

Policy 6 — Operations Planning

Version 2, Draft 2

Policy Subsections

- A. Normal Operations
 - B. Emergency Operations
 - C. Automatic Load Shedding
 - D. System Restoration
 - E. Control Center Backup
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Introduction

Each ~~system, CONTROL AREA, and Region~~ OPERATING AUTHORITY is responsible for maintaining ~~must maintain~~ a set of current plans that are designed to evaluate options and set procedures for reliable operation through a reasonable future time period. In addition, each Operating Authority is responsible for using available personnel and system equipment to implement these plans to assure that interconnected systems reliability will be maintained.

System operations personnel shall ~~seek to~~ participate in the system planning and design study process so that these studies will contain the operators' perspective and the operators will know the intended planning purpose.

(Policy is very high level and uses vague language. Language can be interpreted however the reader would like. Hard to monitor compliance. For example what is the operations planning time horizon? Clarification of what operations planning should be undertaken by CAs versus RCs. Policy may be grossly out dated.)

A. Normal Operations

Criteria *Introduction*

~~Each control area shall plan its future operations in coordination with other affected control areas so that normal interconnection operation will proceed in an orderly and consistent manner.~~

Requirements

1. Each control area shall plan its current-day, next-day, and seasonal operations in coordination with neighboring control areas so that normal interconnection operation will proceed in an orderly and consistent manner. The control area shall coordinate its current-day, next-day, and seasonal operations with all Operating Authorities within its operating area, and its associated Reliability Coordinator.
2. **Planning to meet loads.** Each control area shall plan to be able to meet
 - 4.1. Daily load patterns
 - 4.2. Changes in system load characteristics
 - 4.3. Real reserves
 - 4.4. Voltage and/or reactive profiles
 - 4.5. Interchange schedules
 - 4.6. Generation and transmission maintenance management
 - 4.7. System limits
2. **System studies.** Control Areas shall work in conjunction with facility asset owners within its Control Area boundary to determine System Operating Limits. The Control Area shall ensure that their locally derived System Operating Limits are within simultaneous interconnected transfer capabilities. The results of these system studies ~~pertinent to operations~~ shall be available to the Control Area system operators.
3. **Total Transfer Capability Determination.** Each control area shall utilize the asset owner determined facility ratings to determine the power transfer capabilities within its area and to identify potential operating problems.
 - 4.1. **Determining transfer capability.** Inter-Control Area transfer capability studies shall respect internal and external System Operating Limits. Generating unit and transmission facility outage patterns shall be considered. Studies shall determine additional reactive requirements resulting from reasonable generation and transmission contingencies.
4. **Generator capability verification.** Generating capability verification shall include, among other variables, weather, ambient air and water conditions, and fuel quality and quantity.
5. **Communication of facility status.**
 - 4.1. Generator asset operators shall immediately notify their Control Area operators of changes in capabilities and characteristics including but not limited to:
 - 5.1.1. Changes in real and reactive output capabilities,
 - 5.1.2. Automatic Voltage Regulator status and mode setting

- 4.2. Generation asset operators shall provide a forecast of expected real power output to their Control Areas to assist in operations planning at the Control Area’s request (e.g. a seven-day forecast of real output).
- 4.3. Transmission asset operators shall notify their Control Area operators of changes in capabilities and characteristics including but not limited to:
 - 5.3.1. Changes in transmission facility status
 - 5.3.2. Changes in transmission facility rating
- 4.4. Control Area operators shall communication facility status information to their Reliability Coordinator.
- 6. Computer models. Control Areas shall maintain accurate computer models utilized for analyzing and planning system operations.
- ~~2. Studies of limits and procedures. Appropriate up-to-date studies shall be used as a reference for establishing transmission limits and normal and emergency operating procedures including those for line and equipment loading relief.~~
 - ~~4.1. Load relief procedures. Line and equipment loading relief procedures shall involve those Transmission Operating Entities that have an impact on the overloaded facilities.~~
 - ~~4.2. Access to information. Participants of line and equipment loading relief procedures shall have access to monitored power flows that impact the reliability of the participants’ transmission system.~~

Guides

- ~~1. Planning for transfers. Planned energy transfers should be reviewed ahead of time and compared with expected loads and established transfer limits to ensure that the transfers will not cause any system to violate established reliability criteria.~~
- ~~2. Long range plans. Reviews should be made with planning engineers periodically to ensure that the long range plans will allow for compliance with the NERC Operating Policies.~~
- ~~3. Studies with other systems. Each control area should participate in studies with other systems, when required, to consider:~~
 - ~~4.1. Facilities. The facilities on each system, which may affect the operation of the coordinated area.~~
 - ~~4.2. Generation limits. The operating limitations of generating facilities.~~
 - ~~4.3. Transmission limits. The operating limitations of the system when all transmission facilities are in service.~~
 - ~~4.4. Operating limits. The operating limitations of the system when transmission facilities are scheduled or forced out of service.~~
 - ~~3.5.4.1. Voltage and reactive schedules.~~
- ~~4. Transfer studies between systems. Studies should be made annually (or at such times as bulk system changes warrant) to determine the transfer capability between interconnected control areas.~~
- ~~5. Generator capability studies. Generating capability determination should include, among other variables, weather, ambient air and water conditions, and fuel quality and quantity.~~

~~6. Transfer studies within system.~~ Each control area should determine the power transfer capabilities of its transmission system and identify potential problems by conducting operating studies as required.

~~6.1.4.2. Determining ratings.~~ Thermal, stability, short and long term loading, and voltage limits, plus seasonal (temperature) characteristics, should be considered when determining the ratings on transmission facilities.

~~4.2. Determining transfer capability.~~ Transfer capability studies should consider voltage, reactive, thermal, and stability limits of internal and external system equipment. (Ref: “Transmission Transfer Capability, A Reference Document,” NERC May 1995) Generating unit and transmission facility outage patterns should be considered. Studies should determine additional reactive requirements resulting from reasonable generation and transmission contingencies.

~~7. Computer models.~~ Computer models utilized for analyzing and planning system operations should be renewed and updated as necessary to ensure that they accurately and adequately represent the system.

~~8.7. Uniform line identifiers.~~ Neighboring systems should use uniform line identifiers and ratings when referring to transmission facilities of an interconnected network.

B. Emergency Operations

Criteria

A set of plans consistent with NERC Operating Policies shall be developed, maintained, and implemented as required by each system, control area, pool, and Region to cope with operating emergencies (none of the requirements deal with operating emergencies, mostly just capacity and energy requirements). These plans shall be coordinated with other systems, control areas, pools, and Regions as appropriate. (Perhaps this section of Policy 6 should be merged with policy 5.)

Requirements

1. **Agreements for emergency assistance.** Operating agreements between neighboring systems or pools shall contain appropriate provisions for emergency assistance, including provisions to obtain emergency assistance from remote systems or pools.
2. **Ability to execute procedures.** Plans developed and maintained to cope with operating emergencies shall include procedures that can be executed by system operators.
3. **Authority to shed load.** Each system shall give its system operators the authority to implement manual load shedding when necessary.

Move these 3 requirements into Policy 5A.

Guides

1. **Capacity and energy emergency plans.** Each system or pool should develop capacity and energy emergency plans that will enable it to mitigate, to the fullest extent possible, the effect of a capacity or energy emergency on its customers.
 - 1.1. Appropriate governmental agencies should be apprised of the plans.
2. **Plans shall include...** The capacity and energy emergency plans should include or consider the following items: This list is not complete. What about reserve sharing and shared activation of reserves?
 - 2.1. **Coordinating functions.** The functions to be coordinated with and among neighboring systems.
 - 2.2. **Fuel supply and inventory.** An adequate fuel supply and inventory plan which recognizes reasonable delays or problems in the delivery or production of fuel.
 - 2.3. **Fuel switching.** Fuel switching plans for units for which fuel supply shortages may occur, e.g., gas and light oil.
 - 2.4. **Environmental constraints.** Plans to seek removal of environmental constraints for generating units and plants.
 - 2.5. **System energy use.** The reduction of the system's own energy use to a minimum.

Do any of these guides need to be moved to the requirements section?

- 2.6. **Public appeals.** Appeals to the public through all media for voluntary load reductions and energy conservation including educational messages on how to accomplish such load reduction and conservation.
 - 2.7. **Load management.** Implementation of load management and voltage reductions, if appropriate.
 - 2.8. **Optimize fuel supply.** The operation of all generating sources to optimize the availability
 - 2.9. **Appeals to customers to use alternate fuels.** In a fuel emergency, appeals to large industrial and commercial customers to reduce non-essential energy use and maximize the use of customer-owned generation that rely on fuels other than the one in short supply.
 - 2.10. **Interruptible and curtailable loads.** Use of interruptible and curtailable customer load to reduce capacity requirements or to conserve the fuel in short supply.
 - 2.11. **Maximizing generator output and availability.** The operation of all generating sources to maximize output and availability. This should include plans to winterize units and plants during extreme cold weather.
 - 2.12. **Notifying IPPs.** Notification of cogeneration and independent power producers to maximize output and availability.
 - 2.13. **Requests of government.** Requests to appropriate government agencies to implement programs to achieve necessary energy reductions.
 - 2.14. **Load curtailment.** A mandatory load curtailment plan to use as a last resort. This plan should address the needs of critical loads essential to the health, safety, and welfare of the community. [Address firm load curtailment.](#)
 - 2.15. **Notification of government agencies.** Notification of appropriate government agencies as the various steps of the emergency plan are implemented.
3. **Coordination of emergency plans.** Each Region, system, and/or pool should participate in the coordination of capacity and energy emergency plans and actions to maximize mutual aid during such emergencies. The following steps should be taken:
 - 3.1. **Communications.** Establish and maintain reliable communications between interconnected systems.
 - 3.2. **Interchange agreements.** If existing interchange agreements cannot be used, new agreements should be arranged to provide for emergency capacity or energy transfers.
 - 3.3. **Maintenance coordination.** Coordinate transmission and generator maintenance schedules to maximize capacity or conserve the fuel in short supply. (This includes water for hydro generators.)
 - 3.4. **Energy deliveries.** Arrange deliveries of electrical energy or fuel from remote systems through normal operating channels.

C. Automatic Load Shedding

Criteria

After taking all other remedial steps, a system or control area whose integrity is in jeopardy due to insufficient generation or transmission capacity shall shed customer load rather than risk an uncontrolled failure of components of the interconnection. [\(Perhaps this section of Policy 6 should be merged with policy 5.\)](#)

Requirements

1. **Plans for automatic load shedding.** Each system shall establish plans for automatic load shedding.
 - 1.1. **Coordination.** Load shedding plans shall be coordinated among the interconnected systems.
 - 1.2. **Frequency or voltage level.** Automatic load shedding shall be initiated at the time the system frequency or voltage has declined to an agreed-to level.
 - 1.2.1. **Load shedding steps.** Automatic load shedding shall be in steps related to one or more of the following: frequency, rate of frequency decay, voltage level, rate of voltage decay or power flow levels.
 - 1.2.2. **Minimizing risk.** The load shed in each step shall be established to minimize the risk of further uncontrolled separation, loss of generation, or system shutdown.
 - 1.2.3. **Underfrequency load shedding on separation.** After a system or control area separates from the Interconnection, if there is insufficient generating capacity to restore system frequency following automatic underfrequency load shedding, additional load shall be shed manually.
 - 1.2.4. **Coordination with generator, et al, tripping.** Automatic load shedding shall be coordinated throughout the Region with underfrequency isolation of generating units, tripping of shunt capacitors, and other automatic actions which will occur under abnormal frequency, voltage, or power flow conditions.

Guides

1. **Load shedding studies.** Automatic load shedding plans should be based on studies of system dynamic performance, simulating the greatest probable imbalance between load and generation.
 - 1.1. **Unacceptable results.** Plans to shed load automatically should be examined to determine if unacceptable overfrequency, overvoltage, or transmission overloads might result.
 - 1.1.1. **Action on overfrequency.** If overfrequency is likely, the amount of load shed should be reduced or automatic overfrequency load restoration should be provided.
 - 1.1.2. **Action on overvoltage.** If overvoltages are likely, the load shedding program should be modified to minimize that probability.

2. **Local area considerations.** When scheduling load to be shed automatically, the system should consider its local area requirements and transmission capabilities between areas.

3. **Automatic isolation plan.** A generation-deficient control area may establish an automatic isolation plan in lieu of automatic load shedding, if by doing so it removes the burden it has imposed on the Interconnection. This isolation plan may be used only with the consent of neighboring systems, and if it leaves the remaining bulk electric system intact.

D. System Restoration

[Policy 5E – Emergency Operations–System Restoration]

Criteria

Each system, control area, and Region shall develop and periodically update a logical plan to reestablish its electric system in a stable and orderly manner in the event of a partial or total shutdown of the system.

This plan shall be coordinated with other control areas in the interconnection to assure a consistent Interconnection restoration plan.

A reliable and adequate source of startup power for generating units shall be provided. Where sources are remote from the generating unit, instructions shall be issued to expedite availability. Generation restoration steps shall be verified by actual testing whenever possible.

System restoration procedures shall be verified by actual testing or by simulation. (Perhaps this section of Policy 6 should be merged with policy 5.) Perhaps have one standard

Requirements

1. **Restoration plan.** Each system shall establish a restoration plan with necessary operating instructions and procedures to cover emergency conditions, including the loss of vital telecommunications -channels.
 - 1.1. **Restoration plan update.** The restoration plan shall be updated, as necessary, to reflect changes in the power system network and to correct deficiencies found during the simulated restoration exercises.
 - 1.2. **Restoring the Interconnection.** Restoration plans must be developed with the intent of restoring the integrity of the Interconnection.
 - 1.3. **Coordination.** Restoration plans shall be coordinated with neighboring systems.
 - 1.4. **Testing telecommunications.** Telecommunication facilities needed to implement the plan shall be periodically tested.
2. **System operator training.** Operating personnel shall be trained in the implementation of the plan. Such training should include simulated exercises, if practicable.
3. **Procedure testing.** System restoration procedures shall be verified by actual testing or by simulation.

Guides

1. **Operation at abnormal voltage and frequency.** Generators and their auxiliaries should be able to operate reliably at abnormal voltages and frequencies.
2. **Generator shutdown and restart.** Emergency sources of power should be available to facilitate safe shutdown, enable turning gear operation, minimize the likelihood of damage to either generating units or their auxiliaries, maintain communications, and expedite restarting.
3. **Emergency power source.** Each generating plant should have a source of emergency power to expedite restarting.

- 3.1. Hydroelectric plants should have internal provisions for restarting.
- 3.2. Station service busses. Where station service generators are used in parallel with the system, station auxiliary busses should be separated automatically from the system before the frequency has decayed sufficiently to adversely affect the station service units.
- 3.3. Station service and area security. The effect of station service generators on area security should be considered before they are shut down for economy.
- 3.4. Outside startup power source. Where an outside source of power is necessary for generating unit startup, switching procedures should be prearranged and periodically reviewed with system operators and other operating personnel.
4. **Startup and shutdown plans.** Each control area should have written plans for orderly start-up and shutdown of the generating units.
 - 4.1. **Updates.** These plans should be updated when required.
 - 4.2. **Drills.** Drills should be held periodically to assure that plant operators are familiar with the plans.
5. **Blackstart testing.** Periodic tests should be made to verify blackstart capability.
6. **Synchroscope calibration.** All synchrosopes should be calibrated in degrees, and phase angle differences at interconnection points should be communicated in degrees.
7. **Synchronizing locations and procedures.** System operators should know the preplanned synchronizing locations and procedures. Procedures should provide for alternative action to be taken in case of lack of information or loss of communication channels that would affect resynchronizing.
8. **Protection systems.** Proper protection systems should be considered in the restoration sequence. Relay polarization sources should be maintained during the process.
9. **Telecommunications considerations.** Backup voice telecommunications facilities, including emergency power supplies and alternate telecommunications channels, should be provided to assure coordinated control of operations during the restoration process.
10. **Master trip points.** Control centers using SCADA systems should consider providing master trip points for each station to expedite the restoration process.

E. Control Center Backup

Criteria

Each control area shall have a plan to continue operation in the event its control center becomes inoperable. [\(Perhaps this section of Policy 6 should be merged with policy 5.\)](#)

Guides

1. **Must not burden the Interconnection.** The standards of Policy 1 should be considered when developing the plan to continue operation so that the control area will not be a burden to the Interconnection if its own control center becomes inoperable.
 - 1.1. **Location of backup center.** If the control area has a backup control center, it should be remote from the primary control center site.