Resource Needs and Draft Portfolio Concepts

IRP Stakeholders

Seattle City Light

September 29, 2011

Agenda

- Introduction
- New Resources
- Wood Biomass
- Conservation Potential Assessment
- Draft Portfolio Concepts

New Resources

A Risk Analysis for Resource Need

- A Probabilistic Measure of the ***Difference (+,-) Between Generation Capability and Load in December***, Before Any Corrective Actions are Taken
  - The analysis estimates potential need before any SCL seasonal reshaping, short-term transactions, or hydro flexibility
- Aurora is Used for Estimating Generation Capability Through the Years Considering:
  - Hydro conditions
  - Unplanned outages
  - Changes in long-term power supply contracts
  - Biological opinion impacts for the Columbia River
  - Planned rewinds and maintenance

An Overview of the Methodology

- Over 3,000 Supply and Demand Scenarios
  - Based upon detailed studies of historical hourly supply and demand conditions in winter
- Scenarios Rank Ordered by Resource Need
  - Majority of scenarios are surplus
  - The 99th, 95th, 90th, and 50th percentiles are identified
    - Deficits reduced for amount Power Management expects to augment supply ahead of need
      - Hydro flexibility, seasonal reshaping, and short-term market purchases

Risk Analysis

- Risk is applied to Supply and Demand Independently
  - Supply Risk: Volatility in Hydro (High & Low Water) and Forced Outages
  - Demand Risk: Volatility in Heating Demand November through February

Supply (Hydro) Volatility

- Hydro is About 90% of our Resource Portfolio
  - Water conditions have a major impact on SCL generation capability
- Hydro "Volatility" is Not Uniform Across All of Our Hydro Resources
  - Within a given year, the Skagit projects may have a high water month in December while Boundary may have a low water month in December
- "Time Series" and "Cross-Sectional" Correlations are Incorporated into the Probability Distribution Analysis

Demand Volatility

- Demand is Strongly Related to Temperature
  - Demand and hydro conditions have no correlation
- The Temperature for a Given Hour has Almost No Correlation with the Temperature of an Hour in Another Month
  - Northwest weather variability and seasonal changes
- Historical Demand Variation (AVG, SD, and CV) for December and January are Incorporated in the Probability Distribution Analysis

Developing Risk Metrics: Simulation of Objective Function

- **Resource Adequacy Function:**

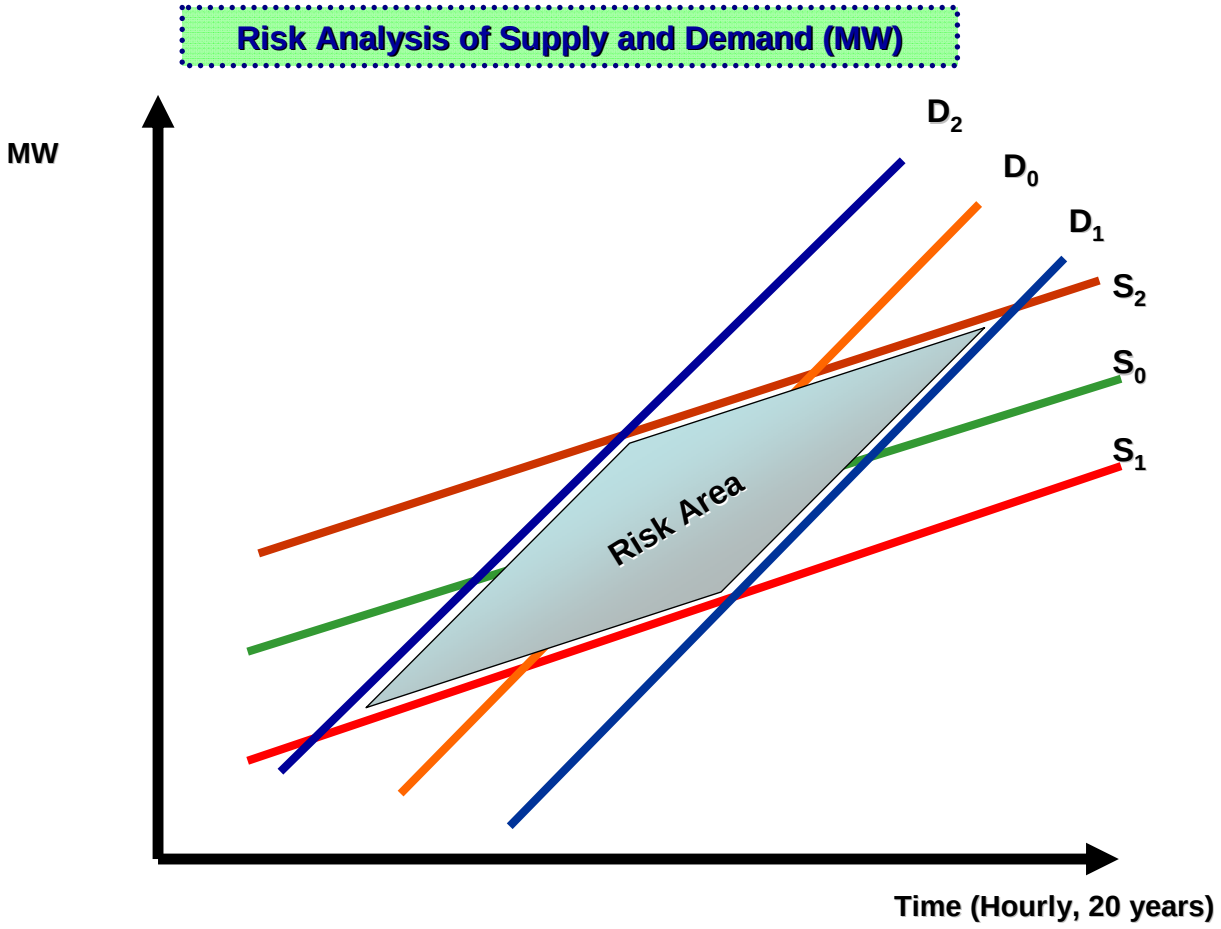
  A Normal Distribution is assigned to both Hydro and Demand inputs in the following objective function

$$R.A. = F(D_{DEC}, D_{JAN}, SKAGIT_{DEC}, SKAGIT_{JAN}, BN_{DEC,} BN_{JAN,} SLICE_{DEC}, SLICE_{JAN})$$

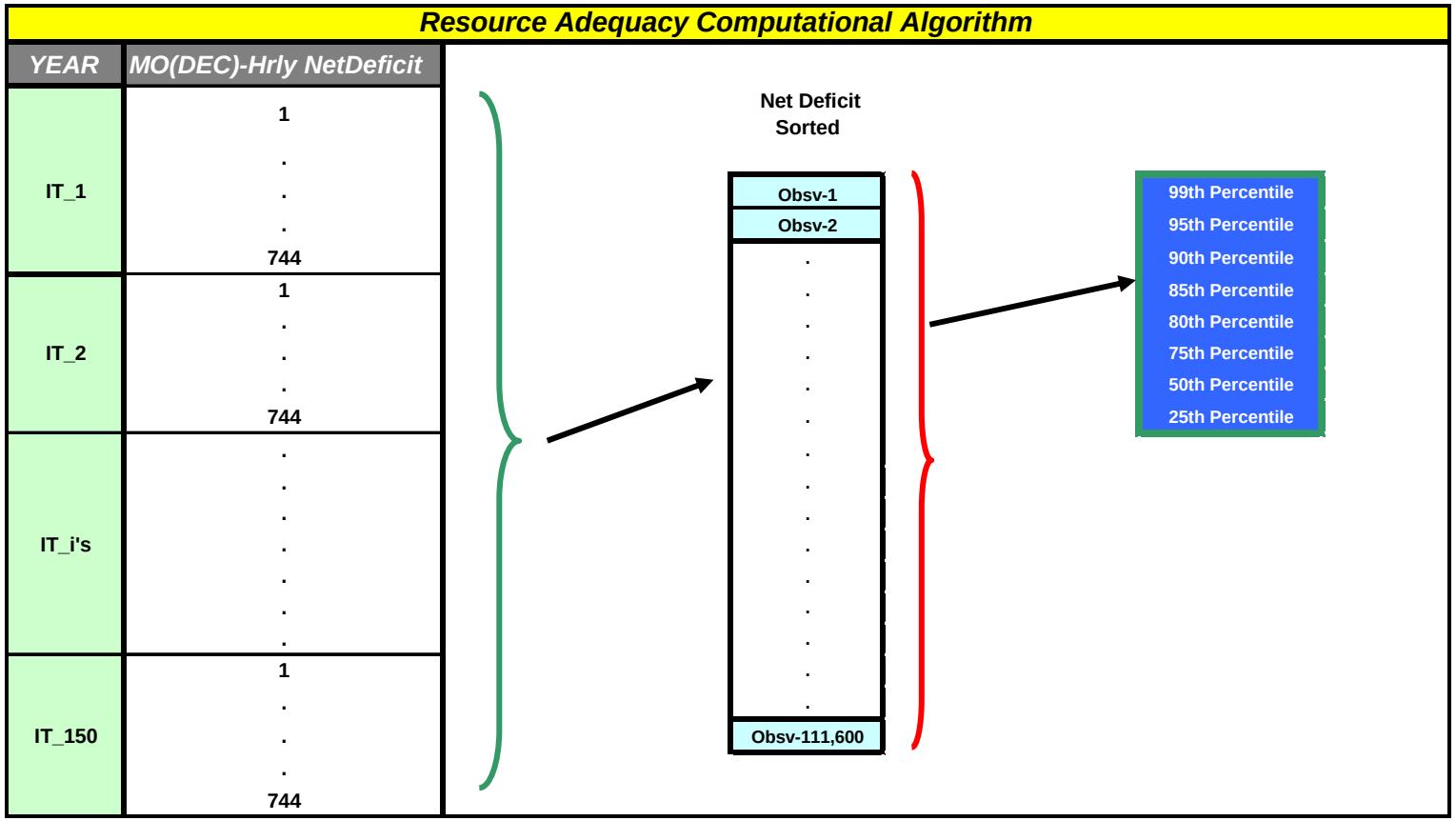
R.A. = Resource Adequacy
D = Demand
BN = Boundary
Skagit = Gorge + Diablo + Ross
Slice Product = SCL Share of BPA's system

The simulation method that has been used in this process is: Latin Hypercube Simulation

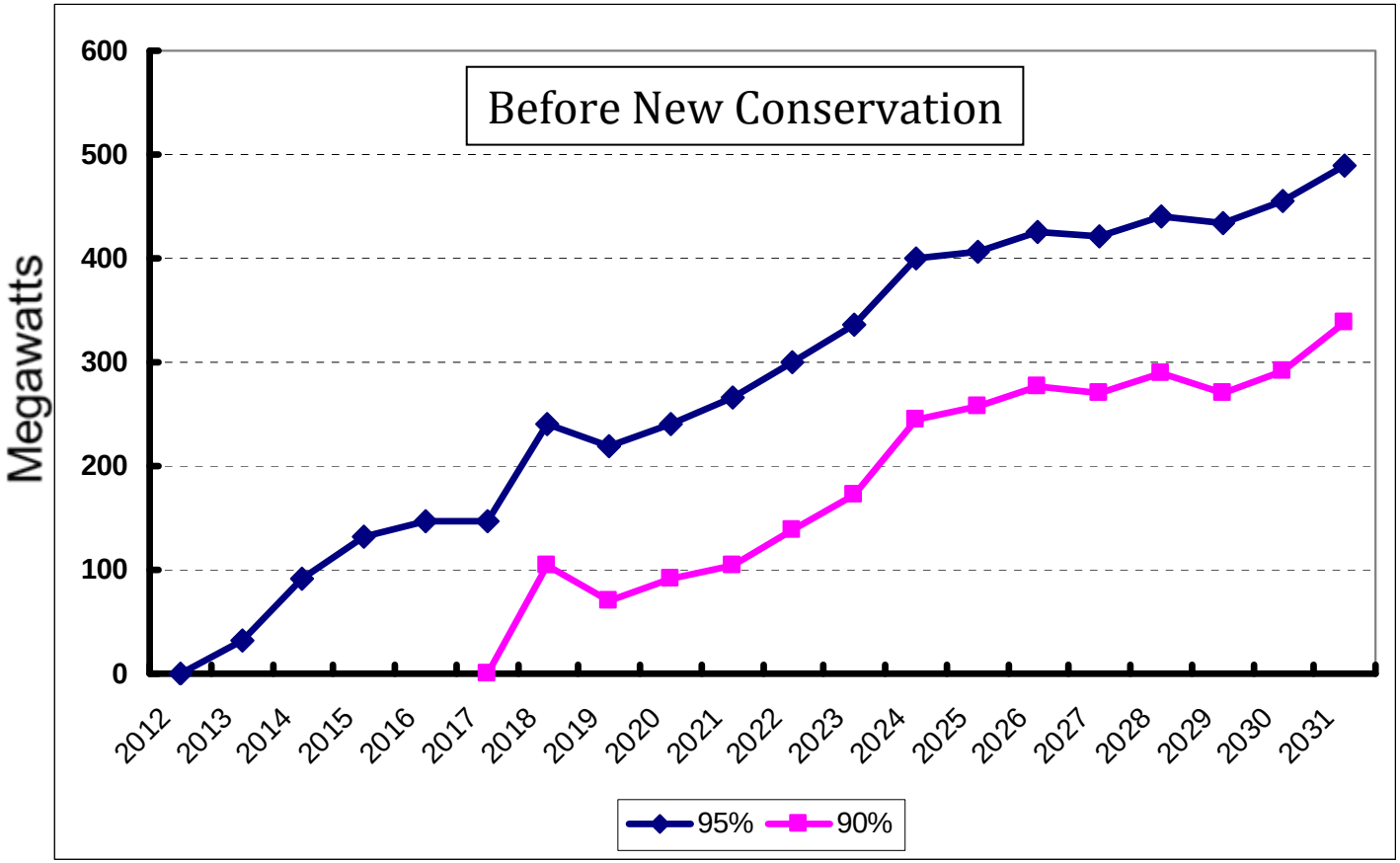
Risk Analysis of Supply and Demand



Estimating Risk for Resources

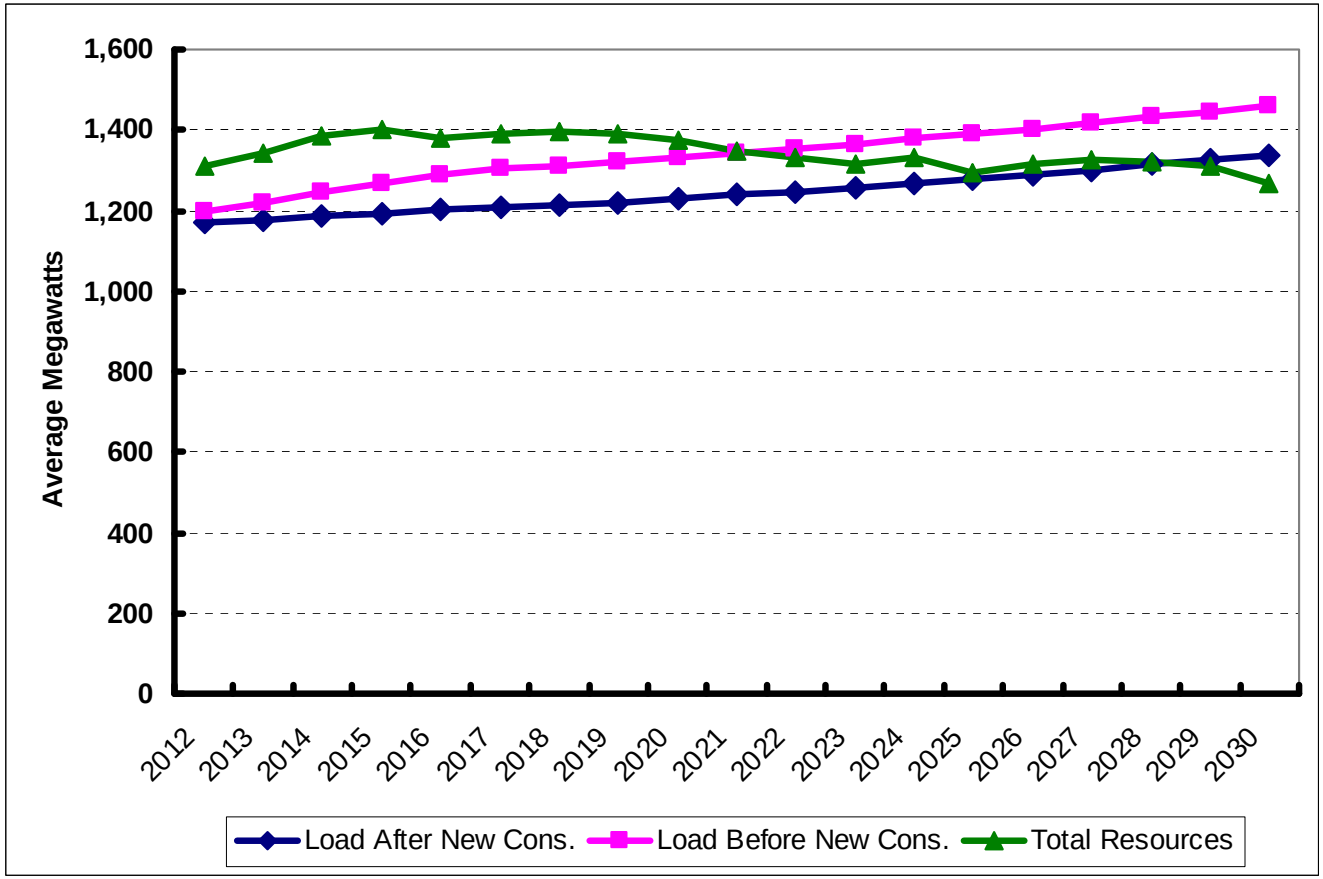


Winter Season One-Hour Resources to Reach 95% and 90% Confidence Levels



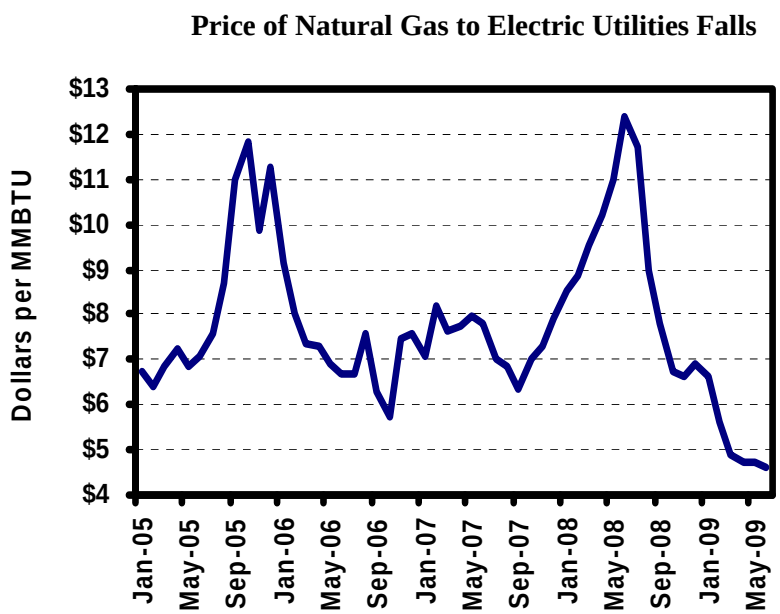
Notes: After up to 300 MW of hydro flexibility, seasonal reshaping, and short-term market purchases. Analysis is an estimate based upon long-term forecasts of hourly loads, resources, and generation capabilities.

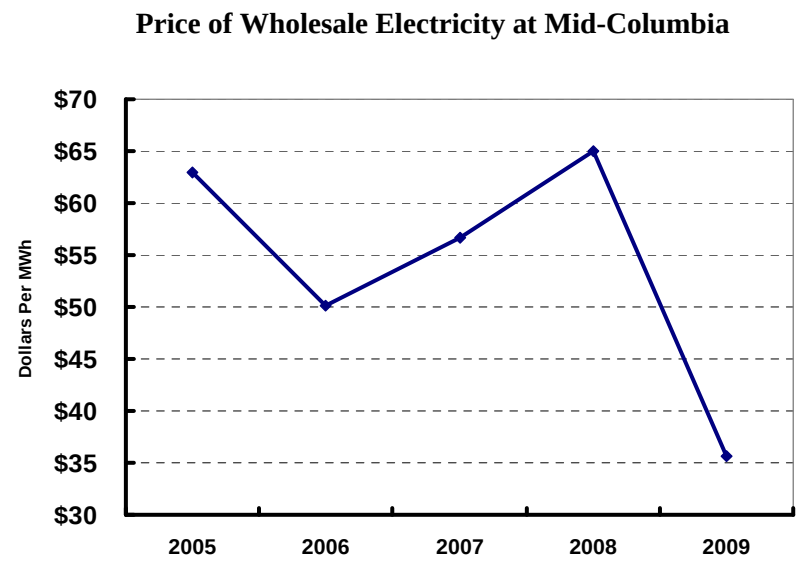
Average Energy Adequate for Many Years



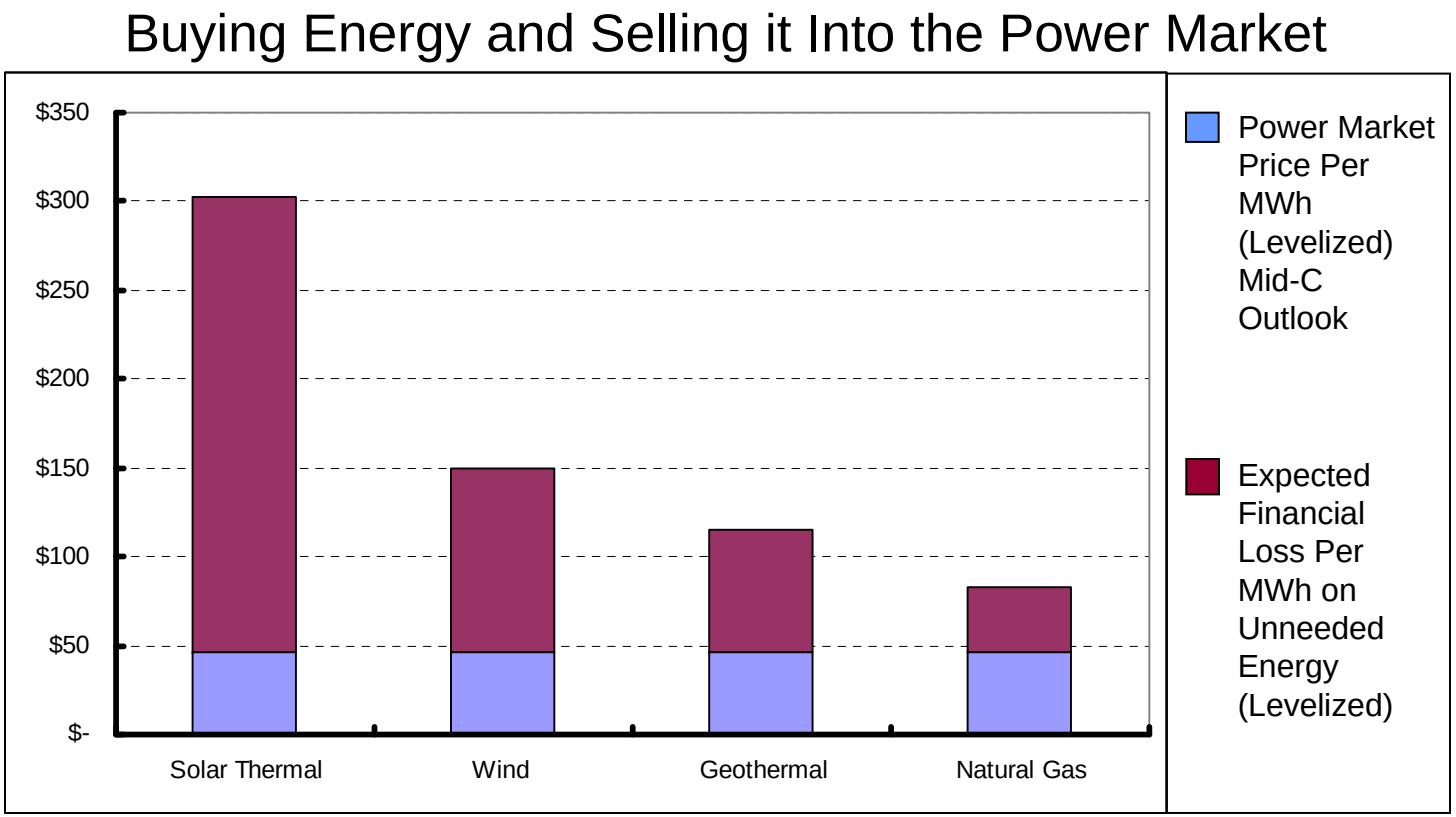
Natural Gas Prices and Recession Drive Lower Power Prices Since 2008

Wholesale Electricity Prices Plummet in 2008-2009





Low Power Prices Make Carrying Unneeded New Resources Costly

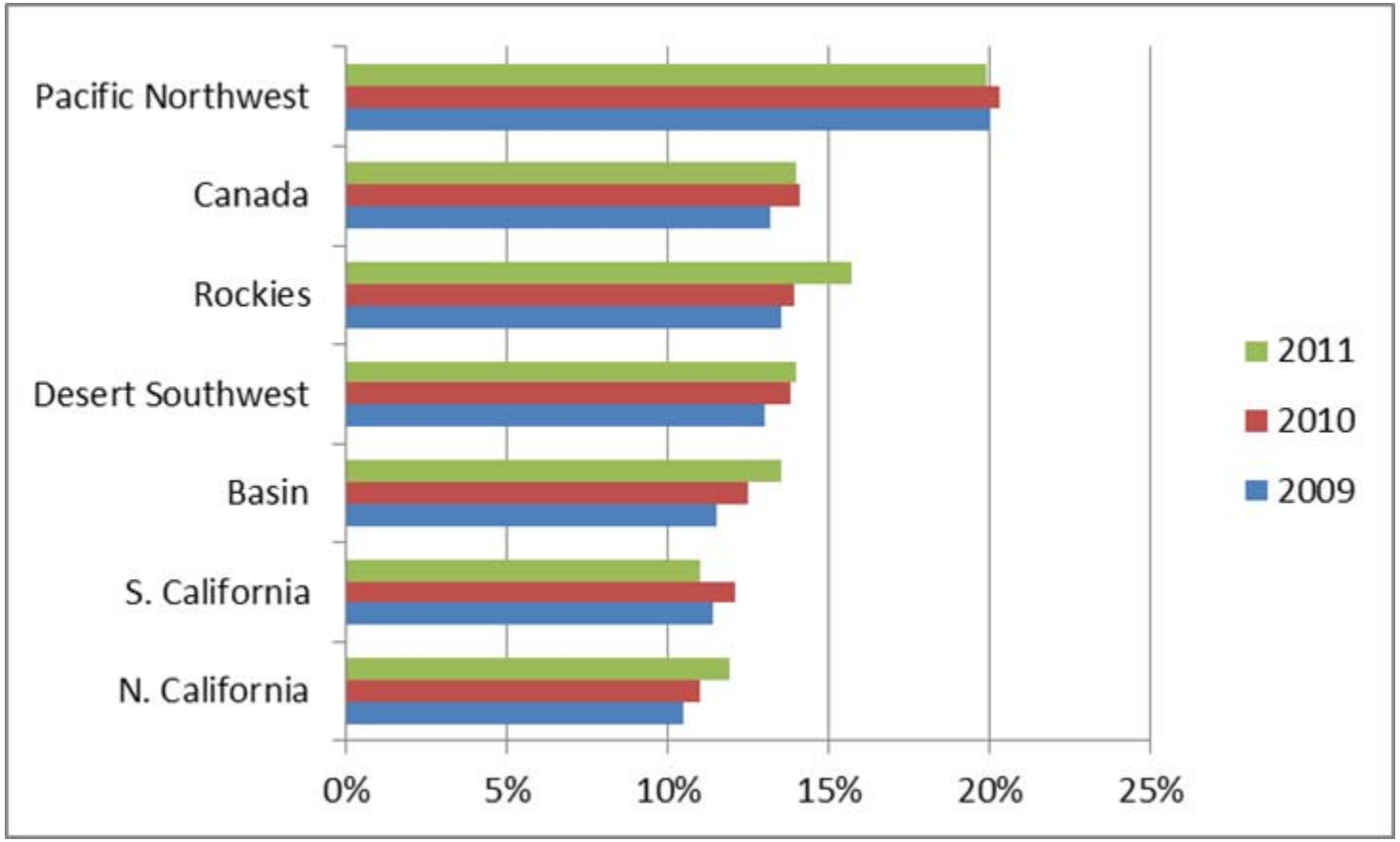


Notes: Resource levelized costs from US Energy Information Administration. Power market levelized prices from Ventyx Spring 2011 Outlook. Levelized costs and power prices are used here only for illustrative purposes.

Renewable Energy Credits (RECs): Window of Opportunity

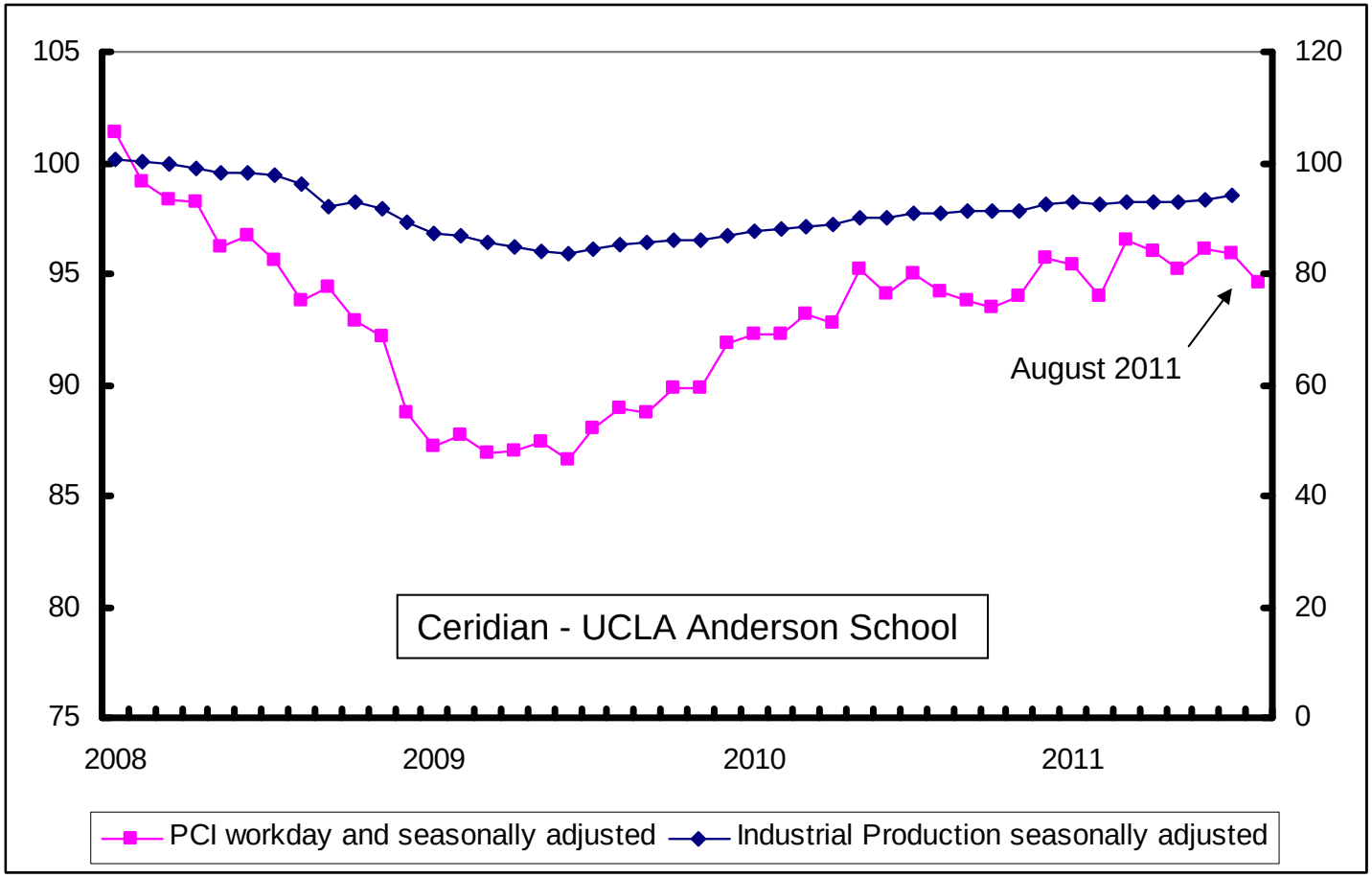
- Buying RECs is an I-937 Compliance Option
- California PUC “25% Ruling” Sends New Northwest Wind Projects Scrambling
  - REC Costs Lower Than the 2010 IRP Forecast for Future Delivery Dates
    - Lowest Cost Compliance Option When Firm Resources Unneeded

Winter (Dec.) Reserve Margins: PNW Surplus Continues



Source: Western Electricity Coordinating Council (WECC)

Leading Indicator: Ongoing Weakness in U.S. "Pulse of Commerce" Index



Energy Standards: Global Energy Partners Outlook

- Global Energy Partners Predicts Gradual Reductions in Future Residential and Commercial Loads
  - Future changes in standards for lighting and appliances are forecast to save more than 40 aMW annually by 2022

Resource Need Summary

- Risk Analysis for Resources
- RECs: Lowest Cost I-937 Compliance Option
- Energy Position Exceeds Standard
- Region in Surplus
- Resource Need Uncertainties
  - Sustained peaking (study underway)
  - Weak economic growth
  - Changes in lighting and appliance standards
- 90th Percentile Target Prudent for 2012 IRP
  - Reevaluate in next IRP

Wood Biomass in the IRP

Wood Biomass Generation in Previous City Light IRPs

- Fuel Source Has Been Specifically Designated as “Wood Waste” in IRPs
- Wood Waste Biomass Was Included For:
  - Relative cost
  - Washington I-937 renewable status
  - Reliable, mature technology
  - High capacity factor, baseload generation
  - Resource diversity with hydro

Wood Biomass-Fired Generation

- Potential Benefits
  - Reduced sulfur dioxide and heavy metals emissions from combustion of fossil fuels
  - Removal of slash may reduce risk to forests from harmful insects, disease, and wildfires
  - Creates jobs
- Potential Concerns
  - Logging forests for fuel
  - Greenhouse gas emissions
  - Health impacts

Logging for Fuel

Hog fuel: Typically comes from grinding or chipping slash (leftover wood debris from logging and thinning), waste from lumber and wood products manufacturing, and urban wood waste

- City Light does Not Consider Logging for Fuel Compliant With I-937
  - "Biomass energy based on animal waste or solid organic fuels from wood, forest, or field residues…" "…that do not include wood from old growth forests"
- Logging for Fuel is Not Cost-effective

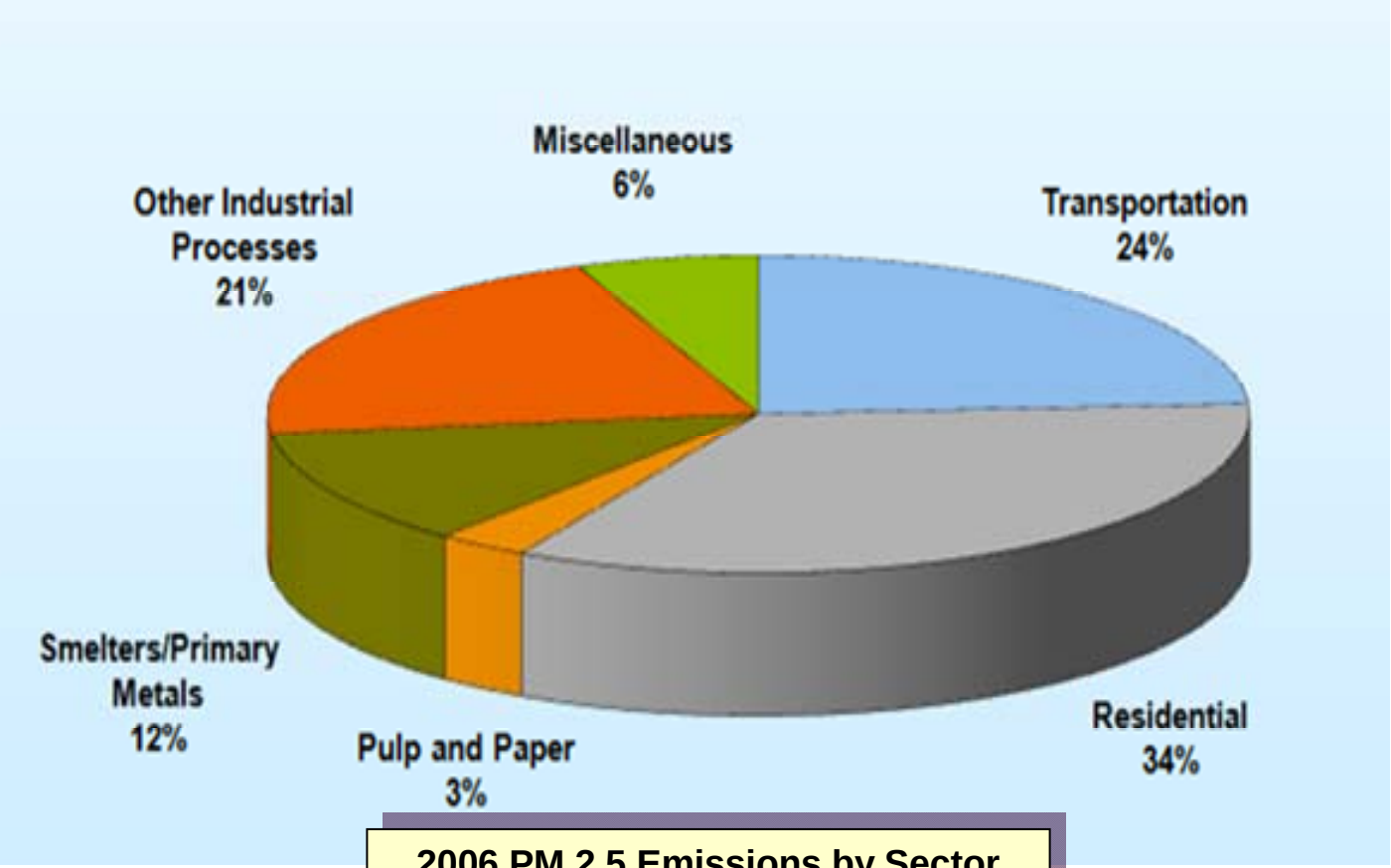
Wood Biomass Greenhouse Gas Emissions

- Biomass GHG Emissions
  - 2010 Manomet study casts doubt
  - Lifecycle analysis of impacts is important
  - The EPA has postponed their ruling on the GHG status of biomass for 3 years

Health

- Particulate is one of six pollutants regulated by the EPA that can lead to serious health problems
  - Recent studies have focused on the health risks from fine particulate (PM 2.5)

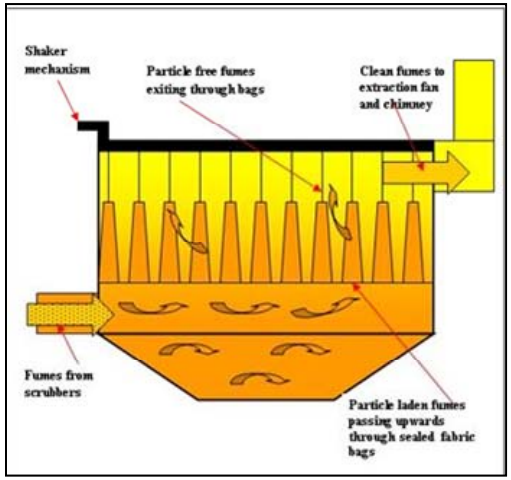
Common Fine Particulate Sources



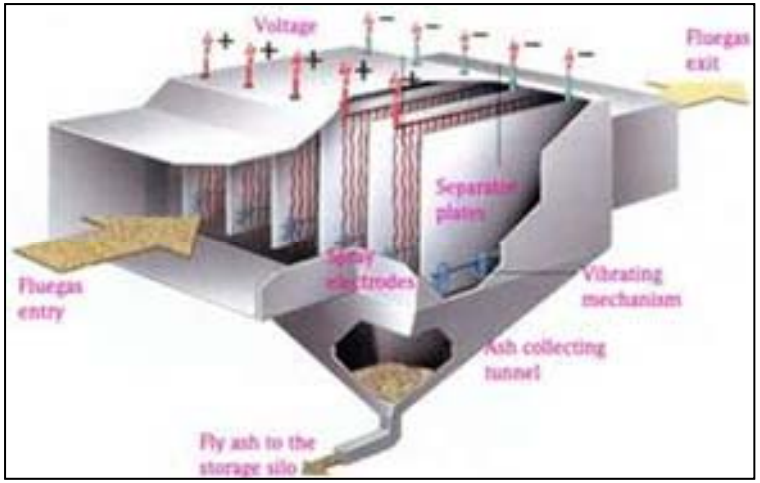
2006 PM 2.5 Emissions by Sector
Province of Ontario, Canada

Particulate Emissions Controls

- Current EPA Maximum Available Control Technologies (MACT)
  - Baghouses and Electrostatic Precipitators



Fabric Filter Baghouse



Electrostatic Precipitator

Approach in IRP

- Only Biomass Power Plants Using Waste Wood Materials per I-937 to be Considered
- Examine Alternative Approaches to Calculating GHG Emissions
- Examine Effectiveness of Control Technologies for Controlling Particulates, Including Baghouses and Electrostatic Precipitators

Update on the Conservation Potential Assessment

Conservation in the IRP

- Recent activity:
  - Single conservation portfolio used for risk analysis
  - Based on assumptions in SCL's Strategic Plan Baseline and averages ~14 aMW over the next 7 years

- Moving forward:
  - Complete a Conservation Potential Assessment (CPA) that can provide conservation supply curves for the IRP
    - Supply curve expressed as conservation potential in aMW across 10 mill increments
  - Use at least two avoided cost parameters for supply curves
  - Consider alternative portfolios by accelerating retrofit activity

Conservation Potential Assessment

Objectives:

- Meet I-937 requirements
- Establish cost-effective conservation targets
- Support IRP development
- Quantify amount, timing, and cost of conservation resources
- Identify data gaps and ways to fill those gaps
- Not intended to design programs

CPA and I-937

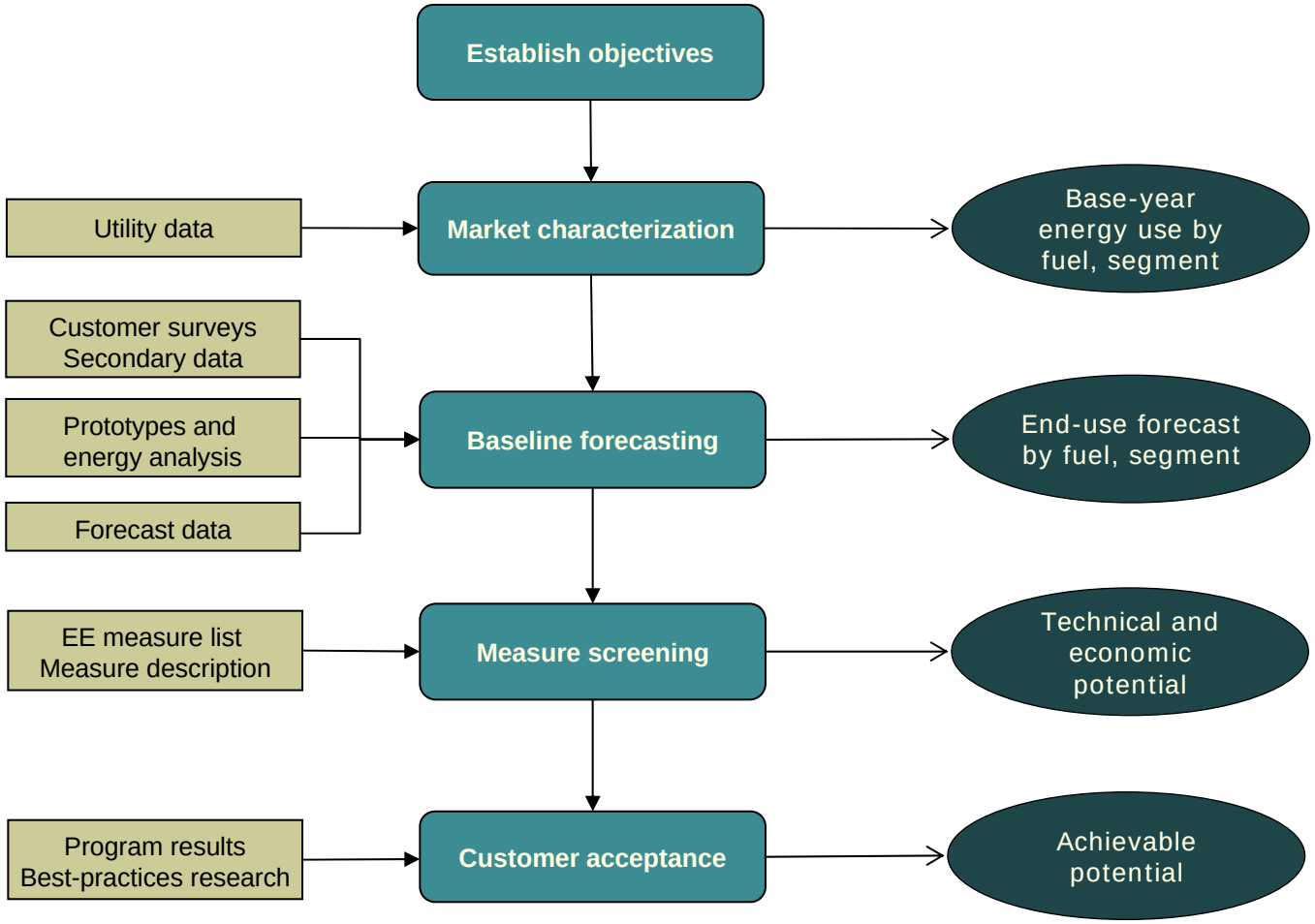
- I-937
  - Requires City Light to submit and meet biennial conservation target starting in 2010
  - Requires utilities to use methodology consistent with Northwest Power and Conservation Council
  - 2010-2011 targets based on NWPCC 5th Plan Calculator: the two-year target is 19.68 aMW and we have exceeded target
  - Use CPA to establish 2012-2013 targets and ten-year potential
  - Need to establish target by Resolution prior to the end of January 2012

Conservation Potential Assessment

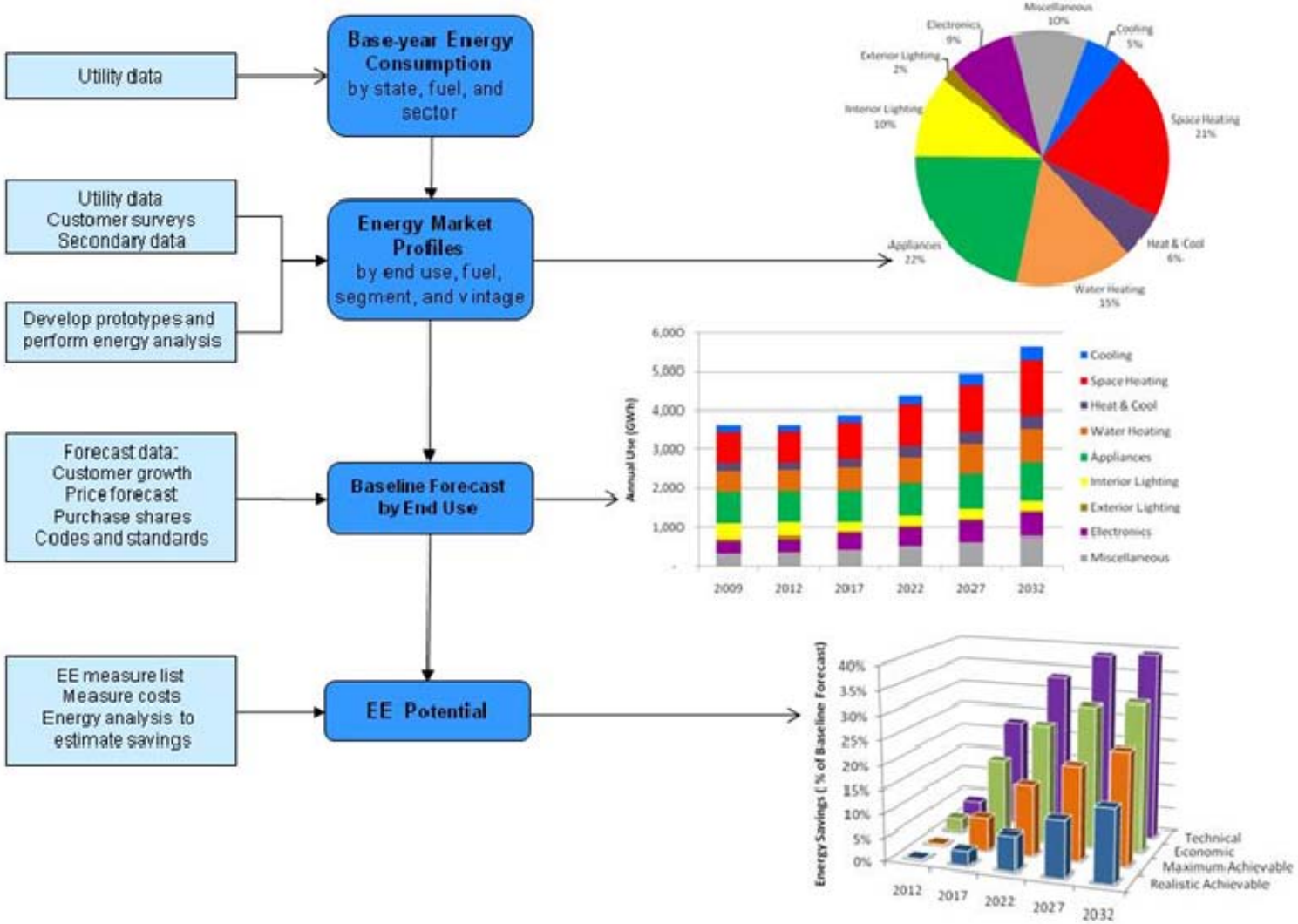
Process/Timeline

- Selected Global Energy Partners – June 2011
  - Done CPA's for other electric utilities across country
  - Cowlitz, Inland P&L, Avista in Washington state
- Baseline developed to match SCL's load forecast – July-September
  - Build up energy consumption by End-use and Sector
  - Account for how codes/standards influence baseline
- Initial Supply Curve for IRP – early October
- Final Supply Curves – mid-October
- CPA report – late October
- Final CPA report – mid-November
- Start next CPA – early 2012

Estimating Conservation Potential



Overview of Analytical Approach for the Conservation Potential Assessment



Draft Portfolio Concepts

Draft Portfolio Concepts

1. **Hi-RECs**
   - Meet all I-937 requirements above reliability requirements with RECs
2. **Med-RECs**
   - Meet all reliability and I-937 requirements with a mix of RECs, renewables, and conservation
3. **Low RECs**
   - Meet reliability and I-937 requirements with mostly renewables and conservation
4. **Natural Gas**
   - Natural gas, RECs for I-937, plus CO_2 offsets

Draft Portfolio Concepts (*cont.)*

5. **Wind & Gas**
   - Meet I-937 with wind, gas, and some RECs
6. **Higher Conservation**
   - Further accelerate conservation
7. **Resource Diversity**
   - Maximum diversity of resource mix consistent with I-937 and Seattle Policy-maker guidance
8. **Cost Minimization**
   - Strive for lowest cost resource portfolio possible that can still be compliant with I-937

Schedule of Meetings

- Thursday, September 29, 2011
- Thursday, February 2, 2012
- Thursday, May 10, 2012

Questions or Comments?

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