DOCKET NO. 54

AN APPLICATION OF O'BRIEN ENERGY SYSTEMS, INC., FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED TO CONSTRUCT A COGENERATION FACILITY IN THE CITY OF HARTFORD.	:	CONNECTICUT SITING COUNCIL
	:	February 19, 1986

F I N D I N G S O F F A C T

1. O'Brien Energy Systems, in accordance with provisions of section 16-50k and 16-501 of the Connecticut General Statutes (CGS), applied to the Connecticut Siting Council (Council) on October 24, 1985, for a certificate of environmental compatibility and public need to construct a 50 MW cogeneration facility to be located at the Hartford Steam Company (HSC), 600 Columbus Boulevard, Hartford, Connecticut. The project is known as the Hartford Steam Company Cogeneration Project. (Record)
2. The fee as prescribed by section 16-50v-1a of the Regulations of Connecticut State Agencies (RSA) accompanied the application. (Record)
3. The application was accompanied by proof of service as required by section 16-501(b) of the CGS. (Record)
4. Affidavits of newspaper notice as required by statute and section 16-501-1 of the RSA were filed with the application. (Record)
5. Pursuant to section 16-50j of the CGS, the Connecticut Department of Environmental Protection (DEP) filed written comments with the Council. (Record)
6. The Council and its staff made an inspection of the proposed facility site on January 6, 1986. (Record)

7. Pursuant to section 16-50m of the CGS, the Council, after giving due notice thereof, held a public hearing at 7:00 P.M., January 6, 1986, in the Hartford Municipal Building, 550 Main Street, Hartford, Connecticut. (Record)

8. The parties to the proceeding are the applicant and those persons and organizations whose names are listed in the Decision and Order which accompanies these findings. (Record)

9. The Council took administrative notice of the following documents:

State of Connecticut Conservation and Development Policies Plan 1982-1985;

Connecticut Siting Council Review of Connecticut Electric Utilities' 1985 Ten-Year Forecasts of Loads and Resources;

Connecticut Cogeneration Handbook, Northeast Utilities and United Illuminating, April, 1985;

Cogeneration in Connecticut: Review of Obstacles, Forecasts, and Potential. A report to the Connecticut Siting Council from Energy and Resource Consultants, Inc., May 20, 1985. (CSC 1985 Review);

The Northeast Utilities System 1985 Forecast of Loads and Resources for 1985-1994;

Northeast Utilities Customer Assistance Conservation Programs, Connecticut 1983; and

Hartford City Zoning Code.

Exhibits submitted by the applicant are as follows:

O'Brien - 1. Application dated October 24, 1985;
O'Brien - 2. Responses to pre-hearing questions dated December 9, 1985;
O'Brien - 3. Responses to pre-hearing questions dated December 26, 1985;
O'Brien - 4. Amendment for five hundred psi natural gas pipeline;
O'Brien - 5. Elevation and view of the substation from the North (Whitehead Highway location) and a map or site plan showing the approximate location and how, looking straight down, the size is going to compare with what is there now;
O'Brien - 6. Floor price of electricity sold to CL&P;

O'Brien - 7. Description of noise attenuation measures; and
O'Brien - 8. Maximum building and stack heights. (Record)

10. The purpose of the facility would be to provide a cost effective, environmentally-sound source of electric power and steam through a combined cycle gas turbine steam and electric cogeneration process. (O'Brien 1, p. 2; pp. 9-10; O'Brien 2, Q. 10, Exhibit A; O'Brien 3, D-SP69-FS-701)

11. Cogeneration is the simultaneous production of heat and electrical or mechanical work from the combustion of fuels. This technique offers both thermodynamic and economic advantages over conventional processes for efficiently producing both forms of energy in combination. (O'Brien 2, Q. 37, Cogeneration in Connecticut 1-1, Connecticut Cogeneration Handbook 1-1-5)

12. Cogeneration technology is supported by Northeast Utilities as a proven technology used to generate electricity while allowing business, industry, and government to efficiently use heat that would otherwise be wasted; to save money; to help conserve the nation's limited fossil fuel resources; and to help reduce the large capital requirements of electric utilities. (O'Brien 2, Q. 37, Connecticut Cogeneration Handbook 1-1; Northeast Utilities Customer Assistance Conservation Programs p. 221; The Northeast Utilities System 1985 Forecast of Loads and Resources for 1985-1994 II-pp. 3-5)

13. The project would serve the needs of the public by providing a small, incremental electric supply that would help forestall the need for new baseload capacity facilities. (O'Brien 2, Q. 37; CSC 1985 Review pp. iii, 16, 17)

14. The provision of small, incremental electric supply facilities as opposed to baseload capacity facilities would help to minimize utility risks and provide additional time for consideration of new and improved generating technologies now under development. (O'Brien 2, Q. 37, CSC 1985 Review pp. iii, 16, 17, 21)

15. The State of Connecticut Conservation & Development Policies Plan 1982-1985 encourages the use of cogeneration and district heating by both utilities and industries to supply electricity and process steam where economically practical. (O'Brien 2, Q. 37, Connecticut Development Plan, p. 26)

16. The facility would be built, operated, and maintained by O'Brien Energy Systems on property owned by HSC and leased to O'Brien. (O'Brien 2, Q. 23, Q. 25; Tr. p. 56; O'Brien 2, Q. 11, Exhibit A, Exhibit C)

17. The .7 acre project site at 600 Columbus Avenue, Hartford, is an existing HSC steam generation, district heating, and cooling facility. (O'Brien 1, p. 1,8,10,12, Drawing SK-09115)

18. The facility would replace the steam generation function of the existing district steam generation plant operated by HSC. (O'Brien 1, p. 1)

19. Sections of the existing roof would be raised for boiler clearance, additional floor supports might be needed, and new wall enclosures would be constructed. Also needed would be two new boilers, four new electric generating turbines, compressors, air and water treatment components, electrical switchgear, and a 115 KV substation. (O'Brien 1, p. 10; O'Brien 3, Q. 4)

20. The project would include two 28 MW (nameplate capacity) combustion turbine generators, an 8.2 MW (nameplate capacity) steam turbine generator, and a 4.7 MW (nameplate rating) steam turbine generator. (O'Brien 2, Q. 1; Tr. p. 17)

21. The combustion turbine generators and steam turbine generators would use natural gas with No. 2 fuel oil as a back-up when gas is not available, which is estimated to occur 10 percent of the time during operating hours. (O'Brien 1, pp. 1, 12)

22. Natural gas was selected as the primary fuel due to availability, cost, and air quality considerations. No. 2 fuel oil was selected as a back-up fuel for operational and air quality (lower sulfur content) advantages. (O'Brien 2, Q. 6; O'Brien 1, pp. 1, 12)

23. The facility is expected to consume $3,260.8 \times 10^6$ cubic feet of gas per year. (O'Brien 2, Q. 6)

24. Natural gas fuel would be provided by an existing 75 pounds per square inch gauge pressure (psig) gas line located outside of the facility. (O'Brien 3, Q. 5, Drawing SK09105)

25. Three high pressure (500 psig) gas compressors would be located adjacent to the facility building to fuel each of the two combustion gas turbines. (O'Brien 4; O'Brien 3, Q. 8, Drawing D-SP69-FS-701, Q. 5, Drawing SK09105; O'Brien 2, Q. 26)

26. A 200' high pressure (500 psig) gas line would be located within the facility between the gas compressors and the gas turbines. (Tr. 38, 56; O'Brien 4; O'Brien 3, Q. 5, Drawing SK09105; O'Brien 2, Q. 26)

27. The high pressure gas line would be tested hydrostatically to 1.5 times working pressure. All codes for manufacture, welding, safety, and x-ray testing would be met during the construction and operation of the gas line. (O'Brien 2, Q. 26; O'Brien 1, pp. 3-7; O'Brien 4)

28. Fuel oil for auxiliary fuel would be supplied by new underground No. 2 fuel oil supply and return piping routed through an existing casing. (O'Brien 1, Drawing SK-06235; O'Brien 3, Q. 6, Q. 5, Drawing SK09105)

29. The 200 psig No. 2 oil supply pumps would be located off-site in the existing storage tank area owned by HSC. (O'Brien 3, Q. 6, Q. 8, Drawing D-SP69-FS-701)

30. Potable water would be supplied to the facility by way of an existing Metropolitan District Commission (MDC) water supply pipeline. (O'Brien 3, Q. 6; Tr. p. 37)

31. Water supply would be most critical during the winter when steam would not be returned to the plant as condensate, as would be done during the summer. (Tr. p. 36)

32. If the estimated water requirements of 200,000 gallons per day from the MDC were to be interrupted, the facility would have to shut down. (Tr. pp. 36-37; O'Brien 2, Q. 14)

33. In 20 years of operation, the MDC has always met the water use demands of HSC. (Tr. p. 37)

34. The existing building roof would be raised approximately 26' to a roof height of approximately 52'. (O'Brien 1, p. 10; O'Brien 5, Drawing C-001, C-002; O'Brien 8, Drawing C-100)

35. The facility would include two gas turbine air inlet stacks approximately 28' high, and two emission stacks approximately 63' 6" high, with final height to be based on DEP air compliance decisions. (O'Brien 8, Drawing C-100; O'Brien 1, Appendix B; O'Brien 5, Drawing C-001)

36. In order to reduce the visual impact of prominent visual features of the facility, the two air inlet stacks, that include access platforms, safety hand rails, and large filter elements, would be designed to blend into the facility as much as possible. (O'Brien 5; O'Brien 8)

37. The new, raised section measuring 105' by approximately 93' would have siding or panels selected to blend into the architecture of the existing building and the surroundings to minimize the visual impact. (O'Brien 5, Drawing C-002)

38. Steam produced by the facility would serve the heating and cooling requirements for approximately one square mile, in approximately 40 buildings, to the year 2008. (O'Brien 2, Q. 12)

39. The installation of the facility would provide economical electricity and process steam to enable HSC to expand in the future. (O'Brien 2, Q. 13)

40. It is expected that Hartford Steam Company customers would pay decreased rates as the result of the cogeneration project. (Tr. pp. 60-61)

41. Customers to Hartford Steam Company enter into long term contracts with Hartford Steam Company that include the right to arbitrate to control rates. (Tr. 61-62)

42. Steam produced by the facility would be measured daily and sold by O'Brien to HSC. The sales price would be based upon the thermal energy contained in the delivered steam minus the thermal energy returned to the facility, HSC avoided fuel costs, and the volume of steam produced as per contract between O'Brien and HSC. (O'Brien 2, Q. 11, Exhibit C)

43. After each seven year period of the O'Brien - HSC 20-year contract, HSC would have the option by unilateral election to purchase ownership of the facility at a fair market price as determined by an appraisal. (Tr. p. 58; O'Brien 2, Q. 11, Exhibit C, p. 38)

44. Hartford Steam Company would not be able to own and operate the facility as a qualifying cogeneration facility under existing Connecticut law. (CGS 16-243b; Tr. p. 58)

45. The facility's generators would use an on-site substation to convert 13.8 kV generated current to 115 kV in order to tie into the 115 kV transmission line planned by Northeast Utilities. (O'Brien 1, p. 10; Tr. p. 22, 40; O'Brien 8)

46. The substation planned by O'Brien would be 30' by 90'. It would be located on the east side of the facility building, 60' north of the Whitehead Highway and 70' west of Commerce Street. (O'Brien 5, Drawing C-001)

47. The base of the substation would be elevated 17' to provide truck access to an existing 16' high door on the east side of the building and to stay within the property boundaries of the new facility as required by HSC. (O'Brien 5)

48. The height of the substation would not exceed the height of the completed facility building. (O'Brien 5, Drawing C-002)

49. The electrical transformers and support structures could be painted the same neutral color as the 26' high metal building behind it to minimize visual impact from the Whitehead Highway and Commerce Street. (O'Brien 5)

50. Specially-constructed transformers would be used to meet state noise regulations. If noise from the transformers did not meet state noise regulations, a sound barrier would be constructed around the transformers. (O'Brien 7; Tr. pp. 41-46)

51. The facility would have a winter-maximum capability of approximately 54,000 kilowatts (net of in-facility use) and a summer maximum capability of approximately 53,500 kilowatts (net of in-facility use), depending on ambient air and water temperatures. (O'Brien 2, Q. 10, Exhibit A, p. 5; O'Brien 3, Q. 8, Drawing D-SP69-FS-701)

52. It is expected that the facility would operate during on-peak hours at an annual capacity factor of approximately 85%. (O'Brien 2, Q. 10, Exhibit A, p. 5)

53. It is expected that the facility would be operated 24 hours per day, 365 days per year. (O'Brien 2, Q. 1)

54. Electricity production from the facility would be maximized at all times, based on operation of one or two combustion turbines during off-peak or peak operating hours, respectively. Electric production from the two steam turbines would depend on the process steam requirements of the Hartford Steam Company. (O'Brien 2, Q. 3)

55. Because waste heat would be used to produce either process steam or steam to drive two steam turbines, the overall process efficiency would be between 55 and 73%, depending on the mode of operation. Large fossil fuel plants which produce electricity are typically 30 to 34% efficient. (O'Brien 2, Q. 9; O'Brien 1, p. 10)

56. The net project output is expected to be approximately 321,109 megawatt hours (MWh) per year. An additional 9929 MWh per year will be used by the plant. (O'Brien 3, Q. 8, D-SP69-FS-701)

57. The Northeast Utilities Service Company (NU) would purchase all net electric output from the facility, up to 54,000 kilowatt hours (KWh) per hour during the months of October through May and up to 53,500 KWh per hour during other months. (O'Brien 2, Q. 10, Exhibit A, p. 23; O'Brien 1, pp. 1, 8, 11)

58. The facility would have a service life expectancy of 20 years. (O'Brien 1, p. 7)

59. The in-service date of the facility would be June 30, 1987, based on a 17-month construction schedule. (O'Brien 1, Progress Schedule; O'Brien 2, Q. 10, Exhibit A)

60. Detailed engineering procurement and site modification work would begin immediately following receipt of the DEP air quality permit and certificate from the Council. (O'Brien 1, p. 8)

61. The turbine generators would be capable of going on line at full load in a few minutes from initiation of start-up procedures. (O'Brien 1, p. 11)

62. Design, construction, and testing of the facility would be in accordance with all applicable safety and engineering standards, as listed in the application. (O'Brien 1, p. 3-4)

63. The facility would have a failsafe, automatic system to shut down gas turbines and close main flow valves. (Tr. p. 20; O'Brien 4)

64. Automatic emergency shutdown and alarms would be activated by temperature, ultraviolet detectors, pressure, electrical failure, vibration, or flame failure. (Tr. p. 20; O'Brien 4)

65. The facility would use explosion-proof rated instruments, electrical devices, and equipment designed to provide redundancy for critical functions. (O'Brien 1, p. 7; O'Brien 4)

66. The plant would be designed so that equipment could be taken out of service for maintenance without a total plant shutdown. (O'Brien 2, Q. 30)

67. Routine preventive maintenance would be performed on a scheduled basis in order to keep the plant running all the time. (Tr. pp. 38-39)

68. The site is zoned for business by the City of Hartford, but is best described as an industrial site. The areas surrounding the site provide business and industrial services. (O'Brien 1, Appendix C, p. 9)

69. The residential area closest to the project is 525' to the southwest. (O'Brien 1, p. 14; Appendix C, p. 9)

70. The site is dominated by the existing HSC building, the CNG loading dock building to the north, and the Whitehead highway to the south. (O'Brien 1, Appendix C)

71. No species listed on the Connecticut Natural Diversity Data Base are present on the site. The shortnose sturgeon (Acipenser brevirostrum), a federally listed species, uses a nearby section of the Connecticut River as a year-round feeding area. Cooling

water discharge from the Park River is 4000' south of this feeding area and should not have any impact on this species. (DEP letter 12/12/85)

72. The project would use water from the Connecticut River for once-through, non-contact cooling at a rate of 39,000 gallons per minute (GPM), 9000 GPM greater than the existing facility. (O'Brien 2, Q. 14)

73. A Natural Pollution Discharge Elimination System Permit issued by the DEP Water Compliance Unit would be required for discharge of cooling water into the Park River, which flows into the Connecticut River. (Tr. pp. 35-36; O'Brien 2, Q. 14; DEP letter 12/12/85)

74. No water quality problems are anticipated as the result of water discharge from the facility. (DEP letter 12/12/85; O'Brien 1, p. 14)

75. A state permit would be required for boiler discharge that would enter the MDC sewer system at a rate of 6,500 GPD, 5,500 GPD more than the existing boiler discharge rates. (O'Brien 2, Q. 14)

76. Based on the probability of a 100-year flood at the site, no flooding is expected. (O'Brien 2, Q. 21)

77. The primary air pollutant from the facility would be nitrogen oxides (NO_X). (O'Brien 1, p. 12)

78. Other air pollutants from the facility would include carbon monoxide (CO), hydrocarbons (HC), and sulfur dioxide (SO_2). (Tr. p. 35; O'Brien 1, Appendix B)

79. Using low sulfur fuel would help control SO_2 emissions. (O'Brien 1, p. 12)

80. The facility would use a Best Available Control Technology (BACT) water injection system to reduce NO_x emissions by 76%. (O'Brien 1, p. 1, 12)

81. Purified water with fuel and compressed air would be injected into the combustion turbines to reduce the spike temperature of combustion, thereby reducing NO_x emissions that form at higher combustion temperatures. (Tr. pp. 33-34)

82. The lower combustion temperatures caused by the water injection system would increase HC and CO emissions which form at lower combustion temperatures. (O'Brien 1, Appendix B; Tr. pp. 33-34)

83. Additional air pollution technology that could control CO, HC, and NO_x emissions has been considered, but was rejected due to unproven reliability and commercial unavailability. (Tr. 33-34)

84. The overall emissions, primarily NO_x and SO_2 from the existing facility, would be reduced as the result of the proposed facility. (Tr. p. 67; O'Brien 1, p. 1, 12)

85. The facility applicants have applied for DEP Air Compliance permits. Permission to construct and operate the facility would be contingent upon DEP's review of air emissions and adherence to DEP's air emission standards. (O'Brien 1, p. 12; DEP letter 12/12/85; O'Brien 2, Q. 37, State of Connecticut Conservation & Development Policies Plan, p. 34, Air Quality)

86. No fuel ash or residue is expected from the combustion units of the facility, thus transportation and disposal of such by-products would not be necessary. (Tr. p. 38)

87. The project would create an increase of traffic during the construction phase, but no significant impact is expected due to

the close proximity of major highways. (O'Brien 1, pp. 13-14)

88. The primary source of noise from the facility would be the combustion turbines. The major sources of tonal noises would be the combustion and steam turbines, gas compressors, and steam reduction values. (O'Brien 2, Q. 19)

89. Noise would be reduced by inlet silencers, double wall enclosures and barrier walls around the two gas turbines, and two inlet silencers. Tonal noises would be reduced by silencers, double wall enclosures, and barrier walls. (O'Brien 2, Q. 19; O'Brien 3, Q. 3; O'Brien 1, p. 9, 12-14, Appendix C)

90. A noise analysis based on a survey of the existing site and surrounding community, proposed construction, receptor and emitter classifications, and experience at other plants of similar size was performed to determine attenuation measures. (Tr. 29-31; O'Brien 1, Appendix C)

91. The facility was designed to meet state noise regulations. (O'Brien 3, Q. 3; O'Brien 1, p. 9, pp. 12-14, Appendix C)

92. The Hartford City noise codes prohibit loud, disturbing, and unnecessary noise, but do not have quantitative noise level limits. (Tr. p. 44; O'Brien 1, Appendix A1)

93. State noise regulations provide quantitative noise level standards for three emitter classes (A, residential; B, commercial; and C, industrial) and for four receptor classes (A, day residential; A, night residential; B, commercial; and C, industrial). (O'Brien 1, Appendix A2; Tr. p. 45)

94. A specially-constructed transformer and, if necessary, a sound barrier would be used to minimize noise emission from the

facility's transformer. (O'Brien 7; Tr. pp. 40-46)

95. Construction noise would not be expected to affect the nearest residential area, approximately 525' from the site. (O'Brien 1, p. 14; O'Brien 2, Q. 22)

96. To prevent excess noise in the event of a sudden shutdown, steam turbines would be designed to absorb excess steam or steam relief valves would be fitted with silencers. (Tr. pp. 21-22)

97. Plant output would be reduced during off-peak hours, 11 p.m. to 7 a.m. and weekends. The reduction would correspond to the state's reduced-noise emission standard for A, nighttime (10 p.m. to 7 a.m.) receptors. (O'Brien 2, Q. 3, Q. 20; O'Brien 1, Appendix C, p. 2; O'Brien 2, Q. 2, Exhibit A, pp. 12-13)

98. The facility would meet all Class C industrial emittor standards, including those applying to prominent discrete tones for all receptor classes at all times. (O'Brien 1, pp. 12-13, Appendix C, pp. 12-13)

99. If requested, O'Brien would conduct a noise survey during operations to show compliance with state noise standards. (O'Brien 2, Q. 20)

100. If state noise code regulations were violated, additional soundproofing could attenuate certain sources of such noise. (Tr. p. 32)

101. Northeast Utilities would purchase electricity from O'Brien at a rate based on capacity delivered during on and off peak hours, market prices, and avoided costs. The floor rate of the purchase price would be 8.35¢/KWh. (O'Brien 1, p. 8; O'Brien 2, Q. 10, Exhibit A; O'Brien 6)

102. The term of the energy purchase agreement would be 20 years with provisions for a negotiated extension. (O'Brien 2, Q. 10, Exhibit A, pp. 9-11)

103. In the early years of the project NU would purchase electricity from O'Brien Systems at a rate higher than NU's avoided costs to help O'Brien Systems obtain financing and have assurance of adequate cash flow for the construction of the project. In the latter years of the project, NU would purchase electricity from O'Brien Systems at a rate less than NU's avoided costs to recover payments above avoided costs made the earlier years of the project. This is known as a front-loaded contract. (O'Brien 2, Q. 10, Exhibit A, pp. 5-7; O'Brien 2, Q. 37, Cogeneration in Connecticut 3-4-36)

104. For reliable electric service to NU's ratepayers, it is expected that the facility would provide the same quantity and energy capacity during the later years of the term as during the earlier years of the term. (O'Brien 2, Q. 10, Exhibit A, pp. 6-7)

105. On-site electrical transformers, switchgear, and metering equipment would be built, owned, and maintained by O'Brien Energy Systems. (Tr. p. 23; O'Brien 2, Q. 10, Exhibit A, pp. 14-18)

106. The electrical interconnection, metering equipment, monitoring equipment, and protective facilities necessary to integrate the facility into the NU system would be built, owned, and maintained by NU. (O'Brien 2, Q. 10, Exhibit A, pp. 14-18; Tr. p. 23)

107. An estimated $3.5 million cost for NU to construct the electrical transmission and protection facilities would be reimbursed on a

quarterly basis by O'Brien Energy Systems. Operation, maintenance, property taxes, and replacement costs for this interconnection would be reimbursed to NU by O'Brien Energy Systems on an annual basis. (O'Brien 2, Q. 29, Q. 10, Exhibit A, p. 15)

108. There would be no capital costs that Northeast Utilities would seek to add to their rate base. (O'Brien 2, Q. 29)

109. The construction costs for the facility would be paid for by O'Brien; thus Northeast Utilities and Hartford Steam Company customers would benefit by not having to pay for the capital investments for the facility. (Tr. pp. 60, 62; O'Brien 2, Q. 11, Exhibit C)

110. The estimated cost of the facility using 1987 as a base year would be broken down as follows:

a. gas turbine and generator	$19.0 million;
b. heat recovery boiler	3.2;
c. auxiliary equipment	10.0;
d. field construction and project management	12.7;
e. Northeast Utilities tie-in	3.5; and
Total	$48.4 million.

(O'Brien 2, Q. 33, Q. 34)

111. In addition to the cost of facility components, interest estimated at $13.2 million would be required for construction cost and fee financing. (O'Brien 2, Q. 35)

112. The estimated annual operation and maintenance cost of the facility would be $1,742,000 in the first year of operation, rising at a rate of 5% per annum. (O'Brien 2, Q. 32)

113. The current price for fuel for the facility would be as follows:

Natural gas (primary fuel) $4/1000 cubic feet; and
No. 2 fuel oil (back-up fuel) $30/barrel.

(O'Brien 1, p. 7; O'Brien 2, Q. 8)

114. The project would be expected to provide tax, job, and business benefits to the Hartford area. (Tr. 66)

115. The construction phase would create jobs representing an estimated $7.5 million in wages for various construction trades. (O'Brien 1, p. 2)