

Comments on Draft 2012 Integrated Resource Plan for Connecticut (January 2012)

Prepared for AARP

February 29, 2012

AUTHORS Rick Hornby and Tyler Comings



485 Massachusetts Ave. Suite 2 Cambridge, MA 02139

617.661.3248 www.synapse-energy.com

Table of Contents

EXECUTIVE SUMMARY1		
1.	INTRODUCTION	2
2.	COMMENTS ON MAJOR RECOMMENDATIONS	3
	A. 2012 DRAFT IRP RECOMMENDATIONS	3
	B. EXPAND ENERGY EFFICIENCY	3
	C. INCREASE FLEXIBILITY IN MEETING RPS TARGETS	6
3.	COMMENTS ON MODELING ASSUMPTIONS	8
	A. PROJECTED PRICES OF CAPACITY	8
	B. FORECAST REC VALUES	0
	C. FORECAST CARBON DIOXIDE PRICES	1
4.	REFERENCES1	4

EXECUTIVE SUMMARY

Connecticut Public Act 11-80 requires the Department of Energy and Environmental Protection (DEEP) to develop an integrated resource plan (IRP) every two years. In January 2012 DEEP distributed a draft version of that IRP for comment (2012 Draft IRP). The AARP retained Synapse Energy Economics (Synapse) to review the 2012 Draft IRP. This report presents our comments resulting from that review.

The 2012 Draft IRP provides projections of annual electricity use, supply costs and average supply rates through 2022 under a Base Case, reflecting a continuation of existing policies, and several alternative resource scenarios including expanded energy efficiency and flexibility in meeting Class 1 Renewable Portfolio Standard (RPS) targets. Based upon the results of those analyses the 2012 Draft IRP makes two major recommendations. The first is that Connecticut *"expand energy efficiency to attain all cost-effective energy savings."* Under this recommendation annual spending on energy efficiency in Connecticut would almost double. The second is that Connecticut *"increase flexibility in meeting renewable energy targets."* Under this recommendation the state would modify the RPS to allow additional resources, specifically energy efficiency and new large hydropower, to be used to satisfy RPS goals.

First, our review indicates that the 2012 Draft IRP does not answer the key question regarding achieving all cost-effective energy efficiency, i.e., what are the policy approaches to effectively and efficiently capture that full potential? It does not identify the mix of policy approaches that would enable Connecticut to expand its energy efficiency at least-cost nor does it evaluate an expanded energy efficiency scenario consisting of a mix of changes in building codes, changes in appliance standards, new program designs and increased funding of existing programs. Instead, the 2012 Draft IRP evaluates an Expanded Energy Efficiency scenario under which all of the additional energy efficiency is achieved by simply doubling the funding of existing programs. As a result the 2012 Draft IRP does not provide a sufficient analysis of several key issues required under Public Act 11-80. The mix of initiatives that Connecticut ultimately chooses to expand energy efficiency, and the funding of those initiatives, will affect everyone in the state. It is essential that DEEP require utilities, as part of their future requests for approval of energy efficiency budgets, to demonstrate that their proposed program designs will maximize customer participation within each rate class and to demonstrate that their proposed budgets reflect an appropriate balance between achieving all cost-effective energy efficiency and minimizing rate and bill impacts.

Second, allowing energy efficiency and new large hydropower to qualify as Class I resources under the RPS would represent a major change in energy policy. The advantages and disadvantages of this major policy recommendation should be studied in more detail.

Third, our review indicates that the 2012 Draft IRP appears to have over-estimated certain aspects of the potential savings from its two major recommendations while under-estimating other savings. The over-estimates result from projections of capacity prices in the Forward Capacity Market (FCM) from 2016 onward and projections of Renewable Energy Credit (REC) values from 2017 onward which appear to be too high. The under-estimate results from a projection of carbon dioxide prices from 2018 onward which may be too low.

1. Introduction

Connecticut Public Act 11-80 requires the Department of Energy and Environmental Protection (DEEP) to develop an IRP every two years. Sections 89 and 90 of that Act require the IRP to address a number of specific issues.

In January 2012 DEEP distributed its 2012 Draft IRP for comment. The AARP retained Synapse to review the 2012 Draft IRP. Our review draws upon the analyses of these issues in *Avoided Energy Supply Costs in New England: 2011 Report* (AESC 2011) as well as our work on a range of electric planning issues throughout the country.

AESC 2011, completed in July 2011, provides projections of avoided electric capacity and energy prices for a hypothetical "Reference Case," in which no new energy efficiency is implemented from 2012 onward. The Study provides detailed projections of avoided costs by year from 2012 through 2026 AESC 2011 was sponsored by a group of approximately twenty energy efficiency program administrators ('PAs") representing the major electric utilities and gas utilities in New England and developed with input from a stakeholder group consisting of those PAs, regulatory agencies and consumer advocates. The Stakeholder group included representatives from Northeast Utilities, United Illuminating; Southern Connecticut Gas, Connecticut Natural Gas and the Connecticut Energy Conservation Management Board.

This report presents our comments resulting from our review of the 2012 Draft IRP.



2. Comments on Major Recommendations

This section provides our comments on the 2012 Draft IRP major recommendations.

A. 2012 Draft IRP Recommendations

The 2012 Draft IRP makes the following two major recommendations:

- expand energy efficiency to attain all cost-effective energy savings. Under this
 recommendation annual spending on energy efficiency in Connecticut would almost
 double;
- *increase flexibility in meeting renewable energy targets.* Under this recommendation the state's renewable portfolio standards (RPS) would be modified to allow additional resources to be used to satisfy RPS goals, specifically energy efficiency and new hydropower greater than 5 MW.

The 2012 Draft IRP states that these two major recommendations are justified by the results of its modeling of a Base Case, which represents a continuation of existing policies, and of various resource scenarios that reflect new energy policies. For the Base Case, and each of the resource scenarios, the 2012 Draft IRP develops a projection of future annual electricity use, supply costs and average supply rates through 2022. The 2012 Draft IRP compares the projected supply costs under each of the resource scenarios to the projected supply costs under the Base Case.

The Expanded Energy Efficiency scenario assumes additional energy efficiency is achieved by doubling funding of existing programs. Relative to the Base Case, the Expanded Energy Efficiency scenario results in several sources of supply cost savings. One source of savings arises from deferring the need for new generating capacity, thereby avoiding projected generating capacity costs.

The Flexibility in Meeting Class 1 RPS scenario allows energy efficiency to satisfy a portion of the Class I RPS targets. Relative to the Base Case, the Flexibility in Meeting Class 1 RPS scenario would enable Load Serving Entities (LSEs) to meet the state's RPS targets at less cost, thereby avoiding projected REC costs. (RECs reflect the difference between the price a 'LSE pays to acquire renewable generation to satisfy the RPS and the wholesale market price of electricity, i.e., the premium over wholesale market prices.)

B. Expand Energy Efficiency

The 2012 Draft IRP recognizes that the key question regarding achieving all cost-effective energy efficiency is "...what are the policy approaches to effectively and efficiently capture the full potential?" (2012 Draft IRP, C-7). The 2012 Draft IRP does not provide an answer to that question.

The 2012 Draft IRP discusses a range of possible policy approaches to expand energy efficiency (2012 Draft IRP, C-7). Those policy approaches include:

- expand innovative financing;
- accelerate market transformation;

- induce behavioral change through information;
- introduce more aggressive codes and standards; and
- explore efficiency-inducing rate structures.

The 2012 Draft IRP does not identify the mix of those policy approaches that would enable Connecticut to expand its energy efficiency at least-cost. In addition it does not evaluate an expanded energy efficiency scenario consisting of a mix of changes in building codes, changes in appliance standards, new program designs and increased funding of existing programs. Thus, the 2012 Draft IRP has not provided the analyses required under Sections 89 (b) 2, 89 (b) 3, 90 (a) 3 or 90(a) 4 of Public Act 11-80.

The Expanded Energy Efficiency scenario which the 2012 Draft IRP does model assumes that all of the additional energy efficiency would be achieved by approximately doubling funding of existing programs. The projected reductions from expanding funding of existing utility programs are based upon an April 2010 report prepared by KEMA which estimates the reductions achievable through an expansion of existing utility programs (2012 Draft IRP, C-4). The KEMA report states explicitly that it does not provide recommendations on the detailed program designs required to achieve those reductions nor on the budget levels for future programs (KEMA 2010, 1-3). In addition, the KEMA report is now almost two years old. The 2012 Draft IRP acknowledges that "…it would be prudent to conduct an updated potential study (2012 Draft IRP, C-7).

Subsections c(2) and c(4) of Section 89 of Public Act 11-80 require the IRP to specify how efficiency can be achieved in a manner that ensures equity in benefits and cost reduction to all classes and subclasses of consumers. Those provisions implicitly establish a goal of attaining all cost-effective energy efficiency savings in the long-run by achieving, and maintaining, broad customer support for those efficiency initiatives. It is vital that the expansion of energy efficiency be achieved through policy approaches which will maximize opportunities for the majority of customers to benefit, both directly through active participation and indirectly through the system-wide benefits of efficiency. The implication of these provisions for residential customers is that the policy approaches and programs should provide the majority of customers in that class the opportunity to participate, with particular emphasis on designing policies for hard to reach subclasses such as low-income customers, senior citizens and renters. The 2012 Draft IRP does not address the selection of policy approaches to accomplish those goals.

Section 90, subsection a (3) of the Act requires the IRP to "include an examination of average consumption and other states' best practices to determine why electricity rates are lower elsewhere in the region." The 2012 Draft IRP implicitly compares energy consumption in Connecticut and New England (2012 Draft IRP, B-3). However, it does not examine differences in average consumption and electricity rates between states in in New England nor does it identify best practices from other states in the region.

In summary, our review indicates that the 2012 Draft IRP has not fully complied with Public Act 11-80 since it does not provide a sufficient analysis of the following key issues required under that Act.

- Section 89, subsection b (2) states that the IRP should assess "the manner of <u>how best</u> to eliminate growth in electric demand" and subsection b (3) states that the IRP should examine "<u>how bes</u>t to level electric demand in the state by reducing peak demand and shifting demand to off-peak periods." (emphasis added)
- Section 89, subsection c (2), requires the IRP to specify "the extent to which demand-side measures, including efficiency, conservation, demand response and load management can cost-effectively meet these needs <u>in a manner that ensures equity in benefits and cost reduction to all classes and subclasses of consumers</u>." In addition, Section 89, subsection c (4) requires it to examine "how the development of such resources will reduce and stabilize the costs of electricity <u>to each class and subclass and subclass of consumers</u>." (emphasis added)
- Section 90, subsection a (3) states that the IRP shall "include an examination of average consumption and other states' best practices to determine why electricity rates are lower elsewhere in the region."
- Section 90 requires the IRP to "assess and compare the cost of transmission line projects, new power sources, renewable sources of electricity, conservation and distributed generation projects to ensure the state pursues <u>only the least-cost</u> <u>alternative</u> project." (emphasis added)

The 2012 Draft IRP should be revised to address those areas of non-compliance. Specifically if it should be revised to:

- examine policy approaches designed to reach under-served groups such as low-income customers, senior citizens and renters in order to achieve equity in benefits and cost reduction to all classes and subclasses of consumers;
- include a discussion of best practices in other New England states; and
- evaluate an alternative expanded energy efficiency scenario consisting of a mix of changes in building codes, changes in appliance standards, new program designs and increased funding of existing programs.

In the event that the 2012 Draft IRP cannot be revised to address those issues, for example due to timing or budget constraints, we recommend that DEEP require utilities to address those issues as part of their future requests for approval of energy efficiency budgets in their annual Conservation and Load Management (C&LM) proceedings, or other appropriate regulatory proceedings. The mix of initiatives that Connecticut ultimately chooses to expand energy efficiency, and the funding of those initiatives, will affect everyone in the state. The 2012 Draft IRP assumes annual utility efficiency program costs of \$101 million in the Base Case and \$206 million in the Expanded Energy efficiency scenario (2012 Draft IRP, 31). Currently, approximately 80 percent of utility efficiency programs costs are funded by revenues from a three-mill charge (0.3 cents/kWh) collected from all ratepayers through the Combined Public Benefits Charge. The remaining funding is primarily from ISO-NE compensation for reductions from these efficiency programs that are bid into ISO-NE markets, from the sale of Class III RECs, and from RGGI auctions of carbon allowances (C&LM 2012, 10). If the additional \$105 million of program costs assumed under the Expanded Energy scenario were funded from these same sources, the

charge paid by ratepayers would have to increase by 70% to 100%, i.e. by 0.2 to 0.3 cents/kWh (2012 Draft IRP, 31).

Thus, it is important that DEEP require utilities to demonstrate that their proposed programs are designed to maximize customer participation within each rate class. DEEP should require program administrators to set target participation levels and report their actual performance in achieving those participation levels.

It is also essential that the expansion of energy efficiency programs be funded in a manner that ensures reasonable rates and bills. Thus annual budgets for energy efficiency should be set in a manner that balances the pace at which all cost-effective energy efficiency is achieved, i.e. the quantity achieved each year, with impacts on rates and on the distribution of bill impacts within the residential class.

C. Increase Flexibility in Meeting RPS targets

The 2012 Draft IRP assesses the costs and benefits of several different energy policy strategies for Connecticut (2012 Draft IRP, iii). One of the major strategies it identifies is expanding the range of resources eligible to satisfy its RPS.

The RPS groups the resources which are currently are eligible to satisfy its targets into three classes.¹ By 2020 the RPS requires LSEs to meet 20% of their load from Class I resources, which consist of generation from new wind, hydro under 5 MW, solar, fuel cell, landfill gas and biomass. They must meet 3% with Class II resources, which is existing renewable generation, and 4% with Class II resources, which consist of energy efficiency and combined heat and power (CHP) for Class II and II, respectively. (2012 Draft IRP, 39)

The 2012 Draft IRP recommends that the RPS be modified to allow energy efficiency to satisfy a portion of the RPS target for Class I resources. It evaluates the costs and benefits of allowing efficiency to satisfy one quarter of the RPS target for Class I resources, e.g. 5% of retail load by 2020. The 2012 Draft IRP also recommends that "stakeholders might also consider allowing other resources, such as out-of-region large hydropower, to serve energy goals" (2012 Draft IRP, iii). It does not evaluate the costs and benefits of revising the RPS to allow hydropower from new projects greater than 5 MW to qualify as an eligible resource.

First, the 2012 Draft IRP should evaluate the costs and benefits of revising the RPS to allow hydropower from new projects greater than 5 MW to qualify as an eligible resource. Section 90 requires the IRP to "assess and compare the cost of transmission line projects, new power sources, renewable sources of electricity, conservation and distributed generation projects to ensure the state pursues only the least-cost alternative project." Section 129 requires DEEP to analyze "the benefits, costs and impacts of expanding the definition of Class I renewable energy source, as defined in section 16-1 of the general statutes, to include hydropower and other technologies that do not use nuclear or fossil fuels."

¹ See Connecticut General Statute 16-1 (a), also summarized here: http://www.ct.gov/pura/cwp/view.asp?a=3354&g=415186

Second, Connecticut established its RPS to achieve various policy objectives including fostering the development of renewable energy sources, and to using competition among renewables to place downward pressure on the price of those renewable sources. Allowing energy efficiency and new large hydropower to qualify as Class I resources under the RPS would represent a major change in energy policy. The advantages and disadvantages of this major policy recommendation should be studied in more detail.



3. Comments on Modeling Assumptions

The 2012 Draft IRP bases its two major recommendations on the results of its modeling of the Base Case, the Expanded Energy Efficiency scenario and the Flexibility in Meeting Class 1 RPS scenario. Our review indicates that the 2012 Draft IRP appears to have over-estimated certain aspects of the potential savings from its two major recommendations while under-estimating other savings. The 2012 Draft IRP appears to have over-estimated the potential savings from each of those scenarios relative to the Base Case due to its projections of capacity prices in the FCM from 2016 onward and its projections of REC values from 2017 onward, both of which appear too high. The 2012 Draft IRP appears to have under-estimated the potential savings from each of those scenarios relative to the Base Case because its projection of carbon dioxide prices from 2018 onward appears too low.

This section provides our review of each factor.

A. Projected Prices of Capacity

One of the major benefits of each of the 2012 Draft IRP's two major recommendations are avoided capacity costs or "capacity savings" from reductions in the quantity of capacity that LSE's will have to purchase from the FCM.² The 2012 Draft IRP forecasts that capacity prices will drop to \$0.92 per kW-month in 2016 and \$1.28 per kW-month in 2017, but will then "…become progressively higher until new generation is needed and prices reach the Net Cost of New Entry level (\$7.1 per kW-month) in 2022/2023" (2012 Draft IRP, 11).³

Our review indicates that the 2012 Draft IRP estimates of avoided capacity costs are not reasonable due to its assumption that the FCM price floor will be removed in 2016 and that there will be no incremental reductions from new energy efficiency implemented from 2016 onward. As a result, our review indicates that capacity prices will not drop as low as the 2012 Draft IRP is projecting nor will they rise as rapidly as it is projecting. Figure 1 presents an illustration of our comments on the 2012 Draft IRP forecast of capacity prices.

 $^{^{2}}_{2}$ Capacity can be expressed in MW or kW.

³ Unless noted otherwise, all dollar concepts in this report are in 2012 dollars to be consistent with the 2012 Draft IRP.

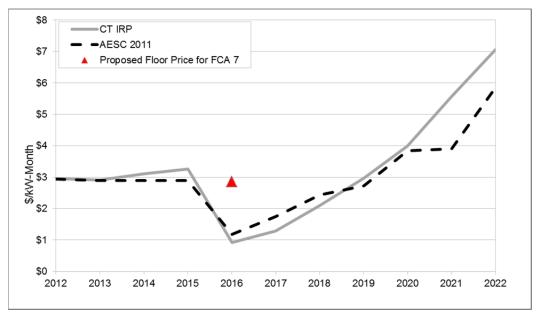


Figure 1: Forecasts of Capacity Prices (\$2012, ISO-NE FCA)

Source: AESC 2011, 2012 Draft IRP, ISO-NE 2012a

Capacity Prices in 2016 (FCA 7) and 2017 (FCA 8). The 2012 Draft IRP forecasts capacity prices will drop to \$0.92 per kW-month in 2016. This forecast is based on its assumption that the FCM price floor would terminate in 2015 (2012 Draft IRP, 11). The AESC 2011 forecast of capacity prices is based on the same assumption.

The assumption that the price floor would terminate in 2015 was reasonable at the time those forecasts were prepared, but that assumption has been rendered moot by the January 31, 2012 filing by ISO-NE to extend the price floor to 2016 (FCA 7). If the FERC approves, the price floor would extend through 2016 at \$3.15 per kW month (\$2.86 in 2012 dollars) (ISO NE 2012a). In that event the 2012 Draft IRP projection that the quantity of active demand response in FCA 7 will drop from nearly 1,982 MW in 2015 to 1,006 MW in 2016 would not be reasonable. Instead, the quantity of active demand response would likely remain closer to 1,982 MW in FCA 7. It is also possible that the price floor would be extended through 2017, as it has been extended in the past.

Capacity Prices from 2017 through 2022. The 2012 Draft IRP projections of peak demand and available capacity indicate that New England will be in approximate balance from 2016 until 2022. It projects new capacity will have to be brought into service in 2022.

The 2012 Draft IRP projection of peak demand assumes that "passive demand response", which are primarily the reductions due to energy efficiency, will remain constant after 2014 (Draft IRP, B-23).⁴ This underestimation of passive demand response capacity leads of the analysis to project a capacity shortage in New England in 2022.

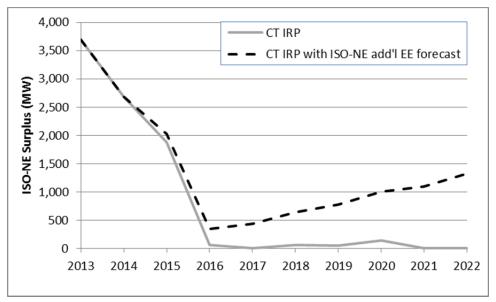
Our review indicates that the capacity prices projected from 2017 through 2022 are too high. First, the 2012 Draft IRP provides no support for its assumption that passive demand response

⁴ The 2012 Draft IRP does assume an additional 87 MW of PDR in the Boston area from 2015 to 2020.

will remain constant after 2014. Moreover, that implicit assumption is inconsistent with its Base Case assumption that annual funding of energy efficiency will be maintained near its present level through 2022 (2012 Draft IRP, C-3).

In the absence of any evidence or analysis to the contrary, it is reasonable to assume MW from incremental energy efficiency will continue to be bid into future FCAs. For example, the average MW from incremental energy efficiency that has cleared in the most recent five FCAs is 232 MW (ISO-NE 2011). According to a December 2011 presentation, for capacity planning purposes ISO-NE is proposing to assume that this level or more MW from incremental energy efficiency that will clear FCA 7, and each subsequent FCA (ISO-NE 2011). ISO-NE is currently evaluating several methodologies for forecasting energy efficiency in terms of energy and capacity. One method under consideration would be to use program administrator data would assume an additional 280 MW in 2015 increasing to 302 MW in 2020 (ISO-NE 2012b).

If one modifies the 2012 Draft IRP projection of demand to reflect the ISO-NE proxy incremental increases in new energy efficiency there is no shortfall of capacity in 2022. On the contrary, keeping all other assumptions in the Draft IRP, there would be over 1,000 MW of surplus capacity in that FCA, as shown in Figure 2.





B. Forecast REC values

The recommendations to expand energy efficiency and increase flexibility in meeting the RPS are based, in part, on the 2012 Draft IRP projection of REC values in Connecticut. As noted earlier, RECs reflect the difference between the price a LSE pays to acquire renewable generation to satisfy the RPS and the wholesale market price of electricity. In essence the REC presumes that price of renewable generation exceeds market prices and thus is a premium over wholesale market prices. As an alternative to buying renewable generation to meet the RPS LSE's have the

Source: 2012 Draft IRP, ISO NE 2011

option of making an Alternative Compliance Payment (ACP). For example, if REC values exceed the ACP it is less expensive for the LSE to satisfy the RPS requirement by paying the ACP.

The 2012 Draft IRP projects REC values of \$23/MWh from 2012 to 2017 (2012 Draft IRP, 18). That projected value is reasonable given the decline in wholesale market prices and the various factors driving up the price of renewable generation. Those factors include uncertainties regarding extension of the Production Tax Credit (PTC) for renewable energy and when Federal regulation of carbon will begin. That projection also reflects information regarding new renewable projects that are currently under development and expected to come online by 2015.

The 2012 Draft IRP projects that REC values will exceed \$45/MWh from 2017 onward (2012 Draft IRP, 18). This projection is based on a projected shortfall of RECs by 2017. The projected shortfall in RECs flows from a projected shortage of new renewable generation available to New England after (2012 Draft IRP, 17-18).⁵ Based upon those assumptions the 2012 Draft IRP projects that LSEs will pay the Connecticut ACP of \$45/MWh instead of paying REC values in excess of that amount.

Our review indicates that the projected REC values from 2017 may be too high. The 2012 Draft IRP provides no support for its projected shortfall in eligible renewable generation from 2017 onward. Its projected shortage in renewable generation during that time period is not consistent with the AESC 2011 projection of new renewable generation. AESC 2011, based on economic modeling by Sustainable Energy Advantage (SEA), projected that New England would have a surplus of renewable capacity relative to RPS targets through 2026.

C. Forecast Carbon Dioxide Prices

Section 89, subsection b (4) states that the IRP should 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 and how different resources could help achieve those standards and goals."

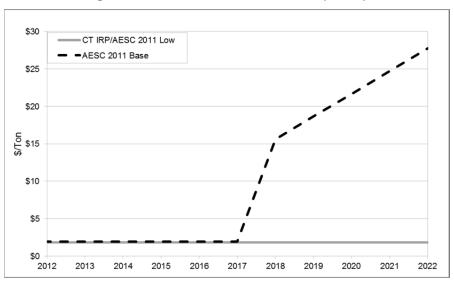
The 2012 Draft IRP evaluates the potential impacts of the federal hazardous air pollutants (HAPS) requirements under the EPA's Mercury and Air Toxics Standards (MATS) on generators in New England, in particular older coal-fired and oil-fired units (2012 Draft IRP, Appendix E). However, the 2012 Draft IRP does not evaluate the potential impact of new legislation or environmental regulations to tighten limits on emissions of carbon dioxide that may be passed or implemented through the report's 2022 planning horizon. The 2012 Draft IRP assumes that the RGGI price floor will set the carbon price (\$1.90/ton) through 2022, based upon its position that "comprehensive federal CO₂ policies are not currently on the horizon" (2012 Draft IRP, E-1). (The Report assumes that the price floor for RGGI, which is scheduled to lapse by 2019, will be continued through 2022.)

⁵ These assumptions include: additional 115 MW of onshore wind per year, new solar to meet RPS carve out targets, no new landfill gas or small hydro and an incremental 10% per year of imported hydro from New York and Canada (assuming these become eligible as Class I renewables in the state's RPS).

The 2012 Draft IRP assumption regarding carbon regulation is not consistent with the 2010 IRP for Connecticut (Brattle 2010, II-19). In addition it is not consistent with recommendations in an October 2011 report by the Regulatory Assistance Project (RAP) that utility resource planning analyses consider a "range of estimates of potential CO₂ regulation costs" (Lazar and Farnsworth 2011, 21). Finally it is not consistent with the assumption regarding carbon regulation used in AESC 2011 or the assumptions various utilities have used in IRPs filed in 2010 and 2011.

There is considerable uncertainty regarding the timing and design of future federal regulation of carbon emissions. However, Synapse considers it reasonable to assume that some form of tighter regulation of carbon dioxide will be implemented prior to 2022.

AESC 2011 assumed there was a significant probability of Federal regulation of carbon emissions beginning between 2015 and 2022, and which included carbon costs in its an estimate of avoided costs. Figure 4 provides a comparison of the forecast of carbon prices in the 2012 Draft IRP with the base and low forecasts in AESC 2011.





Source: AESC 2011, 2012 Draft IRP

A number of electric utilities apparently share the expectation of national regulation of carbon dioxide beginning before 2022 as indicated by their assumptions of costs for complying with carbon emission regulation in long-term plans filed in 2010 and 2011. As shown in Figure 4, those utilities include Delmarva Delaware, Ameren Missouri, PacifiCorp, TVA, Duke Energy Ohio, Georgia Power, and Duke Energy Carolinas (Sierra Club and NRDC 2011).

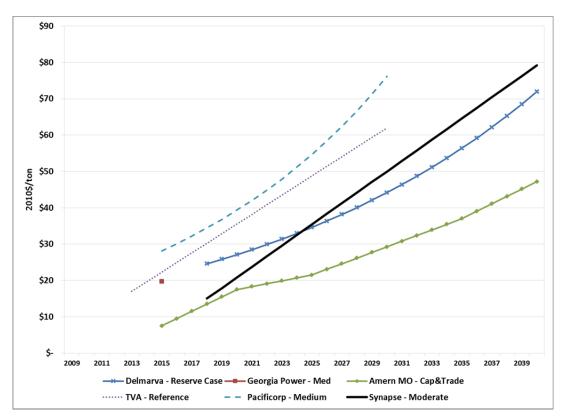


Figure 4: Selected Utility Forecasts of Carbon Prices Used in Planning (\$2010)

Source: Sierra Club and NRDC 2011

4. References

Brattle Group, Connecticut Light and Power, and United Illuminating. 2010. Integrated Resource Plan for Connecticut. January 2010.

Connecticut Department of Energy and Environmental Protection. 2012. Draft 2012 Integrated Resource Plan for Connecticut (2012 Draft IRP). January 2012.

Connecticut Light and Power, United Illuminating, Yankee Gas Services, Connecticut Natural Gas, and Southern Connecticut Gas. 2012. 2012 Electric and Natural Gas Conservation and Load Management Plan (C&LM 2012). Docket No. 11-10-03. September 30, 2011.

CT Energy Info. 2012. Combined Public Benefits Charge, extracted from web on February 14. 2012. <u>http://www.ctenergyinfo.com/dpuc_combined_public_benefits_charge.htm</u>

Hornby, Rick et al. 2011. Avoided Energy Supply Costs in New England: 2011 Report (AESC 2011). August 2011. Prepared for Avoided Energy Supply Component Study Group. August 11, 2011.

ISO New England. 2012a. Revisions to the ISO New England Transmission, Markets, and Services Tariff Related to the Forward Capacity Market. Filing to Federal Energy Regulatory Commission. January 31, 2012.

ISO New England. 2012b. Energy Efficiency Forecast 2015-2020. Presentation to Energy Efficiency Forecast Working Group. February 24, 2012.

ISO New England. 2011. ISO-NE Proof of Concept Forecast of New State-Sponsored Energy Efficiency 2014-2020. RC Meeting. December 13, 2011.

KEMA. 2010. Connecticut Electric Residential, Commercial, and Industrial Energy Efficiency Potential Study. Prepared for the Connecticut Energy Conservation and Management Board. April 2010.

Lazar, Jim and David Farnsworth. 2011. Incorporating Environmental Costs in Electric Rates. Regulatory Assistance Project. October 2011.

Sierra Club and NRDC. 2011. Comments on the 2011 Joint Integrated Resource Plan of Kentucky Utilities Company and Louisville Gas and Electric. Case No. 2011-00140. November 23, 2011. p.10.