

## MAYOR'S WIND FARM COMMITTEE

### OWNERSHIP, OPERATIONS & MAINTENANCE WORKING GROUP

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#### Summary

In reviewing the responses to City's Request for Information (RFI) for an off-shore wind turbine concept, the two responses provided partial information on the various aspects of ownership, operations and maintenance. The working group shares another working group opinion that the RFI language might have been clearer in order to elicit the desired information from the responses.

Ownership of the generating equipment was acknowledged in both responses: The developer in one, Mercury Wind Energy, LLC (MWe) and the turbine manufacturer, Regenedyne, in the other.

Ownership of the various points on which new equipment will reside and the implications to the City was not well acknowledged. However, where details were provided, some appeared contradictory.

The interconnection between the wind farm installation and the local electric transmission system did not contain adequate assessment to match the power production with the potential points of receipt of that power. This will impact the extent of the City's involvement in routing cable from the shoreline to the interconnection point.

Both respondents indicated subcontracting of operations and maintenance (O&M) services. However, useful information regarding O&M was only provided by MWe. The staging facilities suggested by MWe included locations at Winnetka's utility dock, Wilmette Harbor and Evanston's beachfront dock, possibly tied to a new Evanston marina. Lakefront access will be needed for servicing by water and helicopter access needed to address unscheduled maintenance when lake ice prevents boat access.

Ownership of the power needs further clarification. One of the prerequisites to developing and operating a project of this scale involves a contractual agreement between the power producer and the buyer(s), the power purchase agreement, or PPA. With the term of the PPA spanning decades, the PPA becomes a key step. Most power production guarantees, limitations, obligations to perform, verification, remedies for non-compliance, etc., become articulated in the terms and conditions of the PPA. And as such, they become contractual issues between the buyer and seller. Speculation as to potential buyers in this arrangement receives only brief passing, leaving a key player virtually unaccounted for. Because the PPA will also include the price of this wholesale power, it was the opinion of this working group that the likely impact on the retail electric energy costs for Evanston consumers appeared misleading, highlighting the need for additional clarification on this topic.

The topics reviewed by the working group each contain the following components:

- Excerpts from the City's RFI in which the topic is referenced, implied or appears related.
- Excerpts from the Mercury Wind Energy (MWe) response which address the topic directly or appear to be related.
- Excerpts from the Off Grid Technologies (OGT) response which address the topic directly or appear to be related.
- Comments and observations by the working group which summarize the responses, offer clarification to certain points of interest and pose questions that may be pertinent in future steps.

Each excerpt includes the page number(s) of the applicable document from which the excerpt was obtained. Some excerpts are abbreviated while others are presented in their entirety. Related illustrations and diagrams were not included.

This working group has made no recommendations to the City at this time. It is believed that development of recommendations will follow final review of all working group reports as a collaborative process between all members of the committee.

## OWNERSHIP

For an offshore wind turbine installation ownership takes multiple forms. It includes the equipment built in the lake and the lakebed itself, the power cables brought onto land and the land itself, the connections to other existing equipment and the actual power produced. Ownership of each aspect will be implied, in part, by the level of control exerted over each portion.

### **Excerpt from the City's RFI**

"Anticipated Roles of the Project Partner – It is anticipated that the developer(s) would assume all responsibility for siting, permitting, constructing...the offshore wind energy facility...and would assume all development...risks associated with the project." (p. 2)

### **Response of Mercury Wind**

#### **"1.2.3 The City of Evanston's Role**

- A. The role the city can play in the proposed offshore Evanston Wind Farm is aiding the preferred developer in: obtaining land lease rights, obtaining permits from the FAA, obtaining governmental permits, setting contract requirements, and aiding the developer in obtaining electrical interconnection permits.
- B. Specifying and outlining what the developer, the city, and the current electrical provider are responsible for.
- C. Helping with obtaining construction permits and right of way easements to bury electrical interconnection cables under city streets as they are installed from the offshore wind farm to the substation." (p. 18)

#### **"3.0 General Planning and Predevelopment Considerations**

##### **3.1 Regulatory Approval Process**

Mercury Wind Energy believes that the most difficult aspect of constructing an offshore wind farm for the City of Evanston will be in obtaining the regulatory permits. These regulatory permits from local government, state government, and the Federal government will be the most difficult aspect of the project. As of this moment, no offshore wind farms have been constructed in the U.S. Therefore, there are many uncertainties (sic) as to navigating the permit process. The first step is for the City of Evanston to

award a development contract to construct an offshore wind farm. The second step would be getting the approval at the state level. The third and final step would be getting approval at the Federal level. The city's roll (sic) throughout this process is petitioning the State and Federal government to grant the regulatory approval to the preferred developer. The key uncertainties that are not known at this time are:

- A. Who grants approval at the local level?
- B. Who grants approval at the State level?
- C. Who grants approval at the Federal level?
- D. Which entity receives the tax revenue from the wind farm?
- E. Who grants the leasing rights and determines the length of the leasing rights in Lake Michigan?
- F. What entity receives the annual leasing fees of Lake Michigan?" (p. 65)

**Response of Off-Grid Technologies**

**"3. Capital Requirements, Financing & Indicative Pricing**

The following projections were developed using the NREL modeling system...

**Wind Farm - Project Data Summary based on model default values**

Property Taxes	\$1,380,000	
Land Lease	\$600,000..." (p.12)	

**"Tax Parameters**

Local Property/Other Tax Rate (percent of taxable value)	na	
Assessed value (percent of construction cost)	na	
Taxable Value (percent of assessed value)	na	
Taxable Value	na	
Taxes per MW	\$6,900	
Local Taxes	\$1,380,000	100%

**Land Lease Parameters**

Land Lease Cost (per turbine)	\$30,000	
Land Lease (total cost)	\$600,000	
Lease Payment recipient (F = farmer/household, O = Other)	F	100%..." (p.15)

"...the cost efficiency of having the manufacturer as the developer..." (p.16)

"We look to establish a close relationship with the city of Evanston to insure proper permitting and agreements on staging areas, land facilities and transmission lines during construction." (p. 24)

**Comments and Observations by Working Group**

1. Ownership for the various locations of construction and equipment interfaces generally lacked sufficient definition and detail.
2. MWe appears to assume that the City controls more than it does. There is acknowledgement that construction permits and use of City rights-of-way are the City's jurisdiction. However, the State of Illinois owns the lakebed and would be responsible for its leasing arrangements. The City owns the point of "landfall." There's an assumption that the City can affect the outcome of processes by other State agencies, Federal agencies and electrical system operators. Neither FAA permits nor interconnection permits would rely on City involvement.
3. OGT appeared to identify most key areas in which the City would have jurisdiction: staging areas, land facilities and transmission lines. OGT used modeling software that estimated certain

costs related to leasing and property taxes, implying an element of ownership by others, but does not identify the entities with whom these financial arrangements would be made. Some of the modeling parameters do not appear applicable to an offshore installation.

4. The State currently has no leasing protocol for an offshore wind turbine installation. Apparently, existing lakebed structures, such as, intake cribs and marinas have different arrangements not applicable to a wind turbine installation. Rep. Gabel's bill currently awaits final approval in the State legislature for a wind energy council to determine the State's leasing arrangements.
5. Q: Does the City have a leasing agreement, fee or other contractual mechanism for a developer to bring cables onshore and route through City rights-of-way?

## INTERCONNECTION

The electrical interconnection represents the point where the power generated is delivered into the transmission system "grid" at the compatible voltage and other electrical characteristics. This also represents the point at which the wholesale buyer identified in the PPA receives the power purchased.

### **Excerpts from the City's RFI**

**"Anticipated Roles of the Project Partner** – It is anticipated that the developer(s) would assume all responsibility for ... the offshore wind energy facility, including the interconnection to an onshore receiver station..." (p. 2)

### **"B. Technical and Infrastructure Considerations**

1. Interconnection – Please provide information related to the design of the overall electrical interconnection system. Address the need for one or more offshore substations, the preference for, and viability and availability of, AC or HVDC cables for interconnection, location of converter stations (HVDC option), lake floor, routing and landfall considerations, and strategies for interconnection reliability, security, and energy deliverability. In what ways can the City facilitate the interconnection component of the project?" (p. 4)

### **Response of Mercury Wind**

#### **"1.2.3 The City of Evanston's Role**

A. The role the city can play in the proposed offshore Evanston Wind Farm is aiding ... the developer in obtaining electrical interconnection permits...

C. Helping with obtaining construction permits and right of way easements to bury electrical interconnection cables under city streets as they are installed from the offshore wind farm to the substation." (p. 18)

"...Interconnection Facilities also located at: \_\_Emerson & Dewey\_...." (p. 29)

#### **"(c) General Design and Construction of the Facility**

...The Facility shall be:

- (1) Capable of supplying Energy Output in compliance with the requirements of the Interconnection Facilities Agreement;
- (2) Capable of operating at power levels as specified in the Interconnection Facilities Agreement;
- (3) Equipped with protective devices and generator control systems designed and operating in accordance with the Interconnection Facilities Agreement and Good Utility Industry Practice(s).

5.2 Construction.

(a) Design, Development and Construction. Except as otherwise provided in an Interconnection Construction Services Agreement, as between Buyer and Seller, Seller shall have sole responsibility for the design and construction of the Project and the Project Meter and all related metering and submetering facilities, including the obligation to perform all studies, including environmental studies, pay all fees, obtain all necessary Permits and execute all necessary agreements with Exelon/PJM and Participating Transmission Owners for the Electrical Interconnection Facilities necessary for the ownership, construction, operation and maintenance of the Project and delivery of Seller's Products in accordance with the terms hereof. All of such design, construction and upgrades shall be consistent with all standards and provisions set forth by FERC, PJM or any other applicable Governmental Authority and the interconnecting Participating Transmission Owner. All Electrical Interconnection Facilities, including metering and submetering facilities must be of sufficient capacity to permit the Project to operate at all times during each month at the Project Capacity. Metering and submetering facilities must meet such additional specifications as set forth in Section 3.8." (pp. 29-30)

"Regardless of whether Buyer is a Participating Transmission Owner, Seller shall be responsible for all of Seller's interconnection arrangements" (p. 32)

"(ii) Seller shall construct or cause to be constructed the Electrical Interconnection Facilities at no expense to Buyer such that the Electrical Interconnection Facilities are capable of delivering the maximum quantities of Energy to the Delivery Point as contemplated in this Agreement during each month (in addition to any other output of the Project as the Electric Interconnection Facilities are required to transmit) and shall cause them to be placed into service, in each case, in accordance with the requirements of the interconnecting transmission owner and/or operator, and applicable rules, if any, of FERC, PJM, Exelon, the Commission and any other organization or Governmental Authority charged with reliability responsibilities.

(iii) At Seller's expense, Seller shall have obtained (and demonstrated possession of) all Permits required for the lawful construction, operation and maintenance of the Project and the Units, inclusive of the Electrical Interconnection Facilities, including all those related to environmental matters, as necessary to permit the Seller to operate the Project at the Project Capacity and for Seller to perform its obligations under the Agreement.

(iv) Seller shall have executed all interconnection and transmission services agreements, including the Interconnection Services Agreement and the Interconnection Construction Service Agreement, all agreements necessary for its use and control of the Site for purposes of the construction, operation and maintenance of the Project for a term at least equal to the Pre-Services Term Period (if a Pre-Services Term Period occurs) and the Services Term, and all other agreements that are necessary for Seller to perform its obligations hereunder, in form and substance reasonably satisfactory to both Buyer and Seller in the case of each interconnection and transmission services agreement, and which agreements shall be in full force and effect as of the Initial Delivery Date." (p. 34)

## **"2.0 Technical and Infrastructure Considerations**

### **2.1 Interconnection & Overall Offshore Electrical Interconnection System Design**

All existing offshore wind farms without offshore substations are connected to shore at the voltage used within the wind farm (generally 12 - 13.8 kV low voltage, oil and gas platforms also use 13.8kV). However, based upon initial electrical analysis, Mercury Wind has concluded that the Evanston offshore wind farm should have an offshore substation. This substation will take collector voltages of 12kV or 34.5kV and increase them to 69kV or 138kV in the "homerun" cable to shore. In a separate conduit, an interface cable will be installed to enable each turbine to be tripped off in the event of a ground fault on the turbine side of each transformer. Finally, a third conduit will house the fiber optic lines for turbine communication. Interconnection of the wind farm to ComEd's electric grid will consist of an existing three-phase overhead feeder line. The disconnection of wind farm or isolation to faulty equipment from the utility grid will be controlled by switchgear. Underwater cable laying, internal cable layout in the offshore wind farm, cable layout through the shoreline ground area; landfall and connection to the grid will be disclosed in the Evanston RFP. The submarine cables will be buried 3-4 ft into the lake bottom and encased in concrete or grouted into the lake bottom at the shoreline to avoid damage to the cable by the winter ice. This main

“collector” submarine cable will be connected from turbine to turbine, at the offshore wind farm, until all the turbines are connected electrically like a grid. There will be one “homerun” submarine cable from the offshore wind farm substation to take the wind farm output power, to the onshore electrical substation near the intersection of Dewey and Emerson streets.<sup>25</sup> This onshore substation is located approximately 1.4 miles inland and is owned by ComEd/Exelon. Figures 2.1.1 and 2.1.2 illustrate the system design and location of the proposed offshore Evanston wind farm....

Once the ‘homerun’ electrical cable has reached the shoreline, it must be buried underground for approximately 1.4 miles until it reaches the substation. The underground interconnecting cable burial will require the City of Evanston to allow road construction on Emerson Street for about 1-2 months.” (pp. 50-52)

“E. A 1-4 month electrical interconnection feasibility study must be conducted to develop (sic) a safe reliable, efficient, and cost effective offshore wind facility.” (p. 66)

**Response of Off-Grid Technologies**

**“2. Business Structure**

Phase One:

... to provide 200 Mega watts of electricity...

...on shore transmission lines must be analyzed for Kv (sic) carrying capacity data and receiver sub-station for power line load capacity, Interconnection Agreements obtained and considered, Sub-station controls & operating facility, maintaining data,...” (p. 11)

“Detailed Wind Farm Project Data Costs		ILLINOIS
Construction Costs	Cost	Local Share
...		
<b>Development/Other Costs</b>		
HV Sub/Interconnection		
Materials	\$4,683,523	90%
Labor	\$1,434,655	10%
Engineering	\$6,373,102	0%
Legal Services	\$3,473,341	100%
Land Easements	\$0	100%
Site Certificate	\$1,625,141	100%...” (pp. 13-14)

**“B) Technical and Infrastructure Considerations**

**1. Interconnection**

(VAWT OFF SHORE JV) will collaborate with Local and National utilities, Transmission providers, Cities, States, and The United States Government, to determine optimal interconnection design of the first of its kind scalable technology wind power plant system... The Interconnection Customer agrees to construct its facilities or systems in accordance with applicable specifications that meet or exceed those provided by the National Electrical Safety Code, the American National Standards Institute, IEEE, Underwriter's Laboratory, and Operating Requirements in effect at the time of construction and other applicable national and state codes and standards. The Interconnection Customer agrees to design, install, maintain, and operate its Small Generating Facility so as to reasonably minimize the likelihood of a disturbance adversely affecting or impairing the system or equipment of off shore project.” (p. 17)

“Consideration of Kv (sic) line capacity up to lake front substation inverter system to local utility or end user.” (p. 20)

## Comments and Observations by Working Group

1. MWe has assumed that ComEd's transmission substation, TSS47, near Emerson Street and Dewey Avenue has adequate capacity to receive the full power generated by the wind turbine installation. Previous conversations between the Evanston Utilities Commission and ComEd indicated that this location may be inadequate for the wind turbine installation size outlined in the response. An alternative interconnection location for this scale of wind farm capacity may be at ComEd's Skokie substation located on Church Street near Laramie Avenue, several miles further inland.
2. OGT used modeling software that estimated certain costs related to the interconnection, but does not identify the entities with whom these financial arrangements would be made. Potential interconnection points were not indicated by OGT.
3. The developer owns the equipment up to the transmission interconnection point. ComEd owns the transmission interconnection points under consideration for the proposed scale of installation. Evanston currently does not have an end user large enough to use the full power production capability of the generating systems presented. The RFI responses did not satisfactorily address these considerations.
4. A developer must obtain two levels of PJM feasibility study that evaluate all aspects of interconnection capacity, configuration, monitoring, required upgrades, etc. These details primarily affect the developer. The City will be impacted from a scheduling standpoint as these steps will take time to enter into the queue and to fully transact.

## OPERATIONS AND MAINTENANCE (O&M)

O&M is required to perform preventive maintenance, regular servicing and repair or replace worn or malfunctioning components. To keep the facility operational and productive, equipment operations and servicing need management through the allocation sufficient staff, scheduling, supplies and spare parts and budgeting. Special considerations may be needed for the necessary support facilities.

### Excerpts from the City's RFI

"2. Business Structure – Please describe your recommended business structure for the development and operation of an offshore wind facility. Describe the City's role, if any..." (p. 3)

"4. Operations and Performance – Please provide information related to the operations and performance... maintenance plan, facilities, staffing, spare parts, and response time for unscheduled maintenance, scheduled maintenance procedures and frequency (including periodic turbine overhauls or major component replacement/repair), remote communications, control, monitoring and dispatch systems, documented safety and emergency rescue plans and facilities, anticipation of construction and/or operational curtailment due to bird migration, and any additional items to be considered..." (p. 3)

"3. Infrastructure for Construction and Maintenance – Please provide information related to the infrastructure required to execute the construction and maintenance phases of the facility. Address specialized equipment needs and availability, availability of skilled labor and trained crews, access of appropriate port facilities, laying of cable interconnection, insurance matters, potential weather and other seasonal impacts on... maintenance... and any other issues that should be considered." (p. 4)

## **Response of Mercury Wind**

“..Mercury Wind selects only experienced contractors who plan connection to the grid and arrange for delivery of the energy to customers. Lastly, Mercury Wind secures financing early on in the development process to see the project through from concept to eventual decommissioning. (p. 5)

“6. Mercury Wind is hiring experienced contractors and sub-contractors that have completed onshore and offshore wind farms. Table 0.0 list’s (sic) a few of the experienced offshore wind farm contractors Mercury Wind will employ for the proposed Evanston offshore wind farm. Approx. 90% of the sub-contracting companies listed in table 0.0 have installed and worked on one or more of the 28 offshore wind farms in the world. The rest of the sub-contracting companies have experience with onshore wind farms or an extensive marine resume.” (p. 8)

From “Table 0.0.0 Partial List of MWe Sub-Contracting Companies”, for “Operations & Maintenance” includes “Global Wind Alliance, Frontier Pro...et al...” (p.8)

### **“1.2 Business Structure**

#### **1.2.1 Development of proposed Evanston Offshore Wind Farm**

Mercury Wind Energy recommends to the City of Evanston that a wind developer, namely itself; construct, manage, develop, operate, maintain, and eventually decommission (sic) the proposed Offshore Wind Farm for the City of Evanston...”

#### **1.2.2 Operation and Maintenance of an Offshore Wind Facility**

Mercury Wind Energy recommends to the City of Evanston that the operation of the proposed Offshore Wind Farm be operated and maintained by a utility company, the developer, or by another privately held experienced offshore operations and maintenance company for the following reasons;

- A. The City of Evanston has limited expertise... Therefore, it is much less expensive for a larger energy company, such as ComEd/Exelon, EnXco, PJM, or others to operate and maintain the offshore wind farm.
- B. Cost, financial risk, and environmental risk prevent the possibility of the City of Evanston maintaining, building, or owning the wind farm.
- C. Contracting out the operations and maintenance of the proposed offshore wind farm to an experienced operations and maintenance company will allow the developer to utilize previous knowledge, experience, and economies of scale.<sup>8</sup> Mercury Wind has already developed a relationship with 2 highly experienced O&M companies that are interested in operating and maintaining an offshore wind farm for Evanston.” (pp. 17-18)

#### **“1.5.5 Maintenance Plan/Facilities/Staffing**

Figure 5.3 shows Mercury Wind has located 3 ideal port locations from which to perform any operating and maintenance procedures on the Offshore Evanston Wind Farm. These 3 ideal port locations are; Winnetka Electrical Utility dock,<sup>20</sup> Wilmette harbour,<sup>21</sup> or the Evanston dock area currently (sic) located near the Church street beach.<sup>22</sup>

...As was stated earlier in this RFI, 2 people are needed to service every 10 – 20 turbines. The turbine controls facility can be located anywhere in Evanston, but it would be best to locate the controls and monitoring facility as close to the wind farm, and boat port as possible. This allows for a faster service and maintenance time from the crews and for decreased issues with faulty or inaccurate communication.” (p. 44)

#### **“1.5.6 Evanston Marina**

Another O&M facility option is; construct a Marina in Evanston between the Davis/Church and Clark Street beaches. A Marina could be built to include a fine restaurant right on the water, and located on the second floor could be the controls and monitoring facility for the Wind farm. Mercury Wind is in talks now with a well known construction company that just finished building, “The Grand Marlin”.<sup>23</sup> The Grand Marlin is a high end Marina built on the famous white sand beaches of Pensacola, Florida. Here is the URL link to the new Grand Marlin Marina should you care to take a look; <http://www.thegrandmarlin.com/>



### **“1.5.7 Spare Parts**

When an offshore wind farm is out of commission, 83% of the time it is due to a lack of spare parts. It should be obvious here that the wind farm developer and owner do not make money during a downtime. Therefore, it is in the best interest of the wind farm owner to perform regularly scheduled maintenance and replace turbine parts BEFORE needed. In addition, newer turbines are now made without gearbox's (transmissions) to reduce maintenance issues. These newer turbines without gearboxes are referred to as, “direct drive” turbines. Since most of the problems and wear and tear was occurring in the gearbox the turbine engineers redesigned the turbines to run without the gearbox. The gearbox is one of the items that Mercury Wind is eliminating in its turbines to reduce maintenance items and turbine downtime.” (pp. 45)

**Other O&M items described include:**

**“1.5.8 Response Time For Unscheduled Maintenance...” (p.45)**

**“1.5.9 Scheduled Maintenance Procedures And Frequency  
(Including periodic turbine overhauls or major component replacement/repair)...” (p.46)**

**“1.5.10 Remote & Wireless Communications...”**

**1.5.11 Controls...Communications medium...Voice communications...**

**1.5.12 Monitoring And Dispatch Systems...” (pp. 47-48)**

**1.5.13 Safety And Emergency Rescue Plans And Facilities...” (p. 48)**

### **Response of Off-Grid Technologies**

“The maintenance cost of 500 conventional wind turbines over 20 years is tremendous. For newer machines annual maintenance is estimated at 1.5 - 2% of original cost. The annual operation and maintenance of 500 two megawatt commercial wind turbines, using current industry standards is between \$26 and \$35 million. Over 20 years (which is the life expectancy of a current commercial wind turbine) that comes to \$525 million in maintenance costs alone. That is \$25 million more than we estimate the cost of a new One Gigawatt Maglev Wind Turbine will be. This brings the creation and maintenance of a like sized wind farm cost to \$1.025 Billion versus the Regenedyne cost of \$800 Million. The reason the operation and maintenance of the Regenedyne wind turbines is so low is the frictionless power and the lack of wear on the materials as a result of there being no friction.” (p. 10)

### **“2. Business Structure**

Phase One:

...data and receiver sub-station for power line load capacity, Interconnection Agreements obtained and considered, Sub-station controls & operating facility, maintaining data,... operational risk analysis,...safety analysis,...will be completed to evaluate the potential to deliver power to the market.” (p. 11)

“Phase Three:

...Monitor system and service to ensure optimal efficiency...” (p.12)

### **“3. Capital Requirements, Financing & Indicative Pricing**

The following projections were developed using the NREL modeling system...

#### **Wind Farm - Project Data Summary based on model default values**

Direct Operating and Maintenance Costs                      \$2,038,000...” (p.12)

<b>"Wind Farm Annual Operating and Maintenance Costs</b>	<b>Cost</b>	<b>Local Share</b>
<b>Labor</b>		
<b>Personnel</b>		
Field Salaries	\$735,091	100%
Administrative Management	\$117,615	100%
	\$196,024	100%
Labor/Personnel Subtotal	\$1,048,730	
<b>Materials and Services</b>		
Vehicles	\$28,261	100%
Site Maint/Misc. Services	\$11,022	80%
Fees, Permits, Licenses	\$5,511	100%
Utilities	\$22,043	100%
Insurance	\$211,956	0%
Fuel (motor vehicle gasoline)	\$11,022	100%
Consumables/Tools and Misc. Supplies	\$71,641	100%
Replacement Parts/Equipment/ Spare Parts Inventory	\$627,814	2%
Materials and Services Subtotal \$989,270" (p. 14)		

"System will be developed with appropriate maintenance, remote communications, and monitoring to ensure optimal efficiency." (p. 16)

### **"3. Infrastructure for Construction and Maintenance**

RM (sic) Engineering is a world-class engineering and procurement organization. The engineering arm of J. Ray McDermott, JRM Engineering is a leader in offshore fabrication and installation and offers customers a full range of engineering, procurement, and support services." (p. 19)

"We look to establish a close relationship with the city of Evanston to insure proper permitting and agreements on staging areas, land facilities and transmission lines during construction." (p. 24)

"...- Generates Electricity with fewer moving parts  
 -Major Components located at ground level...  
 -Minimal Maintenance" (p. 27)

"All key areas 24/7/365 video & SATCOM monitoring." (p. 33)

"No oil, grease or petro-fuel required." (p. 33)

### **Comments and Observations by Working Group**

1. MWe and OGT both identified that their design technologies have less servicing and maintenance and, therefore, lower O&M costs than other conventional wind turbine designs. Based on the background experience and new technologies presented, an O&M history will require assurance to the power purchaser.
2. MWe identified a significant list of O&M considerations. Among these consideration are potential lake front staging areas: Evanston's beachfront dock, Wilmette Harbor and Winnetka's utility dock.
3. MWe implies an intent to subcontract operations and maintenance of the installation in portions of their response. MWe also lists suggestions for operating the proposed wind farm that do not offer realistic options. Since electric power deregulation became effective in 1999, ComEd has

- operated only as an electrical distribution company, not as a generating company. PJM Interconnection manages and coordinates the power generated to match the power use requirements in ComEd's territory. PJM operates the transmission system to schedule in power from all generating facilities, but does not operate any of those generating facilities. Therefore, neither ComEd nor PJM would likely have the role of operator for any proposed wind farm. enXco, Inc. does provide a range of O&M services.
4. OGT used modeling software that estimated certain costs related to O&M. OGT implies that JRM Engineering would be contracted to perform maintenance at the facility.
  5. OGT's response indicated no specific requirements for monitoring facilities, only that theirs would be "appropriate."
  6. The developer takes on the responsibility and the ongoing costs for O&M in order to comply with the production provisions of the PPA and sustain the revenue stream from the buyer. The O&M costs presented comprise a portion of the estimated developer's costs, but there are no costs presented that place specific requirements on Evanston.
  7. Q: Have any inquiries been made of the potential locations in Winnetka and Wilmette? Q: Is it necessary to presume a helipad would be part of a monitoring facility location? Q: Is this realistic for these sites? What would be likely alternatives?
  8. Q: Would a marina offer a funding mechanism for the facility or would it just blur ownership?
  9. Q: Doesn't an Evanston marina involve similar jurisdictional requirements and aesthetic issues as the wind farm itself? Wouldn't the concept of a marina generate an undesirable debate that distracts from the primary focus of this installation?
  10. Q: Is a local monitoring facility really needed or can monitoring be done remotely?
  11. For 40 turbines MWe implies a service staff of 3-4. Due to likely safety protocols with water access and confined spaces, the Working Group initially speculated that this staff level may be underestimated. Q: Does this staffing assume full time for 1 daytime shift, scheduled periodic visits, or something else?

#### POWER PURCHASE AGREEMENT (PPA)

The PPA gives a detailed articulation of the terms and conditions that form a contractual agreement between the seller of the power generated and the buyer of that power.

#### **Excerpts from the City's RFI regarding City's role in the Project**

"4. Power Purchase Agreement (PPA) – Please describe your interest in maintaining all or a portion of the project output for sale and address the ideal length of a PPA, terms of service, ancillary services, pricing structures, production and availability guarantees, outages, facility operating criteria, curtailment and start-up and shut-down considerations, insurance and indemnification requirements, default provisions, and any additional information or recommendations for PPA terms and conditions that should be considered." (p. 3)

## **Response of Mercury Wind**

“...to eliminate risk and establish a hedge against possible downward pressure on commodity prices, Mercury Wind will sign a 20 year PPA....The 20 year PPA is the best strategy to allow wind developers to reduce pricing uncertainty...” (p.21)

### **“1.4.1 Interest**

Mercury Wind is interested in selling all of the output of the offshore wind farm to the IPA or local utility provider. Mercury Wind prefers to sign a 20 year PPA with the Illinois Power Authority, ComEd/Exelon, PJM, or another local electricity provider....” (p.22)

### **“1.4.3 Terms of Service**

...Mercury Wind would be responsible for delivering this power under the agreed upon contract terms of the PPA...” (p.24)

MWe gives detailed language as an example of general terms and conditions of the agreement that include pricing, definition of power delivery point, availability and performance guarantees, metering requirements for power production measurement and verification, financial arrangements for excess power, insurance and financial remedies for non-performance, etc. A turbine performance warranty was noted and can potentially affect performance requirements of the PPA, although this is an equipment performance issue between the producer and equipment supplier.

## **Response of Off-Grid Technologies**

“Regenedyne turbines are self sufficient and grid ready, and the excess energy will be sold back to the municipalities in which they operate.” (p. 11)

“Phase Two:

...Complete the negotiation & submission of Power Purchasing Agreement (PPA) to local utility or corporate end user...” (p.12)

### **“4. Power Purchase Agreement (PPA)**

It will be the desire of VAWT Off-Shore JV to maintain all or a portion of the power from the proposed project output for sale. Ideally, the power output will be negotiated and sold to a regional utility power company. Basic terms of an agreement will be for a period of 20 years at a price of 18-24 cents per kilowatt hour (kWh). The pricing may remain flat, fixed or may escalate or deescalate over the life of the agreement. Production and Availability Guarantees will be put in place to insure proper operation and maintenance, safe reliable operating conditions in accordance with prudent operating practices. There will also be plans for inspection records available for the buyer. Curtailment provisions will be implemented due to an occasional necessity to curtail the production of wind energy. The request to curtail might come from the Purchaser, Transmission owner, or Transmission Authority for various reasons. Therefore, curtailment calculations will be negotiated depending on the reason and origin of the curtailment. The PPA will require that we, the seller maintain, at our expense, specific insurance policies. In some cases, there will be an option to list the purchaser as an additional insured under the policy. Policies typically required include: commercial general liability insurance; worker’s compensation insurance for seller’s employees; automobile liability insurance; builder’s risk insurance; all-risk property insurance; and business interruption and extra expense insurance. The business interruption and extra expense insurance covers lost revenues or increased expenses needed to resume operations after a claim under the property insurance policy. The PPA will include detailed sections related to ‘events of default.’ Events of default are situations where the action or inaction of one of the party significantly jeopardizes the overall project...” (p. 15-16)

## **Comments and Observations by Working Group**

1. Both respondents identified a 20-year agreement for the PPA.

2. MWe described many of the considerations applicable to a PPA and these represent useful information. Potential candidates identified for this agreement include the Illinois Power Authority, ComEd/Exelon, PJM or other power provider. (PJM is not a power purchaser.)
3. OGT identifies an agreement with a “regional utility power company”, but indicates no potential candidates for this arrangement. OGT gives some examples of provisions the PPA might contain, such as pricing structure, production and availability guarantees, data access, curtailment criteria, various insurance and events of default.
4. OGT also includes some ideas that initially appear unusual and can be construed as contradictory to other information presented. Therefore, questions arise:
 

“...excess energy will be sold back to the municipalities in which they operate.” How does excess energy get generated? How would it get sold to the municipality if a utility is the buyer? If the turbines operate offshore, do they operate in any municipality?

“...the desire of VAWT Off-Shore JV to maintain all or a portion of the power from the proposed project output for sale.” What would be the strategy for selling only a portion of the power output?
5. The developer owns the power produced as the seller until it’s delivered to the interconnection point where buyer takes possession, according to the PPA. The buyer usually purchases at a wholesale price to resell into a retail market.
6. The terms and conditions of the PPA outlines buyer and seller contractual issues and, for most arrangements, these will not affect the price of Evanston customers. Despite the wholesale price agreement in the PPA, it should be noted that the price of electric energy for Evanston’s electric energy users is not determined by any single power generating facility. Unless the City is the buyer in the PPA, the price of power to most customers will continue to be determined by retail supply contracts or by ComEd’s existing retail procurement auction.
7. Q: If Evanston were to prepare a municipal aggregation arrangement, could it be a potential buyer?
8. Q: How would renewable energy certificates (RECs) become available for this installation?
9. Q: Can Evanston receive or have access to any of the production data? Could this be a condition of the PPA?

#### DECOMMISSIONING THE INSTALLATION

When the power production enterprise can no longer be carried out, there need to be provisions for disconnection and removal of equipment and the associated costs.

#### **Excerpts from the City’s RFI**

“3. Capital Requirements, Financing & Indicative Pricing – Please describe ... provisions for decommissioning and removal of turbines ...Describe the City’s role, if any.” (p. 3)

“...assurance of site decommissioning and restoration at end of useful life.... Describe the City’s role, if any.” (pp. 4-5)

## **Response of Mercury Wind**

“...Mercury Wind... secures financing early on in the development process to see the project through from concept to eventual decommissioning.” (p. 5)

### **“1.2 Business Structure**

#### **1.2.1 Development of proposed Evanston Offshore Wind Farm**

Mercury Wind Energy recommends to the City of Evanston that a wind developer, namely itself; construct, manage, develop, operate, maintain, and eventually decommission (sic) the proposed Offshore Wind Farm for the City of Evanston...” (p. 17)

### **“1.3.5 Decommissioning & Turbine Removal**

Mercury Wind accepts full responsibility for the decommissioning and turbine removal of the proposed Evanston offshore wind farm, but asks that a 20 - 50 year offshore land lease be approved by the city of Evanston. The longer the offshore land lease the lease rights, the easier it is for the developer to pay for the offshore wind farm. Mercury Wind has investigated the decommissioning timeline for a wind farm. Estimated site decommissioning has a timeline range from 6 months to 2 years.<sup>10</sup> Based upon additional conservative estimates of tearing down a large scale construction project, Mercury Wind estimates the decommissioning of an offshore wind farm will take approximately 6 months. Site restoration will take anywhere from another 6 months to a year. Total time spent, 1–2 years. The faster a wind farm is decommissioned, the cheaper. However, Mercury Wind is committed to the environment and will do nothing to harm the marine ecological structure within Lake Michigan. If the process to decommission turbines and restore the lakebed floor takes longer than initial (sic) estimates, Mercury Wind has budgeted for that.” (p. 22)

<sup>10</sup> Decommissioning is “estimated” because no companies have torn down an offshore wind farm yet. Every estimate published to date is conjecture. Mercury Wind has spoken with professional contractors and conducted market research on this topic, neither of which was easy because no one in the US has offshore wind energy experience. Mercury Wind in partnership with a sub contractor has developed a proprietary method to decommission an offshore wind farm, quickly and with little environmental effect. This will be discussed in greater detail during the RFP stage.” (p. 22)

### **“1.4.3 Terms of Service**

Mercury Wind is responsible for: delivering power, constructing, maintaining, operating, and the eventual decommissioning (sic) of the wind farm.” (p. 24)

### **“1.6 Timeline**

The proposed offshore Evanston wind farm is expected to be in operation for at least 20~25 years and will consist of; construction, installation, commissioning, operation, and decommission phases...” (p. 48)

### **“3.3.10 Site Decommissioning & Site Restoration**

Mercury Wind has investigated the decommissioning timeline for a wind farm. So far, the timeline’s (sic) range from 6 months to 2 years. Based upon conservative estimates of tearing down a large construction project, Mercury Wind estimates that to decommission an offshore wind farm will take approximately 6 months. Site restoration will take anywhere from another 6 months to a year. Total time spent, 1 – 2 years. Obviously, the faster the wind farm is decommissioned, the cheaper. However, Mercury Wind is committed to the environment and will do nothing to harm the marine ecological structure. So if the process to decommission ends up taking longer, Mercury Wind has budgeted for that.” (pp. 69-70)

## **Response of Off-Grid Technologies**

“We anticipate decommissioning after a minimum of 100 years and should have this revisited on a decade basis.” (p. 24)

“-No Decommissioning” (p. 27)

**Comments and Observations by Working Group**

1. MWe has accounted for the concept of decommissioning the installation in its budgeting and environmental concerns, but states that the lack of case studies for this step currently makes the process more speculative. MWe stated that elaboration on the process would be reserved for a formal proposal.
2. OGT has almost dismissed any need for decommissioning the installation.
3. Q: Can it be assumed that the State will have decommissioning provisions and requirements in its lease?
4. Q: Will the City have decommissioning provisions and requirements in its contractual arrangements for land-based components?
5. Q: Will ComEd have decommissioning provisions and requirements for its interconnection arrangements?

OTHER ITEMS NOTED

The following items were not mentioned in the RFI, nor were they mentioned in either of the developer responses. However, the Working Group found them important when considering the quality of the initial construction and the ongoing operations and maintenance.

- Independent Third Party Oversight during construction - What provisions will be made to insure best construction practices are followed? Will FERC require an oversight committee?
- Performance Bond for Construction - Would the State or FERC require such a bond?
- Independent Third Party Oversight of Operations and Maintenance - What provisions will be made to insure best O&M practices continue?

**Glossary**

“**PJM Interconnection** is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.” It acts as a neutral, independent party, to operate a competitive wholesale electricity market and manage the high-voltage electricity grid to ensure reliability.”

(Source: <http://pjm.com/about-pjm/who-we-are.aspx> )

The **Federal Energy Regulatory Commission, or FERC**, is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. For electricity, FERC also:

- Regulates the transmission and wholesale sales of electricity in interstate commerce; reviews certain mergers and acquisitions and corporate transactions by electricity companies; reviews the siting application for electric transmission projects under limited circumstances; licenses and inspects private, municipal, and state hydroelectric projects; protects the reliability of the high

voltage interstate transmission system through mandatory reliability standards; monitors and investigates energy markets;

- Enforces FERC regulatory requirements through imposition of civil penalties and other means; oversees environmental matters related to natural gas and hydroelectricity projects and other matters; and administers accounting and financial reporting regulations and conduct of regulated companies.
- **Areas considered outside of FERC's responsibility include:** Regulation of retail electricity and natural gas sales to consumers; approval for the physical construction of electric generation facilities; regulation of activities of the municipal power systems, federal power marketing agencies like the Tennessee Valley Authority, and most rural electric cooperatives; regulation of nuclear power plants by the Nuclear Regulatory Commission; tree trimmings near local distribution power lines in residential neighborhoods; issuance of State Water Quality Certificates; reliability problems related to failures of local distribution facilities; and tree trimmings near local distribution power lines in residential neighborhoods.  
(Source: <http://www.ferc.gov/about/ferc-does.asp> )

The **Illinois Power Agency (IPA)** was established in 2007 “for the purposes of:

- Developing and submitting annual electricity procurement plans to the Illinois Commerce Commission that ensure adequate, reliable, affordable, efficient, and environmentally sustainable electric service at the lowest total cost over time, taking into account any benefits of price stability for Commonwealth Edison and the Ameren Illinois Utilities. The plans are to include electricity generated from renewable as well as clean coal resources.
- Conducting competitive procurement processes according to the procurement plans as approved by the ICC.
- Developing electric generation and co-generation facilities that use indigenous coal or renewable resources, or both, financed with bonds issued by the Illinois Finance Authority.
- Supply electricity from the Agency’s facilities at cost to municipal electric systems, governmental aggregators, or rural electric cooperatives in Illinois.”  
(Source: <http://www2.illinois.gov/ipa/Pages/default.aspx>)

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