Resilience Updates

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What do I want a Resilient system to do?

- Tie grid performance objectives to resilience risk measurements
- Set acceptable service levels for resilience, not reliability
- Not all loads are created equal and the performance criteria must account for the difference
- Never forget that time is the enemy!

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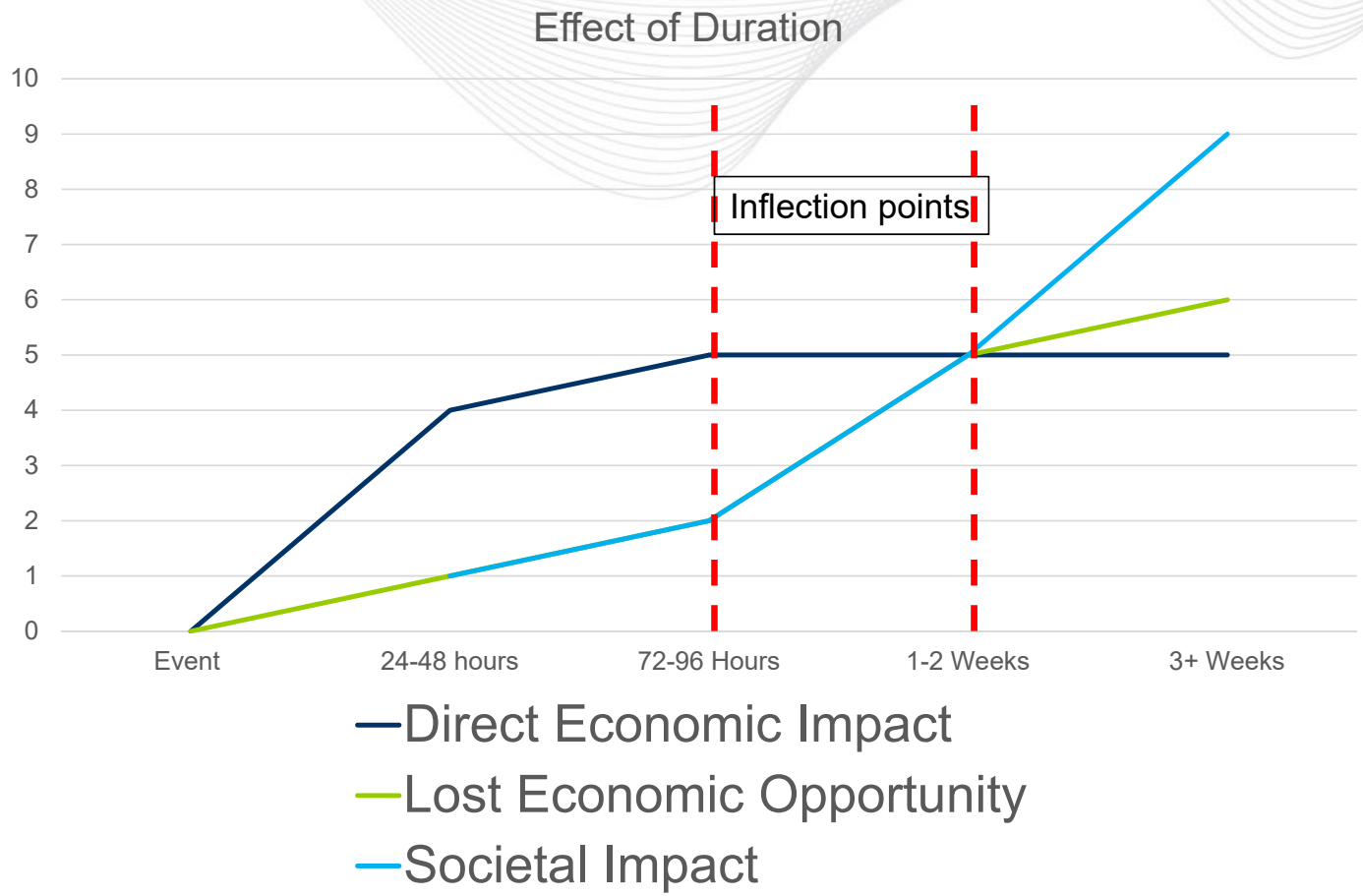
Time is the Enemy



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Resilience Risk Mitigation is a Continuum

- The process begins well before an event occurs, and ends long after the immediate threat has passed
- No system can be fully mitigated from every hazard
  - Protecting against every hazard is cost prohibitive
  - Some hazards will cause disruptions no matter what
- The key is avoided cost optimization and through balanced efforts in multiple areas

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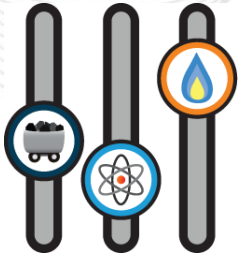
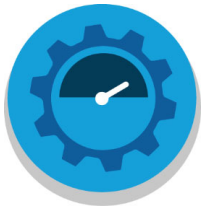
Improving the Resilience of Supply

Changing Load Profiles / Demand Response

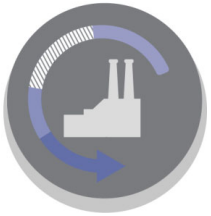


Changing Fuel Mix



Fuel Security

Renewable and Distributed Energy Resource Integration



Generator Performance Criteria

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Direct Economic Impact

Objective also includes threshold for a maximum of one Transmission Owner (TO) Zone involved in a cascade from a single event and does not account for the availability of corresponding distribution infrastructure if transmission and generation are available.

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Lost Economic Opportunity

Outage duration beyond x hours cannot be due to the availability of capacity, functionality/presence of transmission infrastructure, or electricity outages at pre-identified interdependent infrastructures.

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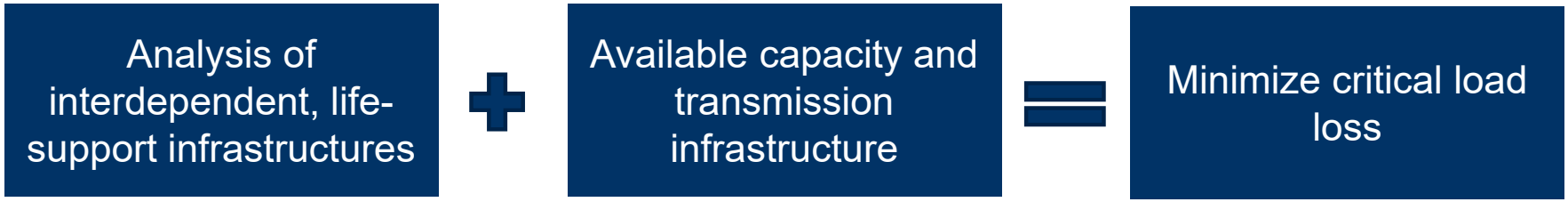
Societal Impact



Subset of the total forecasted load for a Reliability Coordinator (RC) footprint. Categories include black start, high-priority loads for vital system interdependencies (communications, natural gas) and retails loads with essential functions (department of defense, water/wastewater, transportation)

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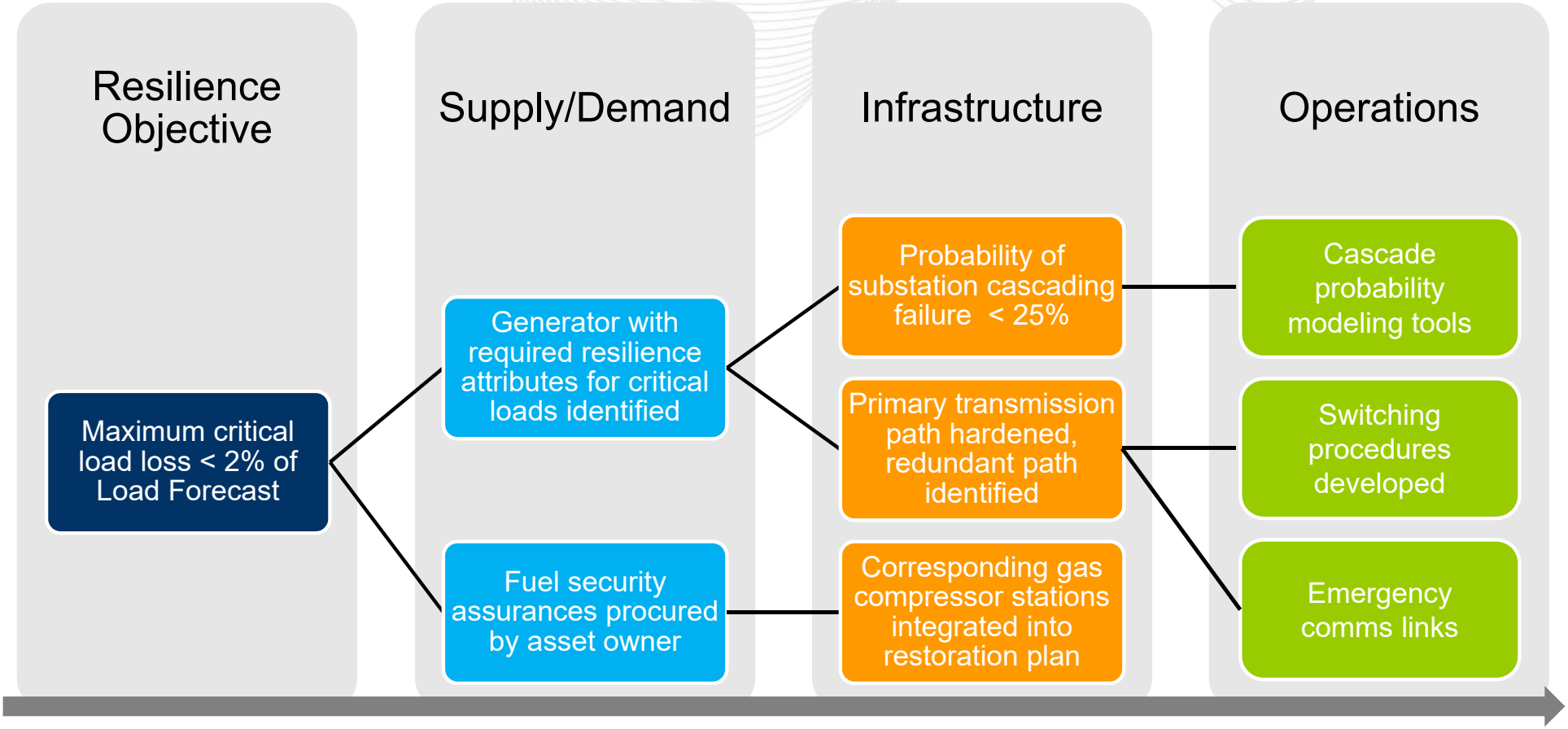
Application of Objectives – Resilience Matrix



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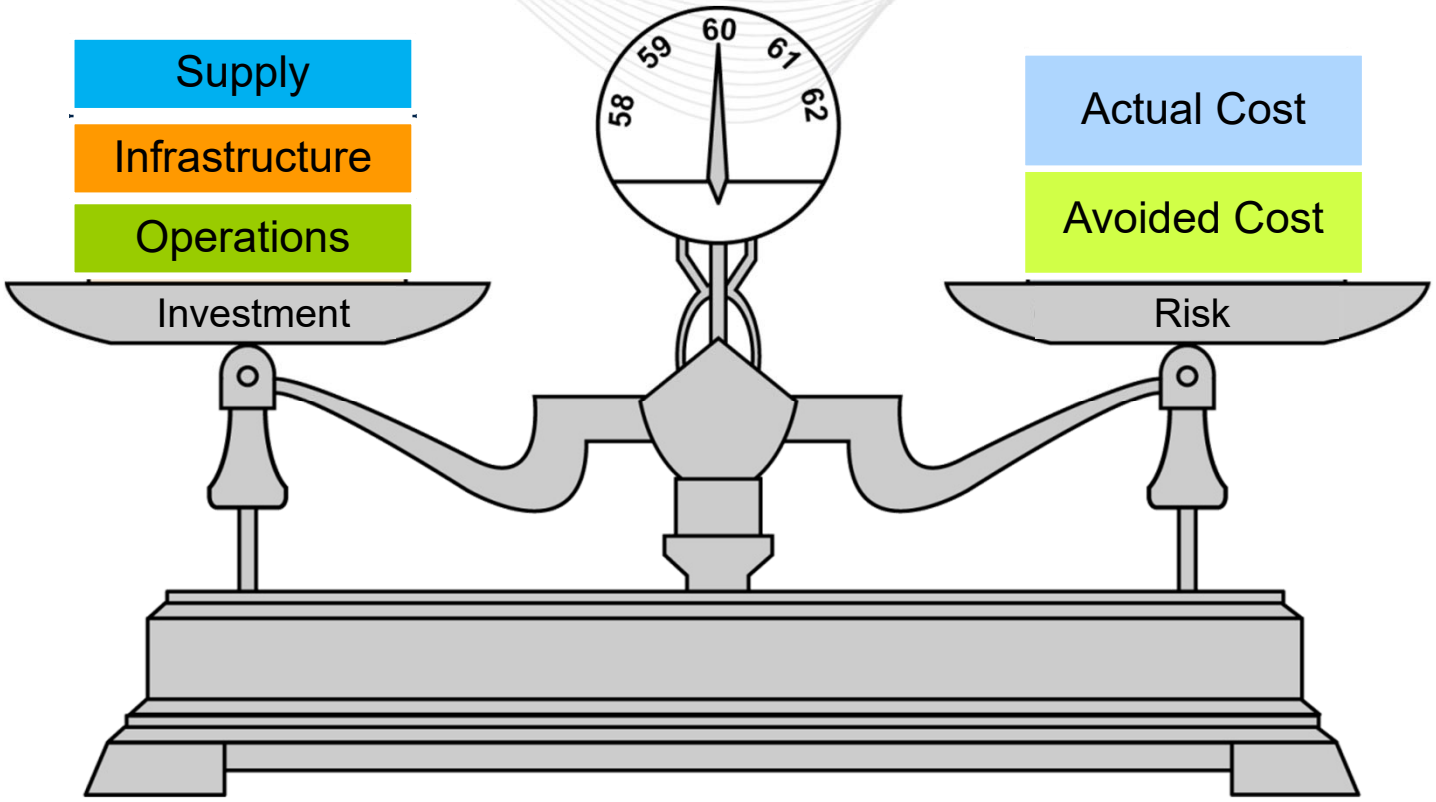
Finding the Right Balance



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Questions?

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