Item 4.3: Overview of New Control Room Desk

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Board of Directors Meeting

ERCOT Public
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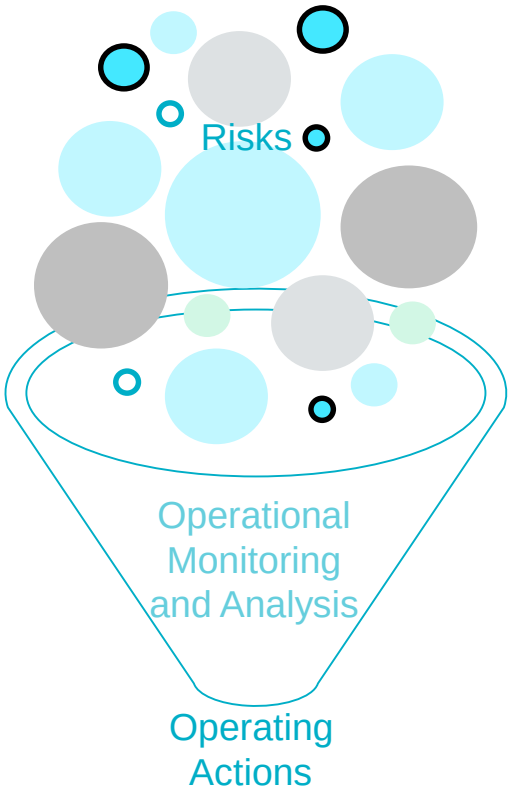
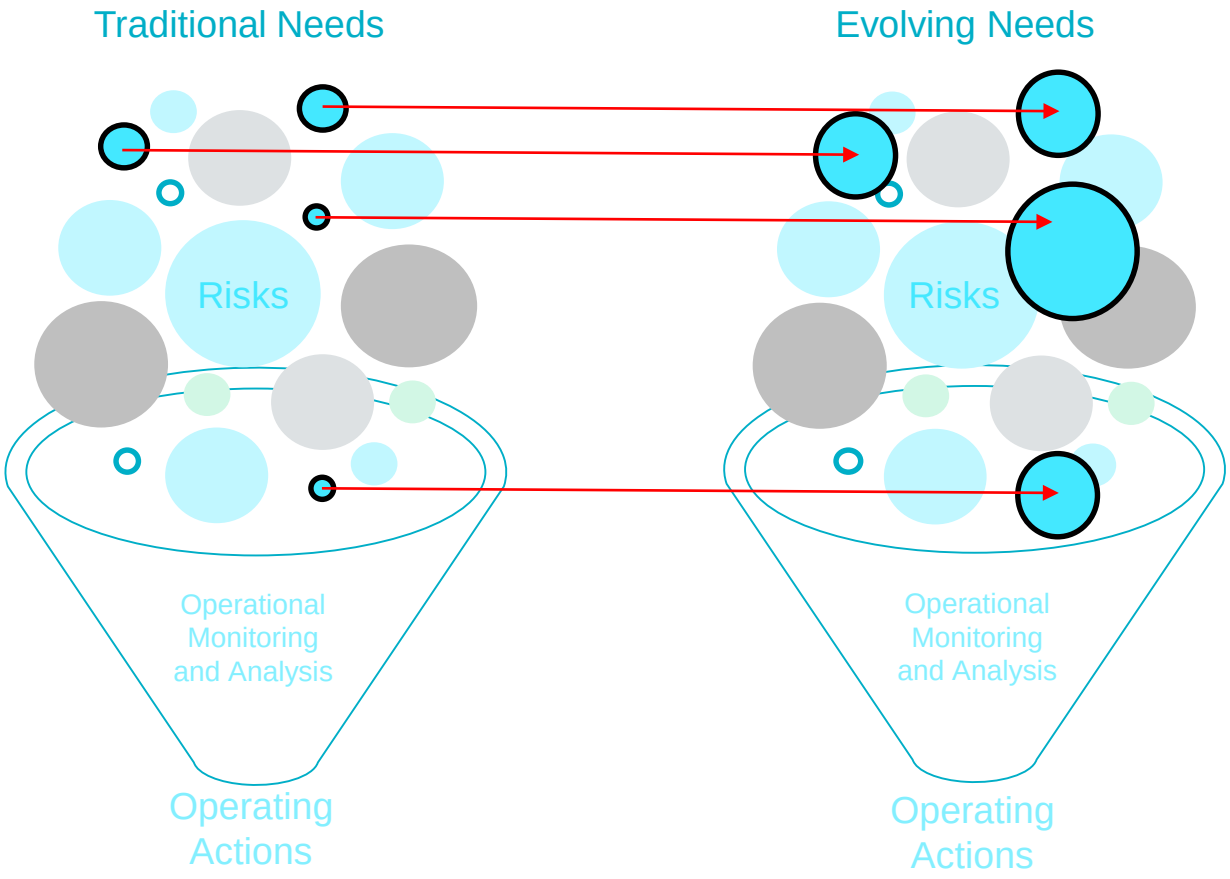
Traditional Operational Risk Management



- Traditional Risks (examples)
  - Transmission line faults and outages
  - Generation Resource trips
  - Load Forecast errors
  - Generation Output Deviations
- Traditional Risk Assessment and Management
  - Characterization of contingencies and their consequences,
  - Determination of operating reserves and limits to be maintained
  - Informed, experienced operator judgment

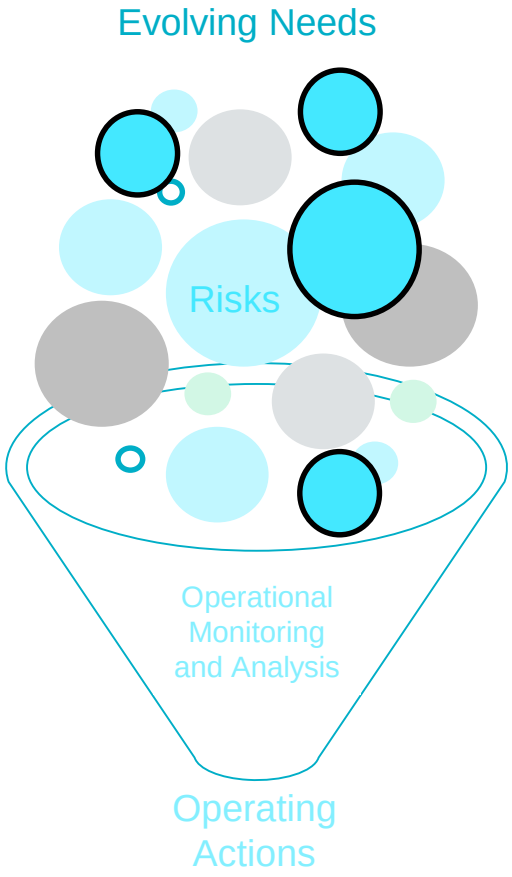
Maintaining Resilience

- With the changing resource mix on the system, the need to assess and manage certain risks has grown.



New and Evolving Risks

- Improved quantitative analysis and dynamic consideration of these risks and controls are needed
  - –Wind and Solar Forecast Errors
  - –Net Load Ramps
  - –Low Inertia
  - –Variable Ancillary Service Needs

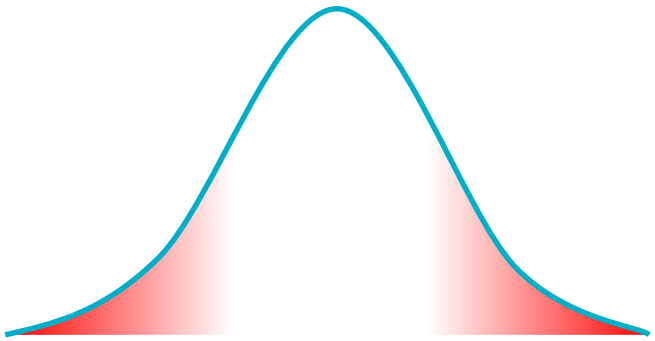


Reliability Risk Desk Status

- Staffing for a new desk in Control Room was approved in 2016-17 budget.
- Implementation required significant program management
  - New Analytical Tools
  - New Operator Displays
  - New Operating Procedures
  - Staffing
  - Training
- New desk went live on 1/30/2017
- New Operations Procedures are posted – Power Operations Bulletin 770

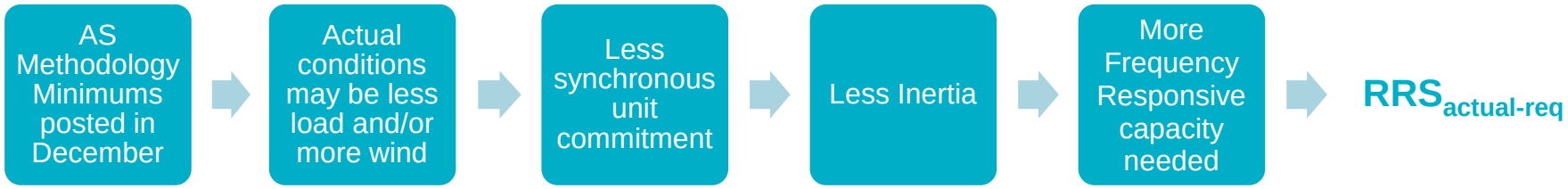
Renewable Forecast Monitoring & Improvement

- Facilitate improved accuracy of wind and solar forecasts.
  - Promote improved telemetry performance from wind/solar plants
  - Monitor forecast variance and perform forecast adjustments during icing and other extreme weather events



Inertia Monitoring and Reserve Sufficiency

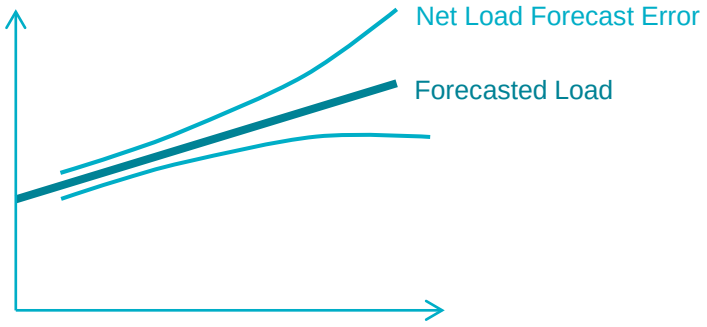
- Maintain sufficient inertia and frequency responsive reserves.
  - Monitor that the inertia on the system is above the Critical Level of Inertia



  - Ensure sufficient frequency responsive capacity is available to cover actual inertia conditions, looking at:
    - Real Time system conditions
    - Day ahead expected conditions and most recent COP submissions

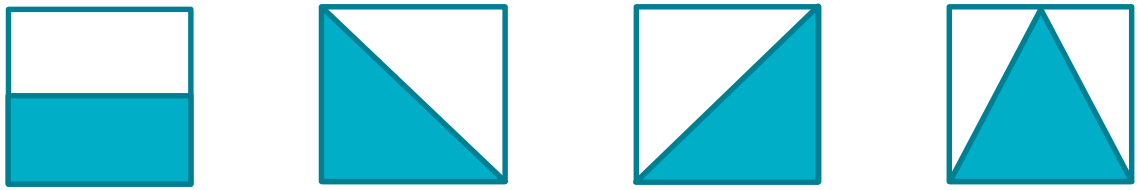
Forecast Risk and Resource Sufficiency

- Maintain sufficient temporally available capacity to cover remaining forecast errors and net load ramps
  - Monitor uncertainty around the Load and renewable forecasts for future hours
  - Identify hours with insufficiency based on scheduled resources and ancillary services
  - Retain sufficient reserves in every hour to cover the higher of:
    - Current level of net load ramp risk
      or
    - Amount that will be needed, based on currently expected operating conditions, to maintain frequency and recover contingency reserves



Intra-hour Resource Monitoring

- Maintain prompt hour resource sufficiency
  - Monitor the short-term load, wind and solar forecasts
    - Intra-hour net load patterns due to load/wind/solar can be vastly different even with same hourly average values.



  - Monitor the adequacy of available generation and reserves to cover the expected volatility in short-term net load over the next 60 minutes and identify sub-hourly intervals with insufficiency
- *Tools for this functionality still under development*

Questions?