Key Messages

- Resilience solutions can be both technological and process based
- Many nations are working toward increasing resilience in the power sector
- Resilience solutions do not have to be highly technical or expensive
- Lessons learned from around the world can be adapted to the Lao power sector
## Addressing Lao Power Sector Vulnerabilities

<table>
<thead>
<tr>
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Coyote Valley Dam: Forecasting for Drought and Flood Control

- Increase observations and monitoring to improve understanding of extreme precipitation behavior, impacts, prediction and flood risk.

- Improve reliability and skill of extended weather forecasts for probability of extreme precipitation events.

- Improved modeling and probabilistic forecasts at the appropriate spatial and temporal scales to inform reservoir operation
  - More granular for extreme events
  - Increased long-ranged forecasting for weather trends

http://www.scwa.ca.gov/water-supply/
Malawi – Generation Diversity for Resilience

- 98% hydro-powered electricity sector
- Variable climate resulted in nationwide energy shortages
- 2016 developed a plan to increase generation diversity
  - 70MW of Solar PV
  - 70MW of Thermal generation
  - Increasing number of DG systems providing energy to rural communities at lower cost than line extension
  - Greater interconnection to surrounding countries allows export during high generation times and import during low generation
Australia: Mitigating Flooding and Cyclone Winds

- 2011 flooding and a severe cyclone event in Queensland, Australia resulted in approximately 480,000 customer power outages. These outages were due to flooded equipment and equipment contact with vegetation.

- New policies specified that equipment must be placed above the flood zone, electrical equipment in zones prone to high winds must be placed underground where possible, and vegetation mitigation programs were increased to remove trees from near power lines.
Kenya - Payment for Watershed Services

- Started in 2006 to reduce sedimentation and turbidity in hydroelectric systems
- Pays upstream users (farmers and communities) to reduce erosion and agricultural runoff
- Reduced sedimentation increases the capacity of reservoirs
- Reduced turbidity reduces operations and maintenance costs on hydroelectric turbines

Before and after river bank stabilization, Waitsfield, VT, USA source: waitsfieldvt.us
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<td>Power system rules, regulations, and technical standards do not meet current and changing environmental conditions</td>
<td>Enact policy to diversify energy supply</td>
<td>Create regulation to move transmission away from high-wind areas</td>
<td>Create regulation to move distribution equipment out of flood zones</td>
<td>Mandate customer equipment be sited properly to avoid hazards</td>
<td>Enact policy to compensate upstream users for watershed services; implement more stringent weather forecasting requirements for dam operations</td>
<td>Train employees in better vegetation management practices</td>
<td>Increase the use of distributed generation where line extension and redundancy would be prohibitively expensive</td>
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Thank you!