The paper presents a methodology to assess the electrical infrastructure of a large Offshore Wind Farm (OWF), in terms of availability. With this methodology, the large OWF structure can be assessed to improve the availability of the system. To achieve this, the critical components of the OWF are identified, whose failures lead to high production losses, and their effects are minimized by using dependability analysis methods and proposing new solutions. Moreover, the availability analysis is extended by mapping component failures and consequences in relation to Grid Code requirements. The methodology is based on the bottom-up dependability methods Event Tree Analysis (ETA) and Failure Modes and Effects Analysis (FMEA). These methods prove to complement each other, providing a comprehensive approach to the dependability analysis of large OWFs. FMEA provides a good summary of how single component failures affect the system availability, while ETA supplements FMEA by investigating the effects of multiple component failures along with the application of external conditions.

**Objectives**
- **Primary objective**: To provide a methodology to assess the electrical infrastructure of a large offshore wind farm, in terms of availability.
- Identification of critical components of the OWF, whose failures lead to high production losses.
- **Target** of the project: The electrical infrastructure of large OWFs, including the wind turbine generating units, collection grid, offshore substation, export cable, onshore substation and external grid.
- **Scope** of the project: Large OWFs located in the UK.

**Methods**

**Apr-14**
- Literature review of methodologies for assessing wind farm availability

**May-14**
- Reference OWF definition

**Jun-14**
- Ranking of component failures consequences in terms of availability
- FMEA adjusted and applied to the reference OWF

**Aug-14**
- ETA adjusted and applied to the reference OWF

**Sep-14**
- Generic methodology for enhanced OWF structure in terms of availability

**17-Mar-14**
- Selection of most suitable dependability methods: FMEA, ETA

**Jun-14**
- Mapping of component failures and consequences in relation to Grid Code requirements

**Results**

- **Examples of how OWF availability can be improved**
  - Broader failures for investigation
  - Cold standby redundant cable ends life
  - Transmission: static range of wind power
  - Cold standby redundant import cable
  - Ring connection of WT arrays with CB
  - Cold standby redundant branch of CB
  - Fault and filter

- **Proposed FMEA report**

- **Traditional FMEA report**

- **Example of ET diagram for the reference OWF**

**Conclusions**
- FMEA and ETA most suitable methods, which complement each other
- Conduction first of FMEA and then ETA is recommended
- FMEA and ETA steps have been modified and adjusted