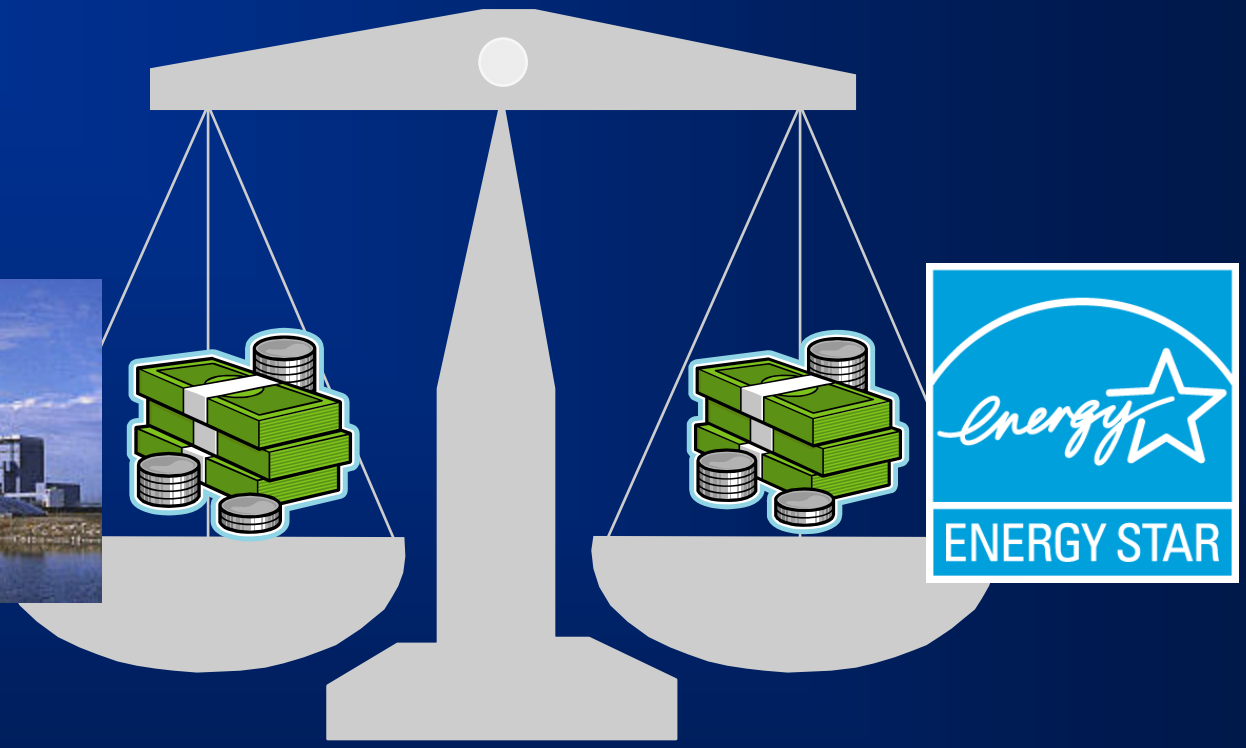
Columbia, MO
City Council Workshop

October 22, 2008

Agenda

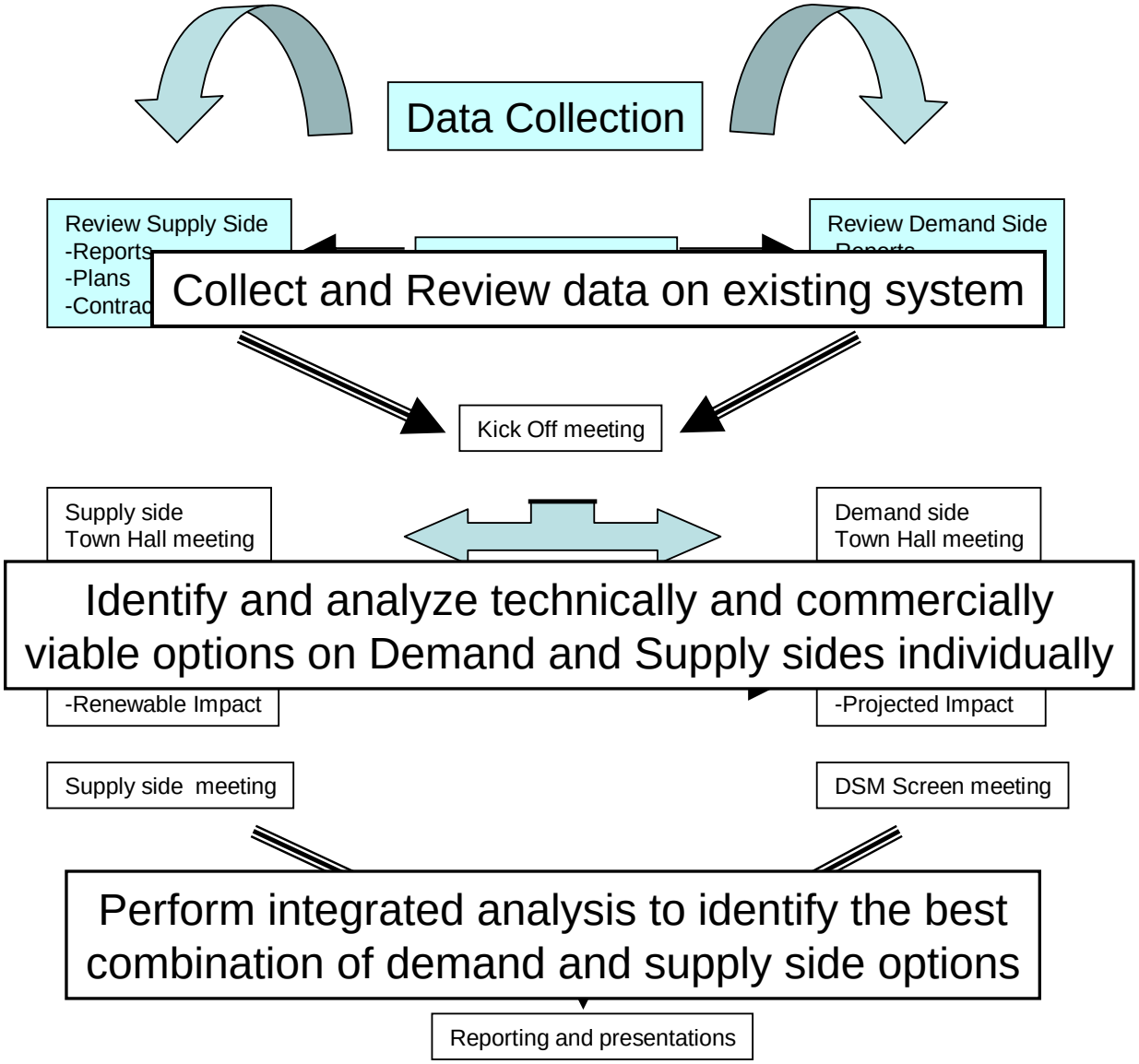
- Review of IRP process
- Summary of supply findings
- Summary of demand side findings
- Conclusions/Recommendations

Integrated Planning Objective

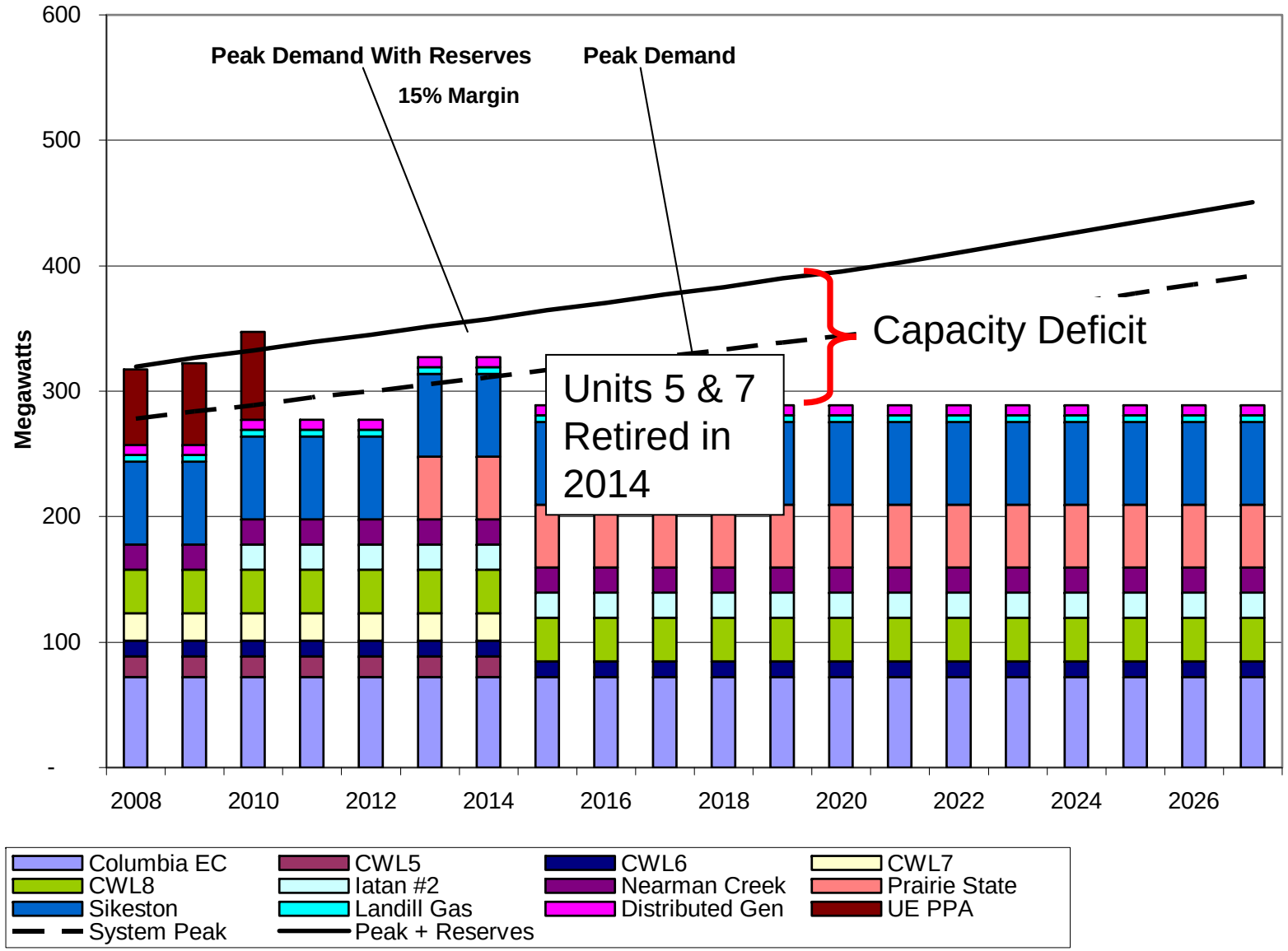


Balance costs of supplying electricity versus saving electricity

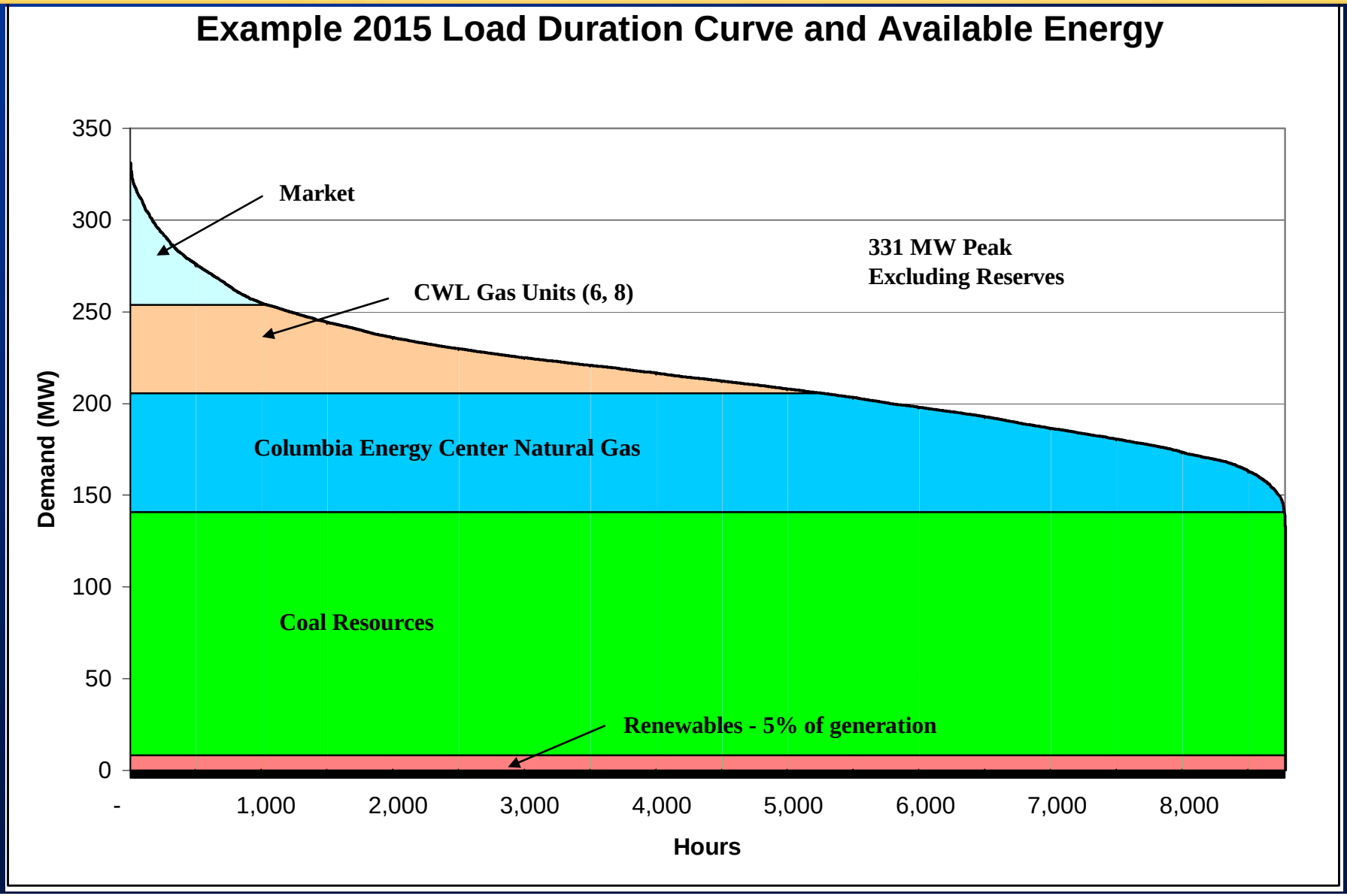
Overview of Study Process



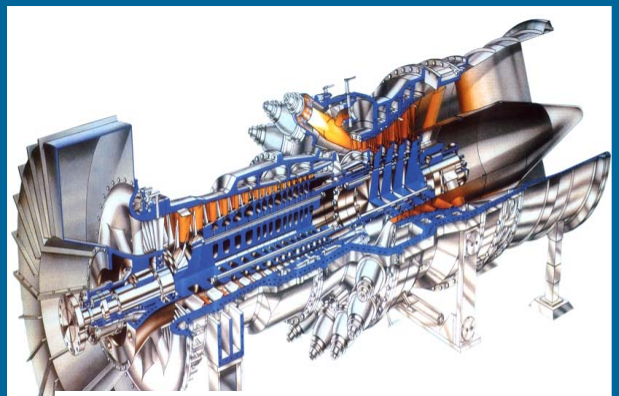
Current Forecast of Demand Compared to CWL Resources



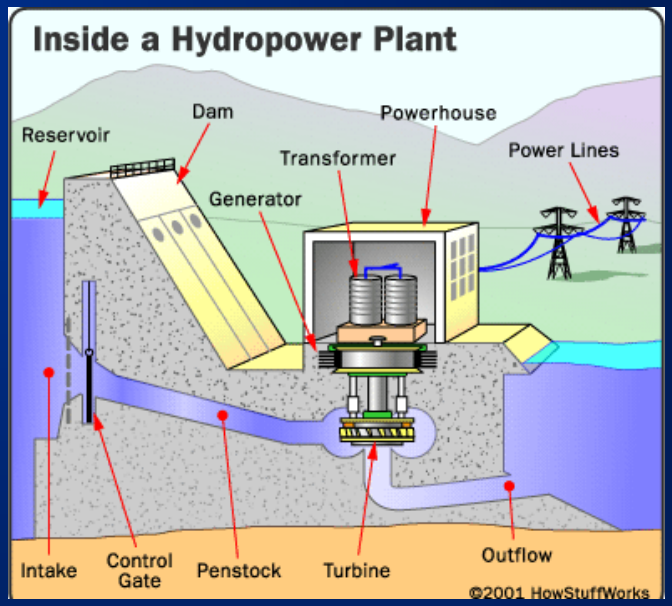
With Existing Resources, energy post 2015 will come increasingly from natural gas, market, renewables



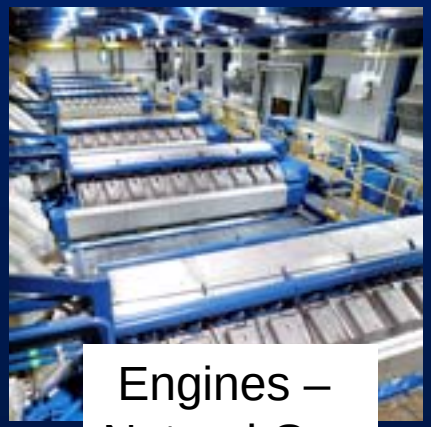
Supply Side Options



Combustion Turbine –Natural Gas



Coal/Biomass



Engines – Natural Gas

Supply Side Options Considered Practical and Competitive for the analysis

- Resource options included in portfolio analysis
  - Regional coal unit – Participation levels of 100MW, 50MW, 25MW
  - Local fluidized bed unit – 110MW, 70MW
  - Local IGCC unit -150MW
  - Local Combustion turbine-50MW
  - Local Engine sets – 8MW
  - Local Solar 10MW PV
  - Regional Wind
  - Area Pumped Hydro – 60MW
  - Market
  - Combined Heat and Power 5MW

Future with No Carbon Tax

Engine sets at CWL Plant

34MW

Participate in Remote Coal Unit

25MW 25MW

Market Purchases
Up to 60MW per year

2011 2015 2016 → 2027

Future with Carbon Tax

Engine sets
at CWL Plant

34MW

Wind to Replace New Coal

Market Purchases
Up to 110MW per year

2011

2015

2027

Future with In Town Options Biomass

Engine sets at CWL Plant

34MW

2011

Local Biomass Plant

73MW

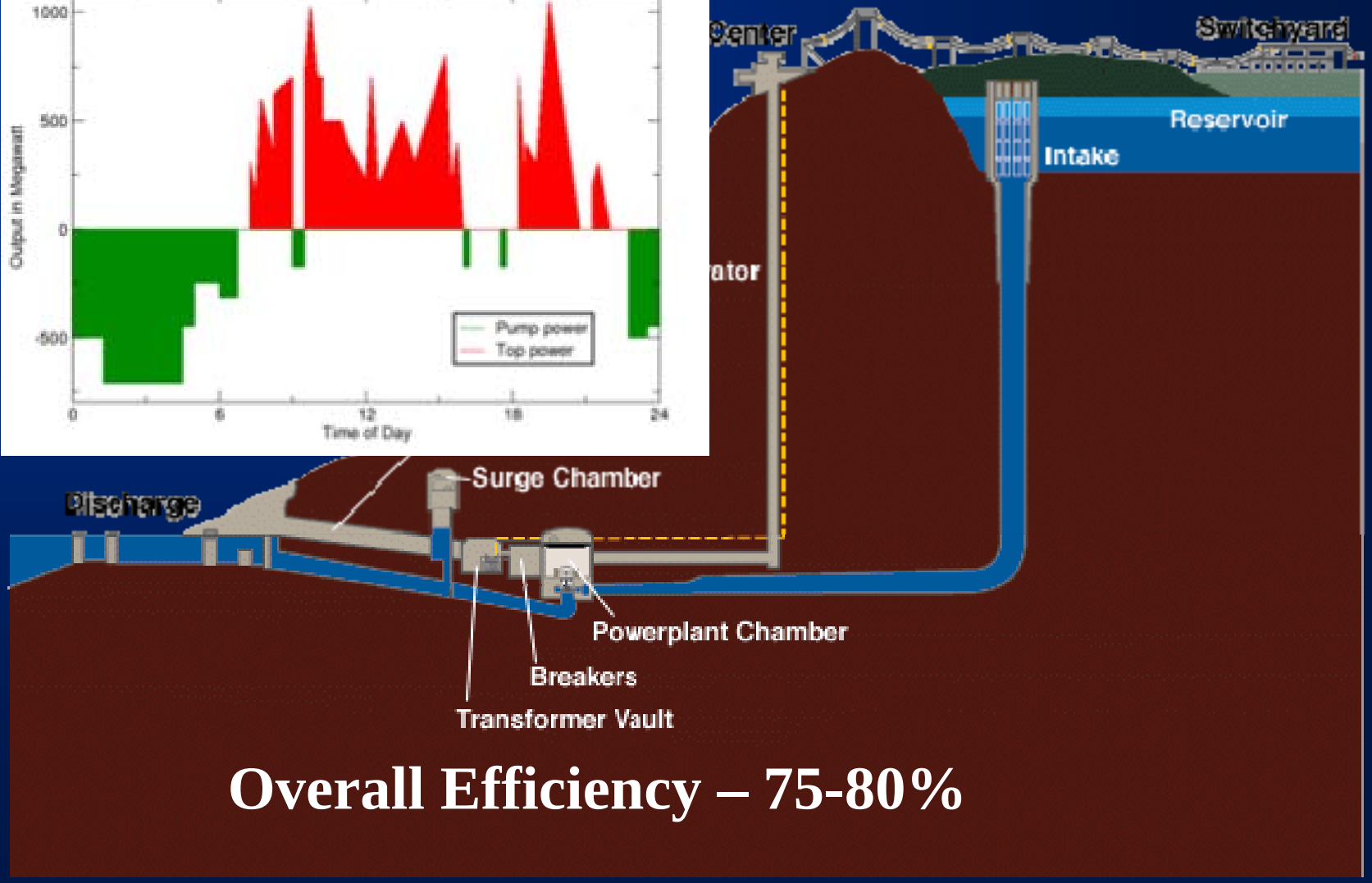
2015

Market Purchases
Up to 100MW

2027

CWL could pursue project with partners
To take some of the capacity.

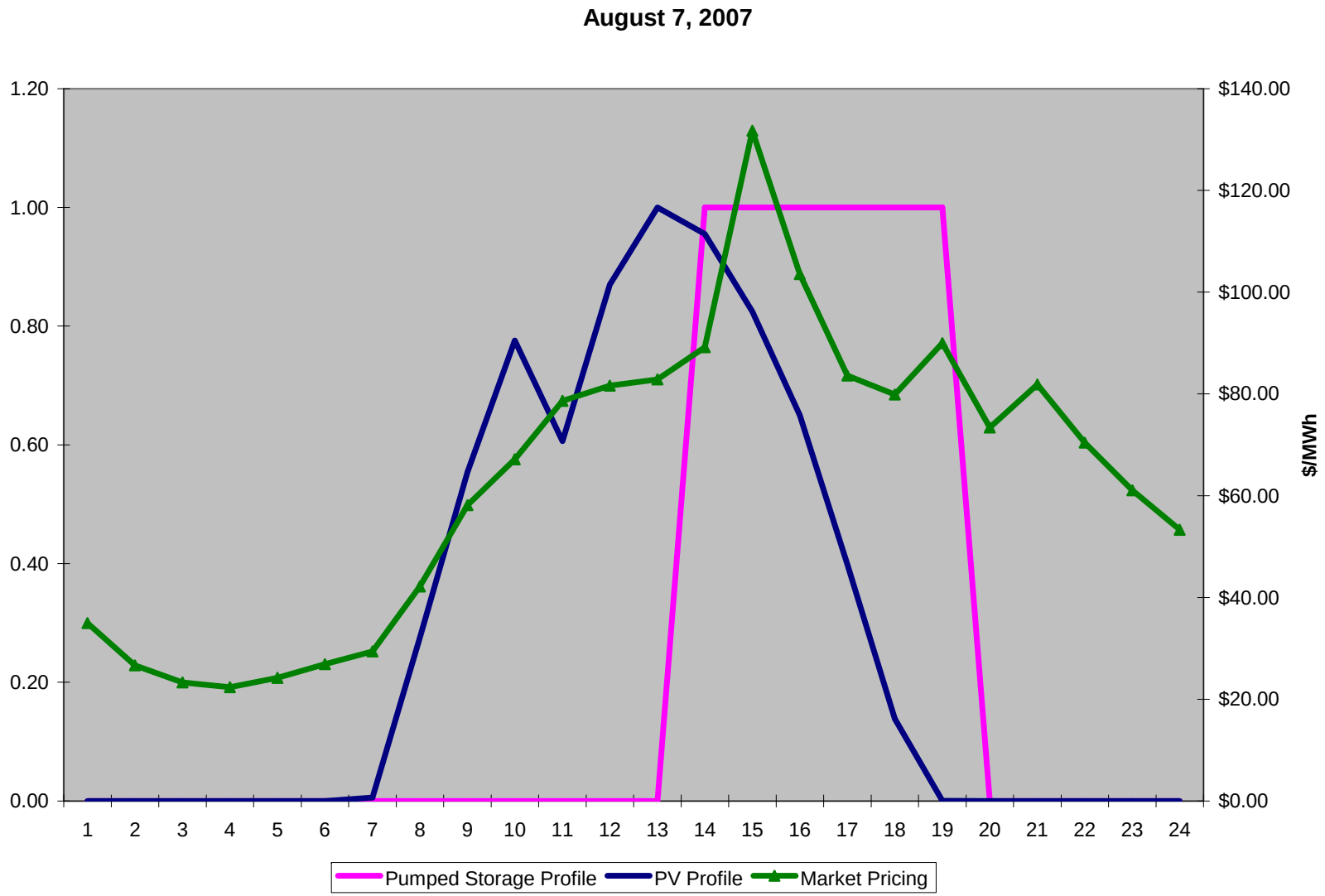
Pump Hydro Concept



Overall Efficiency – 75-80%

Man-Made Upper Reservoir, River/Lake Lower Reservoir

Pumped Storage versus Solar Operations



Pumped Storage vs Solar

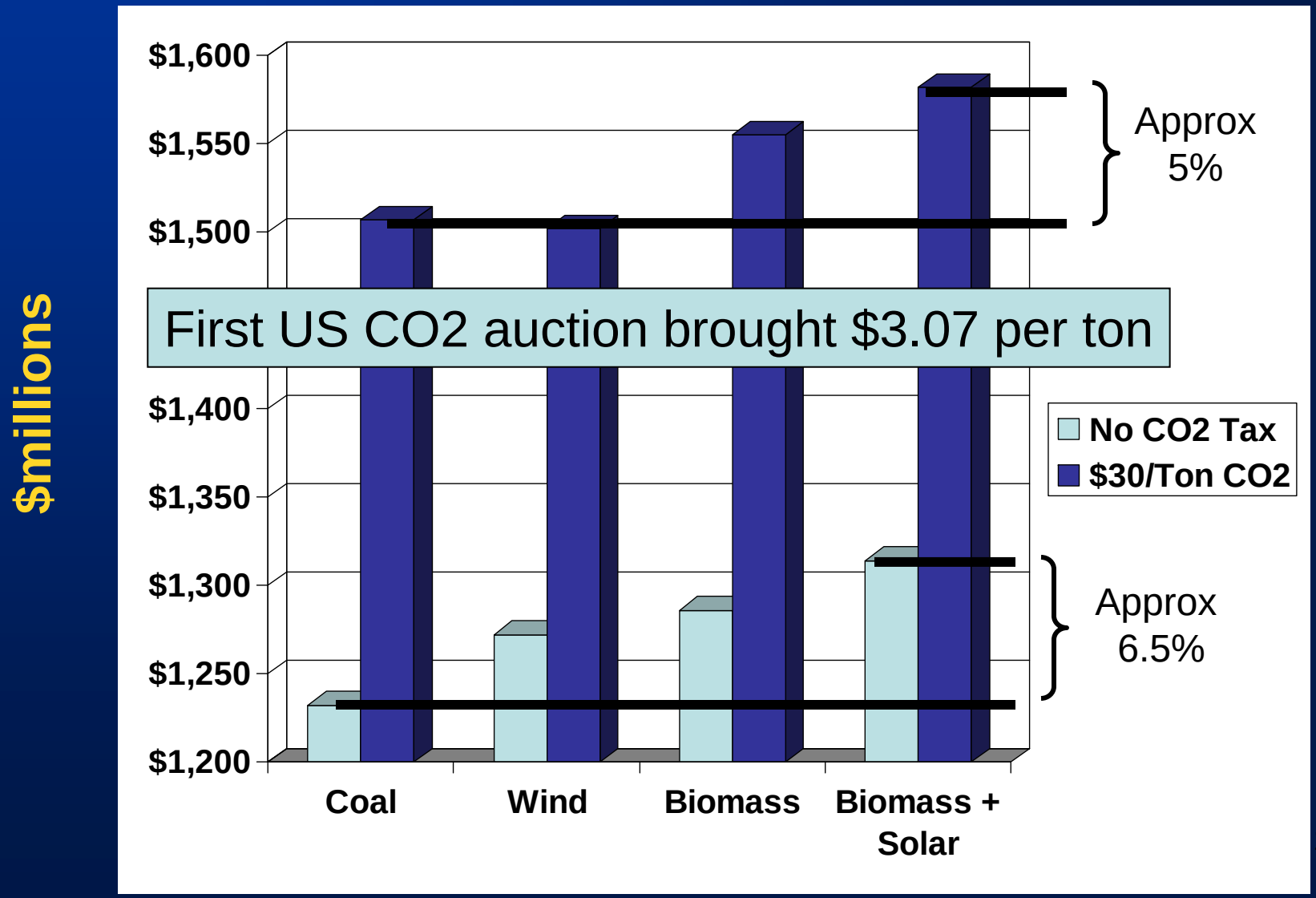
Pumped Storage

- 8 to 10 years before operational
- Siting and permitting uncertain and potentially contentious/costly
- Operations and construction disruptive to environment
- Only net offset of emissions is if wind is used to pump reservoir
- Cost estimated at $4,740 per kW (2015$) plus cost of pumping energy. $285 million. Very site specific.
- Utilized about 17% of time
- Affected by transmission and distribution losses (7% estimate)

Solar PV

- Install/obtain benefits immediately
- Minimal siting issues and ready acceptance
- Minimal environmental impact
- Always offsets carbon fuels
- Cost for PV approximately $8,000 ($2008) per kW. Price expected to decline.
- Utilized about 15% of time
- Reduces transmission and distribution losses

Comparison of Portfolio Costs (Incremental Cost Basis-No DSM Effects)

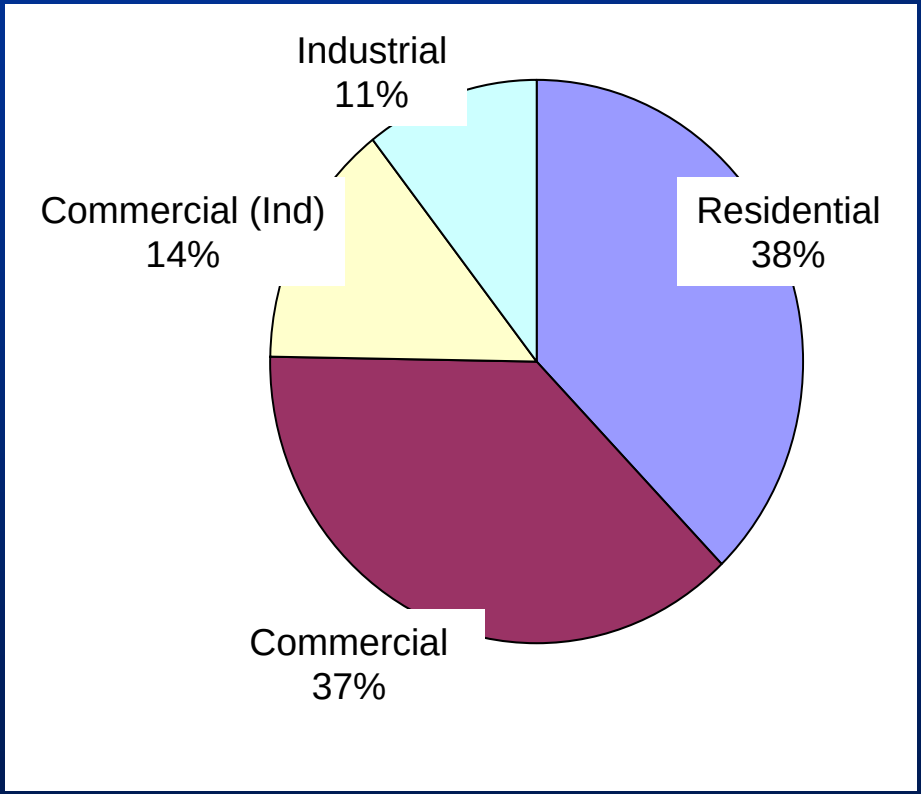


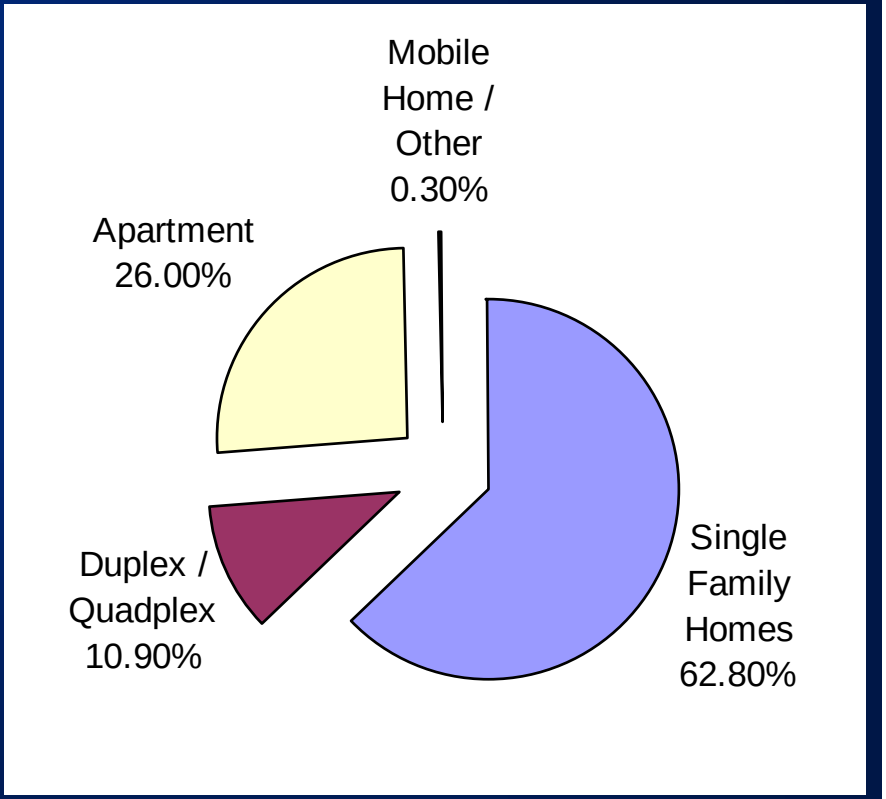
Demand Side Management Discussion

DSM Option Evaluation - Overview

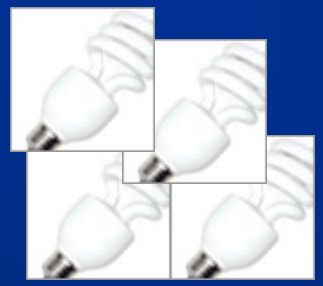
- Develop Options
  - Options had to be quantifiable and measurable to translate into load reductions in forecast.
  - “Soft” programs like energy audits, education programs, etc would continue to be offered by CWL, but are outside this analysis
- Screen Options-Identify Options with Benefit/Cost ratios greater than one.
  - Benefits
    - kW and kWh impacts by option
    - Inventory of option on CWL system
  - Cost of implementation was based on either
    - Total installed cost or
    - Portion of installed cost (CWL rebate)
- Determine total DSM load impact
- Determine total CWL system impact

Columbia Energy Uses by Customer Class



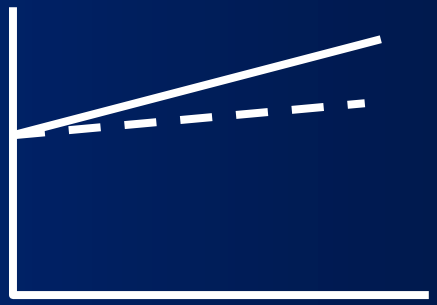


DSM Benefit/Cost



kWh(old)-kWh(new)

kW(old)-kW(new)



Number of End uses X Impact per End use (kW or kWh) = Expected energy or demand reduction for CWL

$ for DSM option
-Cost of device
-Cost of rebates
-Cost of operations & maintenance

Compared to

$ for Power Production
-Cost of Investment
-Cost of fuel, emissions
-Cost of operations & maintenance

DSM Option Evaluation – Major Areas

- Residential
  - HVAC
  - Thermal Envelope
  - Appliance
- Commercial
  - HVAC
  - Appliance
  - Lighting
- Industrial
  - Machine Drive
  - HVAC
  - Lighting

40 Options Evaluated
Cost was CWL rebate= 50% of installed cost.

Lighting and HVAC change out options affected by Federal Energy Stds
-SEER 13 to 16 existing program
-Compact Fluorescent existing program

More effective Residential options included:
-Building envelope modifications
-Tighten ductwork
-Programmable thermostats
-Retire old refrigerators/recycle second units

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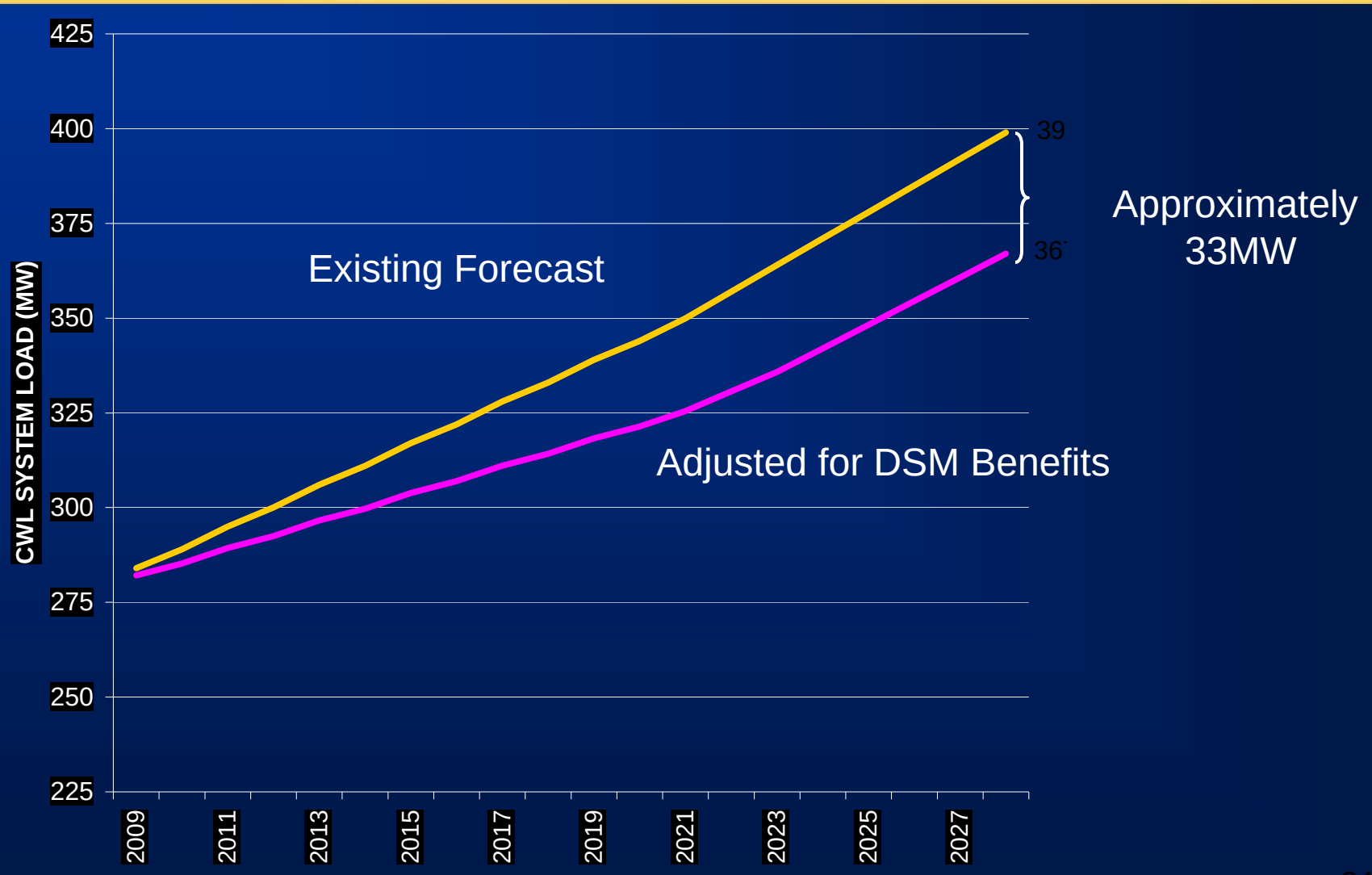
Options did not include building envelope modifications to existing structures:
-Variety of commercial buildings
-Uncertainty of acceptance of architectural changes
-Wide differential in cost to implement

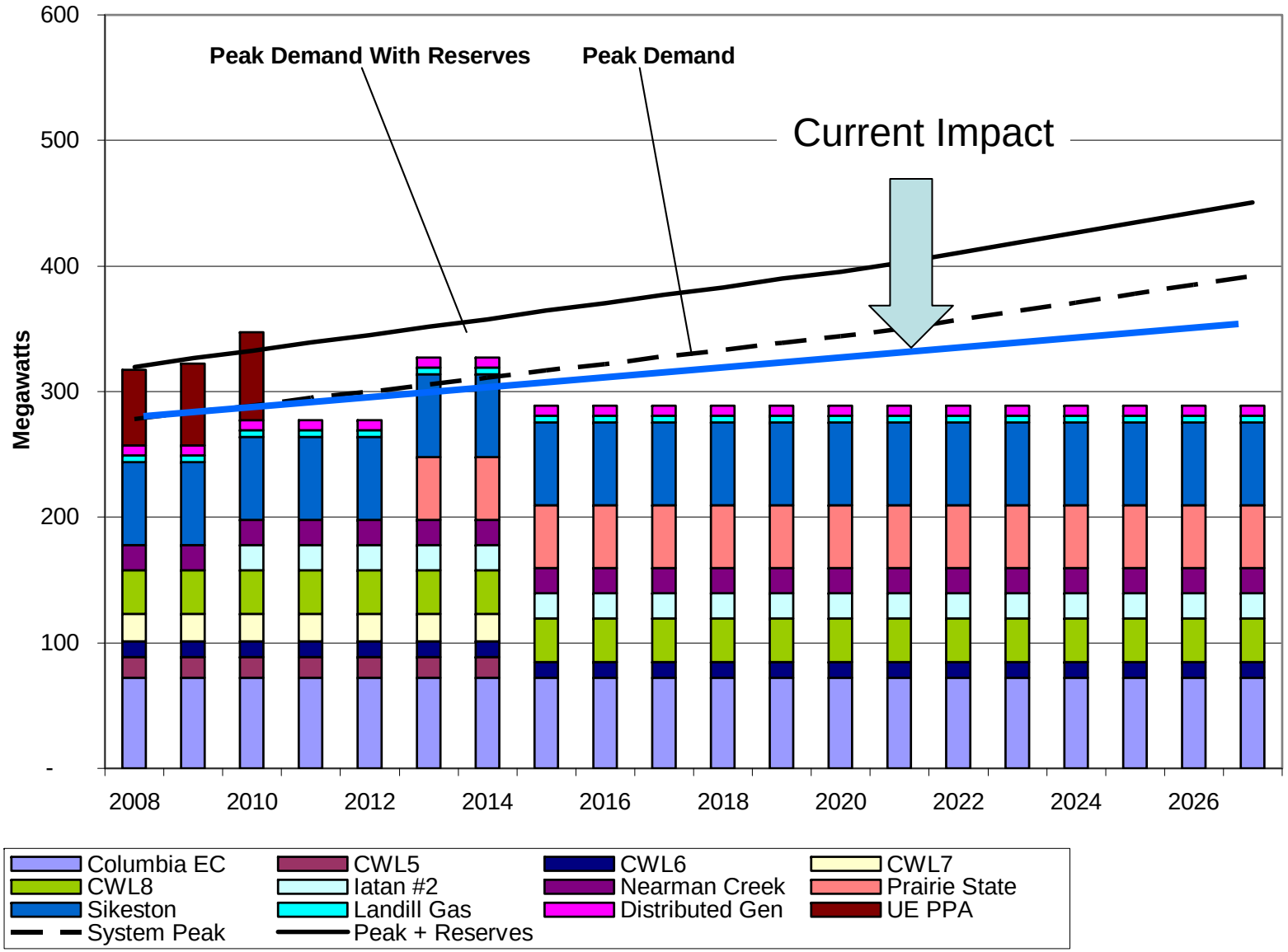
DSM Option Evaluation – DSM Load Impact

- Total amount of demand and energy reductions from options over the study period:
  - MW savings=33MW
  - MWh savings=1035GWh
- Some options are accepted by public at a faster rate than others
  - Residential acceptance ranges from 0.2% to 10% for options
    - Faster acceptance is for options such as appliance change outs,
    - A 3% acceptance rate means that it would take CWL 33 years to achieve full potential savings based on inventory in Columbia.
  - Commercial acceptance is assumed over 15 years due to equipment replacement cycles, depreciation and investment decisions

DSM Results


CWL SYSTEM LOAD (MW)
425
400
375
350
325
300
275
250
225
2009
2011
2013
2015
2017
2019
2021
2023
2025
2027
Existing Forecast
Adjusted for DSM Benefits
39
36
Approximately
33MW

Capacity Needs with DSM

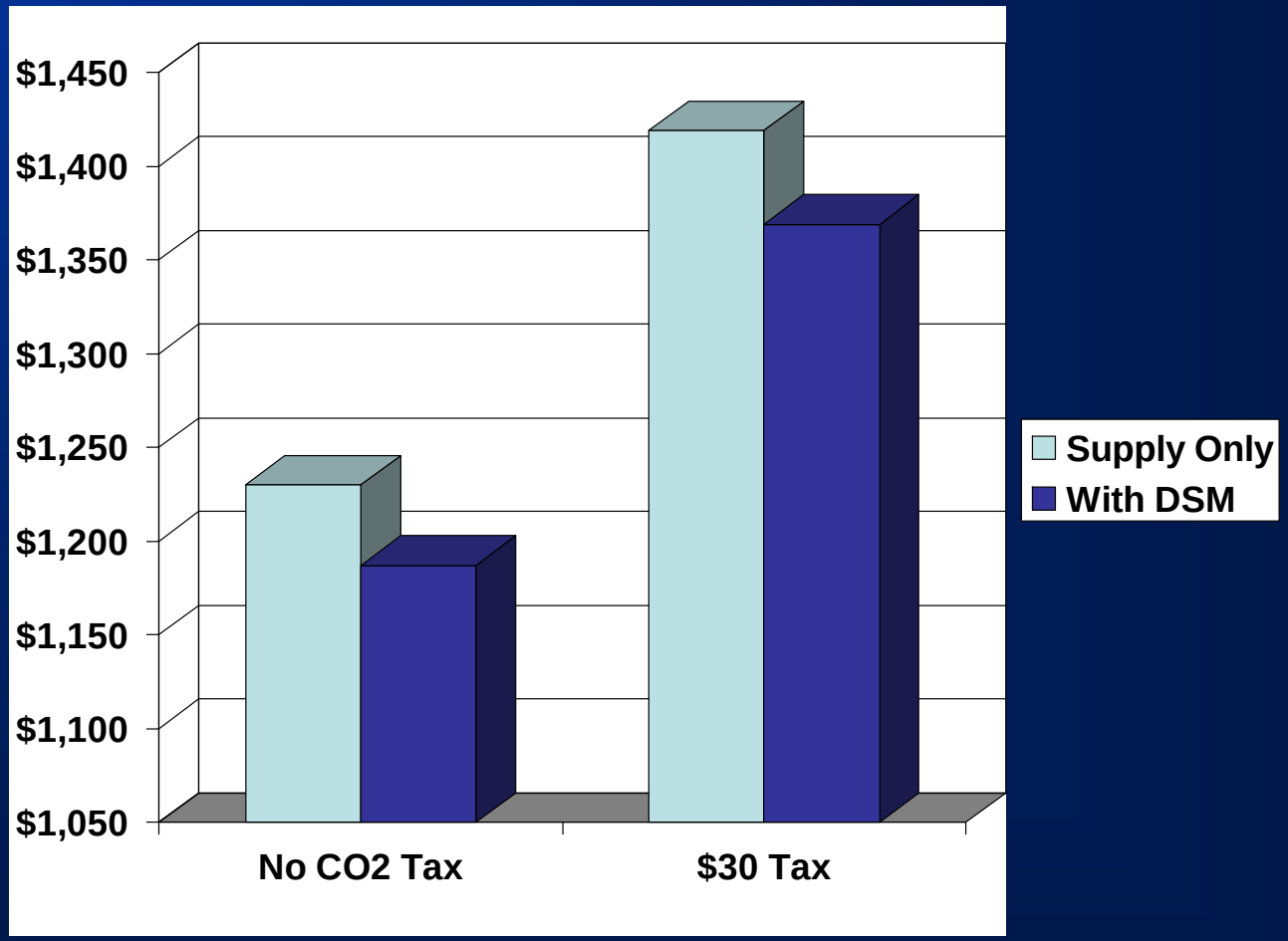


Integration Phase Included

- Updates of costs for:
  - Coal and natural gas
  - Capital cost for options
- Analysis with
  - $30 per ton carbon tax (Modeled with Warner-Lieberman Bill)
  - Customer approach to DSM
- Integration phase determined
  - DSM to be implemented and
  - Technology, MW amount and year for installation of supply side options

Resultant NPVs

$ millions



First Area of Recommendations

- City Council
  - Implement more stringent building codes to Energy Star or LEED standards.
  - More stringent codes would reduce the need for CWL to ask for retrofits.
  - Energy Star approaches to defining codes are described in report.

Second Area of Recommendations

- CWL DSM
  - Increase CWL staff to aggressively pursue DSM programs as outlined in report
  - Move to time of use pricing with pilot
  - Update IRP in 5 years to review DSM success
- DSM programs (and distributed renewables) require more involvement to obtain MW & MWhs than traditional supply options. CWL needs more staff and equipment to:
  - Obtain Columbia specific data on inventories
  - Quantify and verify results
  - Perform “pilot” programs
  - Manage sustainability of impacts
  - Deal with customers, vendors, contractors, etc on new programs, and renewable options.
- Advent of time of use strategy, smart grid deployment
  - CWL operates in time of use world with wholesale pricing, customers operate with rates based on average costs.

Third Area of Recommendations

- CWL Supply Side
  - Pursue resources in CO2 future with DSM. Evaluate market costs with cost of engine set
  - Implement transmission improvements.
  - Identify interest in regional biomass plant with area utilities.
  - Acquire additional wind energy as projects are available.

Discussion