Climate resilience
How can it be demonstrated?

Marco Braun
OURANOS Consortium

For more information: www.hydropower.org/congress
Building Hydropower Business Resilience: Examples of Adaptation to Hydro-Climatic Changes

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Adaptation Example 1: Incorporating climate change into feasibility assessments for hydropower projects
Climate Change Assessment @ Manitoba Hydro

2008
get involved with climate experts
build own hydro climate task force
study observed climate
study climate model projections
assess future water availability from GCMs
asses options using an impact model (SPLASH)

2015
set up a complex hydro model
Adaptation Example 2: Energy Demand Forecasting
Incorporating climate change into power load forecasting

- Assessment of CC impacts on electricity demand
- Increasing temperatures affect both summer cooling and winter heating demand
- Hydro Quebec's Distribution Division started using corrected time series for their forecasts
- 2004: Assessment of temperature trends
- 2007: Update of temperature trends
- 2011: Assessment of trends of winter minimum temperatures

Graph showing changes in the average daily temperature and cold day extremes with assessments in 2004 and 2007.
Adaptation Example 3: Building Climate Resilience in Tadjikistan
Kairakkum Hydropower Plant

Climate data to inform hydrologic scenarios

Range of turbine upgrade scenarios

Inform modelling of the probable maximum flood (PMF)

Max/Min Regret Analysis methodology developed by the Swiss Department of Energy

Model energy production

Reference: EBRD, 2014
Building Hydropower Business Resilience

Ways and Barriers to Adaptation
## Adaptation Prototypes

<table>
<thead>
<tr>
<th>RELEVANCE</th>
<th>Climate services</th>
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<tbody>
<tr>
<td></td>
<td>Supply and demand forecasts</td>
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<tr>
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<td>Design and operation standards, guidelines, tools and schedules</td>
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<td>Equipment protection, upgrades and alternative materials</td>
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<td>Monitoring equipment and technology</td>
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<td>New generation, carrying or transformation capacity</td>
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<td>Insurance and financial risk management</td>
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<td>Regulatory exemptions and contracts</td>
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<td>Demand management and tariffs</td>
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<td>Re-organization and governance</td>
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# Barriers to Adaptation

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<tr>
<th>RELEVANCE</th>
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<tbody>
<tr>
<td></td>
<td>Missing or unreliable data and information</td>
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<td>Absence or lack of funding</td>
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<td>No perceived economic rationale to invest</td>
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<td>Lack of stakeholder pressure</td>
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<td>Corporate culture and how climate change is perceived internally</td>
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<td>Low level of industry awareness about risk</td>
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<td>Lack of industry leadership</td>
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<td>Absence or unfavorable policy, law or regulation</td>
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Building Climate Resilience

Climate Services
What is Ouranos?

- Regional climate modeling
- Climate scenarios and services
- Climate impacts and adaptation studies

- About 400 collaborators
- Over 100 projects completed since 2002
- Partners concerned with hydropower and dam safety
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Climate modelling &
scientific community

needs & questions

models, data, tools, services and answers

Managers and
decision makers
Conclusions

• many energy enterprises around the world have implemented adaptation measures that we can learn from
• Uncertainties must be addressed in decision making
• Often known risk management approaches can be adapted to new normal
• Climate Services and reliable data are at the forefront of the (Canadian) energy sector’s needs in order to adapt and overcome barriers to adaptation
• Climate knowledge development and transfer is a long process – perennity is key
Climate Information Variety