International Energy Agency

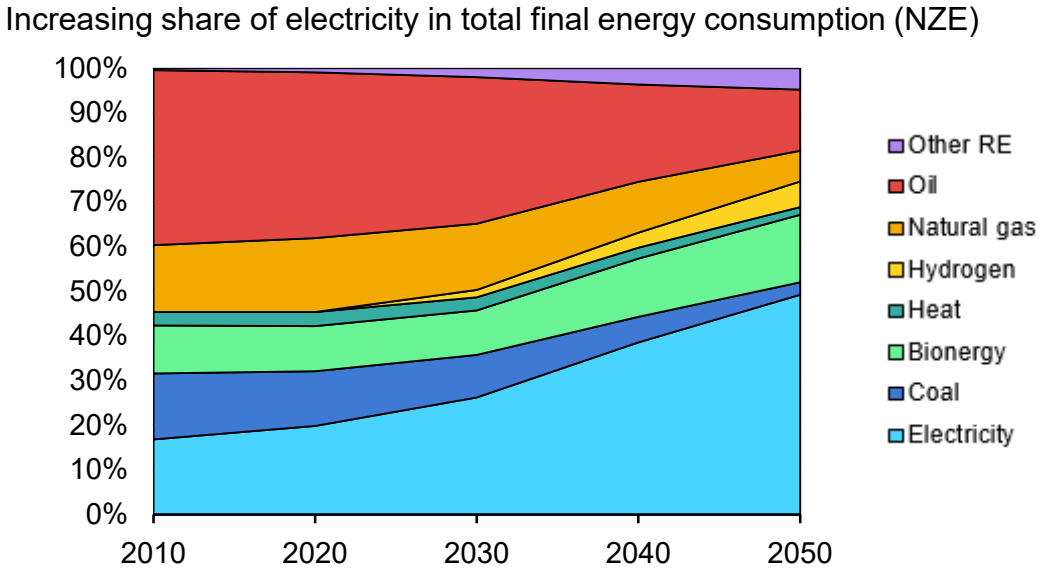
A framework for planning climate resilient systems

Keisuke SADAMORI

8th Annual EPRI-IEA Workshop - Challenges in Decarbonisation

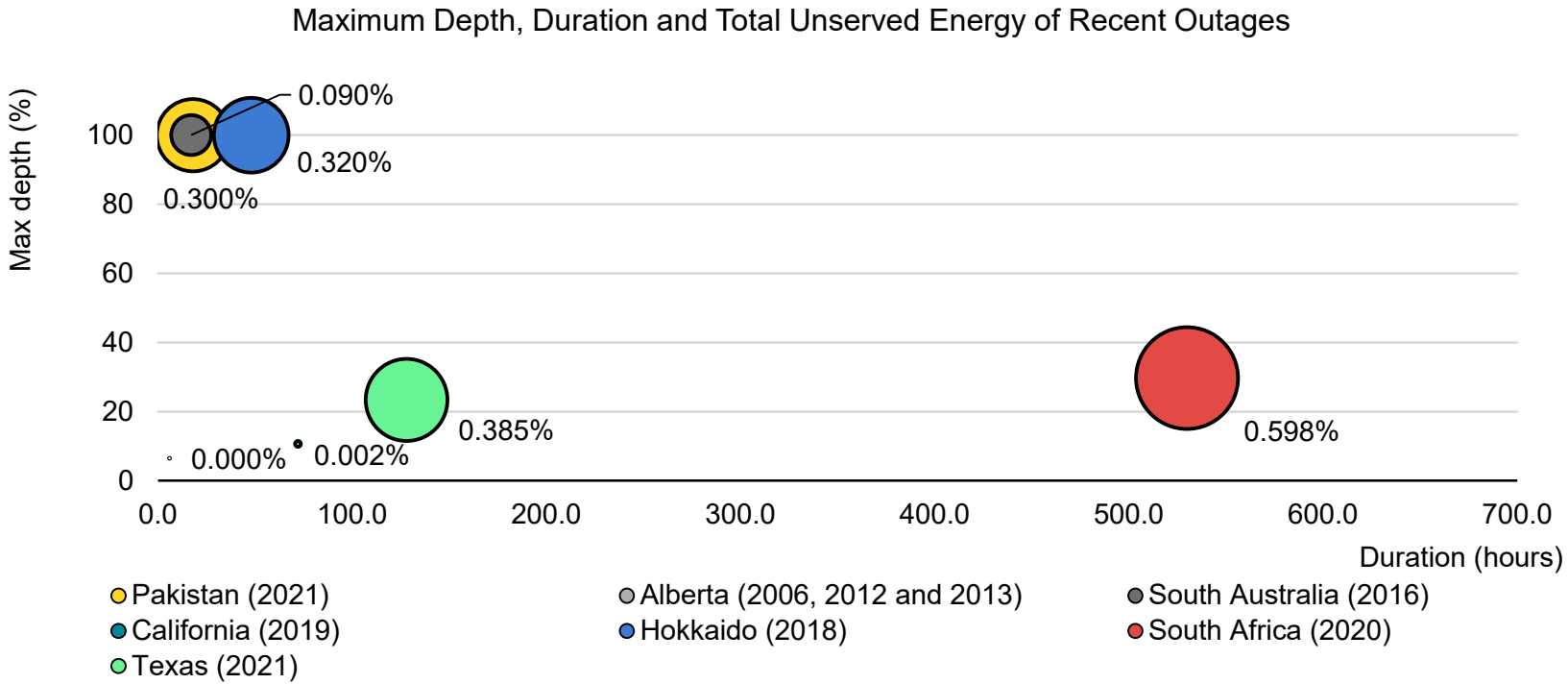
21 October 2021

The role of electricity security in modern power systems



- Electricity security is the power system's capability to ensure uninterrupted availability of electricity by withstanding and recovering from disturbances and contingencies.
- Three main aspects: Adequacy, operational security, resilience
- Covered in a recent IEA flagship report (Electricity Security 2021)

Recent outages affirm the critical role of electricity



Besides failure of physical elements of the grid, lack of investment and proper market frameworks, and increasing extreme weather events can create significant supply interruptions

Climate change poses an increasing threat to electricity security

- The electricity system is witnessing increasing pressure from climate change

- Climate change directly affects every segment of the electricity system

Overview of main potential impacts on the electricity system due to climate change

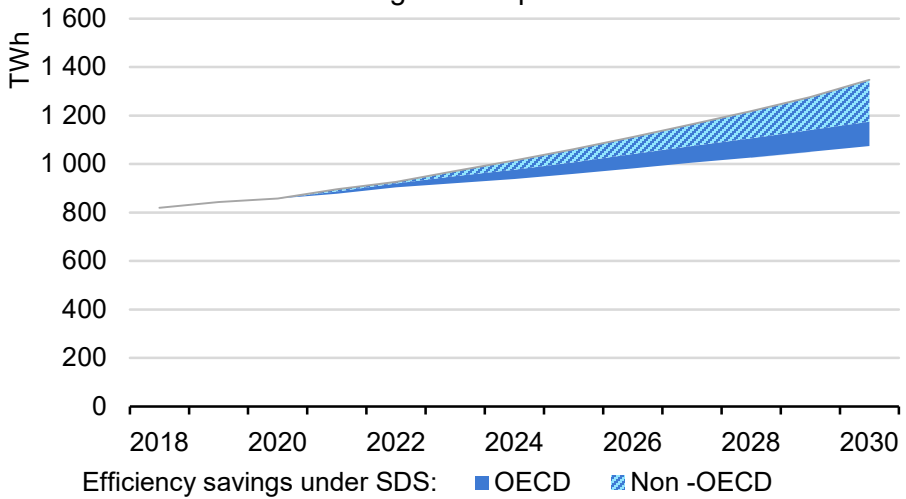
Climate impact	Generation	Transmission and distribution	Demand
Rising global temperatures	• Efficiency • Cooling efficiency • Generation potential • Need for additional generation	• Efficiency	• Cooling and heating
Changing precipitation patterns	• Output and potential • Peak and variability • Technology application	• Physical risks	• Cooling • Water supply
Sea-level rise	• Output • Physical risks • New asset development	• Physical risks • New asset development	• Water supply
Extreme weather events	• Physical risks • Efficiency	• Physical risks • Efficiency	• Cooling

Impacts on electricity systems: Global warming

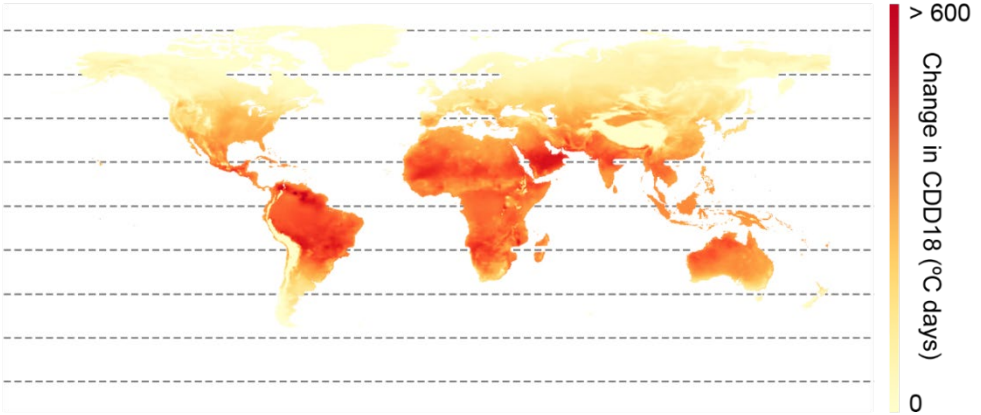
- Increasing temperatures will have an impact on the entire electricity value chain, e.g.:

- **Generation**: decreased efficiency of plants, **T&D**: thermal derating of lines, transformers and other components, **Demand:** increased cooling and refrigeration demand

Residential cooling consumption under STEPS & SDS

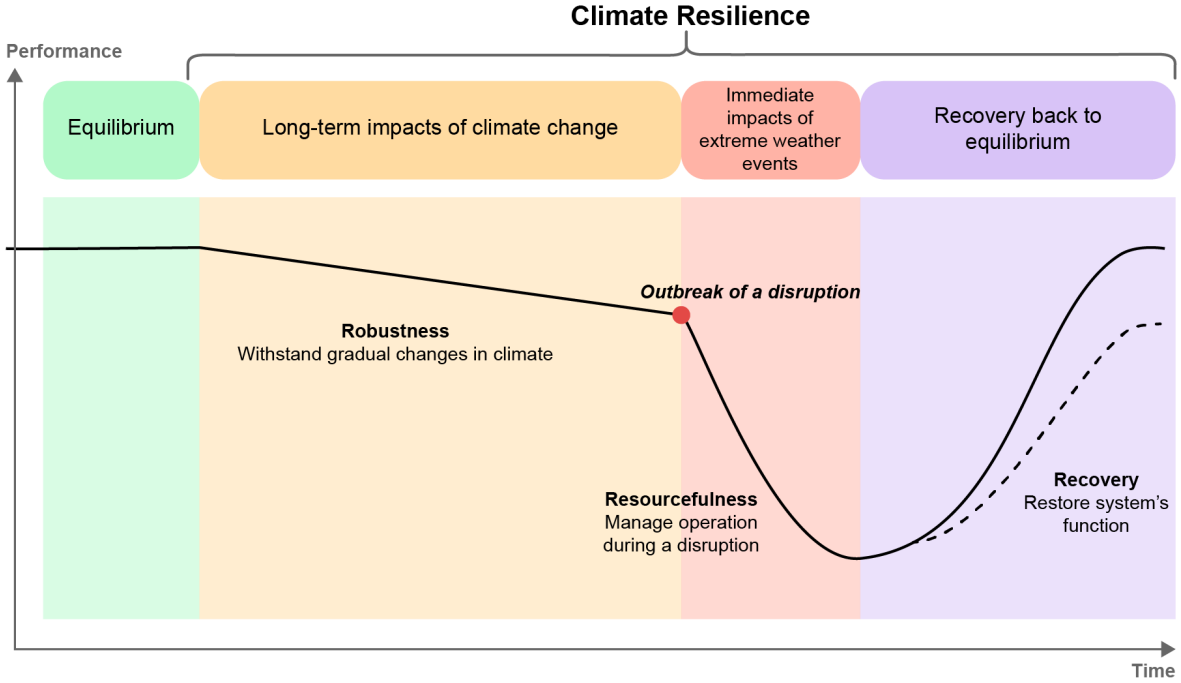


Change in cooling degree days (2019 – 2070) under RCP4.5 IPCC climate change scenario



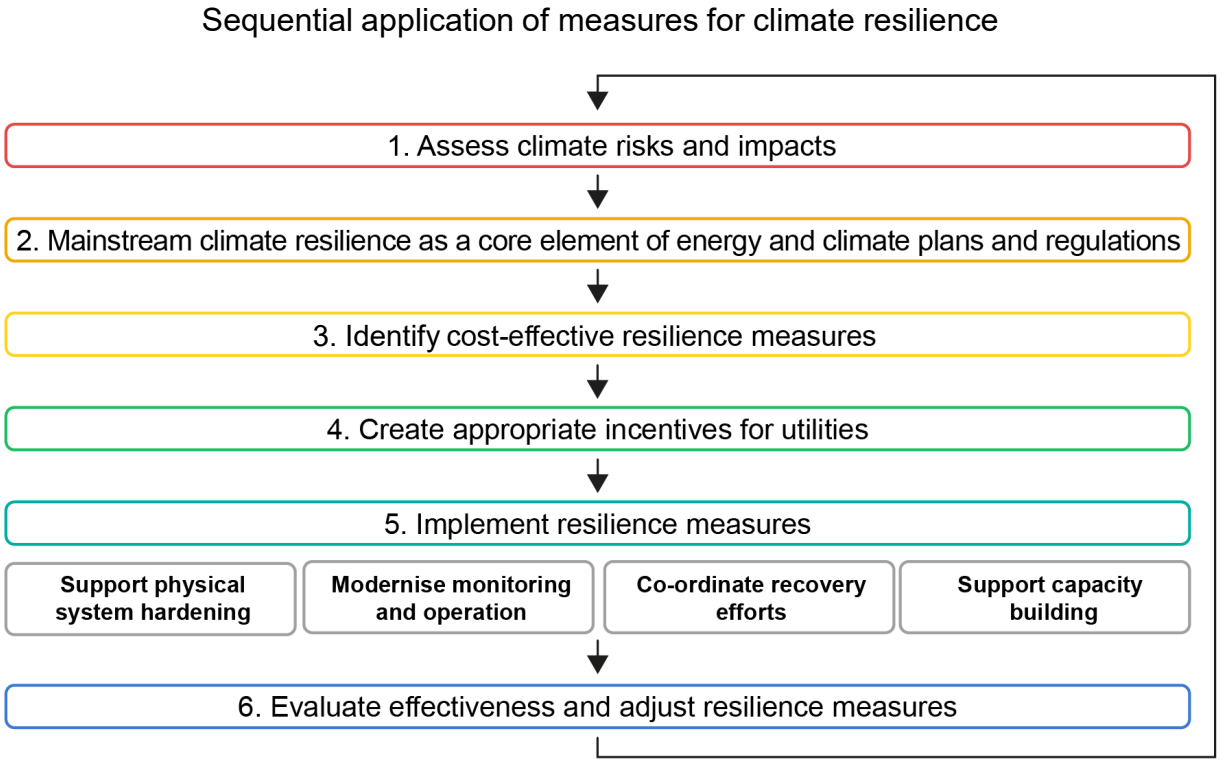
Conceptual framework for climate resilience

Conceptual framework for climate resilience of the electricity system



Climate resilience is the ability to anticipate, absorb, accommodate and recover from adverse climate impacts.

Measures for climate resilience



Effective policy measures and co-ordinated action among key actors can build up climate resilience.

The IEA's work on electricity security was made possible through the Clean Energy Transitions in Emerging Economies programme has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 952363.