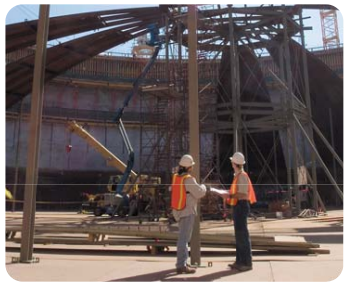
BUILDING A WORLD OF DIFFERENCE®

BLACK & VEATCH


Black & Veatch
Holland Board of Public Works
Energy Plan

February 22, 2010

Introductions

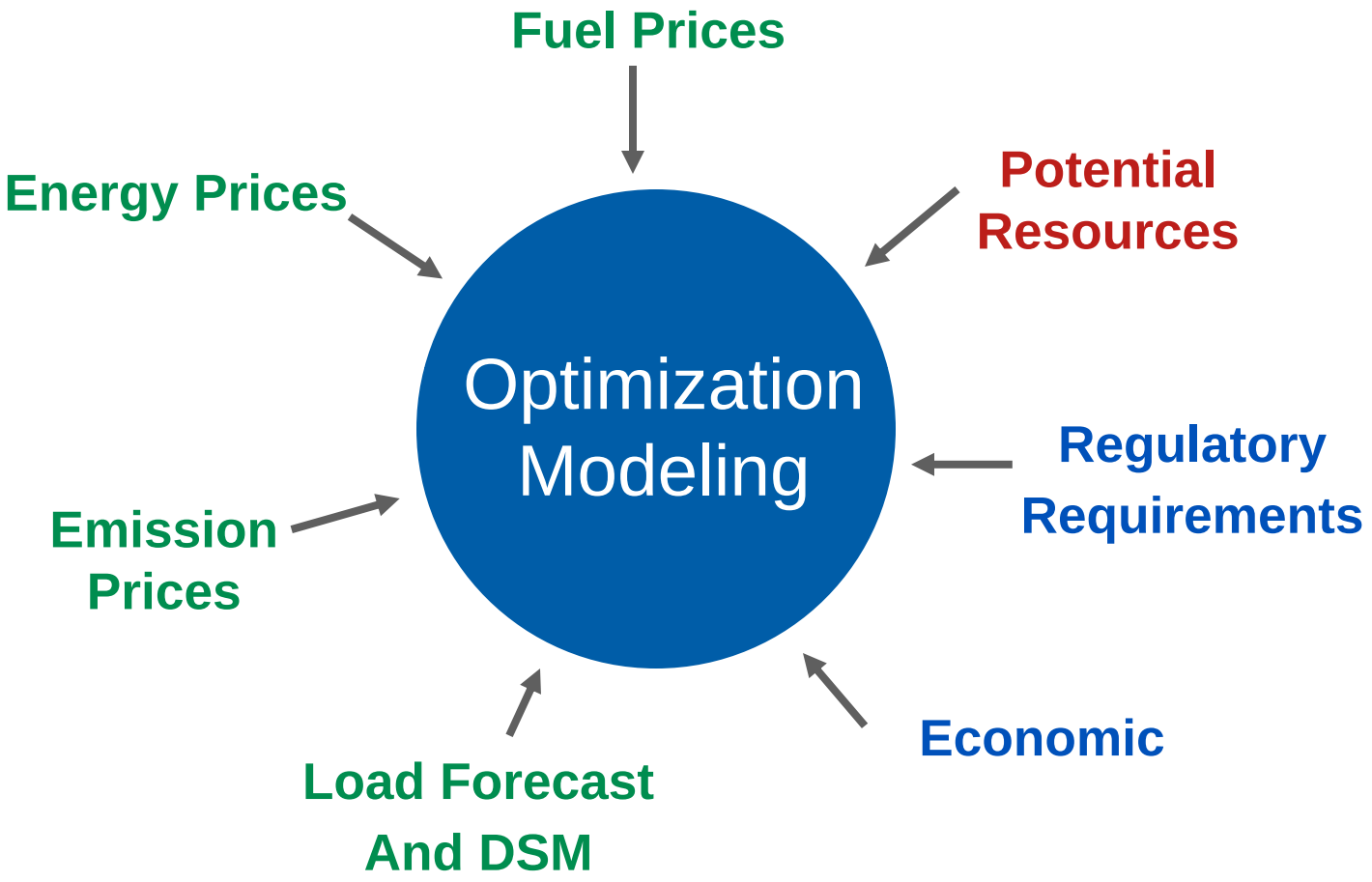
- John Achenbach, Vice President of Infrastructure Consulting and Engineering
- Chris Klausner, Principal and Project Manager
- Debashis Bose, Senior Consultant
  - Lead Strategist™ Modeler

Agenda

- Recap Power Supply Study Process and Load Forecast
- Screening Analysis
- Strategist™ Overview
- Strategist™ Modeling and Indicative Results
- Questions

Recap Power Supply Study Process

Key Inputs to the Power Supply Study Process

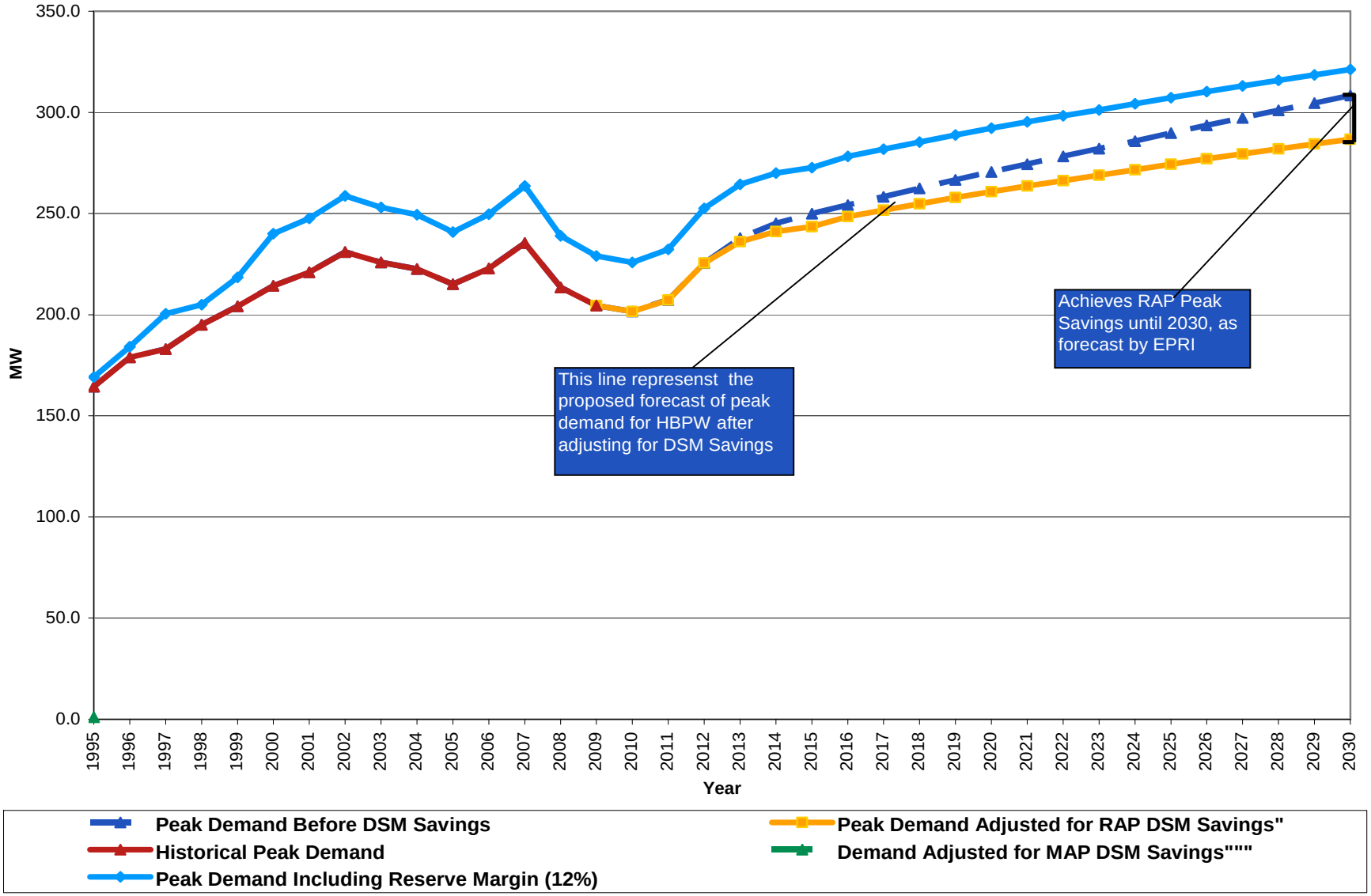


Black & Veatch's Approach to Power Supply Studies

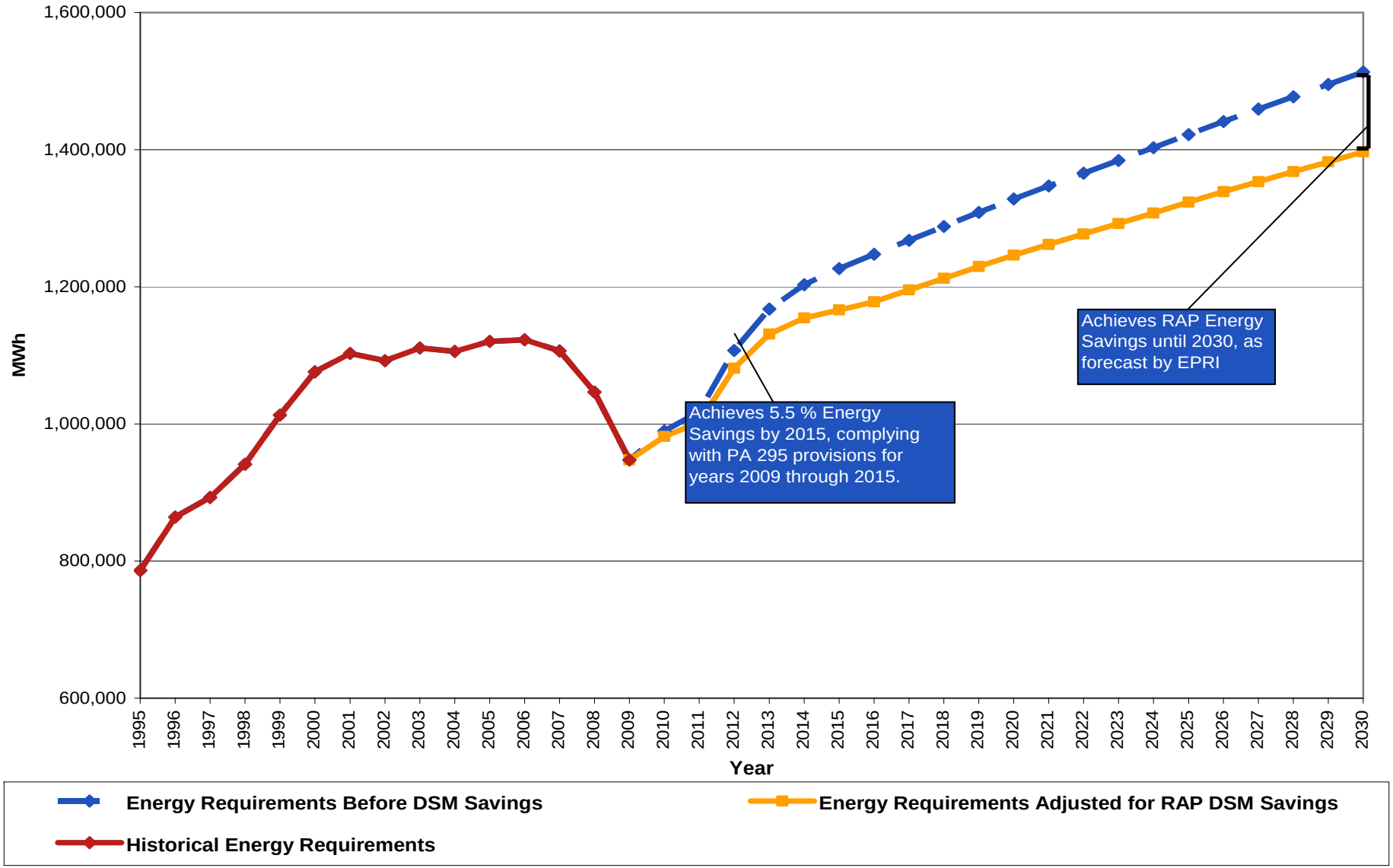
1. Develop/Confirm a load forecast for the utility (includes demand-side programs and load management programs).
2. Document existing resources including purchases.
3. Create a projected capacity balance.
4. Identify year-by-year projected needs for additional capacity and energy resources.
5. Assess offers and opportunities that can meet the utility's long-term resource requirements.
6. Perform screening, optimal generation expansion, and production cost modeling to compare various resource plans.
7. Develop an optimal resource plan addressing utility's specific needs. Optimization using Ventyx Strategist™.
8. Reporting.

Load Forecast

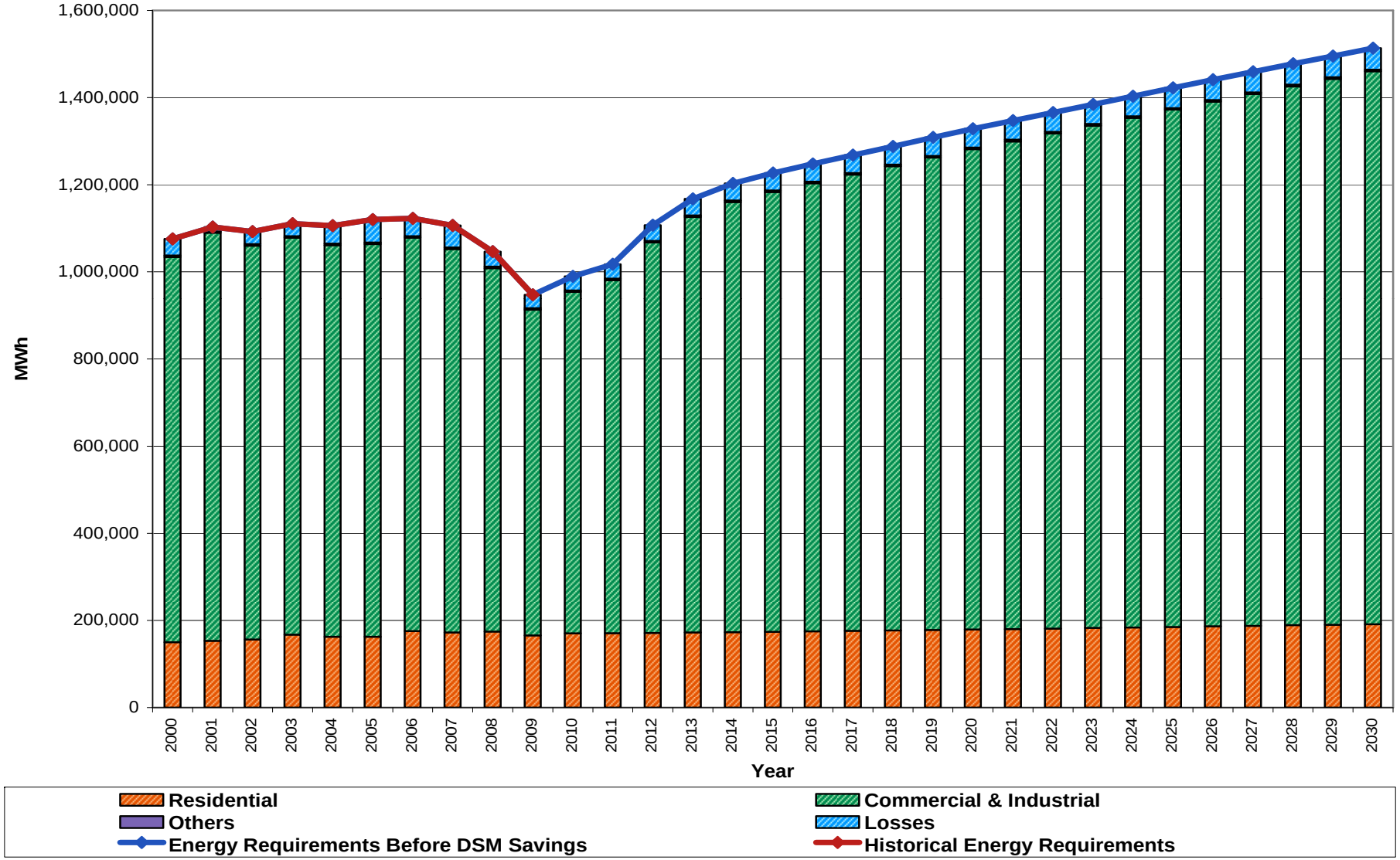
Base Case Peak Demand Forecast



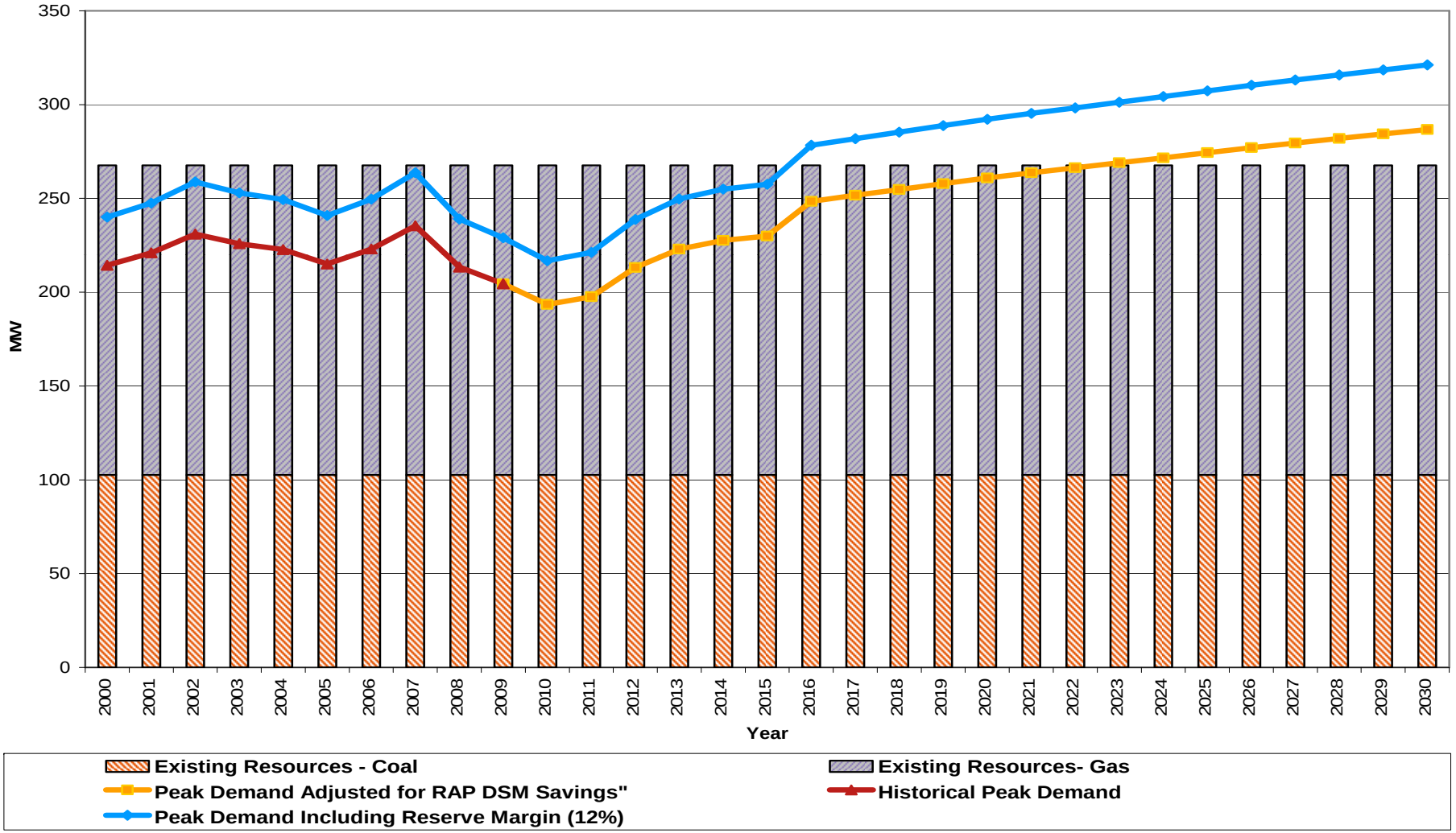
Energy Requirements Forecast Adjusted for DSM Savings



Base Case Energy Requirements Forecast



Net Peak Demand Forecast With Existing Generating Resources and Reserve Margin Requirements



Screening Analysis

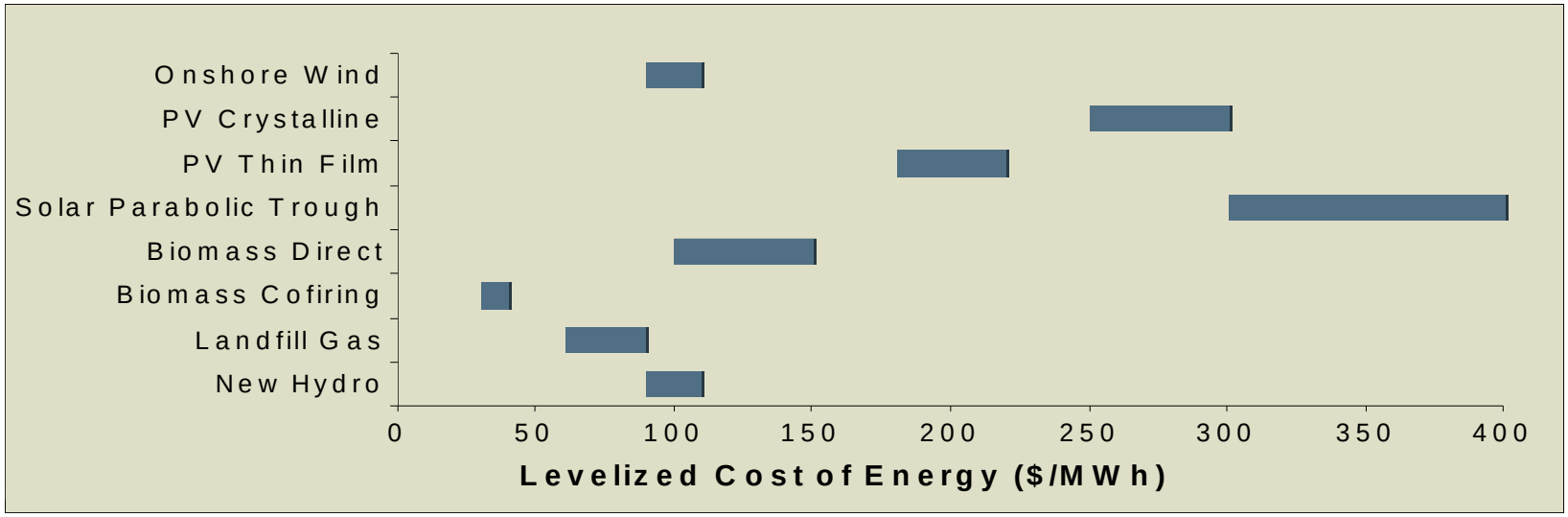
Alternatives Under Consideration in the Study

- **Renewable**
  - Wind (Onshore and Offshore
  - Biogas (Landfill Gas)
  - Solar (Thermal and PV)
  - Wave Energy
  - Hydroelectric
  - Biomass
- **Conventional**
  - Combined Cycle Gas
  - Simple Cycle Gas
  - Supercritical Coal
  - Circulating Fluidized Bed
  - Nuclear

Broad Range of Technologies Being Evaluated

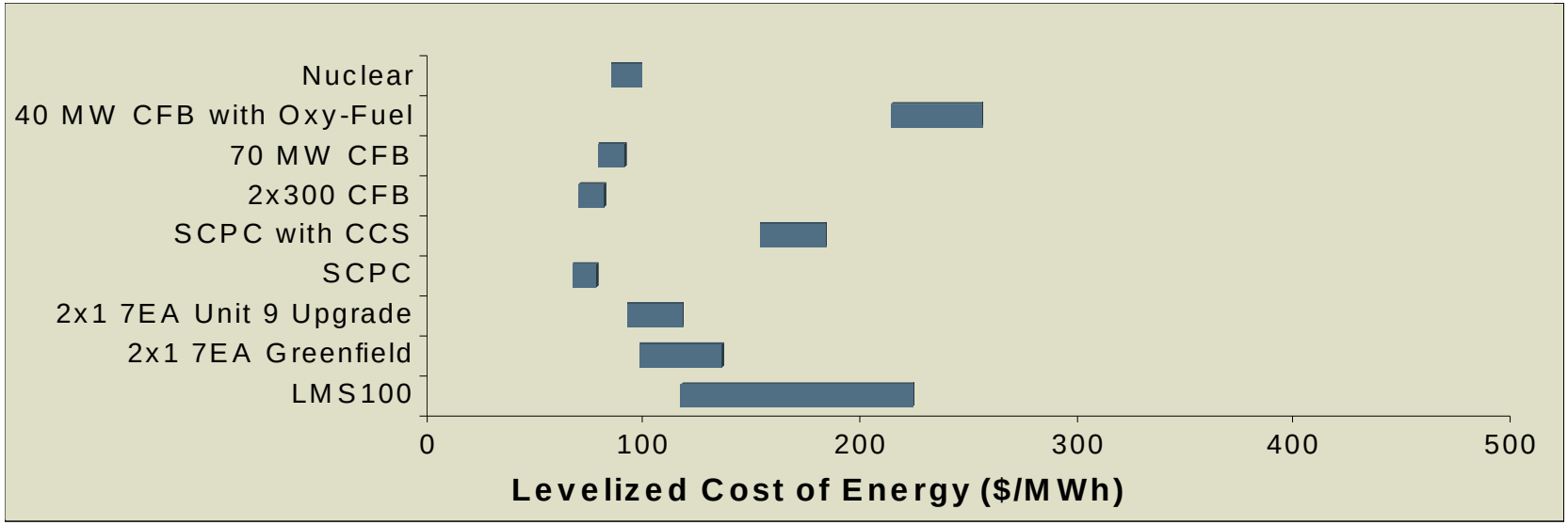
Screening Level Busbar Cost of Renewable Resources

- Biomass cofiring will be most economical
- LFG, Biomass Direct, small hydro, and wind are relatively cost effective
- Solar will be very expensive in Michigan due to low solar resource availability (14 to 15% capacity factor) and high capital cost
- Biomass and LFG are the only resources that are not intermittent



Screening Level Busbar Cost of Conventional Resources

- With no CO2 allowance costs, SCPC most cost effective as a result of economy of scale and fuel
- Carbon capture, compression and sequestration is very expensive (Cost of energy will at least double)
- Nuclear potentially attractive if available (cost estimates still being developed)
- Combined cycle and simple cycle have good relative cost, lower CO2 profile, and are dispatchable



Screening Analysis

- **What it tells us?**
  - It provides an indicative $/MWh cost for specific capacity factor
  - It provides the cost of operating a plant at one particular operating point at all times
  - Helps to show relative economics of various technologies

- **What it does not tell us?**
  - It does not tell us how the plant will actually operate over time (hour to hour)
  - The plant is not dispatched against any actual load profile.
  - Variations in cost due to various levels of dispatch are not considered.

Further analysis needs to be done using Strategist™ to consider these issues.

Strategist™ Overview and Analysis

Optimization Modeling - Strategist™

- Software package from Ventyx licensed by Black & Veatch
- Capacity expansion optimization program is used to develop expansion plans based on cost and other constraints
- Evaluates an hourly profile over a typical week for every month during planning period
- After optimization, electricity production costs are determined
- Evaluation period of 2010 to 2030 to ensure long term solutions
- Resources selected to provide least cumulative present worth cost (CPWC)
- Optimization conducted under ideal world conditions (ie small blocks of resources)
- Multiple resource plans developed

cont

New Resource Options Available to HBPW

- **Conventional Alternatives**
  - Participation in 800 MW Super Critical Pulverized Coal plant proposed by Consumers Energy. Assumed commercial online date : 2016
  - Participation in 2 x 300 CFB Plant at Roger City, proposed by Wolverine. Assumed commercial online date : 2016
  - Conversion of existing 75 MW Combustion Turbine into a 300 MW Combined Cycle plant. Assumed commercial online date : 2016
  - Retire JD Young Unit 3 and build a 70 MW net CFB plant without any carbon capture measures at the plant.
  - Retire JD Young Unit 3 and build a 40 MW net CFB plant with carbon capture measures (Grant funding was sought for this case).
  - Long term market purchases

New Resource Options Available to HBPW

- **Renewable Energy Alternatives**
  - Approximately 10 MW of LFG purchases are committed
  - Use 30 percent biomass fuel blended with coal and/or petcoke on the 70 MW net CFB plant.
  - Participate in wind generation projects in the state

It is assumed that HBPW would meet all RPS requirements set forth in PA 295 under all scenarios.

Preliminary Results from Strategist Analysis

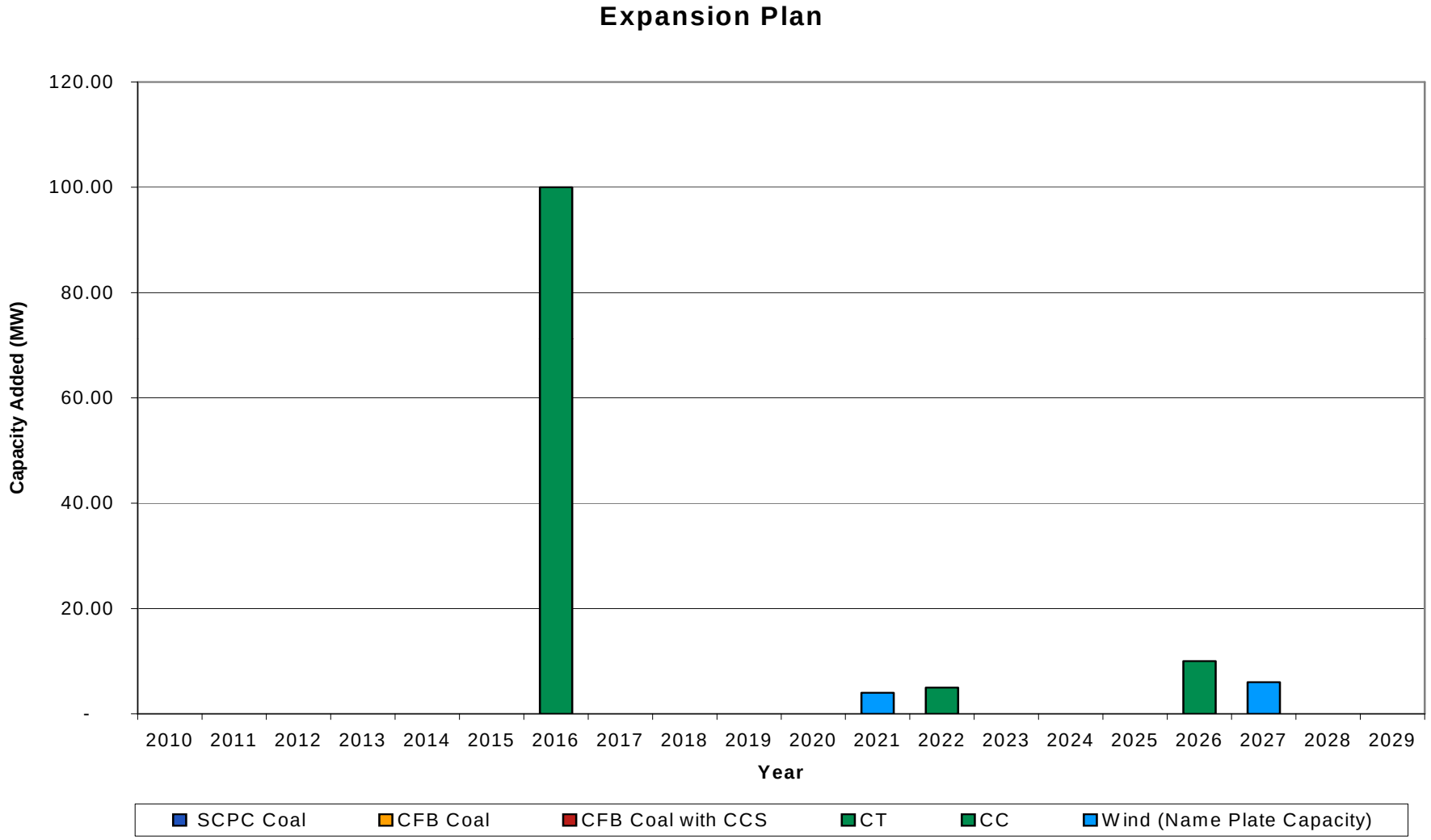
Plan Description	Value 2010- ($000s)	Present Value 2010-	Rank	Percent Difference
Unit 9 Conversion to 2x1 GE 7EA CC. Old Unit retired in 2013. New unit available in 2016.	1,471,948	62.14	1	0.000%
Fully optimized case with 20 percent RPS requirements met with additional wind resources only. Includes buying 5 MW blocks of all Coal and CFB Units (Except CCS Units) and all generic units are available in 2016. Generic Units only are available after 2016. No units are retired.	1,483,438	62.62	2	0.781%
Buying 5 MW Blocks of 2 x300 MW CFB Unit at Roger City in 2016.	1,486,333	62.74	3	0.977%
Fully optimized case. Buying 5 MW blocks of all coal and CFB units (Except CCS Units) and all generic units are available in 2016. Generic units only are available after 2016. No units are retired.	1,486,426	62.75	4	0.984%
Buying 30 MW Block of 800 MW SCPC Unit at Weadock in 2016	1,487,386	62.79	5	1.049%
Buying 5 MW Blocks of 70 MW Net CFB unit using 30 percent biomass as fuelto be built by HBPW in 2016). JD Young Unit 3 retired in 2013. Complies with 20 percent RPS case.	1,497,430	63.21	6	1.731%
No New units/blocks of units added. Everything is purchased from the market	1,497,998	63.24	7	1.770%
Buying 5 MW Blocks of 70 MW Net CFB unit to be built by HBPW in 2016). JD Young Unit 3 retired in 2013.	1,508,468	63.68	8	2.481%
40 MW Net CFB unit with CCS (Whole Plant) to be built by HBPW in 2016. (Conversion of JD Young Unit 3). JD Young Unit 3 retired in 2013. Capital cost assumed to be same as CFB plant. Additional capital required for CCS plant to be provided by DOE funding.	1,565,130	66.07	9	6.331%
70 MW Net CFB Unit (Whole Plant) to be built by HBPW in 2016 (Conversion of JD Young Unit 3).	1,578,576	66.64	10	7.244%

Realistic Available Plans

- Converting Unit 9 Combustion turbine to a Combined Cycle plant (assumes other participants)
- Buying 30 MW share of the proposed Consumers 800 MW SCPC plant
- Building the 70 MW CFB plant and using biomass as 30 percent of the fuel.
- Building the 70 MW CFB plant

All plans developed need to be analyzed for other related advantages and disadvantages.

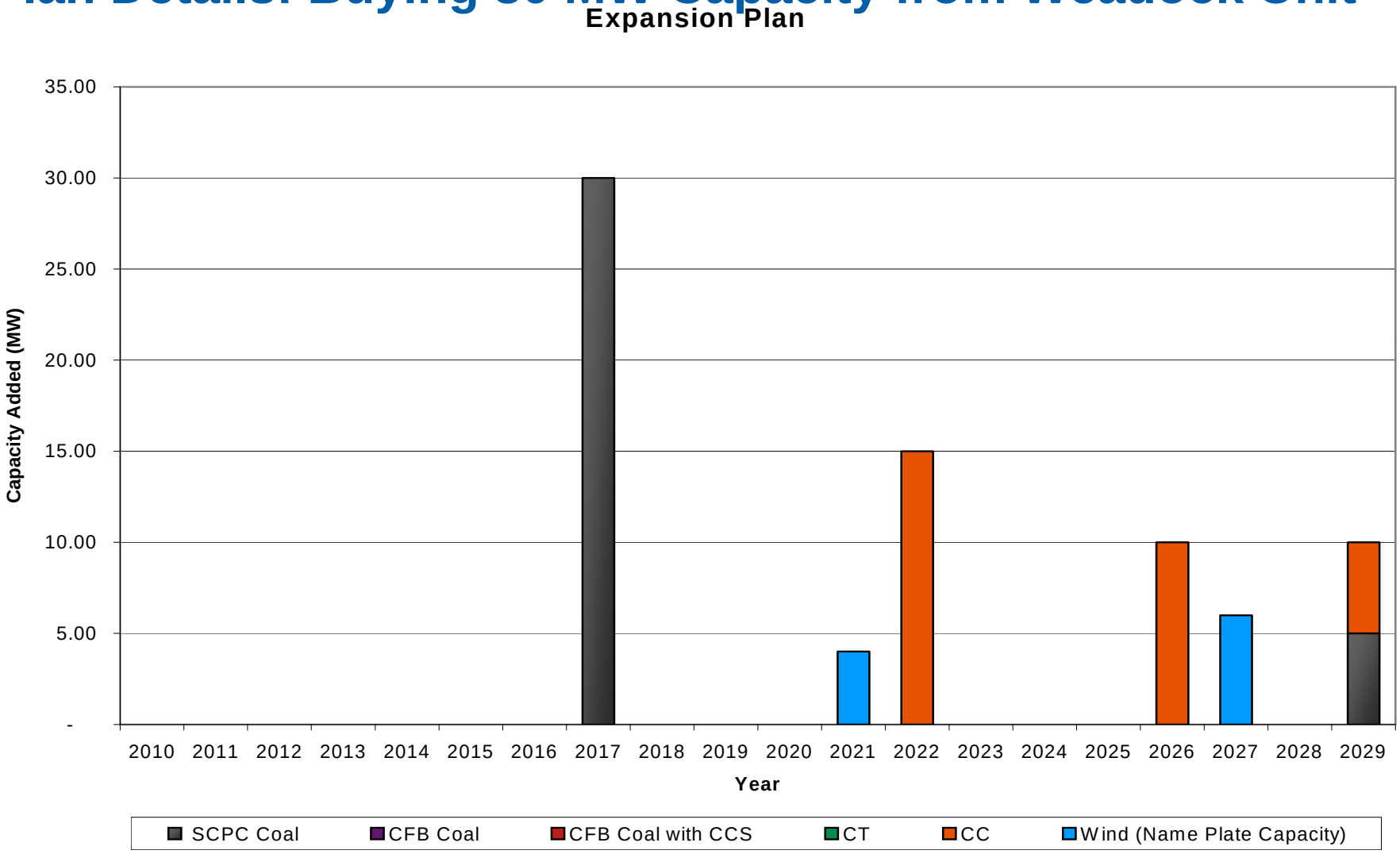
Plan Details: Unit 9 Conversion



Net Present Value - $1471.948 M

Levelized Cost - $62.14/MWh

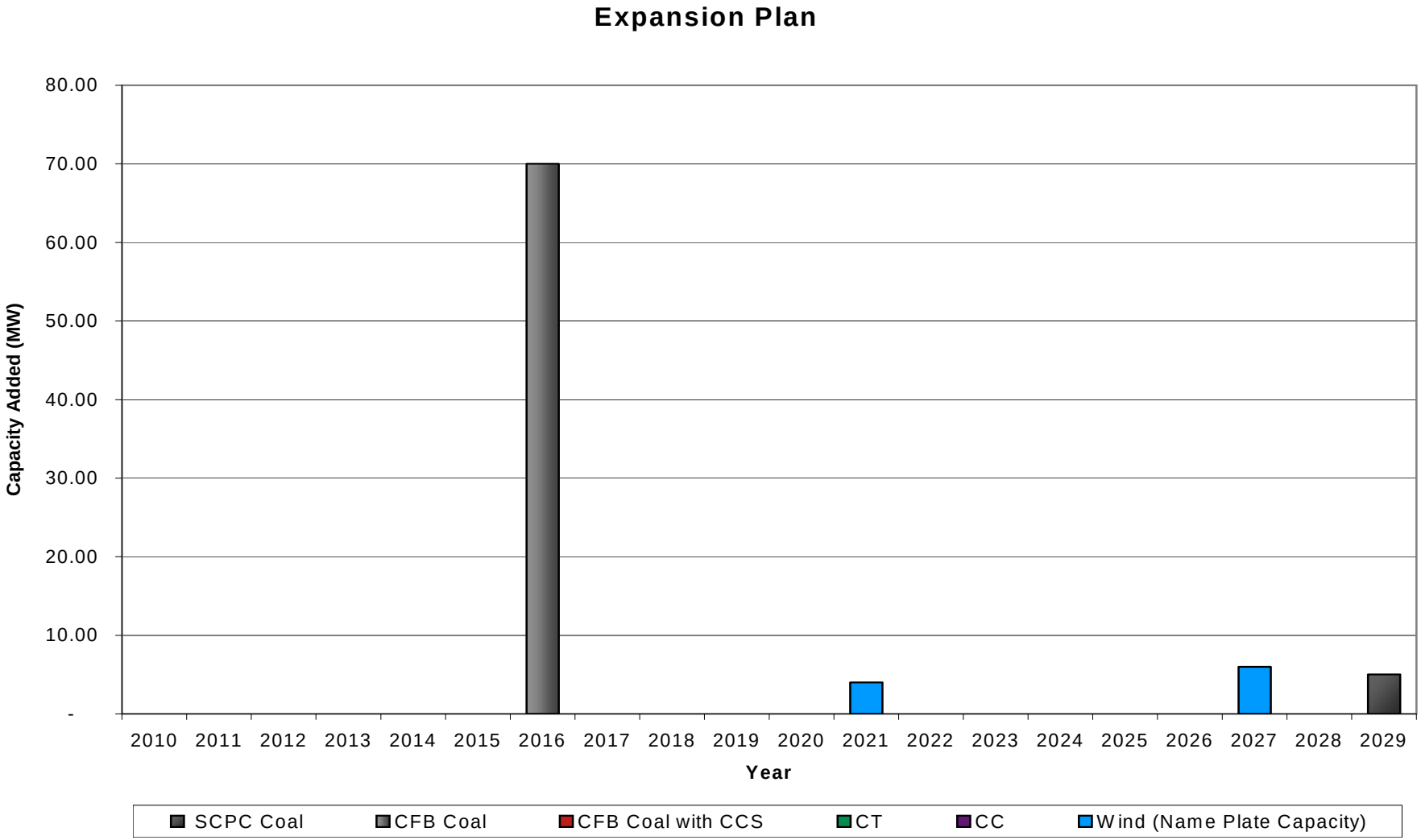
Plan Details: Buying 30 MW Capacity from Weadock Unit



Net Present Value - $1487.386 M

Levelized Cost - $62.79/MWh

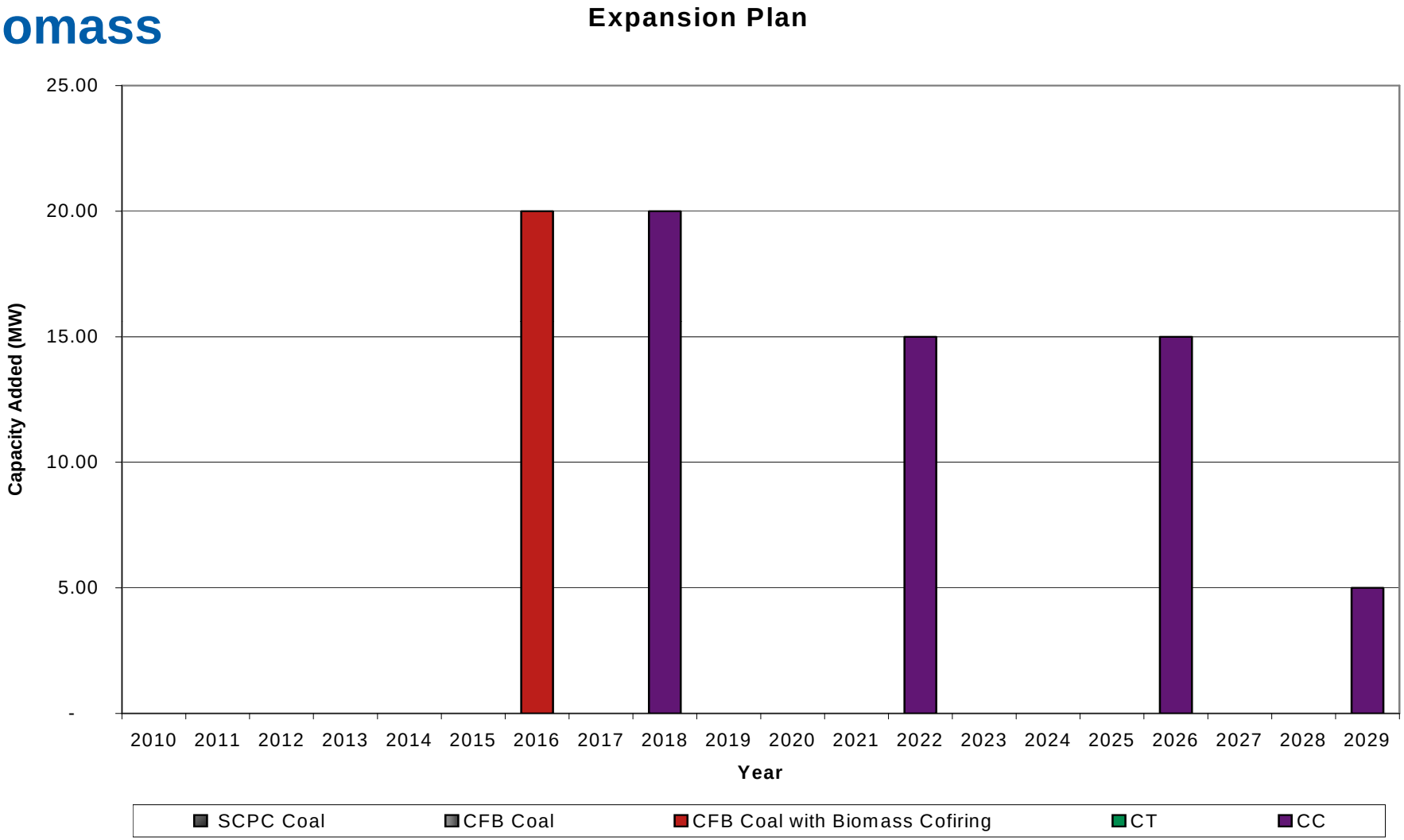
Plan Details: Building 70 MW CFB Plant



Net Present Value - $1578.576 M

Levelized Cost - $66.64/MWh

Plan Details: Plan Details: Building 20 MW CFB Plant with Biomass



Net Present Value - $1497.998 M

Levelized Cost - $63.21/MWh

Impact of CO2 on Selected Plans

Plan Description	Value 2010- ($000s)	Present Value 2010-	Percent Difference
Buying 30 MW Block of 800 MW SCPC Unit at Weadock in 2016	1,044,292	44.08	0.000%
Unit 9 Conversion to 2x1 GE 7EA CC. Old Unit retired in 2013. New unit available in 2016.	1,082,006	45.67	3.611%
Buying 5 MW Blocks of 70 MW Net CFB unit using 30 percent biomass as fuelto be built by HBPW in 2016). JD Young Unit 3 retired in 2013. Complies with 20 percent RPS case.	1,086,533	45.87	4.045%
70 MW Net CFB Unit (Whole Plant) to be built by HBPW in 2016 (Conversion of JD Young Unit 3).	1,093,809	46.17	4.742%

Next Steps

- Consideration of other plans that may be requested
- Assessing other benefits and disadvantages of all these plans
- Add non generation cost to the system cost from model results to estimate total cost to HBPW
- Provide recommendations

Questions