IRP Overview of the Process, Risk Analysis & Drivers

Stakeholder Meeting

December 19, 2011

** PUBLIC **

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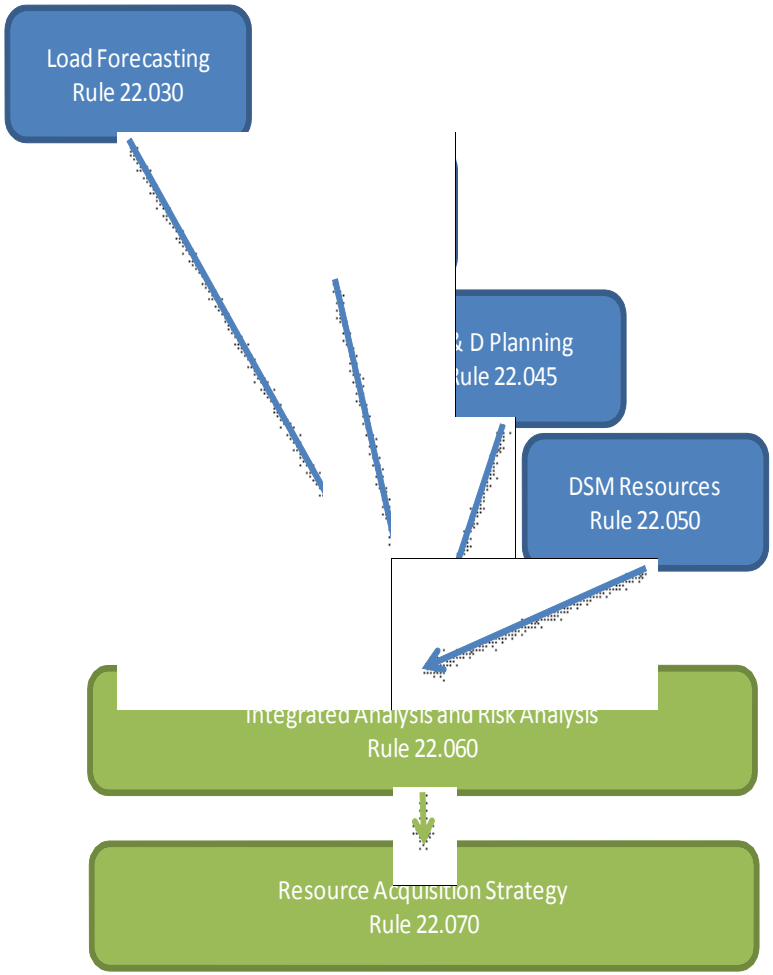
Overview

- The new IRP rule requires that the Company meet with the parties to provide a preliminary look at the first four volumes of the filing
  - Load Forecasting
  - Supply Resources
  - T&D Planning
  - DSM Resources
- Preliminary views on resource plans and the risk analysis are also required



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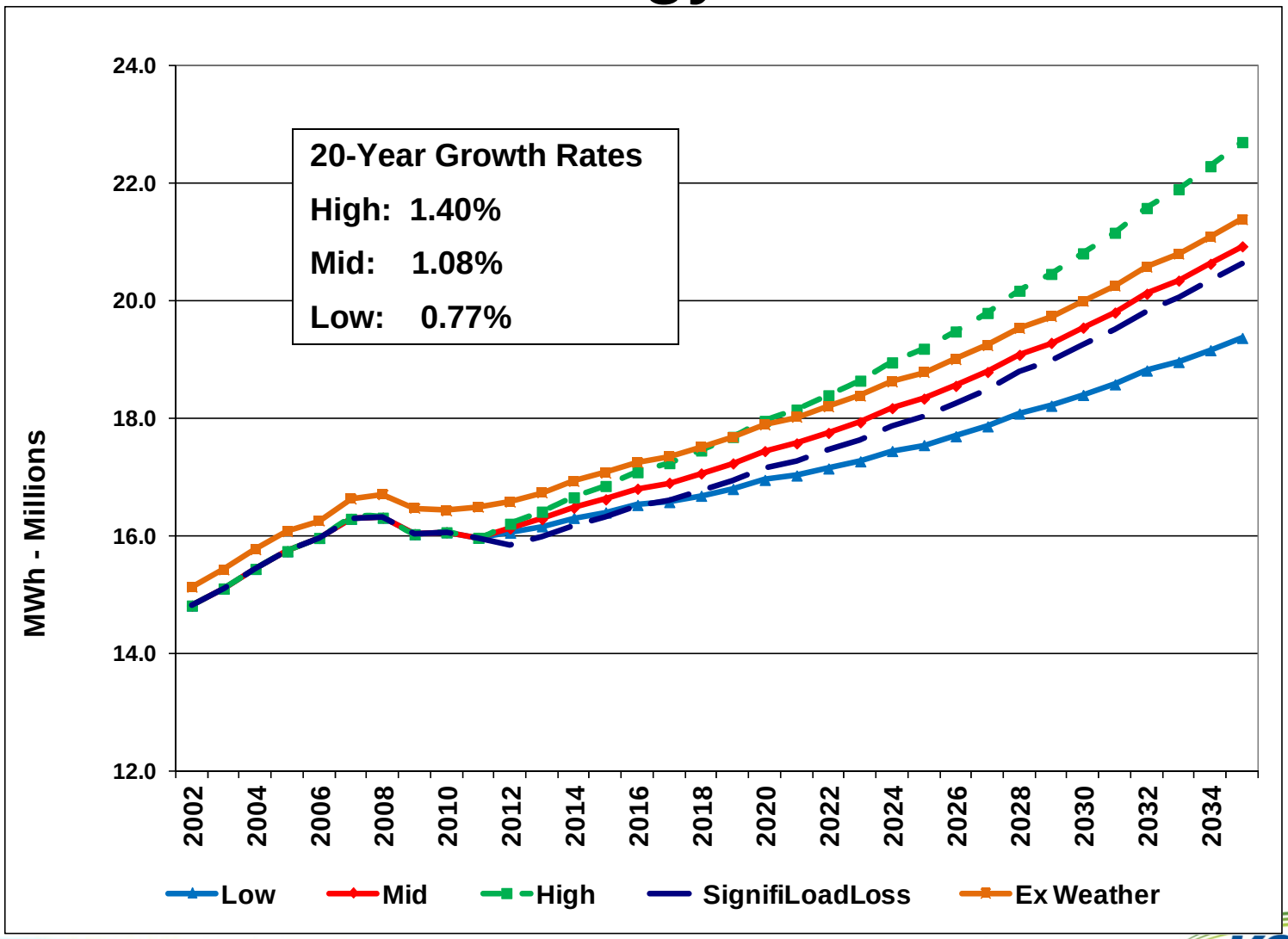
Load Forecast

- New Rule 22.030 details the methodology to produce the load forecasts for use in the IRP.
  - Previously forecasted for residential, commercial and industrial
  - New rule requires forecasts separately for residential, Small General Service (GS), Medium GS, Large GS and Large Power
  - New rule also requires separate forecasts by enduse (AC, heat pumps, refrigerators, etc.) for residential and Small GS (which we were doing previously)
- Major forecast drivers are:
  - Economic forecasts for KC and SJ metro areas via Moody's
  - Forecasts of kWh/appliance and # of appliances/household by DOE (energy standards have a large impact on kWh/appliance)
- New rule requires 5 scenarios, 3 based on economics (low, base and high), 1 "extreme weather", 1 "major loss of load"
  - We chose four years with hottest summers since 1972 for extreme weather (weather averaged over these 4 years vs. last 30 years)
  - We chose loss of two largest customers for "major loss of load"

KCP&L Energy Forecast



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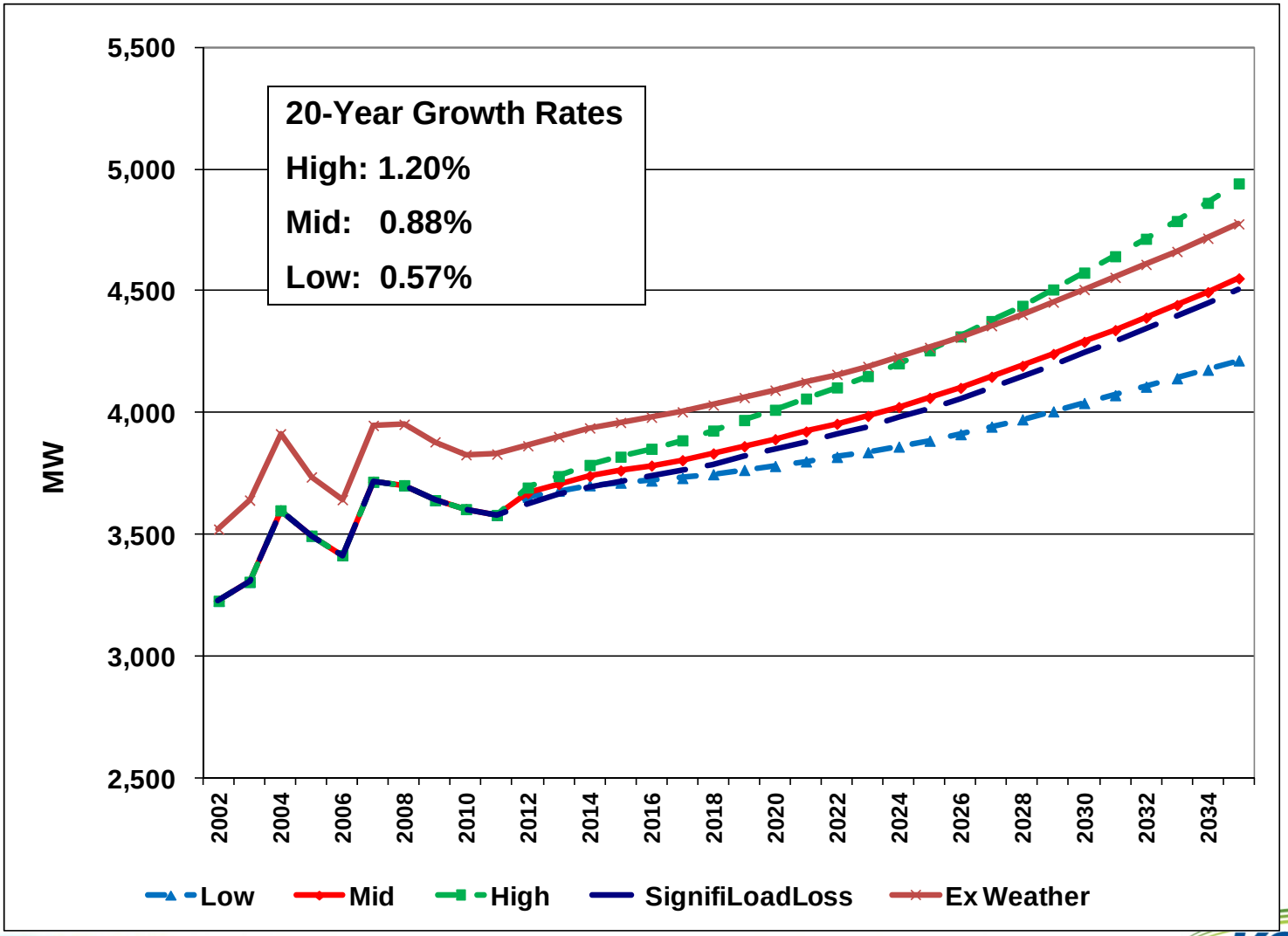
KCP&L Annual Peak Forecast



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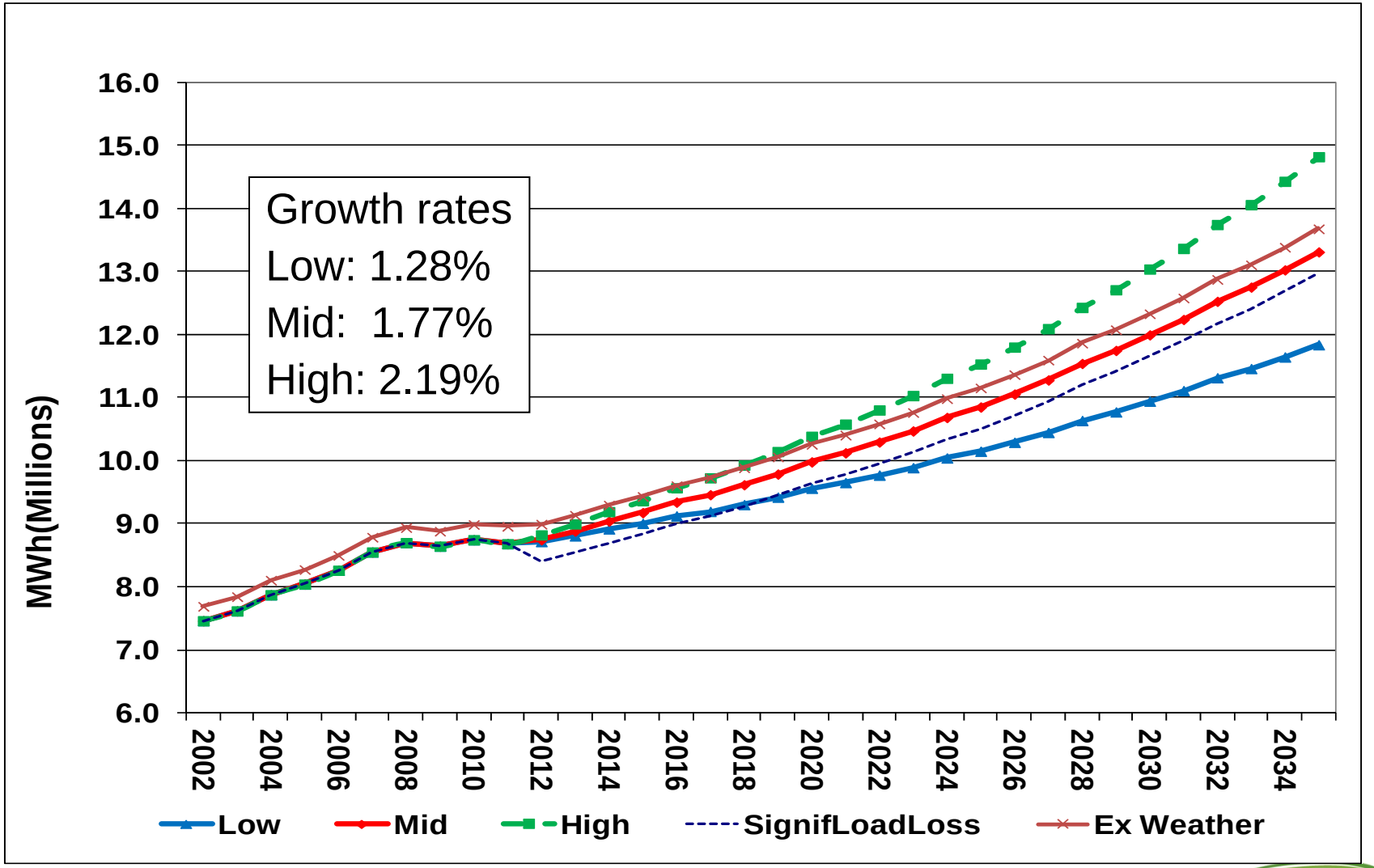
GMO Energy Forecast



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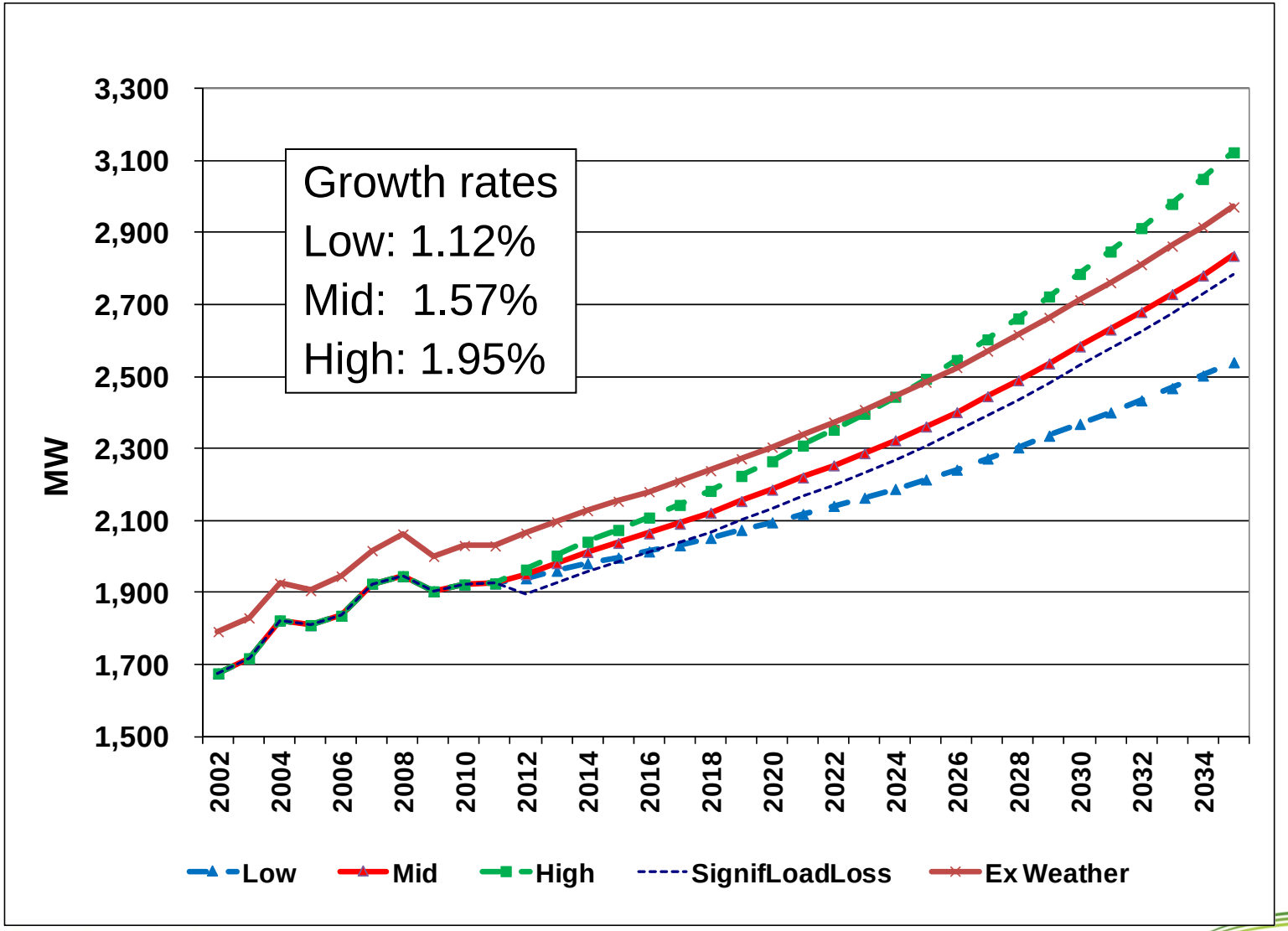
GMO Annual Peak Forecast



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Gas Price Forecast

- Composite of four forecasts
- Sources
  - CERA
  - EIA
  - Energy Ventures Analysis
  - PIRA

Uncertainty – Gas Price Forecast

CO2 Allowance Price Forecast

- Composite of 6 forecasts
- Sources
  - Energy Ventures Analysis
  - JD Energy
  - PEAR
  - PIRA
  - Synapse
  - Wood MacKenzie
    - Note: Energy Ventures Analysis is now forecasting Zero CO2. While PEAR forecasts CO2 prices for RGGI and AB 32 they do not project any CO2 price that will affect KCPL.

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Uncertainty – CO2 Price Forecast

Other Driver Forecasts

- Coal prices
- Oil prices
- Emission allowance prices
  - SO2 – Group 1 and Group 2 states
  - NOx – Annual and Seasonal
- Composite of multiple forecasts

Uncertainty – Coal Price Forecast

Uncertainty – Oil Price Forecast

Uncertainty – SO2 Group 1 (MO) Forecast

Uncertainty – SO2 Group 2 (KS) Forecast

Uncertainty – NOx Annual Forecast

Power Market Drivers

- Natural gas price (high, mid and low)
- CO_2 allowance price (high, mid and low)
- SO_2 allowance prices
- NO_X annual and seasonal allowance prices
- Fuel oil prices

Power Market Assumptions

- Wind builds nationally and regionally are sufficient to meet all current state-based RPS requirements
- The current dataset assumes compliance with the Cross State Rule (CSAPR)
  - Incorporates new Groups 1 and 2 SO_2 allowance markets
  - Regroups states into proper seasonal/annual NO_X requirements
- As Critical Uncertain Factors impacting the power market are determined, additional price forecasts will need to be developed
- Specialty forecasts [i.e. for an assumed Federal EE Standard] will be developed
- Representative forecasts are presented in the next slide

Market Power Prices

Other Portfolio Risks

- Construction costs
- Financing costs

Integrated Resource Analysis
Generation Technologies Construction Costs

Financial Indicators

Supply Side Screening

Generation Technologies – Preliminary Screening Process

- A total of 42 potential supply-side resource alternatives were pre-screened with the primary data source being the Electric Power Research Institute Technical Assessment Guide (EPRI TAG)
  - Supply-side technologies included base load, intermediate load, peaking load, and renewable resources
- The potential supply-side alternatives were ranked by comparing the annual levelized cost per MWh for each technology category:
  - Base load technologies
  - Intermediate technologies
  - Peaking technologies
  - Renewable technologies

Technology Selection for Integrated Resource Analysis

- Criteria considered in advancing technologies from the Preliminary Screening to Integrated Resource Analysis:
  - Quantitative
    - Capital costs
    - Fuel and O&M costs
    - Probable emission costs
  - Qualitative
    - Applicability in meeting Renewable Energy Standards (RES)
      - In particular, wind and MO solar requirements
    - Lack of technological maturity
      - In the development, demonstration or pilot testing phases
    - Lack of geographic features in this region
      - For example, hydro resources

Pre-Screen: Supply Resource Options Considered

BASE LOAD	INTERMEDIATE	PEAKING	RENEWABLE
* SCPC	* Combined Cycle	* Combustion Turbines	* Solar
* SCPC w CO2 Capture	* CAES	* Internal Combustion Engines	* Wind
* Fluidized Bed Combustion	* Fuel Cells	* Small Scale CTs	* Biomass BFB Boiler
* IGCC	* Batteries		* Landfill Gas
* IGCC w CO2 Capture			
* Nuclear			

ACRONYMS KEY:		
	SCPC=Super Critical Pulverized Coal	IGCC=Integrated Gasification Combined Cycle
	CAES=Compressed Air Energy Storage	BFB=Bubbling Fluidized Bed

Levelized Costs – Base Load Technologies

Levelized Costs – Intermediate Technologies

Levelized Costs – Peaking Technologies

Levelized Costs – Renewable Technologies

Technologies Chosen for Integrated Resource Analysis

Transmission and Distribution

IRP T&D Major Requirements

- Incorporate advanced T&D technologies
- Determine avoided T&D costs (for DSM option screening)
- Determine cost effectiveness of load reducing T&D alternatives
- Determine supply plan interconnection and transmission service costs
- Review of RTO transmission plans

Incorporation of Advanced Transmission and Distribution Technologies

- Deployment of automated capacitor controls utilizing GPRS radios throughout legacy KCP&L and GMO territories
- Deployment of 34 KV automated switches using integrated hardware and KCP&L's Energy Management System (EMS)
- Underground network automation incorporating advanced monitoring and fault detection which have eliminated network outages since their deployment in 2007
- Deployment of Dynamic Voltage Control (DVC) which allows for MW reduction through controlled voltage reduction

Advanced Technology Analysis

- KCP&L's development of a DRAFT SmartGrid Vision, Architecture, and Road Map can be utilized as a potential guide to future investments in advanced distribution technologies

- KCP&L will complete a comprehensive cost benefit analysis at the conclusion of the demonstration project in year 2015

KCP&L Avoided Transmission and Distribution Costs

- Assumes DSM programs will be funded to achieve a 1% demand reduction in targeted areas
- Assumes “established areas only” are targeted for concentrated DSM efforts
- Claycomo, Gladstone, and Chouteau comprise the “established areas” targeted for concentrated DSM with projected load growth of approximately 23 MW over 20 years
- The expansions targeted represent 60 MVA of added capacity at the substation level at an estimated cost of
- KCPL avoided T&D cost: **____**

GMO Avoided Transmission and Distribution Costs

- Assumes DSM programs will be funded to achieve a 1% demand reduction in targeted areas
- Assumes “established areas only” are targeted for concentrated DSM efforts
- Since established areas have sufficient existing capacity for future load growth or have declining load, the GMO avoided T&D value is ** ____ **

T&D as a Supply Resource Alternative

- Studies have been completed for rebuilding the five most heavily loaded 161kV transmission lines on the KCP&L and GMO systems
- Cost of rebuilding lines
  - GMO average cost of transmission loss reductions:
  - KCP&L average cost of transmission loss reductions:
- Both the GMO and KCP&L cost of loss reduction from rebuilding the transmission lines is significantly above the cost of new supply or DSM resources

Demand Side Management

DSM Screening

GOAL: All Cost Effective DSM

- In addition to the existing programs, over 400 measures were screened to develop new programs
- All measures with a TRC of 1 or greater were included in the new programs

DSM Avoided Energy Cost

DSM Avoided Capacity and T&D Costs

KCP&L & GMO
Existing DSM Programs

- LOW-INCOME WEATHERIZATION
- RESIDENTIAL ENERGY ANALYZER - ONLINE ENERGY INFORMATION
- BUSINESS ENERGY ANALYZER - ONLINE ENERGY INFORMATION
- Home Performance with ENERGY STAR®
- COOL HOMES PROGRAM
- ENERGY STAR® New Homes
- COMMERCIAL AND INDUSTRIAL REBATE PROGRAM
- BUILDING OPERATOR CERTIFICATION PROGRAM
- MPOWER RIDER
- ENERGY OPTIMIZER PROGRAM

KCP&L & GMO
New DSM Programs

- APPLIANCE TURN-IN PROGRAM
- RESIDENTIAL LIGHTING AND APPLIANCE PROGRAM
- MULTI-FAMILY REBATE PROGRAM
- COMMERCIAL & INDUSTRIAL PRESCRIPTIVE REBATE PROGRAM
- RESIDENTIAL ENERGY REPORTS PILOT PROGRAM

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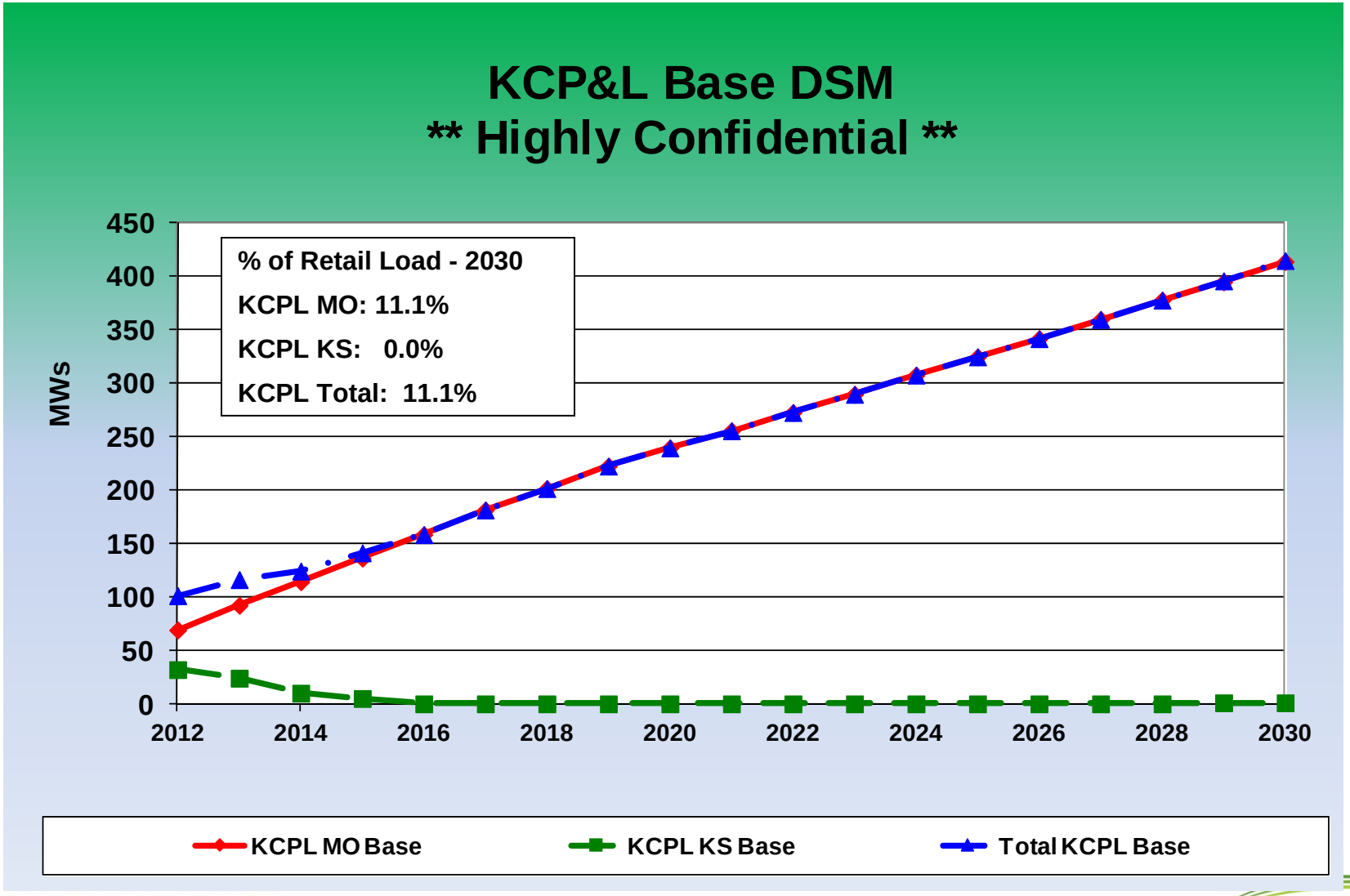
DSM Alternatives

- Several DSM levels will be evaluated per the IRP rule and prior commitments (stipulations and contemporary issues)
  - MEEIA filing DSM levels (both energy efficiency and demand response)
  - “Aggressive” DSM (1% of energy and peak)
  - “Very Aggressive” Energy Efficiency (per IRP)
  - 1% by 2015/2% by 2020 (per GMO Stipulation and Agreement)
  - No DSM

KCP&L DSM – MEEIA Level



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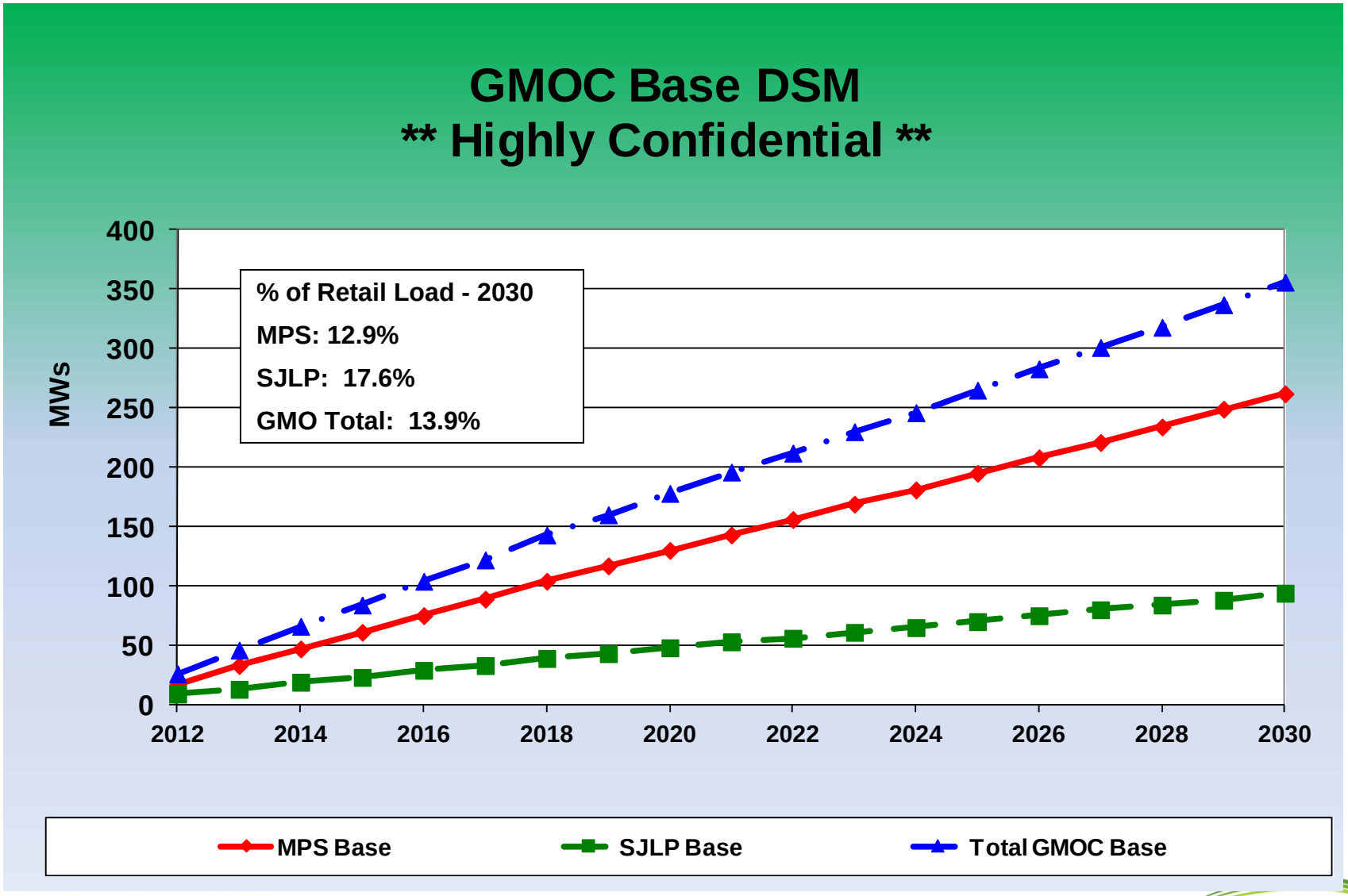
GMO DSM – MEEIA Level



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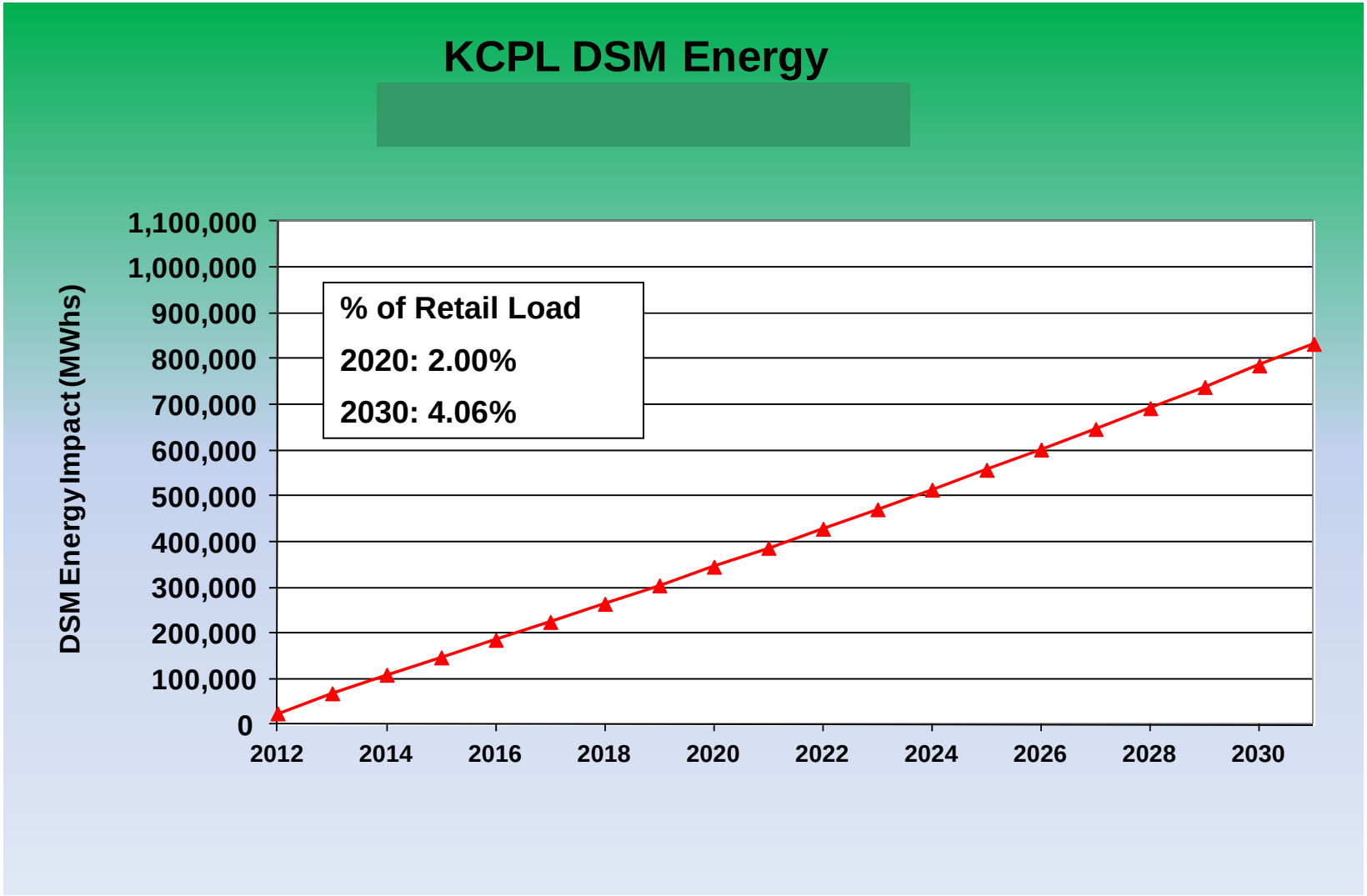
KCP&L Capacity Margin (with MEEIA DSM)

MPS Capacity Margin (with MEEIA DSM)

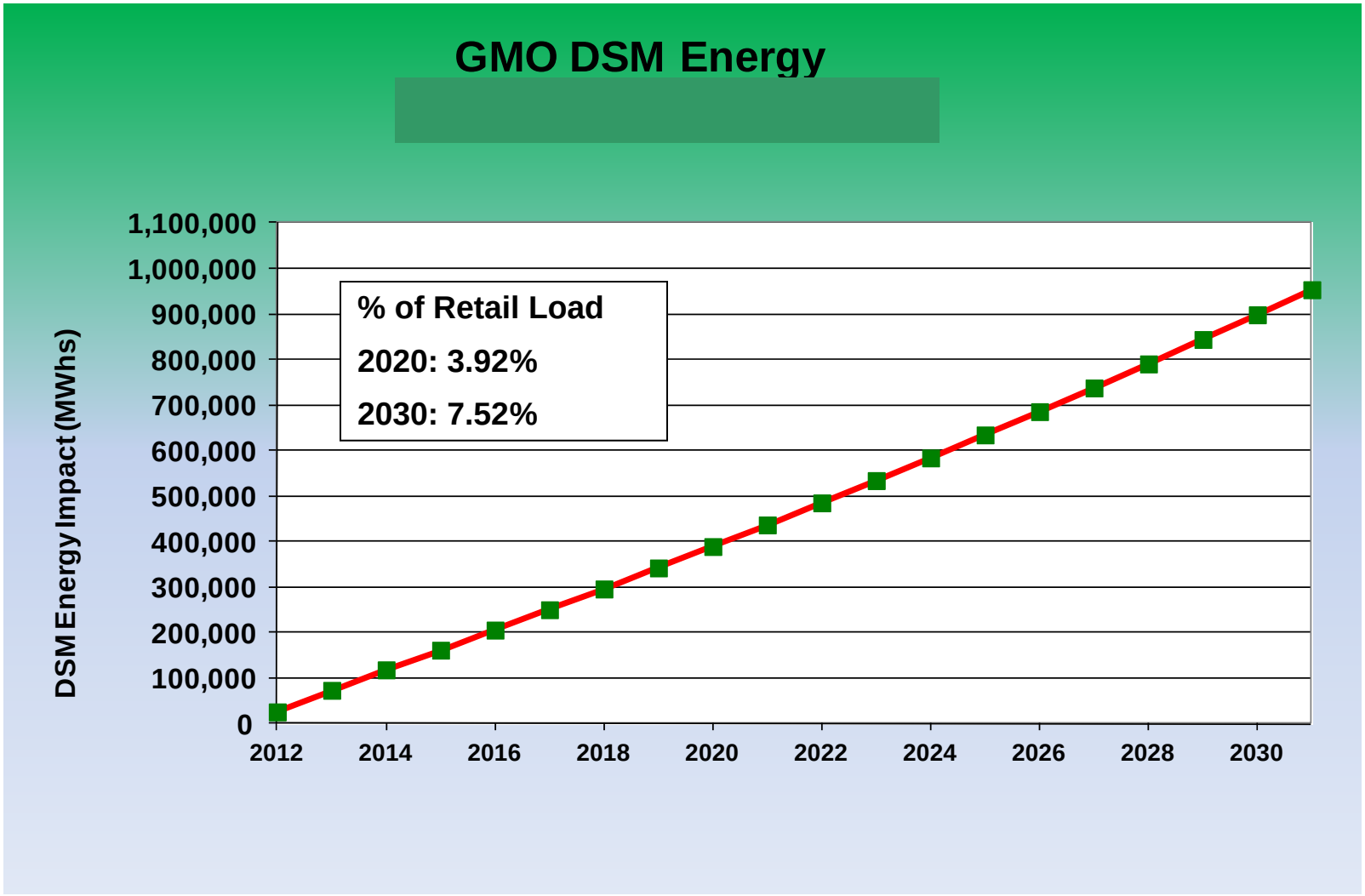
SJLP Capacity Margin (with MEEIA DSM)

GMO Capacity Margin (with MEEIA DSM)

KCP&L DSM Energy Resource



GMO DSM Energy Resource



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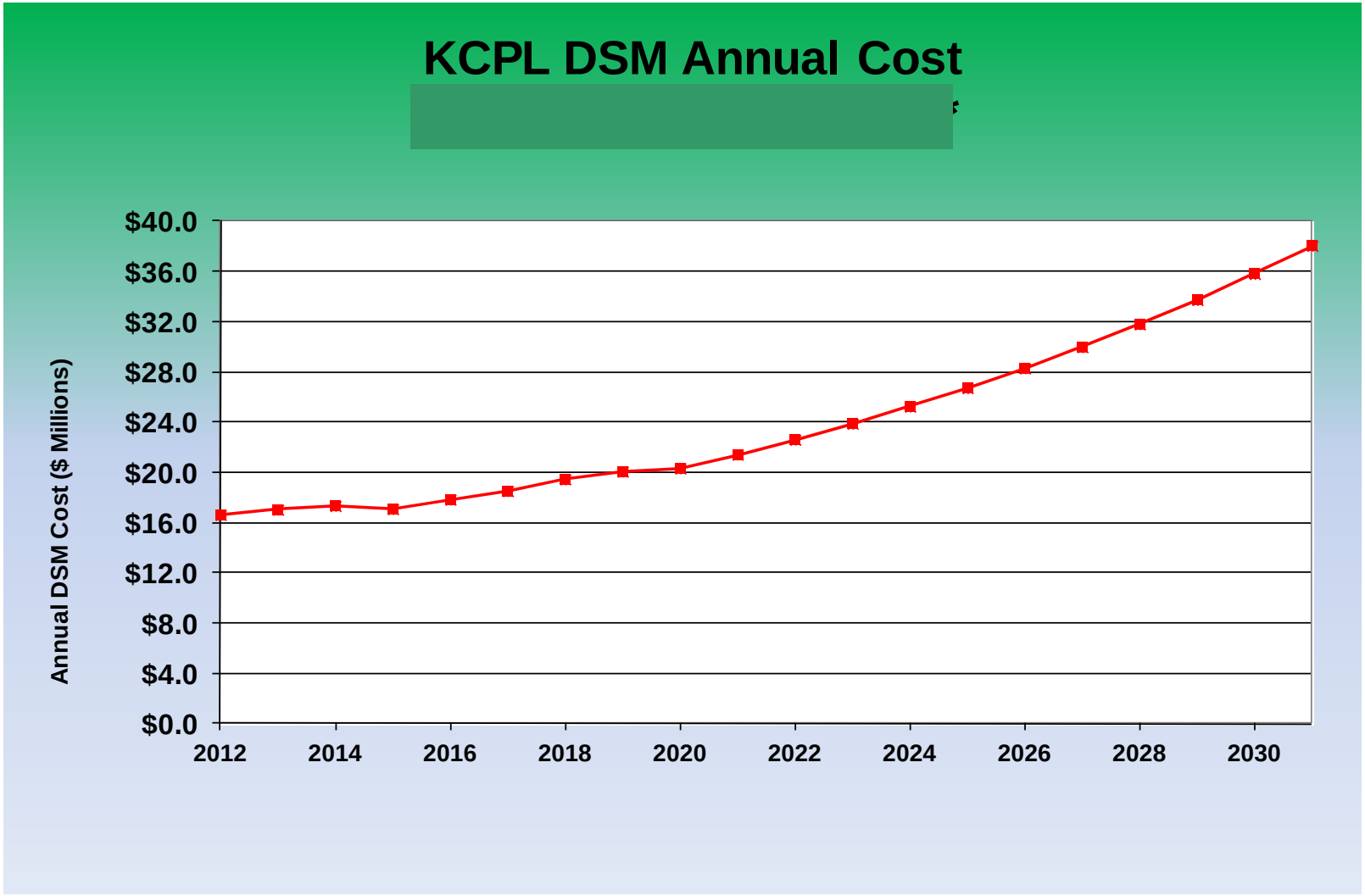
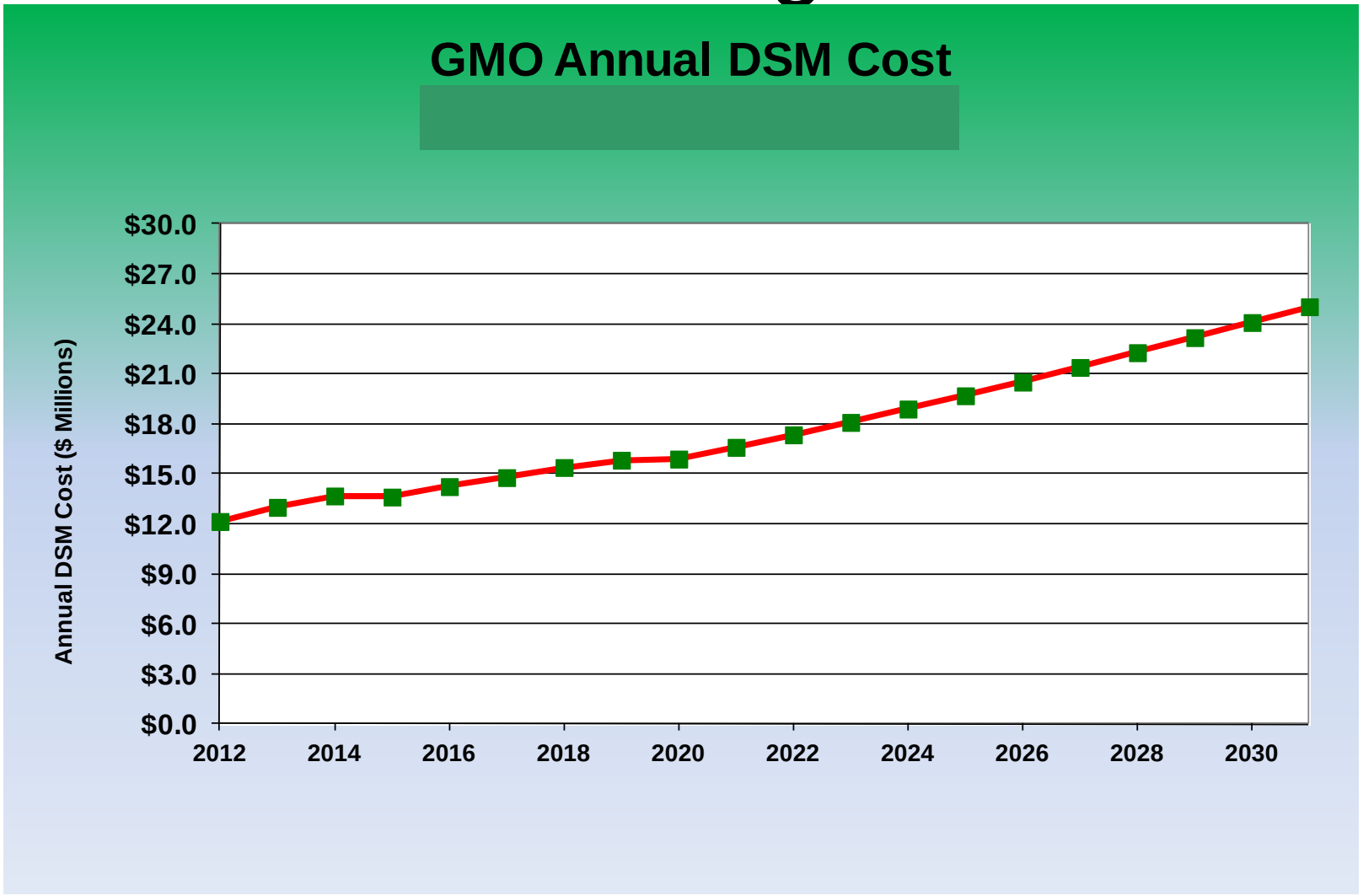
KCP&L DSM Program Costs



GMO DSM Program Costs



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Integrated Analysis and Risk Assessment

Integrated Analysis and Risk Assessment Process

- Determine which uncertain factors have a meaningful impact on selection of the Preferred Plan (i.e., “Critical Uncertain Factors”)
- Develop scenarios (i.e., world views) with varying levels of Critical Uncertain Factors
- Develop alternative resource plans with varying levels of DSM, plant retirements, new supply resources
- Simulate alternative resource plan operation and revenue requirements under each scenario over a 20-year period

- The list of uncertain factors being tested and their source is shown on the next slide

Critical Uncertain Factors

UNCERTAIN FACTOR	RULE	OTHER SOURCE
Load growth	060(5)(A)	
Interest rates/Credit market conditions	060(5)(B)	
Changes in legal mandates	060(5)(C)	
Extention of Wind PTC		MANAGEMENT
Federal Renewable Standard		MANAGEMENT
Federal EE Standard		GMO 2009 STIP
Relative fuel prices	060(5)(D)	
Natural Gas	060(5)(D)	
PRB Coal	060(5)(D)	
Siting and permitting costs	060(5)(E)	
Construction costs	060(5)(F)	
Purchased power availability	060(5)(G)	
Emission allowances	060(5)(H)	
CO_2	060(5)(H)	
SO_2	060(5)(H)	
NO_X	060(5)(H)	
Fixed O&M	060(5)(I)	
EFOR	060(5)(J)	
DSM load impacts	060(5)(K)	
DSM Utility marketing and delivery costs	060(5)(L)	
Other factors	060(5)(M)	
Smart Grid		GMO 2009 STIP

Scenario Development

- Previous GMO IRP work based on 64 scenarios
- Stakeholder process discussed incorporating additional risk scenarios into the 64-scenario risk tree
- The original process kept only the scenarios with a greater than 0.5% probability of occurrence out of 486 possible scenarios
- The proposal was to retain the method of choosing the 64 scenarios but add a randomly selected group of scenarios rejected in the preliminary scenario screening process
- 36 randomly selected scenarios are added to the original 64 to develop a new 100-scenario risk tree
- This risk tree is subject to change based on the results of the critical uncertainty determination currently underway for the April IRP filing

Federal Energy Efficiency Standard

- The Contemporary Issues process requires a test of a proposed Federal EE Standard
  - HR 889 “The Markey Bill” was selected as a model
- A preliminary risk analysis will be conducted to determine resource plan sensitivity to such a law
- A separate integrated analysis will be built to test the lowest cost plan under this law and a contingency plan will be developed to meet a Federal Standard

Alternative Resource Plans

- Resource plans are developed to incorporate different levels of DSM, retirement alternatives and supply options for the company to meet system needs
- Some alternative resource plans are specified in the IRP rule to test Missouri State energy policy impacts

Initial GMO Alternative Plans

- Retirements (2016 and 2019)
  - Sibley 1 & 2
  - Lake Road 4/6
  - Sibley 3
- Multiple DSM levels
  - MEEIA
  - Aggressive (1% per year)
  - Very Aggressive energy efficiency (1.5% per year)
  - 1% by 2015/2% by 2020
  - No DSM
- Additional wind above state RPS requirements
- Coal, combustion turbine, combined cycle, nuclear additions
- Convert Lake Road 4/6 to burn natural gas
- Legal/environmental action such as extension of PTC or a Federal Energy Efficiency Standard

Initial KCP&L Alternative Plans

- Retirements
  - Montrose 1
  - Montrose 1,2 & 3
  - LaCygne 1 (by June 2015)
  - LaCygne 2 (by June 2015)
- Multiple DSM levels
  - MEEIA
  - Aggressive (1% per year)
  - Very Aggressive energy efficiency (1.5% per year)
  - No DSM
- Additional wind above state RPS requirements
- Coal, combustion turbine, combined cycle, nuclear additions
- Legal/environmental action such as extension of PTC or a Federal Energy Efficiency Standard