

A Matrix of Reliability Responsibilities

(Developed through Readiness Review Audits)



Responsibility Matrix

- The purpose is to identify:
 - Ownership of a set of 21 critical responsibilities for each audited entity.
 - The first 5 responsibilities are from Functional Model
 - The next 16 are specific responsibilities that were selected as examples of significant responsibilities whose ownership is now in flux. We hope to note:
 - Responsibilities that may have fallen through the cracks
 - Responsibilities whose ownership is not clear
 - Reasons and solutions for the mapping problem



Set of 21 Selected Responsibilities, First Five are Responsible Entities

- 1 Reliability authority: enforces requirements, monitors parameters, performs analysis.
- 2 Balancing authority: Calculate ACE, review generation commitments, formulate operational plan.
- 3 Transmission operator: Maintain voltage, monitor operations, provide maintenance schedules.
- 4 Interchange authority: Determines interchange schedules, maintains record of interchange transactions.
- 5 Transmission service provider: OASIS, Approves or denies transmission service requests, coordinates ATC with RA.



Selected Responsibilities

- 6 Market operator: Operates a real-time market for energy and ancillary services
- 7 Sets pre-contingency voltage limits: Determines and sets operating voltage limits which will ensure adequate post-contingency voltage
- 8 Determines reactive requirements: Determines and sets reactive reserve requirements such that post-contingency voltage is adequate. The reactive reserve requirement may be expressed by pre-contingency voltage limits
- 9 Determines amount and location of operating reserves: Determines needed amount and location of operating reserves, implements generator commitment and dispatch schedules
- 10 Monitors and takes action on real and reactive reserves. Monitors levels of real and reactive reserves to ensure they are adequate and takes action when they are not
- 11 Monitors flowgate congestion: Monitors and takes action for flowgate congestion. Action can be taken using security-constrained dispatch
- 12 Monitors conditions and declares emergency: Has clearly defined entry criteria for an emergency condition. Has authority to declare an emergency when these conditions are met, and has authority to set aside normal operating procedures and transfer to emergency procedures.



- 13 Sheds load in event of an emergency: Has a procedure and authority to shed load when an emergency is declared without any management approval
- 14 Performs voltage monitoring and control: Responsible for maintaining voltage within set limits. Monitors and maintains voltage within these limits
- 15 Ensures generation and load balance: Implements generator dispatch schedules to ensure that load and generation are balanced
- 16 Performs contingency studies: Performs real-time contingency studies to ensure system is being operated in a manner that will allow it to recover from any N-1 contingency within thirty minutes.
- 17 Performs real-time state estimation: Performs a real-time state estimation of area using telemetered data
- 18 Provides neighbor system awareness: Monitors conditions in real time beyond area footprint into neighboring systems for at least one transmission line into the neighboring system
- 19 Determines nuclear power plant (NPP) voltage adequacy: Has established agreement with NPPs in the area to ensure that the system is operated in a manner such that the NPP voltage will be maintained within needed limits
- 20 Approves generation outages: Approves scheduled generation outages
- 21 Approves transmission outages: Approves scheduled transmission outages



Some Preliminary General Findings

- Some entities are keeping their historical responsibilities even though other new entities are now responsible and have the needed data (EMS, Contingency Evaluation.)
- Alternately, some CA's believe their CA responsibilities have been delegated, and no longer perform them.
- Some entities do not recognize the authority of the RA - to command load shed for example.
- Some Control Areas do not have written agreements with their RC.



Preliminary General Findings

- Some Control Areas do not establish reactive reserve margins.
- The RC, in some cases, does not directly monitor voltage.
- Some ISO's have delegated the voltage responsibility for NPP's to the TSP, but the TSP cannot do this alone.
- Some control areas have no “entry criteria” for emergencies.



Responsibility Matrix, Responsibilities 1-11, Group 1

		Control area, reliability authority, etc.										
	Responsibility	A	B	C	D	E	F	G	H	I	J	K
1	Reliability authority	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No
2	Balancing authority	No	Yes	No	No	No	No	No	No	No	No	No
3	Transmission operator	Yes	No	Comment or clarification	No	No	No	No	Comment or clarification	Yes	No	No
4	Interchange authority	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No
5	Transmission service provider (OASIS)	Yes	No	Yes	Yes	No	No	No	No	No	No	No
6	Market operator	Yes	Yes	Yes	Yes	Comment or clarification	No	No	Yes	No	Yes	Yes
7	Sets pre-contingency voltage limits	?	No	No	?	?	No	No	No	No	No	No
8	Determines reactive requirements	Yes	No	No	?	Comment or clarification	No	No	No	No	No	No
9	Determines amt/location of operating reserves	No	Yes	No	Comment or clarification	Comment or clarification	No	No	No	No	No	No
10	Monitors/takes action on real/reactive reserves.	?	Yes	No	?	No	No	No	No	No	No	No
11	Monitors flowgate congestion	Yes	No	Yes	Yes	No	Comment or clarification	No	No	No	No	No

Yes	Yes
No	No
?	Unknown
Comment or clarification	Comment or clarification

Responsibility Matrix, Responsibilities 1-11, Group 2

		Control area, reliability authority, etc.										
	Responsibility	L	M	N	O	P	Q	R	S	T	U	V
1	Reliability authority	Yes	Yes	No	No	No	Yes	Comment	Yes	No	No	No
2	Balancing authority	No	No	Yes	Yes	Yes	Yes	Yes	Comment	No	Yes	No
3	Transmission operator	No	Yes	Yes	Yes	Yes	No	Yes	Comment	No	Yes	Yes
4	Interchange authority	No	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No
5	Transmission service provider (OASIS)	No	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No
6	Market operator	No	No	No	No	No	Yes	No	No	No	No	No
7	Sets pre-contingency voltage limits	No	No	No	No	No	Yes	No	No	No	Yes	Yes
8	Determines reactive requirements	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
9	Determines amt/location of operating reserves	No	Comment	Comment	Yes	Yes	Yes	Yes	Comment	No	Yes	No
10	Monitors/takes action on real/reactive reserves.	Yes	Yes	Comment	Yes	Yes	Yes	Yes	Yes	Comment	Yes	Yes
11	Monitors flowgate congestion	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Comment	No	No

Yes	Yes
No	No
?	Unknown
Comment	Comment or clarification

Responsibility Matrix, Responsibilities 12-21, Group 1

		Control area, reliability authority, etc.										
	Responsibility	A	B	C	D	E	F	G	H	I	J	K
12	Monitors conditions and declares emergency		?		?							
13	Sheds load in event of an emergency											
14	Performs voltage monitoring and control				?							
15	Ensures generation and load balance											
16	Performs contingency studies											
17	Performs real-time state estimation											
18	Provides neighbor system awareness				?							
19	Determines nuclear power plant (NPP) voltage adequacy				?	?						
20	Approves generation outages											
21	Approves transmission outages											

	Yes
	No
?	Unknown
	Comment or clarification

Responsibility Matrix, Responsibilities 12-21, Group 2

		Control area, reliability authority, etc.										
	Responsibility	L	M	N	O	P	Q	R	S	T	U	V
12	Monitors conditions and declares emergency											
13	Sheds load in event of an emergency											
14	Performs voltage monitoring and control											
15	Ensures generation and load balance											
16	Performs contingency studies											
17	Performs real-time state estimation											
18	Provides neighbor system awareness											
19	Determines nuclear power plant (NPP) voltage adequacy											
20	Approves generation outages											
21	Approves transmission outages											

	Yes
	No
?	Unknown
	Comment or clarification

Notes for Individual Cases

- An entity which stated they had the TO responsibility also stated that they do not have functional control of the transmission system, and that the ISO was responsible for monitoring flows.
- A TO did not have a procedure for monitoring conditions and declaring an emergency.
- A CA would not shed load when directed by the RC if the CA thought it was the wrong step to take.
- The responsibility for contingency studies is taken by both the CA and TO, but not cooperatively.
- A CA was unclear on ownership of many significant responsibilities.



Individual Matrix Notes, Contd.

- An RA exists who is not the interchange authority, does not determine amount and location of reserves, does not monitor voltage, or NPP voltage, and does not approve outages.
- One audited entity was not an RA, BA , TO or IA, and essentially all responsibilities were delegated. In addition, there were no agreements for delegation.



Conclusions

- The ISO must be capable of monitoring system conditions, declaring an emergency when established criteria are met, and then responding with emergency procedures because there is no clear emergency response responsibility below them.
- The actual ownership of the responsibilities is presently disorganized.
- Mapping of responsibilities is going to be a challenge.
- An understanding of responsibility ownership across the nation is not presently available.



Conclusions, Contd.

- There was a recurring theme that key responsibilities had been delegated, yet with the differing institutional frameworks and imprecise splits in functions, it was sometimes difficult to determine if a responsibility was being adequately addressed.
- It may be better to do combined CA/RC, or combined RA/BA/TO reviews of some entities to handle the delegation.
- When entities do functional registration, they should include the responsibilities, tasks and relationships that they perform per the Reliability Functional Model.

