

SCOPE OF WORK

**Optimal High Voltage Technology for Renewable Energy Integration:
Comprehensive Study on Grid Forming Technology**

1. SCOPE OF WORK

The scope of this study includes comprehensive assessments, modeling, and recommendations for Grid Forming (GFM) Technology as detailed below:

1.1. Grid Forming Technology Definition

- Define GFM functionalities such as:
 - Black start capabilities
 - Fault ride-through performance
 - Virtual inertia contribution
 - Voltage and frequency regulation
- Specify technology types, including Grid Forming Inverters and STATCOMs.

1.2. Development of Technical Specifications & Grid Code Integration

- Establish the operational and performance benchmarks for GFM technologies.
- Development of detailed GFM specifications, including technical requirements and performance standards.
- Assessment of Grid Code modifications required to accommodate GFM, ensuring seamless integration with existing infrastructure.
This includes:
 - Specific grid code requirements for compliance assessment and model validation of GFM plants.
 - Operational requirements around firmware/software changes to maintain compliance of GFM plants
 - Ensuring alignment between proposed Grid Code changes and the testing and modeling framework (as detailed in section 1.3 below).

1.3. Testing and Modeling Framework

- Development of a comprehensive testing methodology for GFM, including the identification of key performance indicators (KPIs).
- Establishment of testing procedures and protocols for GFM, ensuring alignment with international standards.
- Development of GFM models for evaluating grid performance under different operating conditions and scenarios.
- Simulation of GFM functionalities and their impact on grid stability and renewable energy integration.

1.4. GFM Placement

- Analysis of optimal GFM placement strategies within NTCSA's grid, considering factors such as grid stability, energy transfer efficiency, and load distribution.
- Evaluation of different GFM placement scenarios and their impact on grid performance.

1.5. GFM Implementation Roadmap

- Outline a phased implementation strategy for deploying GFM technologies over the next decade.
- Address regulatory, operational, and financial considerations.
- Assessment of training and capacity building needs for NTCSA personnel involved in GFM operation and maintenance.