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# VIEJAS

TRIBAL GOVERNMENT

## Renewable Energy Based Tribal Utility Formation



**BLACK & VEATCH**  
building a **world** of difference™

ENERGY • WATER • INFORMATION • GOVERNMENT

October 5, 2005



# Introductions

- Lisa Haws
  - Viejas Tribal Government
  - XXXXX
  - 619 659 2341
- Terry Meyer
  - Black & Veatch
  - Project Engineer,  
Renewable Energy Specialist
  - 913 458 7175



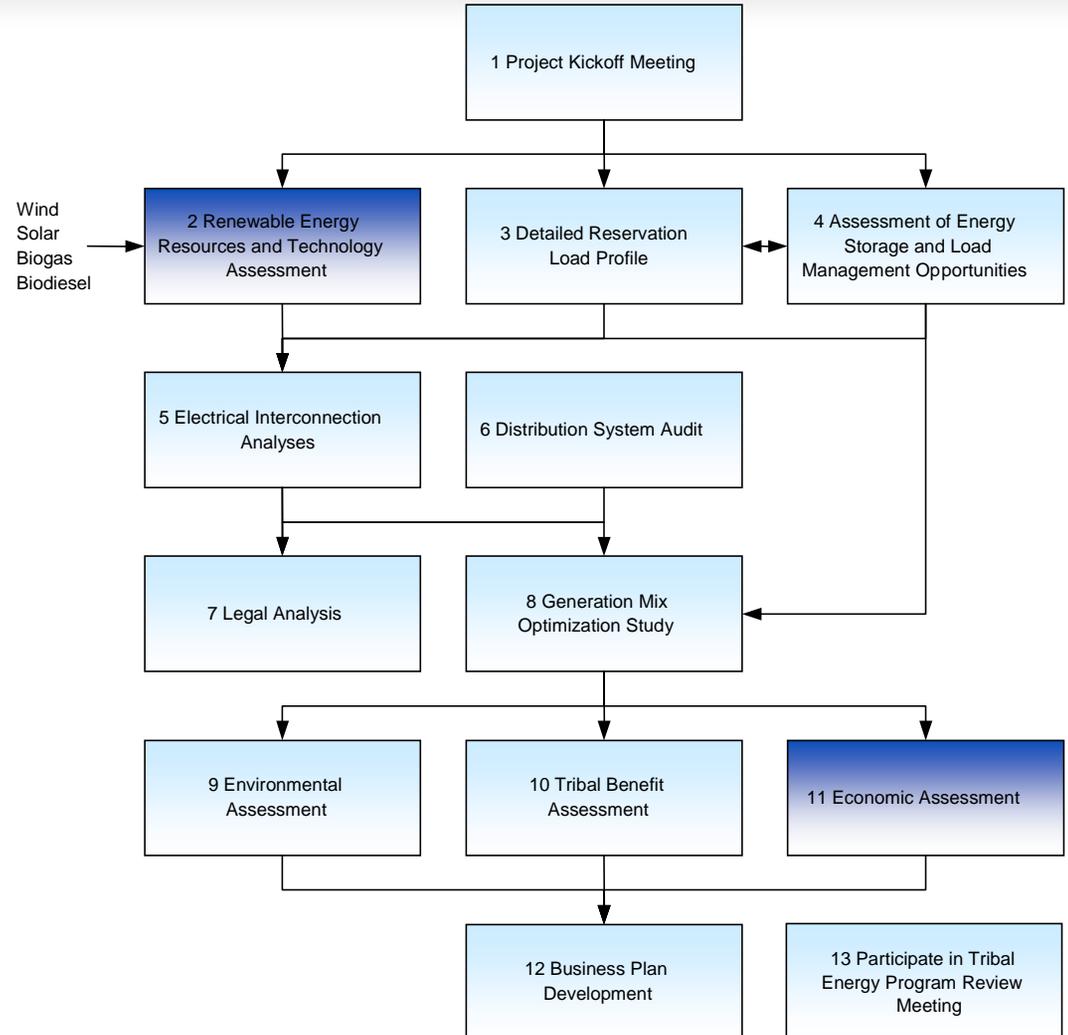
# Agenda

- Study Overview
- Renewable Technology Alternatives
- Environmental
- Economic Analysis
- Tribal Benefits
- Conclusions



# Study Overview

- The Feasibility Study focused on Renewable Energy Alternatives and Utility Formation Feasibility.





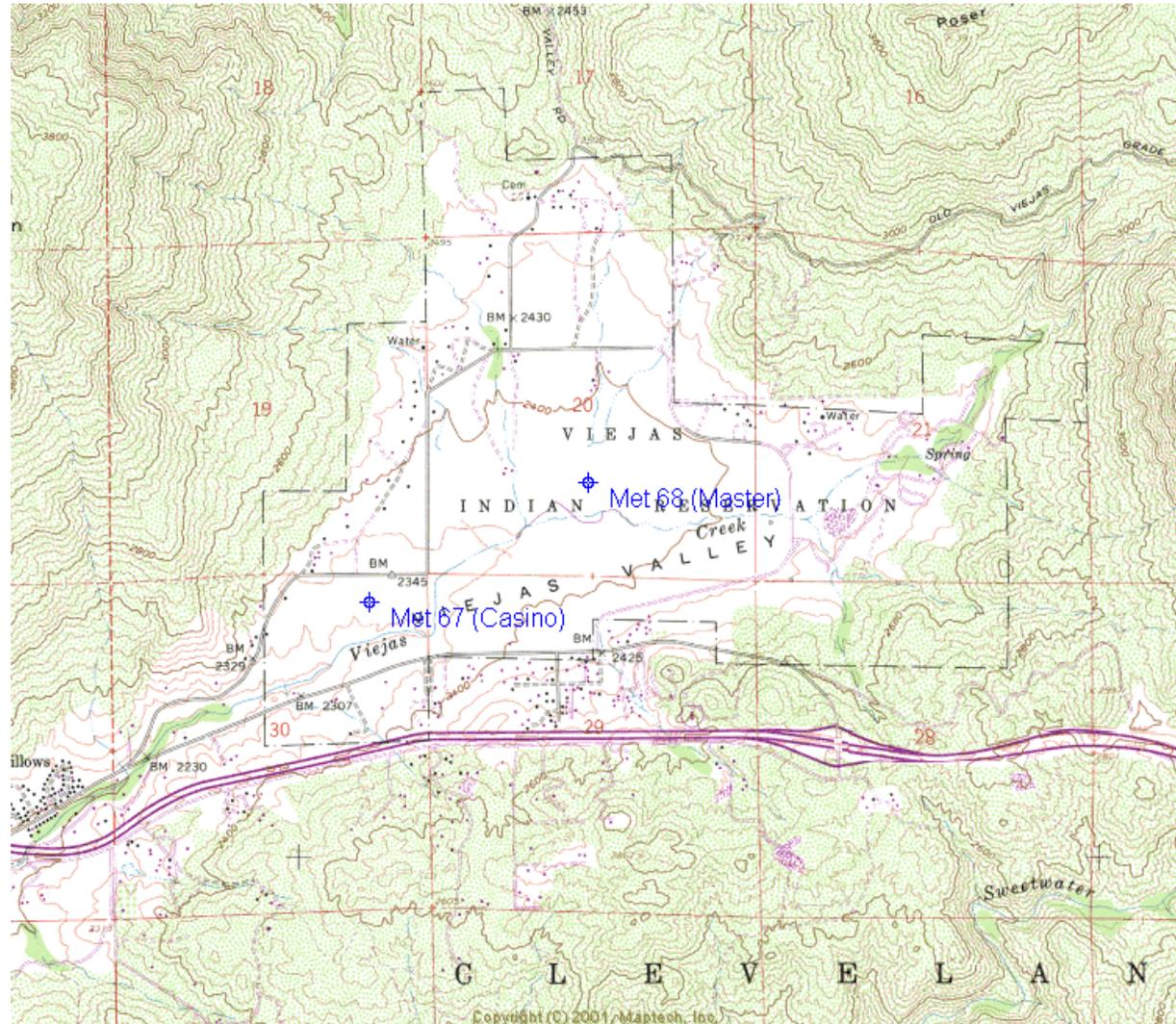
# Study Overview

- Study performed by:
  - Black & Veatch Corporation
  - Viejas Tribal Government Public Works Staff
  - Fredericks, Pelcyger & Hester, LLC
    - Legal Analysis



# Strategic Options

- Net Metering on Individual Accounts
- Tribal Utility Interactive with the Grid
- Tribal Utility Independent of the Grid





# Renewable Energy Alternatives

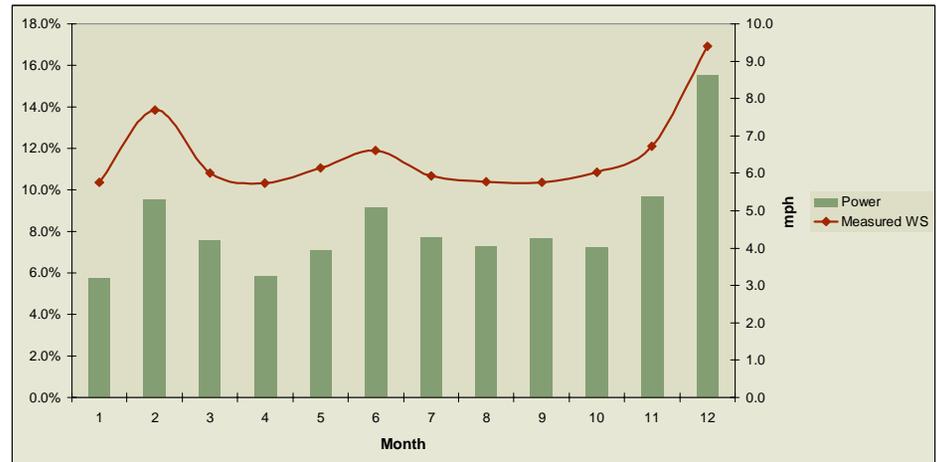
- Wind
- Solar
- Bio-Fuels
- Cogeneration
- Energy Storage
- Load Management



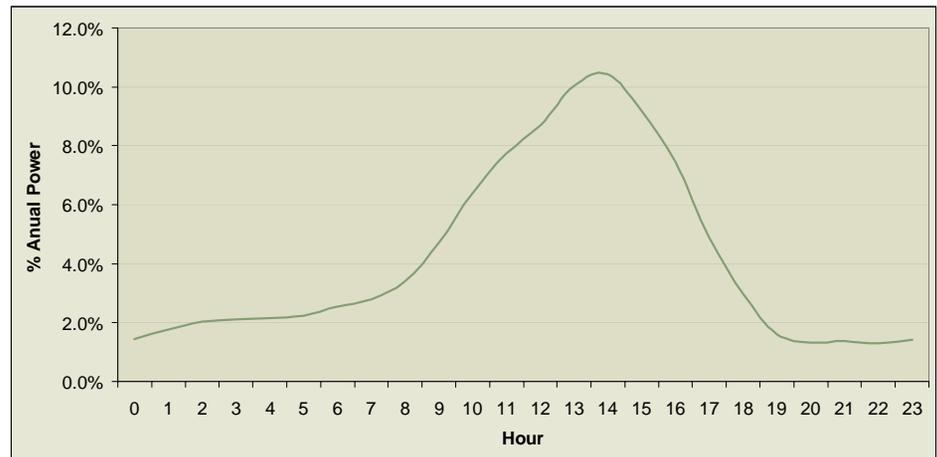
# Wind Data Analysis

- Wind Strongest in Early Afternoon
- Wind From NE and SW
- Estimated Capacity Factor for Wind Turbine between 8% and 13%

### Monthly Power Output



### Power Production by Time of Day





# Single Wind Turbine

- Connects Directly to Casino Loads
- Offsets Retail Electricity (Net Metering)
- Marginal Wind Resource
- Self Generation Incentive Program (SGIP)
- Good Visibility
- SGIP Currently Overbooked

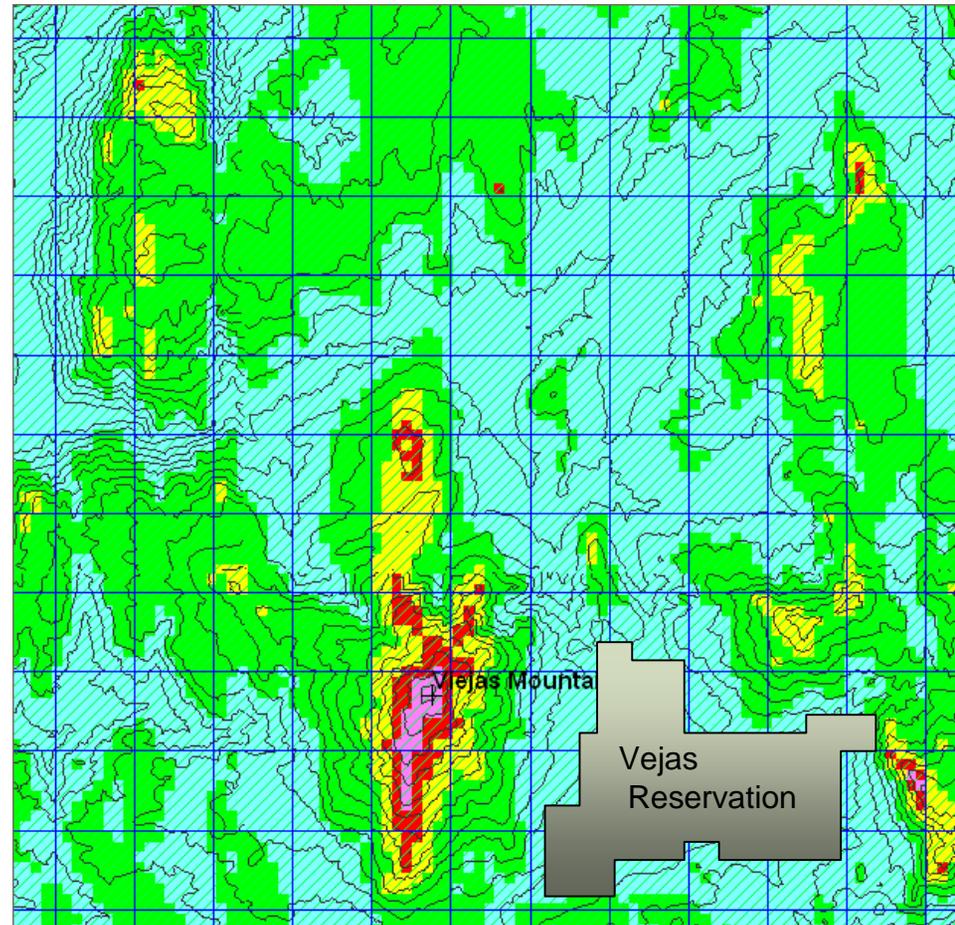




# Small Wind Farm

- Better Wind
- Economy of Scale
- Requires Off-Reservation Land
- Could Sell Power

Wind Resource Gradient





# Photovoltaic (PV) Installation

- Net Metering
- High Reliability
- Good Visibility
- High Cost (per kWh)
- SGIP Applies
- Little Maintenance
- Can be Integrated Into Building Roofs or Parking Shade





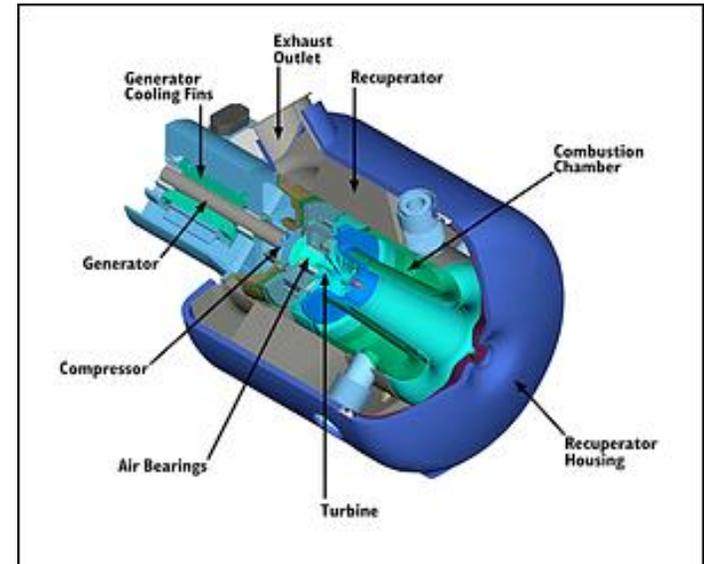
## Bio-Fuels

- Biodiesel, Biogas, and Straight Vegetable Oil Investigated
- Works in Diesel Engine or Combustion Turbine
- Biodiesel is Expensive
- No Known Local Biogas Resource
- Straight Vegetable Oil is Not Proven



# Cogeneration

- Can be small or large size
  - 30 kW Micro-Turbine
  - Diesel Generator
  - 3000 kW Combustion Turbine
- Can Use Bio-Fuels
- If Heat is Used Can be Cost-effective
  - Absorption Chillers
  - Hot water
- Follows Electrical or Heat Load





# Energy Storage

- Critical for a Renewable-based Independent Utility
- Pumped Hydro May Work for Viejas
- Batteries, Hydrogen, and other options are not currently economic
- Pumped Hydro Requires Development Outside of Reservation Boundries.



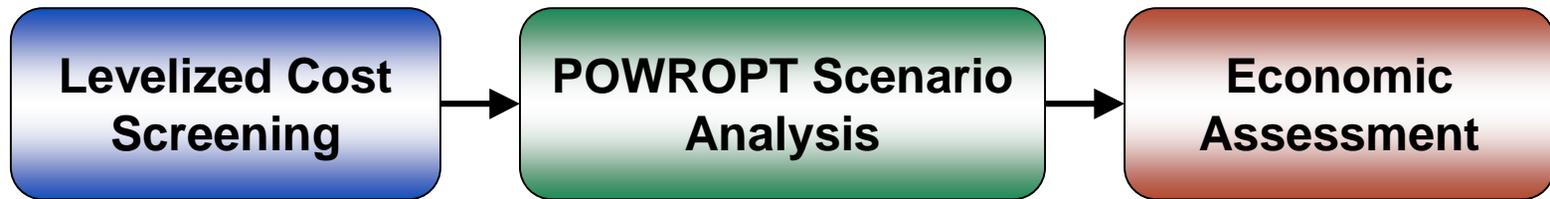
# Load Management

- Energy Efficiency
- Dispatchable Loads
  - Waste Water Treatment Plant
  - Well Pumps
  - Central Chiller Plant
    - With Cold Storage





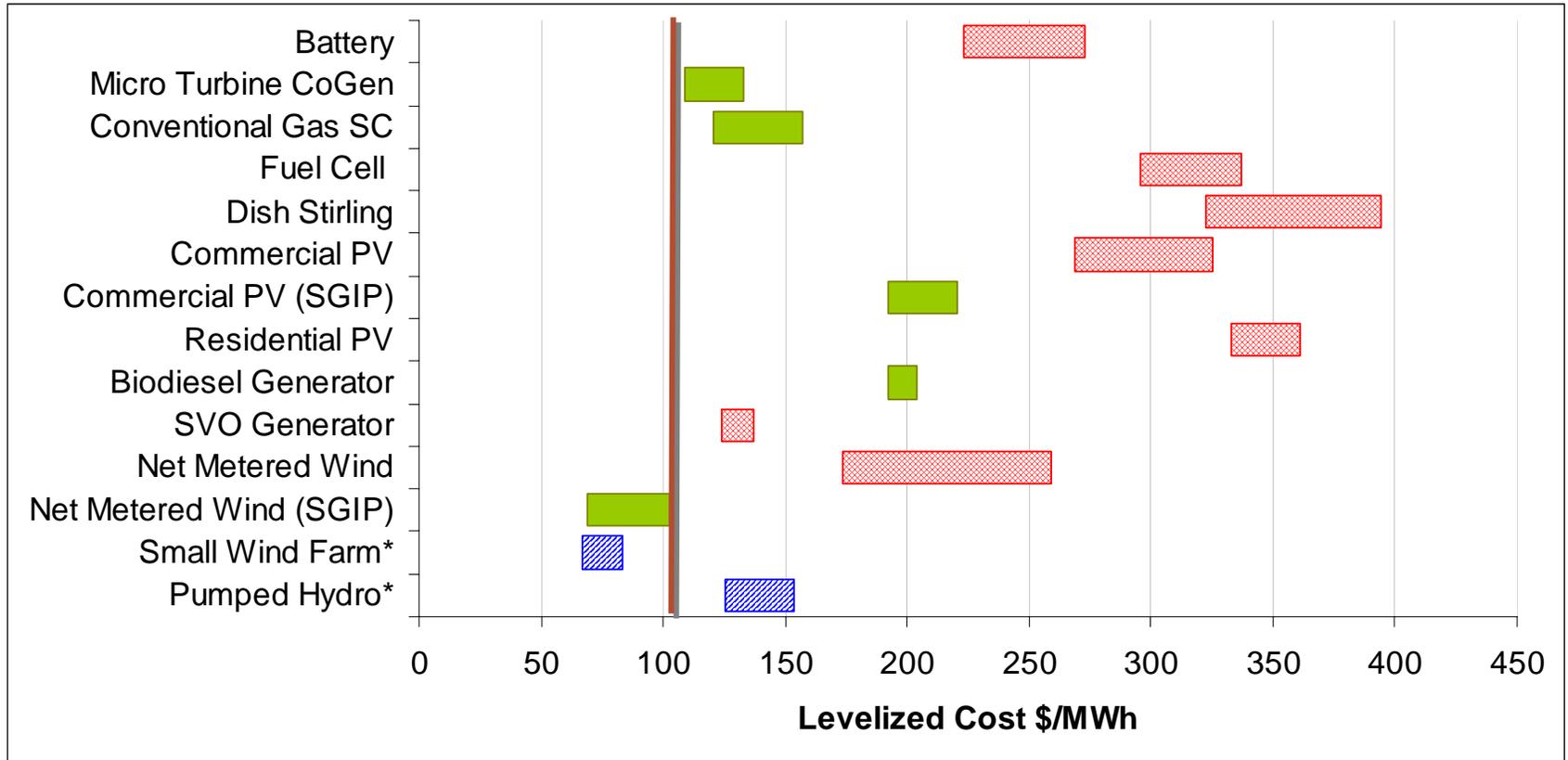
# Economic Analysis Process



- Net Metering
- Interconnected Utility
- Stand Alone Utility



# Levelized Cost Screening Results





# Levelized Cost Screening Results

- The results of the screening analysis and PowerOpt model were used to focus on the most economic alternatives:
  - Net Metering
    - 1 to 3 MW of wind turbines
  - Interconnected Utility
    - No Generation
    - Wind turbines added



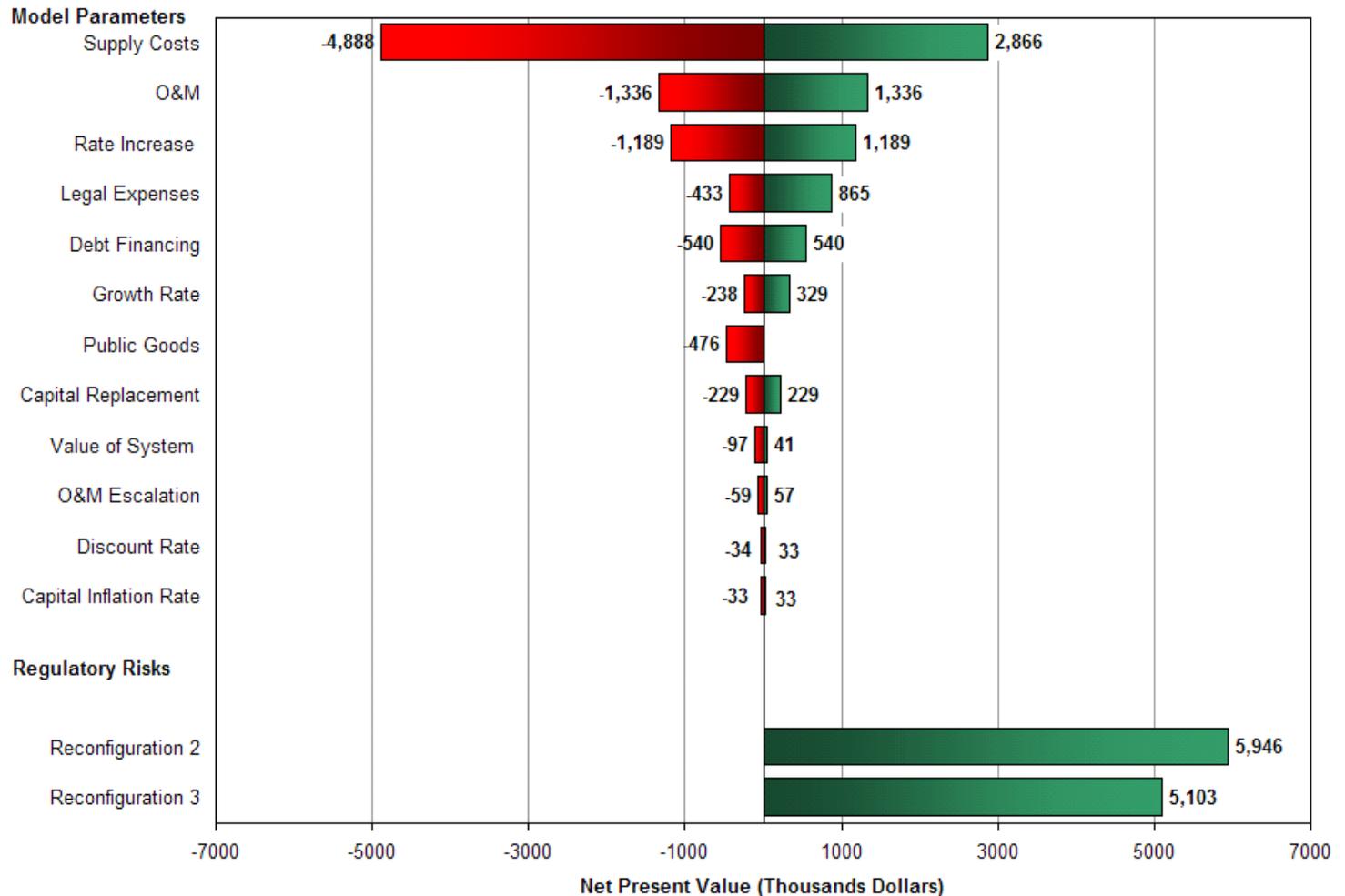
# Cash Flow Results

- 10 Year Cash Flow Analysis yielded the following results:

Option	10 Year NPV	Capital Cost (after SGIP)
Net Metering – 1 WT	\$223,000	\$700,000
Net Metering – 3 WT	\$651,000	\$2,100,000
Utility Base Case – No Generation	-\$1,929,000	\$8,210,000



# Tornado Diagram – Renewable Utility Formation





# Tribal Benefits

- Employment
- Self-determination
- Environmental Stewardship
- Energy Cost??





# Conclusions

- Viable Net Metering Options Include:
  - Wind Turbine
  - PV Parking Shade
  - Boiler Co-Gen
- Utility Formation may be More Expensive Depending On:
  - Transmission Improvements
  - Cost of Energy
- Stand Alone Utility Possible Using:
  - Wind Farm
  - Pumped Hydro Storage
  - Large Co-Gen

