



For Businesses



For Homes



Renewable Energy



For Trade Allies



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# EnergyTrust of Oregon

## Hydropower Technology and Market Assessment

February 18, 2009



# Key Goals

- A better understanding of:
  - Current / emerging technologies & opportunities
  - Project costs
  - An estimated number of potentially developable projects based on existing water rights
  - The state of the market

# Presentation Overview

## Results:

- Technology Assessment
  - Capital Costs
  - *(Brief interlude to discuss hydro permitting)*
  - Resource Assessment
    - Quantitative results
    - Qualitative results
  - Market Barriers
  - Market Opportunities
- 
- Recommendations

# Results – Technology Assessment

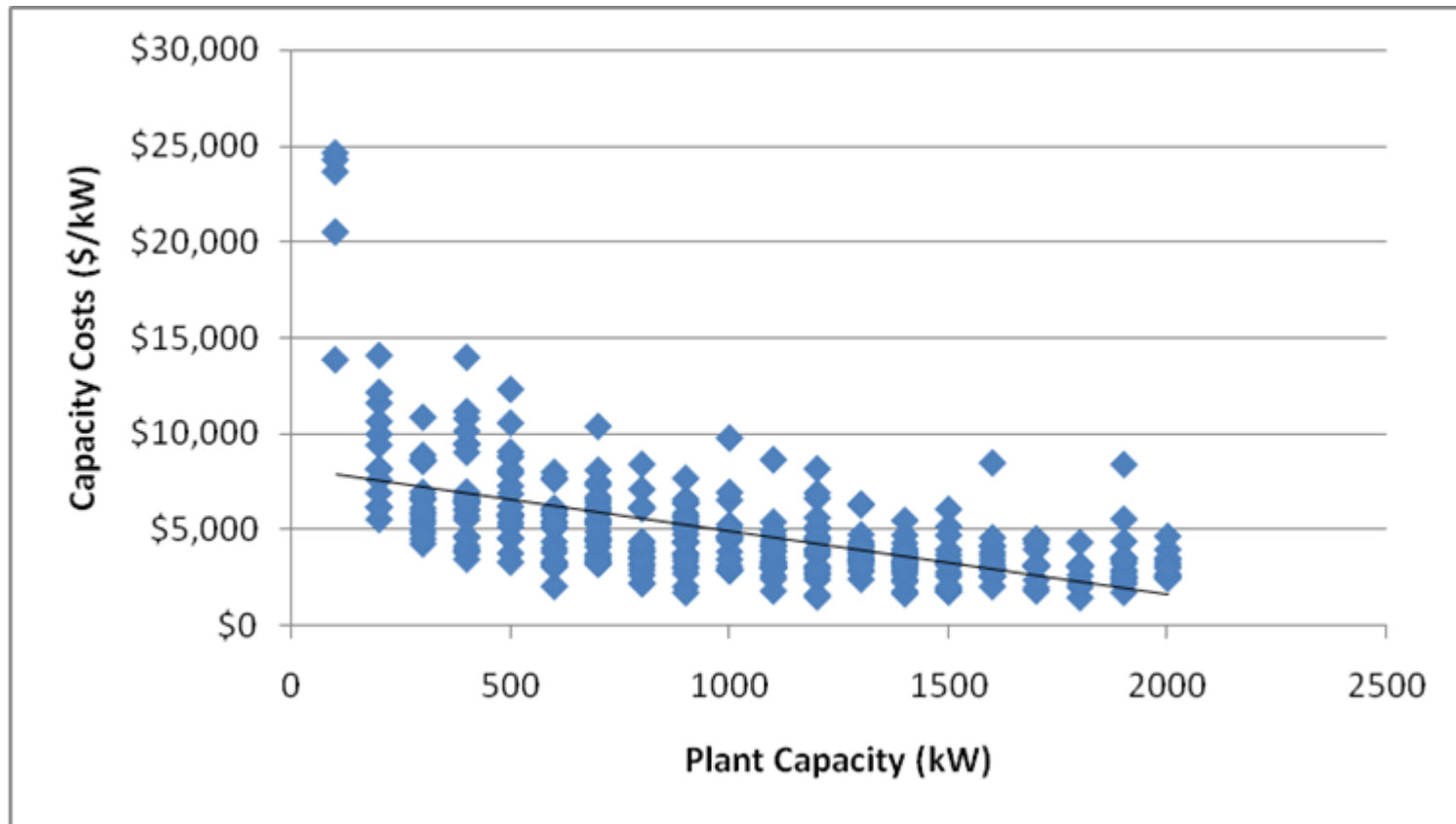
- Hydro is a mature technology...
- But there are areas of advancement:
  - Various low and “ultra-low” head turbines
  - Water wheels with improved efficiency
  - Operation and implementation improvements

# Results – Small Hydro Capital Costs

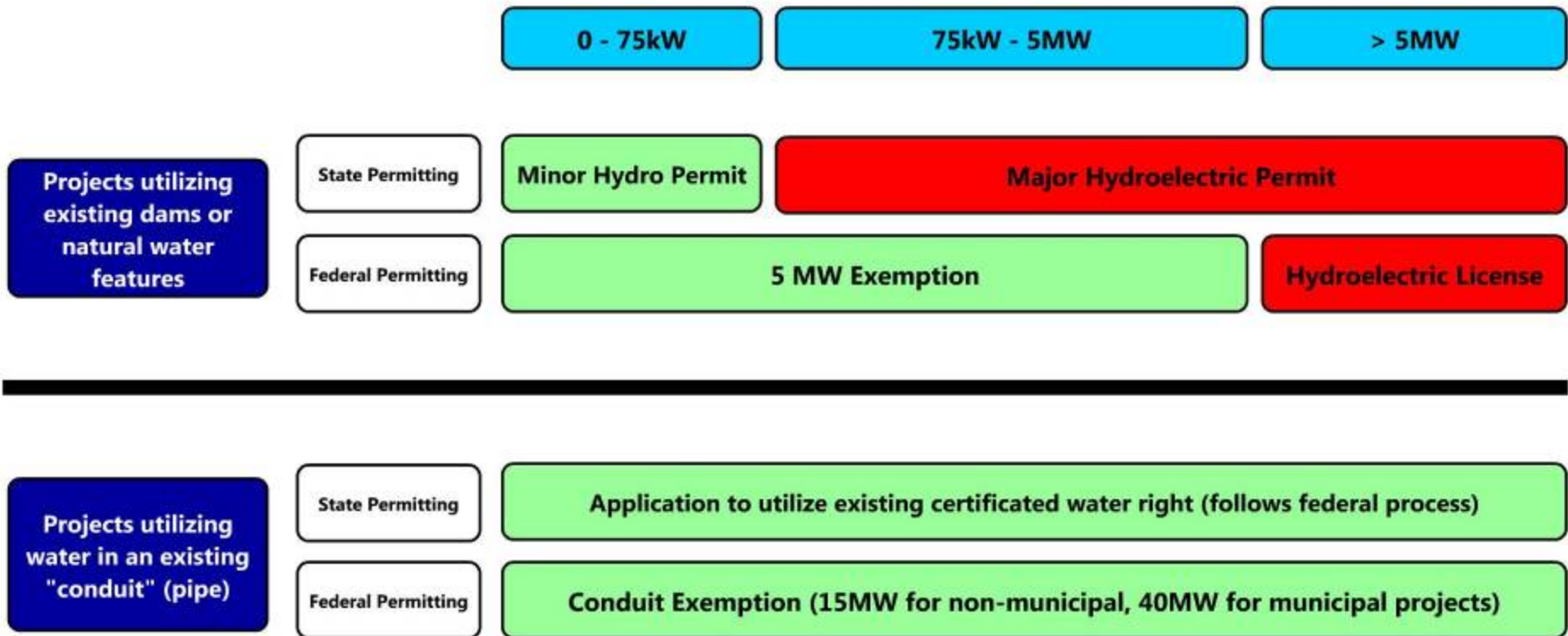
- Extremely site dependent
- Two main factors:
  - Plant capacity
  - Site characteristics
    - Head & flow
    - Distance to transmission
    - Existing infrastructure (if any)
- Best rule of thumb...there is no rule of thumb

# Results – Small Hydro Capital Costs

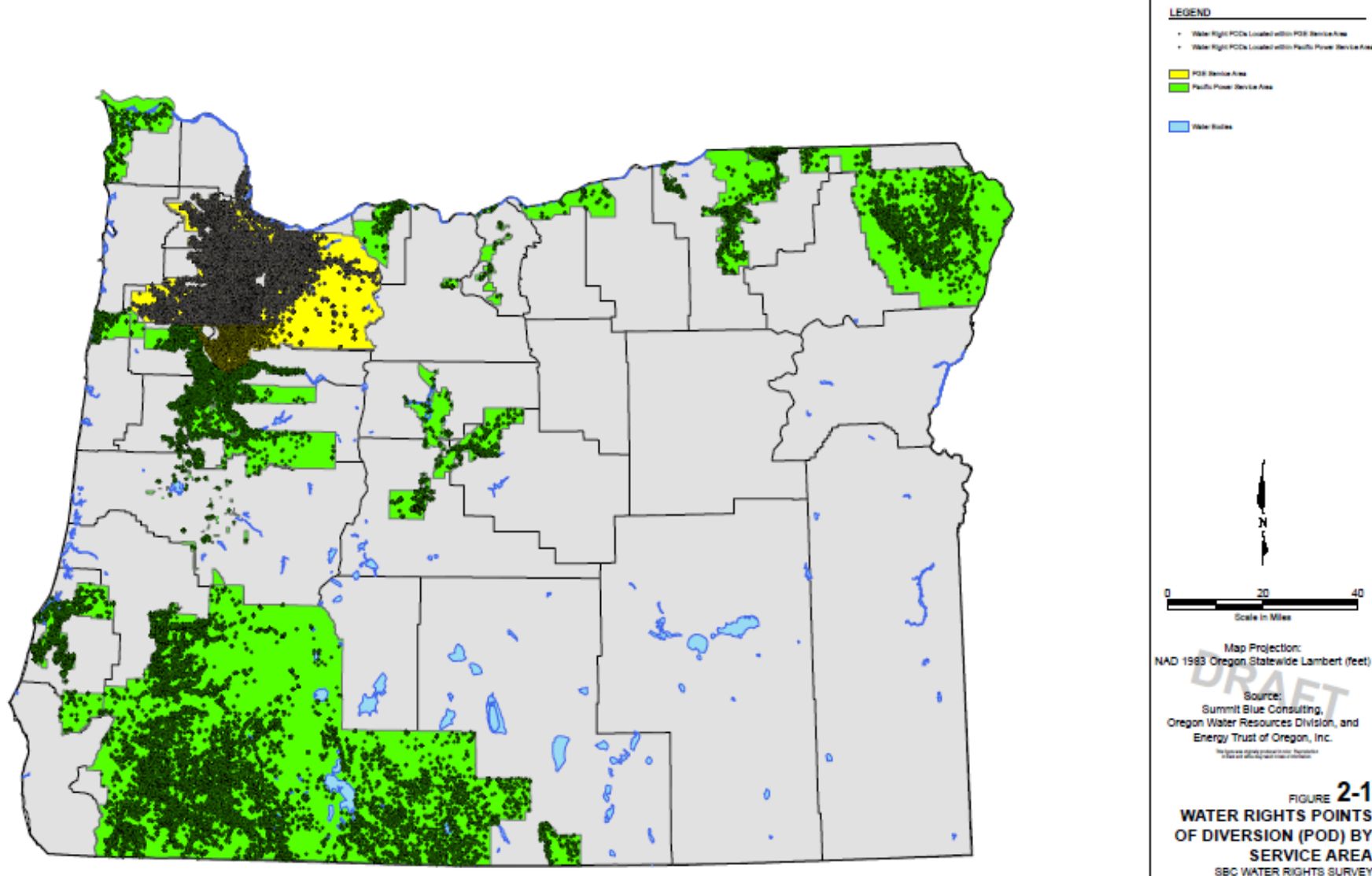
- **Cost per installed capacity *generally* decreases as plant capacity increases**



# Permitting Hydro Projects in Oregon



# Results – Resource Assessment



# Results – Resource Assessment

1<sup>st</sup> Screen: Estimated annual allocation > 5,000 acre-feet

Water Right POD Type	Number of Water Rights Listings Within Service Area	
	PacifiCorp	PGE
Surface Water	781	149
Ground Water	14	12
Storage	15	2
<b>Total</b>	<b>810</b>	<b>163</b>

# Results – Resource Assessment

2<sup>nd</sup> Screen: Reduce number to determine targets for surveying

Water Right POD Type	Number of Water Rights Listings Within Service Area	
	PacifiCorp	PGE
Surface Water	44	20
Ground Water	4	2
Storage	7	1
<b>Total</b>	<b>55</b>	<b>23</b>

# Results – Resource Assessment

- Qualitative Survey parts
  - Participant Characterization
  - Technical Questions for Storage Facilities
  - Technical Questions for Open Channel Flow, Ditch Flow, or Waste Water Discharge
  - Project Development Issues

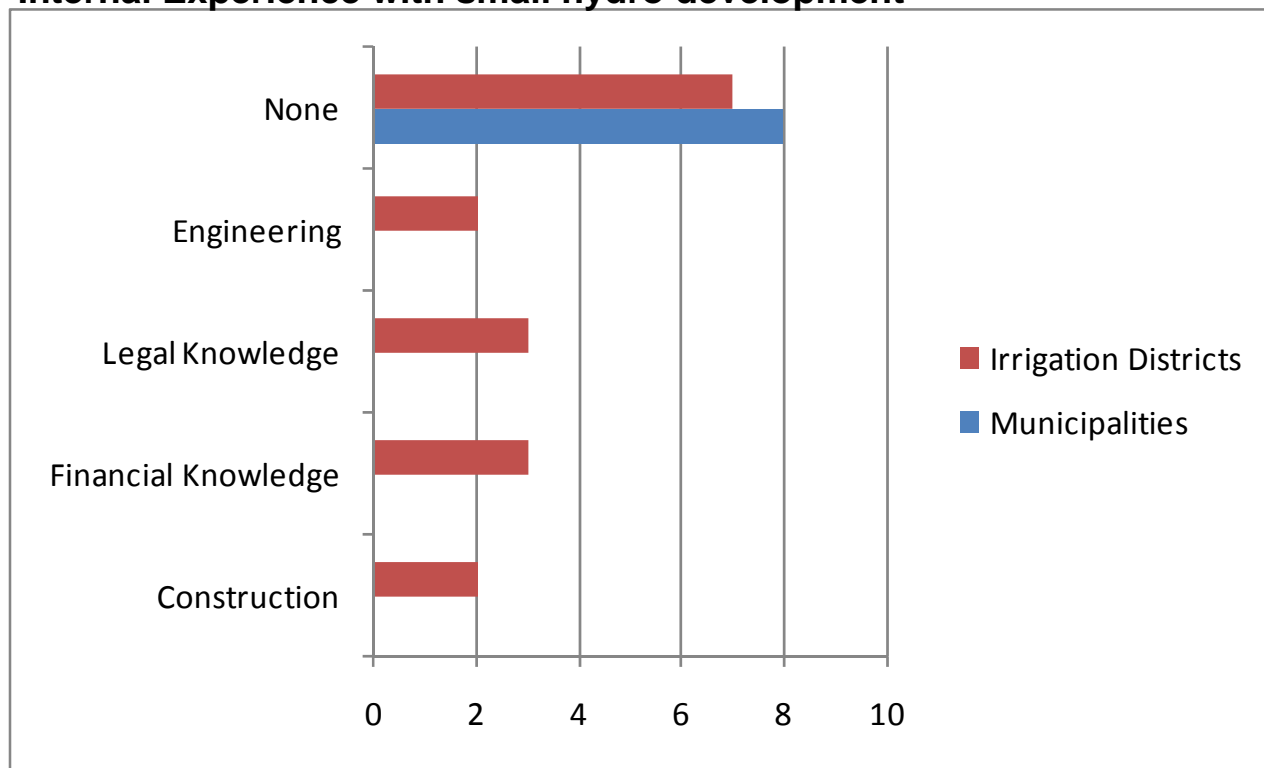
# Results – Resource Assessment

- Survey Results:
  - “Untapped” opportunities exist at storage facilities
  - Wide variety of site characteristics
  - Several survey respondents appear to have sites with favorable characteristics

# Results – Barriers to development

- Lack of internal expertise in coordinating development

**Internal Experience with small hydro development**



# Results – Market Barriers

- Barriers to new development
  - Few experts available in eastern Oregon
  - Long project development horizons
  - Complex permitting (*perception vs. reality*)
    - State and federal processes time consuming and expensive
    - Lack of appropriate county and city ordinances
    - ASR systems face permitting issues

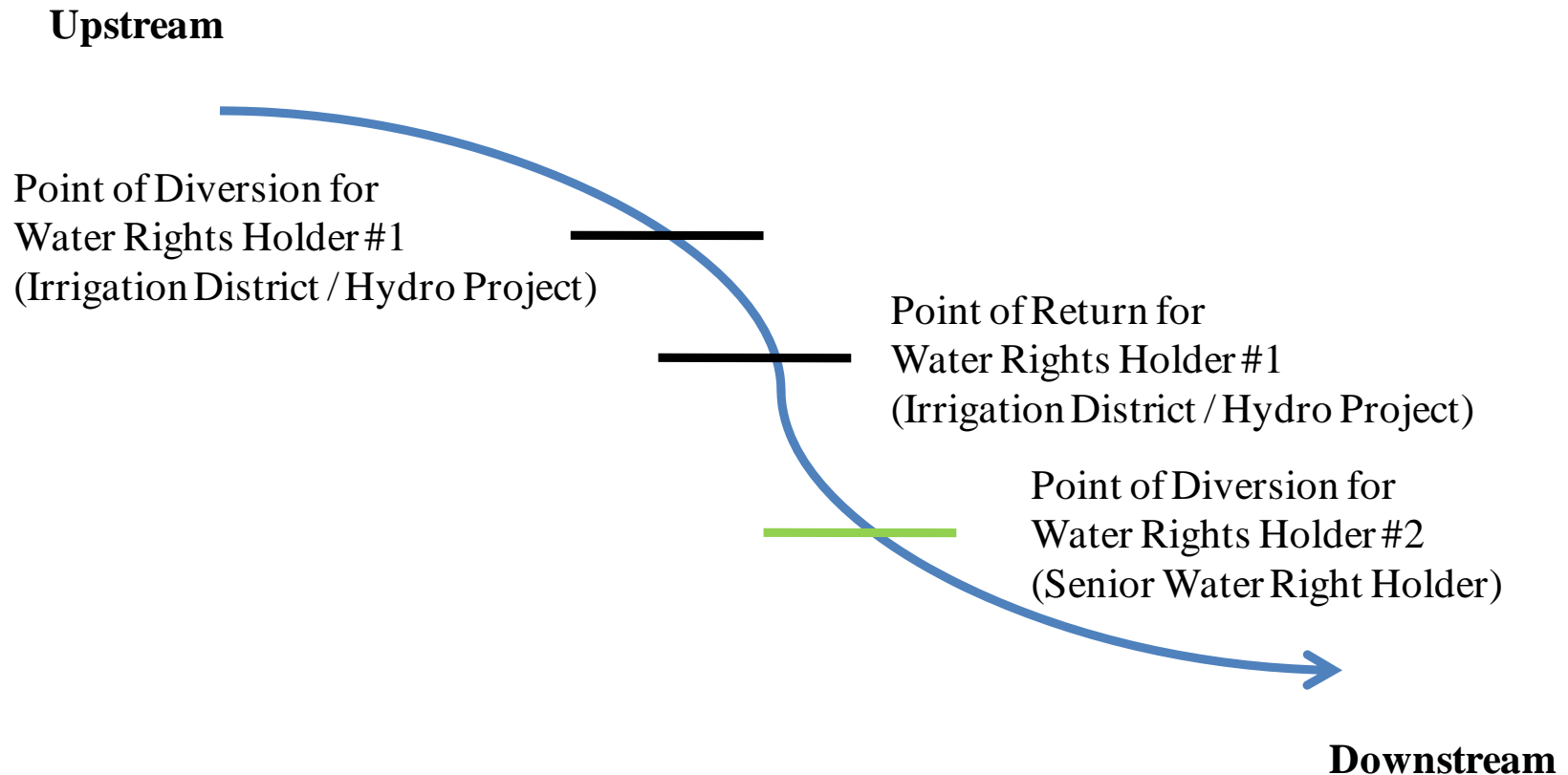


# Results – Market Barriers

- Barriers to new development (cont.)
  - Not all water rights are equal
  - Seasonal water rights hurt economics
  - Interconnection process can be challenging
  - Lack of familiarity with available financial resources

# Results – Market Opportunities

- Piggyback on existing diversions
- Leverage planned water system construction projects
- Access year-round water for irrigation projects



# Recommendations

- Short-term actions to move market forward
  - Provide expert assistance to help project proponents navigate the process
  - Raise awareness about Energy Trust support
  - Create a road map of all permitting requirements
  - Create long-term certainty in incentive levels

# Recommendations

- Long-term actions to move market forward

(Energy Trust cannot take on these tasks due to lobbying restrictions)

- Align state and federal permitting
- Centralize Permitting