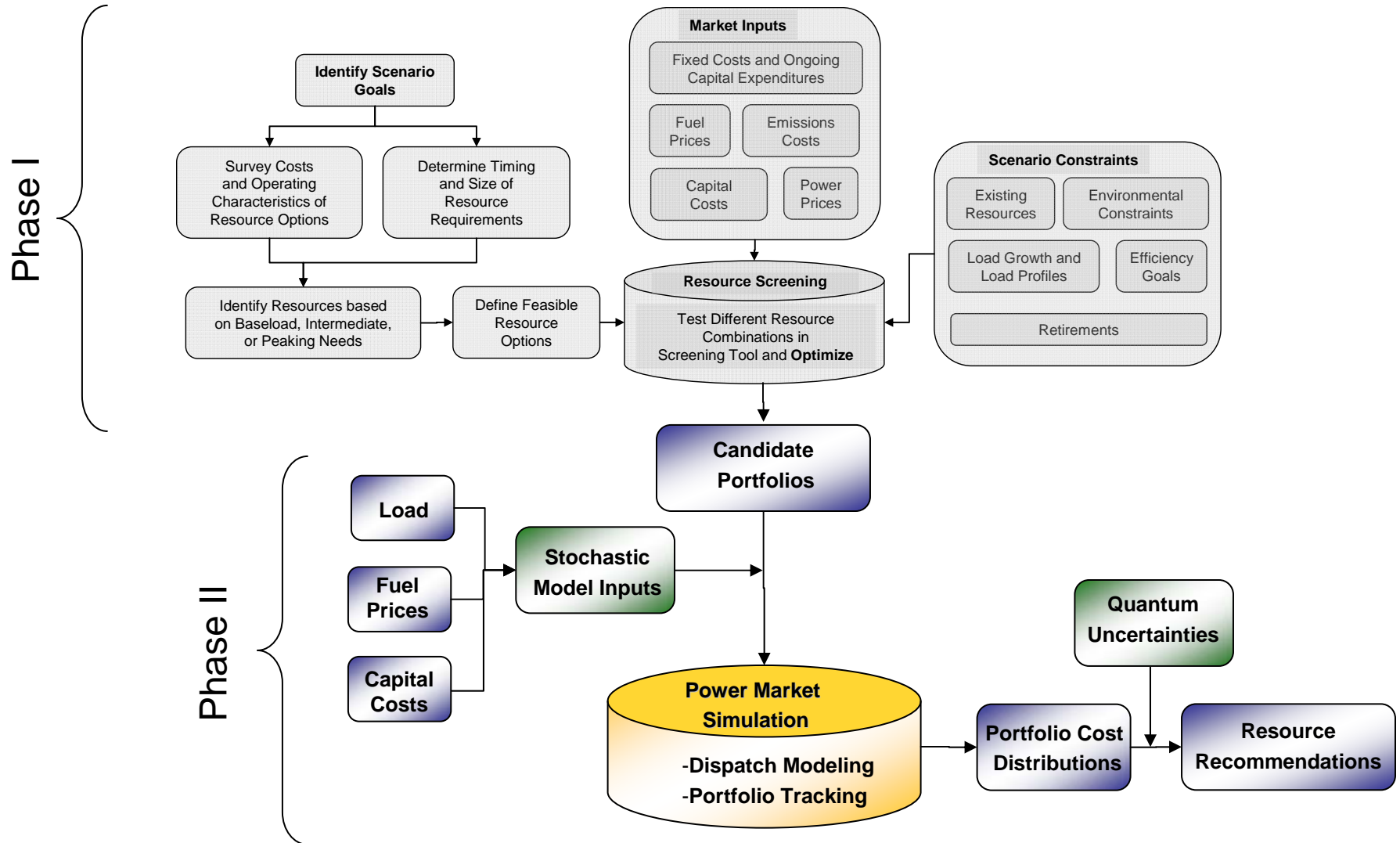




Risk Analysis Results Austin Energy

September 9, 2009

Risk Analysis – Phase II of Resource Planning Effort



Portfolios

- No Additional Generation (Status Quo Risk Profile)
- Draft Energy Resource Plan (“Strawman”)
- Lowest Cost Impact Meeting Council Goals
- Replace FPP with Renewables
- Replace FPP with Nuclear
 - *Replace 300 MW in 2014 and replace with renewables; replace 300 MW in 2020 and replace with nuclear*
- Staff Recommendation

Portfolio Risk Analysis: Approach

- Pace evaluated 6 major portfolio concepts
 - Stochastic confidence intervals were developed to represent uncertainty for local and regional electricity demand, fuel prices, capital costs, and wind generation
 - Simulations of Austin Energy's system were performed in the context of wider ERCOT market 500 times ("iterations")
 - Portfolio costs were tracked by year for each iteration
 - Analyzed range of outcomes in addition to mean of total costs
 - Tracked CO₂ emissions for each portfolio for each iteration
 - Analyzed performance of portfolios against quantum scenarios
 - A quantum scenario is intended to capture the effects of a specific market event that can dramatically alter portfolio performance

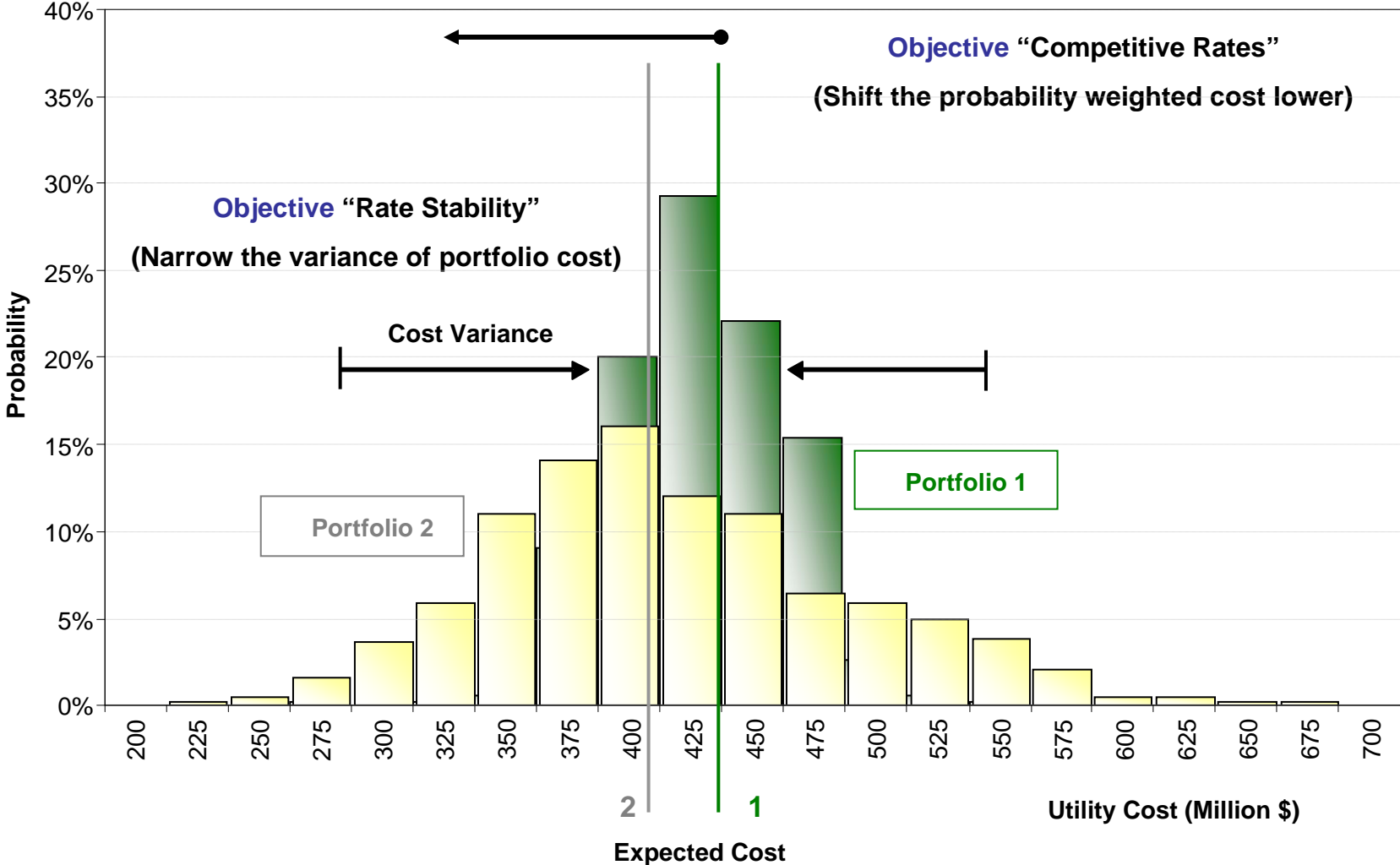
Market Risks

- Fuel Prices
 - Natural gas prices are highly volatile and expected prices heavily impact power market prices, plant dispatch, and renewable expansion economics
- Electricity Demand
 - Load forecast impacts required capacity additions (timing and type) for Austin as well as wider market price projections
- Power Market Prices
 - Power market prices highly dependent on fuel prices and supply-demand balance in wider market area
- Capital Cost Uncertainty
 - Materials costs and capital costs have been volatile in recent years
 - Technology uncertainty results in wide range of potential outcomes
- CO₂ Costs and Regulations
 - Significant uncertainties exist for cost of CO₂ allowances and timing and stringency of regulations
- Resource Availability
 - Many scenarios are heavily dependent on significant renewable capacity additions, which have variable generation and may not be available when expected
 - Transmission risk for significant wind expansion also exists. This could either limit wind procurement or raise the costs, due to transmission charges.
 - Geothermal and LFG additions are highly uncertain

Summary of Objectives and Metrics

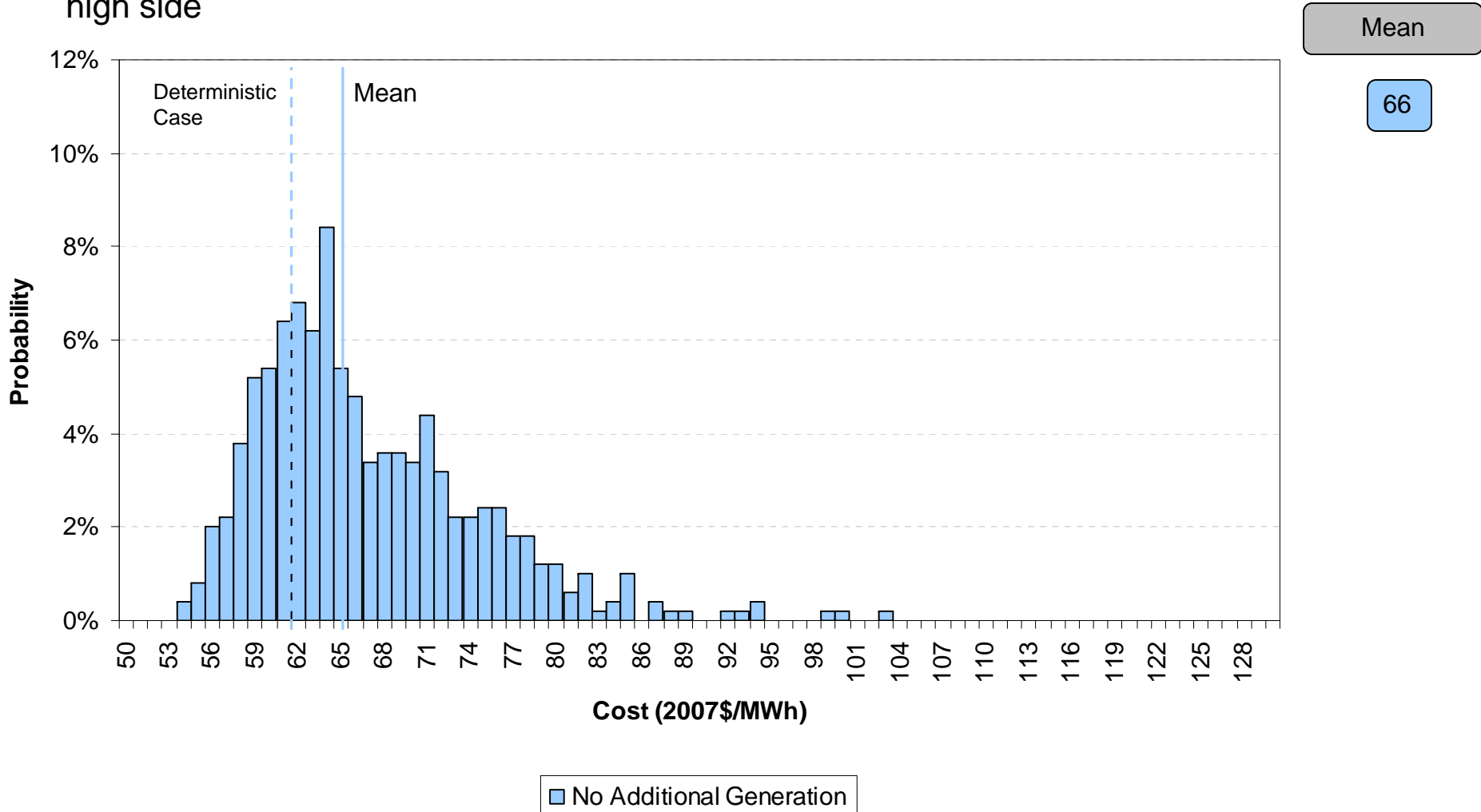
| <i>Objectives</i> | Metrics | |
|---------------------------------------|--|--|
| | Screening Analysis (Phase I) | Risk Analysis (Phase II) |
| <i>Low Cost and Competitive Rates</i> | Cost per MWh | Expected Value of cost per MWh |
| <i>Rate Stability</i> | N/A | Worst outcome cost per MWh (95 th percentile) |
| <i>Environmental Stewardship</i> | CO ₂ emissions reduction; RPS compliance with Council Goals | Expected Value of CO ₂ emissions reduction and Expected Value of RPS percentage |
| <i>Reliable Supply</i> | N/A | Cost per MWh without unsecure technologies |

Risk Integrated Portfolio Distributions



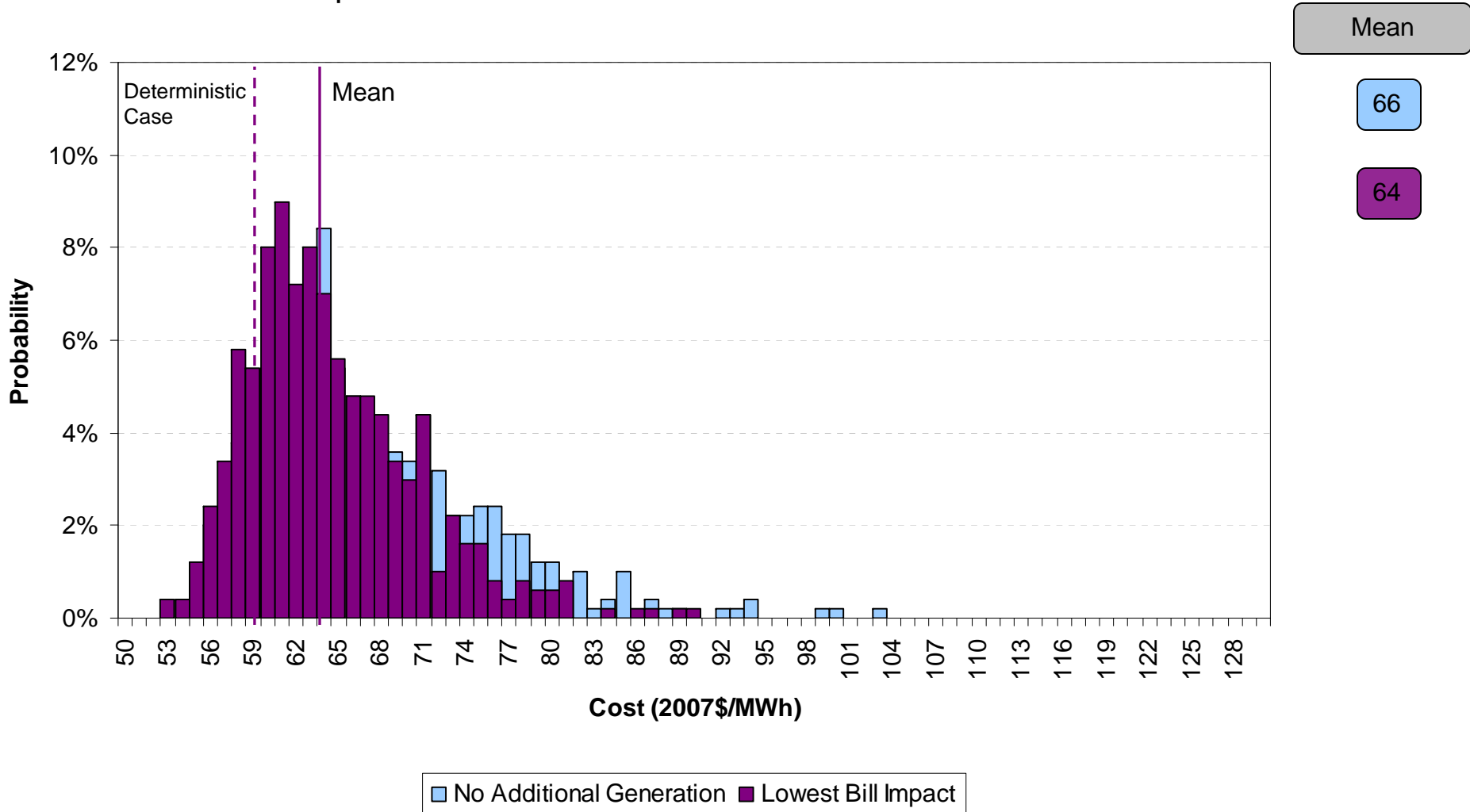
Portfolio Distributions (2020): Status Quo - No Additional Generation

- Status Quo portfolio is exposed to market purchases uncertainty, skewing distribution to the high side



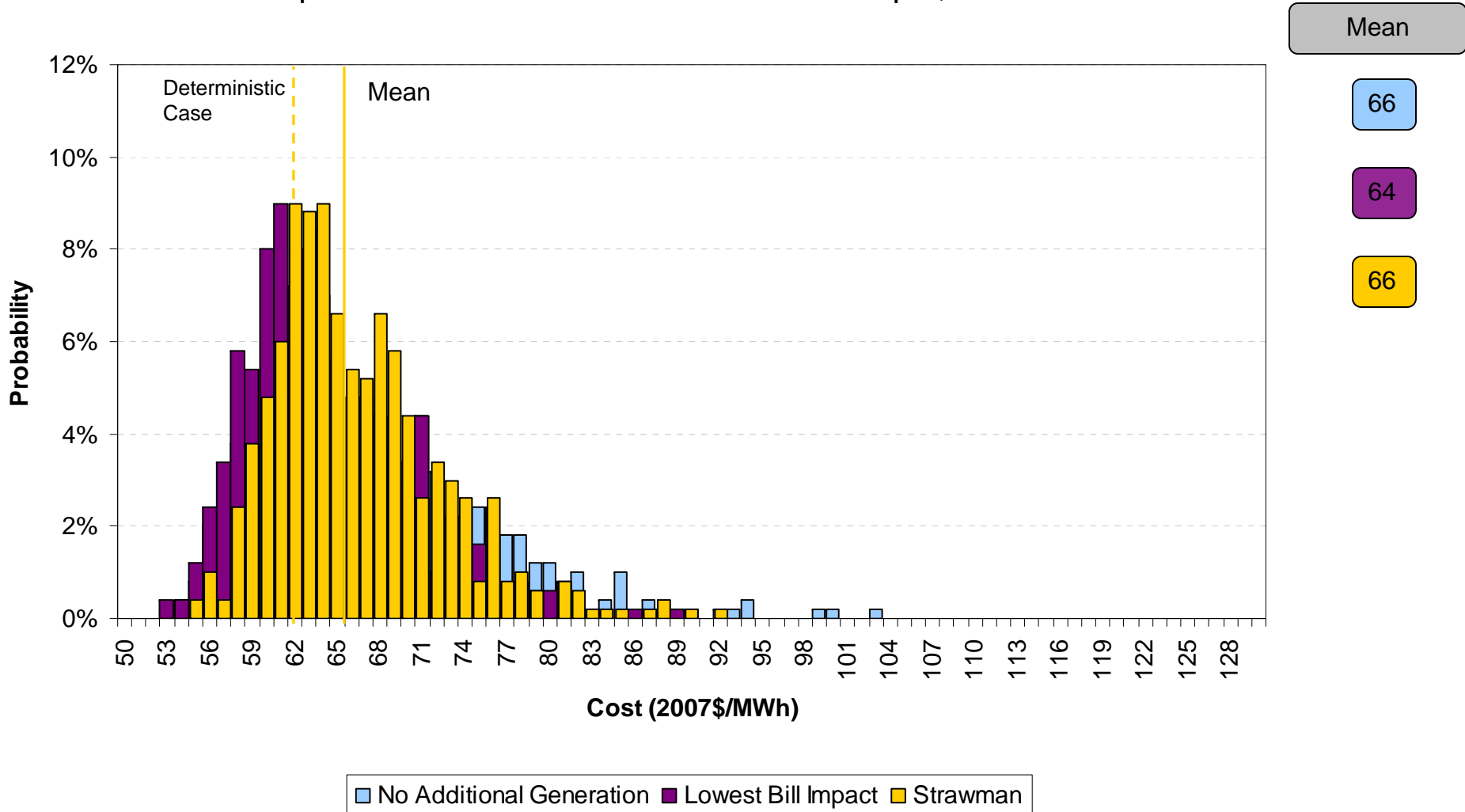
Portfolio Distributions (2020): Lowest Cost Meeting Council Goals

- The Lowest Cost portfolio shifts distribution to the left and narrows it



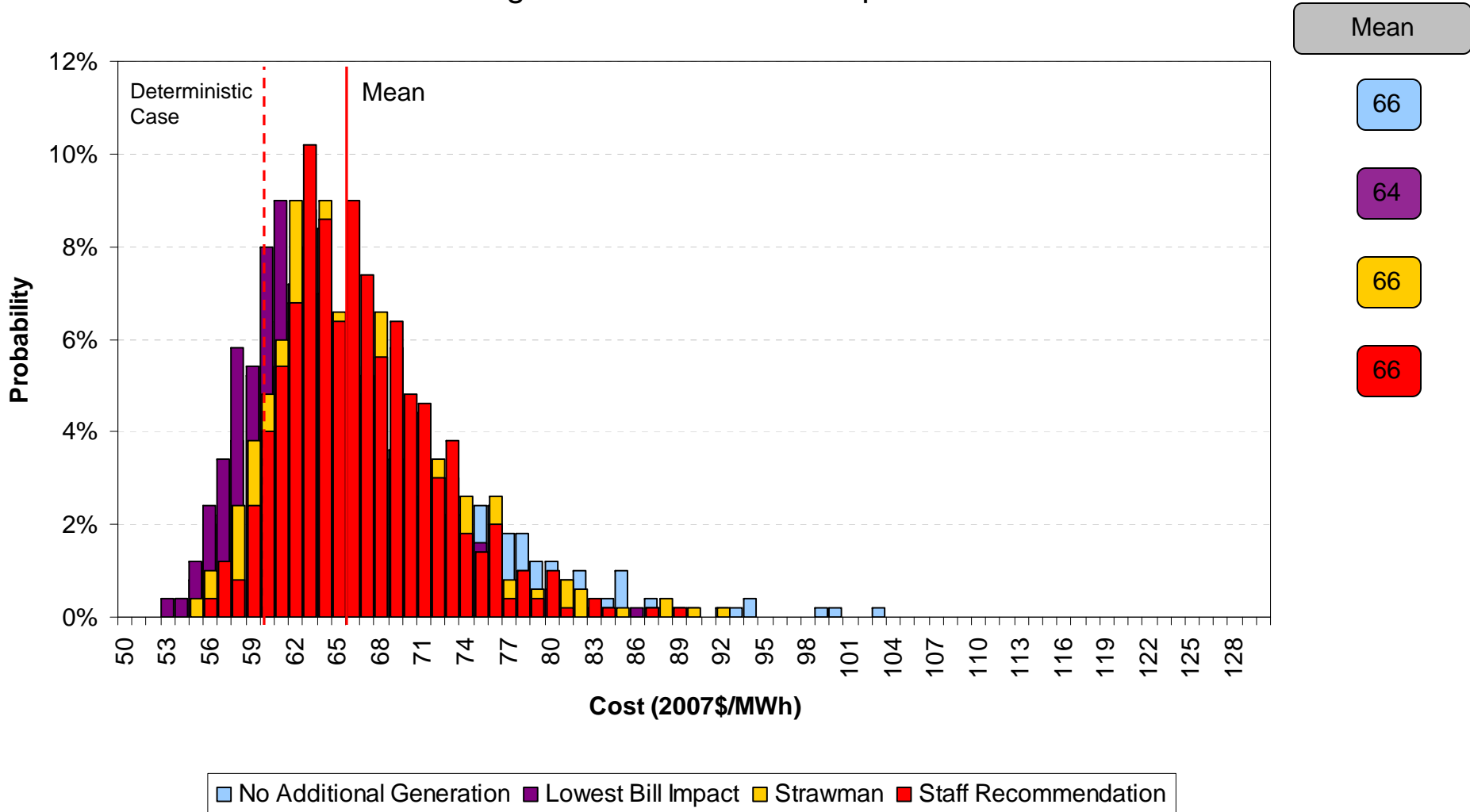
Portfolio Distributions (2020): Strawman

- The Strawman portfolio has similar costs to the status quo, but has a narrower distribution



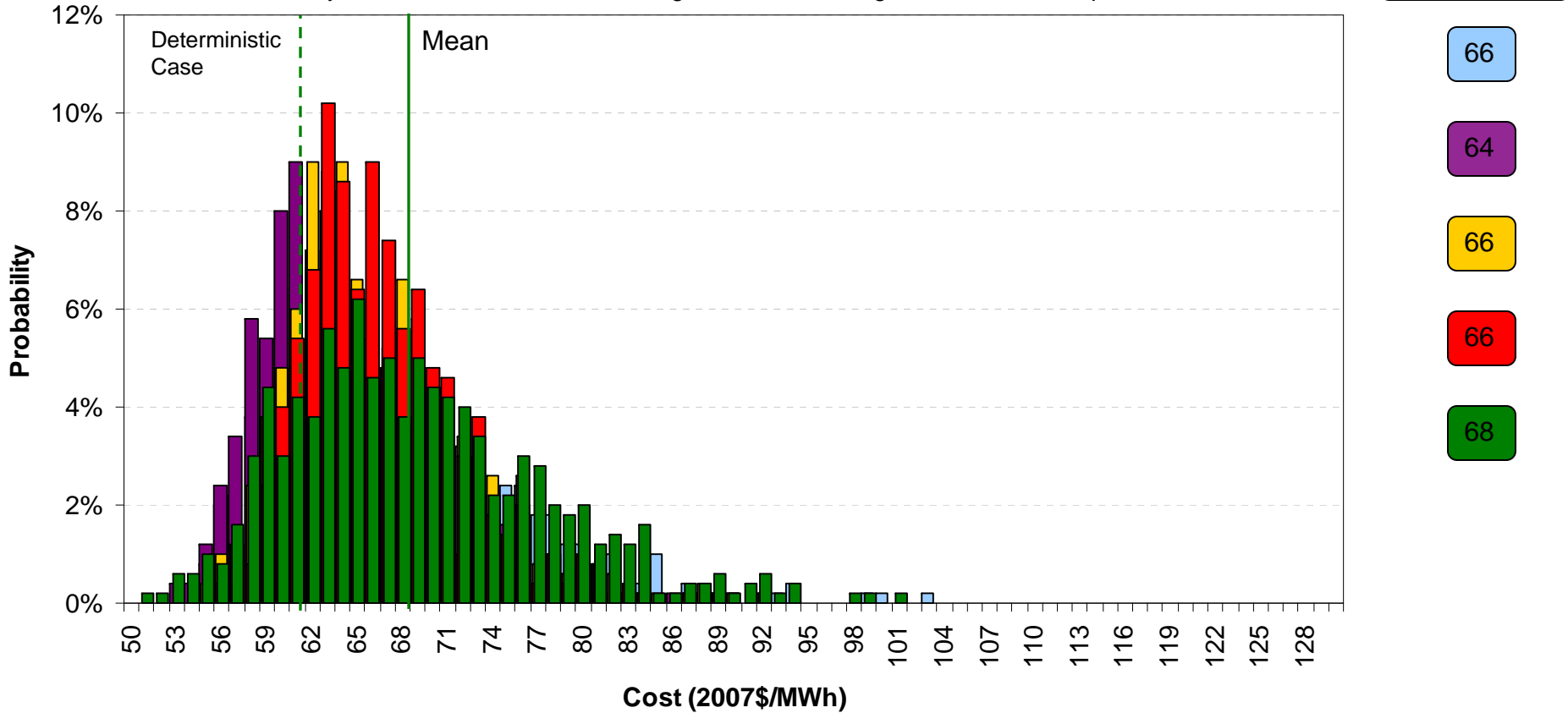
Portfolio Distributions (2020): Staff Recommendation

- Staff Recommendation has tightest distribution of all portfolios



Portfolio Distributions (2020): Replace FPP with Renewables

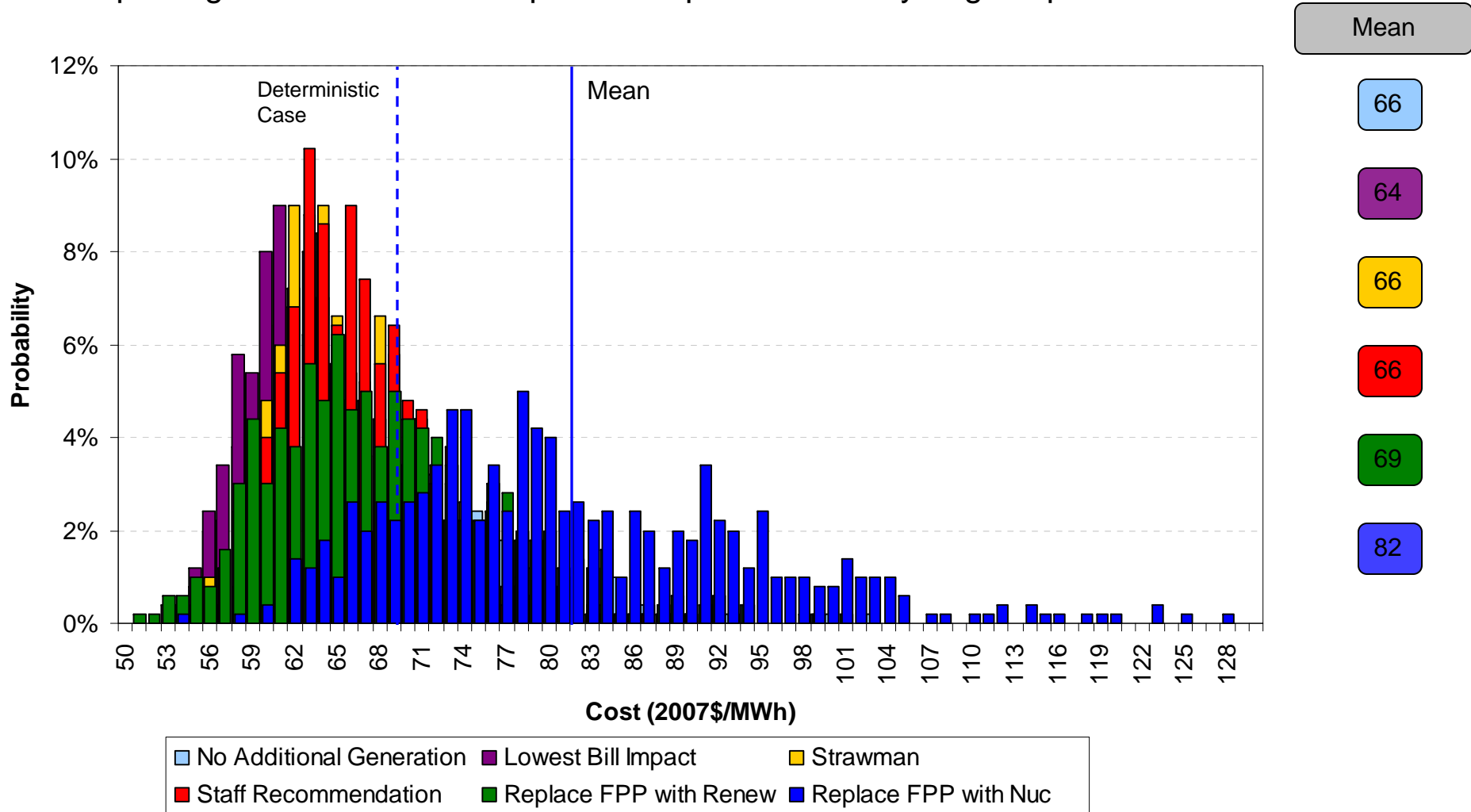
- Replacing FPP adds cost and risk relative to all previous portfolios
 - This portfolio builds more capacity and thus is exposed to more capital cost risk
 - It is also heavily reliant on variable renewable generation, causing increased market purchases



■ No Additional Generation
 ■ Lowest Bill Impact
 ■ Strawman
 ■ Staff Recommendation
 ■ Replace FPP with Renew

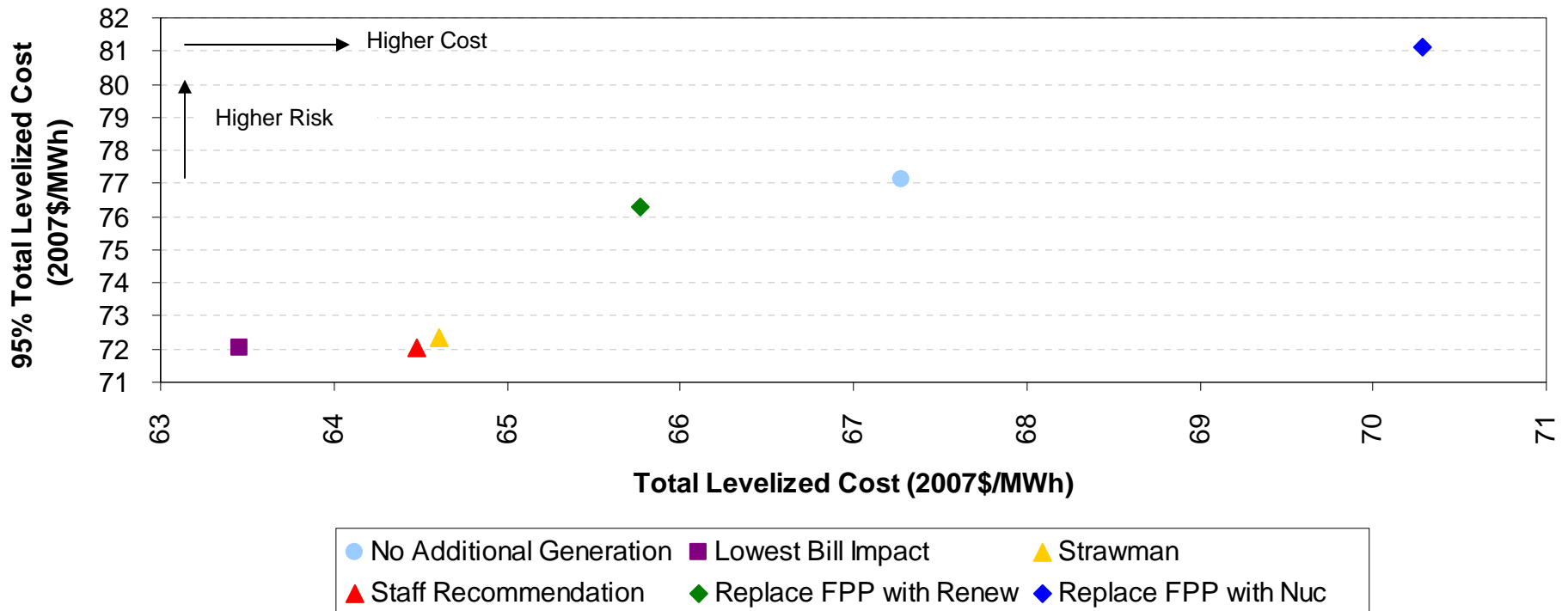
Portfolio Distributions (2020): Replace FPP with Nuclear

- Replacing coal with nuclear exposes the portfolio to very large capital cost risk



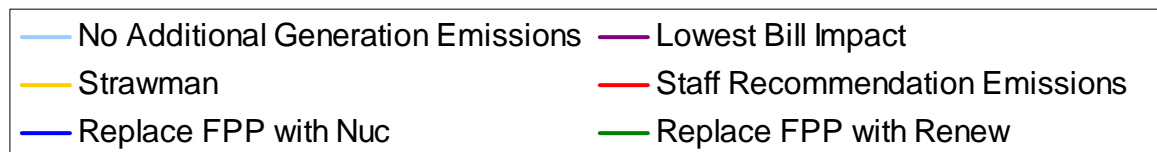
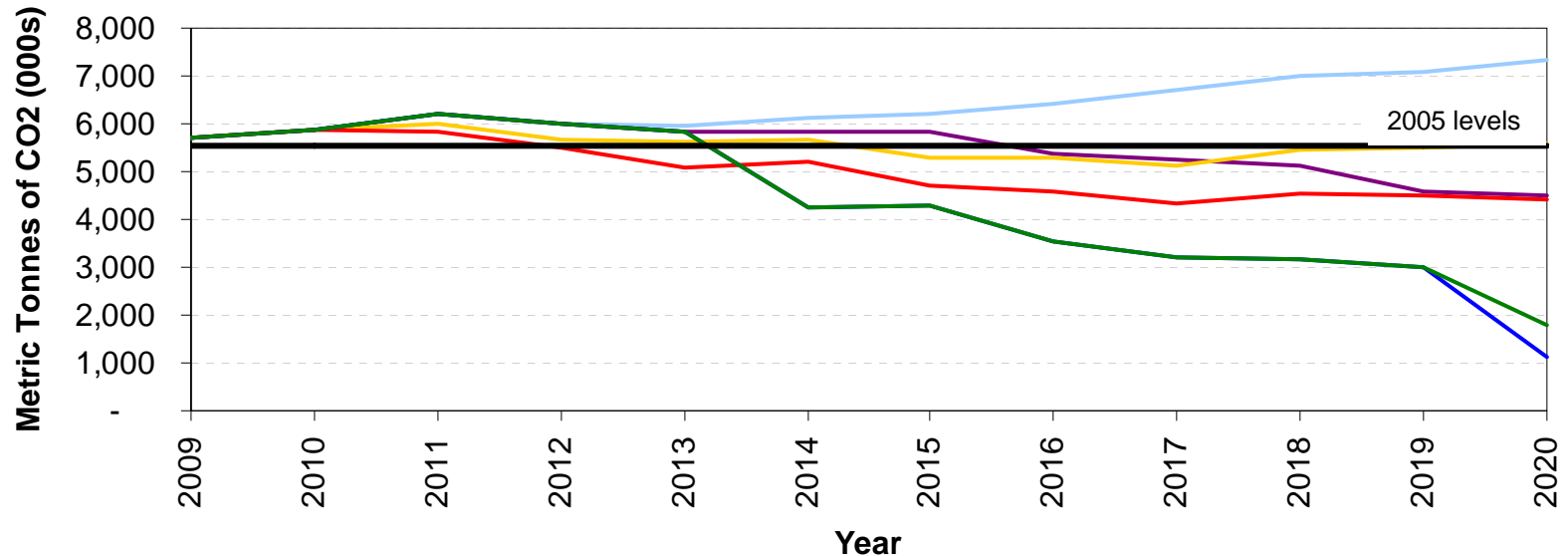
Expected (mean) Value of Levelized Cost (500 iterations)

- When the costs are levelized from 2009 through 2030 (NPV averaged across time), the differences in 2020 are offset by the fact that most portfolios are similar prior to 2017
- The No Additional Generation portfolio increases in cost and risk at it becomes more exposed to the market over time



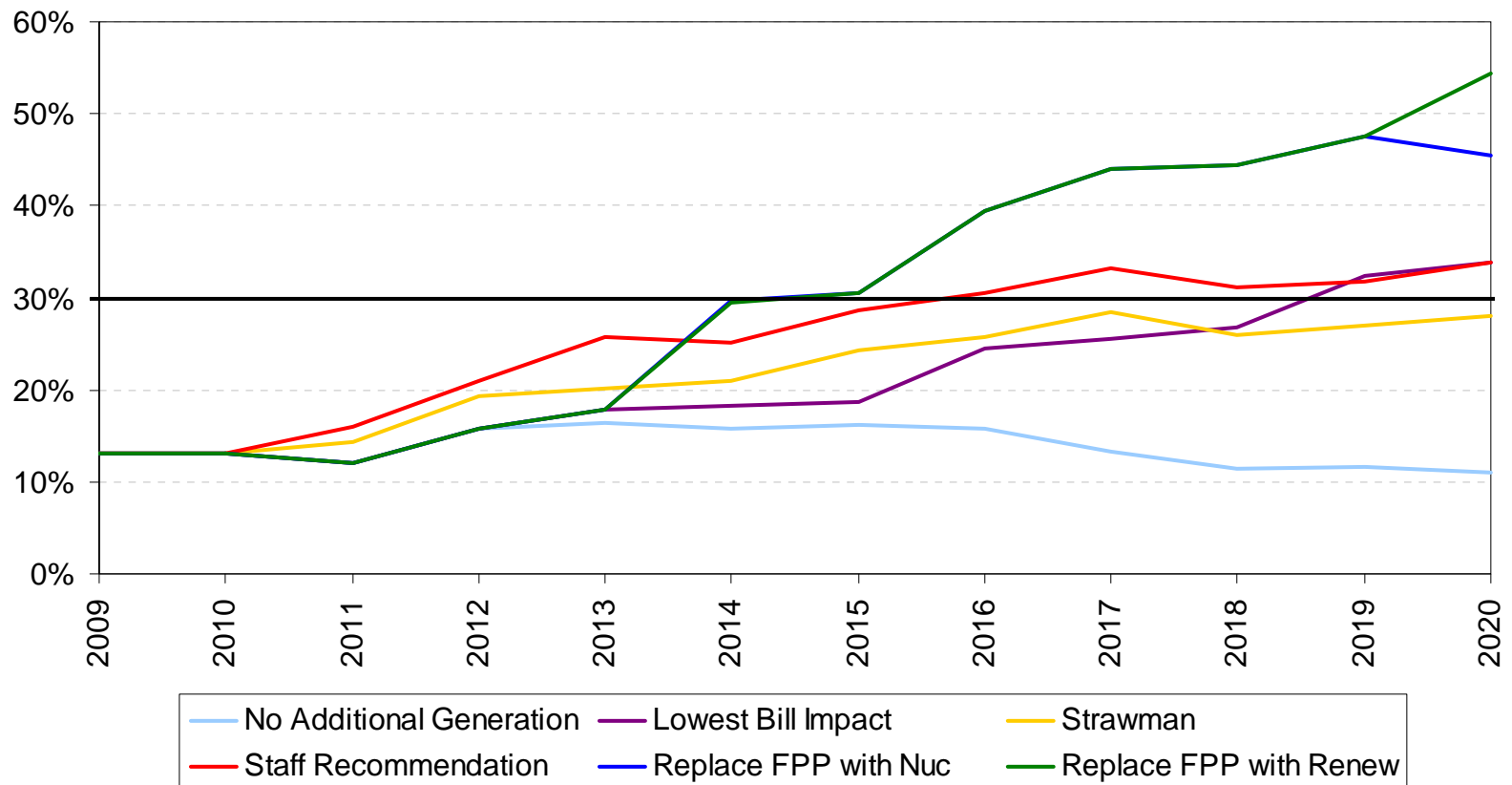
Expected Value of Portfolio Emissions (500 iterations)

- The Staff Recommendation and Replace FPP portfolios reduce below 2005 levels by 2014
- The Staff Recommendation, the Lowest Bill Impact, and the Replace FPP portfolios reduce below 17% of 2005 levels by 2020
- The Staff Recommended portfolio achieves larger reductions sooner than the Lowest Bill Impact case from 2011-2018.



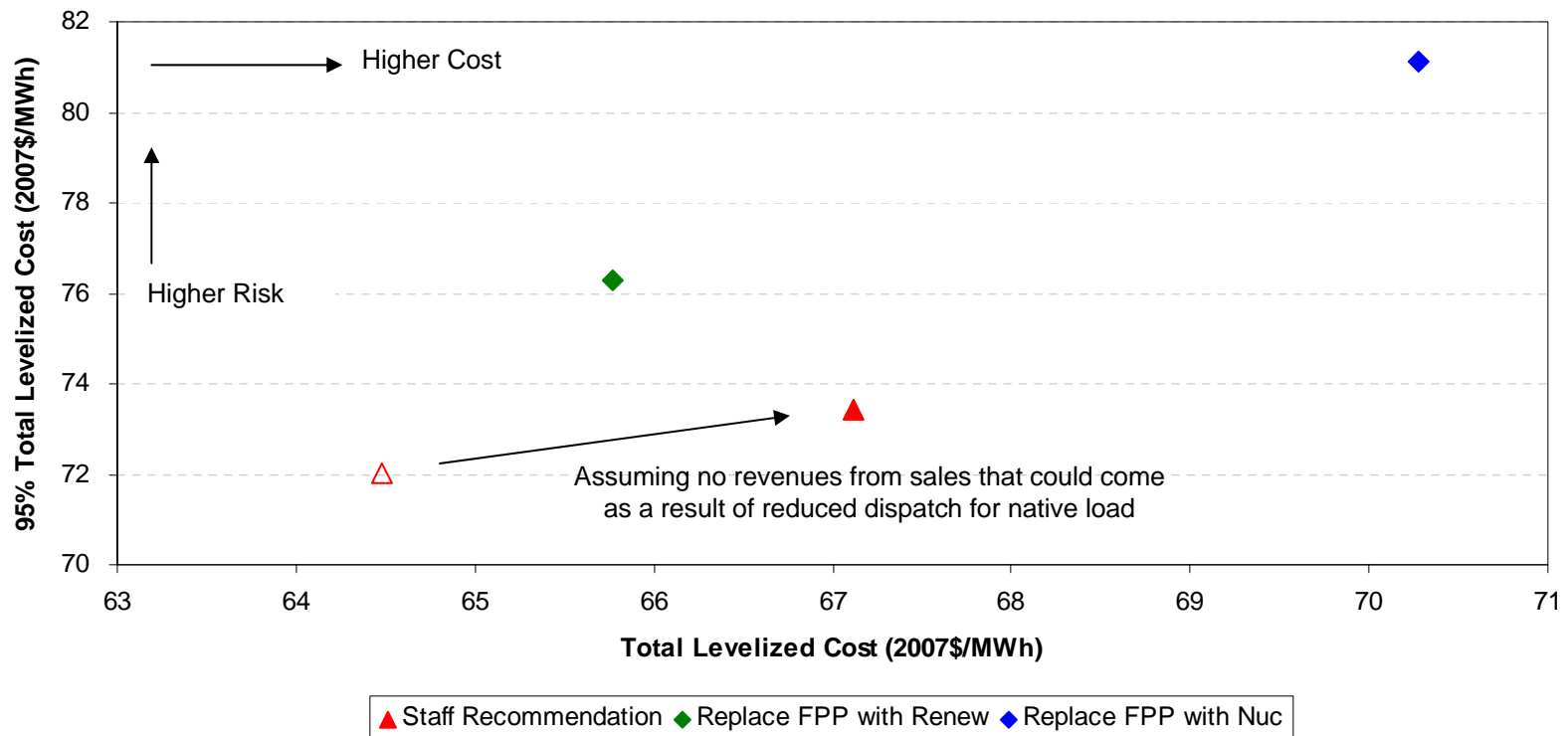
Expected Value of Percentage Renewable Generation

- All Portfolios except for No Additional Generation achieve around 30% generation from renewables by 2020
- Replacing FPP and the Staff Recommended Portfolio achieve the 30% threshold earlier than the Lowest Bill Impact and Strawman Portfolios



Potential Sale of FPP or Power from FPP

- If Austin Energy's share of FPP power can be sold at a margin around \$8-10/MWh, the expected value of portfolio costs become similar to the Staff Recommendation on a levelized basis through 2030, though at higher risk.
 - If levelization is done only through 2020, sale margin must be around \$17-18/MWh
- Assuming a 20 year stream of such revenue, a 75% capacity factor and a 5 percent discount rate, this equates to a sale price in the range of \$700 - \$1,500/kW (\$425 – \$910 million dollars)

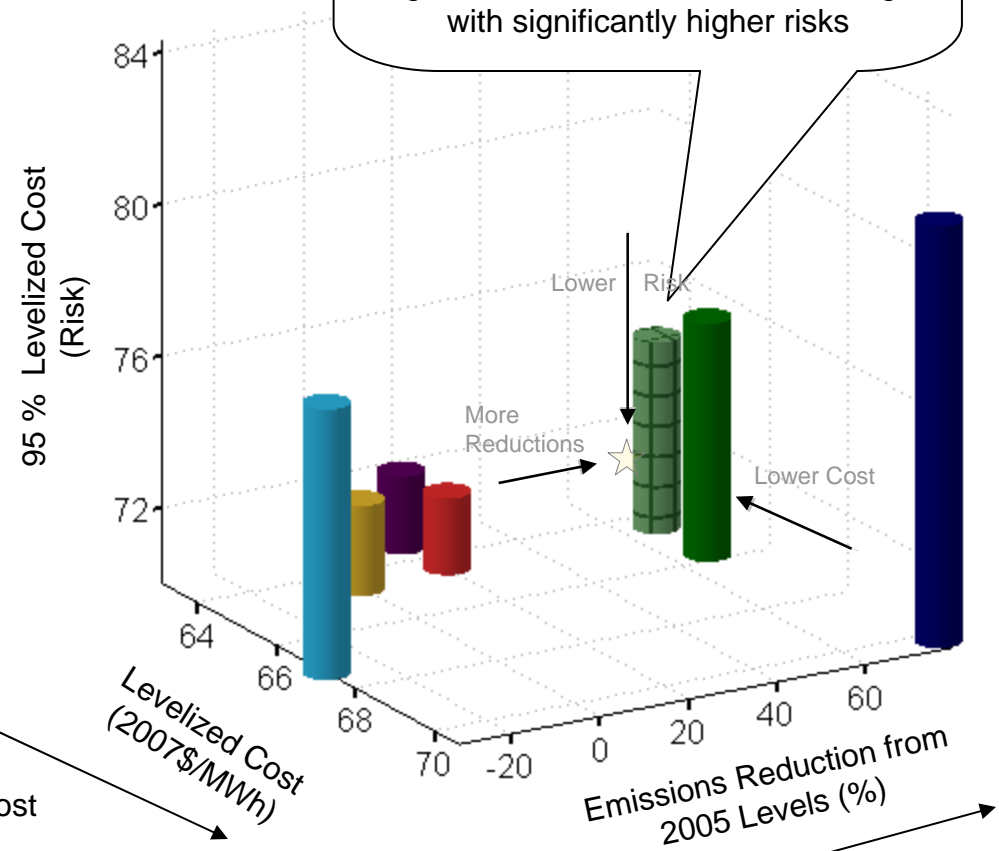


Levelized Comparison of Cost, Risk, and Emission Reductions

If FPP is able to be sold, the Replace FPP with Renewable Portfolio can be cost-competitive with the Staff Recommendation, while maintaining higher emissions reductions, although with significantly higher risks

- Portfolios**
- No Add. Gen.
 - Lowest Bill Impact
 - Strawman
 - Staff Rec.
 - Replace FPP Ren
 - Replace FPP Nuc

Increasing Risk

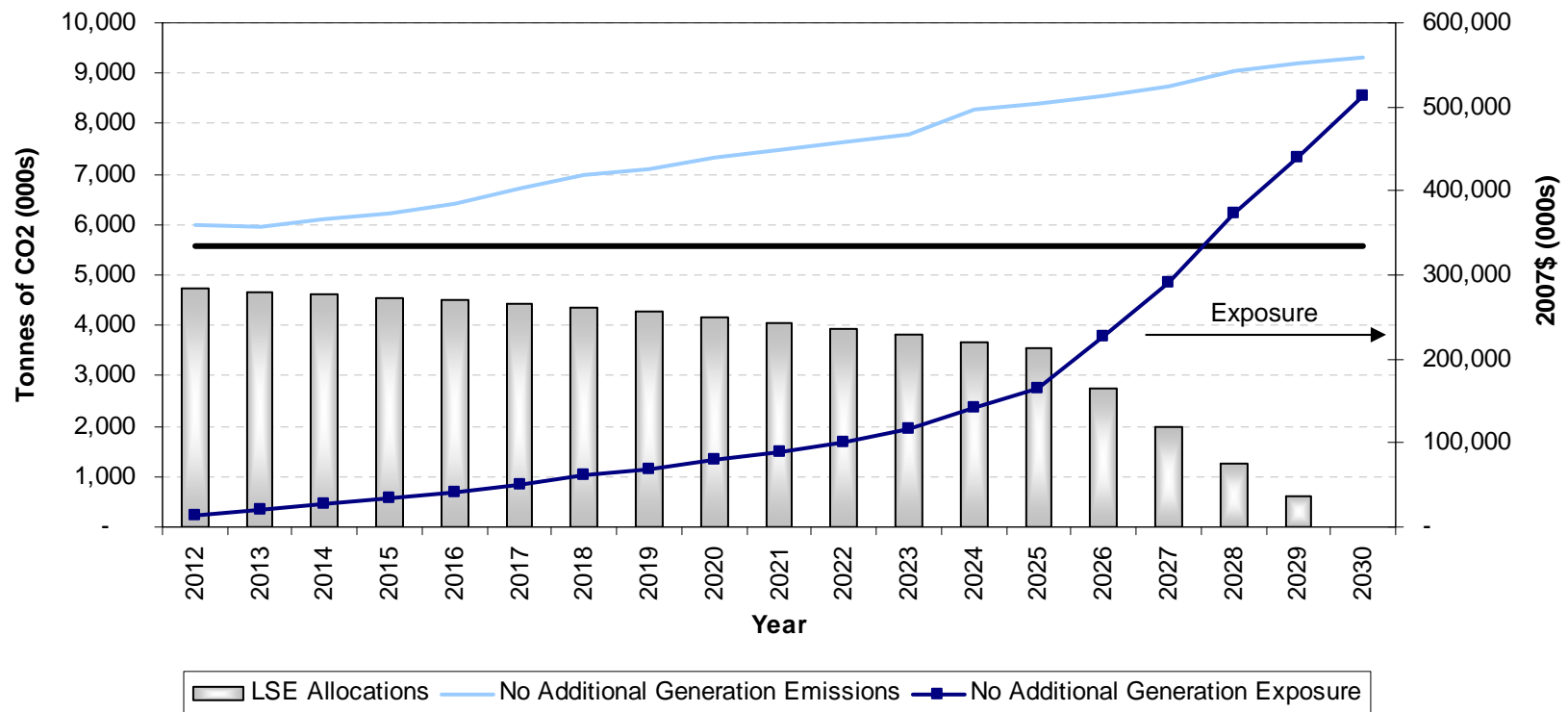


Increasing Cost

Better Emissions Reductions

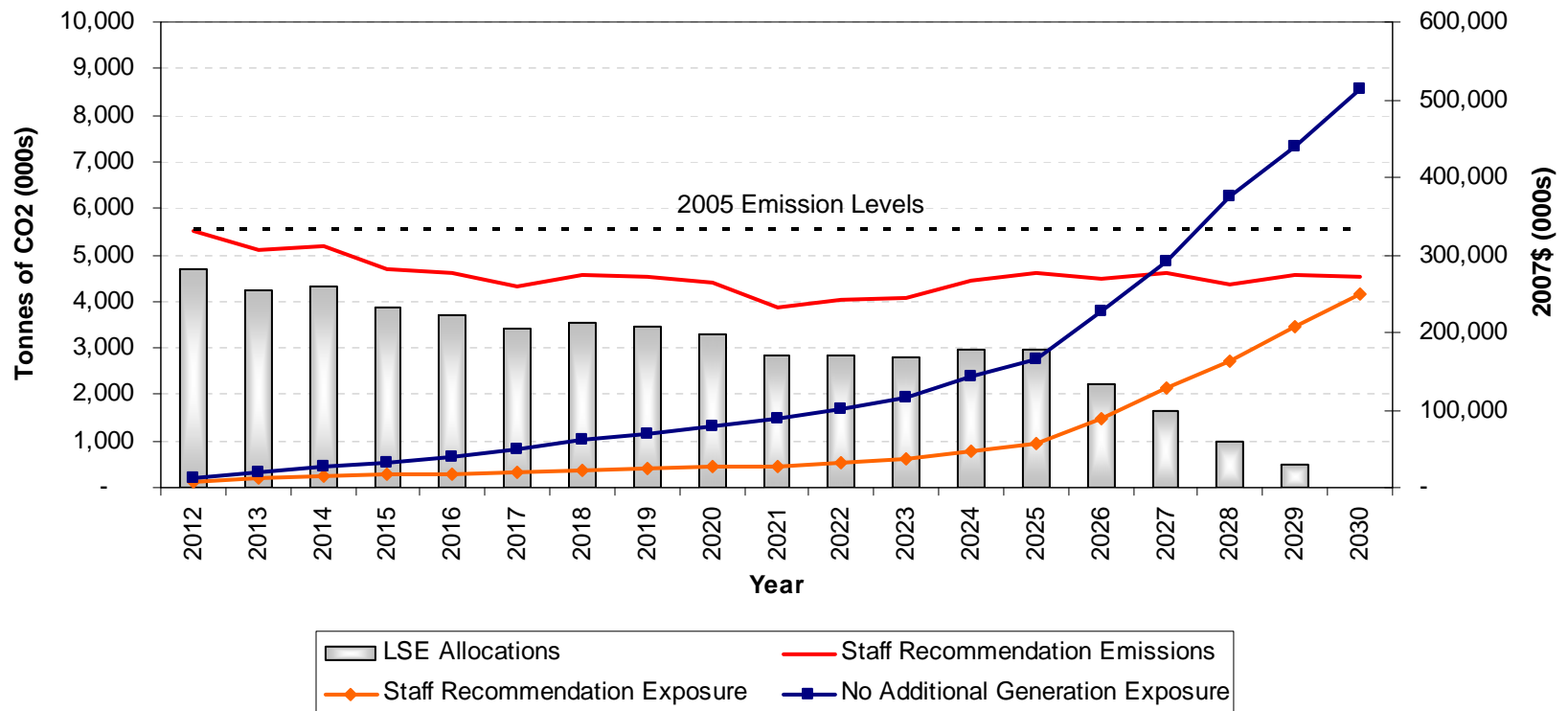
Emission Allowance Exposure Would Grow Significantly under Status Quo Conditions

- As free allocations decline and as price of allowances is expected to increase, total value of emissions exposure increases exponentially



Potential Staff Recommendation Carbon Exposure

- Staff Recommendation reduces emissions in line with expected allowance allocations under Waxman-Markey until after 2025
 - Beyond 2025, exposure (value of carbon liability not covered by free allowance allocations) grows significantly

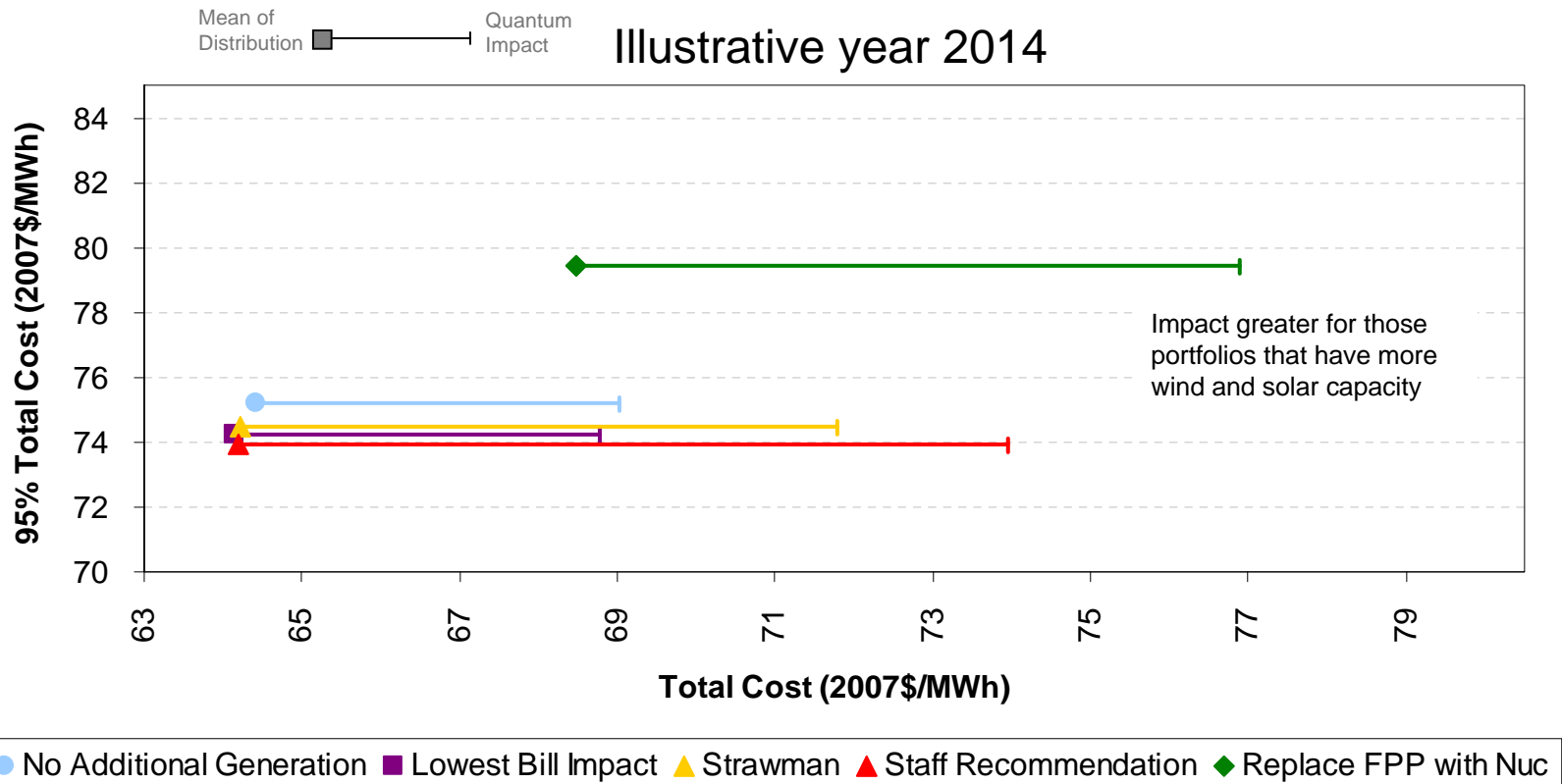


Quantum Scenarios

- CREZ transmission expansion uncertainty
 - Delay expected transfer capability increases between ERCOT West and ERCOT South
 - Congestion price expected to be equal to the zonal price differential between West and South
 - Delay transmission expansion and determine impact for each year on the consequences of more congestion on total portfolio costs
- High CO₂ price regime
 - Assume stricter CO₂ policy that would result in more significant coal retirements and higher carbon compliance prices in the market

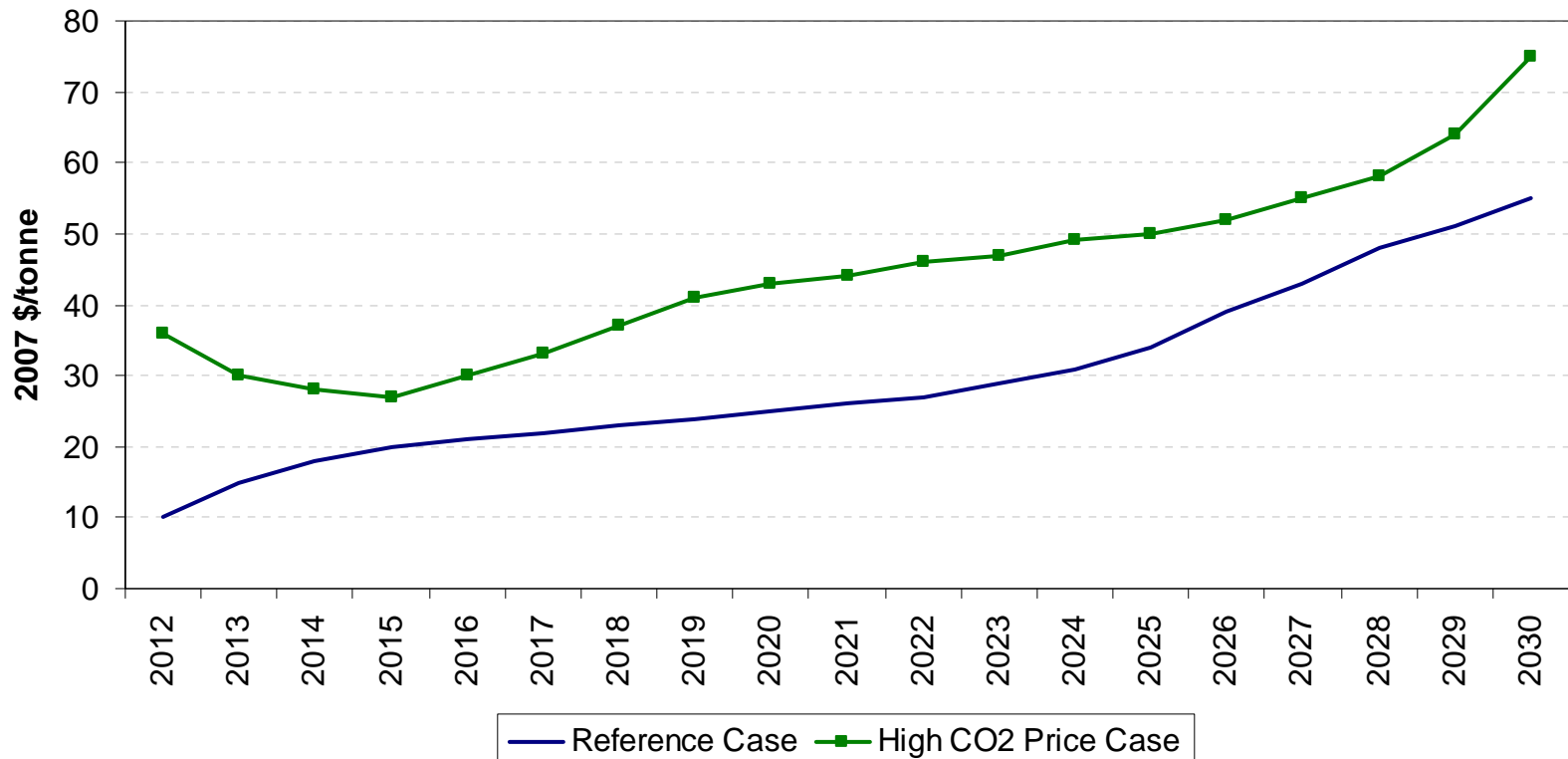
CREZ Quantum Scenario – Delay in Transmission Expansion

- Staff Recommendation has significant wind and solar capacity additions by 2014
 - Quantum scenario results in an expected impact on total portfolio costs of ~\$10/MWh if no changes were made to the portfolio in response to transmission delays
- Portfolios with higher remote renewable additions increase portfolio costs close to 95th percentile levels



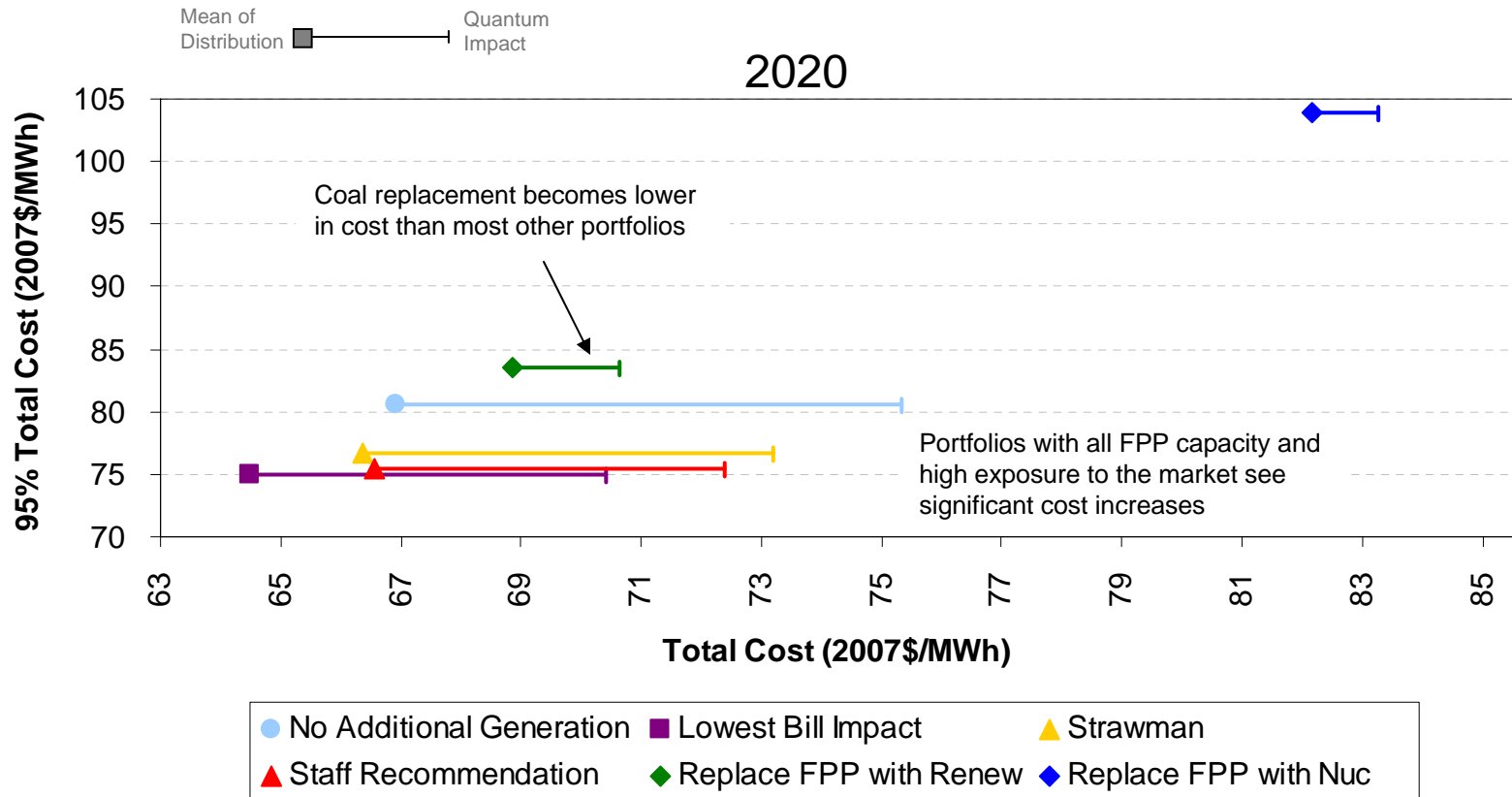
High CO₂ Price Scenario

- Increase in expected price of CO₂ results in:
 - Increased market coal retirements
 - Longer term market response with additional non-emitting resource additions
 - Increased natural gas demand and price in intermediate years, but lower demand and price in the out years as larger amounts of renewable capacity come online



High CO₂ Quantum Scenario

- High CO₂ costs increase No Additional Generation portfolio costs by \$8.50/MWh, while portfolios that replace FPP experience cost increases in the \$1-2/MWh range



Summary of Results and Conclusions

| Portfolios | Primary Objectives | | | | | | Additional Concerns | |
|---------------------------------------|-----------------------|---------------------------|---------------|---|---------------|---|--|--|
| | Cost in 2020 (\$/MWh) | Risk 95% of Cost (\$/MWh) | RPS % in 2014 | % CO2 Reduction Below 2005 Levels in 2014 | RPS % in 2020 | % CO2 Reduction Below 2005 Levels in 2020 | Exposure to High CO2 Costs Increased Cost in 2020 (\$/MWh) | Exposure to Transmission Uncertainty Increased Cost in 2014 (\$/MWh) |
| No Additional Generation "Status Quo" | 66 ● | 81 ● | 16 ● | -10 ● | 11 ● | -32 ● | 8 ● | 5 ● |
| Strawman | 66 ● | 77 ● | 21 ● | -2 ● | 28 ● | 0 ● | 7 ● | 8 ● |
| Staff Recommendation | 66 ● | 75 ● | 25 ● | 7 ● | 34 ● | 20 ● | 6 ● | 10 ● |
| Lowest Bill Impact | 64 ● | 75 ● | 18 ● | -5 ● | 34 ● | 19 ● | 6 ● | 5 ● |
| Replace FPP with Renew with CC | 69 ● | 83 ● | 30 ● | 25 ● | 54 ● | 71 ● | 2 ● | 8 ● |
| Replace FPP with Renew No CC | 68 ● | 84 ● | 30 ● | 24 ● | 54 ● | 68 ● | 2 ● | 8 ● |
| Replace FPP with Nuclear | 82 ● | 104 ● | 30 ● | 24 ● | 45 ● | 80 ● | 1 ● | 8 ● |

- The Staff Recommendation and the Lowest Bill Impact portfolios achieve lowest cost and low risk, with CO₂ emission reductions in line with the 2020 targets of the current Waxman-Markey federal proposal; the Staff Recommendation achieves goals earlier
- Replacing FPP significantly reduces CO₂ emission liability, but at the expense of increases in cost and risk associated with new capital expenditures and exposure to power or fuel market uncertainty
- CREZ transmission expansion uncertainty poses a risk for all portfolios with wind additions, especially in years prior to 2015

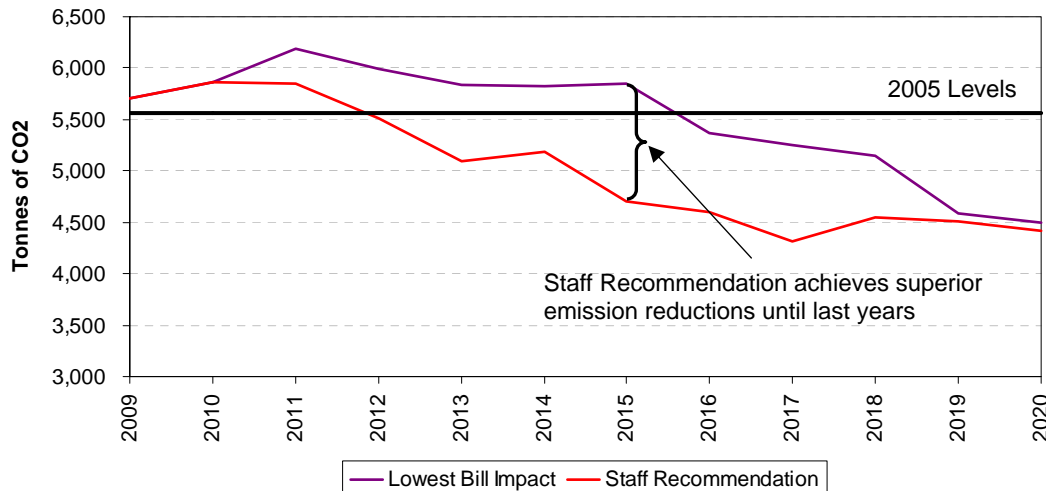
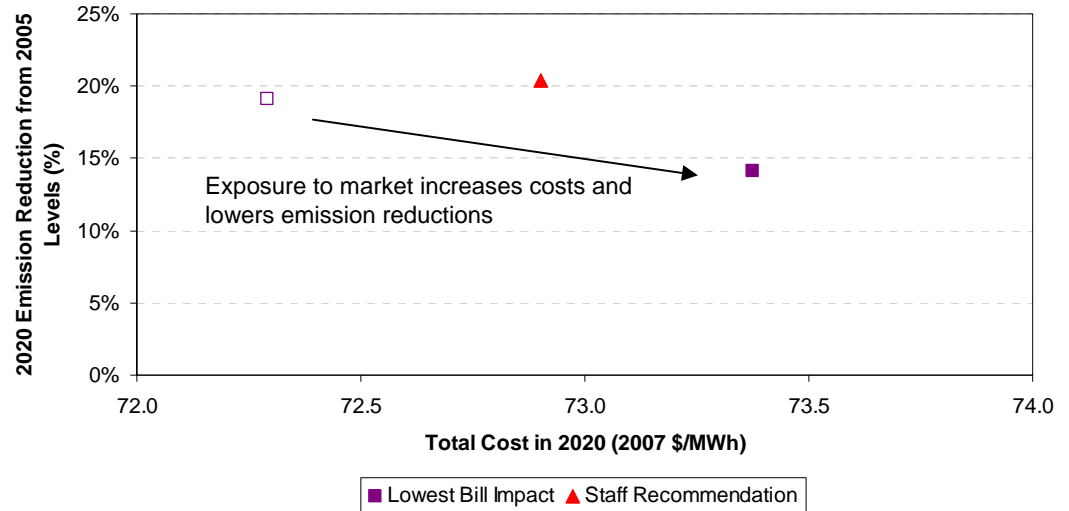
Note: Expected value of distribution of potential outcomes is displayed for primary objectives. This differs from deterministic "best guess" results from Phase I.

Staff Recommendation Portfolio

- The Staff Recommendation achieves high and early levels of environmental stewardship at a cost less than 2.5% higher than the Lowest Bill Impact portfolio on a levelized basis and with the same level of cost risk
 - It displaces around 15% of existing coal-fired generation with over 1,200 MW of renewable additions from 2009 through 2020
 - It achieves the 2020 RPS goal and 2020 likely CO₂ emission reduction target *by 2016*
 - It surpasses the RPS target (34%) and carbon emission limits (20% below 2005 levels) by 2020

Comparison of Staff Recommendation to Lowest Bill Impact

- Staff Recommendation mitigates against risk of supply unavailability for geothermal and landfill gas additions with CC and more readily available renewable additions



- Staff Recommendation reduces emissions and achieves higher RPS much earlier than Lowest Bill Impact portfolio

Comparison of Staff Recommendation to Replace FPP

- Replacement of FPP increases cost and widens the distribution of potential outcomes by removing coal generation from resource base
 - Staff Recommendation results in smaller reduction in coal generation for native load through renewable displacement
- Higher than expected CO₂ compliance costs could make replacement more competitive, but lower than expected costs would result in higher deviation in costs

