Need of Disruption Risk Management System at Power Distribution Utilities

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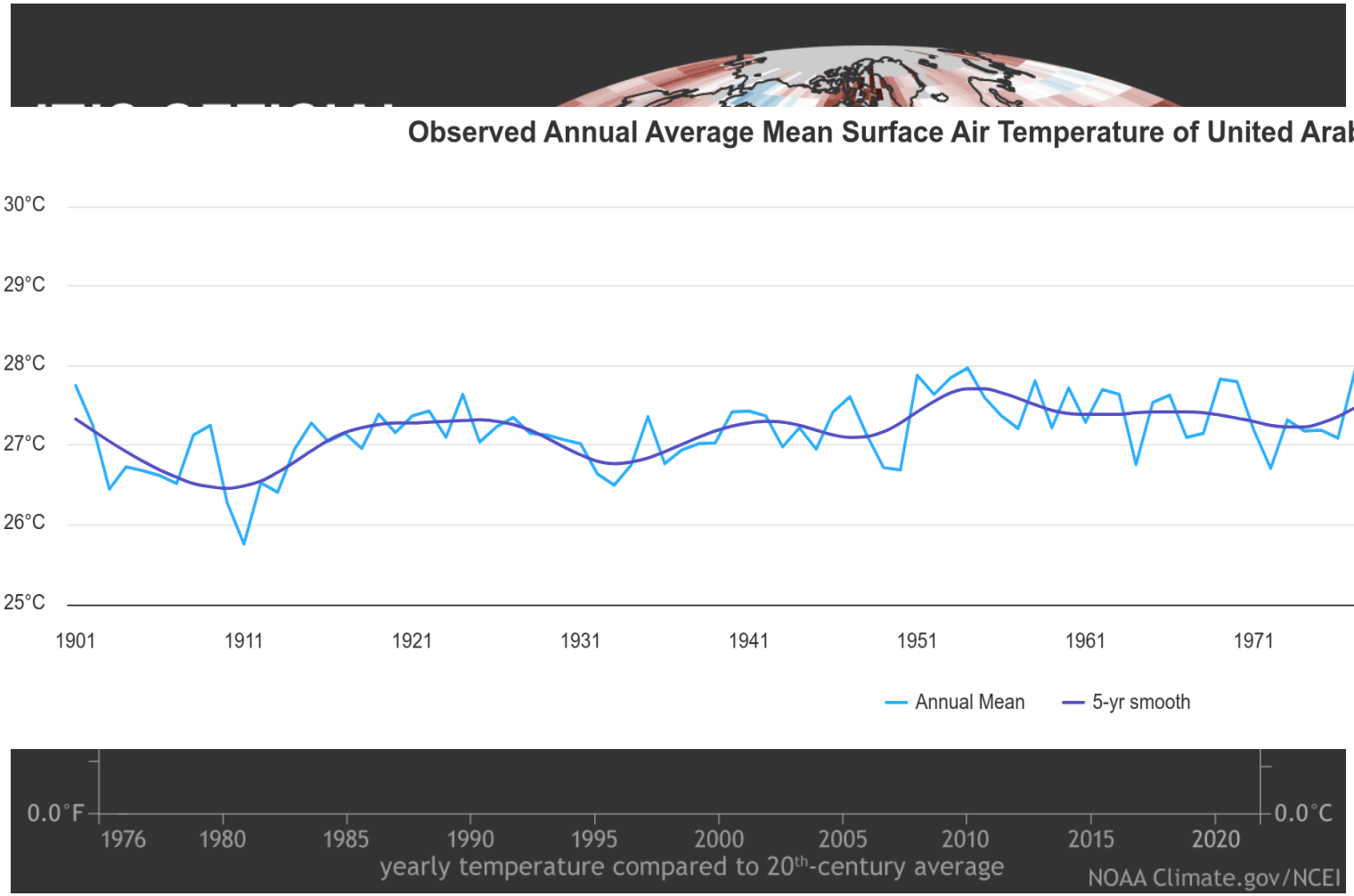
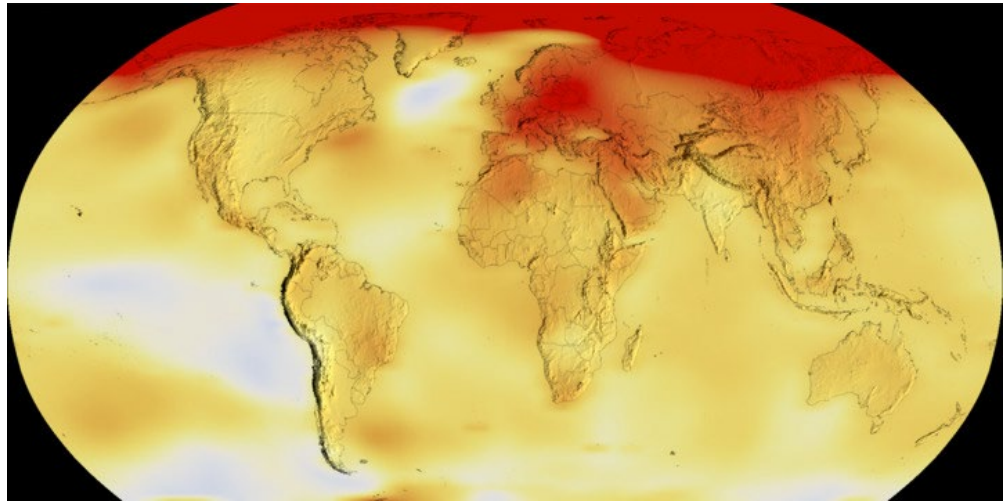
Outline

1. Global Temperature Change
2. Severe Weather and Natural Disasters
3. Hazards, Impacts and Measures
4. Characteristics of Disruption
5. Challenges for Distribution Utilities
6. Disruption Management at Distribution Utilities
7. Key to Disruption Management and What More

Global Temperature Change



Global Temperature Change



Highlights

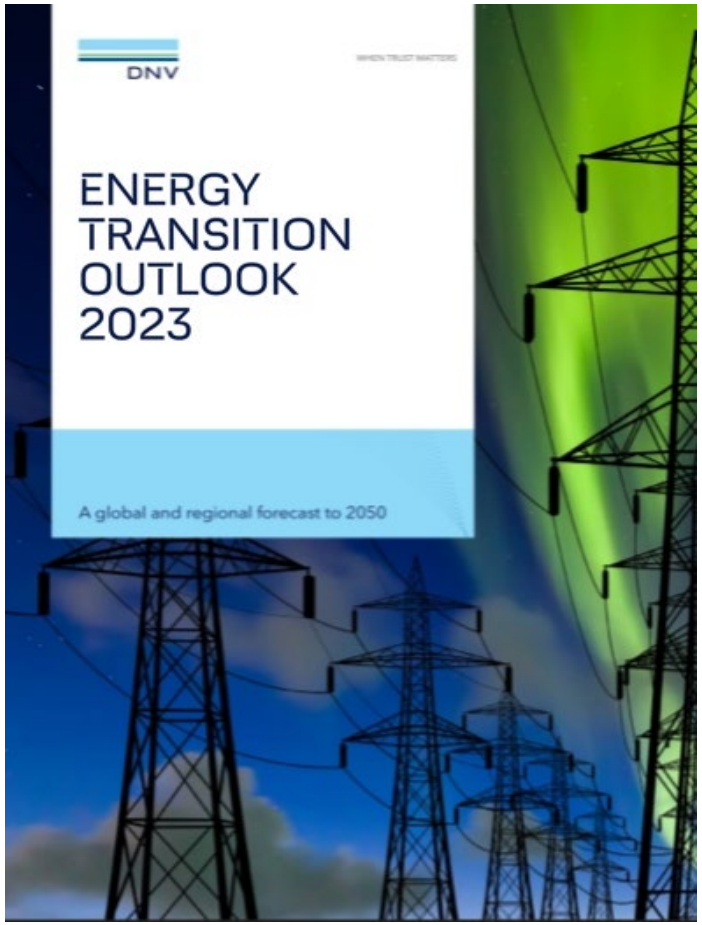
- Temperatures were above average over much of the globe with Africa, Europe and Asia having their warmest July on record.
- Sea surface temperatures were second-warmest on record, ending a streak of 15 consecutive record-setting months.
- Northern Hemisphere snow cover extent and global sea ice extent were both below average, with Antarctic ice coverage ranking second smallest.

July temperature

July 2024 was the warmest July on record for the globe in NOAA's 175-year record. The July global surface temperature was 1.21°C (2.18°F) above the 20th-century average of 15.8°C (60.4°F). This is 0.03°C (0.05°F) warmer than the previous July record set last year, and the 14th consecutive month of record-high global temperatures. This breaks the longest record warm global temperature streak in the modern record (since 1980) previously set from May 2015—May 2016. July 2024 marked the 48th consecutive July with global temperatures, at least nominally, above the 20th-century average.

https://youtu.be/LwRTw_7NNJs

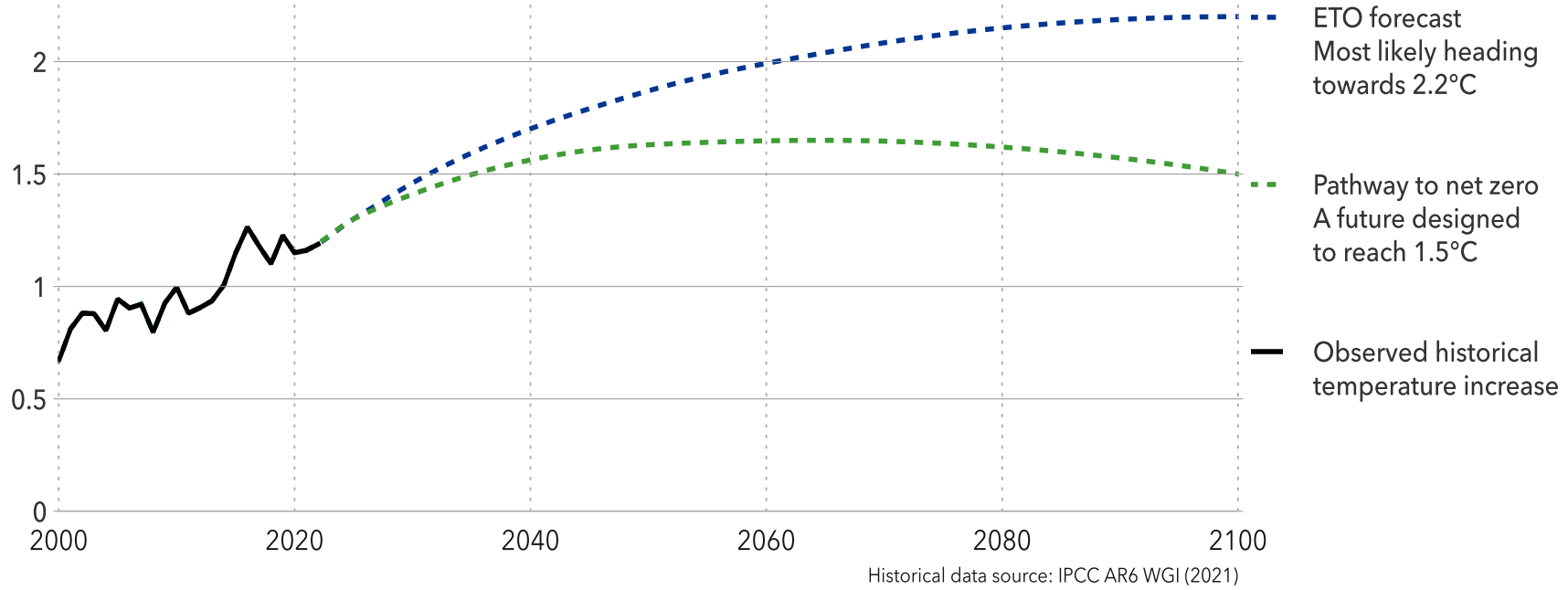
Temperature Change



Closing the gap to 1.5°C

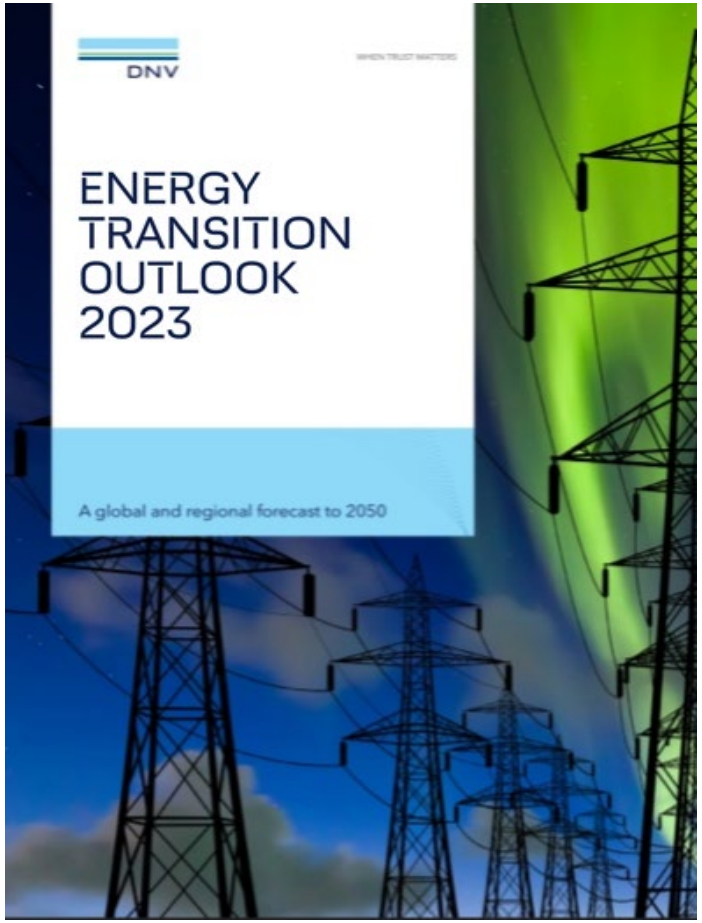
Change in global surface temperature relative to 1850-1900

Units: °C



Historical data source: IPCC AR6 WGI (2021)

Temperature Change

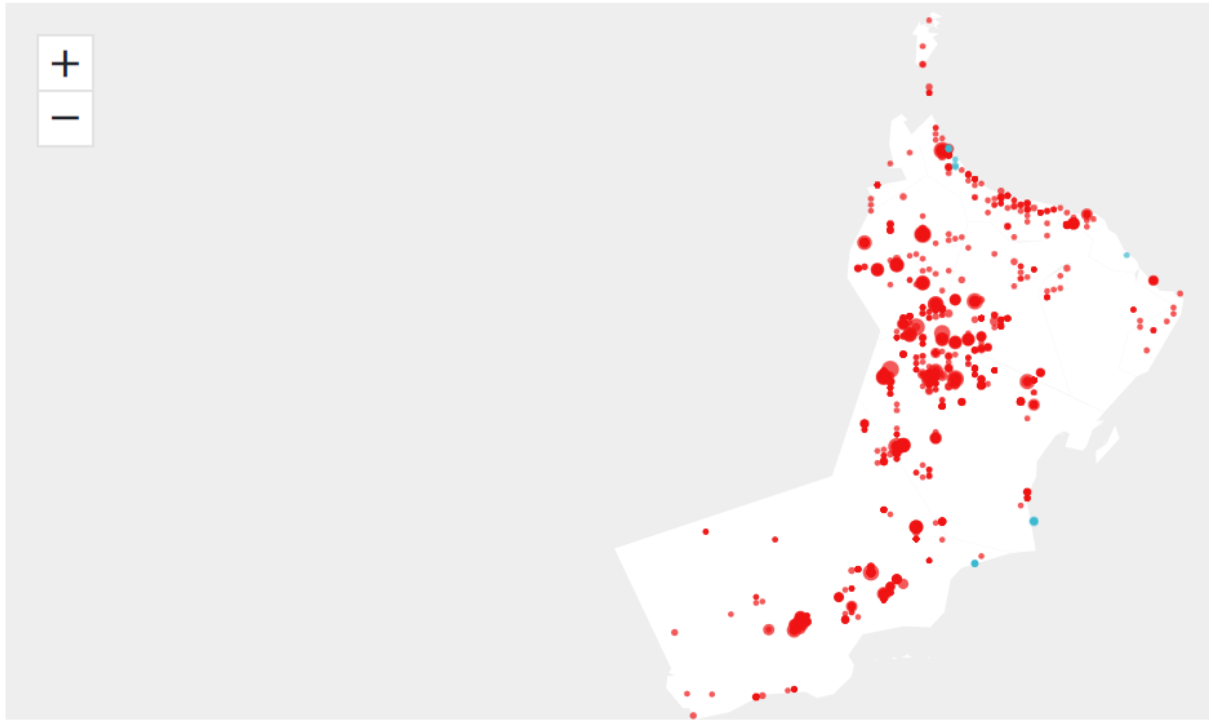


Emissions key findings

- 70% of annual greenhouse gas emissions are from the energy sector of which most are CO_2 from burning fossil fuels
- Global energy-related CO_2 emissions likely to fall only 4% to 2030 and 46% to 2050
- We exhaust the 1.5°C carbon budget in 2029 and 2°C budget in 2054; and are heading towards global warming of 2.2°C by 2100

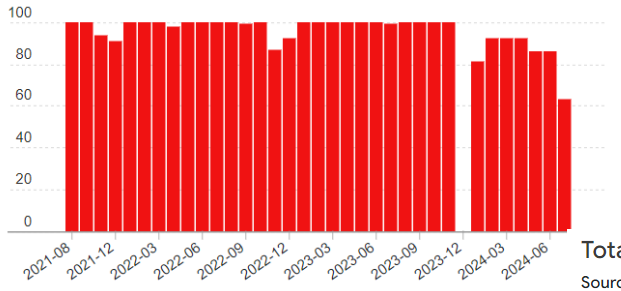
Severe Weather and Natural Disasters in Oman – last 3 years

Source: earthdata.nasa.gov via Google, developers.google.com via Google



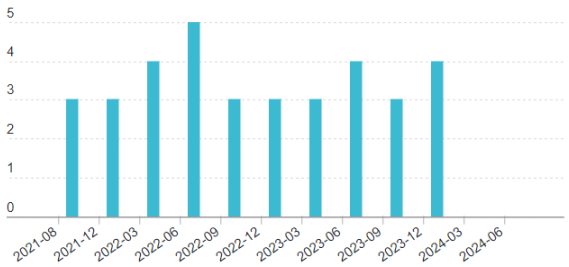
Number of fires

Source: earthdata.nasa.gov via Google



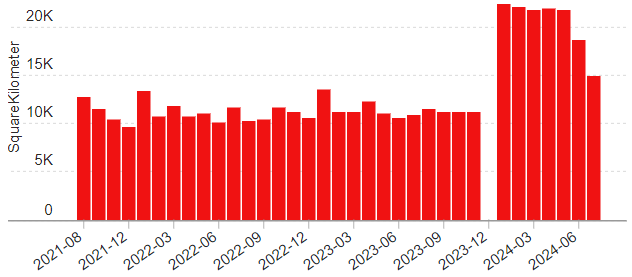
Number of floods

Source: developers.google.com via Google



Total area affected by fires

Source: earthdata.nasa.gov via Google



Total area affected by floods

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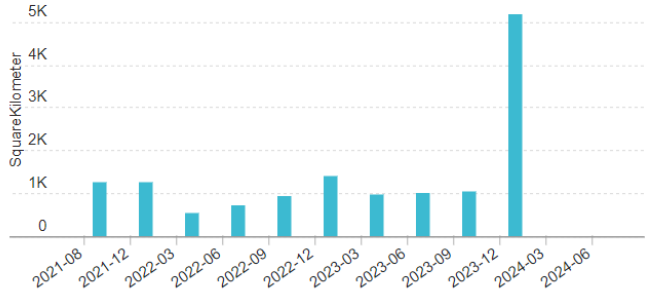


https://datacommons.stanford.edu/disasters/country/OMN

Severe Weather and Natural Disasters

Sikkim’s Glacier Lake Outburst Flood

Hazards, Impacts and Measures

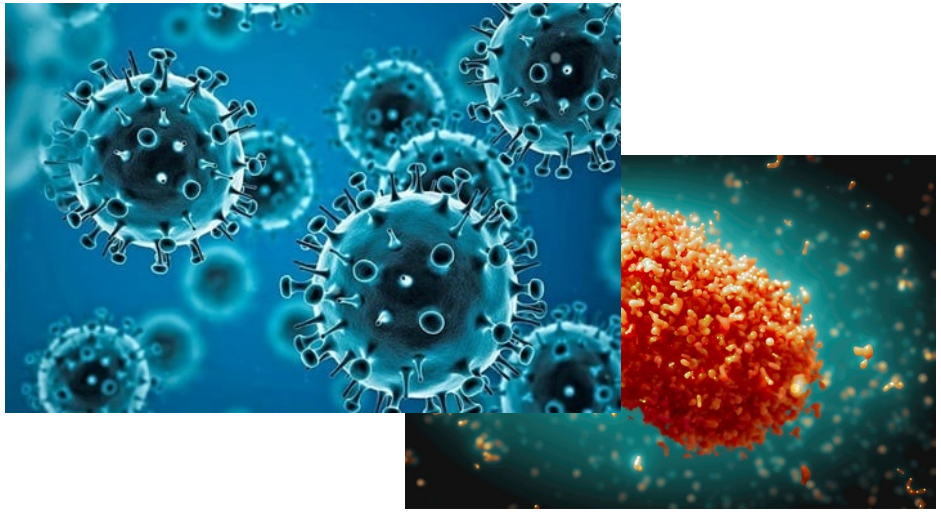
Climatic Hazard	Impact	Impact Segment of Utility	Measures
Extreme Heat	• Increased cooling demand leading to grid strain.	• Transformers	• Use high-temperature-resistant materials.
	• Overheating and reduced efficiency of transformers and cables.	• Cables	• Increase transformer and cable capacity.
	• Accelerated equipment aging.	• Grid management systems	• Implement load management strategies.
Sandstorms	• Abrasion and damage to outdoor equipment.	• Outdoor substations	• Regular cleaning and maintenance of equipment.
	• Reduced efficiency of solar panels.	• Solar power plants	• Install protective covers for sensitive equipment.
	• Clogging of air filters.	• Cooling systems	• Use dust-resistant materials.

Climatic Hazard	Impact	Impact Segment of Utility	Measures
Flooding	• Submersion of substations and transformers.	• Substations	• Elevate critical infrastructure.
	• Short circuits and equipment failure.	• Transformers	• Design flood-resistant substations.
	• Erosion of infrastructure foundations.	• Underground cables	• Implement robust drainage systems.
High Winds	• Damage to overhead power lines.	• Overhead power lines	• Strengthen and reinforce power lines.
	• Fallen trees causing outages.	• Distribution poles	• Regularly trim trees near power lines.
	• Structural damage to facilities.	• Substations	• Design wind-resistant structures.
Drought	• Reduced water availability for cooling in thermal plants.	• Thermal power plants	• Implement water-efficient cooling systems.
	• Increased reliance on alternative water sources.	• Cooling systems	• Use dry cooling technologies.
			• Invest in water recycling and conservation.

Hazards, Impacts and Measures

Climatic Hazard	Impact	Impact Segment of Utility	Measures
Lightning	• Power surges and outages.	• Transformers	• Install lightning protection systems.
	• Damage to transformers and other equipment.	• Substations	• Use surge protection devices.
		• Distribution networks	• Regularly inspect and maintain grounding systems.
Humidity and Salt Fog	• Corrosion of metal components.	• Coastal substations	• Use corrosion-resistant materials.
	• Insulation degradation.	• Transformers	• Apply protective coatings.
		• Outdoor equipment	• Regularly inspect and maintain insulation.
Severe Cold (rare)	• Brittle failure of materials.	• Transformers	• Use cold-resistant materials.
	• Freezing of equipment.	• Substations	• Install heating elements in critical equipment.
		• Transmission lines	• Design systems for cold climate resilience.

Disruption Risk



Characteristics of Disruption

Element of surprise

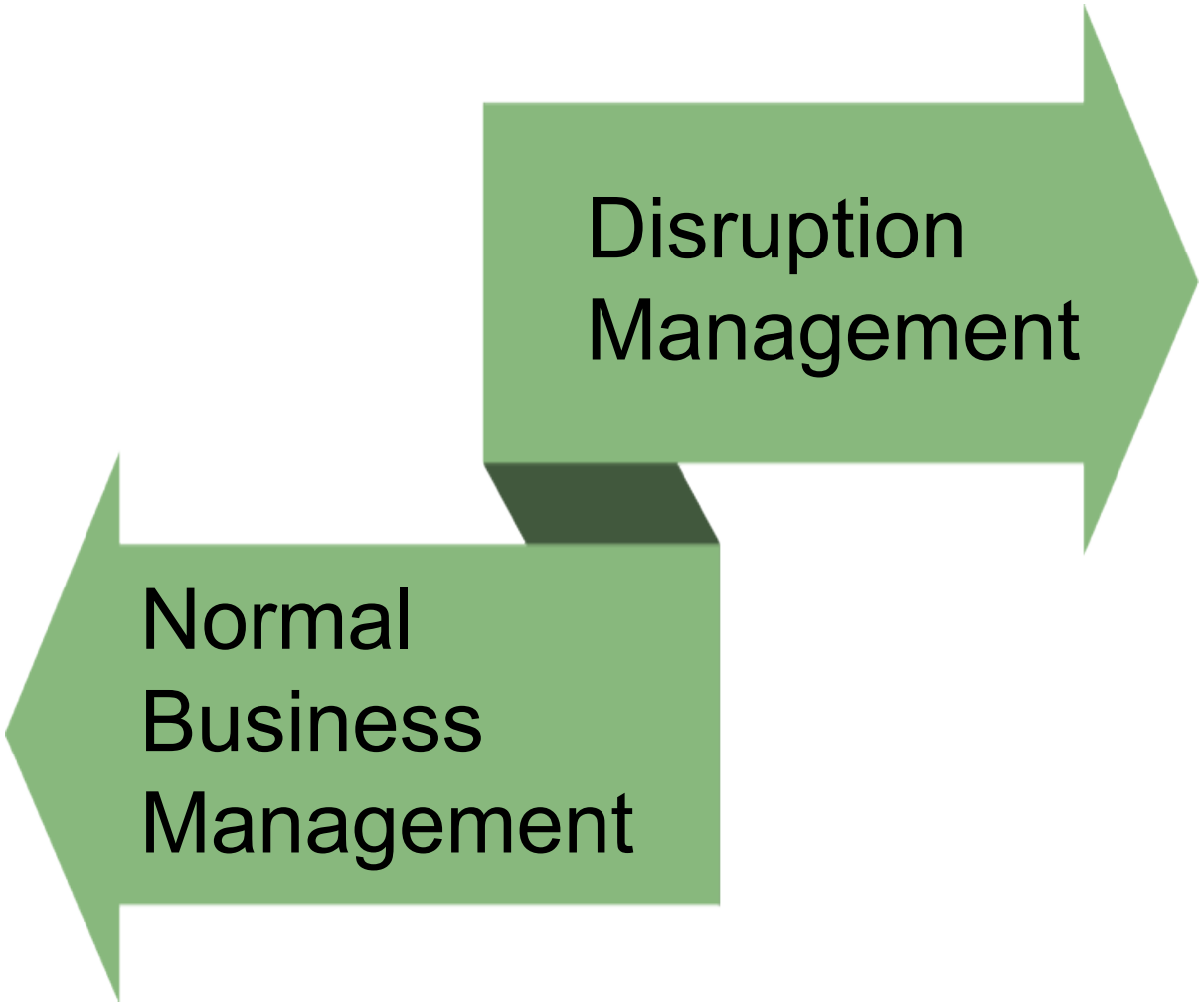
Short decision time

Need for change

Threat to Business

Challenges for Distribution Utilities?

- **Standard**
  - **Policies**
  - **Procedures**
  - **Practices**
  - **Delegation**
  - **Stakeholders**
  - **Mode of communication**
  - **Familiar Infrastructure**



- **Situational**
- **Emergency Procedures can’t be standardised**
- **Change in delegation**
- **Large number of Stakeholders**
- **Communication**
- **Logistics**
- **Infrastructural changes or localised collapse**
- **Changed asset condition**
- **Localised / Global**
- **?**

Disruption Management at Distribution Utilities

Establish a Disruption Management Policy, Procedure and Risk Register

Philosophies and Strategies

- **Fast** and Simple
- Key supply area
- Focus headquarters for info

Critical Alarm selections

- Hierarchical Classification
- Geographic location

Selection of key personnel

- Spokespersons for Media
- Technical Operators
- Coordination

Disruption Management Resources

- Mobile Generating unit resources
- sufficient fuel resources
- Transmission/distribution resources
- communication resources
- mutual assistance arrangements

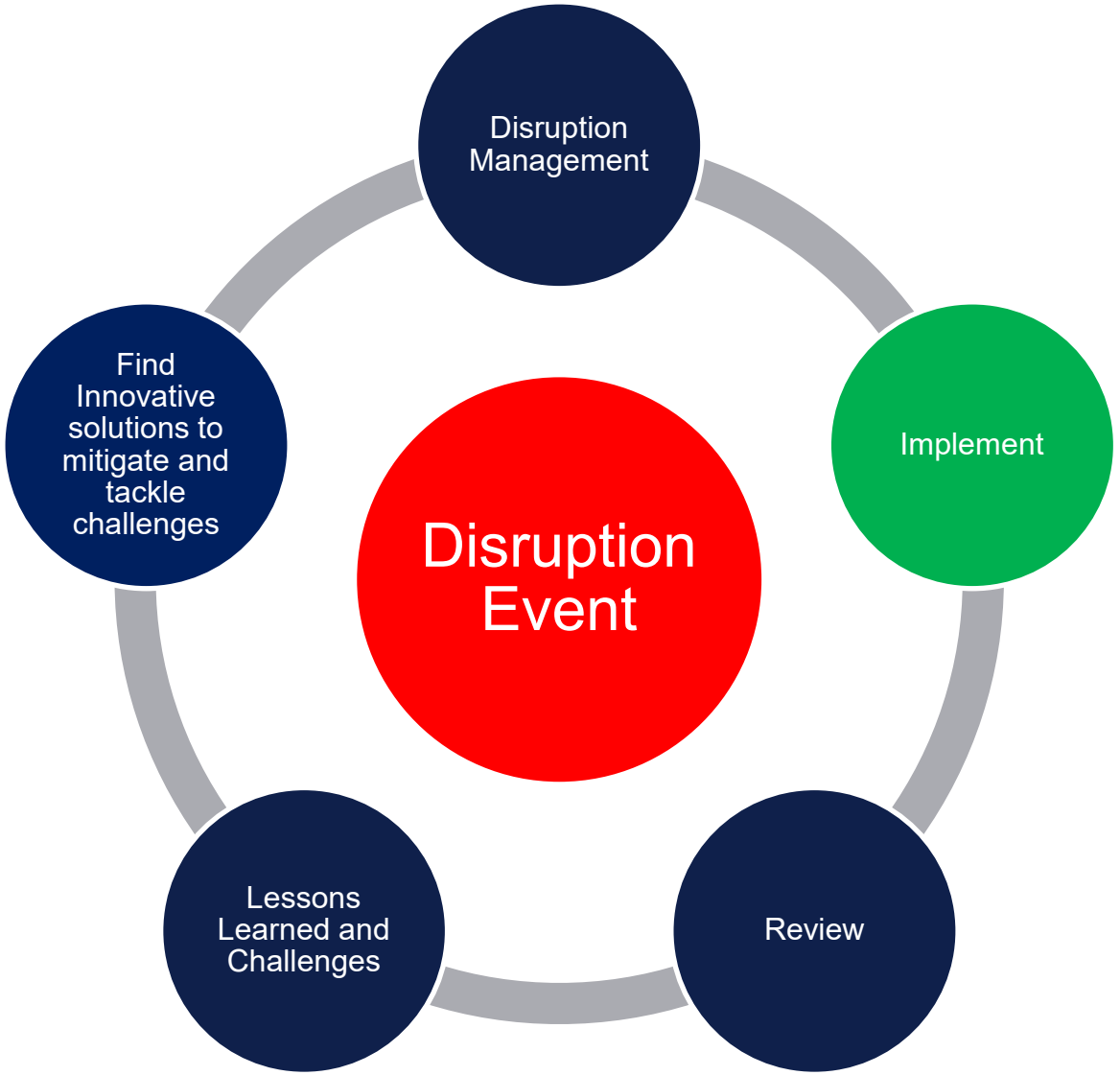
Critical Loads

- List of priorities
- Hospitals
- Government Building
- Train stations/Airport
- Municipalities
- Civil service

Training of Personnel and Simulations

- Testing of the procedure
- Demonstration
- Communication chain

Key to Disruption Management – what more?



Thank You

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