

## **2.13 CONSTRUCTION MANAGEMENT**

*WAC 463-42-245 Proposal - Construction management. The applicant shall describe the organizational structure including the management of project quality and environmental functions.*

### **2.13.1 Construction Management Organization**

The Applicant intends to enter into two primary agreements for the construction of the Project including an agreement for the supply, erection and commissioning of the wind turbines as well as an Engineering, Procurement and Construction (EPC) contract for the construction of the balance of plant (BOP) which includes all other Project facilities and infrastructure such as the roads, electrical collection system, substation, O&M Facility, etc.

#### **2.13.1.1 Project Construction Management**

The Project Management organizational structure will include two support groups: An engineering and design specifications team and the field site management team. Figure 2.13.1-1 illustrates the construction management organizational structure for the Project. The Project Manager will handle contractual aspects of the agreements with the project managers of the wind turbine vendor and the EPC contractor. This organizational chart represents a typical structure for wind power projects. The exact organization may change after award of the turbine supply contract, EPC contract and other subcontracts.

#### **2.13.1.2 Engineering and Design Specifications Team**

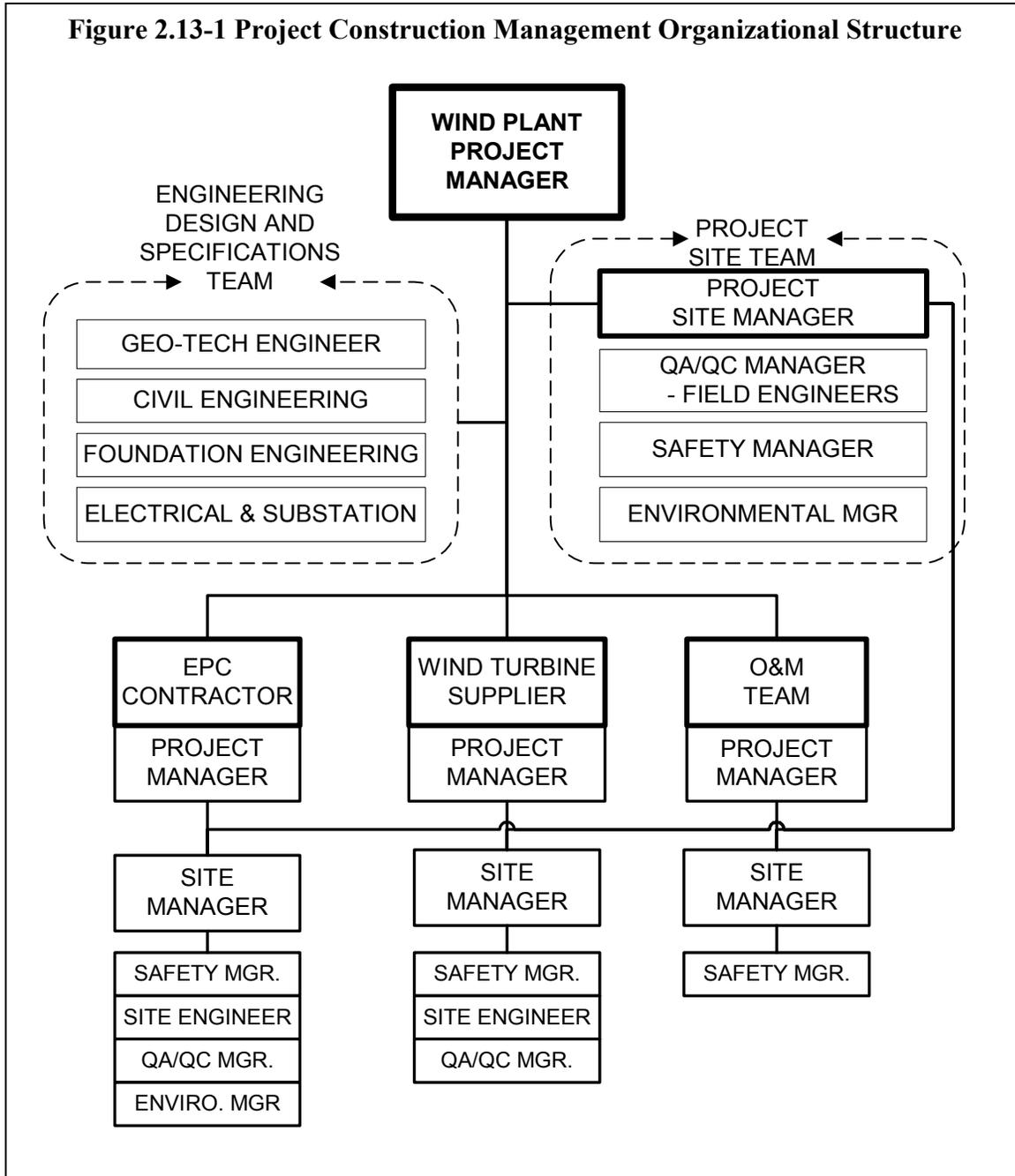
The engineering and design specifications team is responsible for establishing the design and construction specifications for the various portions of the Project. The engineering team acts a third party verification group in conjunction with the Project's field QA/QC team. The engineering team will review proposals from the various turbine suppliers and EPC contractors for equipment supply and construction work. The turbine supplier and EPC contractor will be responsible for the detailed design work for the Project and for submitting these designs and equipment specifications to the Project engineering team for review. Review by the Project engineering team ensures that the detailed construction plans will meet the required design specifications, codes and standards for the Project.

#### **2.13.1.3 Field Site Management Team**

The field site management team will oversee construction on-site and will ensure that construction on-site is done in accordance with the engineering plans and specifications, environmental requirements and good industry practice. The field site team will generally be involved in day-to-day issues as they arise throughout the construction phase. The Project Site Manager will have a support team consisting of quality assurance and quality control (QA/QC) specialists, environmental inspectors, and site safety officers. The site team will also rely on the engineering team for in the field support during critical operations such as for energizing of the substation and for technical issues as they arise during Project construction.

### 2.13.1.4 EPC Contractor's Construction Management Team

The EPC Contractor will be responsible for managing several construction subcontractors including those all of the BOP items such as the roads, electrical and communications system infrastructure, substation and O&M Facility. The EPC Contractor will have a lead Project Manager, a Project Engineer and a Site Manager supported by their own field engineering team, quality assurance and quality control specialists, environmental monitors, and site safety officers. The EPC Contractor will be required to implement and perform a safety plan, a QA/QC plan and an environmental protection plan including the storm water pollution prevention plan (SWPPP).



### **2.13.1.5 Wind Turbine Vendor's Construction Management Team**

The wind turbine supplier will be responsible for the supply, delivery, erection and commissioning of the wind turbines. The turbine supplier's construction team will include a lead Project Manager, a Site Manager, transportation specialists and several lead technicians. The turbine vendor's site team will be supported by their own quality assurance and quality control specialists and site safety officers. The EPC Contractor will be required to implement and perform a safety plan, a rigorous QA/QC plan and a detailed commissioning plan.

### **2.13.1.6 Project Operations and Maintenance (O&M) Team**

The Project O&M group will be on site during the commissioning and start-up phase of construction. Once a turbine is commissioned, it is turned over to the O&M group control. The O&M team generally consists of a Project site manager, a team of wind turbine field technician specialists, and administrative support staff.

## **2.13.2 Quality Assurance, Quality Control, Environmental and Health And Safety Compliance**

### **2.13.2.1 QA/QC Program Characteristics**

#### **2.13.2.1.1 QA/QC Program**

A Quality Assurance (QA) and Quality Control (QC) Program will be implemented during all phases of the Project to ensure that the engineering, procurement, construction, and startup of the facility is completed, as specified. The EPC Contract will require that a Project construction procedures manual be submitted prior to any site construction for review and approval. The manual will describe how the contractors will implement and maintain QA/QC, Environmental Compliance Programs, Health and Safety Compliance Programs and intergrate their activities with the other contractors during all phases of the work. The EPC contractor and turbine supplier will be responsible for enforcing compliance to the construction procedures program of all of its subcontractors.

In the QA/QC Program, the contractor will describe the activities and responsibilities within its organization, and the measures to be taken to assure quality work in the project. Some of the topics that will be covered are design control, configuration management and drawing control. Independent QA/QC personnel will review all documentation (design, engineering, procurement, etc.) and witness field activities as a parallel organization to that of the construction contractors to assure compliance with the specifications. In the installation, alignment and commissioning of all major equipment, field inspectors' acceptance will be required.

#### **2.13.2.1.2 Environmental Protection**

The Environmental Compliance program will ensure that construction activities meet the conditions, limits and specifications set in environmental standards established in the Site Certification Agreement and all other environmental regulations.

Copies of all applicable construction permits will be kept on-site. The lead project construction personnel and construction Project Managers will be required to read, follow and

be responsible for all required compliance activities. A project Environmental Monitor will be responsible for ensuring that all construction permit requirements are adhered to, and that any deficiencies are promptly corrected. The Environmental Monitor will ultimately report to the Project Manager and will provide weekly reports on environmental problems reported or discovered as well as corrective actions taken to resolve these problems. The Environmental Compliance Program will cover avoidance of sensitive areas during construction, waste handling and storage, stormwater management, spill prevention and control and other components required by state and county regulation. Upon identification of an environmental noncompliance issue, the EPC contractor Environmental Monitor will work with the responsible subcontractor or direct hire workers to correct the violation; if not corrected in a reasonable period of time a “stop work” request can be issued for that portion of the work not in compliance with the Project environmental requirements.

#### **2.13.2.1.3 Safety Program**

The EPC contractor, and each subcontractor, will be responsible for construction health and safety issues. The EPC contractor, and each subcontractor, will provide a Health and Safety Coordinator who will ensure that all laws, ordinances, regulations and standards concerning health and safety issues are complied with and that any identified deficiencies are corrected as fast as possible. The EPC contractor Health and Safety Coordinator will report back to EPC contractor corporate management and has the authority to “stop work” when health and safety issues, including EPC subcontractor safety issues, are violated and the health and safety of construction personnel are in danger. Under the EPC contract, the Health and Safety Coordinator position is full time; for the subcontractors it is assumed that this will be a part time responsibility. For health and safety “stop work” orders, the action may only be for a portion of the work that endangers a limited portion of the project site or activities. The project construction procedures will clearly spell out the “stop work” procedures which will require a written action request with justification on the part of the Health and Safety Coordinator. Upon identification of a health and safety issue, the EPC contractor Health and Safety Coordinator will work with the responsible subcontractor or direct hire workers to correct the violation; if not corrected in a reasonable period of time the “stop work” request can be issued.

The “stop work” authority is also given to the project Construction Manager for commercial actions and health and safety issues.

#### **2.13.2.2 QA/QC, Safety and Environmental Inspections, Checks And Reviews**

Safety, Environmental Protection and QA/QC inspections of the major facilities and equipment listed below will typically include, but not be limited to, the following operations, checks and review:

##### **Safety**

- Review of safety procedures;
- Observation and attendance of safety training for supervisors and field staff (tail gate meetings);
- Review of construction safety techniques and implementation;
- Verification of safety incident reports and statistical data.

### **Environmental Protection**

- Review of erosion control and storm water pollution prevention plans;
- Witness of construction implementation;
- Witness of erosion control performance;
- Ensuring sensitive areas are flagged and avoided;
- Inspection of spill sites and cleanup and review of spill reports;
- Continuous inspection for trash and debris removal from the Project site.

### **Wind Turbine Generators and Towers**

- Inspection of turbines at manufacturer's facilities;
- Review and inspection of manufacturer's QA/QC procedures;
- Manufacturing drawing review and verification;
- Verification of welding procedure specifications (WPS) compliance ;
- Material mill certificates tracking system and verification;
- Overall visual inspection (including assembly, fastening systems and welding);
- Inspection of flange interface flatness measurements, finishing and protection;
- Witness or review of turbine run-in load testing;
- Inspection of paint finishing and protection;
- Inspection of painting/marketing/preparation for shipment;
- Verification of field wiring and tagging;
- Pre-Commissioning field testing and verification.

### **Road Construction and Site Preparation**

- Field verification of road locations to site plan and survey markings;
- Review of clearing and grubbing process;
- Verification of adequate road materials and compaction to engineer's specifications;
- Verification of road grade to plans.

### **Concrete/Structural**

- Inspection of batch plant facilities, engineer's review of mix design and break test verification;
- Inspection of forms, structural steel and rebar prior to backfilling and prior to casting;
- Field engineer's witness of concrete pouring;
- Inspection of concrete testing during pour (slump) and verification of break tests results.

### **Electrical Collection System**

- Inspection of cables and trenches prior to burial and backfilling;
- Witness of proper backfilling procedures;
- Inspection of terminations and termination hardware at pad transformers, junction boxes, pad switches, risers, etc.;
- Witness and/or review of polarity, cable marking and phase rotation tests;
- Witness and/or review of grounding system resistance measurements;
- Inspection of all lock-out tag-out locations and energization sequences and plan.

### **Pad-Mount Transformers and Main Substation Transformers**

- Inspection of transformers at manufacturer's facilities;
- Witness and/or review of winding resistance, polarity and phase displacement tests;
- Witness and/or review of no load losses and excitation current at rated voltage and frequency;

- Witness and/or review of impedance voltage and load losses at rated current and rated frequency;
- Witness and/or review of high potential and induced potential tests;
- Witness and/or review of impulse tests, reduced full wave, chopped wave and full wave tests;
- Witness and/or review of regulation and efficiency calculations;
- Verification of compliance to engineering specifications;
- Inspection of painting/tagging/preparation for shipment;
- Verification of field wiring and tagging.

#### **Substation Breakers**

- Witness and/or review of rated continuous current and short circuit tests;
- Witness and/or review of dielectric withstand tests;
- Witness and/or review of switching tests;
- Witness and/or review of insulator tests;
- Witness and/or review of mechanical life tests;
- Witness and/or review of terminal loading tests;
- Witness and/or review of partial discharge tests;
- Verification of compliance to engineering specifications;
- Inspection of painting/tagging/wiring/preparation for shipment;
- Verification of field wiring and tagging.

#### **Substation Relaying and Instrumentation**

- Inspection of manufacturer's facilities
- Verification of instrument and relay compliance to specifications;
- Verification of installation in accordance with drawings;
- Witness and/or review of instrument and relaying calibration;
- Verification of field wiring and tagging.

#### **Substation Structural Steel Work**

- Inspection of manufacturer's facilities;
- Review and inspection of manufacturer's QA/QC procedures;
- Manufacturing drawing review and verification;
- Verification of welding procedure specifications (WPS) compliance ;
- Material mill certificates tracking system and verification;
- Overall visual inspection (including assembly, fastening systems and welding);
- Inspection of flange interface flatness measurements, finishing and protection;
- Inspection of paint finishing and protection.