

## Supplement\_1 Coded Data: Hull

### Memos and Quotes

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#### **MEMO: RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II? (70 Quotations) (Super, 2012-07-24 19:02:03)**

P 1: \_1H0 ONG Flimflam Hull Wind Tour\_WTS 10-7-2010.pdf:  
(1:1050-1:1576)  
P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf:  
(1:186-1:528), (1:532-1:1097), (1:1101-1:1692), (1:3137-1:3934), (2:836-2:1445), (2:1448-2:1954), (2:1958-2:2207)  
P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf:  
(1:90-1:229), (1:231-1:379), (1:975-1:1311), (1:1704-1:1879), (1:1881-1:2063), (2:2913-2:3252)  
P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf:  
(1:2369-1:2613), (2:61-2:330), (2:333-2:499), (2:1496-2:1682), (2:2709-2:3352), (4:1091-4:1293), (5:1003-5:1199), (6:1312-6:1558), (9:1395-9:1686), (19:83-19:782)  
P 6: \_6H0 GOVF Hull Offshore Wind Workshop DOE 5-2011.pdf:  
(1:302-1:975), (1:982-1:1190)  
P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:  
(2:1689-2:1861), (2:1863-2:2026), (3:202-3:335), (3:487-3:572), (3:575-3:664), (3:1275-3:1439), (3:1441-3:1500), (3:1502-3:1596), (3:2945-3:3063), (3:3769-3:4326)  
P 9: \_9H0 ACAD RERL Case Study Hull Wind One 2004.pdf:  
(1:388-1:552), (1:2304-1:2435), (1:2529-1:2642), (3:235-3:525), (3:529-3:705), (3:708-3:1138), (3:2269-3:2789), (3:5542-3:5915)  
P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf:  
(1:692-1:1132)  
P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf:  
(1:2340-1:2603), (3:657-3:975), (3:1860-3:2247), (3:2253-3:2778), (3:2783-3:3198), (4:2828-4:3196), (5:662-5:848), (5:880-5:1208), (5:1278-5:1583), (6:12-6:161), (6:165-6:388), (6:391-6:482), (6:485-6:838), (6:1286-6:1667), (7:4-7:363), (7:366-7:692), (7:695-7:1215), (7:1260-7:1660), (8:105-8:347), (8:350-8:493), (8:529-8:829), (10:683-10:1151), (10:1264-10:1742), (13:533-13:1026), (15:651-15:1256)

No codes

No memos

Type: Analysis

RQ1-Did Hull have experience with wind turbines before construction of Hull I? Hull II?

If so, what was that experience (re either Hull I or Hull II or both)?

- i) What turbines were used?
- ii) Where were they located?
- iii) What worked well?
- iv) What did not work so well?
- v) What was the general reaction to turbine operation (particularly to noise issues)?

#### **P 1: \_1H0 ONG Flimflam Hull Wind Tour\_WTS 10-7-2010.pdf - 1:3 [Little did Irealize that: 1) t..] (1:1050-1:1576) (Super)**

Codes: [Com\_Communication L1] [EneT\_Technology] [EnvL\_Landuse] [EnvN\_Noise] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Little did Irealize that:

- 1) the Hull turbine is a much smaller and quieter model

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- 2) turbine noise is often louder 1000 feet or more away than directly under the machine
- 3) the Hull turbine was on an ocean peninsula nearly surrounded by ocean waves (noise)
- 4) the Logan Airport has jets going over Hull nearly continuously (the photos I took of the turbine that day all have jets in them)
- 5) Hull is the noisiest town in Massachusetts. The people there are too busy complaining about Logan Airport to hear their turbine.

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:1 [this project's history is base..] (1:186-1:528) (Super)**

Codes: [B\_Background-Info L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

this project's history is based on the work of townspeople in the early 1980s. The town installed a 40KW turbine on an 80-foot tower adjacent to Hull's High School, now sited on that same historic point of land jutting out into Boston Harbor. The funds came from the Mass. Department of Energy Resources. The windmill's cost was \$78,000.

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:2 [By spring of 1985 the windmill..] (1:532-1:1097) (Super)**

Codes: [B\_Background-Info L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

By spring of 1985 the windmill (some prefer the more precise term wind turbine) was producing energy. It produced a respectable total in its lifetime, between then and early March of 1997 when a windstorm damaged it beyond repair. The failure was due to a malfunction of its blade-tip brakes that 70 mph winds (this is a speed no longer threatening to today's windmills) were able to do it critical damage. This specific failure was in part due to the school's staff not being able to keep up with the regular maintenance schedule for the brake mechanisms.

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:3 [A report in 1996 showed that t..] (1:1101-1:1692) (Super)**

Codes: [B\_Background-Info L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

A report in 1996 showed that the machine in its final three years of production, -- when it was no longer performing at its best -- reduced the school's electric bills by over 28%. In dollar terms this was a savings of \$21,200 to the town. A DOER report had indicated that over its lifetime the windmill had saved the town nearly \$70,000. It was well known in the community that John MacLeod of the Light Department had worked beyond the call of duty to enhance the turbine's value to the town, both economically and educationally. He had strong support in this from Mr. Don Newton.

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:8 [By the year 2000, newspaper re..] (1:3137-1:3934) (Super)**

Codes: [B\_Background-Info L1] [Com\_Communication L1] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By the year 2000, newspaper reports had appeared, including in the Boston Globe. The Light department also notified townspeople of a town-wide public meeting scheduled for June 16 2000. Mr. MacLeod, along with members of the Light Board, experts from Mass. Municipal Wholesale Electric Company (MMWEC), the RERL at UMass, the town manager, the town historian, and citizen advocate Malcolm Brown made the presentation. This same panel of town representatives fielded questions from the public. The meeting's response was on the whole strongly positive, one citizen objecting strongly,

however. It was announced that the light department would go ahead and put out a Request for Proposals. The preferred site was to be some 75 yards from the site of the previous High School windmill.

**P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:11 [Contract negotiations went on ..] (2:836-2:1445) (Super)**

Codes: [B\_Background-Info L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Contract negotiations went on for several months. It became clear that here too Hull was doing pioneering work. As in the state-sponsored engineering study, Hull's case was being looked at as a "first" in the Commonwealth, and even on the entire East Coast. So our contract should be a transportable template for other similar projects still in the planning stages, or at still earlier stages of advancement. A number of issues needed to be resolved, such as the schedule of advance payments, warranty and maintenance agreement language, the level of ongoing commitment we could expect from Vestas.

**P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:12 [Commissioning date was Decembe..] (2:1448-2:1954) (Super)**

Codes: [B\_Background-Info L1] [Econ\_Economics L1] [EneG\_Energy Policy General] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Commissioning date was December 27, 2001. In its first year, the total generated energy -- all delivered to the municipally owned grid, -- was 1,597,367 KWh. The Light Department's sales of this energy (in addition to 'zeroing out' the town's street lighting bill) were in excess of \$150,000, net of the incentive payments for "renewable energy certificates". Public support was high, and a survey by the light department returned 95% favorable reactions, the commonest question being "why not more?"

**P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:13 [By 2003 planning was underway ..] (2:1958-2:2207) (Super)**

Codes: [B\_Background-Info L1] [EneG\_Energy Policy General] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By 2003 planning was underway for "Hull Wind 2" (citizen advocate Brown had been elected to a 3-year term on the Light Board). By 2005 this same advocate had been re-elected. As he said "my platform had just one plank -- more wind power in Hull."

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:1 [In December of 2001 the town o..] (1:90-1:229) (Super)**

Codes: [B\_Background-Info L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

In December of 2001 the town of Hull Massachusetts made history by bringing online the first commercial wind turbine along the east coast.

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:2 [The Turbine, known as Hull Win..] (1:231-1:379) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

The Turbine,  
known as Hull Wind 1 was installed after the town realized  
just how much money it could save by generating its own,  
renewable energy.

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:6 [In 1998 a group of concerned c..] (1:975-1:1311) (Super)**

Codes: [Econ\_Economics L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

In 1998 a group of concerned citizens led by Malcolm Brown and Andrew Stern formed Citizens for Alternative Renewable Energy (CARE) to look into the possibility of installing a wind turbine in Hull to reduce energy costs after a smaller wind turbine that had saved the town schools tens of thousands of dollars went offline in 1997.

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:9 [In April 2001 the town accepte..] (1:1704-1:1879) (Super)**

Codes: [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

In April 2001 the town accepted a bid from the Danish corporation Vestas, for its 660 Kilowatt, V47 turbine with a tower height of 164 feet and a rotor diameter of 154 feet .

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:10 [That November the turbine was ..] (1:1881-1:2063) (Super)**

Codes: [EnvL\_Landuse]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

That November the turbine was installed within 100 feet of the site of the previous turbine at a location known as Windmill Point, right next to the local school and athletic fields.

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:23 [It must also be noted that aft..] (2:2913-2:3252) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

It must also be noted that after some minor problems experienced with the maintenance and upkeep of the previous turbine, which belonged to the school department , the town was still enthusiastic about pursuing a wind energy project - perhaps due to the money saved by the first project - and made specific provisions for its upkeep.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:1 [The town of Hull is a leader i..] (1:2369-1:2613) (Super)**

Codes: [B\_Background-Info L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

The town of Hull is a leader in wind energy implementation in New England. In 2001 it installed the first and largest commercial wind turbine in New England; and in May of 2006 it

installed another, much larger turbine on its town landfill.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:3 [Hull's pursuit of modern wind ..] (2:333-2:499) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Hull's pursuit of modern wind power began more than 20 years ago, with the 1985 installation of a 40 kW Enertech wind turbine. In 1997, a storm damaged the turbine.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:10 [Soon after HWI started operati..] (2:1496-2:1682) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Soon after HWI started operating the process to add a second and larger wind turbine began. After four years of study Hull Wind II, a Vestas V80 1.8 MW turbine, went on line May of 2006

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:15 [As part of the investigation o..] (2:2709-2:3352) (Super)**

Codes: [EnvL\_Landuse] [EnvN\_Noise] [EnvV\_Visual] [R\_Research L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

[RQ\_H04: Site selection - case study community and imitators]

As part of the investigation of

Mariner's Park as well as for use in a preliminary noise study of HWI, RERL installed a meteorological tower. This tower remained on site for approximately two months. During this time, the RERL team also created a number of photosimulations. These illustrated what a second, larger turbine might look like. Some other possible siting options for a second turbine were also introduced. These included Stony Point, the vicinity of the sewer plant and offshore. The landfill (which was eventually chosen) was also an option, but some of the others were still preferred for a variety of reasons.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:18 [Beginning in May, 2004, the si..] (4:1091-4:1293) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Beginning in May, 2004, the site selection process started over again. One idea discussed was to replace the original 660 kW turbine with a larger one, and then move the smaller one to another site.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:24 [After much additional discussi..] (5:1003-5:1199) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

After much additional discussion, it was decided that an attractive option was to leave HWI where it was on Windmill Point, and endeavor to install a larger wind turbine on top of the landfill.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:32 [Second, since HWI had already ..] (6:1312-6:1558) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [OM\_Operation & Maintenance L1] [R\_Research L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Second, since HWI had already been in operation for a number of years by the time the landfill was seriously being considered, its capacity factor was known, and by extension its wind resource (even though there was no met tower close to HWI).

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:46 [n addition to the initial capi..] (9:1395-9:1686) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

n addition to the initial capital cost of purchasing and installing the wind turbine, there were known annual recurring costs. These are summarized in Table 2.

Item Recurring Cost

Maintenance Contract \$25,000

Insurance \$16,000

Total \$31,000

Table 2 Recurring Costs for Hull Wind II

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:78 [The conclusions and lessons le..] (19:83-19:782) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneR\_Reliability] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The conclusions and lessons learned on the Hull Wind II are summarized below. Of high importance, the first large wind turbine, HW I, was successful and popular. It led directly to the second wind turbine. A municipal electric company such as HMLP is an ideal host for a wind turbine project of this type. They are familiar with electricity and since they are owned by the town that they serve, the residents feel that the turbine is "theirs" as well. Because the value of the electricity is high and guaranteed (and considerably higher than it would be if the electricity were sold into a wholesale market), the unusually high cost of the foundation could be borne by the project.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:84 [Hull is a town of 10,500 resid..] (2:61-2:330) (Super)**

No codes

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Hull is a town of 10,500 residents. It is located on a peninsula in Boston Harbor. Historic manuscripts refer to the tip of this peninsula as "Windmill Point" as far back as the mid 1820s. These original windmills were built to pump sea water for salt production.

**P 6: \_6H0 GOVF Hull Offshore Wind Workshop DOE 5-2011.pdf - 6:1 [Hull -- a seaside community of..] (1:302-1:975) (Super)**

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Codes: [B\_Background-Info L1] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Hull -- a seaside community of 11,000 residents, is located on a peninsula jutting into outer Boston harbor -- has a history of wind power, dating back to the 1800s. Between 1984-1996, Hull had a 40kW Energetech wind turbine installed at "Windmill Point," adjacent to Hull High School. After the decommissioning the Energetech machine, interested citizens formed a group to work with the town manager and the Hull Light Board to re-power the site, with assistance of the Massachusetts Department of Energy Resources and the University of Massachusetts-Amherst Renewable Energy Research Laboratory (RERL). In December 2001, a Vestas V47 660kW machine was installed

### **P 6: \_6H0 GOVF Hull Offshore Wind Workshop DOE 5-2011.pdf - 6:2 [With 95 percent community supp..] (1:982-1:1190) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

With 95 percent community support, the town decided to site and install a second, larger turbine on the town's closed, capped landfill. Hull 2, a Vestas V80 1.8MW machine was commissioned in June of 2006.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:16 [Wind power has a great history..] (2:1689-2:1861) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Wind power has a great history in Hull. There was a 40-kW Energetech turbine at the high school in the mid-1980s -- this is why the site of Hull 1 is called Windmill Point.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:17 [The demise of this small turbi..] (2:1863-2:2026) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [Com\_Communication L1] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

The demise of this small turbine in a storm was the impetus for a group of residents to approach HMLP and ask for a new wind power facility. That led to Hull 1.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:24 [After watching the first turbi..] (3:202-3:335) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [Econ\_Economics L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

After watching the first turbine provide economic benefits to the town, both HMLP and ratepayers began to ask if we could do more.

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### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:26 [For the second turbine, we tri..] (3:487-3:572) (Super)**

Codes: [Com\_Communication L1] [DEC\_Design Engineer Construct] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

For the second turbine, we tried to follow the Hull 1 process as closely as possible

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:27 [Again, we worked with Jim Manw..] (3:575-3:664) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [DEC\_Design Engineer Construct] [P\_Fair Process L1]  
[S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Again, we worked with Jim Manwell and RERL and focused on keeping the community informed

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:33 [Even though we followed the sa..] (3:1275-3:1439) (Super)**

Codes: [EneT\_Technology] [Hlth\_Health Safety Security L1] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Even though we followed the same process as with Hull 1, it was easier the second time around. Our residents had practical experience living with a wind turbine.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:34 [The people in Hull like wind t..] (3:1441-3:1500) (Super)**

Codes: [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

The people in Hull like wind turbines because we have one.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:35 [They have practical experience..] (3:1502-3:1596) (Super)**

Codes: [EnvB\_Migratory Birds] [EnvN\_Noise] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

They have practical experience with the noise and avian impacts, and it makes them want more.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:42 [After Hull 1, the town had a f..] (3:2945-3:3063) (Super)**

Codes: [Com\_Communication L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

After Hull 1, the town had a favorable track record, which made turbine vendors more interested in working with us.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:45 [What are Hull's plans for furt..] (3:3769-3:4326) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneNd\_Need] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

What are Hull's plans for further wind development?

For the past 3 years, the town has discussed the potential for up to four offshore turbines. The proposed offshore project will produce up to 100% of Hull's needs. We hope this will help us continue to maintain stable rates. The Town of Hull hasn't had a rate increase since 1996. At the moment, we are spending a lot of time on community outreach — the same process used for Hull 1 and Hull 2 — and providing information to ratepayers and political bodies to get feedback and build support

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:2 [The 660 kW turbine is close to..] (1:388-1:552) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

The 660 kW turbine is close to the high school, within 100 ft of the site of a 40 kW turbine (since removed) which was installed approximately 20 years before.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:6 [Hull has a long history of lan..] (1:2304-1:2435) (Super)**

Codes: [B\_Background-Info L1] [W\_Wind Resource]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Hull has a long history of land-based wind energy use, beginning at least 200 years ago, when wind was used to produce salt.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:8 [In the 1980's, the town's ?rst..] (1:2529-1:2642) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

In the 1980's, the town's first electricity-producing wind machine was installed, a 40 kW Enertech machine.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:26 [Bene?ciaries vs. those impacte..] (3:235-3:525) (Super)**

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Codes: [AO\_Ownership] [EnvG\_Environment General] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Beneficiaries vs. those impacted The proposed owner and operator of the project was always to be the Hull Municipal Light Plant. The beneficiaries were thus the residents of Hull. Similarly, those affected were also residents, with those closest to the turbine being the most affected.

### **P 9: \_9H0 ACAD RERL Case Study\_Hull\_Wind\_One 2004.pdf - 9:27 [Visual impact To some extent t..] (3:529-3:705) (Super)**

Codes: [B\_Background-Info L1] [EnvV\_Visual]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Visual impact To some extent the concern for the visual impact in Hull was less than it might otherwise have been because there had been a turbine at the site for many years.

### **P 9: \_9H0 ACAD RERL Case Study\_Hull\_Wind\_One 2004.pdf - 9:28 [Noise Noise is commonly brought..] (3:708-3:1138) (Super)**

Codes: [EnvN\_Noise] [M\_Mitigation L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Noise Noise is commonly brought up in relation to wind turbine proposal. The proximity of Hull to the Logan Airport flight paths, as well as the experience with a previous turbine near the site diminished concern with this issue. Nonetheless, detailed consideration was given to this issue in the development process. Experience with the turbine since the installation has confirmed that noise is not a significant problem.

### **P 9: \_9H0 ACAD RERL Case Study\_Hull\_Wind\_One 2004.pdf - 9:33 [Skepticism in technology Skept..] (3:2269-3:2789) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H07: What sci info is available?]

Skepticism in technology Skepticism in new technology is common and not without foundation. Hull had some experience with modern wind energy technology, so it was not completely new to them. The previous turbine did not function as well as hoped. Nonetheless, it did function to some degree, and it may be that the experience with that turbine, together with an understanding of how the wind turbines had changed over the last twenty years, prevented residents from expressing much concern over the technology

### **P 9: \_9H0 ACAD RERL Case Study\_Hull\_Wind\_One 2004.pdf - 9:41 [Previous experience As mention..] (3:5542-3:5915) (Super)**

Codes: [B\_Background-Info L1] [EnvL\_Landuse] [M\_Mitigation L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Previous experience As mentioned above, and as will be described in more detail below, Hull had previously had a wind turbine installed very close to where the current turbine is now located. Experience with that turbine was not altogether positive, but it did help to focus attention on

important issues and minimize concern with issues that are less important.

**P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf - 10:2 [A popular 19th century summer ..] (1:692-1:1132) (Super)**

Codes: [B\_Background-Info L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneNd\_Need] [EneT\_Technology] [EnvL\_Landuse]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

A popular 19th century summer resort that today has more than 11,000 year-round residents, Hull already gets about 12 percent of its electricity from two land-based wind turbines. One is on Pemberton Point near the high school. A second is at the site of a former town landfill near the Hingham line. The four offshore wind turbines would produce close to 15 megawatts of electricity, enough to cover the balance of the town's demand

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:6 [In 2001 HMLP installed a new, ..] (1:2340-1:2603) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

In 2001 HMLP installed a new, 660 kW turbine at Windmill Pt., at the tip of the town. This turbine site is close to the high school, within 100 ft of the site of a 40 kW turbine (since removed), which had been installed approximately 20 years beforehand.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:14 [Noise: Noise is commonly broug..] (3:657-3:975) (Super)**

Codes: [EnvN\_Noise]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Noise: Noise is commonly brought up in relation to wind turbine proposal. The proximity of Hull the Logan Airport flight path, as well as the experience with a previous turbine near the site diminished concern with this issue. Nonetheless, detailed consideration was given to this issue in the development process.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:18 [Responsibility of operation, m..] (3:1860-3:2247) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EneT\_Technology] [OM\_Operation & Maintenance L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Responsibility of operation, maintenance and dismantling: A 40 kW wind turbine was previously installed near the high school, and was operated and maintained by school as well. This method of O&M was perceived as being a factor in the low availability of that turbine. Accordingly, at the outset of the new project, HMLP proposed to assume the role of operator and maintainer

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:19 [Skepticism in technology: Skep..] (3:2253-3:2778) (Super)**

Codes: [EneT\_Technology] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Skepticism in technology: Skepticism in new technology is common and not without

foundation. Hull had some experience with modern wind energy technology, so it was not completely new to them. The previous turbine did not function as well as hoped. Nonetheless, it did function to some degree, and it may be that the experience with that turbine, together with an understanding of how the wind turbines had changed over the last twenty years, prevented residents from expressing much concern over the technology.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:20 [Confidence in proponents: Town..] (3:2783-3:3198) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Confidence in proponents: Townsfolk may understandably be skeptical about advice from any source, whether from local proponents, developers, salesmen, or officials from out of town. The process Hull used was conducive to building up trust, by being slow, deliberate, and securing the assistance of entities that were familiar with the technology and the issues, but did not stand to profit from the outcome

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:31 [Previous experience. As mentio..] (4:2828-4:3196) (Super)**

Codes: [B\_Background-Info L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Previous experience. As mentioned above, and as will be described in more detail below, Hull had previously had a wind turbine installed very close to where the current turbine is now located. Experience with that turbine was not altogether positive, but it did help to focus attention on important issues and minimize concern with issues that are less important

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:35 [Hull has a long history of the..] (5:662-5:848) (Super)**

Codes: [B\_Background-Info L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Hull has a long history of the use of wind for land based application, beginning at least 200 years ago. The following is a brief history of Hull's use of windmills and wind turbines.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:36 [The tip of the Hull peninsula,..] (5:880-5:1208) (Super)**

Codes: [B\_Background-Info L1] [W\_Wind Resource]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

The tip of the Hull peninsula, where the new turbine is located, has been referred to as "Windmill Point" since at least the early 1800's. The spot acquired the name because it was the site of a windmill which was used in the production of salt from sea water. A mill similar to the one used in Hull is shown in Figure 2.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:37 [2.2 The First Modern Wind Turb..] (5:1278-5:1583) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [EneT\_Technology] [EnvL\_Landuse]

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Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

### 2.2 The First Modern Wind Turbine in Hull

In the early 1980's the town of Hull applied for and received a grant to install a wind turbine. In January 1985 a 40 kW horizontal axis wind turbine (Enertech model 44/40) mounted on an 80 ft tower was installed on the grounds of the High School at Windmill

#### **P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:38 [The cost of the turbine and it..] (6:12-6:161) (Super)**

Codes: [Econ\_Economics L1] [EneG\_Energy Policy General]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The cost of the turbine and its installation was \$78,000 with funds provided by the Massachusetts Executive Office of Energy Resources (EOER).

#### **P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:39 [The power produced by the wind..] (6:165-6:388) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EneAlt\_Alternatives] [EneNd\_Need] [EneR\_Reliability]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

The power produced by the wind turbine was intended to offset electrical loads at the High School. When the turbine output exceeded the school's demands, the surplus was fed into the Hull Municipal Lighting Plant grid.

#### **P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:40 [The Hull High School was respo..] (6:391-6:482) (Super)**

Codes: [OM\_Operation & Maintenance L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

The Hull High School was responsible for the operation and maintenance of the wind turbine.

#### **P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:41 [The performance of this wind t..] (6:485-6:838) (Super)**

Codes: [Econ\_Economics L1] [EneR\_Reliability] [EneT\_Technology] [OM\_Operation & Maintenance L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

The performance of this wind turbine was at its best during its first full year of operation (March 1, 1985- February 28, 1986), and, as shown in Table 1, it produced about 84,800 kWh, thus operating at a capacity factor of 24.2%. During this first year period it supplied about 40% of the school's power, resulting in about \$8,000 in cost savings.

#### **P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:42 [It was originally projected th..] (6:1286-6:1667) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [OM\_Operation & Maintenance L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

It was originally projected that the turbine would generate about 75,000 kWh per year (a capacity factor of 21.4%). However, as shown in Figure 2, this estimate was only reached or exceeded in 1986 and 1995. Furthermore, the total generation for

the 11 full years from 1985 through 1995 was about 495,000 kWh, only about 60% of the expected performance of the wind turbine.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:44 [The reasons for the relatively..] (7:4-7:363) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [OM\_Operation & Maintenance L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

The reasons for the relatively poor performance of this machine can be explained by a relatively large amount of repairs required to the machine. Table 2 gives a summary of some of its major repairs during this time period. The machine was damaged beyond repair in March 1997 during a windstorm (70 mph peak winds) when its tip brake mechanism failed.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:45 [Table 2 Summary of Major Repai..] (7:366-7:692) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [OM\_Operation & Maintenance L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Table 2 Summary of Major Repairs to 40 kW Hull Wind Turbine

Time Period Component Repair

Nov 87- May 88 Tip Brake Replacement

June 89-Aug 89 Controller Problems

June 91-July 92 Circuit Breaker Problems

April 92- June 92Power Cable Failure

Jan-93 Generator Winding Failure

Mar-97 Tip Brake Failure- Major

Machine Damage

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:46 [On a positive note, despite th..] (7:695-7:1215) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

On a positive note, despite the number of turbine repairs needed it was estimated (Bolgen, 1996) that the 40 kW wind turbine produced an estimated \$61,500 worth of electricity for the Hull School Department. The estimated maintenance and repairs were about \$17,000, thus the net savings of the turbine was about \$44,500. This was still more than real cost of the turbine, so the overall economics were not positive. The experience did prove of value, however, in it help paved the way for later developments.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:47 [Encouraged by the early succes..] (7:1260-7:1660) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Encouraged by the early success of the 40 kW wind turbine, HMLP supported plans for a proposal in 1987 to install more and larger wind turbines at the Windmill Point site. As a result of this work, the proposed project was awarded a \$600,000 grant from the EOER, (now the Massachusetts Division of Energy Resources or DOER), to install 500 to 600 kW of wind turbine capacity at this site.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:51 [In addition to a detailed disc..] (8:105-8:347) (Super)**

Codes: [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [EnvG\_Environment General]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

In addition to a detailed discussion of state-of-the-art wind turbines for the proposed system, the proposal discussed the environmental characteristics of the installation, potential licensing status as well as its economic considerations.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:52 [Despite the work of the DOER a..] (8:350-8:493) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Despite the work of the DOER and its consultants and the approval of the HMLP Plant Board, the proposal was defeated in a 1993 town meeting.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:53 [opponents of the proposal refe..] (8:529-8:829) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [EneT\_Technology] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

opponents of the proposal referred to the promoters from DOER and its consultants as the "skinny guys in suits." Thus, a combination of bad timing, the worsening performance of the 40 kW machine, and the lack of local "wind energy champions" contributed to this wind system's proposal failure.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:76 [Three historic "firsts" were s..] (10:683-10:1151) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EnvL\_Landuse]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

Three historic "firsts" were simultaneously achieved when the turbine was connected to the grid: (1) it was the first commercial-scale wind turbine to go online anywhere on the U.S. coastline between Maine and Florida, (2) it was the first urban-sited turbine on the North American continent, and (3) it was the first such publically-owned wind turbine to be sited in the United States within easy walking distance of a stop on a mass transit system (a ferry)

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:78 [As previously noted, the insta..] (10:1264-10:1742) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [W\_Wind Resource]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?]

As previously noted, the installation in 2002 of a Vestas 660 kW wind turbine at Windmill Point (now called Hull No. 1) represented the high point of almost 20 years of wind energy activity at this location. In its first year of operation (12/27/01 to 12/26/02) it had a capacity factor of 27.6% (Production of 1,594 MWh). During its current second

year of operation (1/1/03 to 5/1/03, the capacity factor has been 35.5%, giving a cumulative capacity factor of 29.6%.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:86 [In August 2002 a survey was co..] (13:533-13:1026) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [ComN\_Communication Nexus] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

In August 2002 a survey was commissioned by HMLP regarding the new 660 kW wind turbine and the possibility of additional wind turbines in Hull . Of the 499 responses, 475 approved the idea of more wind turbines. Eleven did not approve of more turbines, even though some of these were not opposed to Hull No. 1. Thirteen were noncommittal, but did have questions or comments on the project. Accordingly, HMLP is now considering the options for installing additional turbines

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:93 [Because of the success of Hull..] (15:651-15:1256) (Super)**

Codes: [ComN\_Communication Nexus] [DEC\_Design Engineer Construct] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1] [R\_Research L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

Because of the success of Hull No. 1, investigations are now underway which may result in the installation of at least on more turbine of equal size or larger, and a small offshore wind farm is being considered as well. Following the model used in siting Hull No. 1, the investigation of the offshore options are emphasizing the following points: The project should be (1) suitable scale, (2) attractive, (3) achievable, (4) well-planned, (5) compatible with other activities in Massachusetts Bay, and (6) able to serve as a model for other communities (in Massachusetts and world-wide).

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## Memos and Quotes

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### **MEMO: RQ\_H02: Any big picture lessons b/c of Hull I? Hull II? (47 Quotations) (Super, 2013-09-07 15:34:02)**

P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf:  
(2:836-2:1445)  
P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf:  
(2:104-2:196), (2:364-2:442), (2:2276-2:2510)  
P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf:  
(1:2615-1:2927), (2:2709-2:3352), (6:224-6:389), (6:392-6:576), (19:83-19:782), (19:786-19:1222)  
P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:  
(2:1584-2:1687), (3:337-3:483), (3:1600-3:1700), (3:1781-3:2078), (3:3769-3:4326), (3:5000-3:5416), (4:88-4:235), (4:709-4:1120), (4:1207-4:1600), (4:1603-4:1835), (4:2031-4:2178)  
P 9: \_9H0 ACAD RERL Case Study Hull Wind One 2004.pdf:  
(1:3660-1:3926), (3:708-3:1138), (3:1947-3:2264), (3:3713-3:3942), (3:3947-3:4288), (3:4292-3:4710), (3:4714-3:5272), (3:5276-3:5538), (3:5542-3:5915), (3:5919-3:6247), (3:6251-3:6485), (3:6490-3:6880)  
P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf:  
(2:1-2:360), (2:363-2:519)  
P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf:  
(3:2783-3:3198), (4:404-4:1097), (4:1101-4:1217), (4:1323-4:1626), (4:1632-4:1995), (4:2001-4:2558), (4:2564-4:2823), (4:2828-4:3196), (9:1487-9:1788), (15:34-15:648), (15:651-15:1256), (15:1669-15:2180)

No codes

No memos

Type: Analysis

What lessons -- either for Hull or other communities -- come from the Hull experience? (What big picture conclusions, if any, can be drawn from the case study community's experience?)

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:11 [Contract negotiations went on ..] (2:836-2:1445) (Super)**

Codes: [B\_Background-Info L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Contract negotiations went on for several months. It became clear that here too Hull was doing pioneering work. As in the state-sponsored engineering study, Hull's case was being looked at as a "first" in the Commonwealth, and even on the entire East Coast. So our contract should be a transportable template for other similar projects still in the planning stages, or at still earlier stages of advancement. A number of issues needed to be resolved, such as the schedule of advance payments, warranty and maintenance agreement language, the level of ongoing commitment we could expect from Vestas.

### **P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:16 [Demonstrates local government ..] (2:364-2:442) (Super)**

Codes: [EneG\_Energy Policy General]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Demonstrates local government can lead our country toward energy independence

### **P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:18 [Little or no opposition to a p..]**

**(2:104-2:196) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Little or no opposition to a project when the community is both the investor and beneficiary

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:20 [Perhaps the biggest lesson lea..] (2:2276-2:2510) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Perhaps the biggest lesson learned is that a well-sited, modest wind project owned and operated by a municipal utility with all the benefits flowing to the community can move forward quickly with nearly unanimous community support

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:2 [Two elements have allowed this..] (1:2615-1:2927) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Two elements have allowed this success: a municipally-owned power company whose financial situation made the wind power projects economically feasible; and a citizenry willing to participate actively over a number of years to ensure that the project happened in a way that kept all constituencies satisfied

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:15 [As part of the investigation o..] (2:2709-2:3352) (Super)**

Codes: [EnvL\_Landuse] [EnvN\_Noise] [EnvV\_Visual] [R\_Research L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

As part of the investigation of Mariner's Park as well as for use in a preliminary noise study of HWI, RERL installed a meteorological tower. This tower remained on site for approximately two months. During this time, the RERL team also created a number of photosimulations. These illustrated what a second, larger turbine might look like. Some other possible siting options for a second turbine were also introduced. These included Stony Point, the vicinity of the sewer plant and offshore. The landfill (which was eventually chosen) was also an option, but some of the others were still preferred for a variety of reasons.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:27 [The wind resource and the econ..] (6:224-6:389) (Super)**

Codes: [Econ\_Economics L1] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

The wind resource and the economics were also important, but more in sense of whether the site was adequate, rather than whether it was it the best possible site.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:28 [The approach that was taken wa..] (6:392-6:576) (Super)**

Codes: [Econ\_Economics L1] [EneNd\_Need] [EneR\_Reliability] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

The approach that was taken was to consider the likely range of capacity factors and the expected costs of the project and to use those to assess whether the site was "good enough".

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:78 [The conclusions and lessons le..] (19:83-19:782) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneR\_Reliability] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The conclusions and lessons learned on the Hull Wind II are summarized below. Of high importance, the first large wind turbine, HW I, was successful and popular. It led directly to the second wind turbine. A municipal electric company such as HMLP is an ideal host for a wind turbine project of this type. They are familiar with electricity and since they are owned by the town that they serve, the residents feel that the turbine is "theirs" as well. Because the value of the electricity is high and guaranteed (and considerably higher than it would be if the electricity were sold into a wholesale market), the unusually high cost of the foundation could be borne by the project.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:79 [• Success of Hull One • Local ..] (19:786-19:1222) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

- Success of Hull One
- Local champions
- Municipal electric company – ideal host
- Guaranteed value of energy
- Clear public benefit
- Adequate wind resource
- Non-restrictive regulations
- Opportunities for meaningful public input
- Reputable and responsive turbine supplier
- Municipal electric utility that was an active participant in the process
- Available site
- Qualified and experienced partners

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:15 [Q. How did Hull 1 come about? ..] (2:1584-2:1687) (Super)**

Codes: [A\_Public Accountability L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Q. How did Hull 1 come about?

The process that led to both turbines really centered on the community.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:25 [The first project was such a s..] (3:337-3:483)  
(Super)**

Codes: [Com\_Communication L1] [P\_Fair Process L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

The first project was such a success that RERL had already written a "how-to" book about it. The significant question was not "if" but "where."

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:37 [Community support is strong. W..] (3:1781-3:2078)  
(Super)**

Codes: [A\_Public Accountability L1] [B\_Background-Info L1] [ComN\_Communication Nexus] [Econ\_Economics L1] [EneAlt\_Alternatives] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Community support is strong. We would never have considered the second turbine if it were not. In 2003, after benefiting from the first turbine, the town decided to expand on its history with wind power. Hull citizens voted to install up to two turbines on land and up to four in the water.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:45 [What are Hull's plans for furt..] (3:3769-3:4326)  
(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneNd\_Need] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

What are Hull's plans for further wind development?  
For the past 3 years, the town has discussed the potential for up to four offshore turbines. The proposed offshore project will produce up to 100% of Hull's needs. We hope this will help us continue to maintain stable rates. The Town of Hull hasn't had a rate increase since 1996. At the moment, we are spending a lot of time on community outreach — the same process used for Hull 1 and Hull 2 — and providing information to ratepayers and political bodies to get feedback and build support

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:47 [Making this project happen wil..] (3:5000-3:5416)  
(Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [ComN\_Communication Nexus] [DEC\_Design Engineer Construct] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H07: What sci info is available?]

Making this project happen will take a lot of effort from many sources. It will also provide many valuable learning opportunities. Quite a few state agencies are interested in working with us on the permitting process in order to be involved in this first-of-itskind initiative. What this project will do most of all, however, is give people something to look at so they can arrive at their own

conclusions.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:53 [within the territory of the To..] (4:88-4:235)  
(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [ComN\_Communication Nexus] [P\_Fair Process L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

within the territory of the Town of Hull, in state waters. This should simplify the permitting process a lot, relative to the Cape Cod projects.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:58 [Many communities in New Englan..] (4:709-4:1120)  
(Super)**

Codes: [ComN\_Communication Nexus] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

Many communities in New England are exploring wind development. How can community leaders learn from your experience?  
Representatives from just about every Massachusetts community have visited the Hull 1 turbine. Now, more and more out-of-state communities are coming to look. We give them a good "show and tell" of the area, and people in town are always willing to talk about their wind turbines.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:60 [We offer an example to follow,..] (4:1207-4:1600)  
(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [ComN\_Communication Nexus] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?] [RQ\_H09: What influences choice of turbine?]

We offer an example to follow, and we suggest that other communities contact RERL for assistance, as we did. Also, if you do move forward with a project, get a service agreement from the vendor, so whether or not you operate a municipal light plant, you don't have to worry about keeping it running. Everything is covered and it keeps the blades spinning, which makes everyone happy

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:61 [Also, the process can be daunt..] (4:1603-4:1835)  
(Super)**

Codes: [A\_Public Accountability L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Also, the process can be daunting. Get your local politicians engaged. For example, Congressman Delahunt is enthusiastic about renewable energy and actively trying to help communities understand and pursue wind energy projects.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:63 [My most important recommendati..] (4:2031-**

**4:2178) (Super)**

Codes: [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

My most important recommendation is  
for each town project to make sure it has a dedicated champion,  
committed to maintaining forward momentum. I

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:65 [We will follow this same proce..] (3:1600-3:1700) (Super)**

No codes

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future] [RQ\_H07: What sci info is available?]

We will follow this same process for our offshore project; honest  
information leads to credibility.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:4 [What made Hull Wind One such a..] (1:3660-1:3926) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [Com\_Communication L1] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

What made Hull Wind One  
such a success?  
Municipal electric utility  
that was an active participant in the process  
Local champions  
Good wind resource  
Public involvement  
Previous experience in wind  
Town realized public benefit  
Available site  
Technical support

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:28 [Noise Noise is commonly brough..] (3:708-3:1138) (Super)**

Codes: [EnvN\_Noise] [M\_Mitigation L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Noise Noise is commonly brought up in relation to wind  
turbine proposal. The proximity of Hull to the Logan Airport flight paths, as well as the experience with a previous  
turbine near the site diminished concern with this issue.  
Nonetheless, detailed consideration was given to this issue  
in the development process. Experience with the turbine  
since the installation has confirmed that noise is not a significant problem.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:32 [Responsibility of operation, m..] (3:1947-3:2264) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Responsibility of operation, maintenance and dismantling

The low availability of the old 40 kW wind turbine was blamed in part on the fact that it was maintained by the high school. Since HMLP was assumed to be the new project's operator and maintainer from the outset, this issue was not a major concern

**P 9: 9H0 ACAD RERL Case Study Hull Wind One 2004.pdf - 9:36 [The factors affecting Hull's d..] (3:3713-3:3942) (Super)**

Codes: [P\_Fair Process L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

The factors affecting Hull's decision to install a new wind turbine are closely related to the issues that needed to be addressed to realize such a project (as outlined above). The most important factors are summarized below

**P 9: 9H0 ACAD RERL Case Study Hull Wind One 2004.pdf - 9:37 [Municipal electric light plant..] (3:3947-3:4288) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Municipal electric light plant The presence of a municipal utility in a town simplifies the process of acquiring distributed generation (such as a wind turbine), since there is clear mechanism for doing so. This was certainly true in the case of Hull, where the municipal light plant was a participant in all stages in the process.

**P 9: 9H0 ACAD RERL Case Study Hull Wind One 2004.pdf - 9:38 [Local champions Undertaking pr..] (3:4292-3:4710) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Local champions Undertaking projects of the type described in this paper can be a long, slow process. Experience has shown that having a few local people ("champions") who can push the project along can greatly facilitate the process. Hull was fortunate to have dedicated champions, including a determined resident, the Operations Manager of the Light Plant, and various local and state public officials.

**P 9: 9H0 ACAD RERL Case Study Hull Wind One 2004.pdf - 9:39 [Good wind resource It was alre..] (3:4714-3:5272) (Super)**

Codes: [R\_Research L1] [W\_Wind Resource]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Good wind resource It was already apparent to the casual observer that Hull has a promising wind resource. Hull is on a peninsula far out in the Boston Harbor, with as good

## Supplement\_1\_Coded\_Data\_for\_Hull

1 of 3 Supplemental Files accompanying the dissertation of Enid C. Kumin, Antioch University

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an exposure to the winds as anywhere on the coast of Massachusetts. Historical experience from the days of sail, as well as the performance of the previous wind turbine, were consistent with that observation. During the course of the project, the wind resource was quantified to some extent by reference to monitoring stations at nearby Logan Airport and Thompson Island.

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:40 [Public involvement Public invo..] (3:5276-3:5538) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Public involvement Public involvement is one of the keys to addressing concerns of the residents. The decision making process involved the public at every step. This process was facilitated by the participation of the municipal light plant in the project.

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:41 [Previous experience As mention..] (3:5542-3:5915) (Super)**

Codes: [B\_Background-Info L1] [EnvL\_Landuse] [M\_Mitigation L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Previous experience As mentioned above, and as will be described in more detail below, Hull had previously had a wind turbine installed very close to where the current turbine is now located. Experience with that turbine was not altogether positive, but it did help to focus attention on important issues and minimize concern with issues that are less important.

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:42 [Public bene?t As discussed abo..] (3:5919-3:6247) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Public benefit As discussed above, the energy produced by the turbine was recognized to benefit the town directly, through reduction in purchased energy. This was made particularly concrete by the Light Plant's decision to use part of the "profit" from the wind turbine to cancel the bills to the town for the street lights.

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:43 [Available site No project can ..] (3:6251-3:6485) (Super)**

Codes: [AO\_Ownership] [EnvL\_Landuse] [W\_Wind Resource]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Available site No project can succeed without a suitable site. Hull was fortunate in that it owned a site (Windmill Point) with good exposure to the winds, where the turbine could be sited without serious conflicts with other uses

**P 9: \_9H0 ACAD RERL Case Study\_Hull\_Wind\_One 2004.pdf - 9:44 [Technical support Innovative p..] (3:6490-3:6880) (Super)**

Codes: [A\_Public Accountability L1] [EneT\_Technology]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Technical support Innovative projects such as the one in Hull often require significant technical support in order to be brought to successful fruition. Hull was fortunate in that it could take advantage of the Commonwealth's Division of Energy Resources long-standing partnership with the University of Massachusetts Renewable Energy Research Laboratory to assist in this project

**P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf - 10:4 [Town Manager Philip Lemnios sa..] (2:1-2:360) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

Town Manager Philip Lemnios said one key reason is that Hull's 6,100 electric customers get their power from the town-owned Hull Municipal Light Plant, which means that the windmills will be producing electricity they are paying for directly in their homes and businesses. Also, Hull residents have lived with the Pemberton Point turbine for eight years.

**P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf - 10:5 ["It's our own electricity," Le..] (2:363-2:519) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

"It's our own electricity," Lemnios said. "We work to make sure that kids know when they see a streetlight on that it's being powered by the wind turbine."

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:20 [Confidence in proponents: Town..] (3:2783-3:3198) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Confidence in proponents: Townsfolk may understandably be skeptical about advice from any source, whether from local proponents, developers, salesmen, or officials from out of town. The process Hull used was conducive to building up trust, by being slow, deliberate, and securing the assistance of entities that were familiar with the technology and the issues, but did not stand to profit from the outcome

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:24 [Municipal electric light plant..] (4:404-4:1097) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneNd\_Need] [EneR\_Reliability] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Municipal electric light plant. Hull is one of 40 towns in Massachusetts that have

municipally owned electric utilities. All of these utilities were set up in the early days of electrification (before 1927). They serve about 13% of the customers in the state. Municipal utilities can generate their own electricity, although most of them do not do so. In general, they purchase electricity from wholesalers, such as the Massachusetts Municipal Wholesale Electric Company, and then distribute that power to customers in the town. Municipal utilities own and service the distribution system in their town. Thus, they are experienced in issues associated with electricity supply.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:25 [Municipal utilities are operat..] (4:1101-4:1217) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Municipal

utilities are operated under the management of a Light Board, which is elected by residents of the town.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:27 [The presence of a municipal ut..] (4:1323-4:1626) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

The presence of a municipal utility in a town simplifies the process of acquiring distributed generation (such as a wind turbine), since there is clear mechanism for doing so. This was certainly true in the case of Hull, where the municipal light plant was a participant in all stages in the process

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:28 [Local champions. Undertaking p..] (4:1632-4:1995) (Super)**

Codes: [AO\_Ownership] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Local champions. Undertaking projects of the type described in this paper can be a long, slow process. Experience has shown that having a few local people ("champions") who can push the project along can greatly facilitate the process. Hull was fortunate to have two champions, one a determined resident, the other the Operations Manager of the Light Plant

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:29 [Good wind resource. It was alr..] (4:2001-4:2558) (Super)**

Codes: [W\_Wind Resource]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

Good wind resource. It was already apparent to the casual observer that Hull has a promising wind resource. Hull is on a peninsula far out in Boston Harbor, with as good an exposure to the winds as anywhere on the coast of Massachusetts. Historical experience from the days of sail, as well as the performance of the previous wind turbine, all were consistent with that observation. During the course of the project, the wind resource was quantified to some extent by reference to monitoring stations at nearby Logan Airport and Thompson Island

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:30 [Public involvement. Public inv..] (4:2564-4:2823) (Super)**

Codes: [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Public involvement. Public involvement is one of the keys to addressing concerns of the residents. The decision making process involved the public at every step. This process was facilitated by the participation of the municipal light plant in the project.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:31 [Previous experience. As mentio..] (4:2828-4:3196) (Super)**

Codes: [B\_Background-Info L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Previous experience. As mentioned above, and as will be described in more detail below, Hull had previously had a wind turbine installed very close to where the current turbine is now located. Experience with that turbine was not altogether positive, but it did help to focus attention on important issues and minimize concern with issues that are less important

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:68 [It should be noted that much d..] (9:1487-9:1788) (Super)**

Codes: [ComN\_Communication Nexus]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H09: What influences choice of turbine?]

It should be noted that much detail went into this detailed engineering study because of its potential to guide future projects in Massachusetts, especially the coastal communities. Thus, care was taken to make it function as a template for other towns or agencies who might plan similar projects

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:92 [The success of the project des..] (15:34-15:648) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

The success of the project described in this paper has demonstrated that it is quite possible to site a wind turbine in an urban environment in New England. The secret to the success was first of all to recognize and address the obstacles that were likely to be encountered. The second secret was to have the right mix of favorable factors. In the case of Hull, these were:

- Municipal electric utility that was an active participant in the process
- Local champions.
- Good wind resource
- Public involvement.
- Previous experience.
- Public benefit.
- Available site
- Technical support

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:93 [Because of the success of Hull..]**

**(15:651-15:1256) (Super)**

Codes: [ComN\_Communication Nexus] [DEC\_Design Engineer Construct] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

Because of the success of Hull No. 1, investigations are now underway which may result in the installation of at least on more turbine of equal size or larger, and a small offshore wind farm is being considered as well. Following the model used in siting Hull No. 1, the investigation of the offshore options are emphasizing the following points: The project should be (1) suitable scale, (2) attractive, (3) achievable, (4) well-planned, (5) compatible with other activities in Massachusetts Bay, and (6) able to serve as a model for other communities (in Massachusetts and world-wide).

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:94 [The importance of the municipa..] (15:1669-15:2180) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [ComN\_Communication Nexus] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

The importance of the municipal electric utility in the case of Hull cannot be overstated. Many tasks that could be daunting for other communities are readily solvable when a municipal electric utility is one of the participants. How communities that are not served by a municipal electric utility can carry out such projects is a question that still remains to be resolved. Whatever the model that emerges is, it is likely that it will embody many of the attributes that have proved crucial in Hull.

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## Memos and Quotes

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HU: Project WEMCZ v1 61712  
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Edited by: Super  
Date/Time: 2014-01-08 15:58:43

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### **MEMO: RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct? (32 Quotations) (Super, 2013-09-07 15:42:09)**

P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf:  
(2:1448-2:1954), (2:2335-2:2842)  
P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf:  
(1:231-1:379), (2:32-2:101)  
P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf:  
(11:444-11:948), (12:150-12:664), (19:83-19:782)  
P 5: \_5H0 ACAD Hull Offshore Wind RERL PwrPt 2-24-2007.pdf:  
(2:79-2:131), (2:136-2:195)  
P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf:  
(1:766-2:279), (2:599-2:1111), (2:1114-2:1646), (2:1825-2:2141)  
P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:  
(3:88-3:200), (3:202-3:335), (3:3382-3:3762), (4:1122-4:1205)  
P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf:  
(2:3247-2:3504), (2:3663-2:4128), (3:1385-3:1660), (3:1664-3:1944)  
P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf:  
(2:610-2:1176), (2:1182-2:1565), (2:1571-2:2012), (3:156-3:466), (3:472-3:652), (3:1230-3:1567), (3:1573-3:1855), (4:3202-4:3533), (7:2623-7:2696), (13:5-13:486), (13:1411-13:1557)

No codes

No memos

Type: Analysis

What benefits (or the opposite) have accrued to Hull as a result of Hull I construction?

What was the Town's motivation for constructing a WEF (i.e., what advantages/benefits was Hull anticipating from WEF construction)?

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:12 [Commissioning date was Decembe..] (2:1448-2:1954) (Super)**

Codes: [B\_Background-Info L1] [Econ\_Economics L1] [EneG\_Energy Policy General] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Commissioning date was December 27, 2001. In its first year, the total generated energy -- all delivered to the municipally owned grid, -- was 1,597,367 KWh. The Light Department's sales of this energy (in addition to 'zeroing out' the town's street lighting bill) were in excess of \$150,000, net of the incentive payments for "renewable energy certificates". Public support was high, and a survey by the light department returned 95% favorable reactions, the commonest question being "why not more?"

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:14 [By May of 2006, Hull Wind 2 wa..] (2:2335-2:2842) (Super)**

Codes: [B\_Background-Info L1] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneR\_Reliability] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By May of 2006, Hull Wind 2 was commissioned (a Vestas V80, rated at 1.8 Megawatts). In its first year it produced 4,088,000 KWh, and townsfolk showed considerable pride in the results. Six state and national awards had meantime accumulated. One commissioner joked "we have run out of wall-space in

our the Light Plant's offices to hang our award plaques -- some will have to be moved to Town Hall."  
This pair of turbines was now supplying over 10% of the town's entire consumption of electric energy.

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:2 [The Turbine, known as Hull Win..] (1:231-1:379) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

The Turbine,  
known as Hull Wind 1 was installed after the town realized  
just how much money it could save by generating its own,  
renewable energy.

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:17 [Half million dollars over 3 ye..] (2:32-2:101) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Half million dollars over 3 years cost savings from  
one wind turbine.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:51 [The third part of the economic..] (11:444-11:948) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The third part of the economic analysis considered the net "profit" to the Town of Hull from owning and operating the wind turbine. Quotes are used around profit, because as a public entity HMLP does not really make a profit. The "profit" represents the present value of the surplus of the total value of the electricity produced in excess of the cost of owning and operating the turbine, over the lifetime of the project. The "profit" takes into account the REC's and the REPI mentioned above.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:57 [As can be seen, even in the wo..] (12:150-12:664) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

As can be seen, even in the worst case considered, the cost of energy from the wind turbine would be less than the value of the electricity, even if REC's and REPI were not taken into account. Furthermore over the life of the project, HMLP would reap a substantial "profit". The latter should be at least greater than \$2 million and quite possibly in excess of \$6 million. The overall conclusion is that even under the most conservative assumptions, Hull Wind II should be an economically viable project.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:78 [The conclusions and lessons le..] (19:83-19:782) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneG\_Energy

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Policy General] [EneR\_Reliability] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The conclusions and lessons learned on the Hull Wind II are summarized below. Of high importance, the first large wind turbine, HW I, was successful and popular. It led directly to the second wind turbine. A municipal electric company such as HMLP is an ideal host for a wind turbine project of this type. They are familiar with electricity and since they are owned by the town that they serve, the residents feel that the turbine is "theirs" as well. Because the value of the electricity is high and guaranteed (and considerably higher than it would be if the electricity were sold into a wholesale market), the unusually high cost of the foundation could be borne by the project.

### **P 5: \_5H0 ACAD Hull Offshore Wind RERL PwrPt 2-24-2007.pdf - 5:1 [Price for conventional energy ..] (2:79-2:131) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Price for conventional energy will  
continue to rise

### **P 5: \_5H0 ACAD Hull Offshore Wind RERL PwrPt 2-24-2007.pdf - 5:2 [Supply of conventional energy ..] (2:136-2:195) (Super)**

Codes: [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneNd\_Need]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Supply of conventional energy will  
become more problematic

### **P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:2 [The most recent number is 15,1..] (1:766-2:279) (Super)**

Codes: [AO\_Ownership] [Econ\_Economics L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

The most recent number is 15,173,260 kWhs. It is tempting to do a back of the envelope cost-benefit calculation for the 10 year old turbine. Hull is one of 40 Massachusetts towns that have a municipally owned electrical utility, and the yield from the turbine replaces the need to buy electricity from the grid, which in 2005 was 8cents per kWh. In other words, Hull's first wind turbine has saved the town in the order of 15 million times 8 cents: \$1.2m

### **P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:4 [Brown is keen to point out tha..] (2:599-2:1111) (Super)**

Codes: [AO\_Ownership] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneR\_Reliability]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Brown is keen to point out that the turbine has paid for itself by now and that it will continue to produce electricity for the town of Hull at a very low cost, thus reducing the bill of the town's ratepayers for a long time to come. On top of that, a number of subsidies means that Hull has done extremely well out of this deal. There are additional advantages, for example in the reduction of volatility of electricity prices, since Hull is a little more

independent of the highly volatile oil prices.

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:5 [For 5 years, Hull has had a se..]  
(2:1114-2:1646) (Super)**

Codes: [B\_Background-Info L1] [Econ\_Economics L1] [EneT\_Technology]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

For 5 years, Hull has had a second Vestas turbine almost 3 times as big: 1.8MW. The back of the envelope calculation for this turbine is \$3.2m installation cost plus annual maintenance and insurance cost of \$60K. And in its just over 5 years of operation it has delivered some 20 million kWhs, amounting to some \$1.6m. Disregarding subsidies it will have paid for itself in another 5 years or so. Together, the two turbines produce some 11% of Hull's consumption, and so their reduction of the rate in Hull is considerable.

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:7 [in 2001 it was argued that the..]  
(2:1825-2:2141) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

in

2001 it was argued that the wind turbine would damage tourism, an argument well known from the opponents of the Cape Wind offshore wind farm. But in fact, Hull's first wind turbine, located at the very tip of Hull overlooking Boston Bay, has actually attracted more people, as local retailers will confirm.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:23 [What decision-making process l..] (3:88-3:200)  
(Super)**

Codes: [A\_Public Accountability L1] [B\_Background-Info L1] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

What decision-making process led to Hull 2?

The people of Hull asked for more. It's almost as simple as that.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:24 [After watching the first turbi..] (3:202-3:335)  
(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [Econ\_Economics L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

After watching the first turbine provide economic benefits to the town, both HMLP and ratepayers began to ask if we could do more.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:44 [Despite the turbine supply mar..] (3:3382-3:3762)  
(Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H09: What influences choice of turbine?]

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Despite the turbine supply market, I think we would be able to do the first two projects again. With power price increases and high REC prices, I think Hull would make the same decision again to install the turbines. The economic benefits of Hull 1 are relatively small, but with the addition of Hull 2, the town now meets about 13% of its annual usage with the turbines.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:59 [This has been great for the co..] (4:1122-4:1205) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

This has been great for the community in terms of tourism and its economic benefits.

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:23 [Current status: Hull Wind One,..] (2:3247-2:3504) (Super)**

Codes: [EneR\_Reliability] [OM\_Operation & Maintenance L1] [W\_Wind Resource]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Current status: Hull Wind One, represents the high point of almost 20 years of wind energy activity at Hull's Windmill Point. In its first two years of operation (Dec. 27, 2001 - Dec. 26, 2003) it produced about 3,100 MWh, for a capacity factor of 27%

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:25 [Awards to HMLP include: Certi?..] (2:3663-2:4128) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EneCC\_Climate Change] [EneG\_Energy Policy General] [EneT\_Technology] [EnvG\_Environment General] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Awards to

HMLP include:

Certificate of Special Congressional Recognition from US Congressman Delahunt, June 2002. The Award cites benefits both to the environment and to the community.

EPA Environmental Merit Award, 2002

US Department of Energy Award 2002

Utility Leadership Award from American Wind

Energy Association, 2003

Massachusetts Municipal Association's Innovation Award, 2003

Climate Award for communities from Clean Air

- Cool Planet, 2003

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:30 [Value of energy produced In mo..] (3:1385-3:1660) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneNd\_Need] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Value of energy produced In most non-municipal cases, this is the selling price of energy. In Hull's case, the monetary value of the energy is relatively high, since it displaces

purchases of the transmitted power that the municipal light plant buys from its supplier.

**P 9: \_9H0 ACAD RERL Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:31 [Guaranteed market for the ener..] (3:1664-3:1944) (Super)**

Codes: [AO\_Ownership] [Econ\_Economics L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Guaranteed market for the energy The construction of any power plant depends on a long-term market for the power. Often this is sought in the form of a power purchase agreement (PPA). Since Hull has a municipal light plant, it is its own market, and needed no additional PPA.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:9 [Environmental symbolism: Envir..] (2:610-2:1176) (Super)**

Codes: [B\_Background-Info L1] [ComN\_Communication Nexus] [EnvG\_Environment General] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Environmental symbolism: Environmental symbolism was probably the most important factor among the early proponents of the project. These proponents surmised that Hull had an attractive wind resource, knew that Hull had a history of using wind energy, believed that wind energy could again play a significant role in the town, felt that Hull could make a statement that wind energy was an attractive and environmentally sensible option for the town, and anticipated that a turbine there could serve as an example for other towns contemplating similar projects

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:10 [Electricity cost savings: Pote..] (2:1182-2:1565) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Electricity cost savings: Potential cost savings in electricity was a second reason that was voiced. A number of residents believed that it should be possible to generate electricity from wind at lower cost than the town's municipal light plant could purchase it. If this could be shown to be the case, then that was seen to be a purely pragmatic reason to consider the project

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:11 [Stability of electricity rates..] (2:1571-2:2012) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneR\_Reliability] [EneT\_Technology]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Stability of electricity rates: Price stability in electric rates is a variant of the second reason. In this case, the concern was less with immediate cost savings, and more with insuring more stable electricity costs over the lifetime of the project. The reason was based in the observation that the majority of costs associated with wind energy generation occur at the beginning of the project, and are thus predictable and stable.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:12 [Beneficiaries of project vs. t..] (3:156-3:466) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Beneficiaries of project vs. those impacted by project: The proposed owner and operator of the project was always to be the Hull Municipal Light Plant. The beneficiaries were thus the residents of Hull. Similarly, those affected were also residents, with those closest to the turbine being the most affected

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:13 [Visual impact: The new turbine..] (3:472-3:652) (Super)**

Codes: [EnvV\_Visual]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Visual impact: The new turbine was expected to be large, and thus to be quite visible. To some extent the concern for the visual impact was less than it might otherwise have been

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:16 [Value of energy produced: The ..] (3:1230-3:1567) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Value of energy produced: The value of energy is an important consideration in every wind energy project because it has direct impact on the project's economics. In Hull, the value of was taken to be the average unit cost of energy paid by the municipal light plant to its supplier, Massachusetts Municipal Wholesale Electric Company

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:17 [Guaranteed market for the ener..] (3:1573-3:1855) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Guaranteed market for the energy: Having a guaranteed market for wind generated electricity is crucial to any project. In many cases, what is sought is power purchase agreement (PPA). Since Hull has a municipal light plant, it is its own market, and needed no additional PPA.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:32 [Public benefit. As discussed a..] (4:3202-4:3533) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Public benefit. As discussed above, the energy produced by the turbine was recognized to benefit the town directly, through reduction in purchased energy. This was made particularly concrete by the Light Plant's decision to use part of the "profit" from the wind turbine to cancel the bills to the town for the street lights.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:50 [The anticipated generation was..] (7:2623-7:2696) (Super)**

Codes: [EneNd\_Need] [EneR\_Reliability] [EneT\_Technology]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

The

anticipated generation was estimated to range between 700 to 1160 MWh

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:85 [It can be seen from the above ..]  
(13:5-13:486) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

It can be seen from the above analysis that the wind turbine should be an economic success, provided that it continues to perform as it has done so far. Over the course of the project life, the net present value of the savings to the town will be approximately \$2 million. Note also that if the effects of inflation and discount rate were ignored in the analysis, then the cost of energy would be less than \$0.04/kWh and the savings to the town would be close to \$3 million.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:88 [Another need for increased ele..]  
(13:1411-13:1557) (Super)**

Codes: [EneG\_Energy Policy General] [EneNd\_Need]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?]

Another need for increased electrical generating capacity in Hull has emerged in recent times with a proposal for a town owned desalination plant.

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## Memos and Quotes

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HU: Project WEMCZ v1 61712  
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### **MEMO: RQ\_H04: Site selection - case study community and imitators (46 Quotations) (Super, 2012-11-03 16:44:52)**

P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf:  
(2:2846-2:3592)

P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf:  
(2:995-2:1549)

P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf:  
(2:2362-2:2706), (2:2709-2:3352), (4:71-4:603), (4:1296-4:1831), (4:1930-4:2333), (5:20-5:550), (5:555-5:868), (5:871-5:998), (5:1003-5:1199), (5:1202-5:1542), (6:41-6:221), (6:224-6:389), (6:392-6:576), (6:579-6:718), (6:812-6:1199), (6:1312-6:1558), (6:2169-6:2614), (8:265-8:711), (12:706-12:810), (12:813-12:1310), (12:1316-12:1482), (12:1845-12:2454), (15:63-15:373), (19:786-19:1222)

P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:  
(3:667-3:826), (3:828-3:903), (3:906-3:1047), (3:4329-3:4997)

P 9: \_9H0 ACAD RERL Case Study Hull Wind One 2004.pdf:  
(2:225-2:472), (2:474-2:706), (2:820-2:1210), (3:708-3:1138), (3:3212-3:3645), (3:6251-3:6485)

P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf:  
(1:2606-1:3051), (4:2828-4:3196), (5:6-5:240), (7:1260-7:1660), (7:2027-7:2620), (8:1142-8:1453), (8:2636-8:2825), (8:2831-8:3414), (9:385-9:1032), (13:1030-13:1408)

No codes

No memos

Type: Analysis

What criteria most influence site selection?

- a) Do sites typically meet certain previously identified criteria?
- b) Do communities tend to choose sites expediently (i.e., choose a site that seems adequate despite the fact that there may be a better location b/c the site is available)?

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:15 [A residential-scale windmill w..] (2:2846-2:3592) (Super)**

Codes: [B\_Background-Info L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators]

A residential-scale windmill was installed at the Weir River Estuary's nature center at town expense and with support from the Light Department, to further publicize Hull's commitment to green energy. A book was webpublished in 2006 by Aly Clinton, "Our Neighbor Millie." She is proud of Hull Wind 2, which she nicknamed "Millie."

It stands some 400 yards from the home that 8-year old Aly shares with her parents and her younger brother Charlie. Charlie helped with the illustrations. She and Charlie held a book signing and lecture at Hingham Public Library, where the two received awards -- and revenue from book sales. Part of this revenue stream has been directed by the co-authors to the non-profit Weir River Watershed Association.

### **P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:25 [Since the successful implement..] (2:995-2:1549) (Super)**

Codes: [ComN\_Communication Nexus]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H05: Future]

Since the successful implementation of Hull Wind 1, several other Massachusetts towns have expressed interest in using wind power to provide energy to their communities. The town of Arlington, 26 miles northwest of Hull, is conducting site visits and a feasibility study into the possibility of converting some of the town's energy sources to wind energy. Ipswich has already done a wind analysis that has shown the town is capable of supporting turbines. The town is now planning to install a 1.5 megawatt turbine set to begin operating in 2006.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:14 [By the beginning of 2003, vari..] (2:2362-2:2706) (Super)**

Codes: [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators]

By the beginning of 2003, various options for the location for HWII were being considered. Figure 1 illustrates most of these options. One option was Windmill Point (a.k.a. Pemberton Point), close to where HWI was located. One specific possibility in the vicinity was the former Coast Guard boat house. Another option was Mariner's Park.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:15 [As part of the investigation o..] (2:2709-2:3352) (Super)**

Codes: [EnvL\_Landuse] [EnvN\_Noise] [EnvV\_Visual] [R\_Research L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

As part of the investigation of Mariner's Park as well as for use in a preliminary noise study of HWI, RERL installed a meteorological tower. This tower remained on site for approximately two months. During this time, the RERL team also created a number of photosimulations. These illustrated what a second, larger turbine might look like. Some other possible siting options for a second turbine were also introduced. These included Stony Point, the vicinity of the sewer plant and offshore. The landfill (which was eventually chosen) was also an option, but some of the others were still preferred for a variety of reasons.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:16 [By December, 2003, it appeared..] (4:71-4:603) (Super)**

Codes: [A\_Public Accountability L1] [EnvL\_Landuse] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By December, 2003, it appeared that siting the second turbine near the first one on Windmill Point would be the best option, so preparations for installing HWII there continued into 2004. An RFP for the second turbine was prepared; it was issued in March, 2004. The due date for bids was set for early April, 2004. Test borings were also made at the presumed site. The final decision for siting the second turbine, however, was still yet to be made: The HMLP board had agreed that it would be voted on in a town meeting.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:19 [Possible locations for the sma..] (4:1296-4:1831) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [EneT\_Technology] [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators]

Possible locations for the smaller turbine included Peddocks Island and the landfill.

Peddocks Island lies in Boston Harbor just to the west of Windmill Point. The island is within the borders of Hull, but it is also part of the Boston Harbor Islands National Park. The decision making process regarding whether or not to install a turbine there was not as simple as it was in other locations in Hull. Furthermore, at the time that the turbine was being considered there was no cable connecting the island to the mainland.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:20 [At this point, the best remain..] (4:1930-4:2333) (Super)**

Codes: [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators]

At this point, the best remaining option was the landfill. Early in the site selection process, the landfill was not seen to be the most promising site. There were two basic reasons for this. First of all, the landfill is located in the part of Hull farthest from the sea (although nothing in Hull is really very far from the water). Thus, it was surmised that the site would not be as windy as

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:21 [Second, insofar as majority of..] (5:20-5:550) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators]

Second, insofar as majority of the site is covered by a landfill approximately 20 m thick, it was not obvious how a wind turbine could be installed there. One idea was to relocate HWI to a section of the site just to the side of the landfill itself. This would have allowed a conventional foundation to be used, but the spot available was quite a bit lower than the surroundings, and so the original tower of HWI would have been too short. Furthermore, that location was closer than desirable to the nearest residents.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:22 [The next option was to actual..] (5:555-5:868) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators]

The next option was to actually install a turbine on top of the closed landfill. This option afforded the opportunity to get the rotor relatively high above the surroundings, while still using a tower of moderate height. This was expected to compensate to some degree for the comparatively inland location.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:23 [On the other hand, the issues ..] (5:871-5:998) (Super)**

Codes: [Econ\_Economics L1] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators]

On the other hand, the issues and costs associated with building a foundation on the landfill were not well known at the time.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:24 [After much additional discussi..] (5:1003-5:1199) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

After much additional discussion, it was decided that an attractive option was to leave HWI where it was on Windmill Point, and endeavor to install a larger wind turbine on top of the landfill.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:25 [(By this time, the bids for th..)] (5:1202-5:1542) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [P\_Fair Process L1]

Memos: [RQ\_H04: Site selection - case study community and imitators]

(By this time, the bids for the second turbine had been received, and the light board had indicated its preference for a Vestas 1.8 MW turbine on a 60 m tower). Accordingly, HMLP had soil investigations made at the landfill site. A designer of wind turbine foundations (Patrick and Henderson) was commissioned to design a foundation.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:26 [As should be apparent from the..] (6:41-6:221) (Super)**

Codes: [A\_Public Accountability L1] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

As should be apparent from the discussion in the previous section, the primary consideration in selecting a site for HWII had to do with its acceptability to the citizens of Hull.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:27 [The wind resource and the econ..] (6:224-6:389) (Super)**

Codes: [Econ\_Economics L1] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

The wind resource and the economics were also important, but more in sense of whether the site was adequate, rather than whether it was it the best possible site.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:28 [The approach that was taken wa..] (6:392-6:576) (Super)**

Codes: [Econ\_Economics L1] [EneNd\_Need] [EneR\_Reliability] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

The approach that was taken was to consider the likely range of capacity factors and the expected costs of the project and to use those to assess whether the site was "good enough".

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:29 [At the University of Massachus..] (6:579-6:718) (Super)**

Codes: [P\_Fair Process L1]

Memos: [RQ\_H04: Site selection - case study community and imitators]

At the University of Massachusetts, this process has subsequently been further developed into a method known as Streamlined Site Assessment

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:30 [The normal approach to evaluat..] (6:812-6:1199) (Super)**

Codes: [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?]

The normal approach to evaluate the wind resource at a site is to install a meteorological ("met") tower, monitor the wind resource for one year, extrapolate to estimate the wind at hub height and use long term data from a nearby long term monitoring site to adjust the estimate up or down (see, for example, Rogers et al., 2006). In the case of HWII a different approach was taken

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:32 [Second, since HWI had already ..] (6:1312-6:1558) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [OM\_Operation & Maintenance L1] [R\_Research L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Second, since HWI had already been in operation for a number of years by the time the landfill was seriously being considered, its capacity factor was known, and by extension its wind resource (even though there was no met tower close to HWI).

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:35 [On the other hand, some quanti..] (6:2169-6:2614) (Super)**

Codes: [Econ\_Economics L1] [EneR\_Reliability] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

On the other hand, some quantitative estimate of the wind resource was still desired, so that a range of possible capacity factors could be estimated, and an economic assessment could be performed. Three methods were used: 1) examination of the AWS Truwind maps (2006), 2) undertaking short term monitoring at the landfill site using a SODAR and 3) estimating the wind resource at the HWI site by reference to its known capacity factor.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:38 [One final estimate of the wind..] (8:265-8:711) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?]

One final estimate of the wind speed in Hull was obtained by taking advantage of the known capacity factor of HWI. Over the last several years, the average capacity factor has been approximately 0.27. Assuming that the wind follows a Rayleigh distribution (as does Thompson Island data), and applying the UMass Wind Engineering Minicodes (Manwell, Rogers, and McGowan, 2000), it was estimated that the mean wind speed at HWI was 6.4 m/s.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:58 [The intent to install Hull Win..] (12:706-12:810) (Super)**

Codes: [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators]

The intent to install Hull Wind II on a top of a closed landfill presented an unusual siting situation.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:59 [Landfills have been proposed p..] (12:813-12:1310) (Super)**

## Supplement\_1\_Coded\_Data\_for\_Hull

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Codes: [B\_Background-Info L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [Hlth\_Health Safety Security L1] [OM\_Operation & Maintenance L1]  
Memos: [RQ\_H04: Site selection - case study community and imitators]

Landfills have been proposed previously as sites for wind turbines, because 1) they are often relatively far from residences and 2) it is often of interest to put the land to some other use, especially after the landfill has been closed. In fact there have been turbines installed at landfills, but these have been to the side of the waste pile and not on top. To the best of our knowledge, there have been no other wind turbines installed on top of a closed landfill in the United States.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:60 [The fundamental problem with i..] (12:1316-12:1482) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse] [OM\_Operation & Maintenance L1]  
Memos: [RQ\_H04: Site selection - case study community and imitators]

The fundamental problem with installing a wind turbine on a landfill is that the waste pile itself does not provide a very good support for the turbine's foundation.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:62 [It must be noted, however, tha..] (12:1845-12:2454) (Super)**

Codes: [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [EnvW\_Water & Wetlands] [OM\_Operation & Maintenance L1]  
Memos: [RQ\_H04: Site selection - case study community and imitators]

It must be noted, however, that such a solution would not necessarily be suitable for other landfills. First of all, this method takes advantage of bedrock beneath the landfill. If there were no bedrock close to the bottom of the waste pile, another solution would be needed. Second, many newer landfills have a liner underneath them, whereas older landfills, such as Hull's, do not. If there were a liner, it might not be permissible to drive a piling through it, because to do so would introduce the possibility of leakage of liquid waste out of the landfill, and perhaps into the groundwater.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:71 [There were a number of legal a..] (15:63-15:373) (Super)**

Codes: [A\_Public Accountability L1] [DEC\_Design Engineer Construct] [EnvG\_Environment General] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H04: Site selection - case study community and imitators]

There were a number of legal and permitting issues to be addressed before the turbine could be installed. These initially included: 1) HMLP's gaining use of the site, 2) consent from Hull's Conservation Commission, 3) obtaining a Post Closure Permit from the Department of Environmental Protection (DEP).

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:79 [• Success of Hull One • Local ..] (19:786-19:1222) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1] [W\_Wind Resource]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

- Success of Hull One
- Local champions
- Municipal electric company – ideal host
- Guaranteed value of energy

- Clear public benefit
- Adequate wind resource
- Non-restrictive regulations
- Opportunities for meaningful public input
- Reputable and responsive turbine supplier
- Municipal electric utility that was an active participant in the process
- Available site
- Qualified and experienced partners

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:28 [We spent countless hours polli..] (3:667-3:826)**  
**(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [Econ\_Economics L1] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?]

We spent countless hours polling community interest in location and sharing the results of our site assessments, photo simulations, and economic analyses.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:29 [We circulated a newsletter pro..] (3:828-3:903)**  
**(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

We circulated a newsletter proposing five or six sites for public feedback

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:30 [We even offered to move Hull 1..] (3:906-3:1047)**  
**(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [DEC\_Design Engineer Construct] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H04: Site selection - case study community and imitators]

We even offered to move Hull 1 and put the new turbine in its place. The landfill, which is where Hull 2 stands, was the favored location.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:46 [One of the most important item..] (3:4329-3:4997)**  
**(Super)**

Codes: [Com\_Communication L1] [DEC\_Design Engineer Construct] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H04: Site selection - case study community and imitators]

One of the most important items to involve the community in is site selection. This discussion is currently focused on Harding's Ledge, about 2 miles off Hull's main beach. Interestingly, Harding's Ledge is currently a hazard to navigation (shallow enough to be exposed at low tide), so the Coast Guard would value the turbines there as a navigational aid. We think this location, and Hull's limited capacity distribution system, could accommodate up to four turbines. They

would each be either 3 or 3.6 MW, putting the project total in the 12- to 14.4-MW range. We are targeting a 2008 installation, and we met our targets for the first two projects.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:11 [Work on Hull Wind One began in..] (2:225-2:472) (Super)**

Codes: [A\_Public Accountability L1] [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?]

Work on Hull Wind One began in earnest in 1998, when the UMass RERL, under sponsorship from the DOER, carried out a detailed technical evaluation of possibilities for the replacement of the old wind turbine installed at the High School.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:12 [The study (Ellis, Rogers, and ..] (2:474-2:706) (Super)**

Codes: [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?] [RQ\_H09: What influences choice of turbine?]

The study (Ellis, Rogers, and Manwell, 1999) reviewed the issues related to the installation of a wind turbine at the High School site and identified the potential merits and impacts of a number of different wind turbines.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:14 [The work (which involved exten..) (2:820-2:1210) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?] [RQ\_H09: What influences choice of turbine?]

The work (which involved extensive interaction with numerous Hull community groups) consisted of the following six major parts:  
Detailed description of the proposed site  
Description of the available wind resource  
Description of candidate turbines  
Review of environmental, regulatory, and public acceptance hurdles  
A preliminary economic evaluation  
Discussion and recommendations

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:28 [Noise Noise is commonly brough..] (3:708-3:1138) (Super)**

Codes: [EnvN\_Noise] [M\_Mitigation L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?]

## Supplement\_1\_Coded\_Data\_for\_Hull

1 of 3 Supplemental Files accompanying the dissertation of Enid C. Kumin, Antioch University

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[RQ\_H04: Site selection - case study community and imitators]

Noise Noise is commonly brought up in relation to wind turbine proposal. The proximity of Hull to the Logan Airport flight paths, as well as the experience with a previous turbine near the site diminished concern with this issue. Nonetheless, detailed consideration was given to this issue in the development process. Experience with the turbine since the installation has confirmed that noise is not a significant problem.

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:35 [Permitting and zoning Permitti..] (3:3212-3:3645) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators]

Permitting and zoning Permitting and zoning are often issues in any proposed wind energy project. In Massachusetts, municipal light plants are exempt from zoning requirements, so that was not a concern in Hull. In any case, the land where the turbine was sited was owned by the town. Difficulties with other permitting issues were minimized on account of the deliberate process of involving the town in the decision making.

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:43 [Available site No project can ..] (3:6251-3:6485) (Super)**

Codes: [AO\_Ownership] [EnvL\_Landuse] [W\_Wind Resource]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Available site No project can succeed without a suitable site. Hull was fortunate in that it owned a site (Windmill Point) with good exposure to the winds, where the turbine could be sited without serious conflicts with other uses

### **P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:7 [Insofar as the town is in a hi..] (1:2606-1:3051) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators]

Insofar as the town is in a highly populated coastal area, within 8 miles of Boston (city hall) and 5 miles of the runways at Boston's Logan International Airport it might at first seem that it would be a difficult location at which to site a wind turbine. In fact, there are many factors that affect the siting of a wind turbine anywhere. Some of these tend to make siting more difficult at towns such as Hull; others make it easier.

### **P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:31 [Previous experience. As mentio..] (4:2828-4:3196) (Super)**

Codes: [B\_Background-Info L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators]

Previous experience. As mentioned above, and as will be described in more detail below, Hull had previously had a wind turbine installed very close to where the current turbine is now located. Experience with that turbine was not altogether positive, but it did help to focus attention on important issues and minimize concern

with issues that are less important

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:33 [Available site: No project can..] (5:6-5:240) (Super)**

Codes: [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators]

Available site: No project can succeed without a suitable site. Hull was fortunate in that it owned a site (Windmill Point) with good exposure to the winds, where the turbine could be sited without serious conflicts with other uses.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:47 [Encouraged by the early succes..] (7:1260-7:1660) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Encouraged by the early success of the 40 kW wind turbine, HMLP supported plans for a proposal in 1987 to install more and larger wind turbines at the Windmill Point site. As a result of this work, the proposed project was awarded a \$600,000 grant from the EOER, (now the Massachusetts Division of Energy Resources or DOER), to install 500 to 600 kW of wind turbine capacity at this site.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:49 [During the early 1990's the DO..] (7:2027-7:2620) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

During the early 1990's the DOER still held the opinion that the Hull wind site was still promising enough to support a larger wind turbine and proposed the siting of a new wind turbine. In 1992 they issued a formal proposal (Bolgen, 1992) in response to a New England Electric Power Company (NEP) Request for Power Supply Proposals from Renewable Resource Technologies. The proposed project planned to install 500-660 kW (using two wind turbines) at the Windmill Point site and was to be funded entirely by DOER through the use of DOER's Renewable Energy Alternatives Program.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:55 [This new interest and support ..] (8:1142-8:1453) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

This new interest and support led a new group of citizens to form Citizens for Alternative Renewable Energy (CARE) who then went to the HMLP, urging them to continue a wind energy siting study. Following a positive response from the utility, this group asked the Massachusetts DOER to support a new study.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:62 [Detailed Description of the Pr..] (8:2636-8:2825) (Super)**

Codes: [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H09: What influences choice of turbine?]

Detailed Description of the Proposed Site: This part of the study was straightforward and consisted of a detailed description of the Windmill Point site and the surrounding neighborhood.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:63 [Description of the Available W..] (8:2831-8:3414) (Super)**

Codes: [R\_Research L1] [W\_Wind Resource]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H09: What influences choice of turbine?]

Description of the Available Wind Resource: Under this phase of the work, wind data measurement taken for the early 40 kW wind turbine installation were used, along with data from nearby Logan airport and Thompson Island. (It should be noted that RERL had, with DOER support, been monitoring the winds at Thompson Island, approximately 3 miles away, since 1996.) This combination of data was used to generate the Weibull statistics for a typical year's wind data for the Windmill Point site. In addition, an estimate of the wind shear coefficient for this site was made.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:65 [Review of Environmental, Regul..] (9:385-9:1032) (Super)**

Codes: [A\_Public Accountability L1] [DEC\_Design Engineer Construct] [EnvG\_Environment General] [EnvN\_Noise] [EnvV\_Visual] [OM\_Operation & Maintenance L1] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H09: What influences choice of turbine?]

Review of Environmental, Regulatory, and Public Acceptance Hurdles: Under this phase of the work, a number of important issues were investigated. The more important ones included: 1) noise issues and regulations (probable noise levels at the site were estimated), 2) visual appearance (turbine color schemes and tower designs were discussed), 3) electrical network connection issues, 3) FAA issues- since the proposed site is 1500 ft below the ILS (Instrument Landing System) approach for runway 32 at Logan airport, this was a particularly important potential problem to addressed, and 4) other electromagnetic interference issues.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:87 [Mariner's Point in Hull has be..] (13:1030-13:1408) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators]

Mariner's Point in Hull has been identified as one of the best sites for a second wind turbine, and RERL has recently installed a 40 m wind data acquisition system there. In addition, HMLP is working on the permitting process for this site. If siting and permitting results from this site are favorable, bid requests for a second turbine may be out by the end of 2003.

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## Memos and Quotes

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HU: Project WEMCZ v1 61712  
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### **MEMO: RQ\_H05: Future (21 Quotations) (Super, 2013-09-07 16:26:25)**

P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf:  
(@182-@133), (2:3992-2:4257)  
P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf:  
(2:200-2:361), (2:466-2:802), (2:995-2:1549)  
P 5: \_5H0 ACAD Hull Offshore Wind RERL PwrPt 2-24-2007.pdf:  
(7:88-7:308)  
P 6: \_6H0 GOVF Hull Offshore Wind Workshop DOE 5-2011.pdf:  
(1:1203-1:1557), (1:1574-1:2643)  
P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf:  
(2:1649-2:1810)  
P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:  
(2:143-2:649), (3:1600-3:1700), (3:3769-3:4326), (3:5422-3:5621), (4:709-4:1120), (4:1207-4:1600), (4:1837-4:2029)  
P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf:  
(2:1-2:360)  
P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf:  
(14:5-14:423), (14:428-14:596), (14:652-14:1155), (15:651-15:1256)

No codes

No memos

Type: Analysis

What plans, if any, does Hull have for future WEFs as a result of its current experience? What plans, if any, do other communities have wrt wind turbines as a result of case study community's experience?

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:16 [Meantime, in the ten individua..] (2:3992-2:4257) (Super)**

Codes: [Com\_Communication L1] [EneG\_Energy Policy General] [S\_Stakeholders L1]  
Memos: [RQ\_H05: Future] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Meantime, in

the ten individual election campaigns of Commissioners (each year two terms expire), not a single campaign had omitted the wind power issue. And all 10 campaigns had included ads coming out in favor of more and more various windmills for the town.

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:17 [By early 2007, planning was un..] (@182-@133) (Super)**

No codes

Memos: [RQ\_H05: Future]

By early 2007, planning was underway to install a set of 4 turbines offshore, total rated power to be roughly 15 Megawatts -- enough to supply the town's entire need for electrical energy. A vigorous debate over how to finance this is still ongoing as of this writing (September 2007). The national magazine 'Distributed Energy' has a forthcoming article on the project and on this debate. Meantime, in

### **P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:19 [Other towns in Massachusetts ..] (2:200-2:361) (Super)**

Codes: [ComN\_Communication Nexus]

Memos: [RQ\_H05: Future]

Other towns in Massachusetts - especially those with their own municipal utility - are planning on using wind energy as a result of the success of Hull Wind 1.

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:24 [For the future, the town is pl..] (2:466-2:802) (Super)**

Codes: [A\_Public Accountability L1] [B\_Background-Info L1] [EneG\_Energy Policy General] [EneT\_Technology] [EnvG\_Environment General]  
Memos: [RQ\_H05: Future]

For the future, the town is planning on investing in 5 more wind turbines that would enable the whole town to run on 100% renewable energy. One of these turbines would be land based and would have a maximum output of 1800 kW, nearly three times that of Hull 1. Hull hopes to have this turbine up and running by the end of the summer.

**P 3: \_3H0 ONG Hull Community Wind Case Study CACP 2004.pdf - 3:25 [Since the successful implement..] (2:995-2:1549) (Super)**

Codes: [ComN\_Communication Nexus]  
Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H05: Future]

Since the successful implementation of Hull Wind 1, several other Massachusetts towns have expressed interest in using wind power to provide energy to their communities. The town of Arlington, 26 miles northwest of Hull, is conducting site visits and a feasibility study into the possibility of converting some of the town's energy sources to wind energy. Ipswich has already done a wind analysis that has shown the town is capable of supporting turbines. The town is now planning to install a 1.5 megawatt turbine set to begin operating in 2006.

**P 5: \_5H0 ACAD Hull Offshore Wind RERL PwrPt 2-24-2007.pdf - 5:7 [The alternative to the present..] (7:88-7:308) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [S\_Stakeholders L1]  
Memos: [RQ\_H05: Future]

The alternative to the present situation  
– Electricity from wind one of best options

- Supported in principle by most people
- Incentives in Massachusetts
- In practice, implementation has been slow
- Except in Hull!

**P 6: \_6H0 GOVF Hull Offshore Wind Workshop DOE 5-2011.pdf - 6:3 [The Town of Hull is interested..] (1:1203-1:1557) (Super)**

Codes: [EneT\_Technology] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H05: Future]

The Town of Hull is interested in installing an offshore wind facility. Hull, with support of the US Dept of Energy, is hosting an Offshore Wind Workshop to examine and investigate several installation options, including an R&D platform, a test wind tower with interchangeable components, a 4 turbine

wind facility or some combination of the three.

**P 6: \_6H0 GOVF Hull Offshore Wind Workshop DOE 5-2011.pdf - 6:4 [The Town of Hull is organizing..] (1:1574-1:2643) (Super)**

Codes: [A\_Public Accountability L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]  
Memos: [RQ\_H05: Future]

The Town of Hull is organizing an Offshore Wind Workshop and is engaging with industry, government and academia to assist in determining the outcome of an ideal facility. The goal of the workshop is to present each of the scenarios and combine community and government leaders with industry experts to present the town with various scenarios based on economic, installation, and technical feasibility.

Manufacturers, installers, local, state and government agencies (such as the U.S. Army Corps of Engineers, the Bureau of Ocean Energy Management, Regulation and Enforcement, the National Renewable Energy Laboratory (NREL), and the U.S. Department of Energy) will participate in a oneday workshop that will include conference panels on the latest technology, construction, permitting and finance.

Regional colleges and universities are encouraged to participate in the event through research and analysis of the three scenarios based on a given set of parameters and present their findings through interactive breakout sessions during the workshop

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:6 [Brown is disappointed that not..] (2:1649-2:1810) (Super)**

Codes: [EneT\_Technology]  
Memos: [RQ\_H05: Future] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Brown is disappointed that not many Massachusetts towns have followed Hull's lead. He believes that people are naturally disinclined to accept new technologies.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:45 [What are Hull's plans for furt..] (3:3769-3:4326) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneNd\_Need] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

What are Hull's plans for further wind development?

For the past 3 years, the town has discussed the potential for up to four offshore turbines. The proposed offshore project will produce up to 100% of Hull's needs. We hope this will help us continue to maintain stable rates. The Town of Hull hasn't had a rate increase since 1996. At the moment, we are spending a lot of time on community outreach — the same process used for Hull 1 and Hull 2 — and providing information to ratepayers and political bodies to get feedback and build support

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:48 [How do you expect the developm..] (3:5422-3:5621) (Super)**

Codes: [ComN\_Communication Nexus] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [P\_Fair Process L1]  
Memos: [RQ\_H05: Future]

How do you expect the development challenges of an offshore

project to differ from your land-based experience?  
The offshore project will be more difficult, and it will definitely be more costly.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:58 [Many communities in New Englan..] (4:709-4:1120) (Super)**

Codes: [ComN\_Communication Nexus] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

Many communities in New England are exploring wind development. How can community leaders learn from your experience?  
Representatives from just about every Massachusetts community have visited the Hull 1 turbine. Now, more and more out-of-state communities are coming to look. We give them a good "show and tell" of the area, and people in town are always willing to talk about their wind turbines.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:60 [We offer an example to follow,..] (4:1207-4:1600) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [ComN\_Communication Nexus] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?] [RQ\_H09: What influences choice of turbine?]

We offer  
an example to follow, and we suggest that other communities contact RERL for assistance, as we did. Also, if you do move forward with a project, get a service agreement from the vendor, so whether or not you operate a municipal light plant, you don't have to worry about keeping it running. Everything is covered and it keeps the blades spinning, which makes everyone happy

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:62 [Inspired by Hull's efforts, hi..] (4:1837-4:2029) (Super)**

Codes: [A\_Public Accountability L1] [ComN\_Communication Nexus] [DEC\_Design Engineer Construct]  
Memos: [RQ\_H05: Future]

Inspired by Hull's efforts, his office is working with communities from Provincetown to Quincy to help them gain the benefits of our experience and collaborate to find creative solutions.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:64 [The shoreline town of Hull, Ma..] (2:143-2:649) (Super)**

No codes  
Memos: [RQ\_H05: Future]

The shoreline town of Hull, Massachusetts, pioneered the modern community wind movement in New England with the installations of Hull 1, a 660-kW Vestas V-47 (in 2001) and Hull 2, a 1.8-MW Vestas V-80 (in 2006). Hull 2 is the largest wind turbine in New England and the first U.S. installation

on a capped landfill. Now, communities throughout the region seek to replicate Hull's success. Not satisfied with only two wind turbines, the town looks to parlay its leadership into offshore wind.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:65 [We will follow this same proce..] (3:1600-3:1700) (Super)**

No codes

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future] [RQ\_H07: What sci info is available?]

We will follow this same process for our offshore project; honest information leads to credibility.

**P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf - 10:4 [Town Manager Philip Lemnios sa..] (2:1-2:360) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

Town Manager Philip Lemnios said one key reason is that Hull's 6,100 electric customers get their power from the town-owned Hull Municipal Light Plant, which means that the windmills will be producing electricity they are paying for directly in their homes and businesses. Also, Hull residents have lived with the Pemberton Point turbine for eight years.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:89 [If such a plant were to be bui..] (14:5-14:423) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneNd\_Need] [EneT\_Technology]

Memos: [RQ\_H05: Future]

If such a plant were to be built, one of the major economic considerations would be the availability and cost of the electricity required. Power consumption is estimated at 5 kWh/cubic meter for the reverse osmosis system being considered. Because of the success of Hull No. 1, HMLP is considering options for supply the desalination plant with electricity from another utility scale wind turbine installation.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:90 [One option being considered is..] (14:428-14:596) (Super)**

Codes: [DEC\_Design Engineer Construct] [EneAlt\_Alternatives] [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H05: Future]

One option being considered is a small offshore wind farm in Hull harbor. A proposed layout for a 9 turbine (GE 3.6 MW) system in the Hull Harbor is shown in Figure 7

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:91 [The annual generation of a sin..] (14:652-14:1155) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneNd\_Need] [EneT\_Technology] [R\_Research L1] [W\_Wind Resource]

Memos: [RQ\_H05: Future]

The annual generation of a single 3.6 MW offshore turbine would roughly equal the requirements of the desalination plant, as shown in Figure 7. The output from 5 turbines would provide the majority of the town's electricity. Nine turbines would provide more electricity than the town uses, so much of it would be exported to other utilities. It should

also be noted that the size of the first offshore plant at Hull might be limited to 5 machines because of potential grid connection limitations.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:93 [Because of the success of Hull..] (15:651-15:1256) (Super)**

Codes: [ComN\_Communication Nexus] [DEC\_Design Engineer Construct] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future]

Because of the success of Hull No. 1, investigations are now underway which may result in the installation of at least on more turbine of equal size or larger, and a small offshore wind farm is being considered as well. Following the model used in siting Hull No. 1, the investigation of the offshore options are emphasizing the following points: The project should be (1) suitable scale, (2) attractive, (3) achievable, (4) well-planned, (5) compatible with other activities in Massachusetts Bay, and (6) able to serve as a model for other communities (in Massachusetts and world-wide).

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## Memos and Quotes

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HU: Project WEMCZ v1 61712  
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### **MEMO: RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other? (56 Quotations) (Super, 2013-09-07 17:00:40)**

P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf:  
(1:1696-1:2054), (1:2058-1:2307), (1:3137-1:3934), (2:1448-2:1954), (2:1958-2:2207), (2:2335-2:2842), (2:3992-2:4257)  
P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf:  
(1:2615-1:2927), (2:502-2:628), (4:71-4:603), (4:607-4:1006), (6:41-6:221), (15:379-15:857), (15:1382-15:1572), (19:83-19:782), (19:786-19:1222)  
P 6: \_6H0 GOVF Hull Offshore Wind Workshop DOE 5-2011.pdf:  
(1:302-1:975)  
P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf:  
(1:407-1:762), (2:599-2:1111), (2:1649-2:1810), (2:1825-2:2141)  
P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:  
(2:1130-2:1581), (2:1584-2:1687), (2:1863-2:2026), (2:3594-2:3632), (2:3634-2:3784), (2:3786-2:4023), (3:575-3:664), (3:828-3:903), (3:1502-3:1596), (4:2031-4:2178)  
P 9: \_9H0 ACAD RERL Case Study Hull Wind One 2004.pdf:  
(2:820-2:1210), (2:1538-2:1803), (3:2794-3:3208), (3:4292-3:4710), (3:5276-3:5538), (3:6490-3:6880)  
P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf:  
(2:1382-2:1774)  
P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf:  
(3:2783-3:3198), (4:4-4:101), (4:1101-4:1217), (4:1632-4:1995), (4:2564-4:2823), (5:245-5:622), (8:350-8:493), (8:529-8:829), (8:834-8:1139), (8:1142-8:1453), (8:1456-8:1623), (8:1626-8:1830), (9:1828-9:2153), (9:2156-9:2425), (9:2428-9:2675), (11:359-11:974), (13:533-13:1026), (15:1669-15:2180)

No codes

No memos

Type: Analysis

How are stakeholders involved throughout siting and initial development of WEFs?  
Do outside advisors help or complicate WEF project development and implementation?  
Proponents acting in ways that help or hinder the project?

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:4 [By fall of 1997 a group of cit..] (1:1696-1:2054) (Super)**

Codes: [B\_Background-Info L1] [P\_Fair Process L1]  
Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By fall of 1997 a group of citizens led by Malcolm Brown and a group of teachers at the High School led by Anne Marcks, held meetings to plan what is now called "re-powering" the site. This planning was incorporated into the curriculum of Mrs. Marcks's senior physics class, and had good support from both the school and from Hull Municipal Light Plant.

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:5 [In late 1998 a new group of ci..] (1:2058-1:2307) (Super)**

Codes: [B\_Background-Info L1] [P\_Fair Process L1]  
Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

In late 1998 a new group of citizens eager to see the project go forward formed themselves into C.A.R.E. (Citizen Advocates for Renewable Energy), selected officers Malcolm Brown and Andrew Stern, and petitioned Hull Light to take the project on.

**P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:8 [By the year 2000, newspaper re..] (1:3137-1:3934) (Super)**

Codes: [B\_Background-Info L1] [Com\_Communication L1] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By the year 2000, newspaper reports had appeared, including in the Boston Globe. The Light department also notified townspeople of a town-wide public meeting scheduled for June 16 2000. Mr. MacLeod, along with members of the Light Board, experts from Mass. Municipal Wholesale Electric Company (MMWEC), the RERL at UMass, the town manager, the town historian, and citizen advocate Malcolm Brown made the presentation. This same panel of town representatives fielded questions from the public. The meeting's response was on the whole strongly positive, one citizen objecting strongly, however. It was announced that the light department would go ahead and put out a Request for Proposals. The preferred site was to be some 75 yards from the site of the previous High School windmill.

**P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:12 [Commissioning date was Decembe..] (2:1448-2:1954) (Super)**

Codes: [B\_Background-Info L1] [Econ\_Economics L1] [EneG\_Energy Policy General] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Commissioning date was December 27, 2001. In its first year, the total generated energy -- all delivered to the municipally owned grid, -- was 1,597,367 KWh. The Light Department's sales of this energy (in addition to 'zeroing out' the town's street lighting bill) were in excess of \$150,000, net of the incentive payments for "renewable energy certificates". Public support was high, and a survey by the light department returned 95% favorable reactions, the commonest question being "why not more?"

**P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:13 [By 2003 planning was underway ..] (2:1958-2:2207) (Super)**

Codes: [B\_Background-Info L1] [EneG\_Energy Policy General] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By 2003 planning was underway for "Hull Wind 2" (citizen advocate Brown had been elected to a 3-year term on the Light Board). By 2005 this same advocate had been re-elected. As he said "my platform had just one plank -- more wind power in Hull."

**P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:14 [By May of 2006, Hull Wind 2 wa..] (2:2335-2:2842) (Super)**

Codes: [B\_Background-Info L1] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneR\_Reliability] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By May of 2006, Hull Wind 2 was commissioned (a Vestas V80, rated at 1.8 Megawatts). In its first year it produced 4,088,000 KWh, and townsfolk showed considerable pride in the results. Six state and national awards had meantime accumulated. One commissioner joked "we have run out of wall-space in our the Light Plant's offices to hang our award plaques -- some will have to be moved to Town Hall." This pair of turbines was now supplying over 10% of the town's entire consumption of electric energy.

**P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:16 [Meantime, in the ten individua..] (2:3992-2:4257) (Super)**

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Codes: [Com\_Communication L1] [EneG\_Energy Policy General] [S\_Stakeholders L1]

Memos: [RQ\_H05: Future] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Meantime, in

the ten individual election campaigns of Commissioners (each year two terms expire), not a single campaign had omitted the wind power issue. And all 10 campaigns had included ads coming out in favor of more and more various windmills for the town.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:2 [Two elements have allowed this..] (1:2615-1:2927) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Two elements have allowed this

success: a municipally-owned power company whose financial situation made the wind power projects economically feasible; and a citizenry willing to participate actively over a number of years to ensure that the project happened in a way that kept all constituencies satisfied

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:4 [In response, a group of citize..] (2:502-2:628) (Super)**

Codes: [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

In response, a group of

citizens encouraged the Hull Municipal Light Plant (HMLP) to replace that machine with a newer one.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:16 [By December, 2003, it appeared..] (4:71-4:603) (Super)**

Codes: [A\_Public Accountability L1] [EnvL\_Landuse] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

By December, 2003, it appeared that siting the second turbine near the first one on Windmill Point would be the best option, so preparations for installing HWII there continued into 2004. An RFP for the second turbine was prepared; it was issued in March, 2004. The due date for bids was set for early April, 2004. Test borings were also made at the presumed site. The final decision for siting the second turbine, however, was still yet to be made: The HMLP board had agreed that it would be voted on in a town meeting.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:17 [In spite of the general suppor..] (4:607-4:1006) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

In spite of the general support in Hull for a second turbine, there was still some hesitancy among those who lived closest to HWI about having HWII right next to it. This hesitancy eventually led to a special light board meeting at the end of April, 2004. At that meeting there was sufficient concern expressed by residents that the light board in effect withdrew their support of the project

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:26 [As should be apparent from the..] (6:41-6:221) (Super)**

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Codes: [A\_Public Accountability L1] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

As should be apparent from the discussion in the previous section, the primary consideration in selecting a site for HWII had to do with its acceptability to the citizens of Hull.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:72 [In addition, during the proces..] (15:379-15:857) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [DEC\_Design Engineer Construct] [EnvB\_Migratory Birds] [EnvG\_Environment General] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

In addition, during the process, some residents from the adjoining town of Hingham objected to the possibility of wind turbine being installed in their vicinity. They requested that the Massachusetts Environmental Policy Act (MEPA) Office require a "fail-safe" review of the project. Furthermore, a local conservation group, the Weir River Park Estuary Committee requested that attention be given to the possible effect of the proposed wind turbine on migratory birds.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:74 [In addition, arrangements were..] (15:1382-15:1572) (Super)**

Codes: [A\_Public Accountability L1] [EnvB\_Migratory Birds] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

In addition, arrangements were made with Weir River Park Estuary Committee to undertake a study of the effect of the wind turbine on birds and to facilitate other programs of the Committee.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:78 [The conclusions and lessons le..] (19:83-19:782) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneR\_Reliability] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The conclusions and lessons learned on the Hull Wind II are summarized below. Of high importance, the first large wind turbine, HW I, was successful and popular. It led directly to the second wind turbine. A municipal electric company such as HMLP is an ideal host for a wind turbine project of this type. They are familiar with electricity and since they are owned by the town that they serve, the residents feel that the turbine is "theirs" as well. Because the value of the electricity is high and guaranteed (and considerably higher than it would be if the electricity were sold into a wholesale market), the unusually high cost of the foundation could be borne by the project.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:79 [• Success of Hull One • Local ..] (19:786-19:1222) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

- Success of Hull One
- Local champions
- Municipal electric company – ideal host
- Guaranteed value of energy
- Clear public benefit
- Adequate wind resource
- Non-restrictive regulations
- Opportunities for meaningful public input
- Reputable and responsive turbine supplier
- Municipal electric utility that was an active participant in the process
- Available site
- Qualified and experienced partners

**P 6: \_6H0 GOVF Hull Offshore Wind Workshop DOE 5-2011.pdf - 6:1 [Hull -- a seaside community of..] (1:302-1:975) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Hull -- a seaside community of 11,000 residents, is located on a peninsula jutting into outer Boston harbor -- has a history of wind power, dating back to the 1800s. Between 1984-1996, Hull had a 40kW Enertech wind turbine installed at "Windmill Point," adjacent to Hull High School. After the decommissioning the Enertech machine, interested citizens formed a group to work with the town manager and the Hull Light Board to re-power the site, with assistance of the Massachusetts Department of Energy Resources and the University of Massachusetts-Amherst Renewable Energy Research Laboratory (RERL). In December 2001, a Vestas V47 660kW machine was installed

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:1 [Malcolm Brown is a retired cla..] (1:407-1:762) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Malcolm Brown is a retired classics professor who, as a member of the Municipal Light Board, was instrumental in bringing the first wind turbine to US eastern seaboard: in Hull, Massachusetts. The 0.66MW Vestas turbine was installed in December of 2001, and Brown regularly updates the total number of kWh produced since then on the Hull Wind website

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:4 [Brown is keen to point out tha..] (2:599-2:1111) (Super)**

Codes: [AO\_Ownership] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneR\_Reliability]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Brown is keen to point out that the turbine has paid for itself by now and that it will continue to produce electricity for the town of Hull at a very low cost, thus reducing the bill of the town's ratepayers for a long time to come. On top of that, a number of subsidies means that Hull has done extremely well out of this deal. There are additional advantages, for example in the reduction of volatility of electricity prices, since Hull is a little more independent of the highly volatile oil prices.

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:6 [Brown is disappointed that not..] (2:1649-2:1810) (Super)**

Codes: [EneT\_Technology]

Memos: [RQ\_H05: Future] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Brown is disappointed that not many Massachusetts towns have followed Hull's lead. He believes that people are naturally disinclined to accept new technologies.

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:7 [in 2001 it was argued that the..] (2:1825-2:2141) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

in

2001 it was argued that the wind turbine would damage tourism, an argument well known from the opponents of the Cape Wind offshore wind farm. But in fact, Hull's first wind turbine, located at the very tip of Hull overlooking Boston Bay, has actually attracted more people, as local retailers will confirm.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:14 [Q. What was your role in the d..] (2:1130-2:1581) (Super)**

Codes: [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Q. What was your role in the development, construction, and operation of the two Hull wind turbines?

As operations manager for HMLP, I was the project manager for each of our first two wind turbine installations. I oversaw the pre-development studies, ran the bidding process, and worked with the turbine vendor and construction contractors. In my current consulting role, I track the operations and maintenance of both Hull 1 and Hull 2.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:15 [Q. How did Hull 1 come about? ..] (2:1584-2:1687) (Super)**

Codes: [A\_Public Accountability L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Q. How did Hull 1 come about?

The process that led to both turbines really centered on the community.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:17 [The demise of this small turbi..] (2:1863-2:2026) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [Com\_Communication L1] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

The demise of this small turbine in a storm was the impetus for a group of residents to approach HMLP and ask for a new wind power facility. That led to Hull 1.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:19 [sharing information with the c..] (2:3594-2:3632)  
(Super)**

Codes: [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

sharing information with the community.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:20 [We brought Jim Manwell of the ..] (2:3634-2:3784)  
(Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [P\_Fair Process L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

We brought Jim  
Manwell of the UMASS Renewable Energy Research Laboratory  
(RERL) on board; it is important to have credible, independent  
analysis.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:21 [We did site assessments, photo..] (2:3786-2:4023)  
(Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [Econ\_Economics L1] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

We did site assessments, photo simulations, economic  
analyses, and surveys of residents' reactions, and we presented all  
of them to the community. Everyone got on board. We took the  
proposed project to a town meeting, and it passed.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:27 [Again, we worked with Jim Manw..] (3:575-3:664)  
(Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [DEC\_Design Engineer Construct] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Again, we worked with Jim Manwell and  
RERL and focused on keeping the community informed

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:29 [We circulated a newsletter pro..] (3:828-3:903)  
(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

We circulated a newsletter proposing  
five or six sites for public feedback

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:35 [They have practical experience..] (3:1502-3:1596)  
(Super)**

Codes: [EnvB\_Migratory Birds] [EnvN\_Noise] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

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Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

They have practical experience with the noise and avian impacts, and it makes them want more.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:63 [My most important recommendati..] (4:2031-4:2178) (Super)**

Codes: [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

My most important recommendation is for each town project to make sure it has a dedicated champion, committed to maintaining forward momentum. I

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:14 [The work (which involved exten..] (2:820-2:1210) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?] [RQ\_H09: What influences choice of turbine?]

The work (which involved extensive interaction with numerous Hull community groups) consisted of the following six major parts:  
Detailed description of the proposed site  
Description of the available wind resource  
Description of candidate turbines  
Review of environmental, regulatory, and public acceptance hurdles  
A preliminary economic evaluation  
Discussion and recommendations

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:16 [The meeting included presentat..] (2:1538-2:1803) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

The meeting included presentations by the town manager, the town historian, and representatives from the Hull Light Board, Massachusetts Municipal Wholesale Electric Company (MMWEC), RERL, and the local group Citizens For Alternative Renewable Energy (CARE).

### **P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:34 [Con?dence in proponents Townsf..] (3:2794-3:3208) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

Confidence in proponents Townsfolk may understandably be skeptical about advice from any source, whether from local

proponents, developers, salesmen, or officials from out of town. The process Hull used was conducive to building up trust, by being slow, deliberate, and securing the assistance of entities that were familiar with the technology and the issues, but did not stand to profit from the outcome.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:38 [Local champions Undertaking pr..] (3:4292-3:4710) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Local champions Undertaking projects of the type described in this paper can be a long, slow process. Experience has shown that having a few local people ("champions") who can push the project along can greatly facilitate the process. Hull was fortunate to have dedicated champions, including a determined resident, the Operations Manager of the Light Plant, and various local and state public officials.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:40 [Public involvement Public invo..] (3:5276-3:5538) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Public involvement Public involvement is one of the keys to addressing concerns of the residents. The decision making process involved the public at every step. This process was facilitated by the participation of the municipal light plant in the project.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:44 [Technical support Innovative p..] (3:6490-3:6880) (Super)**

Codes: [A\_Public Accountability L1] [EneT\_Technology]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Technical support Innovative projects such as the one in Hull often require significant technical support in order to be brought to successful fruition. Hull was fortunate in that it could take advantage of the Commonwealth's Division of Energy Resources long-standing partnership with the University of Massachusetts Renewable Energy Research Laboratory to assist in this project

**P10: \_10H0 BOS Wind Farm Draws Few Foes in Hull 01-2008.pdf - 10:10 ["We just want to get together ..] (2:1382-2:1774) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [ComN\_Communication Nexus] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [EnvW\_Water & Wetlands] [M\_Mitigation L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

"We just want to get together and talk" with Hull officials about living with the project, Adler said. It would occupy about 12,000 square feet of ocean floor during construction, less than a third of an acre, and 907 square feet permanently for the foundations of the turbines. Lemnios said the question of Hull paying lobstermen to defuse opposition has not been raised or discussed.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:20 [Confidence in proponents: Town..] (3:2783-3:3198) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Confidence in proponents: Townsfolk may understandably be skeptical about advice from any source, whether from local proponents, developers, salesmen, or officials from out of town. The process Hull used was conducive to building up trust, by being slow, deliberate, and securing the assistance of entities that were familiar with the technology and the issues, but did not stand to profit from the outcome

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:22 [were minimized on account of t..] (4:4-4:101) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

were minimized on account of the deliberate process of involving the town in the decision making.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:25 [Municipal utilities are operat..] (4:1101-4:1217) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Municipal

utilities are operated under the management of a Light Board, which is elected by residents of the town.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:28 [Local champions. Undertaking p..] (4:1632-4:1995) (Super)**

Codes: [AO\_Ownership] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Local champions. Undertaking projects of the type described in this paper can be a long, slow process. Experience has shown that having a few local people ("champions") who can push the project along can greatly facilitate the process. Hull was fortunate to have two champions, one a determined resident, the other the Operations Manager of the Light Plant

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:30 [Public involvement. Public inv..] (4:2564-4:2823) (Super)**

Codes: [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support?]

Process? Time? Other?]

Public involvement. Public involvement is one of the keys to addressing concerns of the residents. The decision making process involved the public at every step. This process was facilitated by the participation of the municipal light plant in the project.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:34 [Technical support: Innovative ..] (5:245-5:622) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Technical support: Innovative projects such as the one in Hull often require significant technical support to be brought to successful fruition. Hull was fortunate in that it could take advantage of the Commonwealth's Division of Energy Resources long standing partnership with the University of Massachusetts Renewable Energy Research Laboratory to assist in this projec

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:52 [Despite the work of the DOER a..] (8:350-8:493) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Despite the work of the DOER and its consultants and the approval of the HMLP Plant Board, the proposal was defeated in a 1993 town meeting.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:53 [opponents of the proposal refe..] (8:529-8:829) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [EneT\_Technology] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

opponents of the proposal referred to the promoters from DOER and its consultants as the "skinny guys in suits." Thus, a combination of bad timing, the worsening performance of the 40 kW machine, and the lack of local "wind energy champions" contributed to this wind system's proposal failure.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:54 [The picture improved during th..] (8:834-8:1139) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [EneT\_Technology] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

The picture improved during the fall of 1997, however, when a group of citizens and High School teachers held meetings to plan the "repowering" of the High School site. This planning was incorporated into the senior physics class at the high school and had support from both the high school and HMLP.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:55 [This new interest and support ..] (8:1142-8:1453) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EnvL\_Landuse] [P\_Fair

Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

This new interest and support led a new group of citizens to form Citizens for Alternative Renewable Energy (CARE) who then went to the HMLP, urging them to continue a wind energy siting study. Following a positive response from the utility, this group asked the Massachusetts DOER to support a new study.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:56 [This time DOER enlisted the he..] (8:1456-8:1623) (Super)**

Codes: [A\_Public Accountability L1] [R\_Research L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H09: What influences choice of turbine?]

This time DOER enlisted the help of the University of Massachusetts' Renewable Energy Research Laboratory (RERL) to perform a wind turbine replacement options study.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:57 [The RERL had been working with..] (8:1626-8:1830) (Super)**

Codes: [A\_Public Accountability L1] [DEC\_Design Engineer Construct] [EneAlt\_Alternatives] [EneG\_Energy Policy General]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

The RERL had been working with DOER for a number of years as part of the Commonwealth's Strategic Envirotechnology Partnership (STEP), and providing assistance to Hull make sense under this arrangement.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:69 [Following the positive results..] (9:1828-9:2153) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H09: What influences choice of turbine?]

Following the positive results and recommendations of the previous study, and after a number of news reports on the subject (Boston Globe, the Patriot Ledger, the Tiny Town Gazette, and the Hull Times), HMLP ran an information campaign to notify the town's citizens of a public meeting on June 16, 2000 at the High School.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:70 [Representatives from the Hull ..] (9:2156-9:2425) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

Representatives from the Hull Light Board, Massachusetts Municipal Wholesale Electric Company (MMWEC), RERL, and CARE; the town manager; and the town historian, led the presentation. This group fielded questions from the public and responded to fellow panelists.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:71 [Following the strongly positiv..] (9:2428-9:2675) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H09: What influences choice of turbine?]

Following the strongly positive results of this meeting, it was announced that HMLP would solicit a Request for Proposals (RFP) for a wind turbine. At the same time, announced its intention to apply for the various permits that would be require

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:79 [The CARE group has established..] (11:359-11:974) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [ComN\_Communication Nexus] [EneAlt\_Alternatives] [EneG\_Energy Policy General]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

The CARE group has established a website for the wind turbine (CARE, 2003) and, as of day 400 since commissioning, there have been over 6,000 hits to the homepage. In addition, a number of technical meetings that have been held at the High School site. For example, a tour of the wind turbine and a project history presentation were major parts of a recent technical conference (RERL, "Wind energy in New England Islands and Coastal Communities", 2002). Many groups of visitors have made special trips to the site and media coverage of the installation, and its successes and awards, have been extensive.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:86 [In August 2002 a survey was co..] (13:533-13:1026) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [ComN\_Communication Nexus] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

In August 2002 a survey was commissioned by HMLP regarding the new 660 kW wind turbine and the possibility of additional wind turbines in Hull . Of the 499 responses, 475 approved the idea of more wind turbines. Eleven did not approve of more turbines, even though some of these were not opposed to Hull No. 1. Thirteen were noncommittal, but did have questions or comments on the project. Accordingly, HMLP is now considering the options for installing additional turbines

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:94 [The importance of the municipa..] (15:1669-15:2180) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [ComN\_Communication Nexus] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?]

The importance of the municipal electric utility in the case of Hull cannot be overstated. Many tasks that could be daunting for other communities are readily solvable when a municipal electric utility is one of the participants. How communities that are not served by a municipal electric utility can carry out such projects is a question that still remains to be resolved. Whatever the model that emerges is, it is likely that it will embody many of the attributes that have proved crucial in Hull.

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## Memos and Quotes

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HU: Project WEMCZ v1 61712  
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Edited by: Super  
Date/Time: 2014-01-08 16:18:15

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### **MEMO: RQ\_H07: What sci info is available? (24 Quotations) (Super, 2013-09-07 17:17:37)**

P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf:  
(1:2311-1:2609), (1:2613-1:3134)  
P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf:  
(2:873-2:1061), (6:812-6:1199), (6:2169-6:2614), (6:2618-6:3462), (7:62-7:1218), (8:265-8:711), (9:1-9:207),  
(9:212-9:809), (13:322-13:1314), (15:379-15:857), (15:861-15:1378), (15:1382-15:1572)  
P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:  
(2:3634-2:3784), (2:3786-2:4023), (3:667-3:826), (3:828-3:903), (3:1600-3:1700), (3:5000-3:5416)  
P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf:  
(2:225-2:472), (2:474-2:706), (3:2269-3:2789), (3:2794-3:3208)

No codes

No memos

Type: Analysis

What scientific information is available?

Is it comprehensive?

Is it reliable?

(i) What is the source of the info?

(ii) Is the methodology appropriate to info sought/gathered?

How is it disseminated?

Are all stakeholders' expectations based on complete and accurate info?

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:6 [The plan was to work in collab..] (1:2311-1:2609) (Super)**

Codes: [P\_Fair Process L1]

Memos: [RQ\_H07: What sci info is available?]

The plan was to work in collaboration with UMass Amherst's Renewable Energy Research Laboratory, and its director, Professor James Manwell. Prof. Manwell, along with his colleagues consults regularly for the Mass. Department of Energy Resources on wind power and other renewable energy sources

### **P 2: \_2H0 ONG History Hull Wind CARE 9-2007.pdf - 2:7 [By fall of 1999 Manwell's team..] (1:2613-1:3134) (Super)**

Codes: [B\_Background-Info L1] [P\_Fair Process L1]

Memos: [RQ\_H07: What sci info is available?]

By fall of 1999 Manwell's team completed an, which included wind-resource assessments, discussions of regulatory issues, noise-level tabulations, and projected economic viability of various hardware options. Special care went into this engineering report, because of its potential to serve as a "template" for other coastal communities in Massachusetts. Various factors were given a 'sensitivity' analysis. This revealed which factors, if not predicted accurately, would have a crucial impact on the entire project.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:7 [This project involved a partne..] (2:873-2:1061) (Super)**

Codes: [A\_Public Accountability L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H07: What sci info is available?]

This project involved a partnership of HMLP, the Renewable Energy Research Laboratory (RERL) at the University of Massachusetts and the Massachusetts Division of Energy Resources (DOER).

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:30 [The normal approach to evaluat..] (6:812-6:1199) (Super)**

Codes: [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?]

The normal approach to evaluate the wind resource at a site is to install a meteorological ("met") tower, monitor the wind resource for one year, extrapolate to estimate the wind at hub height and use long term data from a nearby long term monitoring site to adjust the estimate up or down (see, for example, Rogers et al., 2006). In the case of HWII a different approach was taken

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:35 [On the other hand, some quanti..] (6:2169-6:2614) (Super)**

Codes: [Econ\_Economics L1] [EneR\_Reliability] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

On the other hand, some quantitative estimate of the wind resource was still desired, so that a range of possible capacity factors could be estimated, and an economic assessment could be performed. Three methods were used: 1) examination of the AWS Truwind maps (2006), 2) undertaking short term monitoring at the landfill site using a SODAR and 3) estimating the wind resource at the HWI site by reference to its known capacity factor.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:36 [The AWS Truwind map for Hull ..] (6:2618-6:3462) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [EnvL\_Landuse] [R\_Research L1]

Memos: [RQ\_H07: What sci info is available?]

The AWS Truwind map for Hull at a height of 70 m is shown in Figure 5. As can be seen, the map estimates that the site of HWI is close to the edge of the dark green and light purple zones, where dark green corresponds to 6.5-7.0 m/s and the light purple corresponds to 7.0-7.5 m/s. The landfill site is in the dark green zone. It is important to note that the hub height of HWI is 50 m, so the wind at hub height could be lower than the AWS Truwind values. In addition, it is not clear if the AWS Truwind map can distinguish the landfill, which is 20 m above the surroundings, so it is not apparent whether 70 m refers to height above the actual ground, or height above the surroundings. In any case, assuming the accuracy of the maps, it may be surmised that the average wind speed at hub height should be at least 6.0 m/s.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:37 [In an attempt to confirm the A..] (7:62-7:1218) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [EnvL\_Landuse] [R\_Research L1]

Memos: [RQ\_H07: What sci info is available?]

In an attempt to confirm the AWS Truwind estimates, a SODAR was placed on top of the landfill and used to gather data from October 17 to November 17, 2005; see Walls, Rogers, and Manwell (2005). Figure 6 shows the SODAR in operation. Data was gathered for a range of heights from 5 m (using a conventional anemometer on a short mast) to 160 m. The data from the 60 m level was compared with simultaneous data from a met tower operated by RERL on Thompson Island, also in Boston Harbor, but approximately 14 km away. Long term wind data

is also available from the Thompson Island met tower; that data was used to estimate the long term wind speed from the short term comparisons. Based on the available data, it was concluded that the long term average wind speed at 60 m above the landfill should be approximately 7.0 m/s. This value is within the bounds of the AWS Truewind estimate, although at the high end. A shear profile was also prepared, illustrating the measured wind speeds at various heights. This shear profile is shown in Figure 7. It is noteworthy that the wind speed drops significantly at heights below 60 m.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:38 [One final estimate of the wind..] (8:265-8:711) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?]

One final estimate of the wind speed in Hull was obtained by taking advantage of the known capacity factor of HWI. Over the last several years, the average capacity factor has been approximately 0.27. Assuming that the wind follows a Rayleigh distribution (as does Thompson Island data), and applying the UMass Wind Engineering Minicodes (Manwell, Rogers, and McGowan, 2000), it was estimated that the mean wind speed at HWI was 6.4 m/s.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:39 [Taking all available informati..] (9:1-9:207) (Super)**

Codes: [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H07: What sci info is available?]

Taking all available information into account, it was therefore concluded that the wind speed at hub height of HWII should be in the range of 6.0-7.0 m/s and could be modeled with a Rayleigh distribution

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:40 [With the wind speed estimates ..] (9:212-9:809) (Super)**

Codes: [EneR\_Reliability] [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H07: What sci info is available?]

With the wind speed estimates from the previous analysis, a range of capacity factors was derived. This was also done using the UMass Wind Engineering Minicodes referred to above. The wind speed range was extended down to 5.5 m/s to include the lowest values believed to be possible. Under these assumptions, the calculated capacity values ranged from a low of 0.2 to a high of 0.34. It should be noted that the actual capacity factor could be lower than these estimates due to: 1) a turbine availability of less than 100% and 2) relatively high wind shear below 60 m (see Figure 7).

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:64 [A geotechnical investigation a..] (13:322-13:1314) (Super)**

Codes: [EneT\_Technology] [EnvL\_Landuse] [EnvS\_Soil] [R\_Research L1]

Memos: [RQ\_H07: What sci info is available?]

A geotechnical investigation at the landfill was carried out in the fall of 2004. The purpose was to determine the characteristics of the landfill and the bedrock underneath it in sufficient detail that a foundation could be designed. The geotechnical investigation was carried out by SEA Consultants, Inc. (Dubanowitz and Wright, 2004). A test boring was made down to a depth of 16.2 m (73 ft) below the surface. The study revealed that for a depth of approximately 18.3 m (60 ft) below the surface, the land fill consisted of mixed solid waste material. This waste "consisted of dark brown/gray partially-decomposed waste (garbage/refuse) mixed with varying

## Supplement\_1\_Coded\_Data\_for\_Hull

1 of 3 Supplemental Files accompanying the dissertation of Enid C. Kumin, Antioch University

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quantities of coarse to fine widely-graded sand with trace amounts of silt and fine gravel. The waste contained paper, metal, plastic, wood, glass and other miscellaneous debris that is characteristic of municipal solid waste. Unknown obstructions were encountered intermittently throughout the waste layer."

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:72 [In addition, during the proces..] (15:379-15:857) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [DEC\_Design Engineer Construct] [EnvB\_Migratory Birds] [EnvG\_Environment General] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

In addition, during the process, some residents from the adjoining town of Hingham objected to the possibility of wind turbine being installed in their vicinity. They requested that the Massachusetts Environmental Policy Act (MEPA) Office require a "fail-safe" review of the project. Furthermore, a local conservation group, the Weir River Park Estuary Committee requested that attention be given to the possible effect of the proposed wind turbine on migratory birds.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:73 [Most of the legal and permitti..] (15:861-15:1378) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [EnvB\_Migratory Birds] [EnvG\_Environment General] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H07: What sci info is available?]

Most of the legal and permitting activities proceeded fairly smoothly. The Conservation Commission provided a letter of approval in December, 2004. Ownership of the landfill site was transferred from the town of Hull itself to HMLP in January, 2005. By March, MEPA had concluded that no fail safe study was needed. The final version of the Post Closure Permit, taking into account a number of details on the foundation, was completed in June, 2005. The final approval from DEP was obtained in September.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:74 [In addition, arrangements were..] (15:1382-15:1572) (Super)**

Codes: [A\_Public Accountability L1] [EnvB\_Migratory Birds] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

In addition, arrangements were made with Weir River Park Estuary Committee to undertake a study of the effect of the wind turbine on birds and to facilitate other programs of the Committee.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:20 [We brought Jim Manwell of the ..] (2:3634-2:3784) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [P\_Fair Process L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

We brought Jim Manwell of the UMASS Renewable Energy Research Laboratory (RERL) on board; it is important to have credible, independent analysis.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:21 [We did site assessments, photo..] (2:3786-2:4023)**

**(Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [Econ\_Economics L1] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

We did site assessments, photo simulations, economic analyses, and surveys of residents' reactions, and we presented all of them to the community. Everyone got on board. We took the proposed project to a town meeting, and it passed.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:28 [We spent countless hours polli..] (3:667-3:826)**

**(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [Econ\_Economics L1] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?]

We spent countless hours polling community interest in location and sharing the results of our site assessments, photo simulations, and economic analyses.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:29 [We circulated a newsletter pro..] (3:828-3:903)**

**(Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

We circulated a newsletter proposing five or six sites for public feedback

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:47 [Making this project happen wil..] (3:5000-3:5416)**

**(Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [ComN\_Communication Nexus] [DEC\_Design Engineer Construct] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H07: What sci info is available?]

Making this project happen will take a lot of effort from many sources. It will also provide many valuable learning opportunities. Quite a few state agencies are interested in working with us on the permitting process in order to be involved in this first-of-itskind initiative. What this project will do most of all, however, is give people something to look at so they can arrive at their own conclusions.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:65 [We will follow this same proce..] (3:1600-3:1700)**

**(Super)**

No codes

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future] [RQ\_H07: What sci info is available?]

We will follow this same process for our offshore project; honest information leads to credibility.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:11 [Work on Hull Wind One began in..] (2:225-2:472) (Super)**

Codes: [A\_Public Accountability L1] [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?]

Work on Hull Wind One began in earnest in 1998, when the UMass RERL, under sponsorship from the DOER, carried out a detailed technical evaluation of possibilities for the replacement of the old wind turbine installed at the High School.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:12 [The study (Ellis, Rogers, and ..] (2:474-2:706) (Super)**

Codes: [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?] [RQ\_H09: What influences choice of turbine?]

The study (Ellis, Rogers, and Manwell, 1999) reviewed the issues related to the installation of a wind turbine at the High School site and identified the potential merits and impacts of a number of different wind turbines.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:33 [Skepticism in technology Skept..] (3:2269-3:2789) (Super)**

Codes: [B\_Background-Info L1] [EneT\_Technology] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H07: What sci info is available?]

Skepticism in technology Skepticism in new technology is common and not without foundation. Hull had some experience with modern wind energy technology, so it was not completely new to them. The previous turbine did not function as well as hoped. Nonetheless, it did function to some degree, and it may be that the experience with that turbine, together with an understanding of how the wind turbines had changed over the last twenty years, prevented residents from expressing much concern over the technology

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:34 [Confidence in proponents Townsf..] (3:2794-3:3208) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H07: What sci info is available?]

Confidence in proponents Townsfolk may understandably be skeptical about advice from any source, whether from local proponents, developers, salesmen, or officials from out of town. The process Hull used was conducive to building up trust, by being slow, deliberate, and securing the assistance of entities that were familiar with the technology and the issues, but did not stand to profit from the outcome.



## Memos and Quotes

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HU: Project WEMCZ v1 61712  
File: [C:\Documents and Settings\eckumin\Desktop\WEMCZ Project\Project WEMCZ v1 61712.hpr7]  
Edited by: Super  
Date/Time: 2014-01-22 12:29:42

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### **MEMO: RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility? (36 Quotations) (Super, 2013-09-25 10:59:16)**

P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf:  
(6:1786-6:2163), (6:2169-6:2614), (9:841-9:941), (9:1395-9:1686), (9:1690-9:2000), (10:1-10:691), (@594-@340), (10:866-10:1605), (10:1494-10:1606), (11:444-11:948), (11:951-11:1040), (12:150-12:664), (19:83-19:782)  
P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf:  
(2:599-2:1111), (2:1114-2:1646)  
P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:  
(2:3960-2:4067), (3:2945-3:3063), (3:5714-3:5832), (3:5904-3:6733), (4:1207-4:1600)  
P 9: \_9H0 ACAD RERL Case Study Hull Wind One 2004.pdf:  
(2:820-2:1210), (2:2661-2:2867), (3:1664-3:1944), (4:2622-4:3096), (4:3202-4:3549)  
P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf:  
(6:12-6:161), (7:1260-7:1660), (7:1663-7:2024), (7:2027-7:2620), (10:8-10:223), (11:1021-11:1954), (11:1957-11:2179), (11:2184-11:2431), (@634-@109), (12:5-12:221), (13:5-13:486)

No codes

No memos

Type: Analysis

- a) Does funder have control over some elements of the process?
- b) Is there more or less pre-installation testing depending on funding source?
- c) Is methodology used to estimate necessary funding appropriate?
- d) Does funding influence options for response to concerns/making modifications after operation of the WEF begins?
- e) Does funding play a role in tensions around these concerns/modifications?

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:34 [Fourth, the question to be add..] (6:1786-6:2163) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Fourth, the question to be addressed was whether the project should proceed or not. HMLP was planning to purchase the turbine with its own funds, and would not need to supply data to a financial institution in order to secure a loan. Consequently, if there was good reason to think it should proceed, then there was nothing to be gained by monitoring the site for a year.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:35 [On the other hand, some quanti..] (6:2169-6:2614) (Super)**

Codes: [Econ\_Economics L1] [EneR\_Reliability] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

On the other hand, some quantitative estimate of the wind resource was still desired, so that a range of possible capacity factors could be estimated, and an economic assessment could be performed. Three methods were used: 1) examination of the AWS Truwind maps (2006), 2) undertaking short term monitoring at the landfill site using a SODAR and 3) estimating the wind resource at the HWI site by reference to its known capacity factor.

### **P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:41 [An economic evaluation was per..] (9:841-**

**9:941) (Super)**

Codes: [Econ\_Economics L1] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

An economic evaluation was performed next, with a particular attention to the worst plausible case.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:46 [n addition to the initial capi..] (9:1395-9:1686) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

n addition to the initial capital cost of purchasing and installing the wind turbine, there were known annual recurring costs. These are summarized in Table 2.

Item Recurring Cost

Maintenance Contract \$25,000

Insurance \$16,000

Total \$31,000

Table 2 Recurring Costs for Hull Wind II

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:47 [Three types of economic analys..] (9:1690-9:2000) (Super)**

Codes: [A\_Public Accountability L1] [P\_Fair Process L1] [R\_Research L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Three types of economic analysis were performed. These included 1) a simple payback analysis, 2) a cost of energy analysis, and 3) a net "profit" analysis. The methods used are described in Manwell, McGowan, and Rogers (2003) and implemented in the UMass Wind Engineering Minicodes described previously.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:48 [The simple payback period is f..] (10:1-10:691) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The simple payback period is found from the total installed cost divided by the net annual value of the energy produced. This was based on the estimated capacity factor, the value of the electricity, and the recurring annual costs. The value of the electricity itself to Hull is \$0.10/kWh, since that is what they would pay for the electricity that they would otherwise buy. A range of payback periods for mean wind speeds ranging from 5.5 to 7.0 m/s is shown in Figure 8. As can be seen they vary from 6 to 11 yrs, depending on the wind speed. Based on the wind resource assessment, it is apparent that the payback period should be less than 9 years and probably shorter.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:49 [The cost of energy (COE) analy..] (10:866-10:1605) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The cost of energy (COE) analysis is more detailed than the simple payback analysis. It takes into account various economic parameters, such as a possible loan for the wind turbine, inflation, and discount rate. Plausible values for each of these parameters were chosen for a "base case" analysis. These are illustrated in Table 3. The COE analysis does not directly consider

Massachusetts renewable energy credits (REC's) or federal renewable energy production incentives (REPI), but these may be used in comparing the relative cost of the energy to the value of the energy. They are also included in Table 3. The results of the COE are illustrated in Figure 9 for the same range of wind speeds as for the simple payback

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:51 [The third part of the economic..] (11:444-11:948) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

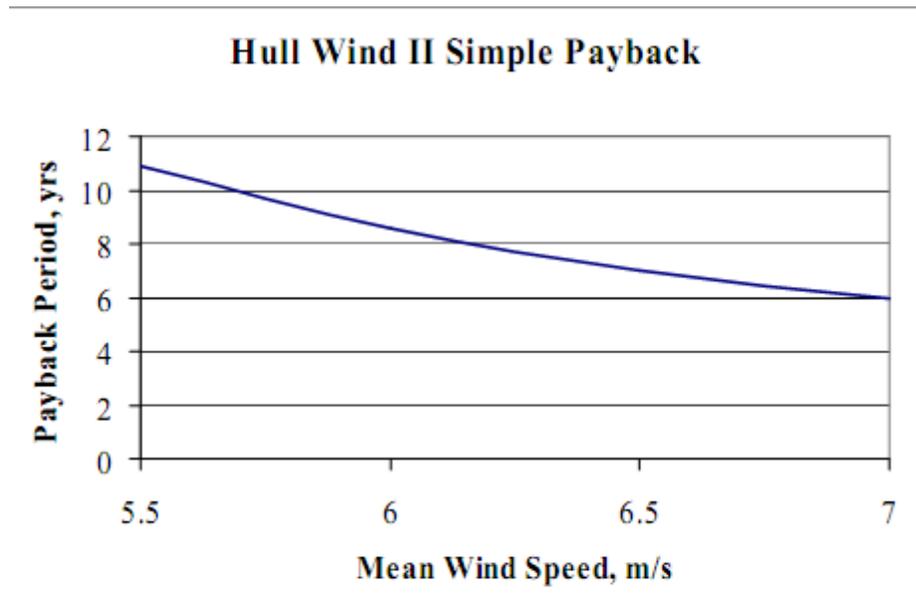
Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The third part of the economic analysis considered the net "profit" to the Town of Hull from owning and operating the wind turbine. Quotes are used around profit, because as a public entity HMLP does not really make a profit. The "profit" represents the present value of the surplus of the total value of the electricity produced in excess of the cost of owning and operating the turbine, over the lifetime of the project. The "profit" takes into account the REC's and the REPI mentioned above.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:53 [Hull Wind II Simple Payback 0 ..] (@594-@340) (Super)**

Codes: [Econ\_Economics L1] [W\_Wind Resource]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]



**Figure 8 Simple Payback Period for Hull Wind II**

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:54 [The results of the COE are ill..] (10:1494-10:1606) (Super)**

Codes: [Econ\_Economics L1] [W\_Wind Resource]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The results of the COE are illustrated in

Figure 9 for the same range of wind speeds as for the simple payback.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:56 [The "profit" from Hull II for ..] (11:951-11:1040) (Super)**

Codes: [Econ\_Economics L1] [W\_Wind Resource]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The "profit" from Hull II for the same range of wind speeds is illustrated in Figure 10.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:57 [As can be seen, even in the wo..] (12:150-12:664) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

As can be seen, even in the worst case considered, the cost of energy from the wind turbine would be less than the value of the electricity, even if REC's and REPI were not taken into account. Furthermore over the life of the project, HMLP would reap a substantial "profit". The latter should be at least greater than \$2 million and quite possibly in excess of \$6 million. The overall conclusion is that even under the most conservative assumptions, Hull Wind II should be an economically viable project.

**P 4: \_4H0 ACAD Hull II Case Study RERL 6-2006.pdf - 4:78 [The conclusions and lessons le..] (19:83-19:782) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneR\_Reliability] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The conclusions and lessons learned on the Hull Wind II are summarized below. Of high importance, the first large wind turbine, HW I, was successful and popular. It led directly to the second wind turbine. A municipal electric company such as HMLP is an ideal host for a wind turbine project of this type. They are familiar with electricity and since they are owned by the town that they serve, the residents feel that the turbine is "theirs" as well. Because the value of the electricity is high and guaranteed (and considerably higher than it would be if the electricity were sold into a wholesale market), the unusually high cost of the foundation could be borne by the project.

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:4 [Brown is keen to point out tha..] (2:599-2:1111) (Super)**

Codes: [AO\_Ownership] [Econ\_Economics L1] [EneG\_Energy Policy General] [EneR\_Reliability]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Brown is keen to point out that the turbine has paid for itself by now and that it will continue to produce electricity for the town of Hull at a very low cost, thus reducing the bill of the town's ratepayers for a long time to come. On top of that, a number of subsidies means that Hull has done extremely well out of this deal. There are additional advantages, for example in the reduction of volatility of electricity prices, since Hull is a little more

independent of the highly volatile oil prices.

**P 7: \_7H0 BOS Hull Wind Power Experiment 9-2011.pdf - 7:5 [For 5 years, Hull has had a se..] (2:1114-2:1646) (Super)**

Codes: [B\_Background-Info L1] [Econ\_Economics L1] [EneT\_Technology]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

For 5 years, Hull has had a second Vestas turbine almost 3 times as big: 1.8MW. The back of the envelope calculation for this turbine is \$3.2m installation cost plus annual maintenance and insurance cost of \$60K. And in its just over 5 years of operation it has delivered some 20 million kWhs, amounting to some \$1.6m. Disregarding subsidies it will have paid for itself in another 5 years or so. Together, the two turbines produce some 11% of Hull's consumption, and so their reduction of the rate in Hull is considerable.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:22 [We took the proposed project t..] (2:3960-2:4067) (Super)**

Codes: [A\_Public Accountability L1] [Com\_Communication L1] [Econ\_Economics L1] [OM\_Operation & Maintenance L1] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

We took the proposed project to a town meeting, and it passed. After that, we put the project out to bid

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:42 [After Hull 1, the town had a f..] (3:2945-3:3063) (Super)**

Codes: [Com\_Communication L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

After Hull 1, the town had a favorable track record, which made turbine vendors more interested in working with us.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:50 [Still, as a small community, H..] (3:5714-3:5832) (Super)**

Codes: [AO\_Ownership] [ComN\_Communication Nexus] [Econ\_Economics L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Still, as a small community, Hull is not able to fund this project with cash, as it did for the other two turbines.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:52 [As the first to do an offshore..] (3:5904-3:6733) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [ComN\_Communication Nexus] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

As the first to do an offshore installation, we are optimistic that financial assistance will be available. For example,

we are currently working with the Massachusetts Technology Collaborative to fund the pre-development activities. In addition, we have applied for federal CREBs (Clean Renewable Energy Bonds). If awarded, this would give the project 16-year, zerointerest financing. Private sources of funding, including venture capitalists, have also approached us with interest in financing the project. We'll consider all of our alternatives, but we need to make sure the economics make sense for the town. If our predevelopment studies and economic analysis suggest the project is not worth doing, we won't present it to the town. Fortunately, we haven't identified any fatal flaws or siting barriers. T

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:60 [We offer an example to follow,..] (4:1207-4:1600) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [ComN\_Communication Nexus] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?] [RQ\_H09: What influences choice of turbine?]

We offer an example to follow, and we suggest that other communities contact RERL for assistance, as we did. Also, if you do move forward with a project, get a service agreement from the vendor, so whether or not you operate a municipal light plant, you don't have to worry about keeping it running. Everything is covered and it keeps the blades spinning, which makes everyone happy

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:14 [The work (which involved exten..] (2:820-2:1210) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?] [RQ\_H09: What influences choice of turbine?]

The work (which involved extensive interaction with numerous Hull community groups) consisted of the following six major parts:  
Detailed description of the proposed site  
Description of the available wind resource  
Description of candidate turbines  
Review of environmental, regulatory, and public acceptance hurdles  
A preliminary economic evaluation  
Discussion and recommendations

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:20 [Note that this ?gure did not i..] (2:2661-2:2867) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Note that this figure did not include work done directly by HMLP, valued at \$54,000. The total installed cost was approximately \$753,000 (not including development services supplied by DOER and

RERL).

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:31 [Guaranteed market for the ener..] (3:1664-3:1944) (Super)**

Codes: [AO\_Ownership] [Econ\_Economics L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Guaranteed market for the energy The construction of any power plant depends on a long-term market for the power.

Often this is sought in the form of a power purchase agreement (PPA). Since Hull has a municipal light plant, it is its own market, and needed no additional PPA.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:46 [Annual energy production: 1,59..] (4:2622-4:3096) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Annual energy production: 1,590,000 kWh

Revenue

Value of energy purchases avoided\*: \$0.08/kWh

Value of REC's\*\*: \$0.03/kWh

Value of REPI: \$0.018/kWh

Total Current Value of Energy : \$0.128/kWh

Costs

Capital cost, incl. installation\*\*\*: \$753,000

Operations, Maintenance & Insurance: ~\$30,000/yr

Economic indicators

Cost of producing energy: ~6 ¢ /kWh

Simple payback: 4-5 years

Net present value of savings: \$2-3 million,  
depending on inflation rates.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:47 [\* This value is quite high bec..] (4:3202-4:3549) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

\* This value is quite high because Hull has a municipal electric company, which means that the value of the power produced is the avoided cost.

A similar project by a town without a municipal power company and without a large electric load would sell the power onto the grid, and the value of the power would be a good deal lower.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:38 [The cost of the turbine and it..] (6:12-6:161) (Super)**

Codes: [Econ\_Economics L1] [EneG\_Energy Policy General]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H08: Is funding/funding source a factor in the

success of efforts to site and operate a wind turbine facility?]

The cost of the turbine and its installation was \$78,000 with funds provided by the Massachusetts Executive Office of Energy Resources (EOER).

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:47 [Encouraged by the early succes..] (7:1260-7:1660) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H01: Did Hull hv experience w/ WEFs pre Hull I? Hull II?] [RQ\_H04: Site selection - case study community and imitators] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Encouraged by the early success of the 40 kW wind turbine, HMLP supported plans for a proposal in 1987 to install more and larger wind turbines at the Windmill Point site. As a result of this work, the proposed project was awarded a \$600,000 grant from the EOER, (now the Massachusetts Division of Energy Resources or DOER), to install 500 to 600 kW of wind turbine capacity at this site.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:48 [Due to the requirements that 3..] (7:1663-7:2024) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Due to the requirements that 30% of the grant be repaid to the state, it was important to justify the economics of the wind turbine to the town. Calculations made at the time, however, showed that the economic value was not sufficient to justify the project. The idea of a utility scale wind energy system for Hull was abandoned for the time being.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:49 [During the early 1990's the DO..] (7:2027-7:2620) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [B\_Background-Info L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [EnvL\_Landuse] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

During the early 1990's the DOER still held the opinion that the Hull wind site was still promising enough to support a larger wind turbine and proposed the siting of a new wind turbine. In 1992 they issued a formal proposal (Bolgen, 1992) in response to a New England Electric Power Company (NEP) Request for Power Supply Proposals from Renewable Resource Technologies. The proposed project planned to install 500-660 kW (using two wind turbines) at the Windmill Point site and was to be funded entirely by DOER through the use of DOER's Renewable Energy Alternatives Program.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:73 [\$54,000. This work included pu..] (10:8-10:223) (Super)**

Codes: [Econ\_Economics L1]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

\$54,000. This work included purchase and installation of the transformer, providing a buried cable, and connection with the HMLP distribution system. The total installed cost was thus approximately \$753,000.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:80 [As previously indicated, the i..] (11:1021-11:1954) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General]  
Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

As previously indicated, the installed cost of the new wind turbine was \$753,000. Using the measured production of the turbine it is possible to evaluate its economic value. The evaluation takes into account the value of the Renewable Energy Credits (REC), which have been developed in conjunction with the Massachusetts Renewable Portfolio Standard (RPS), and the federal Renewable Energy Production Incentive (REPI). The assumptions in the analysis are listed below. The values shown correspond to the known costs, as of the first year. The discount rate is estimated, in accordance with a typical rate of interest that HMLP might pay on a revenue bond, if one were needed. The inflation rate is also estimated. It may be noted that Hull purchased the wind turbine outright, and no loan was involved. It is also assumed in the following that the REC's and REPI will apply over the lifetime of the project.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:81 [The analysis below treats the ..] (11:1957-11:2179) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General]  
Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The analysis below treats the incentives (REC's and REPI) as effectively resulting in an increase in the value of the electricity produced. See <http://www.state.ma.us/doer/rps/> for more details on the Massachusetts RPS

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:82 [Capital cost, CC = \$753,000 Do..] (11:2184-11:2431) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General]  
Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Capital cost, CC = \$753,000  
Down payment as fraction of capital cost = 1  
Interest rate on loan, i = (not applicable)  
Annual energy production, E = 1,594,000 kWh  
Value of energy purchases avoided, VA = \$0.08/kWh  
Value of REC's, VREC = \$0.03/kWh

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:83 [Value of REPI, VREPI = \$0.018/..] (12:5-12:221) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General]  
Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

Value of REPI, VREPI = \$0.018/kWh  
Maintenance contract, CM = \$9,880/year  
Insurance cost, CINS = \$9,000  
General inflation rate = 3%  
Discount rate, d = 5%  
Project life, L = 20 yrs  
Loan period, N = (not applicable)

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:85 [It can be seen from the above ..]**

**(13:5-13:486) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

It can be seen from the above analysis that the wind turbine should be an economic success, provided that it continues to perform as it has done so far. Over the course of the project life, the net present value of the savings to the town will be approximately \$2 million. Note also that if the effects of inflation and discount rate were ignored in the analysis, then the cost of energy would be less than \$0.04/kWh and the savings to the town would be close to \$3 million.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:95 [The total unit value of the en..] (@634-@109) (Super)**

Codes: [Econ\_Economics L1] [EneAlt\_Alternatives] [EneG\_Energy Policy General]

Memos: [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?]

The total unit value of the energy produced,  $V_T$  is given by

$$V_T = V_A + V_{REC} + V_{REPI} = \$0.128 / kWh$$

The total operation and maintenance cost is

$$C_{O\&M} = C_M + C_{INS} = \$18,880 / yr$$

The simple payback period for the investment is:

$$\begin{aligned} P &= \frac{\text{Capitalcost}}{\text{Net revenues}} \\ &= \frac{C_C}{(E)(V_T) - C_{O\&M}} = \frac{\$753,000}{(1,594,000 \text{ kWh} / \text{yr})(\$0.128 / \text{kWh yr}) - \$18,880 / \text{yr}} \\ &= 4.1 \text{ yr} \end{aligned}$$

The levelized cost of energy produced by the turbine may be found with the above assumptions as follows (see Manwell, McGowan and Rogers (2001) for more details):

$$COE = \frac{\left[ P_d + P_a Y\left(\frac{1}{1+r}, N\right) + C_{O\&M} Y\left(\frac{1+i}{1+r}, L\right) \right]}{E Y\left(\frac{1}{1+r}, L\right)}$$

where

$P_d$  = Down payment = \$753,000

$P_a$  = Amount borrowed, = \$0

The variable  $Y(k, \ell)$  is a function used to obtain the present value of a series of payments. It is determined from:

$$Y(k, \ell) = \sum_{j=1}^{\ell} k^j = \begin{cases} \frac{k - k^{\ell+1}}{1 - k}, & \text{if } k \neq 1 \\ \ell, & \text{if } k = 1 \end{cases}$$

Accordingly, the cost of energy is:

$$\begin{aligned} COE &= \frac{\$753,000 + (\$18,800) Y\left(\frac{1+0.03}{1+0.05}, 20\right)}{(1,594,000 \text{ kWh}) Y\left(\frac{1}{1+0.05}, 20\right)} \\ &= \frac{\$753,000 + (\$18,800)(16.44)}{(1,594,000 \text{ kWh})(12.46)} = \$0.053 / kWh \end{aligned}$$


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## Memos and Quotes

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HU: Project WEMCZ v1 61712  
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Edited by: Super  
Date/Time: 2014-01-08 16:20:08

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### **MEMO: RQ\_H09: What influences choice of turbine? (23 Quotations) (Super, 2013-09-28 13:25:29)**

P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf:

(3:1049-3:1164), (3:2517-3:2811), (3:2814-3:2943), (3:3382-3:3762), (4:1207-4:1600)

P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf:

(2:474-2:706), (2:820-2:1210), (2:1888-2:2175), (2:2323-2:2604)

P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf:

(8:1456-8:1623), (8:1942-8:2162), (8:2165-8:2389), (8:2636-8:2825), (8:2831-8:3414), (9:7-9:379), (9:385-9:1032), (9:1038-9:1317), (9:1323-9:1482), (9:1487-9:1788), (9:1828-9:2153), (9:2428-9:2675), (9:2680-9:3140), (10:225-10:335)

No codes

No memos

Type: Analysis

Which factors predominate in turbine choice?

- i) Availability?
- ii) Price?
- iii) Suitability for location?
- iv) Other?

Is turbine designed or modified for site?

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:31 [After passing a town meeting v..] (3:1049-3:1164) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [P\_Fair Process L1]

Memos: [RQ\_H09: What influences choice of turbine?]

After passing a town meeting vote, the HMLP commissioners solicited bids for foundation design and construction.

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:40 [Global supply has not kept up ..] (3:2517-3:2811) (Super)**

Codes: [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H09: What influences choice of turbine?]

Global supply has not kept up with demand for wind turbines in the past 2 years. How did you procure the Hull 1 and Hull 2 machines, and do you think you could do it again today given changes in the turbine market?

Reproducing our turbine purchases in today's market would be difficult

### **P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:41 [We procured the first two mach..] (3:2814-3:2943) (Super)**

Codes: [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneT\_Technology] [P\_Fair Process L1]

Memos: [RQ\_H09: What influences choice of turbine?]

We procured the first two machines through a competitive bidding process. We were fortunate that Vestas offered

compelling bids.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:44 [Despite the turbine supply mar..] (3:3382-3:3762) (Super)**

Codes: [A\_Public Accountability L1] [Econ\_Economics L1] [EneAlt\_Alternatives] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]

Memos: [RQ\_H03: What advan/disadvan to Hull from Hull I /Hull II construct?] [RQ\_H09: What influences choice of turbine?]

Despite the turbine supply market, I think we would be able to do the first two projects again. With power price increases and high REC prices, I think Hull would make the same decision again to install the turbines. The economic benefits of Hull 1 are relatively small, but with the addition of Hull 2, the town now meets about 13% of its annual usage with the turbines.

**P 8: \_8H0 IND NEWF Newsltr 12-2006.pdf - 8:60 [We offer an example to follow,..] (4:1207-4:1600) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [ComN\_Communication Nexus] [OM\_Operation & Maintenance L1] [S\_Stakeholders L1]

Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H05: Future] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?] [RQ\_H09: What influences choice of turbine?]

We offer an example to follow, and we suggest that other communities contact RERL for assistance, as we did. Also, if you do move forward with a project, get a service agreement from the vendor, so whether or not you operate a municipal light plant, you don't have to worry about keeping it running. Everything is covered and it keeps the blades spinning, which makes everyone happy

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:12 [The study (Ellis, Rogers, and ..] (2:474-2:706) (Super)**

Codes: [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H07: What sci info is available?] [RQ\_H09: What influences choice of turbine?]

The study (Ellis, Rogers, and Manwell, 1999) reviewed the issues related to the installation of a wind turbine at the High School site and identified the potential merits and impacts of a number of different wind turbines.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:14 [The work (which involved exten..] (2:820-2:1210) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneT\_Technology] [EnvG\_Environment General] [EnvL\_Landuse] [P\_Fair Process L1] [R\_Research L1] [S\_Stakeholders L1] [W\_Wind Resource]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H08: Is funding/funding source a factor in the success of efforts to site and operate a wind turbine facility?] [RQ\_H09: What influences choice of turbine?]

The work (which involved extensive interaction with numerous Hull community groups)

consisted of the following six major parts:  
Detailed description of the proposed site  
Description of the available wind resource  
Description of candidate turbines  
Review of environmental, regulatory, and public acceptance hurdles  
A preliminary economic evaluation  
Discussion and recommendations

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:17 [Following the strongly positiv..] (2:1888-2:2175) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [EneT\_Technology] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H09: What influences choice of turbine?]

Following the strongly positive results of this meeting, it was announced that HMLP would solicit a Request for Proposals (RFP) for the supply and installation of a wind turbine. At the same time, HMLP announced its intention to apply for the various permits that would be required.

**P 9: \_9H0 ACAD RERL\_Case\_Study\_Hull\_Wind\_One 2004.pdf - 9:19 [In April the town accepted Ves..] (2:2323-2:2604) (Super)**

Codes: [A\_Public Accountability L1] [DEC\_Design Engineer Construct] [Econ\_Economics L1] [EneT\_Technology] [P\_Fair Process L1]  
Memos: [RQ\_H09: What influences choice of turbine?]

In April the town accepted Vestas' bid which included their popular V47 turbine. The "turnkey" contract price was \$698,699, including a standard set of spare parts. This contract included purchase and installation of the transformer, providing a buried cable, and connection

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:56 [This time DOER enlisted the he..] (8:1456-8:1623) (Super)**

Codes: [A\_Public Accountability L1] [R\_Research L1]  
Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H09: What influences choice of turbine?]

This time DOER enlisted the help of the University of Massachusetts' Renewable Energy Research Laboratory (RERL) to perform a wind turbine replacement options study.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:58 [In 1998, the UMass RERL, under..] (8:1942-8:2162) (Super)**

Codes: [EneAlt\_Alternatives] [EneG\_Energy Policy General] [EneT\_Technology] [R\_Research L1]  
Memos: [RQ\_H09: What influences choice of turbine?]

In 1998, the UMass RERL, under sponsorship from the Massachusetts DOER, carried out a detailed technical study for the evaluation of possibilities for the replacement of the wind turbine installed at the High School.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:59 [The work (Ellis, Rogers, and M..)]**

**(8:2165-8:2389) (Super)**

Codes: [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H09: What influences choice of turbine?]

The work (Ellis, Rogers, and Manwell, 1999) reviewed the issues related to the installation of a wind turbine at the High School site and identified the potential merits and impacts of a number of different wind turbines.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:62 [Detailed Description of the Pr..] (8:2636-8:2825) (Super)**

Codes: [EnvL\_Landuse]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H09: What influences choice of turbine?]

Detailed Description of the Proposed Site: This part of the study was straightforward and consisted of a detailed description of the Windmill Point site and the surrounding neighborhood.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:63 [Description of the Available W..] (8:2831-8:3414) (Super)**

Codes: [R\_Research L1] [W\_Wind Resource]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H09: What influences choice of turbine?]

Description of the Available Wind Resource: Under this phase of the work, wind data measurement taken for the early 40 kW wind turbine installation were used, along with data from nearby Logan airport and Thompson Island. (It should be noted that RERL had, with DOER support, been monitoring the winds at Thompson Island, approximately 3 miles away, since 1996.) This combination of data was used to generate the Weibull statistics for a typical year's wind data for the Windmill Point site. In addition, an estimate of the wind shear coefficient for this site was made.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:64 [Description of Candidate Turbi..] (9:7-9:379) (Super)**

Codes: [DEC\_Design Engineer Construct] [EneR\_Reliability] [EneT\_Technology] [R\_Research L1]

Memos: [RQ\_H09: What influences choice of turbine?]

Description of Candidate Turbines: A review of potential commercial available turbines ranging in size from 80 to 600 kW was carried out under this task. The candidate turbines were chosen based on screening criteria that included: use of proven design concepts, operational reliability, maintenance training, safety, and established business presence in the U.S.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:65 [Review of Environmental, Regul..] (9:385-9:1032) (Super)**

Codes: [A\_Public Accountability L1] [DEC\_Design Engineer Construct] [EnvG\_Environment General] [EnvN\_Noise] [EnvV\_Visual] [OM\_Operation & Maintenance L1] [R\_Research L1]

Memos: [RQ\_H04: Site selection - case study community and imitators] [RQ\_H09: What influences choice of turbine?]

Review of Environmental, Regulatory, and Public Acceptance Hurdles: Under this phase of the work, a number of important issues were investigated. The more important ones included: 1) noise issues and regulations (probable noise levels at the site were estimated), 2) visual appearance (turbine color schemes and tower designs were discussed), 3) electrical network connection issues, 3) FAA issues- since the proposed site is 1500 ft below the ILS (Instrument Landing System) approach for runway 32 at Logan airport, this was a particularly important potential problem to addressed, and 4) other electromagnetic

interference issues.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:66 [A Preliminary Economic Evaluat..] (9:1038-9:1317) (Super)**

Codes: [Econ\_Economics L1] [EneT\_Technology] [OM\_Operation & Maintenance L1] [W\_Wind Resource]  
Memos: [RQ\_H09: What influences choice of turbine?]

A Preliminary Economic Evaluation: This work started with an electrical power production estimate for each of the candidate wind turbines based on the previous work for the available wind resource. Next, a lifecycle cost analysis was made for each of the candidate turbines

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:67 [Discussion and Recommendations..] (9:1323-9:1482) (Super)**

Codes: [P\_Fair Process L1]  
Memos: [RQ\_H09: What influences choice of turbine?]

Discussion and Recommendations Section: This section included a summary of the previous results and overall ranking recommendations for the candidate turbines

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:68 [It should be noted that much d..] (9:1487-9:1788) (Super)**

Codes: [ComN\_Communication Nexus]  
Memos: [RQ\_H02: Any big picture lessons b/c of Hull I? Hull II?] [RQ\_H09: What influences choice of turbine?]

It should be noted that much detail went into this detailed engineering study because of its potential to guide future projects in Massachusetts, especially the coastal communities. Thus, care was taken to make it function as a template for other towns or agencies who might plan similar projects

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:69 [Following the positive results..] (9:1828-9:2153) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H09: What influences choice of turbine?]

Following the positive results and recommendations of the previous study, and after a number of news reports on the subject (Boston Globe, the Patriot Ledger, the Tiny Town Gazette, and the Hull Times), HMLP ran an information campaign to notify the town's citizens of a public meeting on June 16, 2000 at the High School.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:71 [Following the strongly positiv..] (9:2428-9:2675) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Com\_Communication L1] [P\_Fair Process L1] [S\_Stakeholders L1]  
Memos: [RQ\_H06: Do stakeholders = success/failure? Tech support? Process? Time? Other?] [RQ\_H09: What influences choice of turbine?]

Following the strongly positive results of this meeting, it was announced that HMLP would solicit a Request for Proposals (RFP) for a wind turbine. At the same time, announced its intention to apply for the various permits that would be require

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:72 [Over the following months, a d..]  
(9:2680-9:3140) (Super)**

Codes: [A\_Public Accountability L1] [AO\_Ownership] [Econ\_Economics L1] [EneT\_Technology] [OM\_Operation & Maintenance L1]

Memos: [RQ\_H09: What influences choice of turbine?]

Over the following months, a detailed RFP was prepared (Hull Municipal Light Plant, 2001). The RFP was formally released in January 2001, and by March several bids were received. In April the Vestas' bid was accepted. They proposed their most popular machine at the time, the V47 with a rotor diameter of 47 m, a rated power of 660 kW, and a hub height of 50 m. The turnkey contract price was \$698,699, including a standard set of spare parts.

**P11: \_11H0 ACAD RERL WTurbine Siting Urban Env 2003.pdf - 11:74 [Vendor selection was followed ..]  
(10:225-10:335) (Super)**

Codes: [P\_Fair Process L1]

Memos: [RQ\_H09: What influences choice of turbine?]

Vendor selection was followed by contract negotiations. These led to the signing of the contract on August 13

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