

A checklist for a Wind Farm Investor for all operational issues in Finland

Are You planning to build a Wind Farm to Finland? Here`s what You need to know as a Wind Farm Owner or a Producer of the mandatory requirements for park operation processes and lean production in Finland:

| Basic information the Service Provider needs for producing operational services | Check |
|---|--------------------------|
| ❖ Location of a wind farm: Coordinates/Address | <input type="checkbox"/> |
| ❖ Connecting point/grid of a wind farm | <input type="checkbox"/> |
| ❖ Grid connection agreement with appendices | <input type="checkbox"/> |
| ❖ Turbine supplier name and turbine type | <input type="checkbox"/> |
| ❖ Nominal production capacity | <input type="checkbox"/> |
| ❖ Status of building permits of the wind farm | <input type="checkbox"/> |

| Relevant stakeholders for operation of a Wind Farm | Check |
|---|--------------------------|
| ❖ Wind farm owner company | <input type="checkbox"/> |
| ❖ S1 qualified person according to Finnish standards for electricity equipment operations | <input type="checkbox"/> |
| ❖ Energy market position owner in Spot market for production trading | <input type="checkbox"/> |
| ❖ Balance Responsible Party for energy market operations | <input type="checkbox"/> |
| ❖ Connecting grid where the production is delivered | <input type="checkbox"/> |
| ❖ Manager of switching operations (outages and switching planning) | <input type="checkbox"/> |
| ❖ Switching operator (local and/or remote operation) | <input type="checkbox"/> |

| Mandatory regulation documentation to operation of the Wind Farm | Check |
|--|--------------------------|
| ❖ Grid compliance documentation: VJV (=Voimalaitosten järjestelmätekniiset vaatimukset*, 2013). Please see: http://www.fingrid.fi/en/customers/connection/Specifications/Pages/default.aspx <small>*System technical requirements of the power plants</small> | <input type="checkbox"/> |
| ❖ TUKES (S1), please see: http://www.tukes.fi/en/Branches/Electricity-and-lifts/Persons-in-charge/Persons-in-charge-in-the-field-of-electricity/ | <input type="checkbox"/> |
| ❖ Nordic Balance Settlement: http://www.esett.com/ | <input type="checkbox"/> |
| ❖ Fingrid, energy market, please see: http://www.fingrid.fi/en/Pages/default.aspx | <input type="checkbox"/> |

| Mandatory requirements | Implementation | Check |
|--|--|--------------------------|
| 1. Green keeping | ❖ Empower's Maintenance and Asset Management Services or separate local up-keeping contractors | <input type="checkbox"/> |
| 2. Maintenance of substation and local production grid | ❖ Empower's Grid Reporting and Follow-up Services ❖ Empower's Management of Interruptions and Connections Service ❖ Empower's Maintenance Services | <input type="checkbox"/> |
| 3. Electrical equipment operation supervision for grid (S1) | ❖ Empower's Management of Interruptions and Connections Service ❖ Empower's Maintenance | <input type="checkbox"/> |
| 4. Maintenance of turbines | ❖ Turbine supplier ❖ Empower's Maintenance Services | <input type="checkbox"/> |
| 5. Management and inspections for warranty period: Turbines and wind Farm Balance of Plant | ❖ Empower's Asset Management Services | <input type="checkbox"/> |
| 6. Electrical equipment operation supervision for turbines (S1) | ❖ Turbine supplier ❖ Empower's Maintenance and Asset Management Services | <input type="checkbox"/> |
| 7. Operation and monitoring of turbines | ❖ Empower's System Services ❖ Empower's Control Room Services | <input type="checkbox"/> |
| 8. Operation and monitoring of local grid | ❖ Empower's System Services ❖ Empower's Control Room Services ❖ Empower's Management of Interruptions and Connections Service | <input type="checkbox"/> |
| 9. Data exchange between TSO and wind Farm (Elcom) | ❖ Empower's System Services | <input type="checkbox"/> |
| 10. Sales of production in Spot market | ❖ Empower's Control Room Services ❖ Local owner of spot position | <input type="checkbox"/> |
| 11. Balance responsible services for position in energy market | ❖ Local balance responsible party services | <input type="checkbox"/> |
| 12. Feed in Tariff reporting | ❖ Empower's Control Room Services ❖ | <input type="checkbox"/> |
| 13. Wind farm management (supervision and coordination of operations on site) | ❖ Empower's Management of Interruptions and Connections Service ❖ Empower's Asset Management Services | <input type="checkbox"/> |

Empower provides the following services for Wind Farm Operation processes:**1. System Services:**

- SCADA system
- Workstations
- Remote Terminal Units
- Signaling system to substations
- Data exchange with other systems
- Video surveillance
- Access control

The monitoring and control services are provided using Empower's SCADA system. Empower is responsible for the functioning of the system and related hardware and services (data connections, connections between different systems, workstations, substations). Empower can also deliver and install needed equipment for services and data-connections (e.g. RTU's, IEC104-connection etc.)

Turbines with a nominal capacity of more than 0,5 MVA and which are connected to the Finnish power system must fulfill "The Specifications for the Operational Performance of Power Plants" (VJV). Real time data delivery to Fingrid with Elcom.

Balance responsibility party (BRP) requires real time data for intra-day electricity market operations. Distribution network operator (DSO) requires real time data for ensuring the status of connection point.

Empower offers services in Security systems from design, installation and implementation into management and administration services. The Empower services encompass the whole lifecycle of the security solution, including adjustments for a dynamically changing environment. In our service concept Empower is responsible of both security systems turnkey deliveries and the administration and update of the system.

2. Control Room services:

- Grid
 - Network operation situation monitoring
 - Remote control of network switchgears
 - Network operation planning
 - Troubleshooting
- Power plant monitoring
- Energy market services
 - Production planning, balance management, production share calculation
 - Electricity trading on behalf of customer (Elspot, Elbas, regulating power)

Continuous service is performed at Empowers Control Room 24/7. Empower ensures the monitoring and operation of the network and/or power plants so that operational reliability in diverse operating situations is kept at the level pursuant to the dimensioning rules. Monitoring includes alarm monitoring and taking the required measures, such as relaying alarm data to maintenance organization in case of persistent failures.

Empower aims to recover the normal state of the network as soon as possible after failures in the regional network and reports the failures that have taken place in the area and resulting measures

Customer and Empower can agree that after an incident or failure Empower will make a report regarding the event (will be done during business hours).

2. Grid Reporting and Follow-up Services

- Incident reporting
- Grid load situation follow-up
- Grid protection situation follow-up

Troubleshooting instructions are prepared for each line section. The troubleshooting instructions will be specified further in cooperation to be in the form of clear network operation and troubleshooting action plan.

A written failure report is prepared afterwards and submitted to the customers as agreed, usually on the next business day. A written failure report is also relayed for equipment owned by the client but controlled by others (eg. Fingrid). Also an annual summary of failures is prepared.

Empower makes proposals on developing the protection of the network due to known structural and other changes taking place in the networks so that the operational reliability of the network can be maintained at a sufficiently high level.

4. Management of Interruptions and Connections (switching operations)

- Management of interruption and connection operations
- Planning of connections
- Planning of operational interruptions

Empower plans and manages all of the connections of the network concerned by the service as assigned by the Client. Empower agrees on the network operation principles with the Client's representative, usually operation manager and with maintenance organization. A preliminary seasonal plan on future network interruptions will be prepared in cooperation with the Client. All of the interruptions required by the Client and customers connected to its network and national grid are collected to the plan by the end of March. This aims to optimize the number of interruptions and merge needs.

A written plan is always prepared for planned connections. There are separate instructions for interruption initiatives and connection decisions. The approved connection decision is a binding plan based on which Empower prepares the connection programme, manages the interruptions, takes care of communication and other contacts with different parties.

5. Maintenance and Asset Management Services

- Wind farm maintenance services
- Wind farm Manager services
- Operation supervisor services

According to Finnish Electrical Safety Act and decree, in order to ensure safe use of electrical equipment, e.g. power generating units, the owner of such electrical equipment must nominate a natural person who will be in charge as Operation Supervisor for its generating units. To act as Operation Supervisor this person has to be certified with the Finnish S1 by SETI Oy.

The Operation Supervisor is responsible for usage and maintenance of all electrical equipment connected to main grid or distribution network so that all electrical equipment will be used according to the Electrical Safety Act and decree instructions.

Empower can take care of task related to substation and other electrical equipment to cover the wind farm grid as a service to the customer. Empower will inform the Safety Technology Authority (Tukes) a name and contact information of the Operation Supervisor.

Where the customer has high demand on the wind farm asset value, but only limited resources to manage and to supervise the actions, Empower can provide services to cover the customer's needs using our expertise on the wind power business and the energy sector. The service target is to enable a smooth runtime for the wind farm by quality up-keeping and professional management supporting the wind farm asset for the customer.

For the management service, we nominate a team that is led by the Wind Farm Manager (WF Manager) and supported by design and specialist personnel that are available to the WF Manager upon all current tasks arising during the service lifetime. The WF Manager will prepare a maintenance plan, manage all scheduled and unscheduled maintenance, perform inspections, supervise the actions and keep a maintenance log record as well as reporting regularly to the customer.

For unscheduled maintenance, Empower can provide services to upkeep sufficient manpower and readiness for locating and handling unexpected faults.

For scheduled maintenance, Empower can provide required services for substation, grid and telecom maintenance works, planning and engineering. Empower's professionals are located around the country in Finland.

For further information, please contact:

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Empower is a multinational service company that builds and maintains electricity and telecom networks, maintains factories and power plants and delivers information management systems and services to energy sector. The company provides services in more than a hundred locations in Finland, Sweden, Norway, Estonia, Latvia and Lithuania. The group's turnover in 2014 was €311 million and it employs some 2,700 persons. www.empower.eu