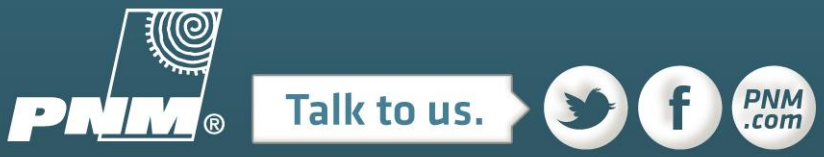
PNM 2014-2033 Integrated Resource Plan

SEPTEMBER 26, 2013



AGENDA

SEPTEMBER 26TH

Today's agenda

- Welcome, Introductions, Safety and Ground Rules
- Provide follow-up information requested last week
- Describe Monte Carlo analysis
- Discuss plan for remaining analysis
- Wrap up and plan next meeting

- Tuesday, September 17 – Describe process and illustrate results
- Friday, September 20 - Discuss assumptions

SAFETY AND LOGISTICS

- Fire escape routes via stairways at east and west ends of hallway; please let us know if you require special handicap egress or special assistance
- We must obey any fire or emergency alarm; even drills/test alarms
- Restrooms – Women's room at west end; Men's room at east end
- Must sign in and sign out with security desk each time you enter the building
- Recycling – please help our efforts by dropping plastic or aluminum containers in the designated recycle bins

MEETING GROUND RULES

- Questions and comments are welcome; please be mindful of our time constraints
- Comments should be respectful of all participants
- Use name tents to indicate you have a comment or question
- Reminder: today's presentation is not PNM's plan or a financial forecast, it is an illustration of the IRP modeling process

DISCLOSURE REGARDING FORWARD LOOKING STATEMENTS

The information provided in this presentation contains scenario planning assumptions to assist in the Integrated Resource Plan public process and should not be considered statements of the company's actual plans. Any assumptions and projections contained in the presentation are subject to a variety of risks, uncertainties and other factors, most of which are beyond the company's control, and many of which could have a significant impact on the company's ultimate conclusions and plans. For further discussion of these and other important factors, please refer to reports filed with the Securities and Exchange Commission. The reports are available online at www.pnmresources.com.

The information in this presentation is based on the best available information at the time of preparation. The company undertakes no obligation to update any forward-looking statement or statements to reflect events or circumstances that occur after the date on which such statement is made or to reflect the occurrence of unanticipated events, except to the extent the events or circumstances constitute material changes in the Integrated Resource Plan that are required to be reported to the New Mexico Public Regulation Commission (NMPRC) pursuant to Rule 17.7.4 New Mexico Administrative Code (NMAC).

IRP GOALS

PNM'S 2014-2033 INTEGRATED RESOURCE PLAN

- 20-year planning horizon
- Revisit plan every three years
- Create a four-year action plan
- Improve plan through public advisory process
- File with NM Public Regulation Commission for review & acceptance

Legislation Governing Utility IRP:

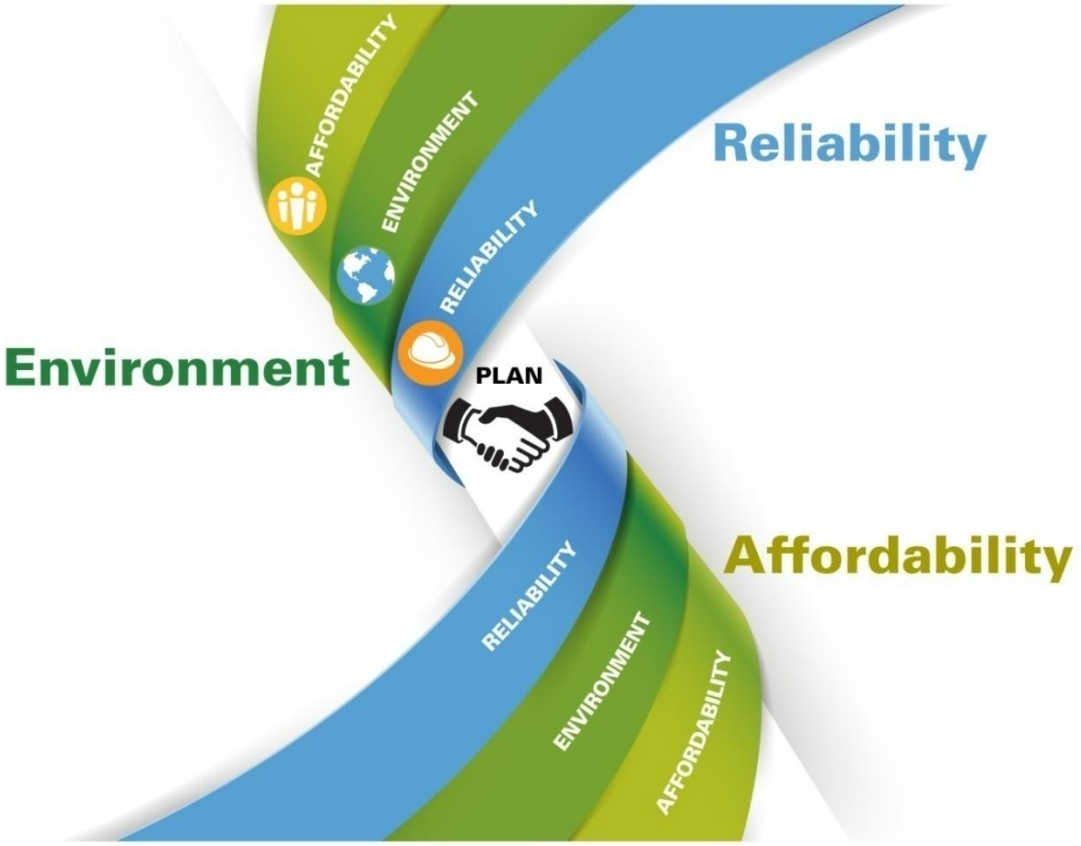
- New Mexico Public Utility Act – 62-3-1 et.seq. NMSA
- Renewable Energy Act – 62-16-1 et.seq. NMSA
- Efficient Use of Energy Act – 62-17 NMSA

NMPRC Rules:

- Integrated Resource Plans for Electric Utilities – 17.7.3 NMAC
- Renewable Energy for Electric Utilities – 17.9.572 NMAC
- Energy Efficiency – 17.7.2 NMAC

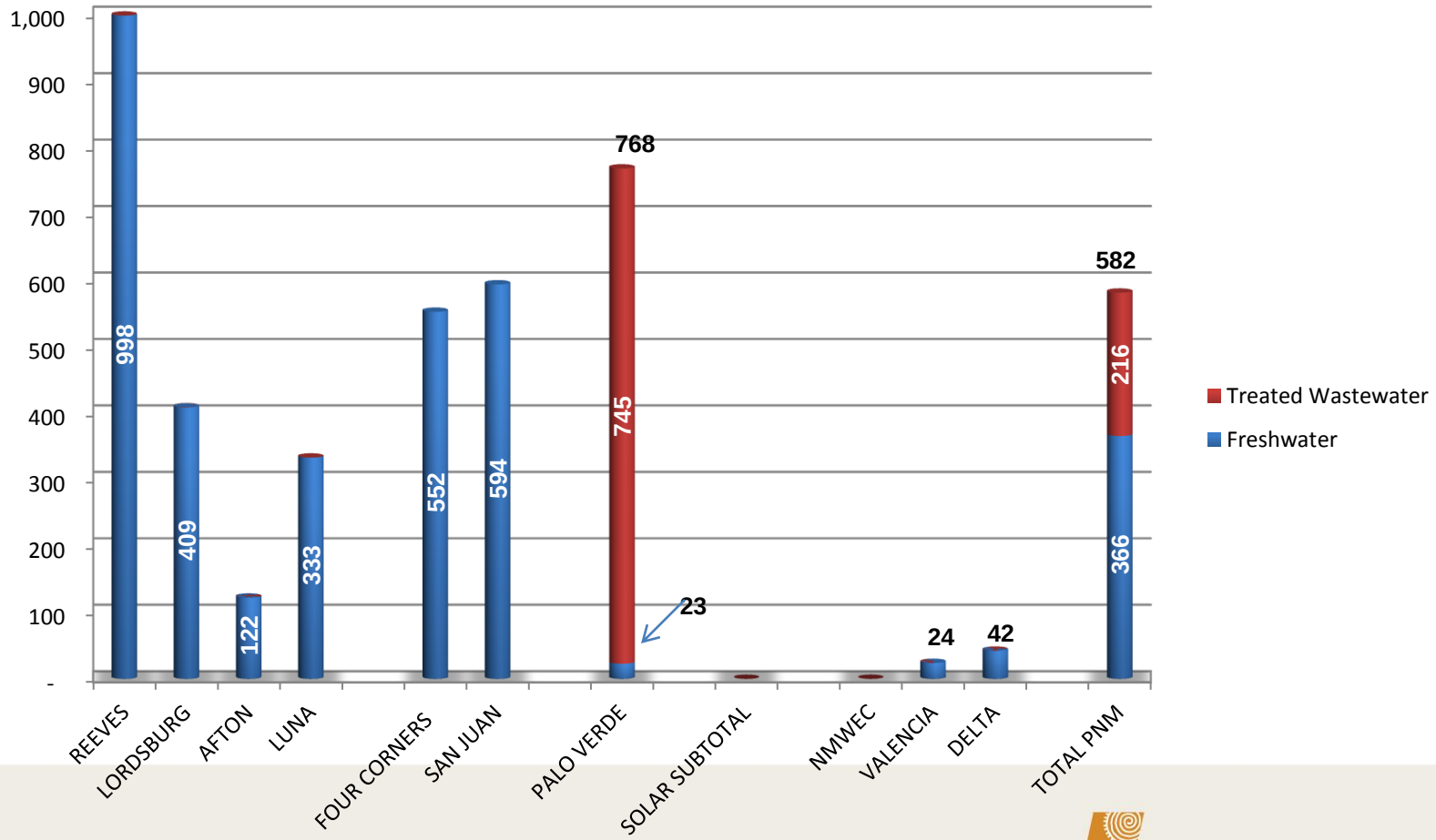
IRP GOALS

BALANCE



FOLLOW-UP

WATER USE INTENSITY FOR EXISTING RATE-BASED GENERATION (2011-2012 AVG GAL/MWH)



FOLLOW-UP

2009-2012 ANNUAL CAPACITY FACTORS

Baseload Resources	Palo Verde	90.6%
	San Juan	75.1%
	Four Corners	73.1%
Intermediate Resources	Luna	26.2%
	Afton	20.9%
Peaking Resources	Reeves	5.3%
	Valencia	4.9%
	Lordsburg	4.3%
	Delta/Person	0.8%
Renewable Resources	NMWEC	30.9%
	22.5 MW Solar PV[1]	26.2%
	Aztec/Algodones Solar PV	15.8%

Notes:

1). Includes Prosperity Project. Based only on 2012 data.

FOLLOW-UP

TYPICAL ANNUAL CAPACITY FACTORS FOR NEW ALTERNATIVES

Baseload Resources	Coal w/carbon capture	60-80%
	Nuclear	85-95%
Intermediate Resources	1x1 Combined Cycle (204 MW)	20-65%
	1x1 Combined Cycle (252 MW)	20-65%
Peaking Resources	Aero Turbine (40 MW)	1-20%
	Small Gas Turbine (85 MW)	1-20%
	Reciprocating Engines (93 MW)	1-20%
	Large Gas Turbine (143 MW)	1-20%
	Large Gas Turbine (177 MW)	1-20%
Renewable Resources	Solar PV Fixed-Tilt (20 MW)	27%
	Solar PV Tracking (20 MW)	31%
	Solar Trough (50 MW)	27%
	Solar Trough w/Storage (50 MW)	36%
	Wind (100 MW)	33%
	Biomass (20 MW)	88%
	Geothermal (10 MW)	81%

FOLLOW-UP

DATA REQUESTS

PNM has provided as a handout to this meeting the following information:

- Acronym Sheet
- Data used to build graphs

Dean Brunton

PNM Senior Financial Modeler

RISK ANALYSIS

OVERVIEW – MODELING KEY COST FACTOR VARIABILITY

The NMPRC's Rule 17.7.3, Integrated Resource Plans for Electric Utilities, requires that the IRP consider risk and uncertainty in its plan, specifically noting price volatility.

PNM's modeling shows that the input factors that both A) display significant variation in their magnitude or costs and B) have a major impact on total ratepayer cost are:

1. Natural gas prices
2. Load growth
3. Potential greenhouse gas emission costs
4. Wholesale electricity market prices

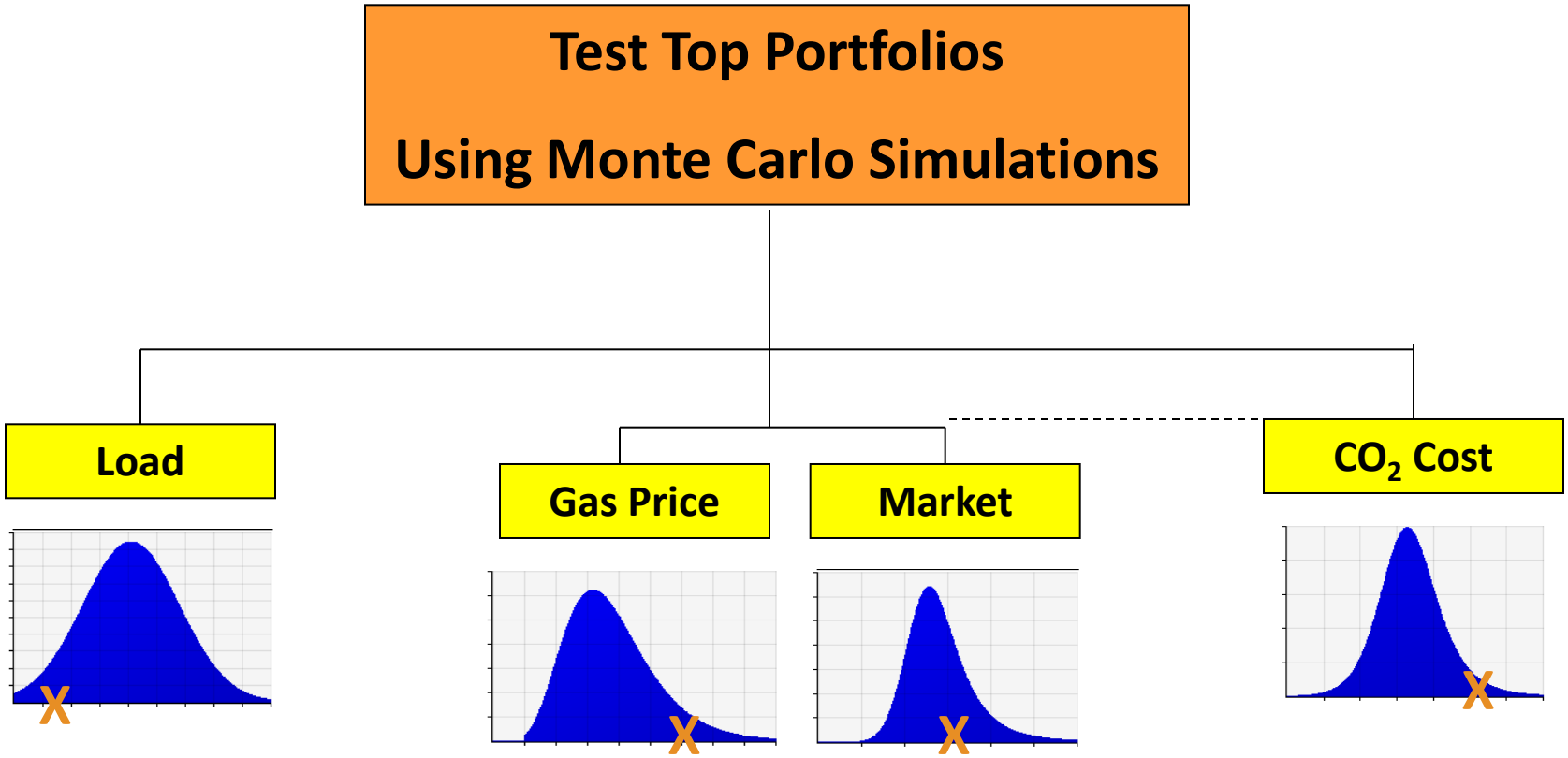
PRICE VOLATILITY

What is Monte Carlo analysis?

- Simulations -- Repeated random sampling of specific variables.
- Stress Test -- Evaluate each of the top portfolios under the same conditions, including some extreme conditions.

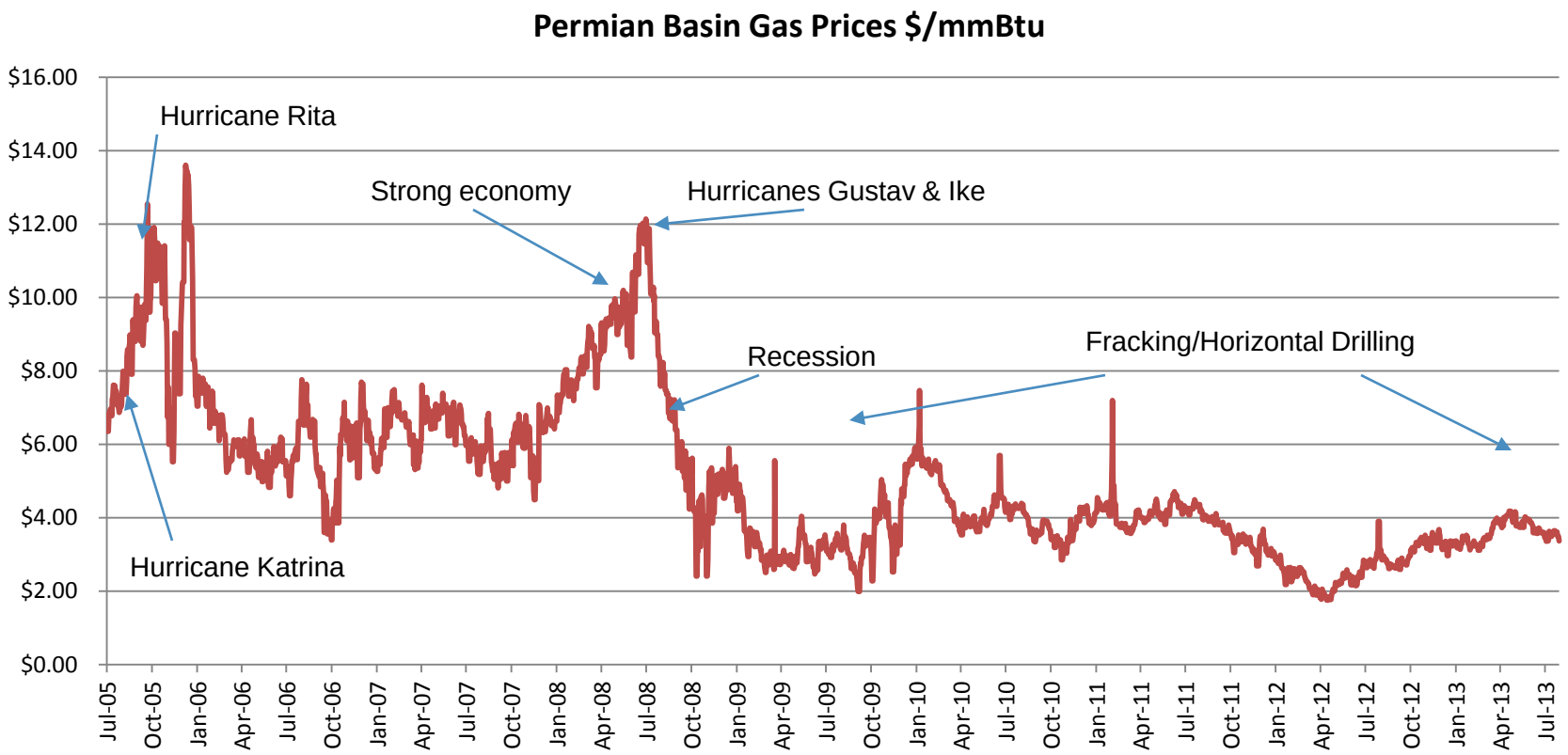
Why perform Monte Carlo analysis on selected portfolios?

- Robustness -- Want to make sure that *portfolios* chosen perform well under a broad range of conditions.
- Resource Diversity -- Balance of individual resources within a portfolio to mitigate overall system risk.



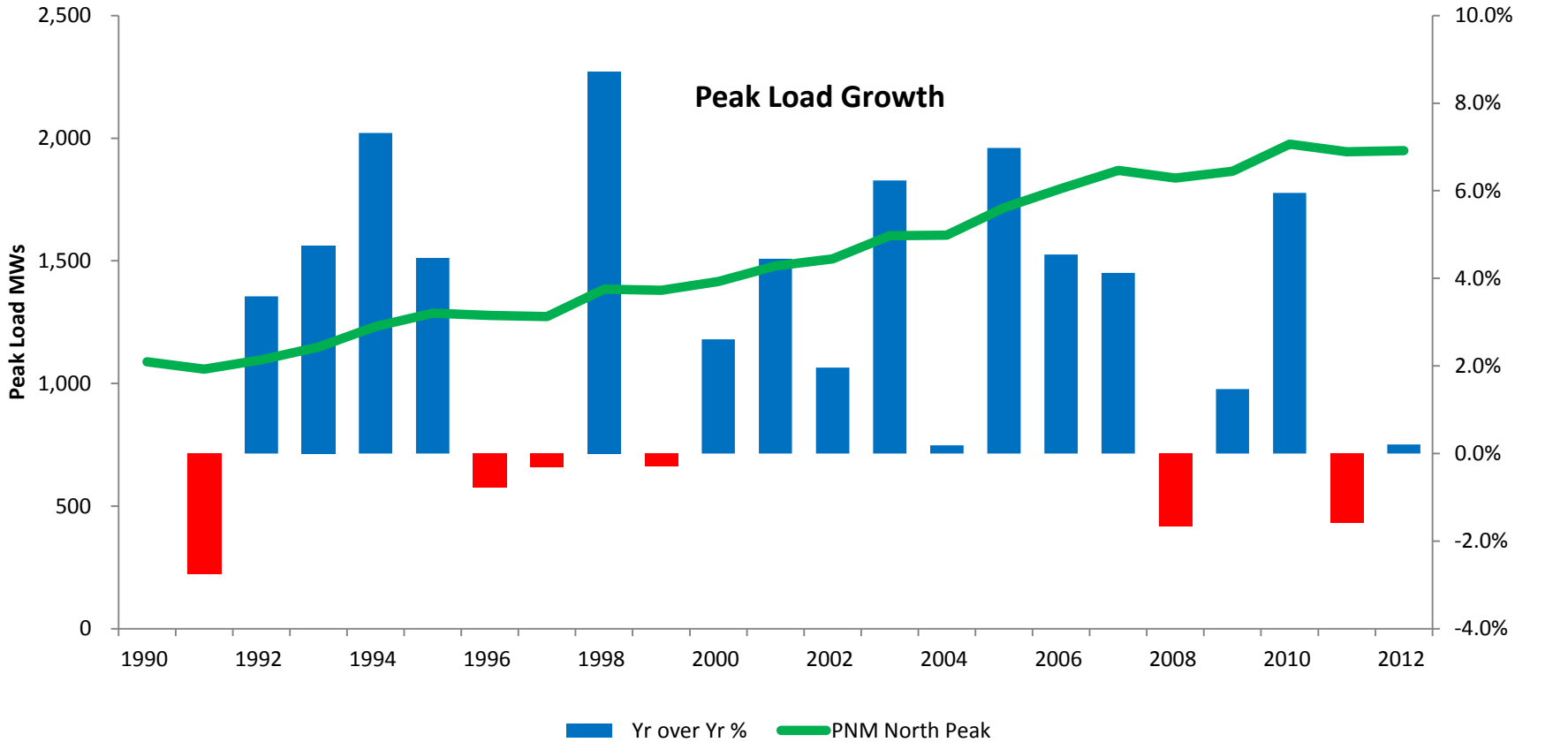
RISK ANALYSIS

PRICE VOLATILITY – NATURAL GAS



INPUT FACTOR VOLATILITY EXAMPLE

QUANTITATIVE RISK ANALYSIS: LOAD GROWTH VARIABILITY



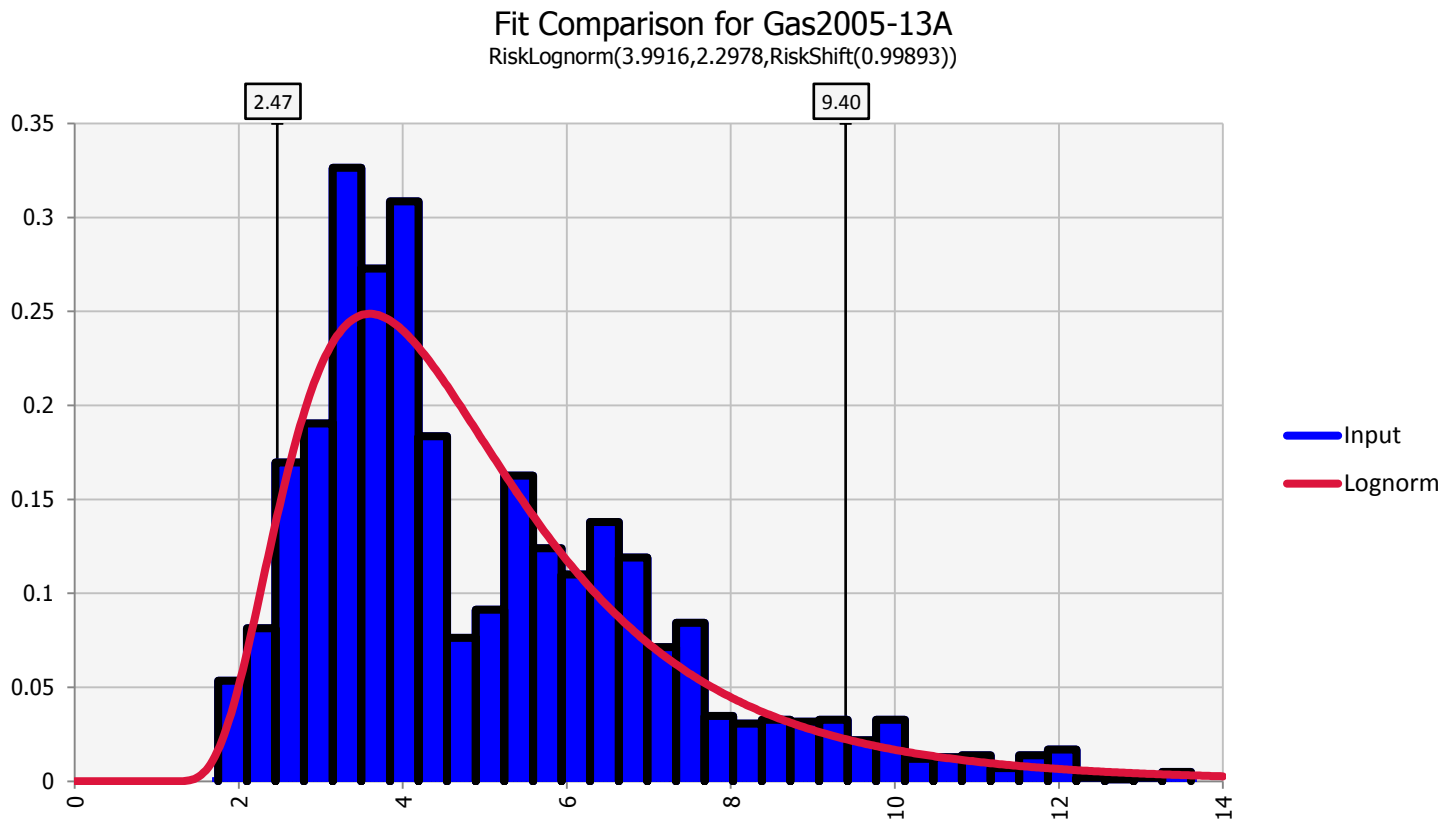
RISK ANALYSIS

HISTORIC VARIABILITY – GAS PRICE AND LOAD GROWTH

PNM Load Growth variability (retail load)		Peak MWs
2012 PNM North		1,949
Mean Annual % Growth	1990 - 2012	2.7%
Std Deviation		3.3%
	% of mean	122.5%
	High	8.7%
	Low	-2.8%
Natural Gas Prices -- Daily		Jul05 - Jul13
	Mean	$4.98
El Paso Permian	Std Deviation	$2.16
Hub ID# 746680	% of mean	43.4%
	High	$13.61
	Low	$1.75

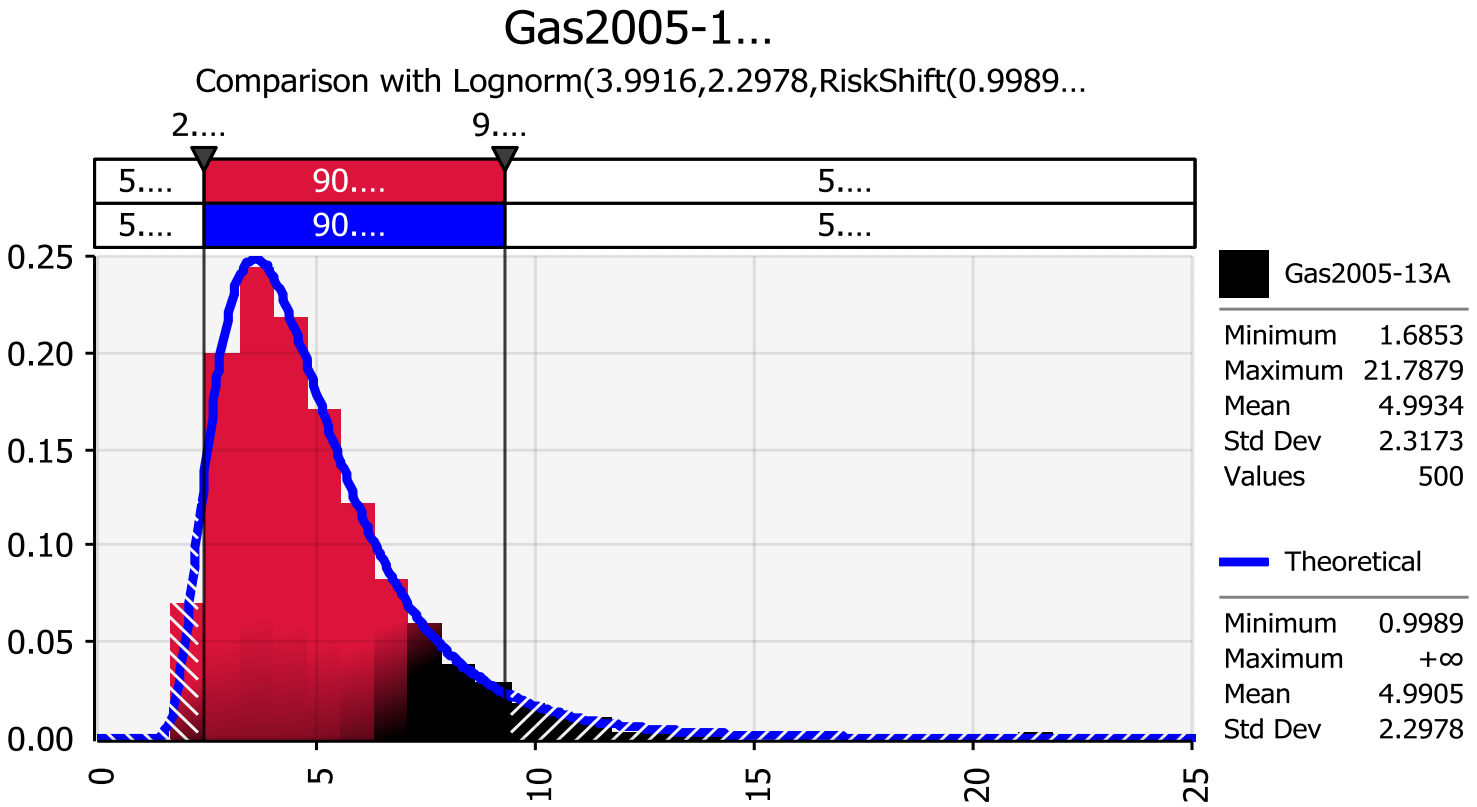
RISK ANALYSIS

NATURAL GAS PRICES – DISTRIBUTION FIT OF HISTORICAL PRICES



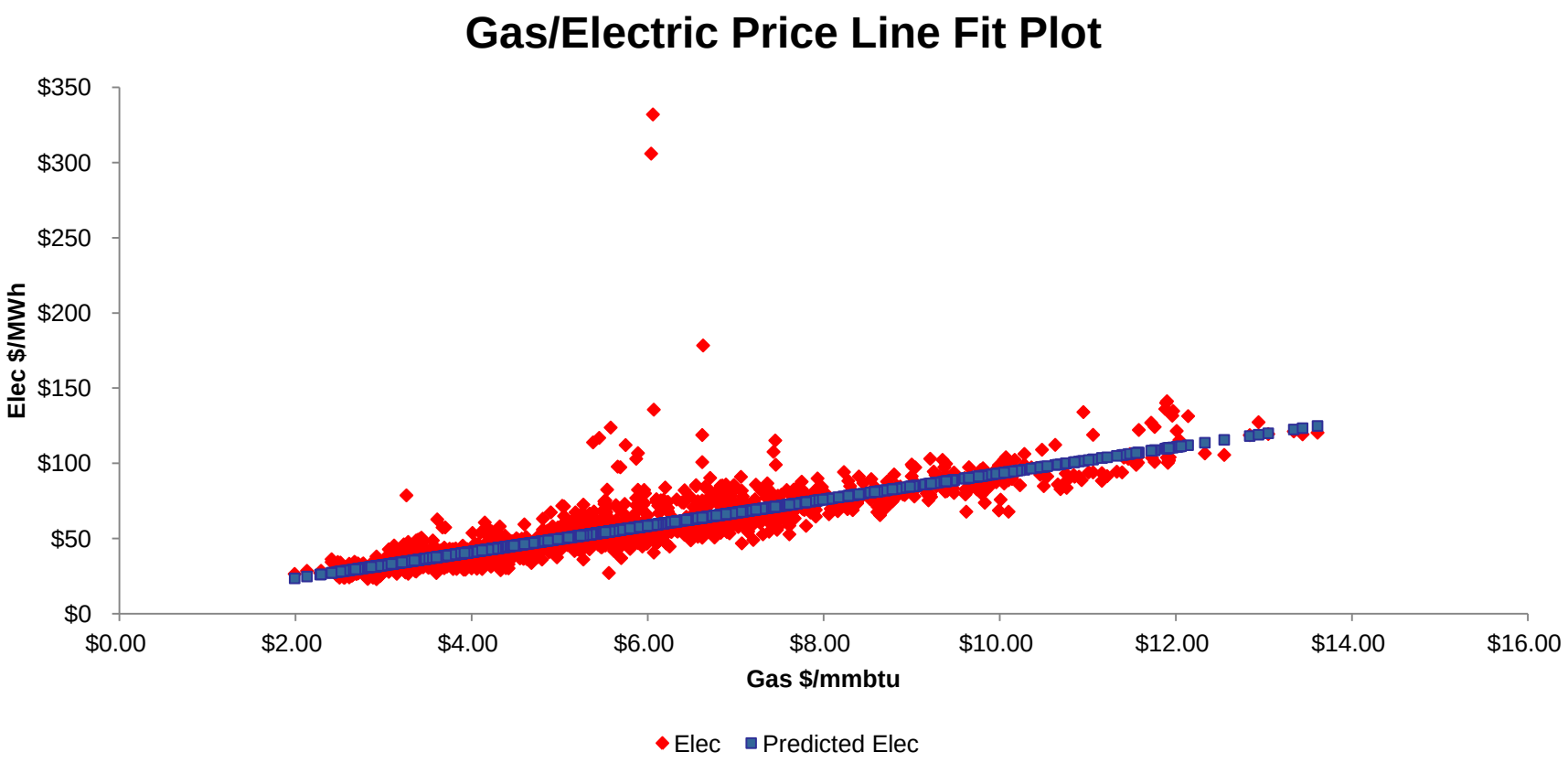
ANALYZE – GAS PRICE VARIABILITY

MONTE CARLO SIMULATION VS. HISTORIC DISTRIBUTION OF PERMIAN BASIN GAS PRICES



RISK ANALYSIS

PRICE VOLATILITY – GAS AND ELECTRIC PRICE RELATIONSHIP (2005-2013)



RISK ANALYSIS

PRICE VOLATILITY

Electricity Price Forecast Formula ($/mwh)

$$\text{Price}_{elec} = A + B \times \text{Price}_{gas} + C \times \text{Price}_{CO2} + \text{variance}$$

$$\text{Price}_{elec} = \$4.16 + 7.866 \times \text{Price}_{gas} + 0.398 \times \text{Price}_{CO2} + \text{variance}$$

Natural Gas Prices ($/mmBtu):

Distribution = Log Normal; mean = $4.99, std. dev. = $2.30

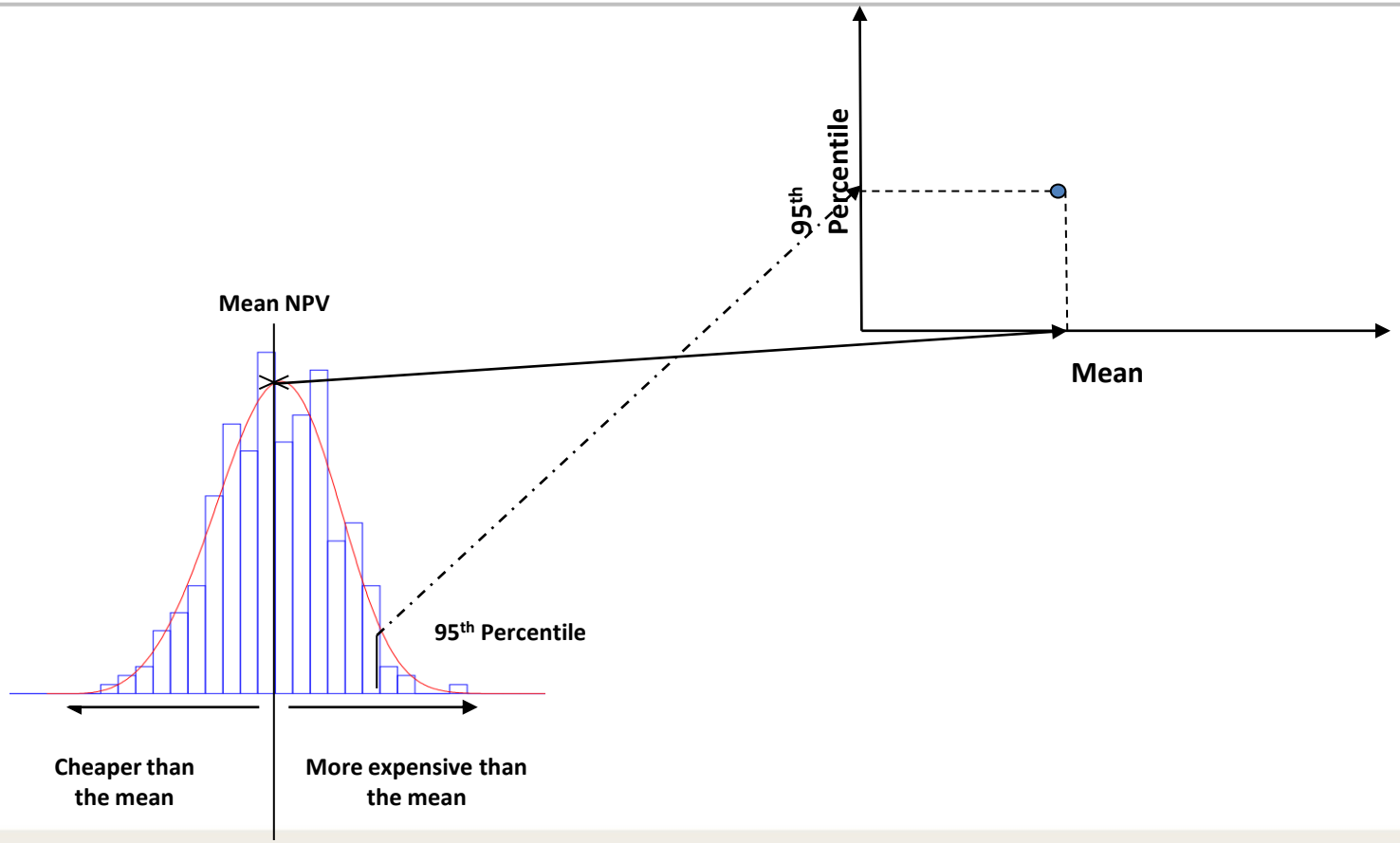
Carbon Prices ($/tonne):

Distribution = Normal; mean = $20.00, std. dev. = $10.00

(normalized mean to Pace projection each year)

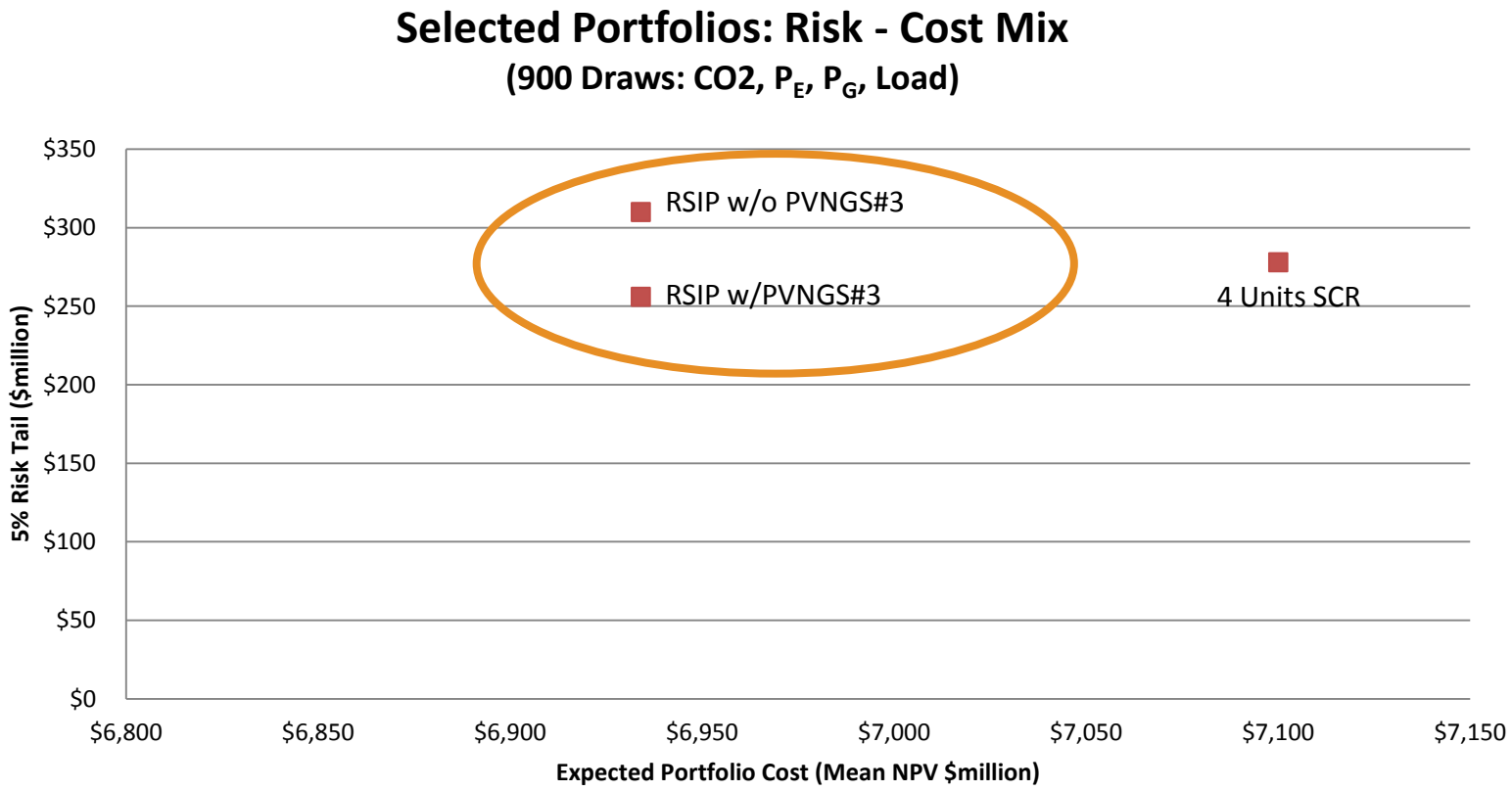
PORTFOLIO RISK AND COST RESULTS

PLOTTING THE SIMULATION OUTCOMES FOR A PORTFOLIO



RISK ANALYSIS

MONTE CARLO SIMULATIONS – COST AND RISK RESULTS



REMAINING ANALYSIS

PORTFOLIO MODELING AND RISK ANALYSIS WORK

	RSIP w/ PV-3	FIP	RSIP w/o PV-3
Load	High/Mid/Low	Mid	Mid
Gas/Carbon	High/Mid/Low	High/Mid/Low	Mid

Additional cases to run on RSIP w/PV-3 Mid Load and Mid gas/carbon prices:

- Energy efficiency sensitivity
- Technology Breakthrough scenario
- Transmission investment scenario
- $0/$8/$20/$40/metric ton CO2 pricing sensitivities
- Water lack of availability sensitivity
- High wind penetration sensitivity

REMAINING ANALYSIS

ANTICIPATED SCHEDULE

- October - continue analysis and define remaining scenarios
- October – issue next renewable energy request for proposals
- November – Public Advisory meeting to present updated analysis & remaining scenario definitions
- December – PNM resource filing addressing some of the SJGS replacements

WRAP UP DISCUSSION

SUMMARY OF PROGRESS TO DATE

- Tuesday, September 17: Illustrate the process
- Friday, September 20: Discuss assumptions
- Thursday, September 26: Plan next steps
- Friday, October 4: Recap Session in Santa Fe (NMPRC Bldg.)

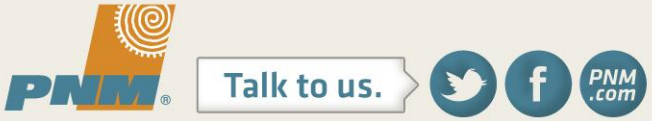
Discuss proposals for next meeting

- Friday, November 15
- Tuesday, November 19

SUMMARY OF PARTICIPATION TO DATE

Name	Organization/Company	Name	Organization/Company
Anderson, Megan	Western Environmental Law Center	Hughes, Ken	NM State Energy Office
Augustine, Pat	Pace Global; PNM consultants	Laine, Lindsay	NM Green Chamber of Commerce
Bergen, Chris	Altis Energy Services	Lara, Robert	NMPRC -- asst to K. Montoya
Brack, Jim	NMPRC	Long, Noah	National Resource Defense Council
Braithwaite, Jane	NMIPL	Menapace, Joseph	JDM Government Relations
Brancard, Bill	NM Energy Minerals & Natural Resources	Miller, Lara	The Nature Conservancy
Burns, Nancy	NMPRC	Payne, Bill	Residential customer
Campbell, Lewis	Keres Consulting; NNSA contractor	Pekarek, Jerry	Residential customer
Chatterjee, Barbara	Residential customer	Randall, Lisa	Santa Fe Public Schools
Christodoulou, Athena	NM Solar Energy Association	Richardson, Clifford	USAF, Kirtland AFB (retired)
Crawford, Donna	Residential customer	Richardson, Katie	US Senator Heinrich's office
Crawford, James	Residential customer	Robertson, David	Interfaith Power and Light
DeCesare, Vincent	NMPRC	Salas, Glen	Professional Engineer
Dingman, George	Residential customer	Sanchez, Laura	NM Green Chamber of Commerce
Donoho, Jodi	McGraw Hill Construction (Finance)	Sidler, Jack	NMPRC Staff
Donoho, Mike	McGraw Hill Construction (Finance)	Singer, Tom	Western Environmental Law Center
Feibelman, Camilla	Sierra Club	Sullivan, Patricia	NMSU
Fielbelkorn, Tammy	Southwest Energy Efficiency Project	Takahashi, Michi	NMSU; NM Solar Station, LLC
Getts, David	SouthWestern Power Group	Thompson, David	Residential customer
Gilmer, Dave	Residential customer; private consultant	Tisdel, Kyle	Western Environmental Law Center
Hickey, Lisa	Interwest Energy Alliance	Van Winkle, David	CCAE/New Energy Economy
Hirsch, Robb	EDL Consulting/CCLI	Wildin, Maurice A. "Bud"	Residential customer
Howard, Brad	TransCanada	Winfield, Bob	Keres Consulting

Thank you



MAKE SURE WE HAVE UP TO DATE CONTACT INFORMATION FOR YOU

www.pnm.com/irp for documents

irp@pnm.com for e-mails

Register your email on sign-in sheets for alerts of upcoming meetings and notices that we have posted new information to the website.

Meetings Schedule:

Tuesday, Sept. 17, 2013, 8 a.m.- noon

Friday, Sept. 20, 2013, 8 a.m.- noon

Thursday, Sept. 26, 2013, 8 a.m.- noon