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Adaptation Challenges and opportunities for Electric Utilities

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3rd Forum on the Climate-Energy Security Nexus: Electricity Sector Resilience

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WBCSD Electric utilities project

Vision

Secure, affordable & clean electricity contributes to 9 billion people living well within the limits of the planet.

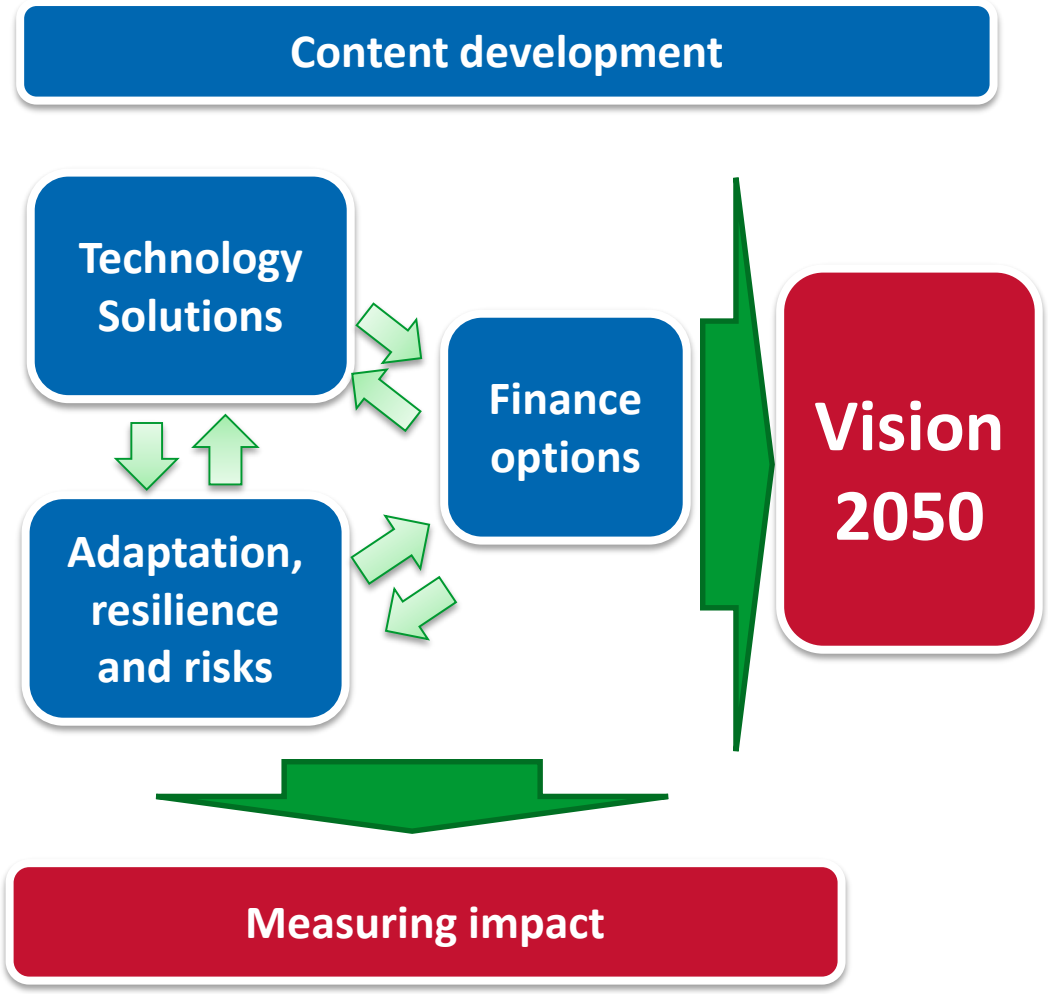
Objectives

1. **Provide a global and progressive perspective**
2. **Share best practices**
3. **Develop strategic partnerships**
4. **Raise the visibility of members actions**
5. **Create a platform for discussion amongst CEOs**

Project members

ABB
EDF
AEP AMERICAN ELECTRIC POWER
Eskom
CLP 中電
HITACHI
Entergy
Statkraft

Work program 2013-2015



Partnerships & Advocacy

Industry partnerships

Global Electricity Initiative

Banking Environment Initiative (Cambridge University)

Intergovernmental

✓International Renewable Energy Agency (IRENA)

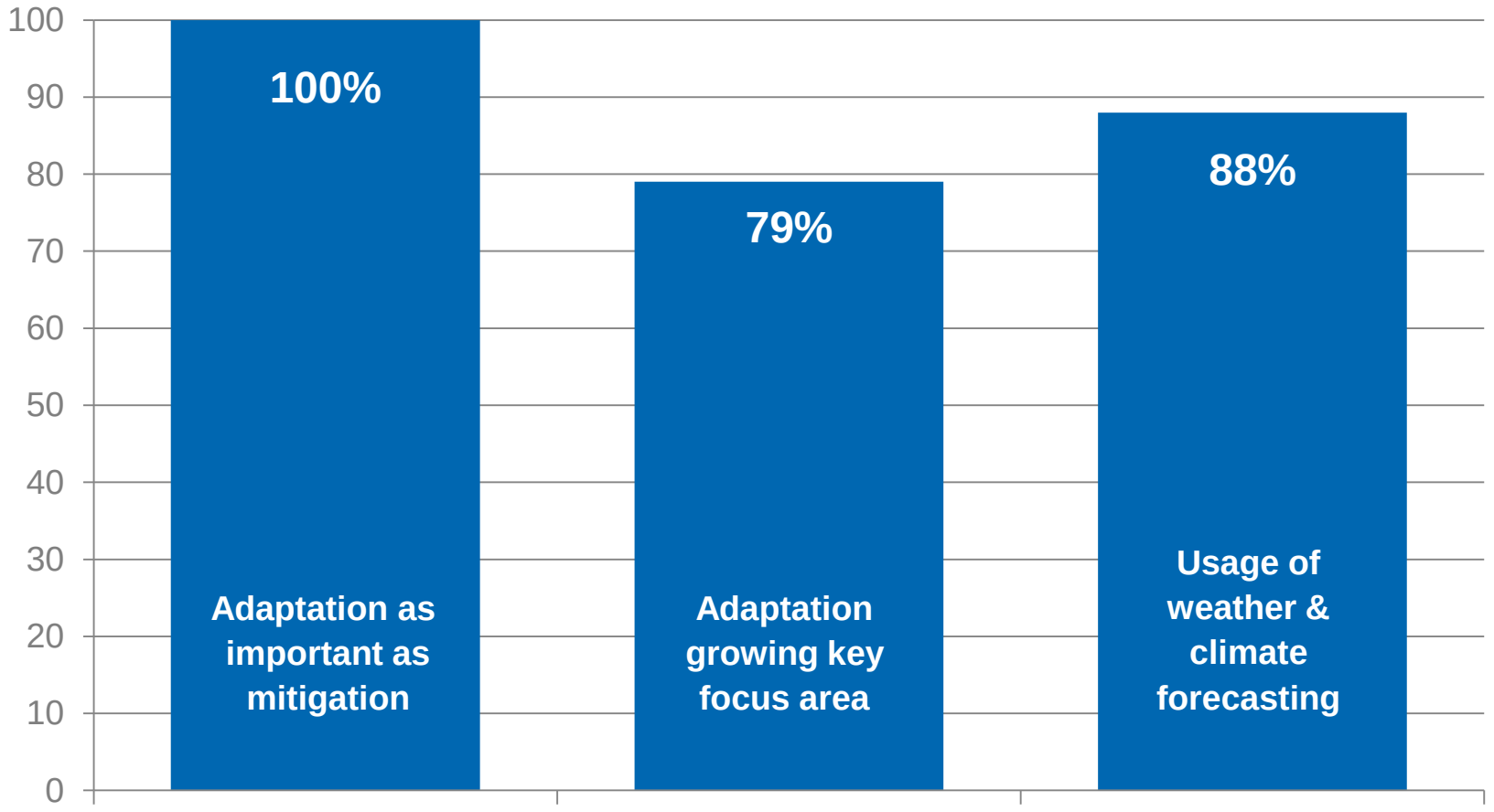
✓UNFCCC

✓Clean Energy Ministerial

✓International Energy Agency (IEA)

✓OECD

Adaptation is regarded by the industry as a key focus area



Route to Resilience

Source: GEI Survey (work in progress)

Drivers for resilience building action within the electricity industry·

Resilience s/t effects & adapt to l/t climate change

Increase in the strength, scale, duration and frequency of hazards

	Generation				Transmission		Distribution	
	Thermal	Hydro	Wind / PV	Bio	Lines	Stations	Lines	Meters
Temperature (warm spells, heat waves)								
Precipitation (heavy rainfall, change rainfall patterns)								
Winds								
Storm Surge								
Droughts								
Floods								

Medium impact

High Impact

Risk Management

Costs

Reputation

Opportunity

· The table reflects the level of climate change impact for specific locations and is not a general description of global climate impacts

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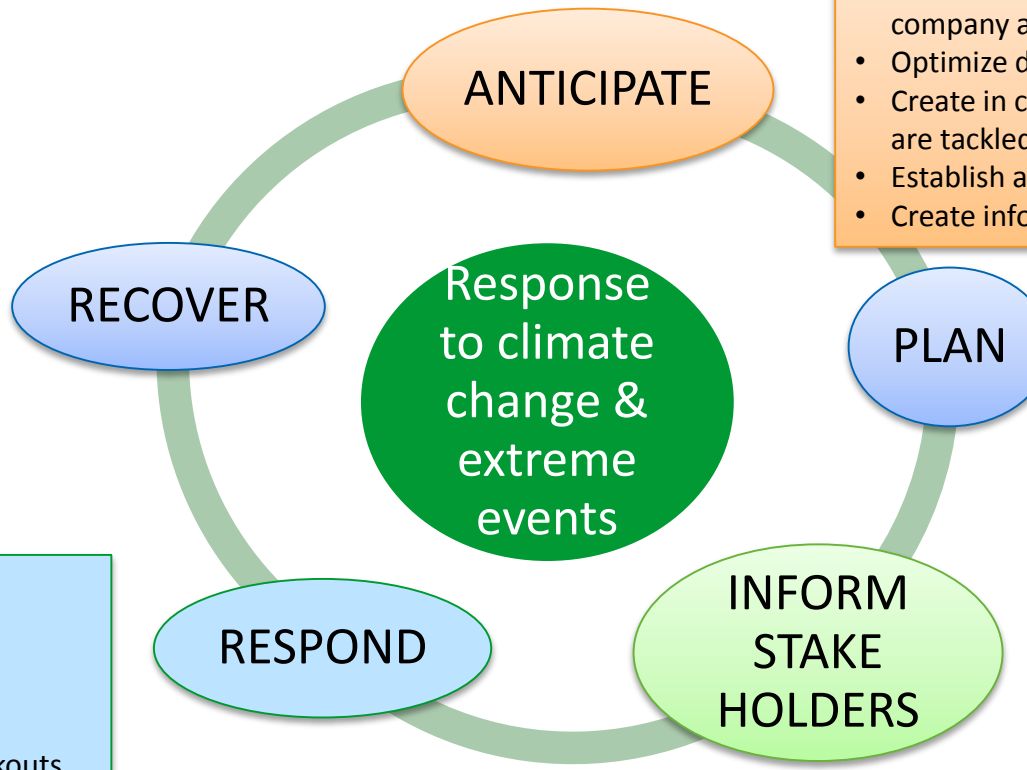
Work in progress

Resilience-building considerations are being incorporated in the companies strategic thinking and relations with stakeholders



- Decide which IPCC scenarios use, downscaling models to local conditions and analyze potential impacts for the company assets and operations (incl. energy demand)
- Optimize data exchange networks to improve modeling
- Create in company systems to ensure that adaptation issues are tackled consistently in the company
- Establish and improve crisis management plans
- Create information channels with stakeholders

Define requirements for power plants and T&D systems (see next page)

- Raise awareness on risks and energy demand management solutions to individuals, local authorities & company staff.
- Explain the rationale for selective power cuts and remind of regulation for backup generating system, especially for hospitals
- Create a list with the local authorities of priority users

- Extended mutual assistance
- Enhanced communications
- Improve coordination with local authorities
- Organize managed rotating blackouts avoiding network collapse risk

- Replace damaged assets with stronger components
- Relocate vulnerable equipment
- Compile lessons learnt

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Generation

- Include climate modeling and downscale in the new investments decision making
- Organize a fast track mobilization of large number of generators
- Additional peak power generation capacity, back-up generation capacity
- Distributed energy resources, including mobile generators, can serve critical loads in an emergency
- Design production facilities less sensitive to air and water temperature
- Maintenance and refueling of nuclear and thermal power stations avoiding summer period
- Design power plants and storage according to potential changes in precipitation and storm surges.
- Develop business models to enhance multi purpose aspects
- Downscale global to regional/local models to better predict droughts/floods.
- Droughts may increase conflict around water, and the need to prioritize water for different uses.
- Floods may threaten security of installations and require preparations in reservoirs to take additional water.

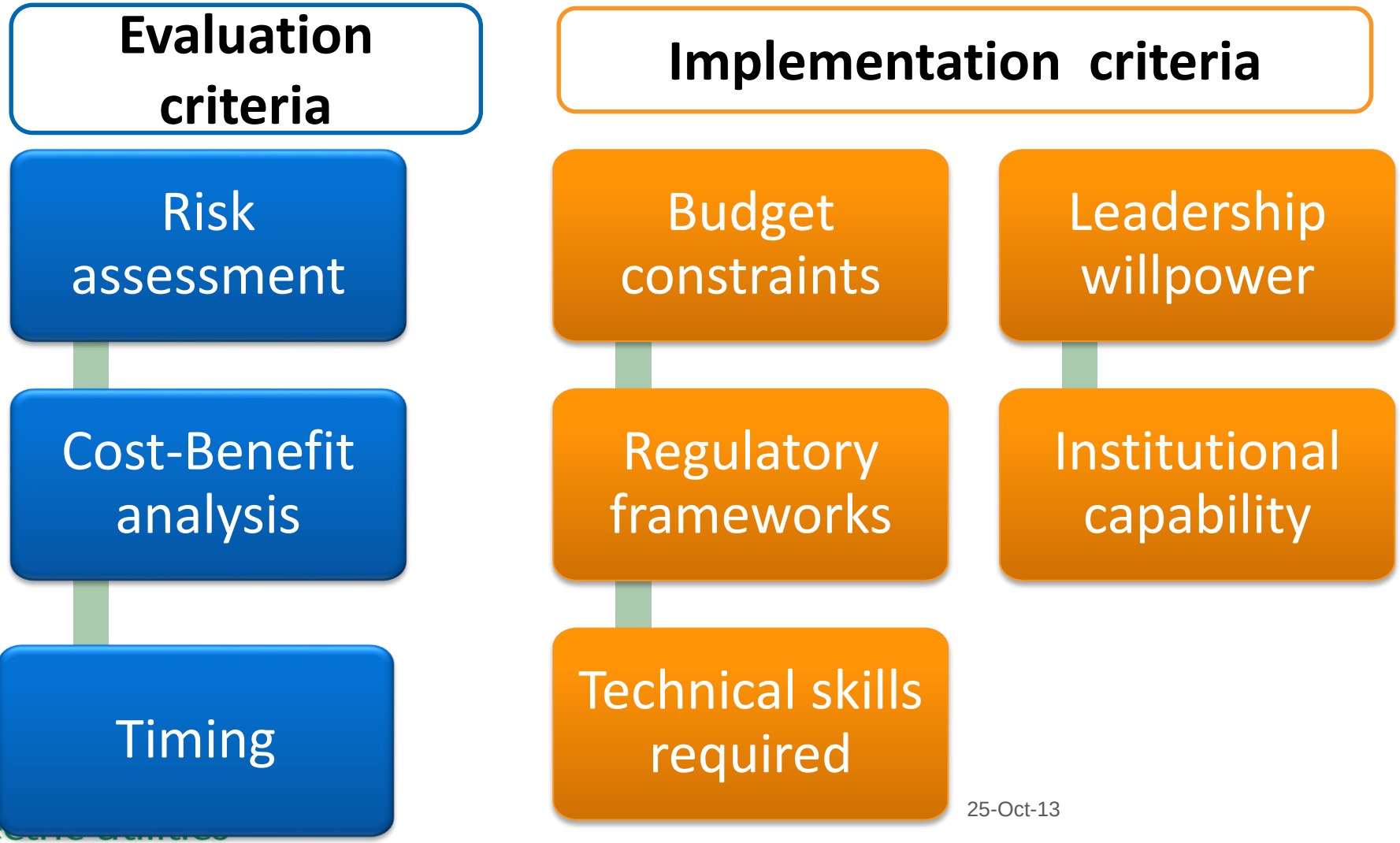
Transmission and Distribution

- Strengthening overhead transmission lines or installing underground cables
- Grid modernization to remotely sense & dispatch crews & equipment to highest priority areas
- Distributed storage applications in buildings (emergency, grid reliability, peak loads)
- Back-up transformers and other essential spare equipment
- Sectional switches to accurate control over feeder shutdowns and isolations
- Reduce the number of electric cables in wooded areas and harden vulnerable overhead lines against winds, tree maintenance, line strengthening, and a line relocation program.
- Networks can be strengthened by upgrading poles and towers to withstand storm force winds
- In coastal locations harden key T&D infrastructure
- Elevate parts of the substations or protecting the perimeter of the facility
- Gradually replace all underground equipment susceptible of flooding with submersible and unaffected to saltwater equipment

Demand Response

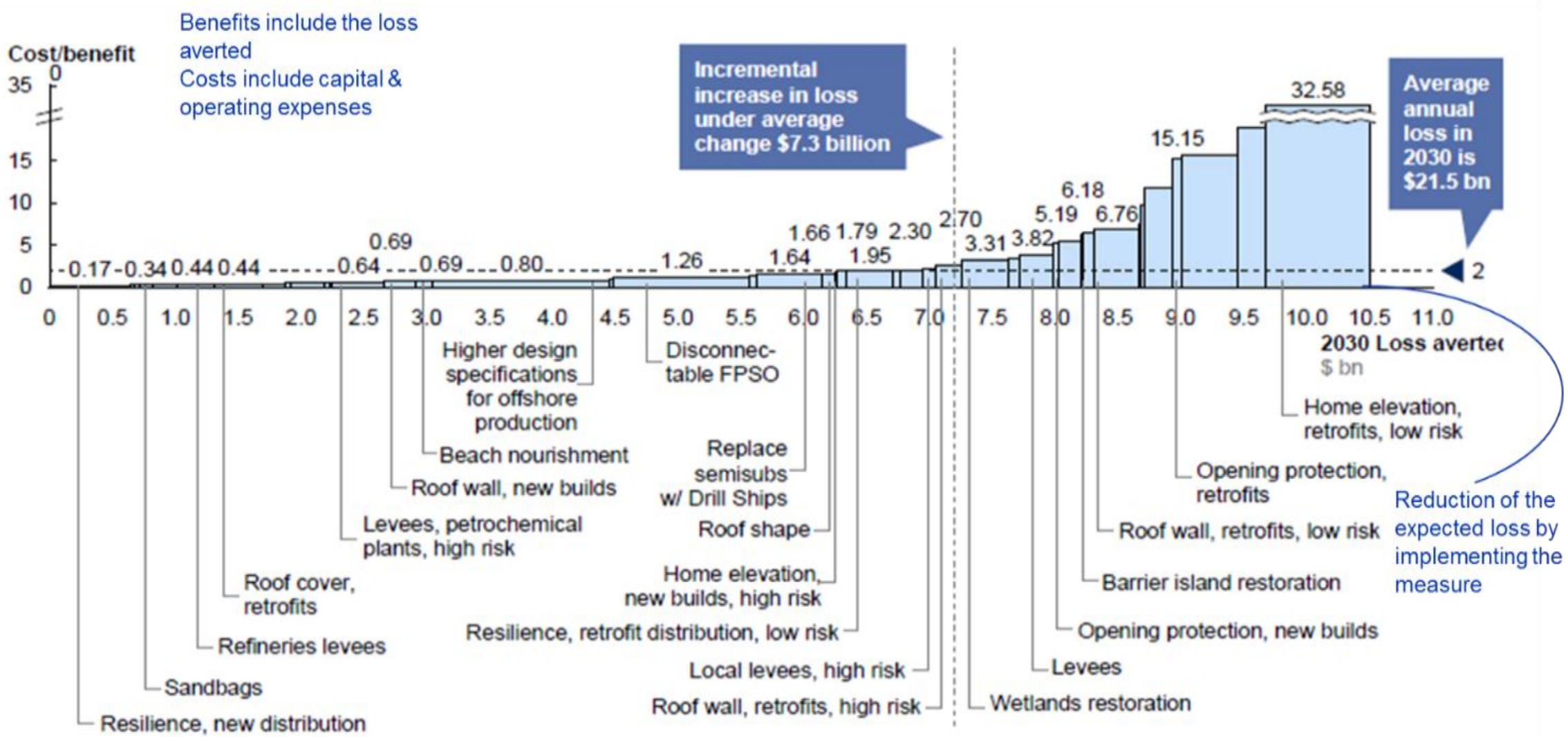
- Ensure power supply to priority users
- Encourage Energy Demand Management
- Advanced meter infrastructure, line sensors and smart relays to comunicate with customers and respond
- Contract consumption waste to industrial customers and export

Risk-cost- benefit analysis is used to inform investment decision making alongside other criteria



Source: Adapted from ECA 2008

Entergy study of hurricanes on the Gulf of Mexico coast



Benefits>Costs

Lessons learned (so far)

- **Industry:**
  - **Electric utilities should apply risk management and risk-cost-benefit analysis when developing adaptation strategies**.
  - The electricity industry needs to build expertise in analysing climate information (e.g. downscaling global climate models) to better understand risks and determine which solutions are efficient and cost-effective.
  - **Electric utilities need to continue investing in R&D** to develop effective upgrades to major infrastructure elements, broadening the range of options and reducing costs over time.
  - **Pool learning,** exchange best practice and share resources to respond more effectively to extreme events.

Lessons learned (so far)

- **Public private collaboration**
  - Public authorities, businesses and a range of stakeholders **need to collaborate** to plan effective resilience and adaptation in the power sector adapted to **specific local circumstances**
  - **Effective pooling of technical expertise**, risk assessment and socio-economic costs will be fundamental to cost benefit assessment and key to developing new business models to price and manage risk.
  - **Regulators need to consider** market signals and regional regulatory structures appropriate to local circumstances that can reduce risks and raise standards.
  - Local Governments and utilities should work together to **raise awareness** of climate impacts and solutions for specific local circumstances

The way forward:

- Incertitude - The “1 in a 100 years” event is increasing in frequency, intensity, special extent and duration
  - Change mindset to include Incertitude in utilities operations
  - Hardening or flexibility?
- Insurance - can play an important role for utilities and customers to understand and quantify the risks
- Anticipation is cheaper – tools emerging to quantify the information
- Community resilience - We need to get better at public-private collaboration to share information, especially at local scale

Thank you

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