

(Unofficial Translation)

Regulations for Synchronization of Generators with Net Output under 1 MW to the Distribution Utility System

Whereas it is deemed appropriate to have the law on regulations for synchronization of generators with net output under 1 MW to the system of the Distribution Utilities [Metropolitan Electricity Authority (MEA)/ Provincial Electricity Authority (PEA)], the Distribution Utilities hereby issue the regulations as follows:

1. This regulation is called "Regulations for Synchronization of Generators with Net Output under 1 MW to the Distribution Utility System" (hereinafter referred to as the "Technical Regulations").
2. The Technical Regulations shall come into force as from May 2002.
3. The provisions of all other orders and regulations in so far as they have already been provided in the Technical Regulations or are contrary to or inconsistent with the Technical Regulations shall be replaced by the Technical Regulations.
4. In this Technical Regulations, "the Contractor" means an entity who wishes to synchronize a generator with net output under 1 MW to the system of the Distribution Utilities and who has submitted a request to and has entered into a contract with the respective Distribution Utility.

5. General Provisions:

- 5.1 The Contractor shall take control measures not to supply electricity from his generator to the distribution system of the Distribution Utility other than as agreed upon in the contract.
- 5.2 The Contractor's net output capacity to be synchronized to the distribution utility system shall be no greater than 1 MW.
- 5.3 The Contractor shall submit to the respective Distribution Utility for prior approval a completed application form for sale of electricity and system interconnection to synchronize his generator to the distribution system of the utility.
- 5.4 The Contractor shall be responsible for the costs of the power system interconnection, costs of modification of the Distribution Utility's system to facilitate synchronization, and costs of equipment testing. The Contractor may request a written explanation from the Distribution Utility in the case where modifications are required.
- 5.5 The Contractor as well as the respective Distribution Utility shall ensure that protective devices are installed to prevent damage to the power system. The said devices shall meet the specifications prescribed in the regulations for synchronization of generators with net output under 1 MW to the system of the Distribution Utilities. Should any damage occur due to faulty electrical devices or any other cause from either party, that party shall be responsible for the damage.
- 5.6 The Distribution Utilities reserve the rights to rectify, modify, or set conditions for the detailed provision under Item 5.2 for the sake of system safety and security. In this connection, the Distribution Utilities shall provide the Contractor with a written explanation for such changes or conditions. The Contractor shall accept and abide by such changes or conditions. In the event that a dispute arises between the Contractor and the Distribution Utilities, either party may submit a petition to the Chairman of the National Energy Policy Council (NEPC), National Energy Policy Office, 121/1-2 Petchaburi Road, Ratchathewi District, Bangkok 10400. The decision made by the NEPC shall be treated as final.

5.7 The Contractor shall connect his power system to the respective Distribution Utility’s system at the voltage levels commensurate with the Contractor’s net power output to be supplied to the system.

5.7.1 For the MEA system:

5.7.1.1 Net power output of 300 kVA or greater shall be connected at the voltage levels 12-24 kV.

5.7.1.2 Net power output of less than 300 kVA shall be connected at appropriate voltage levels to be determined by the MEA.

5.7.2 For the PEA system:

5.7.2.1 Net power output of 66 kVA or greater shall be connected at the voltage levels 22-33 kV.

5.7.2.2 Net power output of less than 66 kVA shall be connected at appropriate voltage levels to be determined by the PEA

Consideration shall be given to the safety, services standards and benefits to the public in determining the actual amount of capacity to be connected to the distribution utility system.

5.8 For systems with voltages less than or equal to 33 kV, the recording meter shall draw the boundary of responsibility between the Distribution Utility and the Contractor.

6. Criteria for Synchronization of the Contractor's Generator to the Distribution Utility System

6.1 Ranges of Power Supply

6.1.1 Voltage Levels

6.1.1.1 The MEA’s standards of maximum and minimum voltage levels are within the following ranges:

Voltage Level	Normal Circumstances		Exceptional Circumstances	
	Min.	Max.	Min.	Max.
24 kV	21.8	23.6	21.6	24.0
12 kV	10.9	11.8	10.8	12.0
230 V	214	237	209	240
400 V	371	410	362	416

6.1.1.2 The PEA’s standards of maximum and minimum voltage levels are within the following ranges:

Voltage Level	Normal Circumstances		Exceptional Circumstances	
	Min.	Max.	Min.	Max.
33 kV	31.3	34.7	29.7	36.3
22 kV	20.9	23.1	19.8	24.2
220 V	200	240	200	240
380 V	342	418	342	418

The Contractor shall design a control system that is commensurate with the above voltage standards.

6.1.2 Voltage Fluctuation

The Contractor's system shall not cause voltage fluctuation exceeding the voltage fluctuation regulations for the commercial and industrial sectors (PRC-PQG-02/1998) of the three power utilities when it is monitored at the point of common coupling (PCC). The voltage fluctuation regulations may be periodically revised.

6.1.3 Frequency

The Contractor shall maintain the frequency level of his system at 50 ± 0.5 cycles per second (Hz). If this level cannot be maintained, an automatic disconnecting switch is required to disconnect the Contractor's power supply from the distribution utility system within 0.1 second. This setpoint may be occasionally reviewed, as deemed appropriate, or in the event of frequent nuisance tripping due to the volatility of the system voltage.

6.1.4 Power Factor

The operating power factor of the Contractor's generator shall be maintained within the limits defined as follows:

6.1.4.1 Generating systems with inverters: 0.85 lagging or leading when the output exceeds 10% of the inverter rating.

6.1.4.2 Non-inverter or rotating machine generating systems: 0.85 lagging or leading.

6.1.5 Harmonics

The Contractor's generator shall not cause excessive distortions of voltage and current in the distribution utility system. The distortions monitored at the PCC shall not exceed the setpoint specified in the harmonic regulations for the commercial and industrial sectors (PRC-PQG-01/1998) of the three power utilities. The harmonic regulations may be revised periodically.

6.2 Supply of Power to the Distribution Utility System

6.2.1 The Contractor shall not supply electricity to the Distribution Utility's system when there is no current in any part of the distribution system that is connected to the Contractor's system. The Contractor shall ensure that his existing equipment can prevent power distribution to the utility's system at such time.

6.2.2 The Contractor shall be responsible for synchronization to the Distribution Utility's system and shall always acquire authorization from the Distribution Utility prior to synchronization to the system. Exception is for the case of an induction generator or a generating system with inverters or for the case where the Distribution Utility deems appropriate.

6.2.3 Synchronization shall be undertaken at the Generator Breaker or at the Interconnection Circuit Breaker, whichever is the case.

6.3 Disconnecting Switch

The Contractor shall furnish and install a manual disconnecting switch which, when opened, will have the effect of isolating his generator from the Distribution Utility's system. For safety during

system maintenance, the Distribution Utility shall be able to see the edge of the disconnecting switch when it is disconnected. For the group switch system, the disconnecting switch must be lockable when it is disconnected.

6.4 Energy Recording Equipment

6.4.1 If the Contractor's generation system qualifies as a Very Small Renewable Energy Power Producer as defined in the Regulations for the Purchase of Power from Very Small Renewable Energy Power Producers, the Contractor may choose either one meter (configured to record the net of energy generation and consumption) or two meters (one meter recording energy consumption and the other recording energy generation). The type of meter(s) shall be compatible with the customer category of the Contractor.

6.4.2 The Instrument Transformer used for the Distribution Utility's metering shall not be jointly connected to other meters or relays.

6.5 Patterns of the System Interconnection

The Distribution Utility reserves the right to modify or set conditions for patterns of the system interconnection as detailed in the attachments to this Technical Regulations for system safety and security. The Distribution Utility shall provide written explanation for such changes or conditions to the Contractor, who shall accept and abide by such modifications or conditions.

6.6 Protective Devices

6.6.1 Relays: The Contractor shall install relays of standards and a number of types acceptable to the Distribution Utility.

6.6.2 Circuit Breaker: The circuit breaker shall be of a type that requires minimum maintenance care. For a generating system connecting at a medium voltage level, it can be a vacuum or a gas circuit breaker, which can resist the short-circuit current at the installation point. The Distribution Utilities have determined an appropriate level of the short-circuit current on an individual basis.

6.6.3 Automatic Reclosing Schemes: Generally, the Distribution Utility will have automatic reclosing at the transmission system and the aerial feeders system. Therefore, the Contractor shall ensure that his disconnecting switch will properly disconnect power distribution before the utility's Automatic Reclosing is in operation. Otherwise, the Distribution Utility shall not be liable for any damage caused to the Contractor's equipment as a result of such reclosing.

6.6.4 The Distribution Utility may disconnect the generating unit, without prior notice to the Contractor (a) to eliminate conditions that constitute a potential hazard to the utility's personnel or the general public; (b) if emergency conditions exist in the utility's system; (c) if a hazardous condition affecting other generating units is observed by a utility inspection; (d) if the generating unit interferes with the utility's equipment or equipment belonging to other customers of the utility; or (e) if the Contractor has tampered with any protective device. The utility shall, however, notify the Contractor of the emergency if circumstances permit.

Non-Emergency Disconnection: The Distribution Utility may disconnect the generating unit, after reasonable advance notice to the responsible party has been provided, if a planned outage is scheduled on the paralleled line.

Disconnection by the Contractor: The Contractor may disconnect his generating unit from the utility's system at any time.

6.7 Communication Channels

The Contractor shall furnish at least one communication channel that will allow communication with the Distribution Utility at all time.

7. Amendments to the Technical Regulations

Any amendments to the Technical Regulations shall be made with the approval of the Sub-Committee for the Coordination of the Power Utilities' Future Operation.
