



Topaz Power Group LLC

Quick Start Task Force Meeting

April 23, 2010

Austin, Texas

Ten Minute Non-Spinning Reserve Service

- Background
- 10MNSRS
- Existing 30 Minute NSRS
- Question and Answer

Background

- In September 2009, Topaz proposed developing a 10 Minute NSRS in response to PUCT Project 37339
- The proposal has been discussed at the QSTF, WMS and TAC

Quick Start Units

➤ 2-6 Minutes from Instruction

- Quick Start Unit fleet synchronizes.

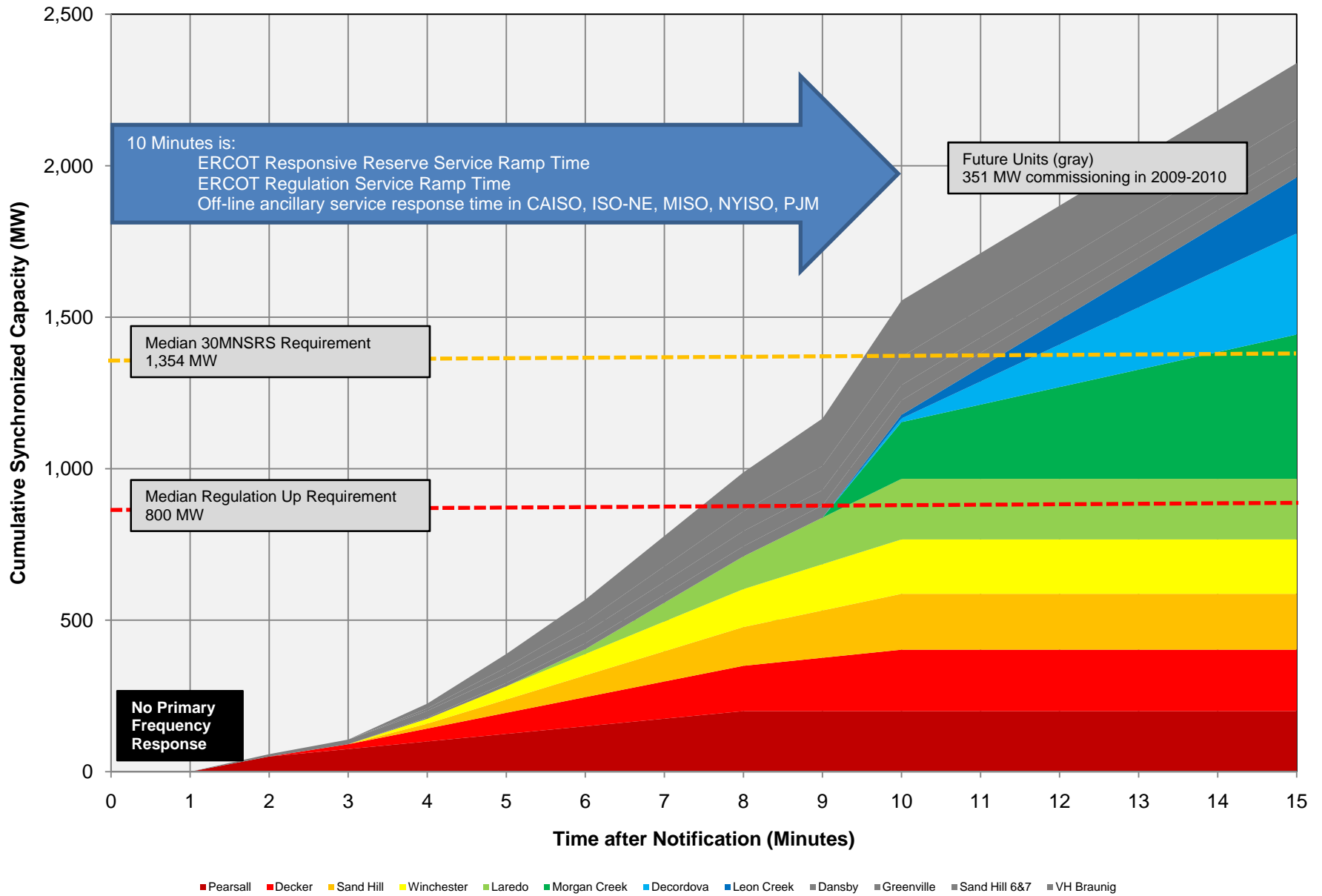
➤ 5 minutes

- Quick Start Units **ramp faster** than Generation RRS.

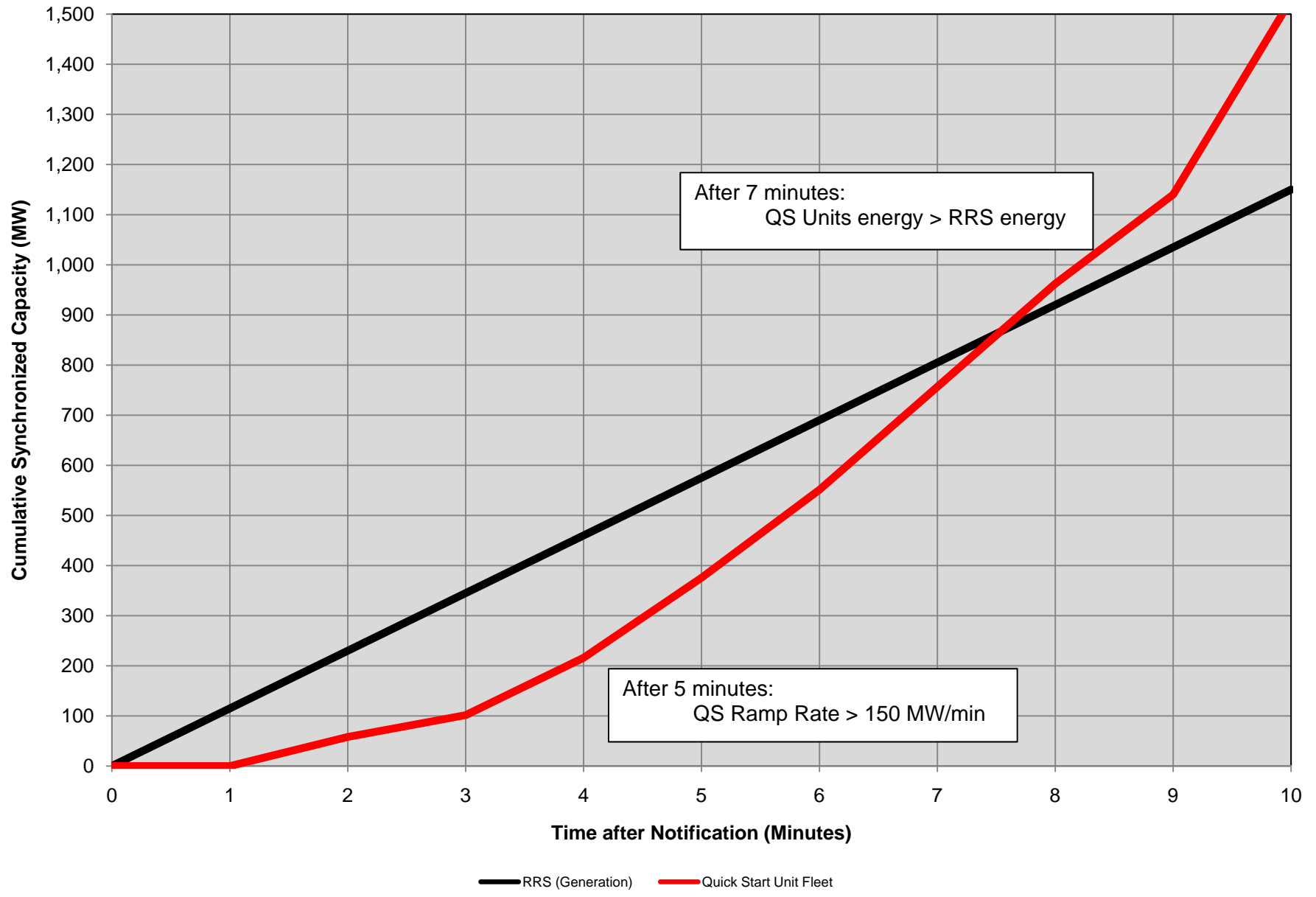
➤ 7 minutes

- Quick Start Units **provide more energy** than Generation RRS.

Quick Start Unit Cumulative Synchronized Capacity



RRS (Generation) vs Quick Start Unit Fleet



RRS vs Quick Start Units

- Generation RRS and 10 Minute Quick Start Units have similar characteristics.

Generation RRS Capacity	Quick Start Unit Capacity
Convertible to energy in 10 minutes	Convertible to energy in 10 minutes
1,150 MW procured ~98% of deployments are <1,150 MW	~1,500 MW (Go-Live capacity)
115 MW / minute ramp rate	>150 MW / minute ramp rate after 5 minutes
Used for Contingency Reserve	May serve as Contingency Reserve
Used as Backup Regulation	Can serve as Backup Regulation

Quick Start Unit Value

- **Committing a Quick Start Unit** in the Adjustment Period or Hour Ahead is comparable to **deploying Responsive Reserve** in the Adjustment Period or Hour Ahead.
- Quick Start Unit capacity can **avoid costs** associated with excessive On-line reserves.

10MNSRS Benefits

- Enhances reliability
- Reduces cost
- Creates a market opportunity for flexible Quick Start Units
- Potentially reduces excessive spinning reserves and emissions

Reliability Enhancement

Actions that reduce the duration or frequency of RRS deployments **enhance reliability** by maintaining unloaded RRS capacity.

Reliability Enhancement

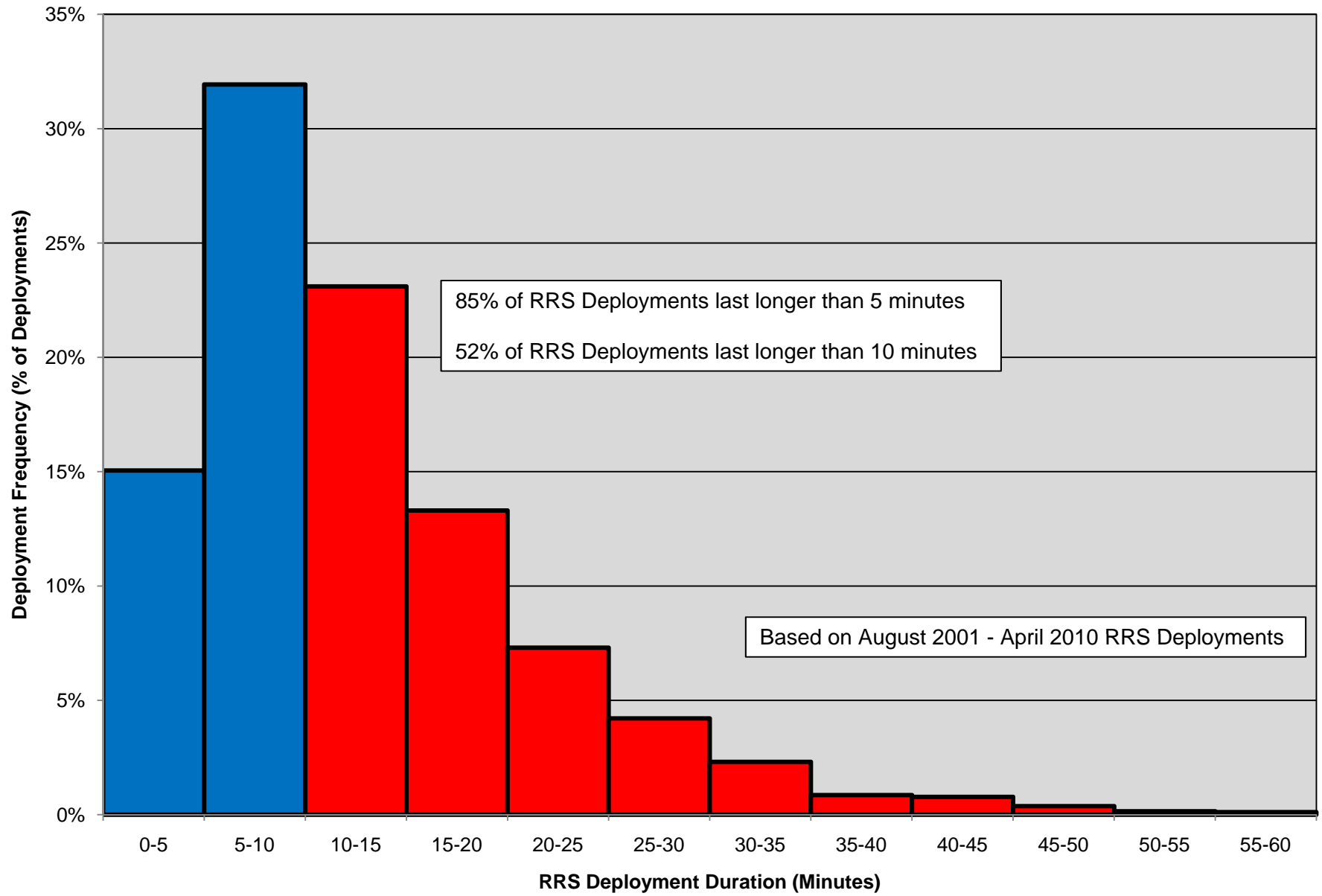
- 10MNSRS can reduce RRS duration as:
 - **Responsive Reserve Recall**

- 10MNSRS can reduce RRS deployments as:
 - **Backup Regulation Up**

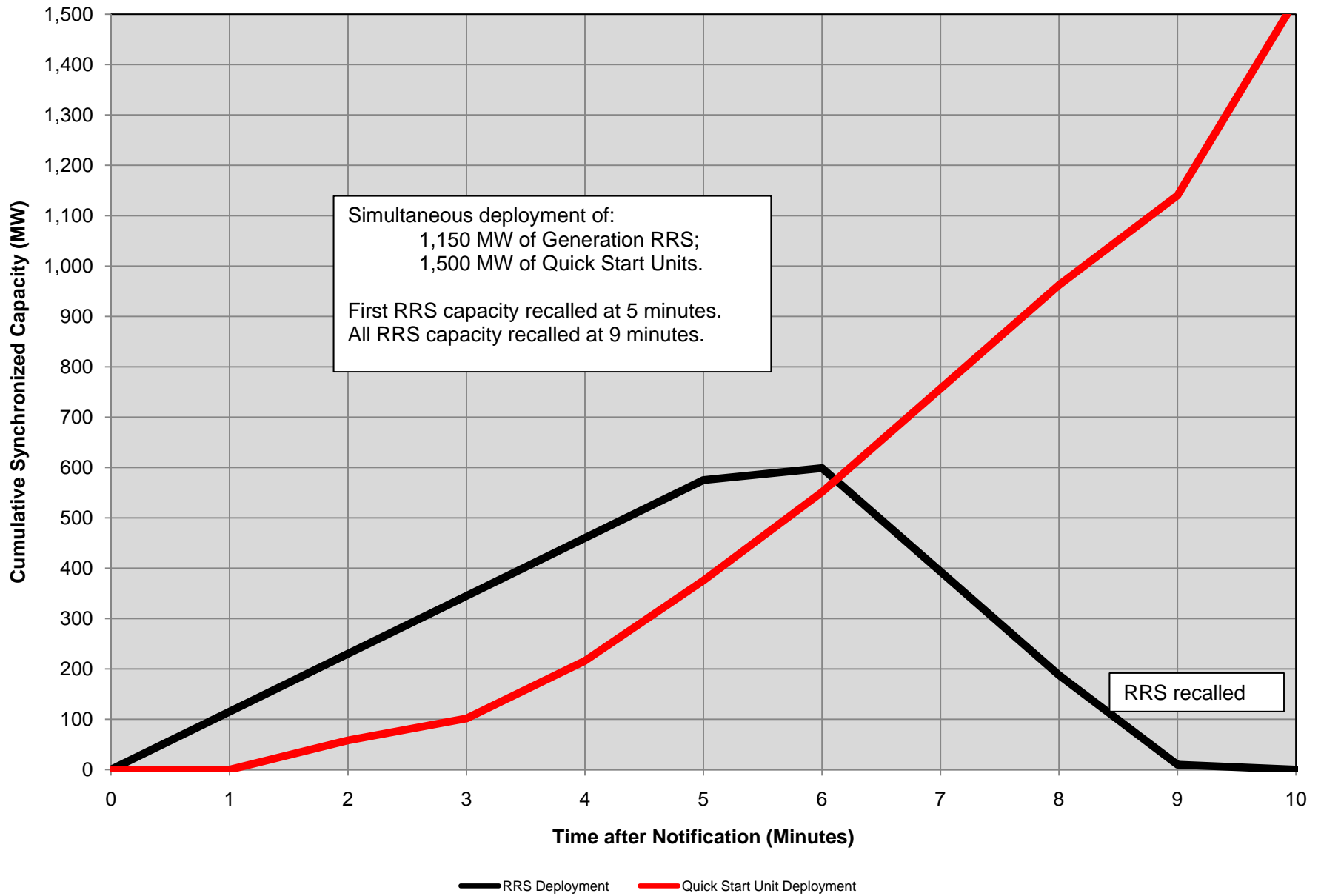
RRS Recall

- Near simultaneous 10MNSRS and RRS deployment **hastens the recall of RRS.**
- Deployments
 - 85% last longer than 5 minutes
 - 53% last longer than 10 minutes
- Quick Start Units can limit RRS deployment duration.

RRS Deployment Duration Histogram



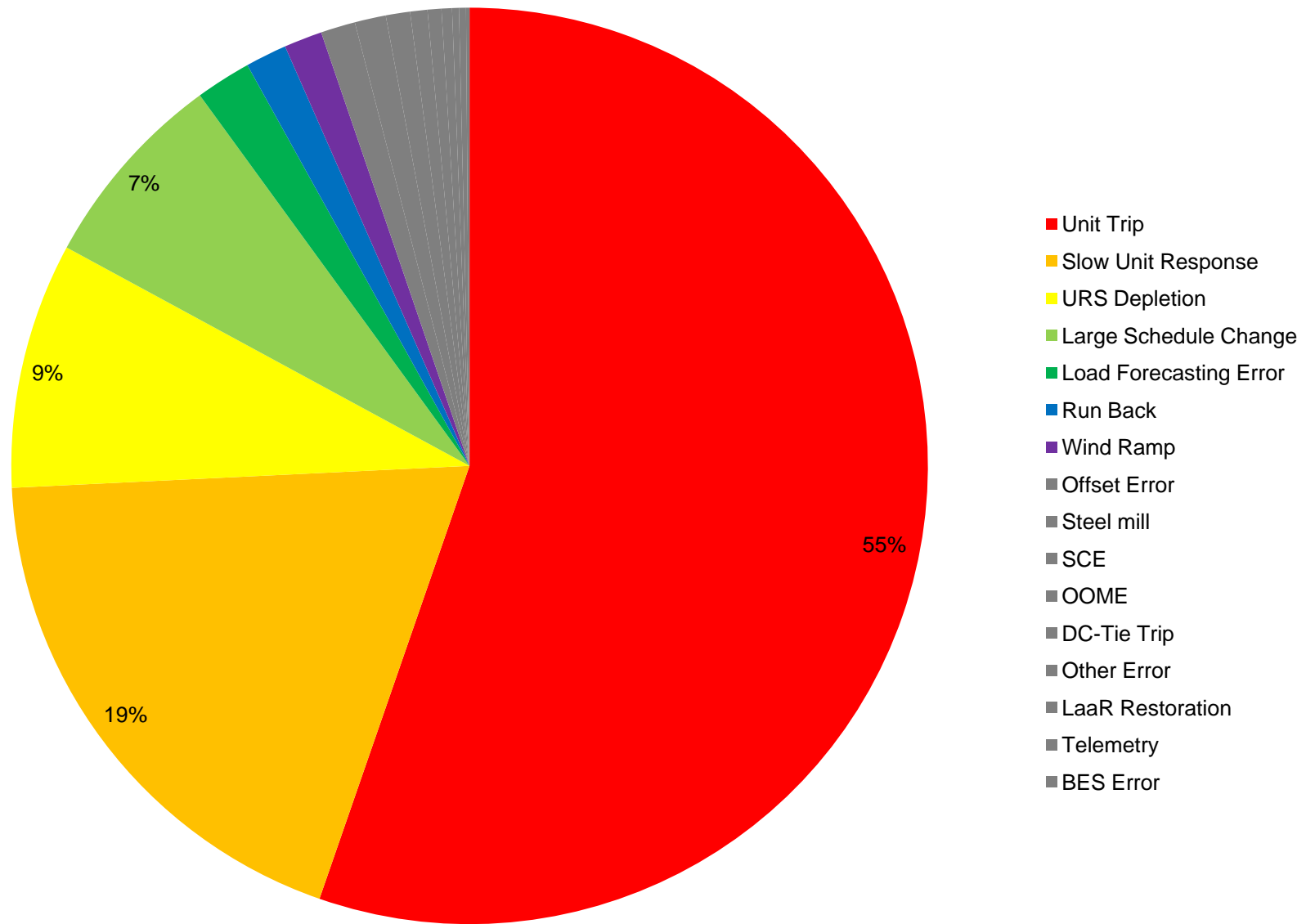
Quick Start Units as RRS Recall



Backup Regulation

- Current Protocols utilize RRS as Backup Regulation.
- Off-line Generation Resources can serve this role, avoiding:
 - Some RRS deployments; and
 - Excessive costly Regulation Up procurement.

Historical Distribution of RRS Deployments



Nodal Changes

- SCED promises On-line dispatch improvements.
- However, Real Time uncertainty, beyond On-line capability, will likely persist given:
 - History of significant schedule changes;
 - History of slow unit response; and
 - Increase of renewable resources.

Cost Reduction

- Off-line reserves, capable of delivering energy within minutes, provide a **low cost alternative** to excessive On-line reserves (**beyond** Responsive Reserve and Regulation Up)

On-line vs. Off-line Reserves

Energy Type	On-line Reserves	Off-line Reserves
Associated Energy	<p>High Heat Rate Energy</p> <p>Water</p> <p><u>Significant Environmental Costs</u> NO_x, SO_x, CO, CO₂ Mercury Particulate Matter</p> <p>Variable O&M</p> <p>Uplifted RUC Costs</p>	Nothing
Deployment Energy	<p>Potentially inefficient energy</p> <p>Low ramp rates</p>	<p>Highly efficient energy</p> <p>High ramp rates</p> <p>Start-up Cost</p>

30 Minute NSRS

- Reach LSL in 25 minutes
- Reach instructed level in 30 minutes
- Deployment
 - Load forecasting errors
 - After system disturbances
 - On-line reserve depletion

Nodal NSRS Market

- Over 2,000 MW can deliver energy in <25 minutes
- No distinction between Off-line Resources with response times >30 cycles and <90,000 cycles
- No incentive to deliver energy any faster than 25 minutes.

Thermal NSRS Technology

- 10 minutes is **today's state-of-the-art** for the thermal Brayton and Otto Cycles
 - The future may bring faster Start-Up times.
- Lower cost CC Resources can deliver energy in 30 minutes
 - Siemens provides:
 - **Brayton Cycle in 5-10 minutes**
 - **Combined Cycle in 15-30 minutes**

ERCOT Actions

- Reluctant to utilize 30MNSRS because of extended lead time
- OOMEVDI Quick Start Units **in lieu of** or **in advance of** NSRS
- Without an intermediate tool, ERCOT must rely on RRS as Backup Regulation



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Questions