Comment Version

Comments due February 27, 2004

NERC Reliability Functional Model Technical Document

- ***Entity Responsibilities and Interrelationships***
- ***Technical Discussions***

This document is a companion to Version 2 of the Functional Model and includes explanations, opinions, and discussions of the Functional Model Review Task Group and Planning Reliability Model Task Force.

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Comment Example

1. Reliability Authority

See "Electrical and Physical Boundaries" for a description of the Reliability Authority Area.

The Reliability Authority is the highest-level authority and can direct all operational reliability functions within its **Reliability Authority Area**[1] The Reliability Authority determines Interconnected Reliability Operating Limits[2] based upon Transmission and Generation Owners' specified equipment ratings, system operating limits calculated by the Transmission Operator(s), plus system studies. The Reliability Authority monitors its Reliability Authority Area to ensure the system operates within its th[illegible] stability limits. The Reliability Authority monitors and ensures trans[illegible] reliability at all times. It also specifies the requirements for Interconn[illegible] Services to ensure transmission reliability.

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The Reliability Authority's purview must be broad enough to enable[illegible] Interconnection Reliability Operating Limits, which may be based o[illegible] parameters of other transmission systems beyond the Transmission C[illegible] The Transmission Operator is responsible for the reliability of its "lo[illegible] system, and may not be aware that its system is violating an Intercon[illegible] Operating Limit. Therefore, the Reliability Authority may direct the Transmission Operators or Balancing Authorities to take action to mitigate Operating Reliability Limits.

The Reliability Authority also assists the Transmission Operator in relieving equipment or facility overloads through transmission loading relief measures if market-based dispatch procedures are not effective.

Role in approving Transactions. The Reliability Authority approves Transactions with respect to transmission reliability and provides its approval or denial to the Interchange Authority.

Comments – 1. Reliability Authority

Add relationship between the Reliability Authority and Planning Authority.

Therefore, the Reliability Authority ~~may~~ must have the authority to direct the Transmission Operators or Balancing Authorities to take action to mitigate Interconnection ~~Operating~~ Reliability Operating Limits.

[1] There is a "reliability function" performed at all levels of the transmission system. For example, the Transmission Operator provides an operating reliability function that covers a more "local" level. This is briefly mentioned in the Transmission Operator section on Page.

[2] **Interconnection Reliability Operating Limit (IROL).** The value (such as MW, MVar, Amperes, Frequency, or Volts) derived from, or a subset of, the system operating limits, which if exceeded, could expose a widespread area of the bulk electrical system to instability, uncontrolled separation(s) or cascading outages. (*Excerpt from Operating Limits Definition Task Force report to the NERC Operating Committee, March 2003*)

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Functional Model Review Task Group and Planning Reliability Model Task Force .5757~~52~~

Introduction

As it spent many months discussing and debating the details of the Functional Model, the Functional Model Review Task Group prepared this companion document to record its thoughts and conclusions. The Task Group hopes this companion to the Functional Model will help the reader better understand the functions and the relationships between and among the responsible entities that perform the functions.

Section 1 provides details about each of the responsible entities. Some entities, such as the Transmission Owner or Purchasing-Selling Entity, are adequately described in the Functional Model document, and there is little detail to add here. Others, such as the Interchange Authority and Balancing Authority, are more complex both unto themselves and in their relationship with other functions, and this document provides additional explanations. Descriptions of the three new Planning functions and their interrelationships between and among these functions and the other functions in the Model is included in this section.

Section 2 includes technical discussions on related topics and tasks such as managing bilateral transactions, task assignment and delegation, the Planning functions, and boundary conditions. Many of these topics are mentioned in the Functional Model, but the details may not be obvious.

The discussion of Market Structures helped the Task Group understand the various types of markets and pools and conclude that the Model was not dependent on any particular market structure or pool "depth." The Task Group retained these discussions for future reference.

The Task Group spent considerable time deliberating over the role of a "scheduling agent" or the notion of non-coincident resource dispatcher (Market Operator) and Balancing Authority Areas, only to decide that these functions were not readily separable from the Balancing Authority. The Task Group kept these discussion as well.

Comments – Introduction

We recognize and accept the value of a companion document of an illustrative and explanatory nature. However, material relating directly to responsibilities, such as entity boundaries or identities needs to be approved as part of the model or in a separate process such as a standard.

Section 1 – Entity Responsibilities and Interrelationships

2. Reliability Authority

See "Electrical and Physical Boundaries" for a description of the Reliability Authority Area.

The Reliability Authority is the highest-level authority and can direct all operational reliability functions within its **Reliability Authority Area**[3] The Reliability Authority determines Interconnected Reliability Operating Limits[4] based upon Transmission and Generation Owners' specified equipment ratings, system operating limits calculated by the Transmission Operator(s), plus system studies. The Reliability Authority monitors its Reliability Authority Area to ensure the system operates within its thermal, voltage, and stability limits. The Reliability Authority monitors and ensures transmission system reliability at all times. It also specifies the requirements for Interconnected Operations Services to ensure transmission reliability.

The Reliability Authority's purview must be broad enough to enable it to calculate Interconnection Reliability Operating Limits, which may be based on the operating parameters of other transmission systems beyond the Transmission Operator's vision. The Transmission Operator is responsible for the reliability of its "local" transmission system, and may not be aware that its system is violating an Interconnection Reliability Operating Limit. Therefore, the Reliability Authority may direct the Transmission Operators or Balancing Authorities to take action to mitigate Operating Reliability Limits.

The Reliability Authority also assists the Transmission Operator in relieving equipment or facility overloads through transmission loading relief measures if market-based dispatch procedures are not effective.

Role in approving Transactions. The Reliability Authority approves Transactions with respect to transmission reliability and provides its approval or denial to the Interchange Authority.

Comments – 1. Reliability Authority

[3] There is a "reliability function" performed at all levels of the transmission system. For example, the Transmission Operator provides an operating reliability function that covers a more "local" level. This is briefly mentioned in the Transmission Operator section on Page 6.

[4] **Interconnection Reliability Operating Limit (IROL).** The value (such as MW, MVar, Amperes, Frequency, or Volts) derived from, or a subset of, the system operating limits, which if exceeded, could expose a widespread area of the bulk electrical system to instability, uncontrolled separation(s) or cascading outages. (*Excerpt from Operating Limits Definition Task Force report to the NERC Operating Committee, March 2003*)

Day-ahead analysis. The Reliability Authority will receive the dispatch plans from the Balancing Authority on a day-ahead basis.[5] The Reliability Authority will then analyze the dispatch from a transmission reliability perspective. If the Reliability Authority determines that the Balancing Authority's dispatch plans will jeopardize transmission reliability, the Reliability Authority will work with the Balancing Authority to determine where the dispatch plans need to be adjusted. The Reliability Authority has the "final say" in the generation dispatch.

The Reliability Authority obtains generation and transmission maintenance schedules from Generator Operators and Transmission Operators. The Reliability Authority can deny a transmission outage request if transmission system reliability would be adversely affected.

Emergency actions. The Reliability Authority is responsible for real-time system reliability, which includes calling for the following emergency actions:

- Curtailing Transactions
- Directing redispatch to alleviate congestion
- Mitigating energy and transmission emergencies, and
- Ensuring energy balance and Interconnection frequency.

The Reliability Authority, in collaboration with the Balancing Authority and Transmission Operator, can invoke public appeals, voltage reductions, demand-side management, and even load shedding if the Balancing Authority cannot achieve resource-demand balance.

[5] These dispatch plans may have been developed by the Market Operator.

3. Planning Authority

The Planning Authority ensures a long-term (generally 1 year and beyond) plan is available for adequate resources and transmission within its Planning Authority Area. That area encompasses a defined area and the customer demands therein. It may be smaller than, equal to, or larger than that of a Reliability Authority or a Regional Reliability Council.

In providing analyses and reports on the long-term resource and transmission plan(s) for the Planning Authority Area, the Planning Authority may also:

- Assess and publish industry trends (demands, transmission, and resources) within the Planning Authority Area in the time frame of generally 1 year and beyond, and

- Provide reports and data, as requested or required, to the Standards Developer, Compliance Monitor, Regional Councils, NERC, regulatory authorities, and governmental agencies.

Even when the transmission and resource plans developed by the Transmission Planners and Resource Planners comply with reliability standards, the Planning Authority will monitor the implementation of the transmission and resource plans, including the tracking of generating capacity, demand program, and transmission in-service dates. It will also evaluate the impact of revised transmission and generator in-service dates on transmission and resource adequacy.

In its evaluation of resource plans, the Planning Authority will likely review the conversion of various resource adequacy requirements and methodologies into equivalent resource capacity (or reserve) margins (or requirements) for use within the Planning Authority Area.

Comments – 2. Planning Authority

4. Balancing Authority

See "Electrical and Physical Boundaries"

The Balancing Authority operates within the metered boundaries that establish the **Balancing Authority Area**. Every generator, transmission facility, and end-use customer must be in a Balancing Authority Area. The Balancing Authority's mission is to maintain the balance between loads and resources in real time within its Balancing Authority Area by keeping its actual interchange equal to its scheduled interchange and providing its frequency bias obligation. The load-resource balance is measured by the Balancing Authority's Area Control Error (ACE) defined as:

$$ACE = (I_A - I_S) - 10\beta(f_A - f_S)$$

Perfect balance occurs when ACE = 0; however, perfect balance requires perfect resource control, which is impossible. Therefore, NERC's reliability standards require that the Balancing Authority maintain its ACE within acceptable limits.

Maintaining resource-demand balance within the Balancing Authority Area requires four types of resources management, all of which are the Balancing Authority's responsibility:

1. Frequency control through tie-line bias
2. Regulation service deployment
3. Load-following through generator dispatch
4. Interchange implementation

See "Task Responsibilities and Delegation"

Regulation service deployment. To maintain its ACE within these acceptable limits, the Balancing Authority controls a set of generators within its Balancing Authority Area that are capable of providing regulation service[6].

Generator dispatch. The Functional Model assumes that the organization that serves as the Balancing Authority is also performing the generator commitment and economic dispatch. Included in the commitment and dispatch tasks is the designation of those resources that are available for regulation service.

Interchange. The Balancing Authority receives Interchange Schedules from one or more Interchange Authorities, and enters those Transactions into its energy management system.

Generation commitment and schedules from Load-Serving Entities. The Balancing Authority also receives generator commitment and dispatch schedules from the Load-Serving Entities who have bilateral arrangements for generation within the Balancing Authority Area. The Balancing Authority provides this commitment and dispatch schedule to the Reliability Authority.

[6] Regulation service is one of the NERC-defined Interconnected Operations Services. The Balancing Authority is said to "deploy" this service when it controls the generators that are available for regulation.

Role in approving Transactions. The Balancing Authority approves bilateral transactions with respect to the ramping requirements of the generation that must increase or decrease to implement those transactions. The Balancing Authority provides its approval or denial to the Interchange Authority.

Energy Emergencies. In the event of an Energy Emergency, the Balancing Authority can implement public appeals, demand-side management programs, and, ultimately load shedding[7]. Obviously, it must do this in concert with the Reliability Authority.

See "Managing Bilateral Transactions"

Failure to balance. The Balancing Authority must take action, either under its own initiative or direction by the Reliability Authority, if the Balancing Authority cannot comply with NERC's reliability standards regarding frequency control and Area Control Error.

Comments – 3. Balancing Authority

[7] The Balancing Authority can not implement voltage reductions because it does not control the distribution system. Voltage reductions are accomplished by the Transmission Operator under the direction of the Reliability Authority

5. Resource Planner

The Resource Planner develops a long-term (generally 1 year and beyond) plan for the resource adequacy of specific loads (customer demand and energy requirements) within a Planning Authority Area.

This Resource Planning function may be performed by one or more Resource Planners within the Planning Authority Area. The resource plans may include generation capacity from resources outside of the Planning Authority Area.

In some markets it may be required that the same entity be the Resource Planner as well as the Planning Authority. For example, the Resource Planner may also be the Planning Authority in those markets where there are no entities responsible or obligated to serve load. In these cases, the Planning Authority identifies the need for additional resources to be provided by the market.

In developing resource plans, the Resource Planner will also collect and develop related resource information for planning purposes from other entities, including:

- Demand and energy end-use customer forecasts from the Load-Serving Entities,
- Demand management data and programs,
- Generator unit performance characteristics and capabilities from Generator Owners and others, and
- Information on existing and proposed new capacity purchases and sales.

In developing and reporting its resource plans to the Planning Authority for assessment and compliance with reliability standards, the Resource Planner will be expected to:

- Identify those resources that may be considered firm resources (e.g., under contract, under construction, environmental permits in place, etc.),
- Verify that resource plans meet adequacy resource requirements or identify resource deficiencies, and
- Work with the Planning Authority to identify potential alternative solutions to meet resource requirements should the resource plans be deficient.

In reporting on resource plan implementation to the Planning Authority, the Resource Planner should provide:

- The tracking of capacity and demand program in-service dates, and
- An evaluation of revised transmission and generation in-service dates on resource adequacy.

Comments – 4. Resource Planner

6. Transmission Operator

The Transmission Operator is designated by the Transmission Owner, and operates or directs the operation of the transmission facilities, and is responsible for local reliability functions. The Transmission Operator is responsible for reliably operating the transmission system within its purview by maintaining proper voltage profiles and honoring transmission equipment limits established by the Transmission Owner. The Transmission Operator is under the Reliability Authority's direction and can take action, such as implementing voltage reductions, to help mitigate an Energy Emergency.

Maintenance. The Transmission Owner provides the overall maintenance plans and requirements for its equipment, specifying, for example, maintenance periods for its transformers, breakers, and the like. The Transmission Operator must then develop the detailed maintenance schedules (dates and times) based on the Transmission Owner's maintenance plans and requirements, and provide those schedules to the Reliability Authority and others as needed.

The Transmission Operator may also physically provide or arrange for transmission maintenance, but it does this under the direction of the Transmission Owner who is ultimately responsible for maintaining its transmission facilities.

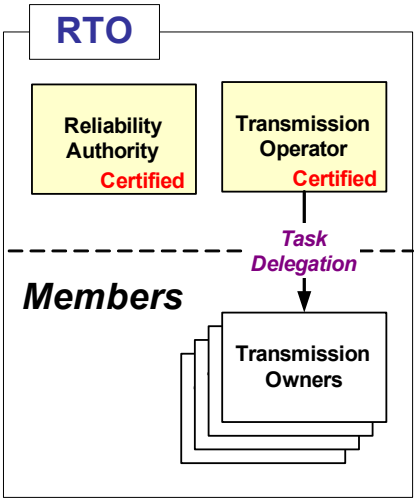


Figure 1 - Transmission Operator bundled with Reliability Authority.

Bundled with the Reliability Authority or Transmission Owner

The Transmission Operator may be a separate organization. However, in many cases the Transmission Operator is bundled with either the Reliability Authority or the Transmission Owner.

Bundled with Reliability Authority. For example, consider an RTO with several members (Figure 1). The RTO registers with NERC as a Reliability Authority and Transmission Operator and is NERC-certified for both. The RTO then delegates some of the Transmission Operator tasks as appropriate to its members. Regardless of this delegation, the RTO remains the entity responsible for complying with all reliability standards associated with the Reliability Authority and Transmission Operator, and would be NERC-certified for both.

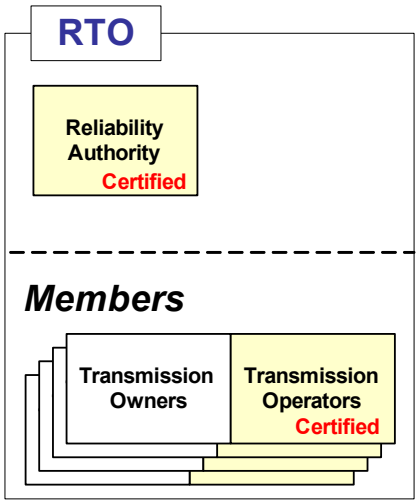


Figure 2 - Transmission Operator bundled with the Transmission Owner.

Bundled with the Transmission Owner. In other situations, the RTO registers with NERC as the Reliability Authority, and its members register as Transmission Owners and Transmission Operators. In this case, the RTO is responsible for complying with all reliability standards associated with the Reliability Authority function and would be a NERC-certified RA. The RTO members, who are typically the Transmission Owners, would be responsible

for complying with all reliability standards associated with the Transmission Operator, and would be NERC-certified.

Comments – 5. Transmission Operator

The section should begin "The Transmission Operator ~~is designated by~~ , under an agreement with the Transmission Owner, ~~and~~ operates or directs the operation of the transmission facilities …". The original words suggest the Transmission Owner has discretion regarding the choice of operator - this is not always the case. However, there is invariably an agreement when the operator and owner are distinct entities.

7. Interchange Authority

See "Managing Bilateral Transactions"

The Interchange Authority provides a service very similar to the Tag Authority that is now assigned to the Sink Control Area. That is, it collects approvals or denials from the other reliability functions — Reliability and Balancing Authorities, and Transmission Service Providers — and verifies the validity of the source and sink.

The Scheduling Agent performs a service for a group of Balancing Authorities. See "Managing Bilateral Transactions" for additional details.

The Interchange Authority provides the Balancing Authority with the individual bilateral Interchange Transactions as well as the "net" of those Transactions, which is the net interchange from that Interchange Authority that the Balancing Authority enters into its energy management system. The Balancing Authority must track the individual Transactions in case one or more of them are curtailed by the Reliability Authority, or by the Balancing Authority in those cases where the generator or load is interrupted. The net Interchange Schedule is used by the Balancing Authority for checkout with the Interchange Authority.

All bilateral Transactions *that cross both a Balancing Authority Area boundary* must be authorized by the Interchange Authority.

The Interchange Authority function is not needed to manage Bilateral Transactions that are internal to a Balancing Authority Area.

Assessing ramping capability and reliability. The Balancing Authority (or Scheduling Agent for those cases where the transaction is between Resource Dispatch Areas with multiple Balancing Authority Areas) also approves the capability to ramp the Transactions in or out and the Reliability Authority performs a reliability assessment to make sure the Transaction will not jeopardize the integrity of the Transmission System.

Confirming transmission arrangements. The Transmission Service Provider is responsible for approving the Transaction by confirming to the Interchange Authority that there is a valid transmission service arrangement. During the authorization process, the Interchange Authority sends the "tag"[8] to each Transmission Service Provider on the scheduling path. Thus, even if the Interchange Authority had determined that the source and sink are "valid" generator and load busses, if the Transmission Service Provider, upon reviewing the "tag," does not believe the source and sink information is equivalent to the source-sink information that was provided when the transmission service was arranged, then it can inform the Interchange Authority that it (the TSP) does not approve the Transaction.

Ensuring balanced, valid Interchange Transactions. The Interchange Authority also ensures that the resulting Interchange Transactions are balanced and valid prior to physical delivery. This means:

1. The source MW must be equal to the sink MW (plus losses if they are "self-provided"), and

[8] We use the term "tag" because of its familiarity. It refers in the general sense to the collection of data that defines a Transaction, not specifically to the "E-tag" or ERCOT tagging system.

2. The Transactions are between valid sources and sinks (see "Handling Partial Path Transmission Arrangements below), and
3. There is a (continuous) transmission arrangement from the Source to the Sink.

Only when it receives approvals from the Transmission Service Provider, Balancing Authority, and Reliability Authority, does the Interchange Authority direct the source and sink Balancing Authorities to implement the Transaction. If any of these three — TSP, BA, or RA — do not approve the Transaction, then the Interchange Authority cannot authorize the transaction.

Handling "Partial Path" Transmission Arrangements. The NERC Operating Manual defines a **Transaction** as "An agreement arranged by a Purchasing-Selling Entity to transfer energy from a seller to a buyer." For the purposes of the Functional Model, it is important that adequate information be provided to enable the Reliability Authority to properly assess the impact of a Transaction ready to "go physical" on the Interconnection. This does not mean that the Functional Model prohibits partial path transmission arrangements. It does mean that when the Purchasing-Selling Entity is ready for the Transaction to be handed off to the Interchange Authority for physical implementation, the PSE must "link" those partial paths so that the Reliability Authority can study the effects of the transaction on the transmission system under its purview. Until the Reliability Authority has a valid source and sink on which to base its study, knowing the partial path is of no use, and there is no reason for the Purchasing-Selling Entity to submit a partial path arrangement to the Interchange Authority.

Curtailments. The Interchange Authority coordinates curtailments ordered by the Reliability Authority by notifying the Balancing Authorities, Transmission Service Providers, and Purchasing-Selling Entities. The Interchange Authority also communicates and coordinates the resulting modified Interchange Schedules that resulted from the curtailments. This should also help remedy the myriad problems with inadvertent balancing that the Eastern and Western Interconnections are experiencing today.

Comments – 6. Interchange Authority

8. Transmission Planner

In developing plans for transmission service and interconnection requests beyond one year, the Transmission Planner is expected to coordinate and jointly plan with other Transmission Planners, as appropriate, to ensure new facilities do not adversely affect the reliability of neighboring transmission systems.

In reporting its transmission expansion plan to the Planning Authority, the Transmission Planner is also expected to verify that its plans for new or reinforced facilities meet reliability standards or identify the transmission deficiencies. The Transmission Planner is to work with the Planning Authority to identify potential alternative solutions, including solutions proposed by stakeholders, to meet interconnected bulk electric system requirements.

The Transmission Planner, in connection with monitoring and reporting its transmission plan implementation to the Planning Authority, should address:

- Transmission facility in-service dates,
- Coordination with Transmission Operators on projects requiring transmission outages that can impact reliability and firm transactions, and
- The impact of revised transmission in-service dates on transmission and resource adequacy.

Comments – 7. Transmission Planner

9. Transmission Service Provider

The Transmission Service Provider is designated by the Transmission Owner, and authorizes the use of the Transmission System. In most cases, the Transmission Service Provider is the tariff administrator.

See "Interchange Authority," Section "Confirming transmission arrangements"

Role in approving Transactions. The Transmission Service Provider approves Interchange Transactions by comparing the transmission service previously arranged by the transmission customer (Purchasing-Selling Entity, Generator Owner, Load-Serving Entity) with the transmission information supplied by the Interchange Authority. The Transmission Service Provider then provides its approval or denial to the Interchange Authority.

Providing Transmission Service. As its name implies, the Transmission Service Provider is responsible for providing transmission service to transmission customers, such as Generator Owners, Load-Serving Entities, and Purchasing-Selling Entities. The Transmission Service Provider determines Available Transfer Capability and coordinates ATC with other Transmission Service Providers. The Transmission Service Provider manages the requests for transmission service according to the Transmission Owner's tariff, and within the operating reliability limits determined by the Reliability Authority. The Transmission Service Provider does not itself have a role in maintaining system reliability in real time — that is the Reliability Authority's and Transmission Operator's responsibility.

The Transmission Service Provider arranges for transmission loss compensation with the Balancing Authority.

Comments – 8. Transmission Service Provider

The first sentence should read: "The Transmission Service Provider, under an agreement with ~~is designated by~~ the Transmission Owner, ~~and~~ authorizes the use of the Transmission System. See same comment regarding Transmission Operator.

10. Transmission Owner

The Transmission Owner owns and maintains its transmission facilities. It also specifies equipment operating limits, and supplies this information to the Transmission Operator, Reliability Authority, Transmission Planner, and Planning Authority.

In many cases, the Transmission Owner would have contracts or interconnection agreements with generators or other transmission customers that would detail the terms of the interconnection between the Owner and customer.

See "Transmission Operator," Section "Bundling with the Reliability Authority or Transmission Owner"

Relationship with the Transmission Operator. The Transmission Owner may also operate its transmission facilities and register with NERC as a Transmission Operator. In that case, it would also need to apply for organization certification as a Transmission Operator.

On the other hand, the Transmission Owner may arrange for another organization to operate its transmission facilities.

Comments – 9. Transmission Owner

11. Distribution Provider

The Distribution Provider provides the physical connection between the end-use and the electric system. For those end-use customers who are served at transmission voltages, the Transmission Owner also serves as the Distribution Provider. Thus, the Distribution Provider is not defined by a specific voltage, but rather as performing the Distribution function at any voltage.

The Distribution Provider is responsible for "local" safety and reliability. The Distribution Provider knows which customers are "critical" loads that should be shed only as a last resort, and provides the switches and reclosers for this emergency action. The Distribution Provider may need to demonstrate load-shedding capability to the Balancing Authority and Transmission Operator.
We may find the same organization serving as the Distribution Provider and Load-Serving Entity, but they may be separate organizations as well. Unlike the Load-Serving Entity, the Distribution Provider does not take title to any energy. However, in many cases an organization, such as a vertically integrated utility, may bundle these functions together.

Comments – 10. Distribution Provider

12. Generator Operator

The Generator Owner may also operate its generating facilities or designate a separate organization to perform this Generator Operator service.

Comments – 11. Generator Operator

13. Generator Owner

The Generator Owner owns and maintains its generation facilities. It also specifies equipment operating limits, and supplies this information to the Generator Operator, Reliability Authority, Transmission Planning Function, and Planning Authority.

In many cases, the Generator Owner would have contracts or interconnection agreements with Transmission Owners that would detail the terms of the interconnection between these parties.

Relationship with the Generator Operator. The Generator Owner may also operate its generation facilities or arrange for another organization to operate those facilities.

Comments – 12. Generator Owner

14. Purchasing-Selling Entity

The Purchasing-Selling Entity arranges for and takes title to energy that it secures from a resource for delivery to a Load-Serving Entity. The PSE also arranges for transmission service with the Transmission Service Provider(s) that connect the resource to the LSE.

The Purchasing-Selling Entity implements a bilateral Transaction between Balancing Authority Areas by submitting the transaction information to the Interchange Authority.

Comments – 13. Purchasing-Selling Entity

15. Load-Serving Entity

The Load-Serving Entity provides energy to its end-use customers, but does not include distribution services ("wires").

The Load-Serving Entity will either own generation, contract with Generator Owners for capacity and energy to serve the LSE's customers, or purchase capacity and energy from non-affiliated Generator Owners through a Purchasing-Selling Entity (or Market Operator), or a combination of these three options. The Load-Serving Entity is responsible for dispatching its affiliated generation resources to meet its load and has the "initial say" in that dispatch or redispatch.

The Load-Serving Entity will report its generation (affiliated and non-affiliated) arrangements to serve load to the Balancing Authority, who forwards this information to the Reliability Authority, sometime before the generation is actually dispatched, perhaps noon the day before for day-ahead analysis.

The LSE will also contract for Interconnected Operations Services (through the Market Operator if it is part of a market or pool) or directly from Generator Owners. The LSE may also provide certain Interconnected Operations Services itself.

Comments – 14. Load-Serving Entity

16. Compliance Monitor

Today, the Regional Councils are the Compliance Monitors in NERC. The Regional compliance plans are audited by the NERC organization.

In those situations where the Compliance Monitor is also the organization performing a reliability service or operating function (such as a Regional Council that is also the Reliability Authority), then the Compliance Monitor for that function should be a third party that is unaffiliated with that organization.

Comments – 15. Compliance Monitor

We suggest the following change to reflect situations such as that in Ontario where the monitor is affiliated with, but reports directly to the Board of Directors of the organization performing the reliability function. Therefore change to:

> In those situations where the Compliance Monitor is also the organization performing a reliability service or operating function (such as a Regional Council that is also the Reliability Authority), then the Compliance Monitor for that function should have an appropriate degree of separation from the reliability performers. ~~be a third party that is unaffiliated with that organization.~~

17. Standards Developer

The Reliability Standards Developer includes NERC and the Regional Councils; however, the Functional Model is written to accommodate any organization that develops reliability standards.

Comments – 16. Standards Developer

Section 2 – Technical Discussions

1. Functions, Tasks, Responsible Entities, and Organizations – The Guiding Principles

While reviewing Version 1 of the Functional Model, the Functional Model Review Task Group heard many complaints that the Model improperly conflated functions and organizations, and did not clearly explain how tasks could be delegated to other organizations. The Functional Model Review Task Group addressed these concerns by:

1. Reformatting the Functional Model document to clearly delineate between the tasks that comprise *Functions* and the interrelationship among *Responsible Entities,* and

2. Listing the Guiding Principles upon which the Model itself is based.

Guiding Principles. The Guiding Principles listed in the Functional Model document are not new—indeed, the Control Area Criteria Task Force (CACTF) based Version 1 of the Model on these very principles, but didn't specifically list the principles themselves in the Functional Model document. The Task Force assumed these principles would be understood once the Model was explained, but it has since became obvious that was not the case.

As the CACTF assembled the Model's functions, it kept these Guiding Principles in mind. It built each *function* on a set of *tasks* so closely related to one another that separating those tasks would impair the integrity of the function.

Likewise, the Task Force believed that an organization that performed a function must be responsible for each task within that function. For example, the Balancing Function includes generation commitment, dispatch, regulation, frequency response, and the integration of scheduled interchange. The entity responsible for maintaining the resource-demand balance within its metered boundaries must be responsible for ensuring that all of these tasks are performed. It may delegate one or more of these tasks to others, but it can not delegate its responsibility. Allowing an entity to assign its responsibilities to others could result in uncertainty as to who is actually responsible for resource -demand balance, which, in turn, makes compliance enforcement difficult, if not impossible.

The Functional Model Review Task Group continues to support these Guiding Principles and believes they are so integral to understanding the Functional Model that they are specifically listed in the Functional Model document itself.

The Model provides the framework on which the NERC reliability standards are based. These standards rely on the stability and integrity of the Model to provide this foundation, and the Functional Model Review Task Group believes NERC must adhere to these Guiding Principles as the Functional Model is further developed and revised. These Principles should not be compromised for short-term expediency.

Functions. The FMRTG reformatted the Functional Model document to delineate between Functions and Responsible Entities. The diagram of the Model now includes two names within each function box as shown in Figure 3. The functions is shown in a larger typeface with the associated Responsible Entity underneath.

Responsible Entities. Organizations, such as Regional Transmission Organizations, Control Areas, Regional Councils, and Transmission Operators, will register with NERC as *Responsible Entities* by identifying which functions they perform.

For example, an RTO (organization) may register with NERC to be a Reliability Authority, Balancing Authority, and a Transmission Service Provider. Thus we say that the RTO is the *Responsible Entity* for the Operating Reliability, Balancing, and Transmission Service *functions*. We also use the expression that the RTO has "rolled up" these three functions and is responsible for ensuring that the tasks within each of those functions are performed.

See "Rollup Examples"

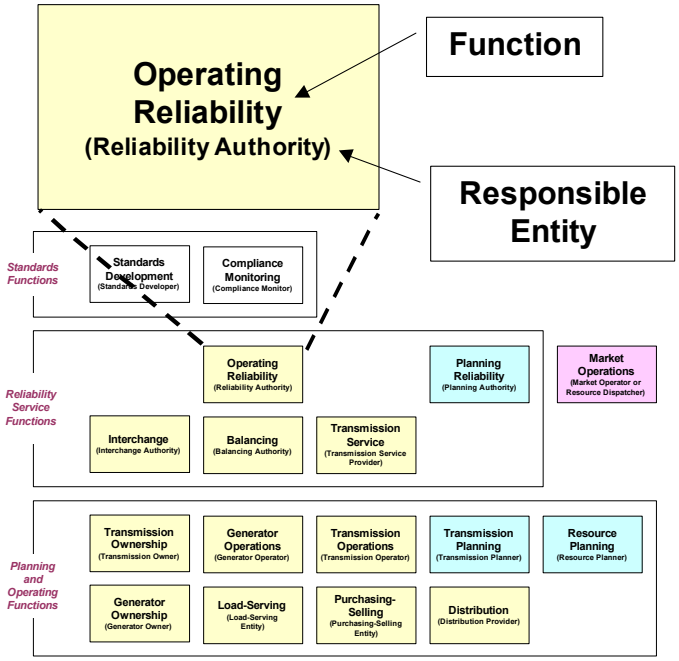


Figure 3 - The Functional Model depicts Functions and Responsible Entities

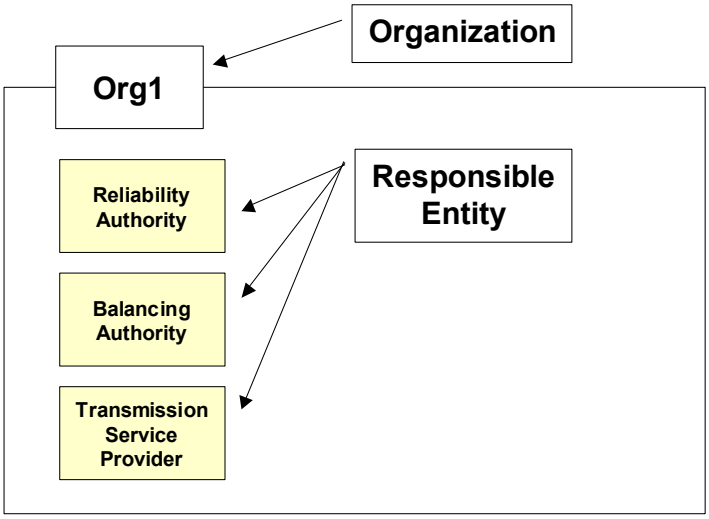
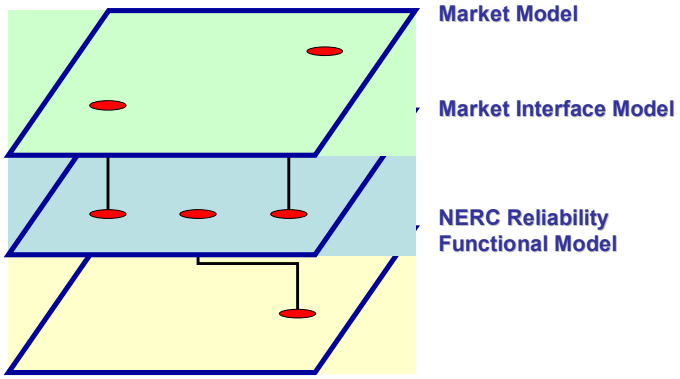


Figure 4 – Organizations are the entities responsible for performing the functions that they "roll up."

Comments – 1. Functions, Tasks, Responsible Entities and Organizations – The Guiding Principles

2. The Market Operator

The Market Operator is included in the Functional Model to provide an interface point with other functional models. For instance, the North American Energy Standards Board (NAESB) may develop a commercial model that explains the tasks and relationships necessary for electronic scheduling.



See next section on "The Functional Model and Market Structures"

Market Operators vary in design and responsibilities, but many perform the resource dispatch ("economic dispatch") tasks under a set of market rules that are established by a state, federal, or provincial regulator. Following its market rules, the Market Operator calculates a generation dispatch to meet the load forecast for the current dispatch cycle (typically five minutes or longer). This generation dispatch is usually a function of:

1. The generators' incremental costs or bids ("merit order"), and
2. Limitations caused by transmission congestion.

Taken together, this constitutes a "security constrained" dispatch.

Relationship between the Market Operator and Balancing Authority. The Functional Model Review Task Group spent considerable time discussing the feasibility of the Market Operator as an entity separate from the Balancing Authority, especially when the Task Group realized that at least one organization was planning to include several control areas into a single market area. To understand the Task Group's conclusions, it's important to understand that the Market Operator, in performing the resource dispatch tasks, is responsible for:

1. Determining the generation plan (unit commitment) ahead of time,
2. Integrating scheduled interchange into that generation plan,
3. Designating which generators are available for regulation service, and
4. Dispatching generation in real time.

Performing any of these tasks improperly can result in an imbalance between resources and demand within the market area. For example, if the Market Operator does not commit enough generation, or incorrectly dispatches the generation, or does not properly integrate bilateral interchange transactions that source from or sink into the market area, the market area's generation may not be sufficient in real time to meet its demand. Furthermore, if the Market Operator does not provide for sufficient regulation resources, the Balancing Authorities within that market area, in turn, might not successfully maintain their scheduled interchange within reliability standards, and Interconnection frequency will be affected.

Therefore, the Functional Model Review Task Group believes that if the Market Operator performs a real-time resource dispatch, the organization that serves as the Market Operator must also be the Balancing Authority to mitigate Market Operator dispatch or scheduling errors that could affect Interconnection frequency**.** This has three important implications:

1. The Market Area is the same as the Balancing Authority Area.

2. Bilateral transactions *within* the Market Area do not require the authorization of the Interchange Authority.

3. The Functional Model is unaffected by market rules or structures.

Non-market Resource Dispatcher. As explained in the next section on "The Functional Model and Market Structures," in the traditional vertically integrated organization, the "Resource Dispatcher" performs the economic dispatch tasks. The Functional Model Review Task Group assumes that, for the same reasons explained above, the organization that serves as the Resource Dispatcher must also be the Balancing Authority.

The Task Group is also aware of some organizations that serve as the Balancing Authority with multiple Resource Dispatchers. The Task Group believes that relationship is feasible because any generation-demand mismatches that might result from dispatch errors would be mitigated by the Balancing Authority.

Comments – 2. The Market Operator

3. The Functional Model and Market Structures

This section explains how the Functional Model accommodates various market structures by examining these structures from two perspectives:

1. The **dispatch protocol** that the Resource Dispatcher follows, which varies from cost-based to bid-based. When the Resource Dispatcher operates a bid-based generation market, then we call it a Market Operator.

2. The **depth of the resource pool** under the Resource Dispatcher's purview that supplies the Load-Serving Entities.

Generation Dispatch Protocol

The dispatch protocol is the method that determines the merit order of the generation dispatch. Generally, dispatch protocols are either cost-based or bid-based, depending on the market rules established by the regulatory authority. The dispatch algorithm for cost-based and bid-based dispatch is generally the same, which is why the Functional Model can accommodate either method.

Cost-based dispatch. Traditional, vertically-integrated utilities typically dispatch their resources based on actual fuel cost plus operations and maintenance costs and losses. The regulatory authority, such as the state public utility commission, might specify the accounting rules for calculating these costs. In this case, the "market" is cost-based, and the Resource Dispatcher determines the generator dispatch according to the same incremental cost ("lambda"). Transmission constraints can cause the incremental costs to be different on either side of the constraint. Thus, the lambda can vary by location.

Bid-based market dispatch. In some areas of the U.S. and Canada, market protocols provide Generator Owners the ability to bid into the market. In those cases, Generator Owners will submit bids via the Generator Operators to the Resource Dispatcher who operates the market. The market protocols are established by the regulatory authority, such as the Federal Energy Regulatory Commission. **In this situation, the Resource Dispatcher is the Market Operator.** The Market Operator, in turn, provides the Generator Operators with the generator dispatch so that the generators within the market footprint operate at the same incremental bid. As with the traditional cost-based incremental dispatch, transmission constraints may cause the price to vary by location. This is called "Locational-based Marginal Price," or LMP.

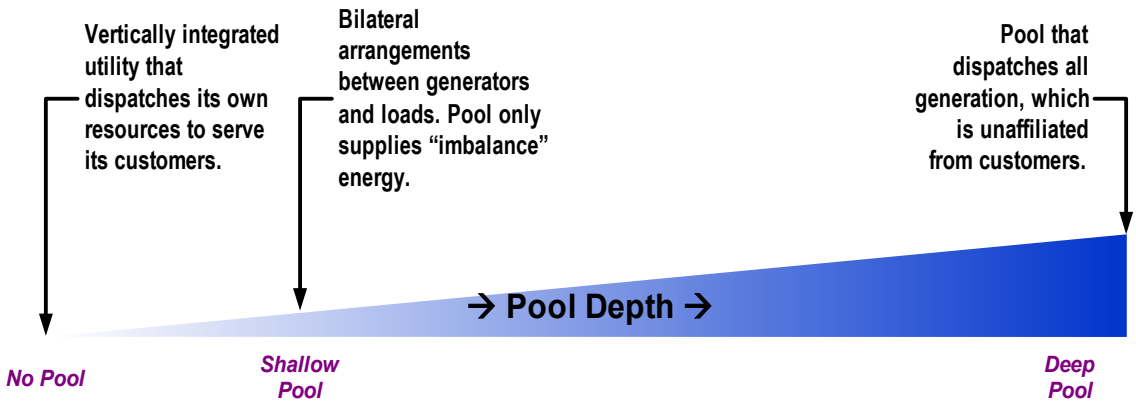
If the Market Area includes more than one Balancing Authority Area, then the Market Operator will also provide each Balancing Authority with the net "interchange" schedule that results from the resource dispatch ("Resource Dispatch Interchange Schedule"). Each Balancing Authority's Resource Dispatch Interchange Schedule will be an import or export to the Dispatch Area, **and the sum of all Resource Dispatch Interchanges within the Resource Dispatch Area must add to zero at each dispatch cycle**.

The Market Operator's generation dispatch will be constrained from time to time by transmission congestion as well as voltage and stability limits established by the Transmission Operator and Reliability Authority. Thus, the Market Operator performs both a market service as well as a reliability service.

Generation Pools

By generation "pool" we mean a collection of generators that are dispatched by an organization other than the Load-Serving Entities served by that generation. The depth of the pool progresses as a continuum from no pool to a shallow pool to a deep pool, as the diagram below shows.

No pool. When an organization has "bundled" the Load-Serving Entity, Generator Owner, and Resource Dispatcher functions, then it doesn't operate a pool per se. This could be an example of a vertically integrated utility serving its own customers with its own generation. The Resource Dispatcher would probably dispatch this generation on an incremental cost basis.



Shallow pools. In a shallow pool, the Load-Serving Entities might obtain energy to varying degrees from their own generation, or through bilateral arrangements with Generator Owners and Purchasing-Selling Entities, with the balance of their energy needs supplied by a pool of generation that a Market Operator administers. For example, within the ERCOT ISO, Load-Serving Entities arrange for their energy using bilateral agreements with "qualifying scheduling entities," who, in turn, have bilateral arrangements with Generator Owners. However, while the Generator Owners have a *financial* commitment to provide energy, they may find it more financially advantageous to purchase their energy commitment from the ERCOT "imbalance" energy pool. ERCOT provides the Market Operator function for this imbalance pool, and dispatches pool generation based on bid prices.

Deep pools. In the deepest pool, Load-Serving Entities obtain most of their energy and Ancillary Services from a pool of Generator Owners, some of which may be affiliated with the LSEs and others that are independent, but whose energy is commingled in the pool. The Resource Dispatcher provides the dispatch order for the entire pool of resources that comprises the Resource Dispatch Area based on load forecasts provided by the Load-Serving Entities. This is an arrangement we find in those RTOs and ISOs that provide the Resource Dispatcher function. If the Resource Dispatcher also runs a market by dispatching the pool resources based on bid prices provided by the Generator Owners and Load-Serving Entities, then we refer to the Resource Dispatcher as a Market Operator.

The table below explains further how the Functional Model applies to tasks that are performed by both the vertically integrated utility and the unbundled, market-based pool.

Task	*No Market – Vertically Integrated*	*Market – Unbundled*
Unit Commitment	Utility (performing the Generator Owner function) decides which units to run.	Generator Owners decides which units to make available.
Economic Dispatch	Utility (as Resource Dispatcher) performs economic dispatch calculation based on incremental costs or other requirements. Utility (as the Resource Dispatcher) must consider generator operating limits, which units are providing regulation service, and any commitments for bilateral arrangements.	Market Operator collects bids from Generator Owners and dispatches generators based on market rules (e.g. bids). Market Operator must consider generator operating limits, which units are providing regulation service, and any commitments for bilateral arrangements.
Congestion Management	Results in different incremental costs ("lambdas").	Depending on the market structure, results in 1. Different locational marginal prices (LMP), or 2. Different marginal costs
Regulation Service	Utility (performing the Balancing Authority, Load-Serving Entity, and Generator Owner functions) in concert with the Reliability Authority function, determines the amount of regulation service required and designates those units that can be regulated to maintain ACE. Utility (as the Resource Dispatcher) uses this information in its economic dispatch.	Balancing Authority, along with Reliability Authority, determines amount of regulation service required. Generator Owners decide which units to bid in for regulation service. Market Operator runs bid pool for regulation service. Load-Serving Entity arranges for regulation services.
Generator Control	Utility (performing the Balancing Authority function) pulses units that are designated by Resource Dispatcher for regulation service. As regulating ability declines, Balancing Authority asks Resource Dispatcher for new dispatch.	Balancing Authority pulses units that are designated by Market Operator for regulation service. As regulating ability declines, Balancing Authority asks Market Operator for new dispatch.

Comments – 3. The Functional Model and Market Structures

4. Providing and Deploying Ancillary and Interconnected Operations Services

Requirement for Ancillary Services. The open access (pro forma) tariff requires the Transmission Provider to *provide* the following Ancillary Services:

1. Scheduling, system control, and dispatch
2. Reactive supply and voltage control from generation

And the tariff requires that the Transmission Provider *offer*:

3. Energy imbalance
4. Regulation and frequency response
5. Operating reserve – spinning
6. Operating reserve – supplemental

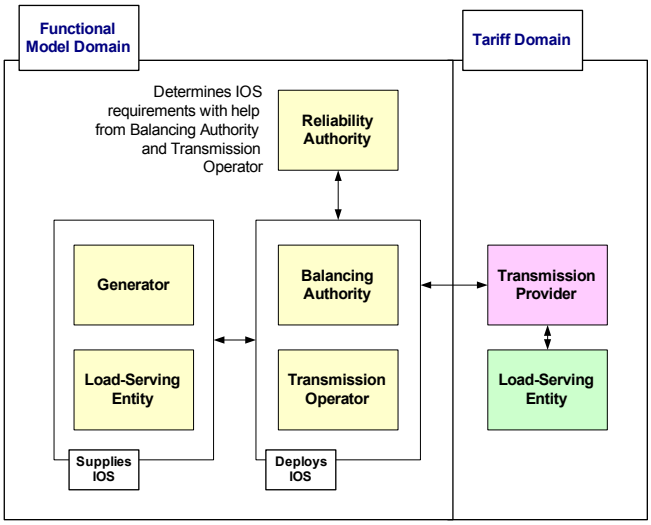


Figure 5 – Supply and deployment of Ancillary Services.

Interconnected Operations Services. NERC defines Interconnected Operations Services as the building blocks of Ancillary Services, and are physically provided by generators and loads[9]. The diagram on the right shows how Ancillary Services in the "tariff domain" are created as Interconnected Operations Services in the "Functional Model domain." The Functional Model explains that the Balancing Authority "Determines [the] amount required and arranges for Interconnected Operations Services to ensure balance in coordination with the Reliability Authority."

- The Balancing Authority determines regulation, load following, frequency response, and contingency reserves, and deploys these as Interconnected Operations Services.
- The Transmission Operator determines reactive power requirements to maintain transmission voltage within operating limits, and deploys these as Interconnected Operations Services.
- The Reliability Authority, working with the Transmission Operator, determines the need for Black Start capacity. The Transmission Operator cannot do this alone, because it may not have a wide enough picture of the transmission system.

[9] Loads can provide reserves through load-shedding or demand-side management. Loads also provide frequency response, depending on the characteristic of the loads.

Comments – 4. Providing and Developing Ancillary and Interconnected Operations Services

5. Managing Bilateral Transactions – Basic Concepts

Today, interchange transactions that cross multiple Control Areas are broken down daisy-chain fashion into individual Control Area-to-Control Area schedules, with the sink Control Area designated as the "manager" (the "tag authority"). The Control Area Criteria Task Force thought this arrangement to be clumsy, and knew that occasionally schedules were "lost" along the chain.

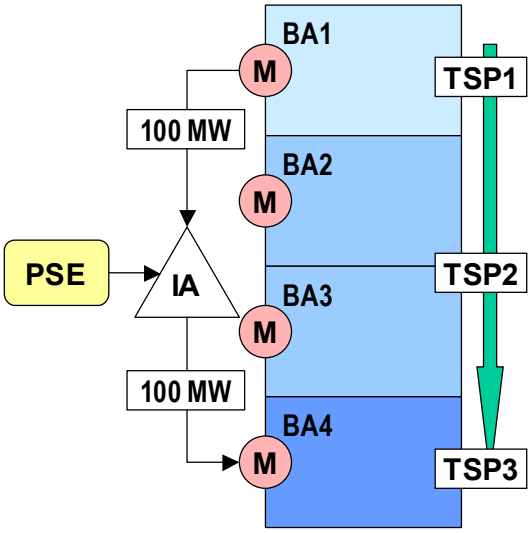


Figure 6 - The Interchange Authority manages transactions between the source and sink Balancing Authorities.

The Functional Model addresses this by including the Interchange Authority as the function responsible for managing Interchange Transactions ("deals") that were ready for physical implementation between Balancing Authorities, and removing the requirement that the source and sink BA's be physically adjacent. Balancing Authorities would then schedule interchange with Interchange Authorities, not other Balancing Authorities, and the IA's would ensure that the schedules were balanced (equal and opposite) between the source and sink BA's. In the example in Figure 6 on the right, the IA manages a transaction from BA1 to BA4. The schedule is

BA1 → IA → BA4

and the transmission service path is

TSP1 →TSP2 → TSP3.

The tables on the following page compare the interchange schedule checkout procedures that the Control Areas use today with the procedures that the Balancing Authorities will use.

Transactions within the Balancing Authority Area. A bilateral transaction within a Balancing Authority does not require Interchange Authority authorization. In the example in Figure 7, the Purchasing-Selling Entity submits the 100 MW transaction to the Balancing Authority who will inform the Resource Dispatcher (or Market Operator) if the Resource Dispatcher needs to know which generators are committed to the transaction, and to the Reliability Authority for reliability assessment.

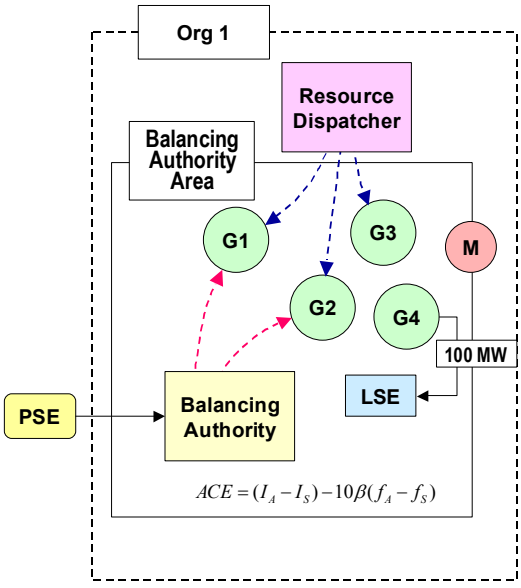
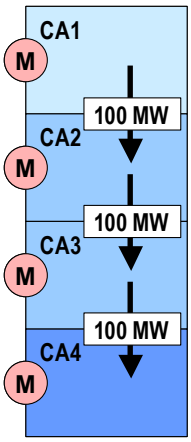
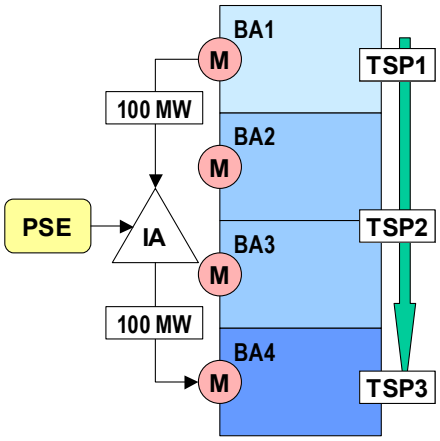


Figure 7 – The Purchasing-Selling Entity submits the bilateral transaction to the Balancing Authority for intra-BA transactions.

Comments – 5. Managing Bilateral Transactions – Basic Concepts

Checkout under Existing NERC Policies			
Control Area	***Actual from Tie Meters***	***Schedule with CA***	***Inadvertent***
CA1	+100 to CA2	+100 to CA2	0
CA2	-100 from CA1 +100 to CA3	-100 from CA1 +100 to CA3	0
CA3	-100 from CA2 +100 to CA4	-100 from CA2 +100 to CA4	0
CA4	-100 from CA3	-100 from CA3	0
Checkout under the Reliability Model			
Balancing Authority	***Actual from Tie Meters***	***Schedule with IA***	***Inadvertent***
BA1	+100 to BA2	+100 to IA	0
BA2	-100 from BA1 +100 to BA3	0	0
BA3	-100 from BA2 +100 to BA4	0	0
BA4	-100 from BA3	-100 from IA	0





6. Managing Bilateral Transactions – Scheduling Agents

Some Transmission Providers provide a Scheduling Agent service for their Control Area members. The Scheduling Agent provides a single point of contact for all Interchange Schedules into or out of those Control Areas. For example, the Southwest Power Pool serves as a Scheduling Agent for its members, and any Control Area external to SPP will schedule to any SPP Control Area by way of the SPP as the Scheduling Agent. This simplifies interchange scheduling for parties both internal and external to SPP.

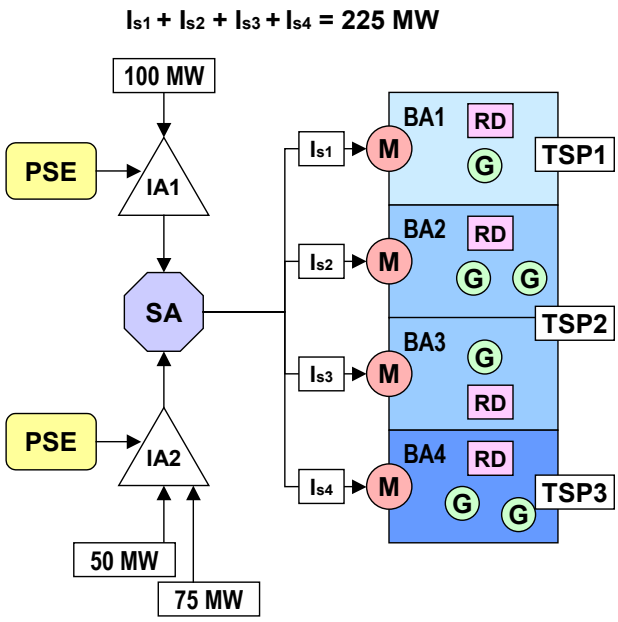


Figure 8 – The Scheduling Agent divides a 100 MW transaction among a group of Balancing Authorities.

In the example in Figure 8, two Interchange Authorities schedule a total of 225 MW with the Scheduling Agent for a group of four Balancing Authorities as follows:

I_{S1} = 100 MW into BA1
I_{S3} = 50 MW into BA3
I_{S4} = 75 MW into BA4
I_{S2} = 0

The Scheduling Agent must ensure that the sum of the Interchange Schedules from all Interchange Authorities is exactly equal to the sum of the Interchange Schedules from the Scheduling Agent to its Balancing Authorities:

$$I_{SA1} + I_{SA2} = I_{S1} + I_{S2} + I_{S3} + I_{S4}$$

If the Balancing Authority(ies) use a Scheduling Agent, then the Interchange Authority will request ramp confirmation from the Scheduling Agent — not the Balancing Authority(ies) — during the Interchange Transactions authorization process. The Interchange Authority will also notify the Scheduling Agent of any Interchange Transaction curtailments.

Because interchange scheduling is an integral function of the Balancing Authority, the Functional Model Review Task Group believes that the Scheduling Agent is actually an agent of the Balancing Authorities. The Balancing Authorities would still be the *Responsible Entities* for ensuring that the interchange schedules from the Scheduling Agent were incorporated into the BAs' energy management systems. Some have argued that the Scheduling Agent would need to be certified and monitored to ensure that it handled the interchange schedules properly.

Comments – 6. Managing Bilateral Transactions – Scheduling Agents

For discussion purposes only. The FMRTG believes these scenarios would be difficult to implement.

7. Non-coincident Resource Dispatch and Balancing Authority Areas

Bilaterals between Resource Dispatch Areas. In the examples above, each Balancing Authority Area was the same as the Resource Dispatch Area. When a Resource Dispatcher or Market Operator dispatches generation (either cost-based or bid-based) over several Balancing Authority Areas, we may be faced with a bilateral transaction whose source or sink is the entire Resource Dispatch or Market Area, and can not be identified with any particular Balancing Authority within that area. In this situation, the Interchange Authority schedules with the Scheduling Agent for the Resource Dispatch Area. Then the Scheduling Agent, working with the Resource Dispatcher, will determine how the bilateral transaction is allocated among the Balancing Authority Areas within the organization.

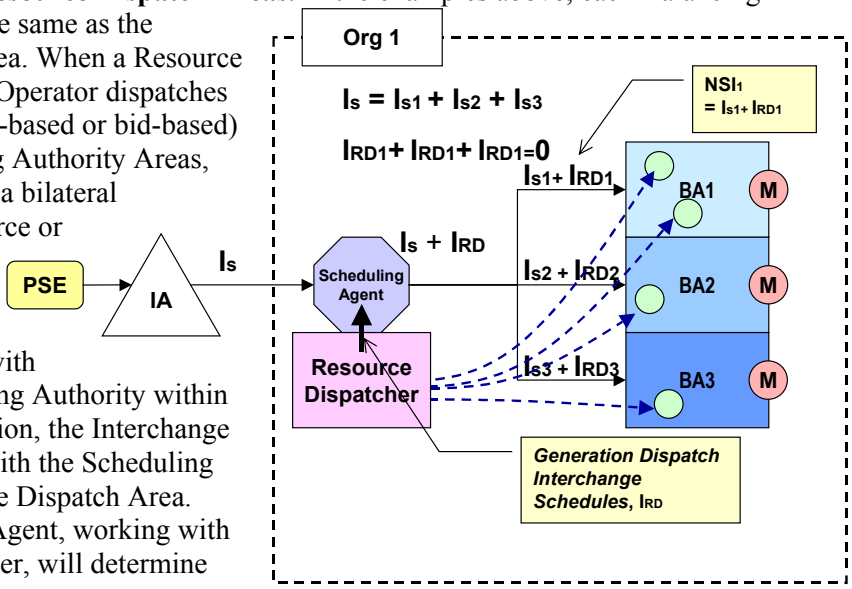


Figure 9 – The Scheduling Agent manages bilateral transactions in to or out of the Resource Dispatch Area as well as the Resource Dispatch Interchange Schedules that result from

As we explained in the technical discussion on Load Following and Regulation, the Scheduling Agent ensures that the RDIS are properly allocated to the Balancing Authorities. Now we can combine the Scheduling Agent's management of RDIS with bilateral transactions as shown in Figure 9.

Bilaterals between Balancing Authorities within the same Resource Dispatch Area. A bilateral transaction between two Balancing Authorities within the same Resource Dispatch Area does not require Interchange Authority management because the Resource Dispatch Area is under a common tariff, and the Resource Dispatcher would have a close relationship with the Reliability Authority. In the example in Figure 10, the Purchasing-Selling Entity has submitted a 100 MW bilateral transaction from BA1 to BA3 directly to the Scheduling Agent who would then coordinate the transaction between the source and sink Balancing Authorities. The Scheduling Agent then submits the

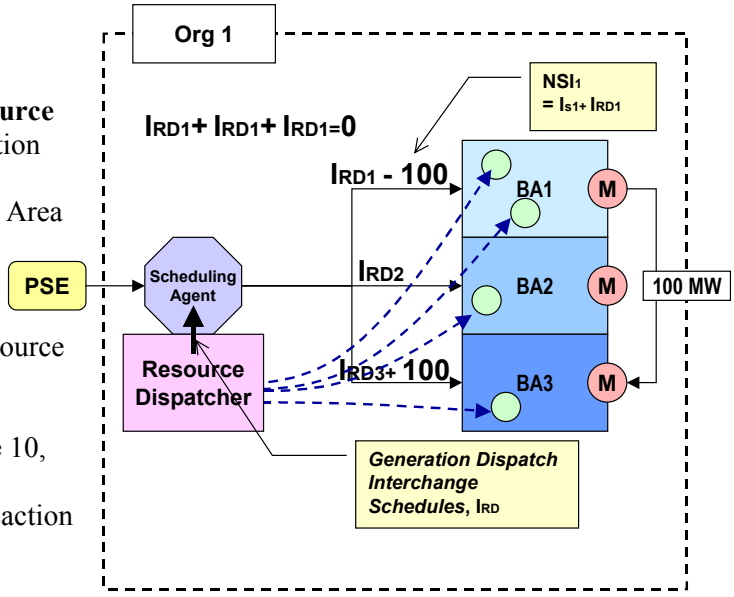


Figure 10 - The PSE submits its transaction information directly to the Scheduling Agent when the bilateral transaction is within the same Resources Dispatch Area.

resulting interchange schedule to the source and sink Balancing Authorities, and inform the Resource Dispatcher if the Resource Dispatcher needs to know which generators are committed to the transaction.

Comments – 7. Non-coincident Resource Dispatch and Balancing Authority Areas

8. Reliability Coordinators

After NERC implemented Version 1 of the Functional Model, some people questioned why the Model did not include the Reliability Coordinator as a function. As the Functional Model Review Task Group was developing Version 2, many suggested that the Reliability Coordinator be included in the Model because they were worried about losing the operational coordination that the RC provides. As this paper explains, the lack of the Reliability Coordinator in the Functional Model should not imply that the RC won't exist. In fact, we expect it to. To help explain this, let's look at the history of the Reliability Coordinator.

The Reliability Coordinator arose from the control area model that still exists. The RC was added in 1996 because NERC was concerned that the 150 control areas would have difficulty coordinating their operations under the open access rules that were emerging. Every Regional Council or Regional Transmission Organization must file a reliability plan with NERC, and that plan must explain how the reliability organization will ensure coordination within its "footprint" and the list of Reliability Coordinators. Each Reliability Coordinator is then audited against NERC's Reliability Coordinator criteria and responsibilities that are included in the Operating Manual.

When the Control Area Criteria Task Force (the FMRTG's predecessor) began developing the Functional Model in 1999, it assumed that the Reliability Authority would perform the role of the Reliability Coordinator. The Task Force picked a different term because the RC was specifically defined in relation to control areas, and not BAs, Transmission Operators, Generators, and so on. Indeed, the tasks that comprise the Reliability Authority function align closely with those of today's Reliability Coordinator, though the Model does not include the degree of detail found in the Reliability Coordinator criteria in the Operating Manual. For example, Version 1 of the Functional Model requires that the Reliability Authority calculate Operating Security Limits (OSL), which means the RA must have a very wide view of the interconnection and the ability to conduct contingency analyses over that area. Version 2 of the Model replaces "OSL" with "Interconnection Reliability Operating Limits" that's now referenced in draft Standard 200, but they mean the same thing.

But we need to look further than the Functional Model to fully develop the functionality of the Reliability Authority, its scope of coverage, and the criteria and standards that the RA must follow. Properly crafted, the following documents will tailor the requirements of the RA to meet the needs of the industry that the RC provides today:

1. **Regional Reliability Plan**. As they are today, the Regions (or Regional Entities within an SRO structure) will be responsible for developing a plan that specifies how reliability will be maintained within that Region, and that plan must include provisions for reliability coordination. The reliability plan will specify who the Reliability Authorities will be, and how they will provide the coordination among the Balancing Authorities, Transmission Operators, Generator Operators, and others. The NERC Operating Committee will continue to review and approve those plans. If the Region wants to call their designated Reliability Authorities "Reliability Coordinators," that's just fine. But NERC will certify them as Reliability Authorities.

2. **Certification requirements**. Based on the Regional plan, the designated RA(s) will be certified against a list of criteria that are developed through the Standards Development

Process. Those criteria should require the RA to have the "big picture" and be able to calculate Interconnection Reliability Operating Limits. Those criteria should also require the RA to have the authority to direct actions necessary to mitigate IROLs as well as other emergencies.

3. **Reliability Standards**. Standard 200, which is still in draft form, requires the RA to determine Interconnection Reliability Operating Limits (the new term replacing OSL). This determination requires a wide view of the transmission system.

In summary, the Functional Model alone is not designed to provide all the relationships and criteria that are needed to ensure a reliable system. The regional reliability plans, the certification requirements, and the standards all play an important role. If the industry wants the Reliability Authority to have the attributes of today's Reliability Coordinator, then the industry will need to write the RA certification criteria accordingly and the regional reliability plans will need to accommodate those criteria.

Comments – 8. Reliability Coordinators

We agree that the Regional Plan, described in section 1 above, will be an essential complement to the model and standards. It could be used in particular to help resolve the more complex boundary questions between functions, where the answer may be dependent on the specific characteristics of the region in question. It is unrealistic for the functional model itself to provide specific answers to all such questions that would be applicable to all regions.

9. Task Assignment Options

Delegation

An organization, such as an RTO, can delegate tasks to one or more organizations. In this example (Figure 11), the organization is the NERC-certified Transmission Operator, but has delegated some of the Transmission Operator tasks to its members. In this situation, NERC would expect that the organization would be the Responsible Entity, and that its members are carrying out certain tasks under that organization's direction.

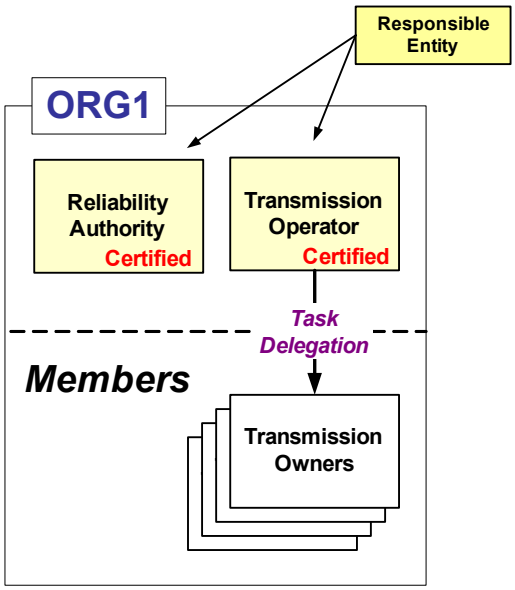


Figure 11 - In this example, Organization 1 has delegated certain Transmission

Organization Pact

In this example, the two organizations have assumed the tasks that must be performed by the Balancing Authority. One of these organizations (in this case, Organization 2) registers with NERC that it is the Designated Responsible Party, and is responsible for compliance requirements and penalties. It would have an agreement with Organization 1 on how penalties would be assigned between these two organizations.

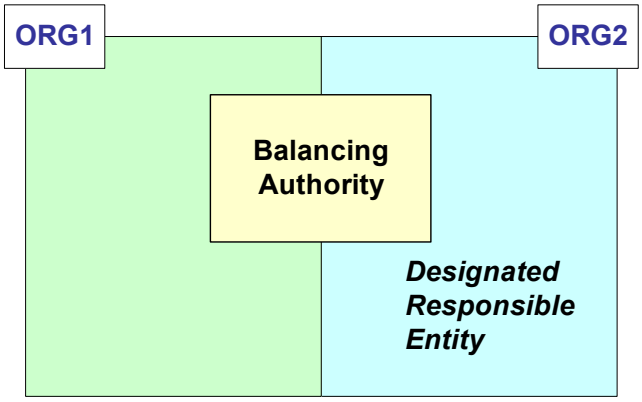


Figure 12 - An organization "pact" allows the Balancing Authority's tasks to be shared, but one of the organizations must register with NERC as the Balancing Authority ("responsible entity) for that function.

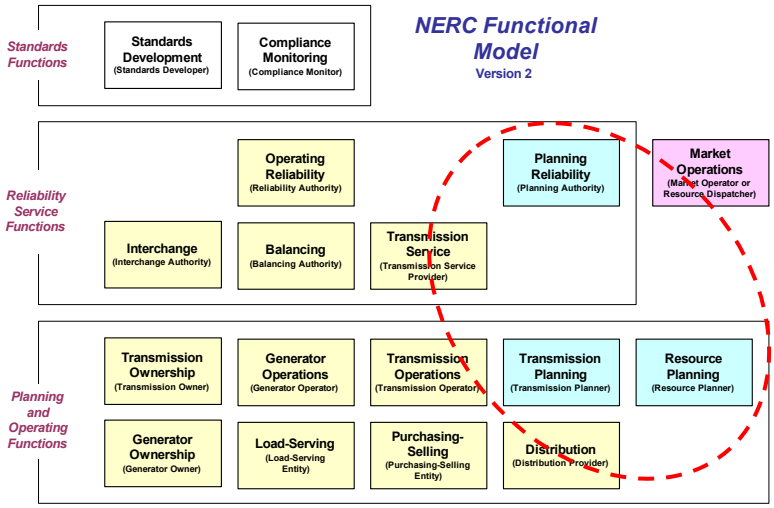
The certification audit team may have to visit both organizations.

Comments – 9. Task Assignment Options

We agree with the concept of the delegability of performance but not responsibility. However, it is important that there be an approvals process for any delegation in order to ensure that reliability will not be compromised.

10. Planning Functions

During the past year and a half, the NERC Planning Committee and its Planning Reliability Model Task Force (PRMTF) have been working to expand the NERC Functional Model to include the planning functions. The Operating Committee's Control Area Criteria Task Force had previously developed the operational portion of the Functional Model (Version 1), which was approved by the NERC Board of Trustees in June 2001. Adding the planning functions completes the NERC Functional Model, and allows it to serve as the framework for the Reliability Standards that cover resource planning and transmission planning.



The PRMTF and Functional Model Review Task Group (FMRTG) propose adding three planning functions to the model: Planning Reliability function, Transmission Planning function, and Resource Planning function. The Planning Authority, who is the responsible entity for the Planning Reliability function, resides at the "highest" planning level, with the Transmission Planners and Resource Planners within their respective Planning Authority Area reporting to the Planning Authority.

Planning Reliability Function

The Planning Authority, who is responsible for the Planning Reliability function, ensures that a long-term (generally 1 year and beyond) plan is available for adequate resources and transmission within its Planning Authority Area. It integrates and assesses the plans from the Transmission Planners and Resource Planners within its Planning Authority Area to ensure that their plans comply with reliability standards. It also develops and recommends solutions to plans that do not meet reliability standards. The Planning Authority is not responsible for implementing the transmission and resource plans. However, it helps to ensure that adequate resources and transmission facilities are placed into service in a timely manner through the Resource Planners, Transmission Planners, and possibly others through open solicitations for facilities.

Like the Resource Planners and Transmission Planners at the "local" level, the Planning Authority maintains system models and performs the necessary studies to evaluate whether the composite resource and transmission plans of its Resource Planners and Transmission Planners are in compliance with reliability standards.

Calculates operating and transfer limits. The Planning Authority reviews the transmission transfer capability determinations of the Transmission Planners and also determines future (generally 1 year and beyond) transfer capabilities and operating limits

between and among the Transmission Planners and other Planning Authorities based on the transmission and resource plans. These longer-term transfer and operating limits are provided to the Reliability Authority and Transmission Operator(s) for their use in developing shorter-term (generally less than one year) operating limits.

Evaluates plans for customer requests. The Planning Authority evaluates responses for long-term (generally 1 year and beyond) transmission service requests developed by its Transmission Planners and provides the resulting plans to the Transmission Service Providers, Transmission Owners, and Transmission Customers. The Planning Authority also reports on industry trends for customer demand, transmission expansion, and resources within its Planning Authority Area. It also provides, as appropriate, plan assessments and reports to regulatory authorities and government agencies, and tracks capacity, demand programs, and transmission in-service dates. Finally, the Planning Authority evaluates the impact of revised generation and transmission in-service dates on the long-term reliability of the bulk transmission systems.

Resource Planning Function

The Resource Planners, who are the responsible entities for the Resource Planning function, develop long-term (generally 1 year and beyond) resource adequacy plans necessary to supply specific customer demands within the Planning Authority Area. These plans can also be provided by the Load-Serving Entities or Generator Owners, or both, within the Planning Authority Area.

Develops resource plans. The Resource Planners maintain resource models to develop and evaluate resource plans in conjunction with reliability standards. These models also are coordinated with the Resource Planner's related Planning Authority. The Resource Planners also identify areas of resource deficiency and provide potential alternative solutions to meet resource requirements.

The Resource Planners also evaluate, in conjunction with the Transmission Planners and Transmission Owners, the deliverability of the planned resources to the customer demands.

Provides resource plan to Planning Authority. The Resource Planners provide their resource plans to the Planning Authority for assessment and review for compliance with reliability standards. They also track capacity and demand program in-service dates, and evaluate the impact of revised generation and transmission in-service dates on resource adequacy.

Transmission Planning Function

The Transmission Planners, who are the responsible entities for the Transmission Planning function, provide long-term (generally 1 year and beyond) transmission plans for the areas under their purview, called the Transmission Planning Areas. A Transmission Planning Area may be smaller than or equal to the Area of its related Planning Authority. Every existing and proposed transmission line, or portion thereof, must be within the boundary of a Transmission Planning Area.

The Transmission Planners coordinate with other Transmission Planners to include the impacts of transmission plans on both on an intra- and inter-area basis. The Transmission Planners also maintain the system models and perform the necessary steady-state,

dynamic, and short-circuit studies to ensure that their transmission plans meet reliability standards. These models are also coordinated with the Transmission Planner's related Planning Authority.

Evaluates customer requests for transmission service. The Transmission Planner evaluates long-term (typically longer than one year) requests for transmission service (as compared to the Transmission Service Provider who evaluates and provides transmission service for the shorter term (generally less than one year)), and identifies the facilities that will be needed to integrate new generation, transmission, and end-use customers into the bulk electric systems. Requests for transmission service will usually come from Transmission Owners, Generator Owners, Load-Serving Entities, and Transmission Service Providers.

Develops planning procedures and protocols. The Transmission Planners develop the planning procedures and protocols that are necessary to ensure that a reliable transmission system is developed within their respective Transmission Planning Areas. These procedures and protocols include specifications for transmission data, system protection and control and special protection systems as needed, and voltage and stability limits to meet reliability standards. They also coordinate these procedures and protocols with neighboring Transmission Planners and their related Planning Authority.

Develops transmission expansion plans. Based on customer requests for transmission service, the planning procedures and protocols established for their Transmission Planning Areas, plus the reliability standards, the Transmission Planners will develop transmission plans to accommodate long-term firm transmission service requests. While developing these plans, they may provide alternate solutions and evaluate alternatives suggested by the transmission customers.

Provides transmission plan to Planning Authority. The Transmission Planners provide their transmission plans for their respective Transmission Planning Areas to their Planning Authority for assessment and review for compliance with reliability standards.

Comments – 10. Planning Functions

11. Electrical and Physical Boundaries

Boundaries for Operations

Today, NERC requires that every generator, load (customer), and transmission facility be within the metered boundary of a control area. This ensures that the control area:

1. Balances all resources with demand, including transmission system losses, and

2. Operates all transmission facilities within their operating limits.

The Functional Model groups the control area tasks into functions, but we must still ensure that all generation, load, and transmission facilities be physically located within certain boundaries to ensure generation-load balance and reliable transmission operations. However, under the Functional Model, we need to consider these boundary conditions from the Reliability Authority's and Balancing Authority's points of view. NERC will need to incorporate these boundary conditions into its Reliability Standards.

Boundary Conditions for Transmission Reliability

The boundary conditions for transmission reliability deal with where generators, transmission facilities, and customers are *physically* located.

- The Reliability Area must include all transmission facilities within the Area's metered boundaries, and all load and generation physically connected to those transmission facilities.
    - The transmission facilities within the Reliability Area are defined as those within the transmission metered boundaries of the Balancing Authority Areas under the RA's purview.
    - The Reliability Area will therefore include all load and generation physically connected to those transmission facilities.

Boundary Conditions for Balancing

The boundary conditions for balancing deal with where generators and customers are both *physically and electrically* located. This recognizes that a generator or load may use a "pseudo" tie to virtually move itself out of one Balancing Area and into another.

- Every generator must be metered into a Balancing Authority Area.
- Every load (customer) must be metered into a Balancing Authority Area.
- Every transmission facility must be within the metered boundary of a Balancing Authority Area.
- Every Balancing Authority must designate a Reliability Authority.

Discussion

Considered together, these boundary conditions mean that:

- A Reliability Area is defined by the metered boundaries of the Balancing Authority Areas under its purview.

- A generator or customer falls within the purview of the Reliability Area in which that generator or customer is *physically* located.

- The Regional Reliability Plan will specify those organizations that will serve as the Reliability Authorities and Balancing Authorities within the Regional Council.

Boundaries for Planning

The Planning Reliability functions and the associated Transmission Planning functions and Resource Planning functions apply to specific defined areas that may or may not have a direct correlation with the operating reliability areas defined as a Reliability Authority Area or a Balancing Authority Area. The planning areas and their boundary relationships with other areas are defined below.

Planning Authority Area

The Planning Reliability functional tasks that must be performed by a Planning Authority include an integration and assessment of the resource and transmission plans of others to ensure that an adequate long-term (generally 1 year and beyond) resources and transmission plan is available for an area called the Planning Authority Area. The Planning Authority Area is a defined area for which the Planning Authority has responsibility and includes the generators, transmission facilities, and customer demands in that area.

Each Planning Authority Area is a unique area and cannot overlap other Planning Authority Areas. The Planning Authority Area also may be smaller than, equal to, or larger than a Reliability Authority Area or a Regional Reliability Council.

Transmission Planning Area

The Transmission Planning Area is a defined area within a specific Planning Authority Area. The Transmission Planning Area is the designated Area for which a Transmission Planner has the responsibility for developing a long-term (generally 1 year and beyond) plan for the reliability (adequacy) of the interconnected bulk electric systems within its portion of the Planning Authority Area. The Transmission Planning Area may be an area smaller than or equal to its related Planning Authority Area.

Existing and proposed transmission lines, or portions thereof, must be within the boundary of a Transmission Planning Area. The Transmission Planners must agree on how transmission between Transmission Planning Areas will be addressed.

A given Transmission Planning Area may encompass an area smaller than, equal to, or larger than its related Reliability Authority Area.

Resource Planning

The boundaries for the Resource Planning function are difficult to define as a Resource Planner developing a long-term (generally 1year and beyond) resource adequacy plan for specific loads (customer demand and energy requirements) within a Planning Authority

Area may consider generation capacity both within and outside of the Planning Authority Area.

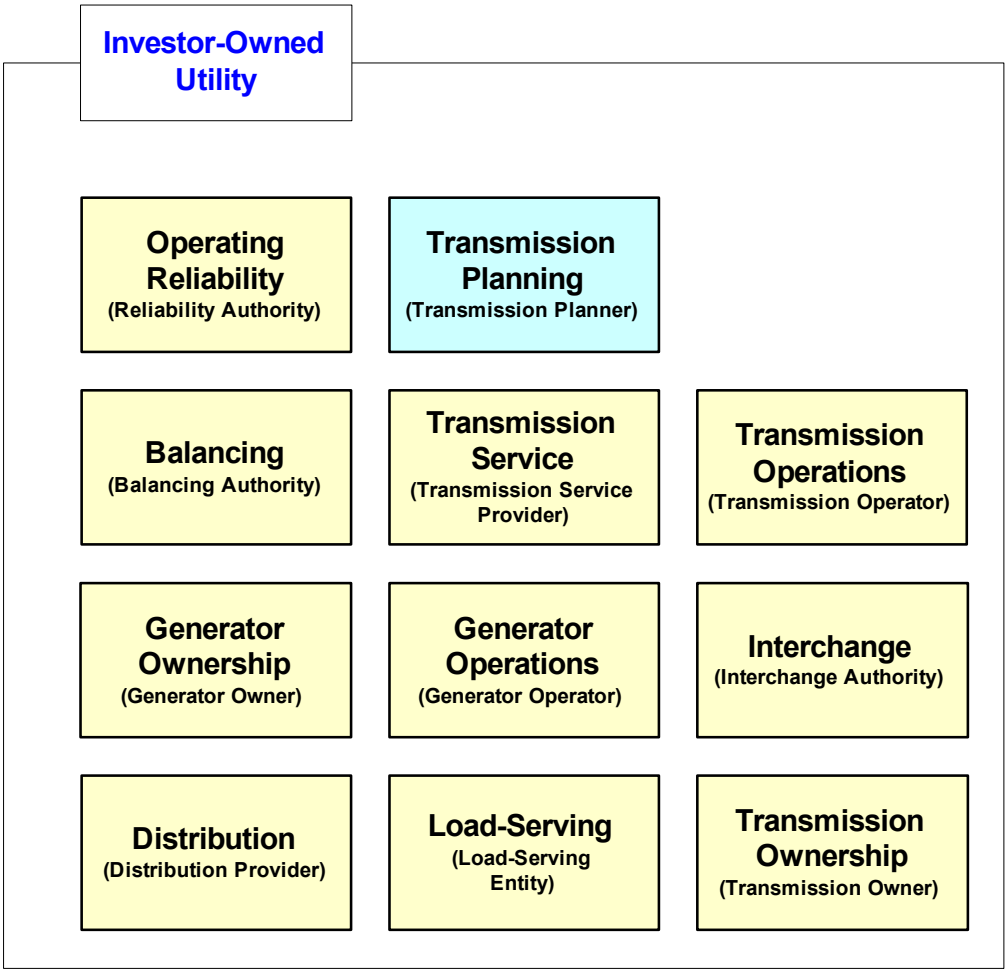
The loads addressed by a Resource Planner may encompass customer demands smaller than or equal to its related Planning Authority Area, but these customer demands must be within the Planning Authority Area. It may take one or more Resource Planners to cover all of the customer demands within a given Planning Authority Area.

Comments – 11 Electrical and Physical Boundaries

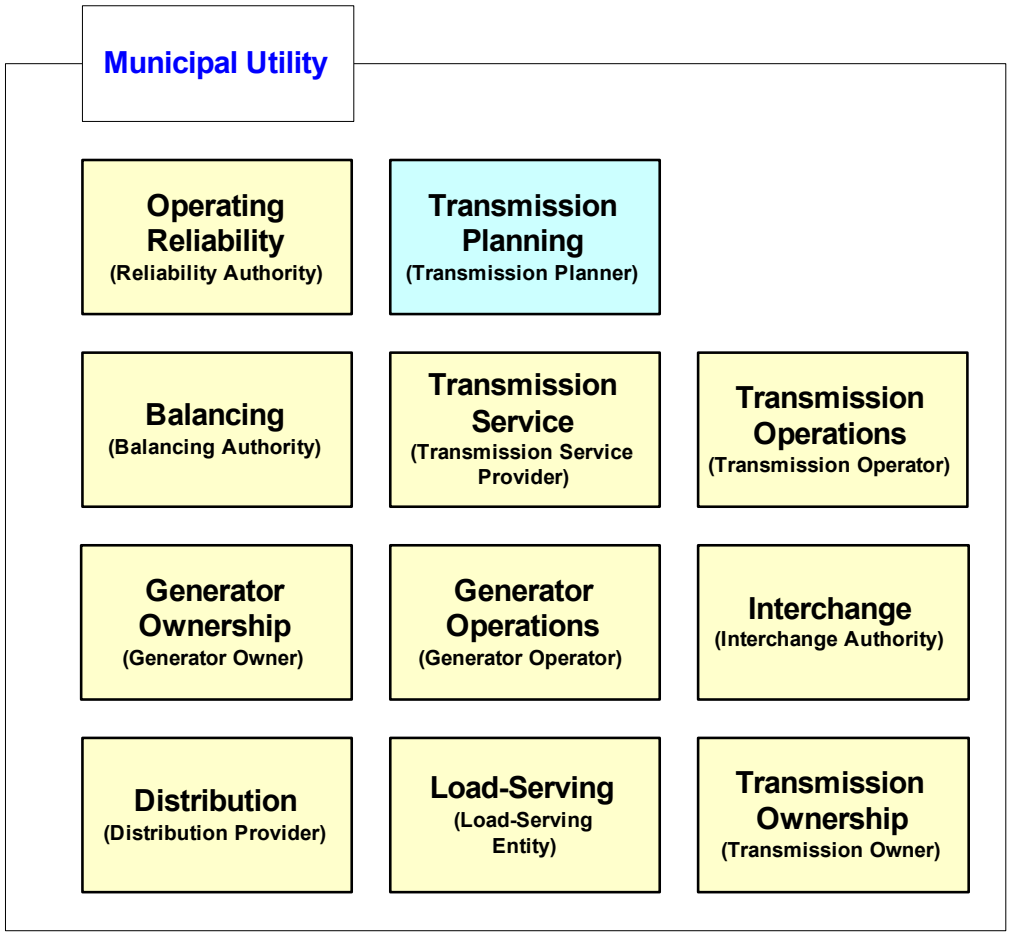
We support the development of a SAR and standard addressing boundary conditions and relationships. The IA should be considered in this process.

12. Rollup Examples

Organizations will "roll up" the *Functions* they intend to perform and register with NERC as *Responsible Entities*. This section includes a number of examples to show how this would work.



Comments – 12. Rollup Examples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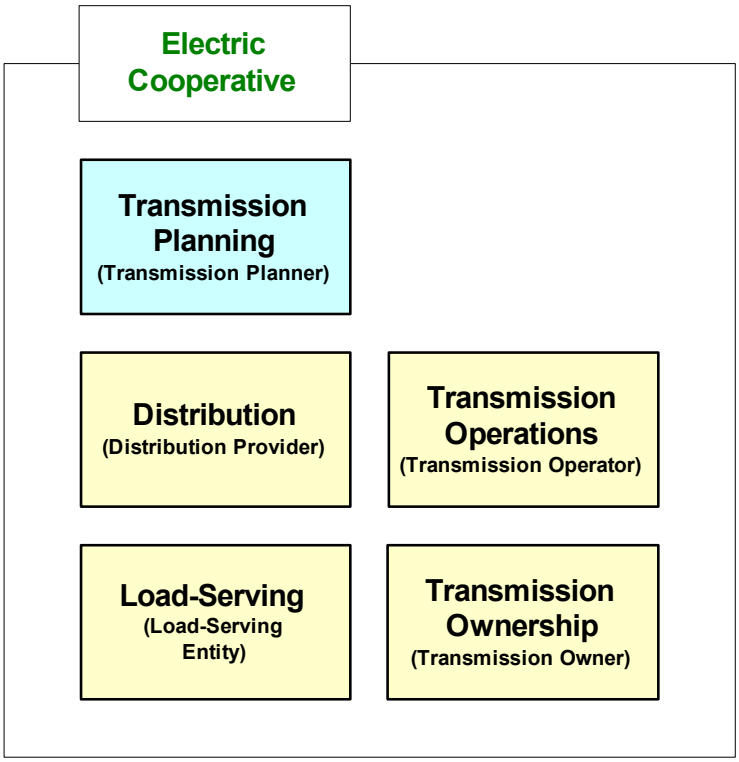
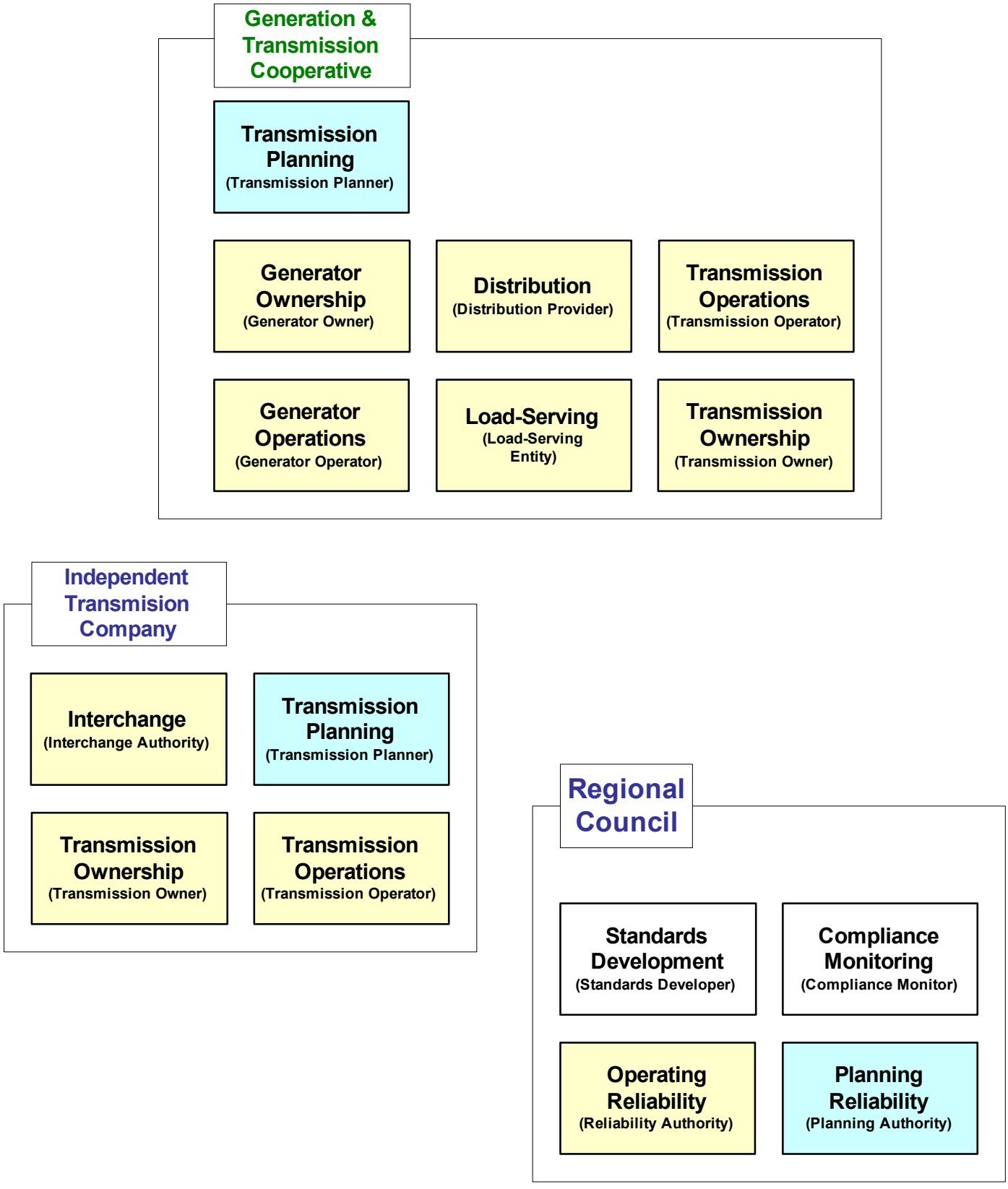
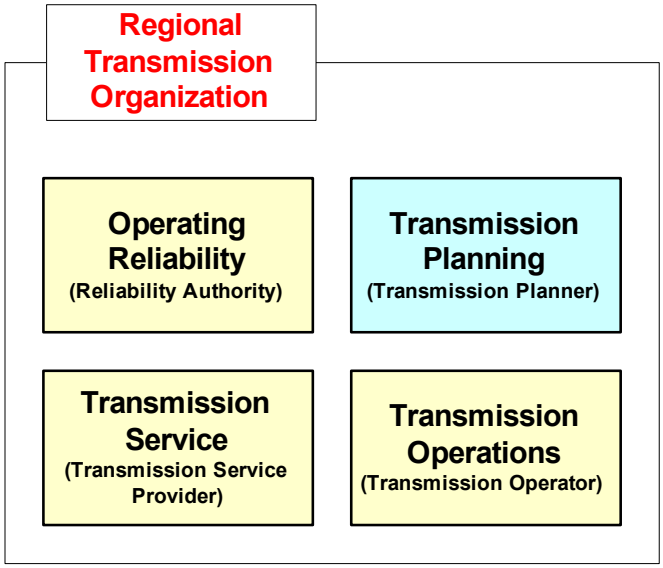
(Reliability Authority)
Transmission Planning
(Transmission Planner)
Balancing
(Balancing Authority)
Transmission Service
(Transmission Service Provider)
Transmission Operations
(Transmission Operator)
Generator Ownership
(Generator Owner)
Generator Operations
(Generator Operator)
Interchange
(Interchange Authority)
Distribution
(Distribution Provider)
Load-Serving
(Load-Serving Entity)
Transmission Ownership
(Transmission Owner)


Electric Cooperative
Transmission Planning
(Transmission Planner)
Distribution
(Distribution Provider)
Transmission Operations
(Transmission Operator)
Load-Serving
(Load-Serving Entity)
Transmission Ownership
(Transmission Owner)


Generation & Transmission Cooperative
Transmission Planning
(Transmission Planner)
Generator Ownership
(Generator Owner)
Distribution
(Distribution Provider)
Transmission Operations
(Transmission Operator)
Generator Operations
(Generator Operator)
Load-Serving
(Load-Serving Entity)
Transmission Ownership
(Transmission Owner)
Independent Transmision Company
Interchange
(Interchange Authority)
Transmission Planning
(Transmission Planner)
Transmission Ownership
(Transmission Owner)
Transmission Operations
(Transmission Operator)
Regional Council
Standards Development
(Standards Developer)
Compliance Monitoring
(Compliance Monitor)
Operating Reliability
(Reliability Authority)
Planning Reliability
(Planning Authority)


Regional Transmission Organization
Operating Reliability
(Reliability Authority)
Transmission Planning
(Transmission Planner)
Transmission Service
(Transmission Service Provider)
Transmission Operations
(Transmission Operator)

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