

**Wind Energy
Operations & Maintenance Summit
USA
Renaissance Marriot Hotel - Dallas, TX
- April 1-2, 2009**



Industrial Power Plants Around the World



Power Plants Around the World



WHO DOES THE O&M?



Presented by

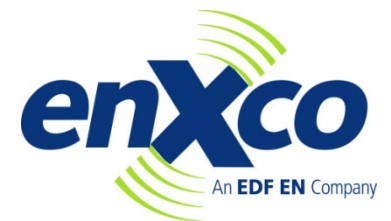
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Who does the O&M?

- During the warranty period of the turbine, the project may be required to utilize the turbine manufacturer for O&M of the turbines. If that is not the case, or after the warranty period, there are three basic choices for performance of the O&M:
 - The project owner (including affiliates).
 - The turbine manufacturer (some are willing to continue).
 - An O&M specialty company.
- Each option has positives and negatives, and there are many factors often overlooked by project owners with limited experience. There are also factors that involve the characteristics and objectives of the project owner. We will be discussing all of these today.



Option 1: O&M by project owner

Potential positives include:

- Close integration of project owners objectives and O&M
- Possible low cost option (if “economy of scale” exists)
- Ease of making changes in O&M activities and structure



Option 1: O&M by project owner

Potential risks and downside include:

- O&M skill set is fundamentally different than project development
- Nominal number of projects results in necessary support functions being amortized over few projects (higher cost per project)
- Difficult to hire and retain properly qualified and trained Wind Technicians, Site Supervisors and support personnel.
- Lack of access to large amounts of experience-based information – both technical and budgetary.
- Need to develop and refine off-site functions such as parts procurement, quality control, health and safety programs and maintenance procedures.



Option 2: O&M by turbine manufacturer

Potential positives include:

- Potential close interaction with design group and factory
- Some are willing to extend aspects of the warranty
- Potential expedited access to parts
- “Warm Fuzzy” working with manufacturer (sometimes an issue with lenders)



Option 2: O&M by turbine manufacturer

Potential risks and downside include:

- Quality (personnel and results) varies significantly between companies even down to the site level
- Often the high priced option
- Potential benefit of factory and design access does not always materialize
- Several turbine manufactures use out-of-area workforces (a potential downside to community good will – often necessitated due to short term warranty / service agreement



Option 2: O&M by turbine manufacturer

Potential risks and downside include: (cont'd)

- Several manufacturers rely on subcontractors (training and skill levels can vary)
- Sometimes reluctant to share “gory details” of turbine problems in attempt to protect industry reputation of the make.



Option 3: O&M by specialty company

Potential positives include:

- Focused business model and infrastructure
- Often the low cost option
- Those with extensive experience can apply “fleet” lessons learned
- Large O&M companies have full range of support functions
- Large companies have personnel “depth” to cover emergencies and changes by employees
- The best ones maximize use of local personnel to improve community relations



Option 3: O&M by specialty company

Potential risks and downside include:

- Some rely heavily on subcontract and temporary personnel
- Many have limited resources
- Some are regionally limited
- Some have limited financial depth
- Challenge to separate the “hype” from reality



Decisions Considerations: “The Devil is in the Details”

If the decision is to do the O&M on a contract basis, there are a significant number details that require serious due diligence. Many of these considerations apply to O&M by project owner as well, and include:

- **Experience** – The O&M provider should have significant documented experience providing comprehensive O&M on wind projects.



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- **Experience** – The O&M provider should have significant documented experience providing comprehensive O&M on wind projects.
- **Personnel** - Are the personnel on the site full-time employees, subcontractor’s personnel, or temporary labor? Does the O&M provider have sufficient personnel to deal with emergency situations or multiple start-ups without sacrificing quality?



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- **Training** – What formal training will the personnel who will be performing the O&M have? Is the training in-house by the O&M provider, by manufacturer, or a combination of both? Is it documented?



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- **Safety** – Does the O&M provider have a comprehensive, wind specific, Safety Team and Safety Program? What is the TRIR (and what is basis for number provided)? These should be reviewed.



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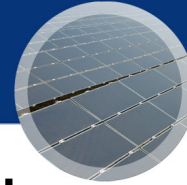
- **Procedures** - What formal procedures does the O&M provider have for the performance of the work?
- **Inventory Management** – What procedures and software does O&M provider utilize for inventory control and reporting?



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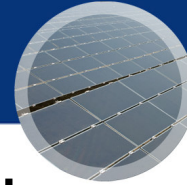
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- **Inventory Management** – What procedures and software does O&M provider utilize for inventory control and reporting?
- **High Voltage Work** – Is the O&M provider qualified and trained to perform HV work such as substation switching?
- **Equipment** – Evaluate the equipment used by the O&M provider, such as service trucks and tooling.



More Decision Considerations: (behind the scenes)

In addition to the things that are evident on the site, there are a number of additional things that require the same level of due diligence that are not as evident, such as:

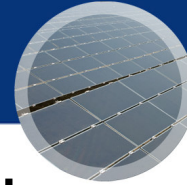
- **HR Function** – The O&M is very much a people intensive business, and requires focused efforts on recruiting, benefits, retention.



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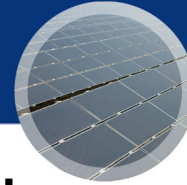
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- **HR Function** – The O&M is very much a people intensive business, and requires focused efforts on recruiting, benefits, retention.
- **Procurement** – The O&M provider should have experienced procurement specialists and sufficient volume in the industry to obtain best pricing.



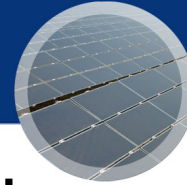
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- **Insurance Coverage** — There should be comprehensive insurance in place (at correct levels) and the ability to provide things like insurance certificates.



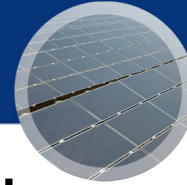
More Decision Considerations: (behind the scenes)

- **Insurance Coverage** — There should be comprehensive insurance in place (at correct levels) and the ability to provide things like insurance certificates.
- **Financial Strength** — Does the company have the financial resources to stay on the job and stand behind things like warranties.



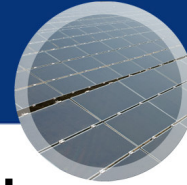
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- **Quality Control** — There should be an independent QC Group and specific protocol to assure O&M functions are properly carried out.



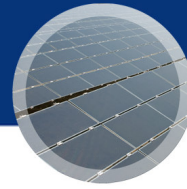
More Decision Considerations: (behind the scenes)

- **Quality Control** – There should be an independent QC Group and specific protocol to assure O&M functions are properly carried out.
- **Technical Services** – In house Field Engineers, controls and SCADA, composite and gearing experts – and a deep network of expert consultants.



More Decision Considerations: (behind the scenes)

- **Quality Control** – There should be an independent QC Group and specific protocol to assure O&M functions are properly carried out.
- **Technical Services** – In house Field Engineers, controls and SCADA, composite and gearing experts – and a deep network of expert consultants.
- **24/7 Services** – Remote monitoring can done at a variety of levels. Determine the facility utilized the number, training and qualifications of personnel in the facility and the protocols used. Is the facility NERC compliant?



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In Conclusion:

- O&M professionals “make it look easy”.
- Doing O&M right (keeping costs low and availability high) is anything but easy.

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