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## Demand Curve Reset Financial Assumptions

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# There Are Two Parts to this Presentation

- **Part 1** – Use a probabilistic model as described at the January meeting to determine a carrying charge that reflects merchant risk.
- **Part 2** – Examine the implications of the probabilistic model from the perspective of what level of resources are desired

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## PART 1



# Proposed Basic Assumptions

## □ WACC

- 50/50 Capital Structure
- 7% Debt Cost
- 12% Equity Cost (subject to further research on beta)
- Objective method reflective of investment grade company

# Resulting Real Levelized Carrying Charges<sup>1</sup>

Amortization Period	Basic Assumptions	Plus 200 Basis Points in Cost of Debt and Equity
10	16.27%	18.07%
15	12.55%	14.31%
20	10.65%	12.42%
30	8.90%	10.73%



# NERA Constructed a Probabilistic Risk Based Model

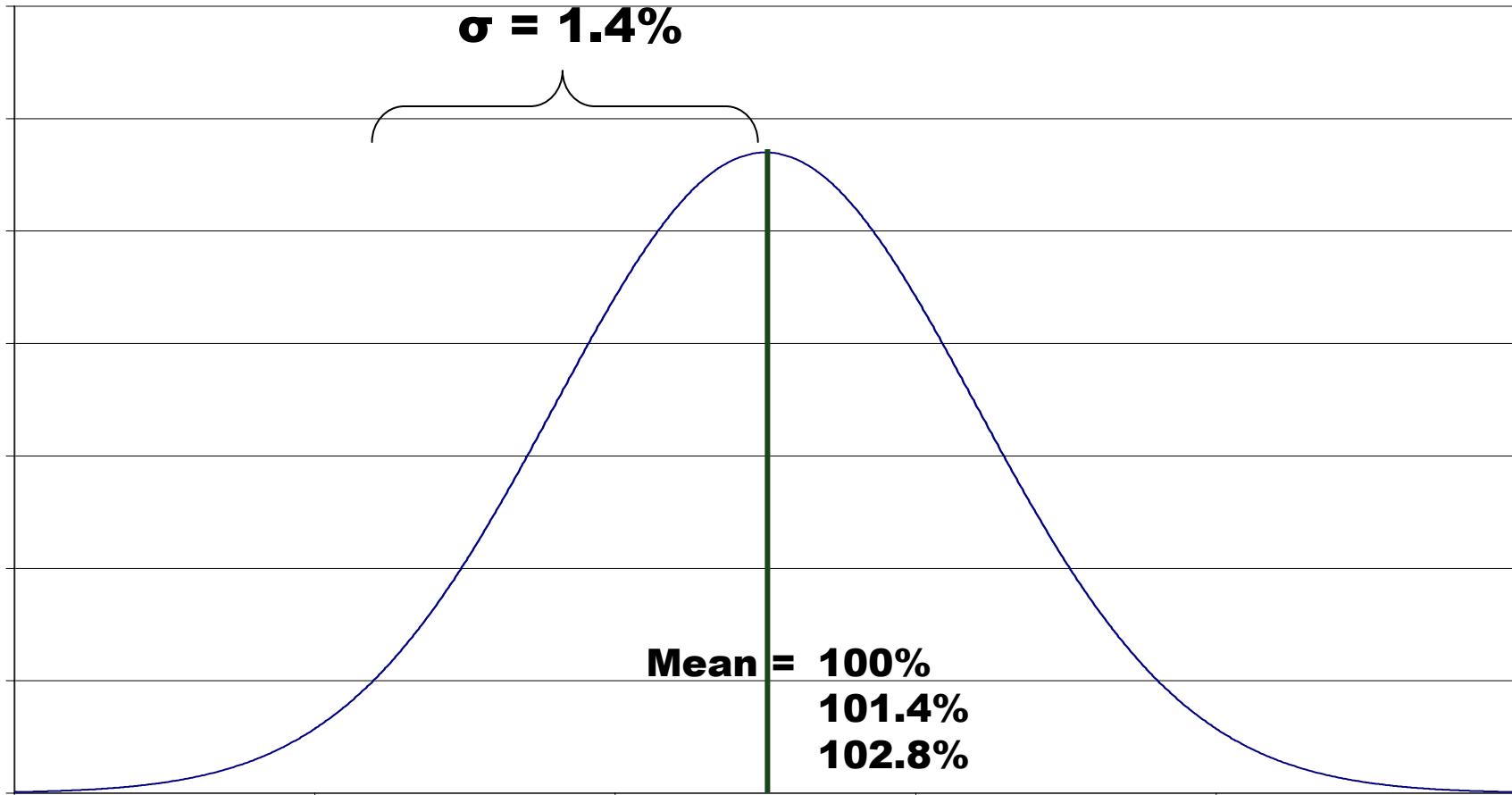
- Used only basic financial assumptions – account for risk probabilistically
- Risk factors and sensitivities examined are:
  - Surplus/excess capacity
  - Level of energy and AS revenues
  - Slope of demand curve
  - Technical progress reducing future entry cost
  - Regulatory risk



# High Level Description of Model

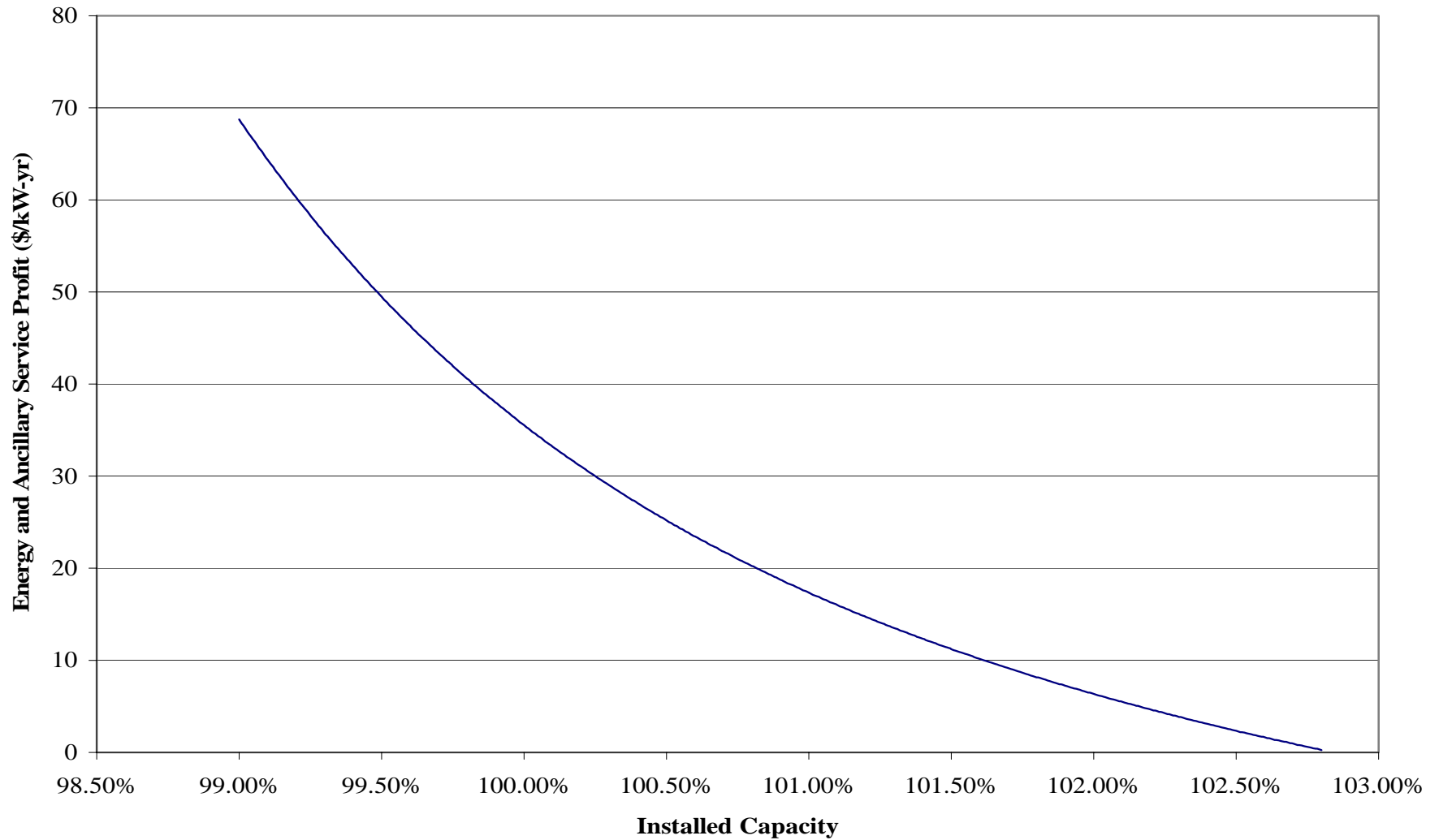
- ❑ Calculates real carrying charge
- ❑ Solves for demand curve reference point needed to fully recover present value of capital outlay over thirty years given risk of excess capacity
- ❑ Basic financial assumptions used to derive discount rate
- ❑ Used in probabilistic (i.e.  $\sigma > 0$ ) mode to test risks and sensitivities

# Surplus and Excess Capacity is Examined Probabilistically



Note: The standard deviation is taken from Professor Hobbs's model filed by PJM in the PJM capacity market case. The model was run with the NYISO demand curve slope. These values are illustrative and not final recommendations.

# Energy and Ancillary Service Profit Function



# Risk Results for Amortization Period<sup>1</sup>

Mean Reserve  
as % of Target<sup>2</sup>

Energy and Ancillary Services Profit at  
Reference Point

\$35.00/kW-yr

\$67.50/kW-yr

100.0%

>35

>35

101.4%

16.5

17.5

102.8%

10.5

11.5

<sup>1</sup>Real levelized carrying charge calculated using basic financial assumptions. Amortization period (+/- .5 years) calculated by solving for period that provides for full present value capital recovery over 30 years.

# Risk and Results Real Levelized Carrying Charge<sup>1</sup>

Mean Reserve as % of Target	Energy and AS Profit at Reference Point		Comparable to:
	\$35.00/kW-yr	\$67.50/kW-yr	
100.0	6.66%	6.66%	Base financial assumptions and 40+ year amortization
101.4	11.82%	11.42%	Base financial assumption and about 17 year amortization – or plus 200 basis points and about 23-year amortization
102.8	15.36%	14.47%	Base financial assumptions and about 12 year amortization or plus 200 basis points and 14-year amortization

**Reference Scenario** → (Arrow pointing to the 101.4 row)

Note: Results are sensitive to achieved mean reserve.

<sup>1</sup>This real levelized carrying charge is needed to provide full present value recovery over 30 years.

# Sensitivity Results – Impact of Various Assumptions

Scenario	Real Levelized Carrying Charge	Amortization Period
Reference scenario	11.82%	16.5 years
1% technical progress	12.91%	14.5 years
20% probability that demand curve is only 50% adequate	12.67%	14.5 years
Zero crossing point at 106%	12.97%	14.5 years
Zero crossing point at 118%	11.49%	17.5 years

Note: All results are for a scenario with mean reserves at 101.4% of target, 1.4% standard deviation and base energy and ancillary services profit at \$35/kW-yr. Unless noted otherwise, the zero crossing point is at 112% of target.



# Preliminary Ideas with Respect to Financial Assumptions

- Absent merchant risk the basic financial assumptions and a 25-30 year amortization period would be reasonable and would result in real carrying charges of about 9.25%
- Allowing for merchant risk through a 200 basis point premium provides for a charge rate of about 11%, a 400 basis point premium provides for a charge rate of about 13%
- Allowing for merchant risk through a 15-year amortization period provides for a charge rate of about 12.5 %

# Preliminary Ideas with Respect to Financial Assumptions (continued)

- Scenario allowing for merchant risk:
  - 0.5% technical progress (capital costs decrease by this)
  - 10% probability of regulatory risk (probability of 50% demand payment recovery)
  - Average reserve = 101.4% of target ( $\sigma = 1.4\%$ )
  - Corresponds to a carrying charge of 12.78%
  - Equivalent to about 400 basis point premium over cost of capital or 16-year amortization period (subject to change based on energy and AS curve)
- Average reserve parameters (mean = 101.4%;  $\sigma = 1.4\%$ )
  - 83.5% chance that capacity will exceed the target
  - 16.5% chance that it will be below the target
  - 5% chance that it will be more than 500MW below the target
- To the extent that the above are reasonable, the carrying charge rate (12.78%) is reasonable
- To the extent one believes that there is an equal chance of being above or below the target, the above carrying charge rate would be too high

# The Slope of the Demand Curve and the Capacity Mitigation Rules Will Have an Impact

Scenario	Zero Crossing Point (X-Intercept)		
	112%	106%	118%
All capacity considered when solving for demand curve payment – i.e., strict mitigation	12.78%	14.00%	12.43%
Demand curve payment with average reserve at 100.5% of target and zero standard deviation – i.e., limited mitigation which results in prices not moving down demand curve	12.12%	12.48%	12.01%

- A crossing point beyond 112% does little to reduce carrying charges.
- A crossing point at 106% raises carrying charges by over 100 basis points.
- Depending on zero crossing point, the mitigation scheme can have a 50 to 150 basis point impact on carrying charges



# Going Forward

- ❑ Develop NYISO specific energy and AS net revenue function
- ❑ Further consider and select parameters for average reserve as percent of target, standard deviation, rate of technical progress and regulatory risk
- ❑ After selecting parameters develop real levelized carrying charge consistent with selected zero crossing point and mitigation scheme



# Sanity Check – How Do Customers and Investors Fare?

Scenario

Real Levelized  
Carrying Charge

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Without merchant risk

8.90%

With merchant risk, 112% zero crossing  
point and strict mitigation

12.78%

With merchant risk, 112% zero crossing  
point and relaxed mitigation

12.12%



# Sanity Check – How Do Customers and Investors Fare? (continued)

- ❑ Is a 300 to 400 basis point premium on carrying charge a reasonable price for converting a life of plant obligation to cover cost to a three year obligation?
- ❑ Is a 300 to 400 basis point premium sufficient to attract investment with only a three year commitment?
- ❑ Are the assumptions of 101.4% and a 1.4% standard deviation within the realm of reason?
- ❑ Would the demand curve survive with higher premiums – say, 500 to 600 basis points?
- ❑ Would the demand curve attract sufficient capacity with lower premiums – say, 100 to 200 basis points?

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## PART 2



# An Alternative Perspective

- ❑ In order to attract investment, the expected return must be sufficient to cover all the costs of the efficient new entrant
- ❑ There are a variety of ways in which this can be accomplished
- ❑ The difference is not aggregate prices over time anticipated by the entrant – they must be the same – but the pattern of prices

# Different Patterns Correspond to Different Scenarios

	Energy Only	Demand Curve, Low Carrying Charges, Steep Slope	Demand Curve, Medium Carrying Charges, Medium Slope	Demand Curve, Higher Carrying Charges, More Gradual Slope
Expected Pattern	Shortages develop, prices spike, entry induced by spikes, prices subside	Less severe shortages develop, lower prices spike, entry induced by combination of spikes and demand payments, prices subside	Very few shortages develop, moderate price spikes, entry induced by demand curve supplemented by energy prices, relatively stable prices	Tendency toward excess capacity supported by predictable demand curve payments and fewer price spikes

- ❑ Question is not, what is the appropriate carrying charge?
- ❑ Question is, given a desired result for the level of capacity and volatility in capacity adequacy and energy prices, what carrying charge and demand curve slope is consistent with the desired outcome?



# The Desired Outcome Has Several Elements

- ❑ **Reliability:** Is target reserve a minimum or an average to be achieved?
- ❑ **Volatility:** Is price stability considered desirable or should short-term prices be more volatile reflecting more accurately short-run marginal cost?
- ❑ **Sustainability:** Does the outcome produce a consistent result that will minimize the probability of intervention?

# The Modeling Approach Can Be Used To Identify Consistent Demand Curve Parameters

## Desired Outcome

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- ❑ 50% probability of achieving target reserve, high price volatility
- ❑ 83.5% probability of achieving target reserve, 5% probability of falling more than 500 MW short, limited price volatility
- ❑ 95% probability of achieving target reserve, virtually no price volatility

## Demand Curve Parameters

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- ❑ Steep slope, real carrying charges of 7%, let energy price spikes play substantial role in inducing investment (energy revenue expectation is 150% of energy at reference point)
- ❑ Current slope, real carrying charge rates of between 12% and 13%, reduced role for energy price spikes (energy revenue expectation is 55% of energy at reference level)
- ❑ Current slope, real carrying charge rate of 16%, virtually no role for energy prices (energy revenues only 10% of that at reference level)



# NERA Is Inclined to Recommend Parameters Consistent with 83.5% Probability of Meeting Target

- Current demand curve slope and real levelized carrying charge of between 12% and 13% (excluding insurance, property taxes and fixed O&M)
- Equivalent to:
  - 15-year amortization; 7% cost of debt; 12% cost of equity; or
  - 29-year amortization; 11% cost of debt; 16% cost of equity
- Excluding property taxes and fixed O&M, net energy revenues are estimated to provide about 25% of revenue required by new peaking plant and demand curve revenues the remainder



# Implications of Recommendation

## □ Existing plant

- Absent market intervention expected returns to existing plant should be the same across all consistent scenarios – the difference is in volatility and probability of intervention

## □ New Entrants

- Absent market intervention expected returns to new entrants should be the same across all consistent scenarios – difference will be in volatility and probability of intervention

## □ Cost to Consumers

- Increased demand curve payments from scenarios which employ higher carrying charges will be in large part offset by reduced energy prices, but total customer cost will increase linearly and proportionally to the average reserve level more capacity is paid the new entrant costs over time– the benefit of higher cost comes in force of reduced volatility and greater reliability



# Going Forward

- ❑ Feedback on desired outcome – what level of capacity relative to target is desirable?
- ❑ NERA to finish development of energy profit function and update results – changes may be significant if the slope of the energy profit function is different from that imported from PJM analysis
- ❑ Suggestions on model inputs and structure
- ❑ Final recommendation on carrying charge and demand curve slope to be based on a consistent scenario designed to meet a desired outcome reflecting a consensus