Supplemental Material for Task Force Portfolio Analysis

October 13, 2009

PACE

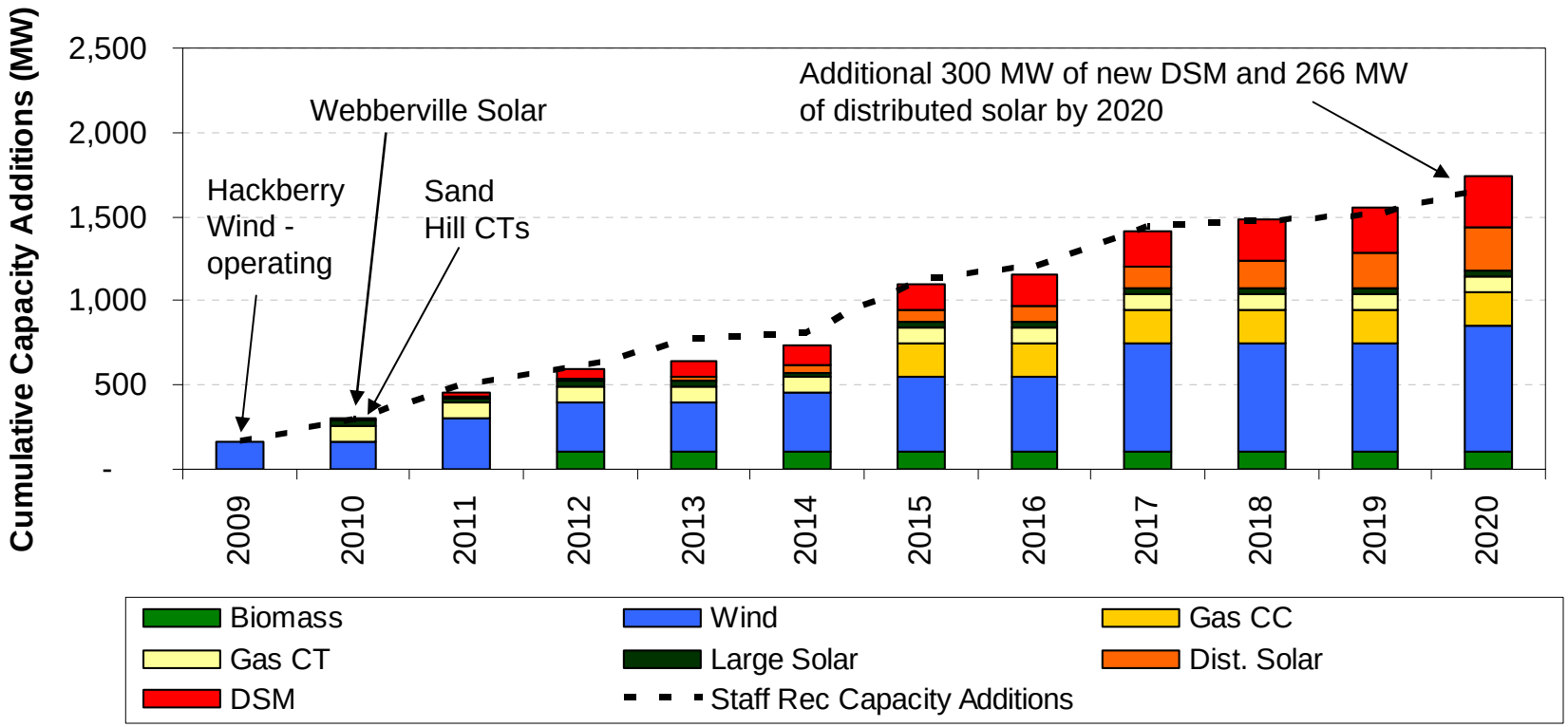
Task Force Scenario #2 (1000 MW DSM Replacement with Strawman Base)

Scenario #2 Key Assumptions and Changes

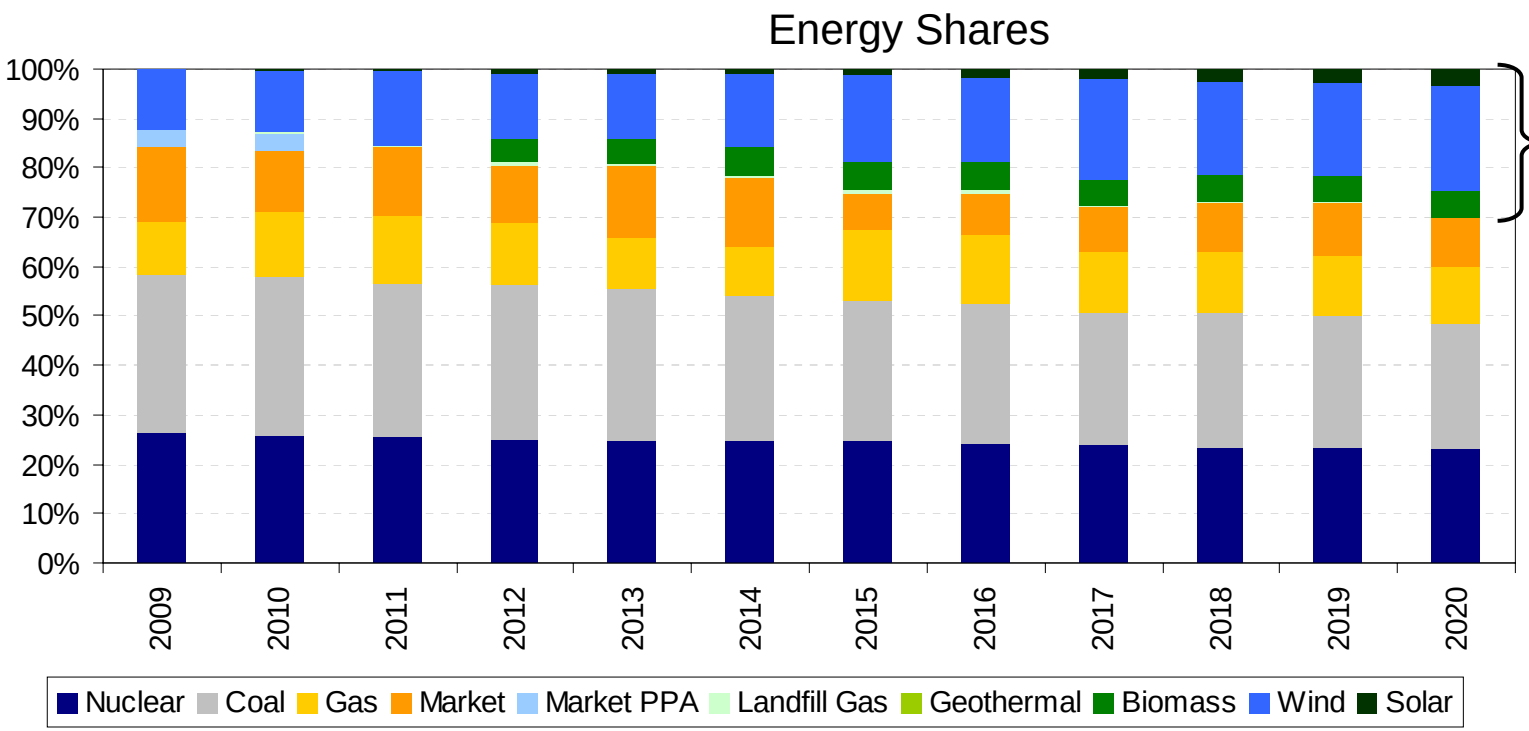
- Total DSM increased to 1,000 MW by 2020
  - Beyond 700 MW in base load forecast, first incremental 100 MW costs $500/kW, with each incremental 100 MW being 25% higher
- 266 MW of distributed solar PV in order to meet a 30% RPS
  - Operational evidence indicates lower capacity factors than larger, centralized systems
  - AE would offer a rebate
  - Distributed solar will lower on-system energy demand and impact overall portfolio costs per MWh
- No biomass beyond current contract
- As in other screening runs, base cost summaries exclude off-system sales revenues

Task Force Scenario #2 Annual Capacity Expansion Plan

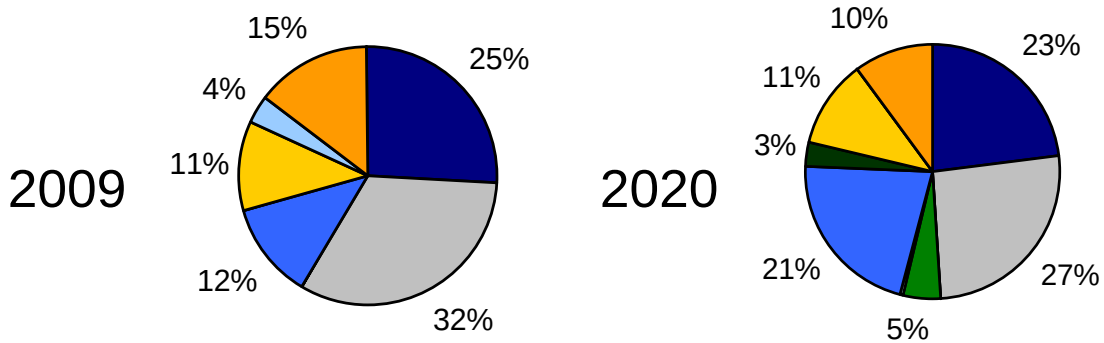
- Base expansion plan (2009-2020) includes 300 MW Natural Gas, 750 MW of wind, 30 MW of large solar, 266 MW of distributed solar, 100 MW biomass, and 300 MW of additional DSM



Task Force Scenario #2 Annual Generation for Native Load

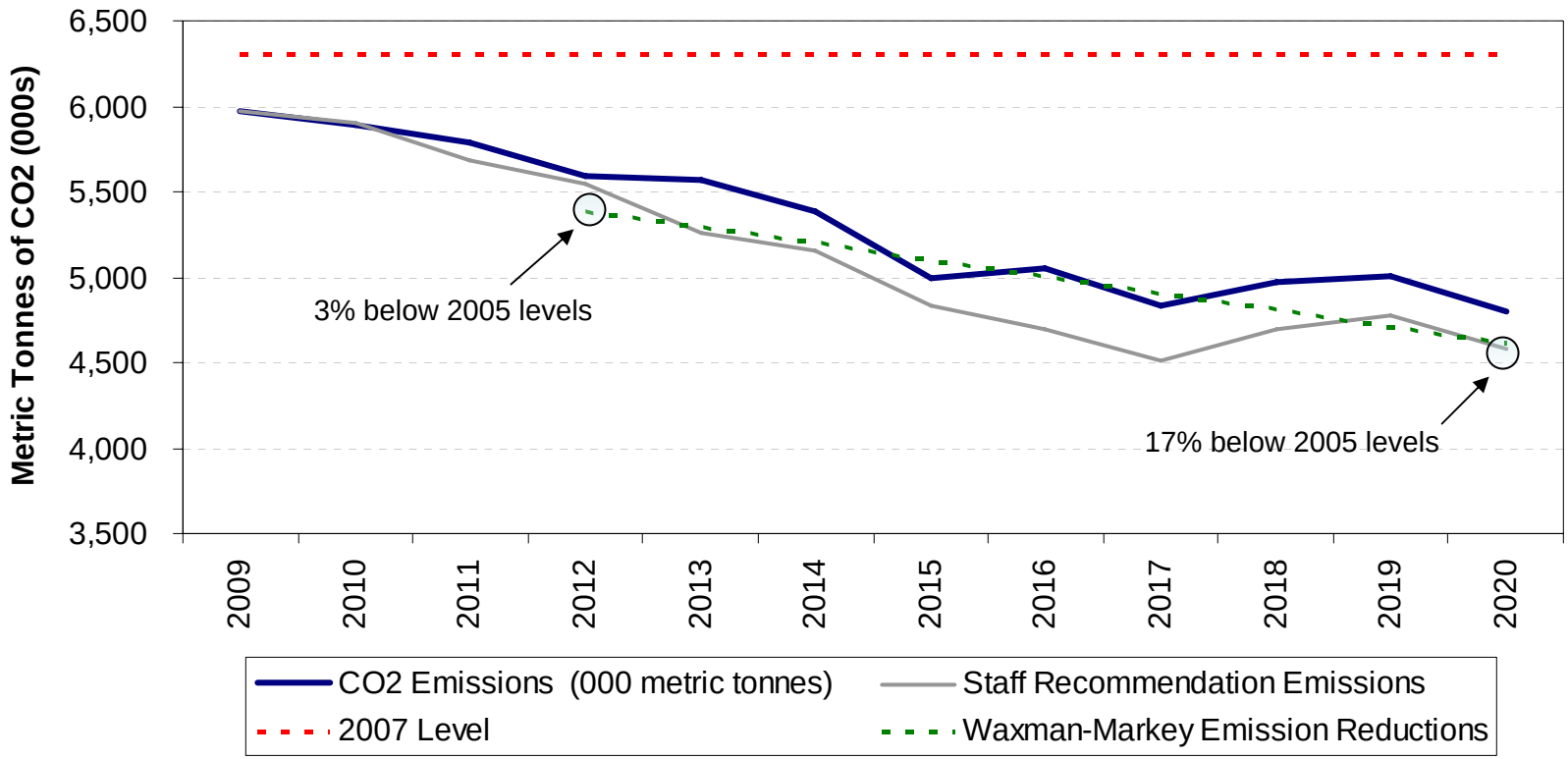


- When counting all local solar generation, portfolio achieves a 30% RPS
- Staff Recommendation achieves 36%



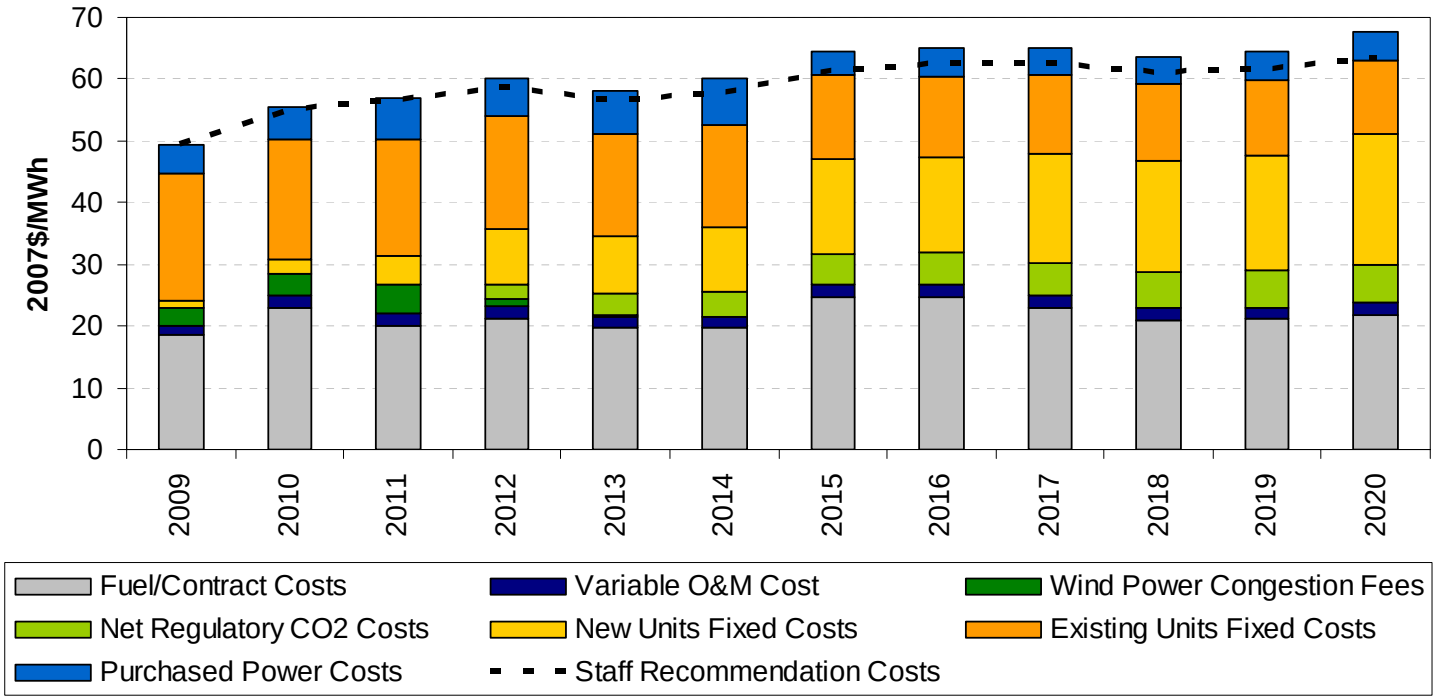
Task Force Scenario #2 CO_2 Emissions

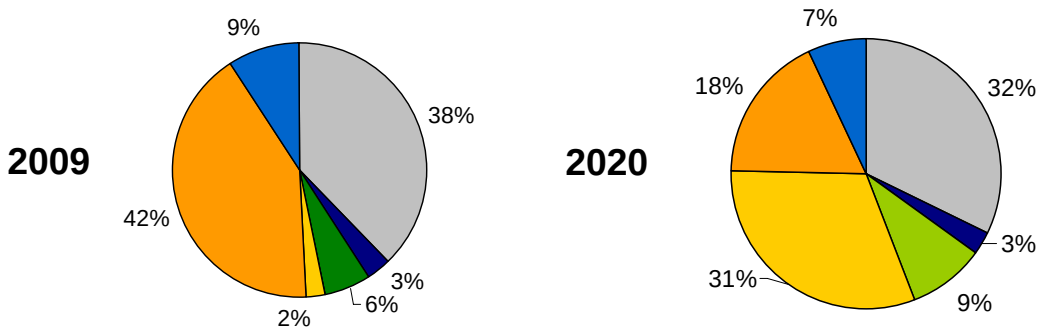
- CO_2 emissions expected to decline with DSM and renewable additions.
- However, emission reductions do not physically reach expected federal targets like in the Staff Recommendation



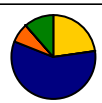
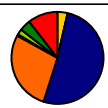
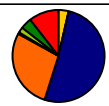
Cost Components for *Task Force Scenario #2*

- Additional DSM and distributed solar fixed costs result in portfolio cost increases above Staff Recommendation





Comparison to Strawman and Staff Recommendation (Without Sales)

Description		Units	*Strawman*	*New Staff Recommen-dation*	*Task Force Scenario #1*	*Task Force Scenario #1 Solar as Off-System*	*Task Force Scenario #2 Revised*
Capacity Additions (MW)	**Early (09-12)**	MW	525	590	985	985	598
	Middle (13-16)	MW	420	550	830	830	557
	Late (17-20)	MW	350	435	940	940	586
Replacements		MW	0	0	600 (Coal)	600 (Coal)	0
Levelized NPV of Portfolio Costs		2007 $/MWh	57.97	58.15	62.59	64.15	60.08
Real Increase from 2009 to 2020		%	29%	28%	46%	59%	38%
Nominal Increase from 2009 to 2020		%	69%	69%	92%	108%	81%
CO2 Emissions 2020		Tonnes (000s)	5,238	4,580	2,170	2,170	4,803
2020 CO2 Percent Reduction from 2005		%	-6%	-18%	-61%	-61%	-14%
Renewable Percentage in 2020		%	30%	36%	52%	48%	30%
Total Capital Expenditures		$MM	1,796	2,671	3,301	3,301	1,725
Incremental Capacity Additions		Share					

*Solar as “off-system” refers to the condition where distributed solar is considered similar to DSM, excluding generation from total energy served

Gas Wind Solar Bio DSM

Comparison to Strawman and Staff Recommendation (With Sales)

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	Middle (13-16)	MW	420	550	830	830	557
	Late (17-20)	MW	350	435	940	940	586
Replacements		MW	0	0	600 (Coal)	600 (Coal)	0
Levelized NPV of Portfolio Costs		2007 $/MWh	55.18	54.41	60.68	62.17	56.67
Real Increase from 2009 to 2020		%	20%	15%	39%	51%	24%
Nominal Increase from 2009 to 2020		%	58%	51%	83%	98%	63%
CO2 Emissions 2020		Tonnes (000s)	5,238	4,580	2,170	2,170	4,803
2020 CO2 Percent Reduction from 2005		%	-6%	-18%	-61%	-61%	-14%
Renewable Percentage in 2020		%	30%	36%	52%	48%	30%
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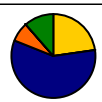
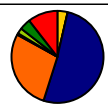
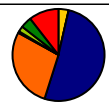
Incremental Capacity Additions		Share					

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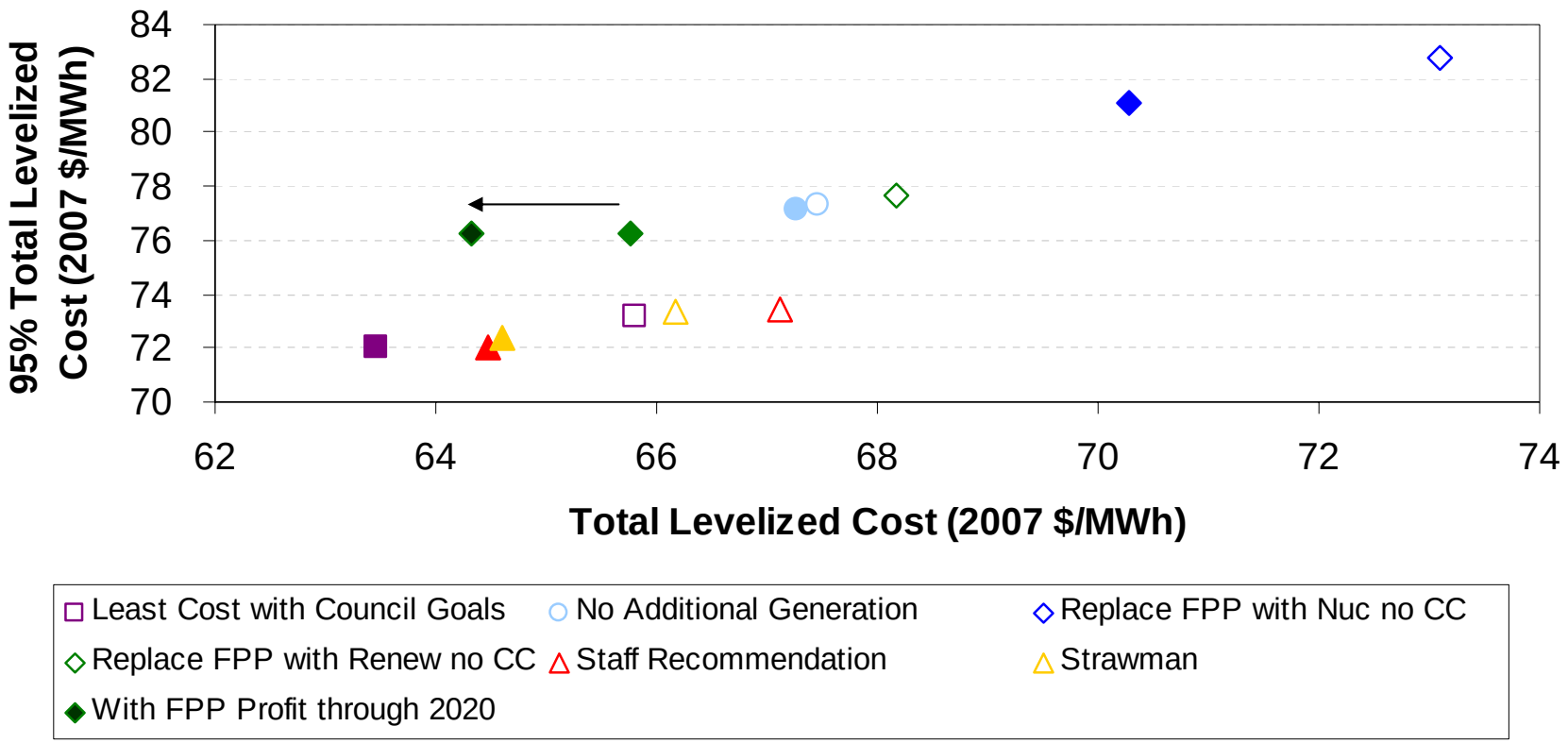
Gas Wind Solar Bio DSM

Additional Questions

Impact of FPP Merchant Sales on Levelized Portfolio Costs

- If margins from coal sales were accrued through 2020, overall levelized portfolio costs could be on equal footing with Staff Recommendation
- If margins were to continue to be realized beyond 2020, costs *could be lowered further*

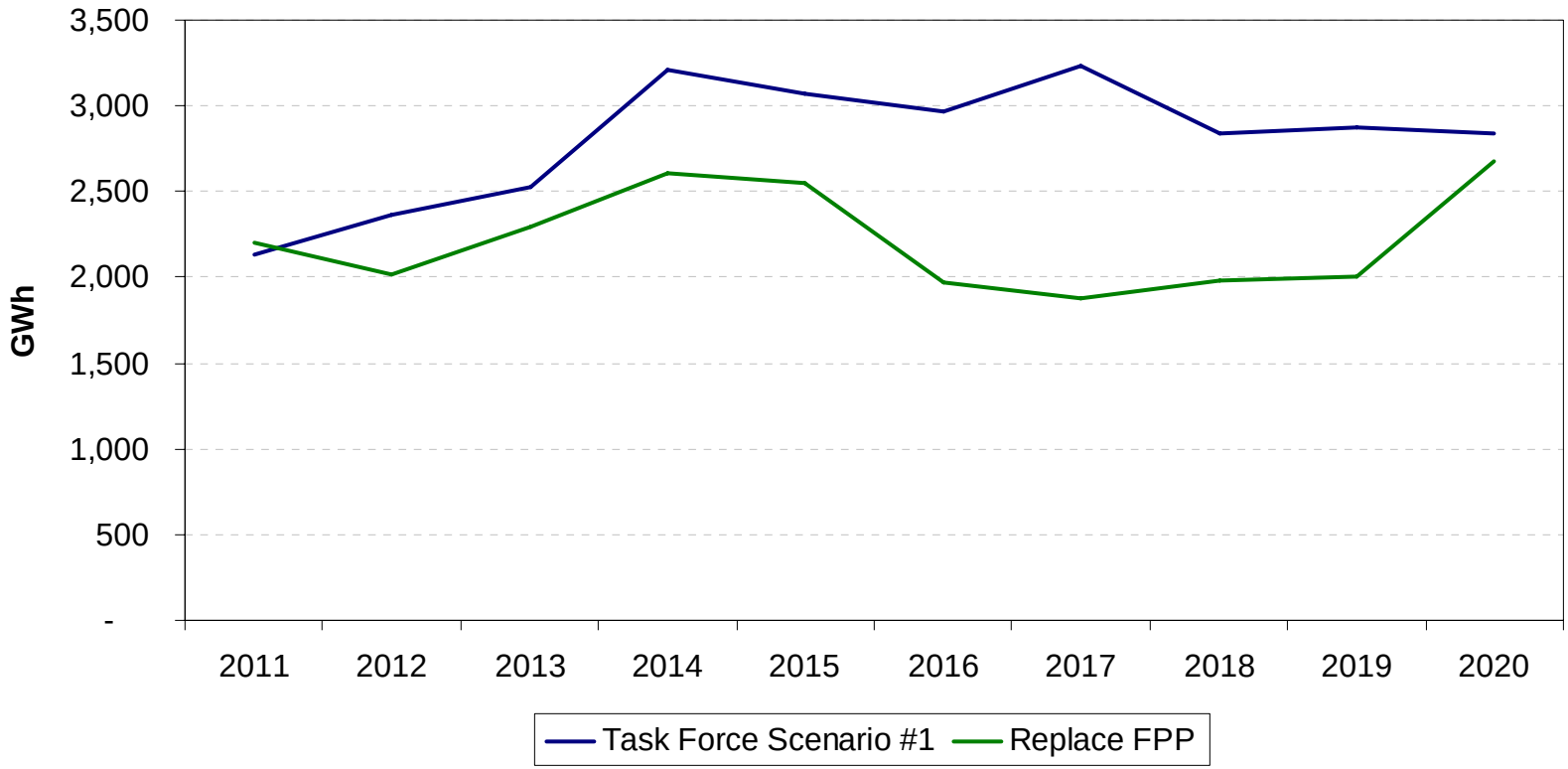


- Note that assessment is based on *one deterministic analysis*, and does not capture risks associated with coal plant dispatch, costs, and revenues

Illustration of Difference in Cost Increase with and without Solar "Off-system"

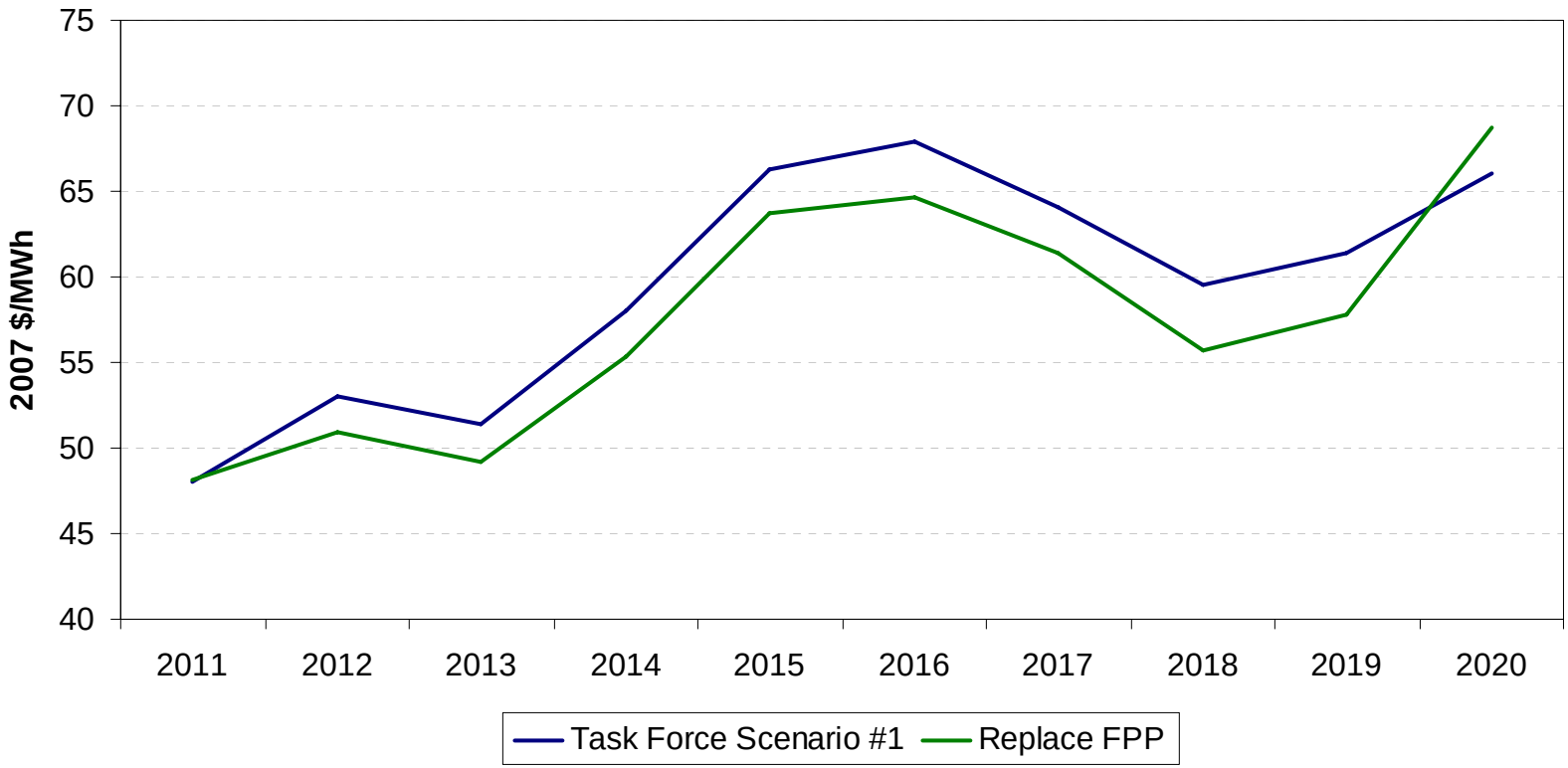
	Item	***2009***	***2020***	***Percent Change***
1	Revenue Requirement (nominal MM$)	642	1,268	
2	Sales Expectation (GWh)	12,563	13,594	
3	Generation from Remote Solar (GWh) 750 MW * 8760 hrs * ~16% CF	0	1,076	
4	Remaining Sales (GWh) (Row 2 – Row 3)	12,563	12,518	
5	Nominal $/MWh Cost (including solar as gen) (Row 1 / Row 2)	51.10	93.29	83%
6	Nominal $/MWh Cost (solar off-system) (Row 1 / Row 4)	51.10	101.30	98%

Purchased Power Quantity Comparison
Task Force Scenario #1 vs. Replace FPP



		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Task Force Scenario #1	GWh	1,913	1,566	2,131	2,369	2,531	3,208	3,072	2,966	3,237	2,835	2,875	2,835
Replace FPP	GWh	1,913	1,588	2,207	2,017	2,291	2,602	2,553	1,967	1,873	1,979	2,003	2,683

Purchased Power Cost per MWh Comparison
Task Force Scenario #1 vs. Replace FPP



		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Task Force Scenario #1	$/MWh	29.97	42.04	48.04	53.01	51.39	58.00	66.29	67.93	64.08	59.54	61.39	66.06
Replace FPP	$/MWh	29.97	42.10	48.19	50.91	49.13	55.33	63.75	64.62	61.36	55.74	57.83	68.71

Costs per MWh of DSM

- In assessing DSM costs above those embedded in the original 700 MW and the additional 100 MW in the Staff Recommendation, Pace assumed full availability for each additional MW
  - Thus, for investment in a single year, costs would be as follows:

Installation Cost ($/kW)	Fixed Cost ($)	Generation Saved (MWh)	Cost/MWh (1 year)
$625	$625,000	8760	$71.35
$781	$781,250	8760	$89.18

  - If amortization of costs was made over 10 years, they would be in the range of $9-$12/MWh
- Assumption for full availability is likely aggressive, but due to upfront cost outlays, additional DSM increments above 800 MW total are more costly through 2020 and on an NPV basis

Costs per MWh of Solar

- As with DSM, the payment structure of the distributed solar resources introduces multiple ways of presenting costs per MWh. Rebate costs are paid once during the year of project installation:
  - If the costs were only incurred for one year of operation, they would range from $1,128/MWh (in first year) to $665/MWh by 2020
  - With a weighted average cost per Watt of $1, a levelized NPV of costs would be $92/MWh if amortized over 10 years or $57/MWh if amortized over 20 years
- Since all costs are paid in year of installation by AE, costs per MWh through 2020 are significantly elevated above those that would result from an amortization

Annual Costs for Screening Runs

- Major differences between Task Force #1 and Replace FPP
  - Large solar cost outlays vs. amortized capital expenditures ($750 million over 10 years for new solar PV)
  - Early coal replacement results in cost increases before expected rises in natural gas and carbon compliance costs and disproportionately impacts NPV
  - Market purchases are higher in both quantity and cost per MWh
  - Additional DSM above 800 MW (significant MWh assumed, but costs are incurred upfront)