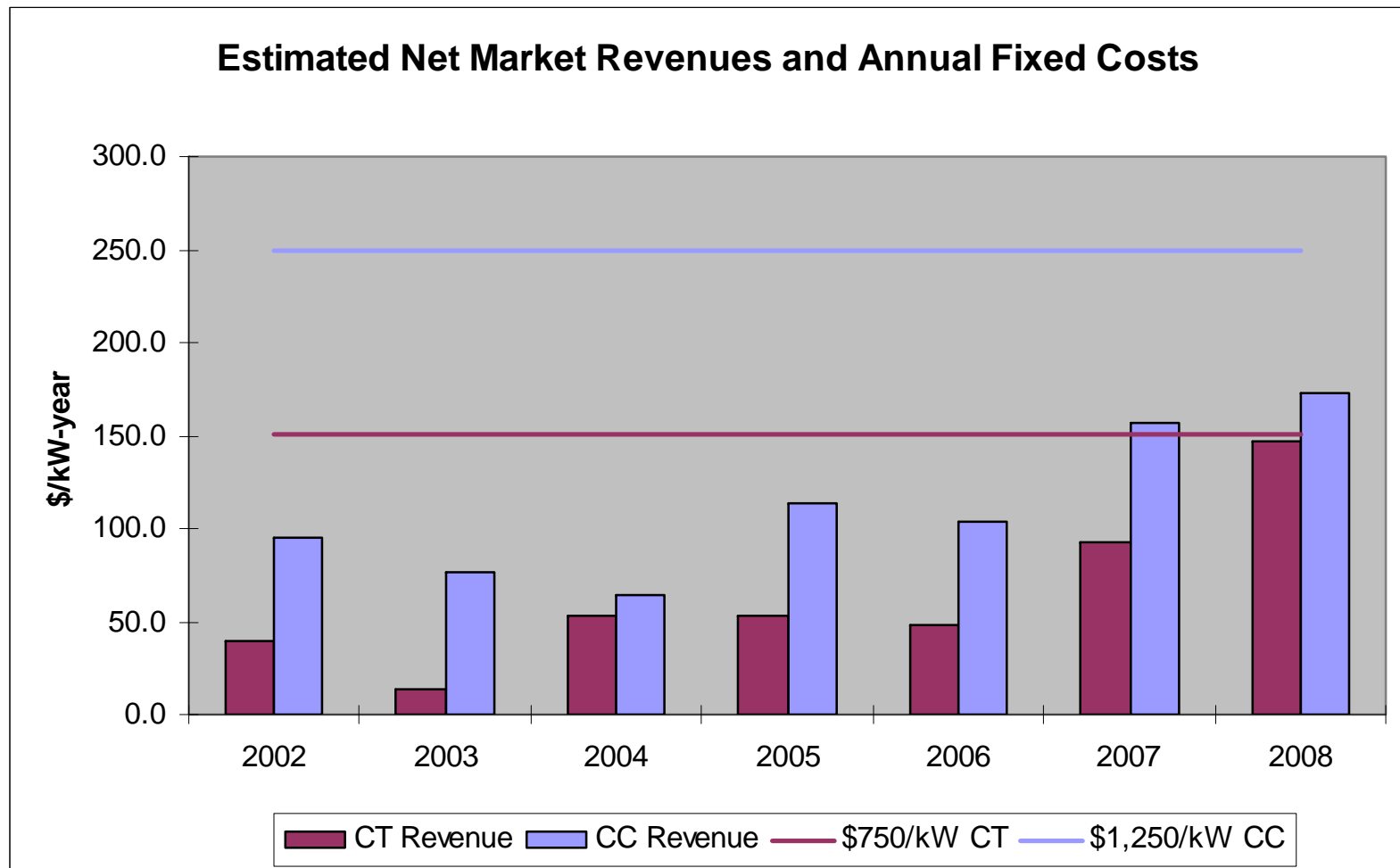


- **Existing resources are under pressure**
 - Current market revenues severely challenge on-going operations
 - Environmental regulators increasingly concerned with trend in HEDD emissions as load recovers from the recession
 - Proposed federal actions on GHG and cooling water discharges could add significant operating and/or capital costs to existing units
 - Markets are not likely to provide additional revenues to support major environmental upgrades
 - Operation of these units is questionable in the long run

Existing Unit Economics

- Plants are not recovering their full costs and in some cases, their Fixed O&M costs
- The capacity market is not expected to strengthen for many years
- Environmental compliance upgrades are likely to cost millions of dollars and generally cannot be justified on a \$/ton removed basis
- Contracts for repowering will shore up resource economics while providing the vehicle for desired emission reductions to help Connecticut meet federal air quality standards

New Plant Economics



Sources: Cost – NRG estimates of \$750/kW-year (CT) and \$1,250/kW-year (CC) and 20% annual carrying charge rate.

Revenue – ISO-NE Annual Market Reports, http://www.iso-ne.com/markets/mkt_anlys_rpts/annl_mkt_rpts/2008/index.html. ISO-NE characterizes these estimates as 'theoretical maximum' net revenues, since they ignore plant outages and certain operating characteristics.

IRP and 'Need'

- To date, IRP has considered 'need' only in the context of a shortage of MW to meet demand
- To fulfill its purpose, IRP must consider 'need' to include the statute's directive to update and optimize existing sites
- PA 27-242 does not require a resource need or resource 'gap' in order to trigger a DPUC procurement – the statute only requires a demonstration that an alternative provides 'benefit' (cost, environmental, reliability, security)
- The general case for the benefits of repowering has been made many times; the IRP should evaluate more specific opportunities
- With a demonstrated benefit, DPUC procurement should solicit proposals for actual repowering projects

Evaluating Repowering in IRP

- Use the EDCs' economic model and anticipated environmental regulations to screen for units 'at risk' for retirement
- Stakeholders establish conceptual repowering configuration for each 'at risk' site
- Evaluate production costs, clearing prices and emissions performance with repowered vs. existing units
 - Also consider:
 - representative infrastructure costs of new sites vs. existing
 - congestion and transmission losses
 - other costs/benefits

Montville Station

- Montville 5 – Repower existing boiler and turbine/generator with greenwood biomass
 - All permits expected to be in hand by end of year
 - Certified for Class 1 RECs
 - Repowering creates substantial cost savings
 - Significant cost advantage vs. greenfield sites
 - Repowering substantially reduces emission rates
 - Long-term contract will enable financing and construction
- Montville 6 – Potential to repower existing turbine/generation in dual-fueled combined cycle



- Active rail and deep water access.
- 46 Acres on the Thames River
- 345kV and 115kV interconnections
- Natural gas on-site

Norwalk Harbor Station

- Units 1 and 2 steam turbines are candidates for gas combined cycle repowering
- Oil storage for dual-fuel operation
- Expand gas and transmission infrastructure to the site. Opportunity for joint generation/gas transmission plan.
- Located in southwest Connecticut load pocket



- Former coal ash fill area is a renewable energy opportunity
 - 40-60 acres for PV - 10-12 MW of solar
 - Demonstration/educational resource: PV, wind, fuel cell, etc, with supporting test and educational facility
- Combined cycle 'anchors' the site for renewables

Middletown Station

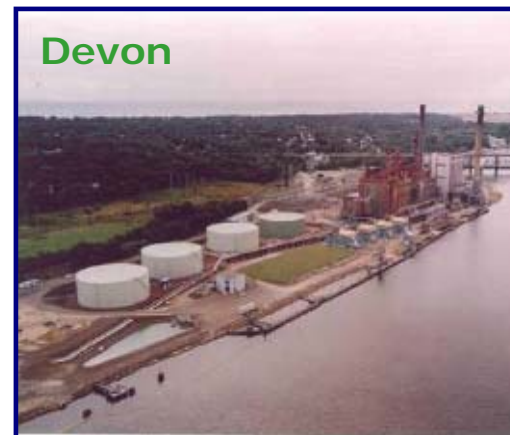
- Site of new GenConn Energy peaking units (anticipated in-service date 2011)
- Repower/replace steam units with dual-fueled combined cycle
- 345kV and 115kV interconnections
- Natural gas on-site
- Oil storage on-site
- Central location in Connecticut



- 67 Acres
- Connecticut River access
- Potential clean energy
 - Biomass
 - Biofuels
 - Fuel cell
 - PV
 - Hydrokinetic

Devon Station

- Site of new GenConn Energy peaking units (anticipated in-service date 2010)
- 220MW existing peaking units plus two retired steam units
- Housatonic River access
- Potential clean energy
 - Biomass
 - Biofuels
 - Fuel cells
 - PV
 - Hydrokinetic



- River access
- On-site gas
- On-site oil storage
- 62 acres

The Reward

Benefits of a procurement framework that encourages the EDCs to contract with existing generation:

- Procurement of the least-cost resources in the most efficient manner thus delivering greater savings to ratepayers
- Orderly transition to a modernized generation fleet
- Proactive compliance with environmental regulations
- Certainty for both the state and the generator, with definitive contractual performance and cost recovery terms
- More efficient planning, state-supervised capital expenditures, and orderly fleet transition
- Preservation of the resource adequacy of the state in the most cost-effective manner
- Stability and predictability of energy costs.