COMMONWEALTH OF MASSACHUSETTS

BEFORE THE ENERGY FACILITIES SITING BOARD

PETITION OF BROCKTON POWER COMPANY, LLC	))	EFSB 07-7, DPU 07-58 & 07-59

DIRECT TESTIMONY OF PAUL CHERNICK ON BEHALF OF THE ALLIANCE AGAINST POWER PLANT LOCATION

Resource Insight, Inc.

MARCH 25, 2008

TABLE OF CONTENTS

TABLE OF EXHIBITS

I. Identification and Qualifications

Q: Mr. Chernick, please state your name, occupation and business address.

A: I am Paul L. Chernick. I am the president of Resource Insight, Inc., 5 Water Street, Arlington, Massachusetts.

Q: Summarize your professional education and experience.

A: I received an SB degree from the Massachusetts Institute of Technology in June 1974 from the Civil Engineering Department, and an SM degree from the Massachusetts Institute of Technology in February 1978 in technology and policy. I have been elected to membership in the civil engineering honorary society Chi Epsilon, and the engineering honor society Tau Beta Pi, and to associate membership in the research honorary society Sigma Xi.

I was a utility analyst for the Massachusetts Attorney General for more than three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, and the evaluation of power supply options. Since 1981, I have been a consultant in utility regulation and planning, first as a research associate at Analysis and Inference, after 1986 as president of PLC, Inc., and in my current position at Resource Insight. In these capacities, I have advised a variety of clients on utility matters.

My work has considered, among other things, integrated resource planning, the cost-effectiveness of prospective new generation plants and transmission lines, retrospective review of generation-planning decisions, ratemaking for plant under construction, ratemaking for excess and/or uneconomical plant entering service, conservation program design, cost recovery for utility efficiency programs, the valuation of environmental externalities from energy production and use, allocation of costs of service between rate classes and jurisdictions, design of retail and wholesale rates, and performance-based ratemaking and cost recovery in restructured gas and electric industries. My professional qualifications are further summarized in Exhibit____PLC-1.

Q: Have you testified previously in utility proceedings?

A: Yes. I have testified more than two hundred times on utility issues, before regulators in more than thirty U.S. and Canadian jurisdictions. My previous testimony is listed in my resume.

Q: Have you testified previously in Massachusetts energy-planning proceedings?

A: Yes. As described in my resume, I have testified numerous times before the Massachusetts Department of Public Utilities, Department of Telecommunications and Energy, and Energy Facilities Siting Council, the predecessor to this Board.

II. Introduction

Q: On whose behalf are you testifying?

A: My testimony is sponsored by the Alliance Against Power Plant Location.

Q: What is the purpose of your direct testimony?

A: I respond to several statements on the record of this proceeding regarding the environmental effects of operation of the proposed Brockton Power plant.

Q: What documents did you review?

A: I reviewed several documents related to the Project, including the Petition to the Energy Facilities Siting Board ("Petition"), Draft Environmental Impact Report ("DEIR"), the Final Environmental Impact Report ("FEIR") and

Brockton Power Company's ("Brockton Power") responses to Information Requests.

Q: Which assertions of Brockton Power will you be addressing?

A: I comment on Brockton Power's statements regarding the need for resources, dispatch of the plant, and the potential effects of Brockton Power on the regional air emissions.

Q: What are your key conclusions about the environmental impacts of the operations of the proposed power plant?

A: Brockton Power has overstated its likely effect on the dispatch of higher-emission plants. Brockton Power is unlikely to be built in the next few years. When and if it is built, it may well delay the construction of plants with emissions comparable to or lower than those of Brockton Power. Even under extremely unlikely or counterfactual conditions—no supply or demand resources are added from 2004 to 2011, Brockton Power is the only resource available in 2011—Brockton Power's own evidence indicates that it would primarily displace other gas combined-cycle plants, not the aging steam plants and old inefficient high-pollution oil-fired peakers Brockton Power claims it would displace.

III. Need for Resources

Q: Does Brockton Power argue that the power from its project is urgently needed?

A: Yes. According to Brockton Power:

> In its recent system planning studies, the New England Independent System Operator ("ISO-NE") has identified a need for over 1,000 MW of Future Locational Forward Reserve Market Requirements by 2010, some of which needs to be met by quick-start facilities. (ISO New England 2006 Regional System Plan, October 26, 2006, page 6 and 11.) This need is forecasted to increase to 4,300 MW by 2015 and will be even greater if there are retirements of existing generating units. (Petition at 1-3; DEIR at 1-2; FEIR at 1-2)
>
> In June, 2006, the Chairman of the Federal Energy Regulatory Commission, Joseph T. Kelliher stated: "There is little doubt that New England is not adding sufficient electricity supply. In fact, last year New England added a total of 11 megawatts to its regional electricity supply. At the same time, peak demand rose by 2,700 megawatts." Since last June, there have been three studies (one by National [sic] Electric Reliability Corporation (NERC), sanctioned by FERC and two by ISO-NE, concluding that additional power is needed in New England). (FEIR at 1-2; similar language appears in DEIR at 1-2 and Petition at 5-9)

Q: Do these paragraphs accurately describe the need for Brockton Power?

A: No. Brockton Power makes a number of claims about various issues of capacity and reserves, without properly clarifying the differences among those issues. Brockton Power's description of these issues are incomplete or misleading.

Q: What are Brockton Power's claims about need?

A: Disambiguated, the observations in the text I quote above can be enumerated as follows:

- In its 2006 Regional System Plan, ISO-NE identified the need for locational forward reserves (LFR) in certain zones.[1]

[1] It is not clear why Brockton Power says "some of [these reserves] need to be met by quick-start facilities," since resources count as LFR only if they agree to be offline under most conditions and full fully functioning within 30 minutes. Hence, *all* LFR needs to be met by quick-start facilities.

- In its 2006 RSP, ISO-NE identified the need for additional capacity-market resources starting in 2009, rising to 4,300 MW by 2015.
- Little new generation was added in 2005.
- Actual New England peak load in 2005 was about 2,700 MW greater than the 2004 peak.

Q: What does the 2006 Regional System Plan say about locational forward reserve market requirements on pages 6 and 11, the pages cited by Brockton Power?

A: Page 6 of the RSP consists entirely of Table 1-1, "Representative Future Operating-Reserve Requirements in Major New England Import Areas (MW)," which shows needs only in Connecticut and Boston; Brockton Power is not located in either of those areas.

The relevant portion of page 11 includes the following in a list of regional needs: "Implement...the locational Forward Reserve Market. In the short term, add dual-fuel fast-start resources and demand response, especially in Greater Connecticut, to satisfy both the system-wide requirements and the load-pocket needs, make more efficient use of existing transmission and generation infrastructure, and save consumer capacity and congestion costs." Again, Brockton Power is not in Connecticut. The same paragraph continues "Over the long term, add economically efficient baseload generation with low marginal production costs, particularly units that do not burn natural gas or oil but have relatively low emissions. This would reduce the region's reliance on natural gas and decrease wholesale electric energy market prices." Brockton Power would not advance that goal.

Q: Would Brockton Power be eligible to serve the locational-forward-reserve requirement in the zones that are short on LFR?

A: No, for two reasons. Brockton Power is in the wrong place and is the wrong type of capacity for LFR.

Q: What is the basis for your conclusion that the Brockton Power Plant would be located in the wrong place?

A: The 2006 RSP found needs for LFR only in the Boston area and in Connecticut. As far as I know, that remains the case and is unlikely to change (other than declining need for LFR in the Boston since the recent completion of new transmission, and the possibility of decreased LFR requirement in Connecticut if major new transmission facilities are constructed in southeast New England). Brockton Power would be in the Southeast Massachusetts (SEMA) zone, where eligible resources can contribute to pool-wide forward reserves, but there is no locational forward-reserve requirement in SEMA.

Q: What is the basis for your conclusion that the Brockton Power Plant would have the wrong type of capacity?

A: Forward-reserve resources must be off-line and able to reach their reserve resource capacity within thirty minutes when needed. Hence, ISO-NE sets minimum prices below which forward-reserve resources cannot bid into the energy market; those prices have been set at the equivalent of natural gas at about 14,300 Btu/kWh. The high dispatch prices, roughly twice Brockton Power's full-load fuel cost, are intended to limit LFRM resources to capacity factors of 2% or 3%.[2] While the Brockton Power combustion turbine could provide forward-reserve resources, Brockton Power would need to agree to keep the entire plant offline to qualify as a forward-reserve resource. Building a combined-cycle plant as a forward-reserve resources, or bidding it into the

[2] Montalvo, Mark. "Forward Reserve Market," ISO-NE, power-point presentation of Nov. 9, 2006, at unnumbered slide 13.

forward-reserve market, would leave the steam portion of the plant idle, earning neither LFRM nor energy revenues. Brockton Power would bid into the forward-reserve market only if it expected to be dispatched rarely in the energy market; that is clearly not Brockton Power's expectation.

Q: Could Brockton Power ever provide any operating reserves to the system?

A: Yes. Brockton Power could bid two services into the real-time reserve market. When it was economic to operate Brockton Power, it could run at less than full load, and offer its remaining capacity (such as the duct-firing capacity) as real-time reserves. When Brockton Power was shut down, it could offer the combustion turbine capacity into the real-time market.

In its discussion of LFRM, Brockton Power (DEIR at 2-29; Petition at 1-7) says,

> Since Brockton Clean Energy will be able to be at 100% gas turbine load (i.e., 194 MW) within 30 minutes, it would be also classified as a quick-start resource and would help maintain operational control and/or reduce peak loads during periods of high demand.

Q: Would Brockton Power's quick-start turbine provide forward reserves during periods of high demand?

A: No. At times of high demand, the Brockton Power gas turbine would be operating and would not be available for quick-start reserves.

Q: Has Brockton Power suggested that Reliability Must Run (RMR) contracts are due to insufficient capacity?

A: Yes. Brockton Power says, "Absent new generation resources, some of the region's older, less-efficient power plants are being dispatched at low load levels to ensure sufficient electric supply to meet the region's demands.

These plants are currently being dispatched by ISO-NE under Reliability-Must-Run...contracts" (DEIR at 2-27, substantially repeated at 5.13-2).

Q: What sort of capacity would be required to avoid the "dispatch at low load levels" of the RMR units?

A: In general, the RMR units are dispatched at low load levels when they are needed as operating reserves. Most RMR capacity used in this way was in the Boston or Connecticut load pockets. The Canal plant in SEMA is also operated out of merit order to provide operating reserves.[3]

Q: When do the RMR contracts terminate?

A: The remaining RMR contracts were scheduled to end on June 1, 2010, when the forward capacity market takes effect. The ISO has determined that Norwalk Harbor needs to remain in operation at least in 2010–11, due to Connecticut transmission security requirements. Brockton Power would not contribute to shutting Norwalk Harbor.

Q: How would Brockton Power affect the RMR contracts?

A: Other than Norwalk Harbor, the RMR contracts will have terminated before Brockton Power could be on line, so Brockton Power would have no effect on those contracts. Since Brockton Power is not in Connecticut, it would not contribute to shutting Norwalk Harbor, were that plant still operating under an RMR contract when Brockton Power reached commercial operation.

Q: You have dealt with the first of Brockton Power's claims regarding forward reserves. What about the Brockton Power's points regarding capacity resources?

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[3]The ICF report notes that ISO-NE is in the process of solving the transmission problems driving the use of Canal and assumes those solutions are in place by 2011.

A: It is not particularly surprising that additional capacity-market resources will be required over time so long as load grows, or that little new generation came on line in 2005, when ISO-NE had a surplus of capacity and capacity prices were low.

Q: In the DEIR, FEIR and Petition, Brockton Power repeatedly quotes the FERC chairman, rather than ISO-NE data, on the growth in peak load from 2004 to 2005. Did peak really grow by 2,700 MW in a single year?

A: Only because of differences in weather in the two years. The ISO-NE's CELT reports give weather-normalized adjusted reference peak loads of 25,760 MW in 2004 and 26,545 MW in 2005, for 785 MW of growth. Without weather normalization, the corresponding values are 24,116 MW in 2004 and 26,885 MW in 2005. The 2004 actual peak was an anomaly, 569 MW below the 2003 peak. So this quote is quite misleading.

Q: Has the capacity situation changed since 2005?

A: Yes. ISO-NE established transitional capacity payments from late 2006 through May 2010, providing higher and rising prices for capacity. Starting in June 2010, capacity will be provided through a forward-capacity market, which will be cleared three years in advance, allowing new peaking capacity to be built if forward-capacity-market prices are high enough for new peakers to successfully bid into the market.[4] Connecticut—faced with transmission constraints and higher market prices than the reset of the region—has provided incentives for various resources. As a result, enough central and distributed generation, demand-response and energy-efficiency resources

[4]Brockton Power discusses the forward-capacity market at 2-28 of the DEIR.

have been developed to more than meet the 2010 forward capacity requirement.

Q: What happened with the 2010 forward-capacity auction?

A: In the first forward-capacity auction, the final price of capacity was $4.50/kW-month, the minimum allowed, compared to the ISO's estimate of $7.50/kW-month for the cost of new peaking capacity. There were about 2,050 MW of excess capacity at the floor price; several proposed generation projects, dozens of demand resources and imports from Quebec and New Brunswick also did not clear at the floor price but would have been available at higher prices. In all, about 3,300 MW of excess capacity was offered at or below the cost of new capacity. Some Connecticut projects with incentives or contracts did not bid into the 2010 capacity auction, including the 620-MW Kleen combined-cycle plant, and the Connecticut Department of Public Utility Control is likely to approve about 400 MW of peakers this spring. That capacity would come on-line by 2012.

Q: In the DEIR at 5.13-1, Brockton Power asserts that the only other combined-cycle plant proposed in New England is MMWEC's Ludlow project. Is that true?

A: No. The DEIR was filed September 17, 2007, at which time the ISO-NE interconnection queue included 15 combined-cycle projects totalling 5,400 MW of summer capacity.[5] The queue now includes 21 combined-cycle projects totalling 7,200 MW of summer capacity.

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[5]By September 2007, the Kleen combined-cycle plant had been provisionally selected by the Connecticut DPUC for a utility contract, over competition from NRG's proposal to repower its oil-fired Montville Unit 6 to a 630-MW combined-cycle. Those proposals were well known in the industry.

Q: Is there currently a problem of inadequate capacity resources in New England?

A: No.

IV. Dispatch of Brockton Power

Q: What does Brockton Power say about the dispatch of its plant?

A: Brockton Power provides the following three inconsistent descriptions of the plant's dispatch:

> It is anticipated that Brockton Clean Energy will be operated as a "mid-merit" plant. Brockton Clean Energy will be very efficient and will be using cleaner fossil fuels (natural gas, ULSD) than some older steam cycle plants that can fire coal and heavy oil. A mid-merit plant is typically dispatched after all of the baseload (nuclear, hydro-electric, renewable and large scale coal) facilities. A mid-merit plant will typically operate during the day on weekdays. The plant will not typically operate at night or on weekends. Duct firing will typically be used during peak power demand times in the summer and in the winter. (DEIR at 2-25)

> As a "mid-merit" to "baseload" plant, the Company will dispatch more often during peak energy periods (when power prices are high) and less during off-peak energy periods (when power prices are low). Based on historical data and anticipated future demand and supply, the Company anticipates operating at a capacity factor of about 40 to 90 percent. (Brockton Power Response to IR EFSB A-3)

> The Facility...dispatches at a capacity of approximately 71 percent in 2011. (ICF study, Attachment AAPPL-15)

The first quote suggests that Brockton Power would operate as a combined-cycle plant less than the sixteen hours Monday–Friday (about 47% of the year) that are generally considered on-peak for wholesale power transactions, and the duct firing would operate even less often, for an overall capacity factor of about 40% or less. The second and third quotes suggest that the plant might operate at much higher levels.

Q: How do these various capacity-factor forecasts compare to the recent experience for modern combined-cycle plants in New England?

A: In 2006 and 2007, the capacity factors of New England combined-cycle plants that entered service since 1998 varied from about 20% to about 75%, averaging about 60%. Unless something changes dramatically, the capacity factor for Brockton Power is likely to be in the lower half of the 40%–90% range in Brockton Power's second description, and probably well below the 71% that ICF projects. Since ICF appears to omit energy efficiency and generation additions between 2004 and 2011, its estimate of Brockton Power's capacity factor is likely to be overstated..

Q: Are conditions likely to change dramatically in the foreseeable future?

A: While forecasts are always uncertain, I see no reason to expect large changes anytime soon. Future operation of combined-cycle plants depends on the relationship among fuel prices; the development of renewable energy, cogeneration and energy-efficiency; the level of imports from other regions (especially hydro- and wind-power generation from Canada); and whether new nuclear and clean coal plants are developed. While some of these factors are difficult to predict, it is unlikely that gas prices will decline enough to be competitive with coal and it is likely that large amounts of renewable generation and energy-efficiency resources will be developed. On the whole, ICF's projection of a 71% capacity factor for Brockton Power seems optimistic for several years to come.

V. Environmental Effects

Q: What is Brockton Power's position on the environmental effect of the economic dispatch of its plant?

A: Brockton Power makes a number of far-reaching claims in this regard in various filings with the EFSB and MEPA.

> The Project will improve regional air quality.... Construction of new highly efficient gas fired plants will displace aging, less efficient, higher emitting conventional power plants across New England. For several criteria pollutants, emissions from these existing plants are an order of magnitude higher than emissions from the Project and other proposed gas fired combined cycle plants. The economic displacement of aging plants (e.g., older inefficient steam cycle facilities firing fuel oil) will result in sizeable reductions in NO_x, SO_2, PM and CO emissions with an attendant improvement in regional air quality. The emissions improvements will be better than an order of magnitude greater.... (Petition at 4-103–4-104)

> If the Project and other highly efficient natural gas-fired, combined-cycle power plants are not constructed, the region will continue to rely on existing facilities in a fleet of aging oil and coal-fired conventional power plants.... These higher emissions stem from the fuel used, the lower efficiency of these plants and their lack of state-of-the-art pollution control systems. (DEIR at 4-1)

> The use of the cleanest possible fossil fuels in a very high efficiency plant such as Brockton Clean Energy, will displace older, less efficient units during many parts of the year thus reducing regional emissions. (FEIR at 1-4)

> The Project will be more efficient and have lower emissions than many existing sources and so will displace older, dirtier plants. (FEIR at 1-7, Table 1.5.-1)

> Brockton Clean Energy will be capable of supplying much needed electricity to the ISO-NE system while using approximately 28% less fuel than older, less efficient generation currently being dispatched. Brockton Clean Energy will have a highly efficient heat rate of 7,226 Btu/kW-hr (HHV) at ISO conditions as compared to inefficient heat rates in the 9,500 to 10,500 Btu/kW-hr range for existing steam electric generating units. (FEIR at 2-1)

> To produce the same amount of power as Brockton (assuming 8,760 hours per year of full load operations), a utility boiler firing oil will produce 2,368,167 tons of CO_2 (twice Brockton's CO_2 rate) while an oil-fired peaking facility will produce 3,554,882 tons of CO_2 (three times Brockton's CO_2 rate). These are the types of facilities that Brockton Clean Energy will displace (i.e., cause to operate less often) as described in Section 1.2. Furthermore, in order to meet new growth demand that is not met by renewable energy, facilities using the most advanced technology, like Brockton Clean Energy, are the best option. For green-house gases, Brockton Clean Energy is not part of the problem, but rather part of the solution. (FEIR at 6-55)

> The Company forecasts plant CO_2 emissions at 795 lbs/MW-hr when firing natural gas and 1,181 lbs/MW-hr when firing ULSD. By comparison, a conventional oil-fired steam-cycle plant has CO_2 emissions of approximately 1,667 lbs/MW-hr while a conventional coal-fired plant has CO_2 emissions of approximately 2,300 lbs/MW-hr. (Brockton Power Response to IR EFSB A-11)

> A highly efficient combined-cycle combustion turbine has the lowest CO_2 emissions of any fossil-fuel-fired facility. (Brockton Power Response to IR EFSB A-12)

Q: Is it clear that the construction of Brockton Power would reduce carbon emissions from the New England electric generation fleet?

A: No. Bringing Brockton Power on line would displace some other resource or resources. The effect of Brockton Power on emissions thus depends on what else would have been built and run in the absence of Brockton Power.

Q: Does the report of ICF International (Attachment AAPPL-1-5) demonstrate that Brockton Power's claims above are correct?

A: Not really. There are serious problems in the ICF analysis, biasing the results toward overstating Brockton Power's effect on regional emissions. Some of ICF's results are also implausible. Even so, the results do not support Brockton Power's claims.

Q: What are the problems in the ICF analysis?

A: The ICF study makes the following peculiar assumptions about the New England load and capacity situation in 2011:

- The study uses the 2007 ISO-NE CELT forecast of load and energy, which does not reflect future DSM programs, even though every state is running DSM programs and some jurisdictions are increasing DSM efforts. The ISO treats new DSM as resources; ICF does not appear to have included future DSM as either load reductions or resource additions.
- The study lists only capacity added through 2004, apparently ignoring all capacity resources (demand and supply) added due to the transitional capacity payments, the forward capacity market, renewable portfolio standards, and Connecticut's solicitations and subsidies for generation.
- The study compares a base case with a change case which is exactly the same, except that Brockton Power comes on line in 2011. ICF does not offer any justification for the assumption that market conditions would support Brockton Power entering service in 2011, but not some other plant if Brockton Power is not built.

As a result of these odd assumptions, the ICF study would tend to overstate the operation of older plants and hence the claimed benefits of Brockton Power.

Q: Which ICF results are implausible?

A: Some of the combined-cycle plants that ICF thinks Brockton Power would displace—specifically Lake Road and Blackstone—report heat rates just as good as the heat rate Brockton Power hopes for. Yet somehow ICF expects Brockton Power to reduce the operation of those units by 3% or 4%.[6]

The study also projects Brockton Power's operation to result in a significant amount of CO_2 reductions from the Salem Harbor coal plant. That plant operated at around 75% capacity in 2006 and 2007, generally higher than the roughly 60% capacity factors typical of recently-built combined-cycles. Considering the low cost of coal (less than $2/MMBtu) compared to natural gas (roughly $8/MMBtu), it is hard to see how Brockton Power or any gas combined-cycle plant can be expected to back down a coal plant, at least until greenhouse-gas charges become substantial.

Q: How do ICF's results contrast with Brockton Power's statements about the types of generation the plant would displace?

A: Even with the problems in the study I described above, ICF's results (Table 8, at 6) indicate that at a large portion of Brockton Power's output—perhaps half—would displace other gas-fired combined-cycle plants, rather than the existing steam electric generating units, oil-fired steam-cycle plants, and oil-fired peaking facilities that Brockton Power describes as the alternative to Brockton Power.

In summary, ICF's analysis appears to be based on unrealistic assumptions, produces some counter-intuitive results, and indicates that even with those assumptions, Brockton Power would tend to compete largely with

[6]This may be an artifact of the production-costing model ICF used. The dispatch of plants can differ between cases due to use of different random outages, the order in which plants are listed, and other extraneous factors.

other gas-fired combined-cycle plants, rather than the high-emission oil and coal plants Brockton Power suggests in its filings.

Q: Would EFSB approval of Brockton Power be likely to result in the prompt construction of the plant?

A: No. The market is not currently supporting combined-cycle plants, or even new peakers. Brockton Power not likely to be built until market prices—specifically, the forward-capacity price and the difference between LBMP and Brockton's dispatch price—rise further, or some party offers long-term contracts for non-renewable generation in Massachusetts.

Q: Why are market prices not supporting new combined-cycle plants?

A: New combined-cycle plants would earn most of their revenues through the energy market and the Forward Capacity Market (FCM). While energy prices are currently very high by historical standards, so are prices for natural gas, limiting the profit margin from the energy market.

In the first forward-capacity auction, the final price of capacity was the minimum allowed, with about 6% excess capacity at that floor price.[7] If no bids change, prices will fall further the next couple years. If additional demand response, energy efficiency, renewables and other resources are developed, in response to various state initiatives (enhanced utility and state-wide efficiency programs, renewable portfolio standards, Connecticut incent-ives for fuel cells, Connecticut RFPs for capacity to reduce locational prices),

[7] "Forward Capacity Auction Results Filing," filed by ISO-NE in FERC Docket No. ER08-633-000, March 3, 2008.

the price may continue to be very low.[8] The new generation that cleared the first capacity auction is listed below:

	Zone	LFRM Eligible?		Summer MW
Thomas A. Watson[9]	SEMA	●	municipal utility	105.0
Swanton Gas Turbine 1	VT	●	municipal utility	20.0
Swanton Gas Turbine 2	VT	●	municipal utility	20.0
Cos Cob 13&14	CT	●	sited with existing units	34.0
CMEEC Gas Turbine	CT	●	municipal utility	75.0
DFC-ERG Milford	CT		Fuel cell with state subsidy	7.8
Haverhill Landfill Gas Engine	NEMA		Renewable	1.6
Ansonia Generating Facility	CT		cogenerator	60.0
Waterbury Generation	CT	●	state-mandated utility contract	96.0

Each of these projects has one or more of the following advantages:

- Ability to participate in the locational-forward-reserve market, which adds considerably to the FCM value of the plant.
- Location in Connecticut, where energy and locational-forward-reserve-market prices are the highest in New England.
- Ownership by municipal utilities, with very low costs of capital, no income taxes, and a guaranteed market for the plant's output.
- Incentives under Connecticut energy legislation, including a utility contract for all the capacity of one plant and subsidies for fuel-cell development for another.
- Renewable status, which provides an additional revenue stream.
- Being sited next to existing similar plants, minimizing labor requirements.

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[8]Conversely, if a large number of generators are deactivated and demand-response offers are withdrawn due to the low prices, the clearing price may rise.

[9]This is the Braintree plant that Brockton Power mentions at 2-27 of the DEIR.

- Cogeneration, which can radically improve the efficiency of the plant, as well as allowing the host facility to avoid utility charges.

Plants without any of these advantages, such as Brockton Power, are unlikely to be able to compete in the capacity market for some years to come.

Q: Were new generators proposed that did not clear in the FCA?

A: Yes. While less information is available about the resources that did not clear, about a dozen proposed generators (including the Billerica plant Brockton Power mentions at 2-27 of the DEIR) failed to clear at the floor price in the FCA, even though almost all of them were in Connecticut, eligible for FRM revenues, and/or renewable.

Q: When might market conditions change enough that the market would support new combined-cycle plants?

A: That depends on a number of factors, including underlying load growth, the rate at which DSM is developed, the amount of renewable capacity that comes on line in response to renewable portfolio standards and other incentives, the extent of imports from Canada, the amount of capacity brought online through long-term contracts in Connecticut, and the extent to which environmental pressures on steam plants increase their operating cost or encourage their retirement. Merchant combined-cycle plants may well not clear in the FCA until 2015 or later.

Q: When market conditions change so that Brockton Power is competitive, with what sort of resources would it be competing?

A: Brockton Power would compete with other new combined-cycle units, repowerings, combustion-turbine peakers, renewables, cogeneration, and perhaps energy efficiency and demand response.

Q: Please describe the environmental effect of Brockton Power being selected in some future FCA, displacing a different combined-cycle unit?

A: If the displaced combined-cycle unit would have been a new unit located in most parts of New England, there would likely be little difference in the environmental effects. Were the displaced combined-cycle unit to have been located in Connecticut, the selection of Brockton Power would probably increase the use of less-efficient units in Connecticut, many burning heavy oil. In that case Brockton Power would increase emissions compared to the alternative.[10]

If the other combined-cycle unit would have been a repowering of an existing steam unit (especially an oil-fired unit, such as Montville 6), the selection of Brockton Power would probably result in the steam unit continuing to operate, increasing emissions compared to the alternative.

Q: Please describe the environmental effect of Brockton Power being selected in some future FCA, displacing a renewable resource, cogeneration, or energy efficiency?

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[10] According to Brockton Power (DEIR at 4-1), "The Project will be a new source of competitively priced power. Such projects are essential if the Commonwealth is to realize the full benefit of the restructured competitive marketplace for electrical power. Realization of these benefits is impaired and delayed under the 'no-build' alternative." Since Brockton Power would compete with other plants of similar or lower dispatch costs, it is unlikely that Brockton Power would be particularly beneficial to the market. In any case, it is not clear that lack of combined-cycle development has impaired and delayed the benefits of restructuring. Combined-cycle generators provide a large amount of New England's electric energy, and many operate at rather low capacity factors, indicating that they are not economic in many hours. The presence of enough new combined-cycle capacity to create an overall surplus has not resulted in competition being beneficial for most New England customers.

A: The selection of Brockton Power in such a case would increase emissions, compared to the alternative.

Q: Is it true that "a highly efficient combined-cycle combustion turbine has the lowest CO_2 emissions of any fossil-fuel-fired facility," as Brockton Power claims?

A: No. Cogeneration, or combined-heat-and-power, projects can achieve much lower net heat rates and CO_2 emissions than free-standing combined-cycle plants.

Q: Is an oil-fired peaker typical of "the types of facilities that Brockton Clean Energy will displace," as Brockton Power asserts at 6-55 of the FEIR?

A: No. Oil-fired peakers in New England operate at substantially less than 1% capacity factors, and some of that operation must be for capability and other testing, operating reserves and local transmission issues, none of which are likely to change much due to operation of Brockton Power. No oil-fired peaker operated at a capacity factor greater than 2.5% in 2006 or 1% in 2007. Hence, Brockton Power's estimates of avoided emissions from oil-fired peakers operating at 100% capacity factors are not realistic.

Q: In Table 5.1-7 of the DEIR and Table A-11.1 of its response to IR EFSB A-12, Brockton Power estimates the heat rate for an oil-fired peaker at 17,211 Btu/kWh. Is this a reasonable estimate?

A: No. From the fuel-use and energy-output data reported by generators to the Energy Information Administration in Form EIA-906, I estimate that the average heat rate for the reporting oil-fired peakers was about 11,800 Btu/kWh in 2006 and 12,800 Btu/kWh in 2007, not 17,211 Btu/kWh. The only oil-fired peakers with capacity factor higher than 1% in 2006 were the new combustion turbines at Devon and West Springfield, for which the heat rates averaged about 10,500. [11]

The relevance of an oil-fired peaker for Brockton Power's analysis of its effects on CO_2 emissions is questionable, since 85–90% of the energy generated by New England peakers in 2006 and 2007 was from natural gas, not oil, again mostly at the new units: Devon, West Springfield, and Wallingford.

Q: Is Brockton Power's claim in FEIR at 6-55 that "an oil-fired peaking facility will produce… [CO_2 at] three times Brockton's CO_2 rate" based on its overestimation of oil-peaker heat rate?

A: Yes. Using a more-realistic heat rate for the small amount of oil-fired peaker generation that Brockton Power might back out would suggest a CO_2 emission rate for that oil peaker energy about twice that of Brockton Power or other modern combined-cycle units, not three times.

Q: Have you reviewed the validity of Brockton Power's analysis in Table 4.4.5 of the Petition and its claims (at 4-66) that "a conventional plant would emit more than 150 times the NO_x and SO_2 and a peaking unit would emit nearly 250 times the NO_x and SO_2 to produce the same 240 MW-hrs.?"

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[11] In response to IR EFSB A-20, Brockton Power says it used the Medway plant as its surrogate for all peakers. I have not found recent data on Medway's annual capacity factor, but the last year Boston Edison owned the plant (1997) it operated at a 0.7% capacity factor and a heat rate of 16,303 Btu/kWh. Based on the EPA's Unit Level Emissions database (searchable online at camddataandmaps.epa.gov/gdm/index.cfm), it appears that Medway operated at about 0.2% capacity factor in the summer of 2006. Medway is clearly not a typical New England peaker. Nor is it appropriate to apply oil-fired peaker emission rates to this plant, since it also burns gas.

A: Yes. For the "conventional plant," Brockton Power assumes emission rates of 3 lbs./MWh for NO_x and 6 lbs./MWh for SO_2 and cites 310 CMR 7.29(5). As I read that regulation, Brockton Power is citing maximum emission rates allowed for any calendar month; the annual limits are half those rates, so a plant emitting NO_x at 3 lbs./MWh in one month would need to emit at rate far enough below 1.5 lbs./MWh in other months to bring its annual average rate under 1.5 lbs./MWh. The lower annual average rate would be more likely to limit emissions than the higher monthly rate.

Hence, Brockton Power should cut its emissions estimates for the "conventional plant" at least in half.

For the "peaking unit," Brockton Power's comparison is unrealistic for the following reasons:

- It would be very unusual for peakers to be the marginal source of supply in New England for the 24-hour period Brockton Power analyzes in Table 4.4.5.
- Brockton Power must have assumed an oil-fired peaker, since gas-fired peakers emit very little SO_2. As I show above, the bulk of New England peaker energy is from gas, not oil. The dominance of gas is likely to increase as additional dual-fueled peakers are added. Since gas tends to be relatively inexpensive in the summer (the period Brockton Power is discussing in Table 4.4.5), dual-fuel peakers would rarely run on oil in the summer.
- Using the highest-sulfur #2 oil allowed by the Massachusetts DEP and SO_2 emissions from Table 4.4.5, I calculate that Brockton Power assumed the peaker has a heat rate of 17,350 Btu/kWh. This is atypically high, as I have shown above.

Q: Does this conclude your testimony?

A: Yes.