

Generating plants black start requirements

Introduction

After total or partial blackout incident, black start capability of generating units in each region is required to re-start themselves without external supply sources and then initially supply electricity to other power plants and supply some load in their region to bring the system back to normal condition in the limited time. Then, there shall be generating plants black start requirements standard to ensure that black start services are provided in case of emergency.

Objective

- Establish black start capability plan which already integrated in the blackout restoration manual after total or partial blackout incident. Black start capability plan shall define appropriate quantity and location of system black start generators.
- To ensure that black start capability plan is applicable in case of emergency.
- Black start capability plan has to be reviewed and updated regularly to ensure that the plan is always ready to use.

Definition

- Necessary load:
The electricity requirement of communication system and station service of control centers or high voltage substations.

Requirement

Regional reliability organizations or control centers shall coordinate with each other as appropriate to define appropriate quantity and location of system black start generators and to develop black start capability plan in order to bring the system back to normal condition in the limited of time after total or partial blackout incident.

The black start capability plan shall include:

1. Conduct database that contains all black start generators designated for use in system restoration plan in respective areas by define:-
 - Name
 - Location

- Dependable capacity (MW)
- Type of unit
- Starting method
- Latest date of black start test

This database must be updated on an annual basis.

2. Demonstration of black start units to perform their intended functions as required in the regional system restoration plan which shall be met through simulation or testing method.
 - Availability of designated black start units
 - Initial transmission switching
3. Define black start unit testing in terms of:-
 - Testing frequency
 - Type of test
 - Minimum duration of each test
4. Review and update the regional black start capability plan at least every 2 years
5. Regional reliability organizations or regional control centers shall provide documentation of their system black start capability plans to audit committee within 30 days of a request.

Standard

1. Each region must have black start generators or power plants designated for use in system restoration plan at least 2 units.
2. Conduct black start test as follows:- (Table 1)

Type of unit	Type of test	Testing frequency	Testing duration
Hydro	- Exercise emergency diesel generator (EDG)	Once a week	10-15 Min.
	- Start EDG - Supply station service - Start-up black start unit - Synchronize to the system	Every 3 months	10-15 Min.
	- Simulate blackout situation (by switching operations) - Start EDG - Supply station service - Start-up black start unit - Supply local load - Synchronize to the system	Every 2 years	Within 30 Min.
Gas turbine	- Exercise EDG - Supply station service (house load)	Once a month	10-15 Min.
	- Simulate blackout situation (by switching operations) - Start EDG - Supply station service - Start-up black start unit - Supply local load - Synchronize to the system	Every 2 years	Within 30 Min.

Table 1 : Black start test

3. Emergency diesel generator can start-up and ready to supply station service within 1 minute.
4. Start-up first generating unit after total or partial blackout incident as follows:-
 - Hydro unit within 10 minutes
 - Gas turbine unit within 20 minutes

5. Black start unit can charge line to other substation in order to supply station service of other power plants or supply necessary load in their region within 30 minutes.
6. The other power plants must be started-up within short period of time according to start-up time defined in their power purchase agreement (PPA).

Measures

1. Database that contains all black start generators designated for use in system restoration plan in respective areas is provided.
2. Demonstration of black start units to perform their intended functions as required in the regional system restoration plan is conducted regularly.
3. Switching orders related to black start test are reviewed and checked in order to confirm that black start unit can charge line to other substation and then supply station service of other power plants or supply necessary load in their region.
4. Black start plants' database must be reviewed and updated as defined earlier the requirement

Compliance

Measures are conducted.

Level of non-compliance

- Level 1 : All of measures are conducted.
- Level 2 : Only 3 measures are conducted.
- Level 3 : Only 2 measures are conducted.
- Level 4 : Only 1 measure is conducted.