

IRP Modeling Results
May 11th, 2007
Deliverable to Stakeholders

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Overview

Recall IRP Terms of Reference

- The objective will be the minimization of the cumulative present worth of annual revenue requirements*, adjusted for end effects, and subject to a number of considerations, including:
 - System reliability requirements;
 - Plan robustness - the ability of a plan to withstand realistic potential changes to key assumptions;
 - Cash flow - the timing and magnitude of benefits relative to the timing and magnitude of required expenditures;
 - Flexibility - the absence of constraints on future decisions arising from the selection of a particular plan; and
 - Future regulatory emissions outlook.

*Note that the original terms of reference referenced annual revenue requirements based on total utility costs. As a result of including the analysis of DSM in the IRP, it was agreed with stakeholders that the IRP would evaluate total resource costs in the net present value analysis.

Collaborative Process

- Analysis was a collaborative process between the Company, Board Staff and their consultants, informed by consultation with stakeholders.
- The process included:
 - Using the basic assumptions to develop significantly different resource plans
 - Conduct sensitivity analysis on resource plans
 - Complete worlds analysis on resource plans
 - Agreement on analysis results
 - Documentation of analysis results
- Synopsis of the work done to date:
 - Started February completed May
 - 6 Base Plans
 - 96 Sensitivity runs
 - 9 World Runs
 - Additional analysis/troubleshooting
- Process also included screening of supply side options. This information is provided in Appendix A.

Confirm Basic Assumptions & Action to other Stakeholder Feedback

- As of February 22nd Technical Conference, no further changes were made to the Basic Assumptions
- An additional “World” was added to the modeling analysis plan, per Ecology Action Center (EAC). To allow the model to solve in these worlds additional options had to be added to the assumptions. These are explained later in the document
- Carbon Hard-cap to “Deep Green” trajectory:

Case	Approximate Emissions (Million tonnes)				
	2010	2015	2020	2025	2030
“Deep Green” World (per EAC)	6.44	4.93	3.43*	2.95	2.53

- Additional DSM “World” was added to the modeling analysis plan, per SEB request that potential MW/MWh contribution from Pulp & Paper be minimized due to upgrades already completed by this industrial sector

Review Key Issues of IRP

- Scrubber Timing versus Fuel Switching
- Amount of DSM
- Amount of Renewables Beyond RPS
- Next Major Generation Addition
- Near Term Supply & Environmental Additions
- Carbon Offsets/Credits versus Physical Reductions

High Level Conclusions

Results

- FGD appears to be needed and economic by 2020. May be required earlier depending on new regulations.
- 5% annual spending on DSM appears to be economic versus alternatives
- Renewables beyond RPS appear to be economically attractive.
- In almost all resource plans, certain near term supply and environmental additions are economic and provide for risk mitigation to meet constraints.
- Next major generation addition may be deferred indefinitely if DSM and renewables are successful
- New technology, import power, financial instruments may also be needed to meet near and longer term carbon regulation

Actions

- Complete further analysis of new federal emissions framework.
- Ramp up DSM effort to target savings for 5% spending case, monitor results
- Conduct wind integration study to assess feasibility and system costs
- Prepare related work orders.
- Monitor DSM results and integration study.
- Understand feasibility and timing of technology solutions in Nova Scotia.

Resource Plans

Description	Plan Name
5% Spend DSM + Renewables beyond Renewable Portfolio Standard (RPS)	Reference Plan
5% Spend DSM	DSM Plan
2% Spend DSM + Renewables beyond RPS	Renewables Plan
2% Spend DSM + New 400 MW Pulverized Coal Plant (LIN FGD 2020)	Coal Plan (FGD 2020)
2% Spend DSM + New 400 MW Pulverized Coal Plant (LIN FGD 2012)	Coal Plan (FGD 2012)
2% Spend DSM + New 280 MW CC Natural Gas Plant	Gas Plan

Detailed description of each plan is available in Appendix B. 5% spend on DSM equates to spending 5% of electric revenue on DSM

6 Base Resource Plans Summary MW

2007 IRP REFERENCE PLANS: SCHEDULE OF SUPPLY OR DSM MWs

	"Reference" 5% Spend DSM + Renewables > RPS	5% Spend DSM	2% Spend DSM + Renewables > RPS	2% Spend DSM Coal Plant (FGD in 2020)	2% Spend DSM Coal Plan (FGD in 2012)	2% Spend DSM Natural Gas
New Resources 2008-2014						
DSM	256	256	146	146	146	146
TUC 6	50	50	0	50	50	50
LM 6000						
Uprates	20	20	20	20	20	20
Hydro	4.3	4.3	4.3	4.3	4.3	4.3
RPS	166	166	166	166	166	166
Additional Wind	16		16			
	512.3	496.3	352.3	386.3	386.3	386.3
New Resources 2015-2029						
Additional Wind	144		144			
Pulverized Coal				400	400	
LM 6000						
Combined Cycle			280			560
DSM	857	857	559	559	559	559
SUBTOTAL	1001	857	983	959	959	1119
TOTAL SUPPLY AND DSM MWs OVER PLANNING PERIOD	1513.3	1353.3	1335.3	1345.3	1345.3	1505.3

Additional detail provided in Appendix C

Reference Case

Least cost plan using base assumptions
(5% DSM Spend + Renewables beyond RPS)

Reference Plan

5% DSM + Renewables

- Least cost plan under the “base assumptions”
 - Lowest long term cost as measured by the net present value of revenue requirements and total resource costs
 - It does not mean that it is the plan with the lowest rate impact or the plan that is the most robust
- 5% of annual revenue spent on DSM programs with ramp up beginning in 2008
- Ten 50 MW (16MW firm) blocks of wind added over the period 2013 to 2029 (beyond the RPS)

Note: Resource plan NPVs are shown in Appendix B

Loads & Resources – Reference Case

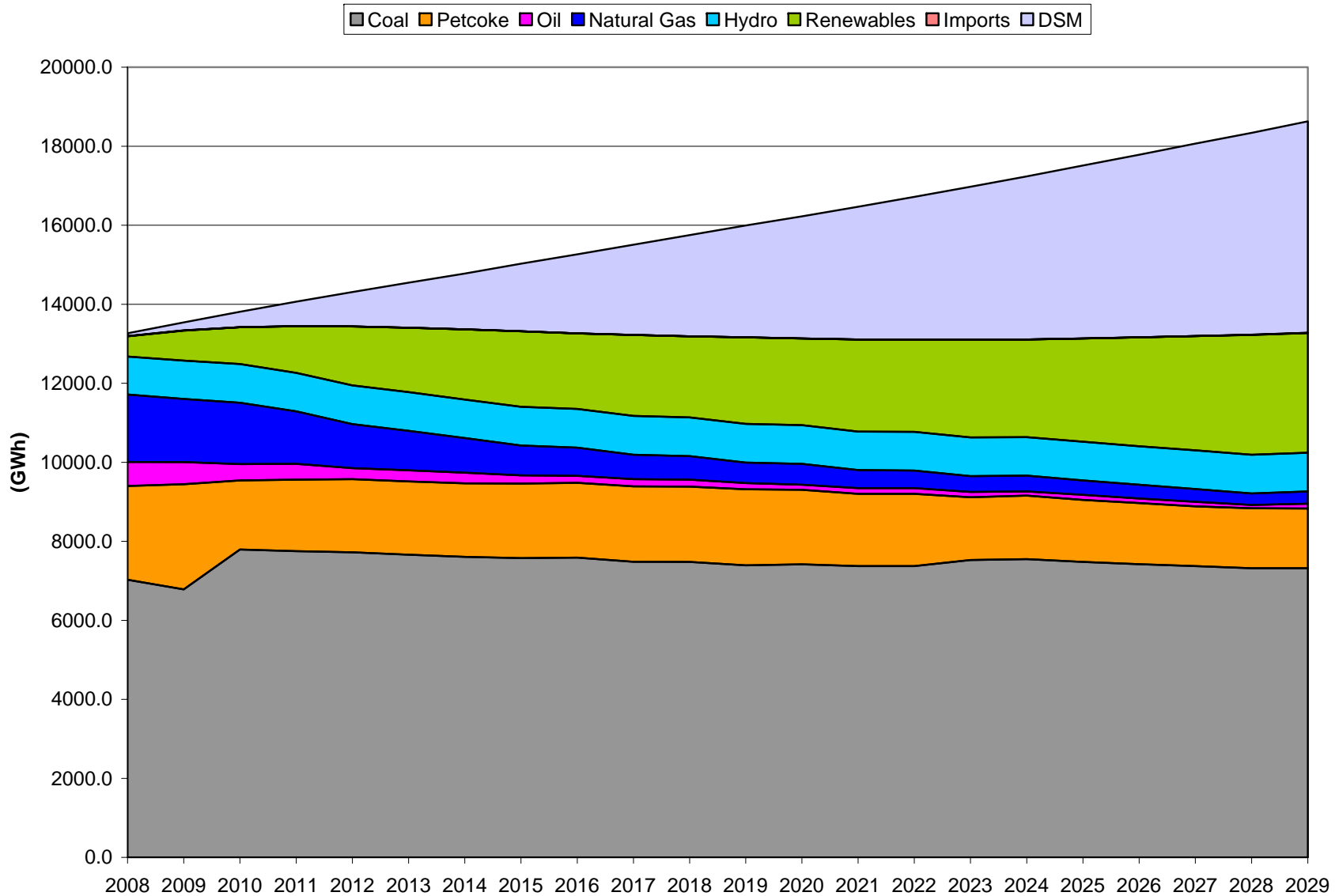
5% Spend DSM & Renewables beyond RPS

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2029
Peak Firm Load (MW)	1,927	1,973	2,019	2,061	2,101	2,141	2,181	2,224	2,264	2,306	2,856
Peak Firm Less DSM	1,919	1,951	1,975	1,988	1,995	1,999	1,998	1,999	1,998	1,999	2,066
DSM Firm	8	22	44	73	106	142	183	225	266	307	790
RM Required (MW)	460	468	474	477	479	480	480	480	479	480	496
Required MWs	2,302	2,342	2,371	2,386	2,395	2,399	2,398	2,399	2,397	2,399	2,479
Existing MWs	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334
Additions MWs											
TUC6			51.9								
LIN 1 Uprate					5						
LIN 2 Uprate			5								
LIN 3 Uprate				5							
LIN 4 Uprate			5								
Hydros			4.3								
RPS	4.7	28.8	27.8	19.2	28.8	38.7					
Additional Wind							16	16		16	
FGD											
Total Annual Additions	4.7	28.8	94	24.2	33.8	38.7	16	16	0	16	0
Total Cumulative Additions	4.7	33.5	127.5	151.7	185.5	224.2	240.2	256.2	256.2	272.2	376.2
Total Firm Capacity (MW)	2338.7	2367.5	2461.5	2485.7	2519.5	2558.2	2574.2	2590.2	2590.2	2606.2	2710.2
Surplus (Deficit) MWs above RM	36	26	91	100	125	160	176	191	193	208	232
Reserve Margin %	22%	21%	25%	25%	26%	28%	29%	30%	30%	30%	31%

Note: All years are shown in Appendix D. Reserve Margin (RM)

Energy – Reference Case

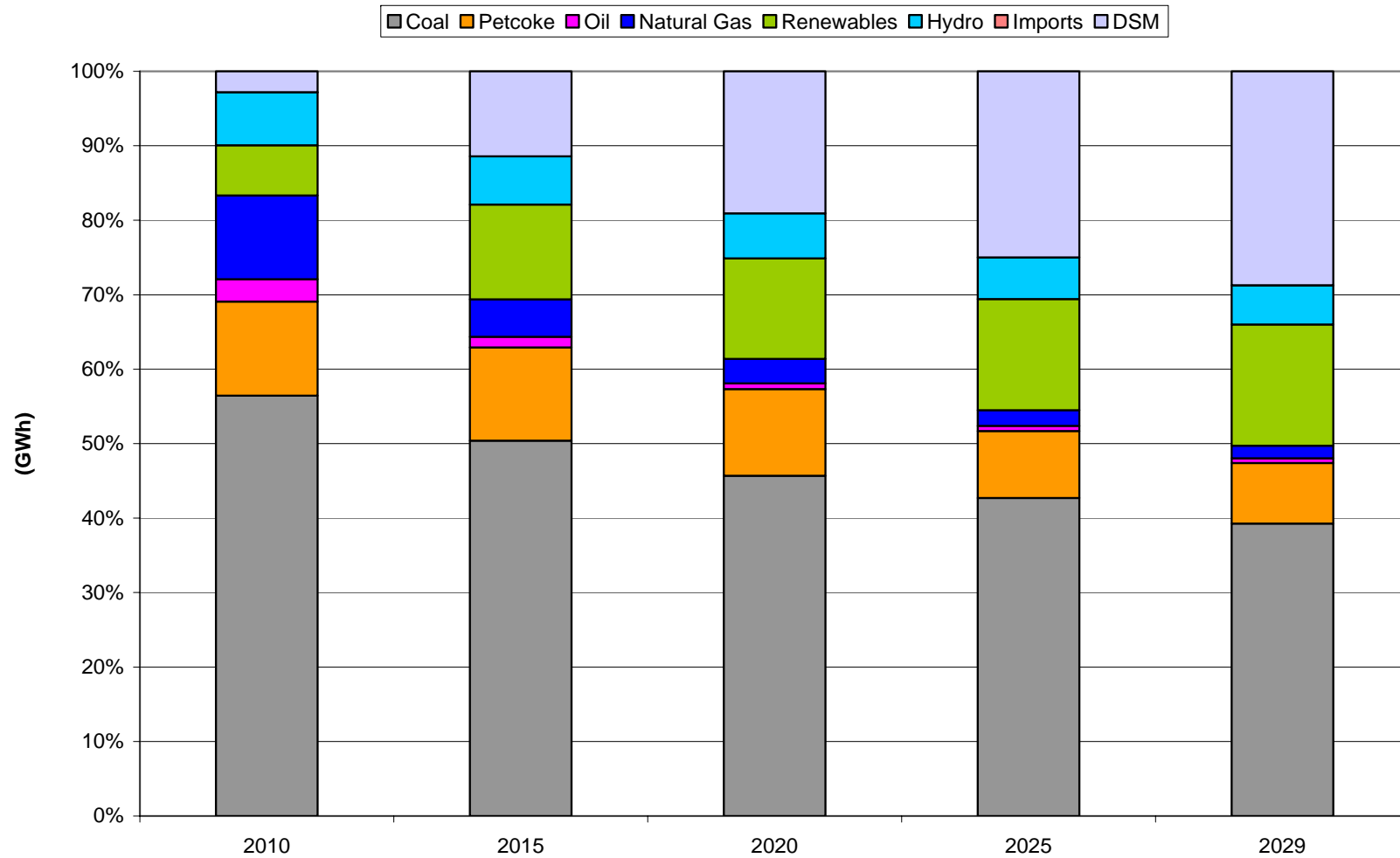
“5% Spend DSM & Renewables beyond RPS”



Energy – Reference Case

5% Spend DSM & Renewables beyond RPS

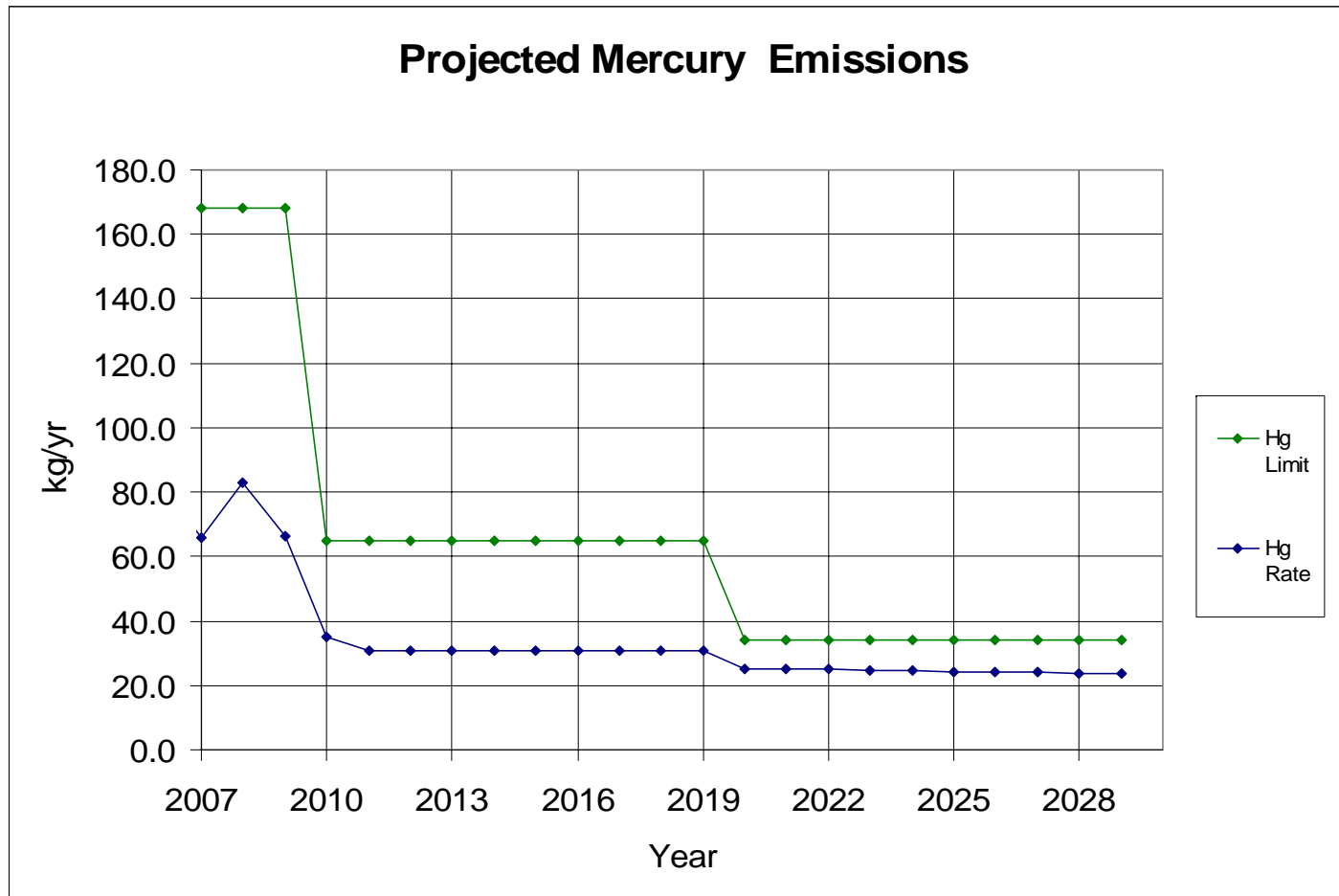
Future Generation 5% DSM + Renewables



Emissions Trajectories: – Reference Case

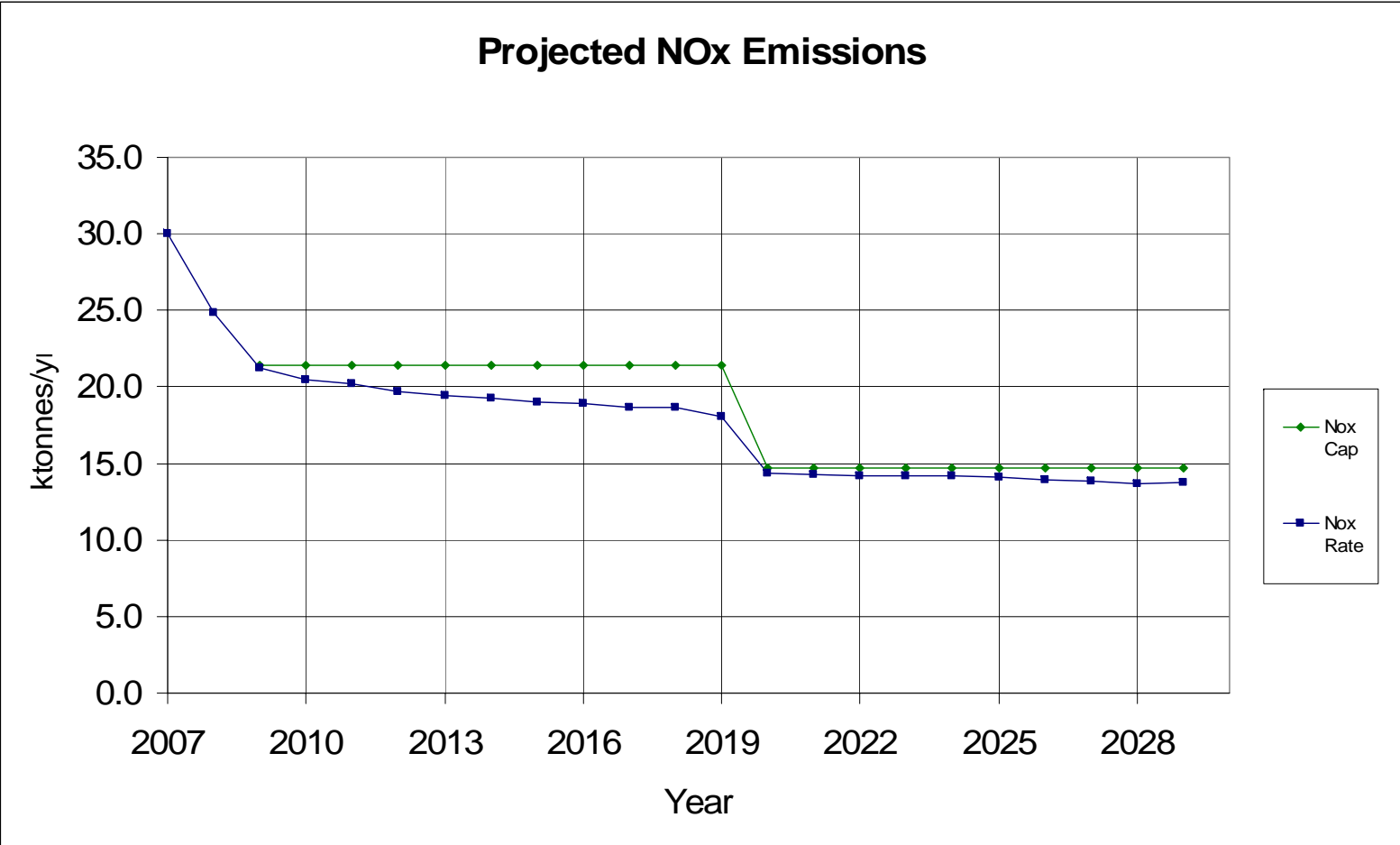
5% Spend DSM & Renewables beyond RPS

Hg



Emissions Trajectories: – Reference Case

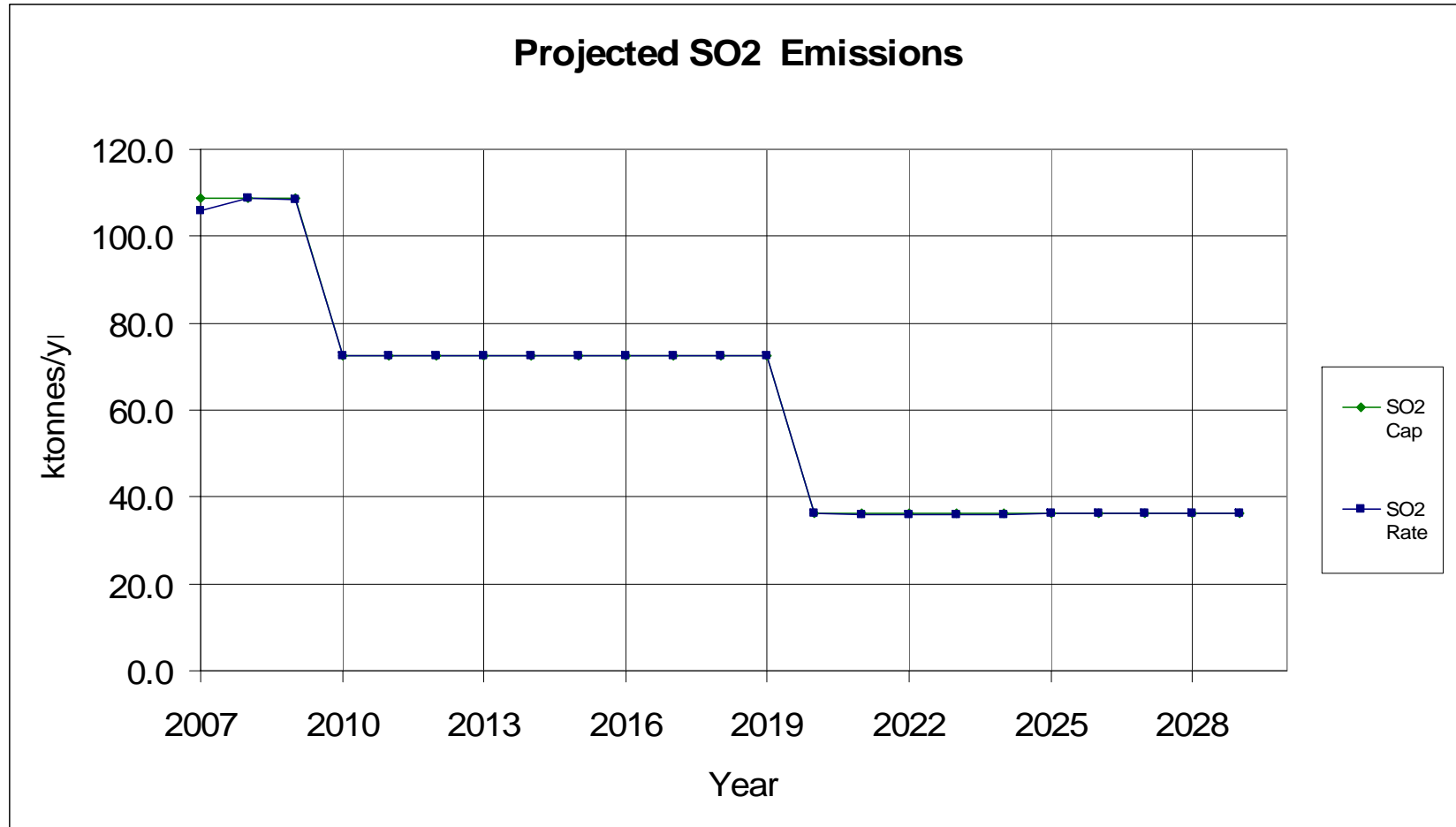
5% Spend DSM & Renewables beyond RPS
NOx



Emissions Trajectories: – Reference Case

5% Spend DSM & Renewables beyond RPS

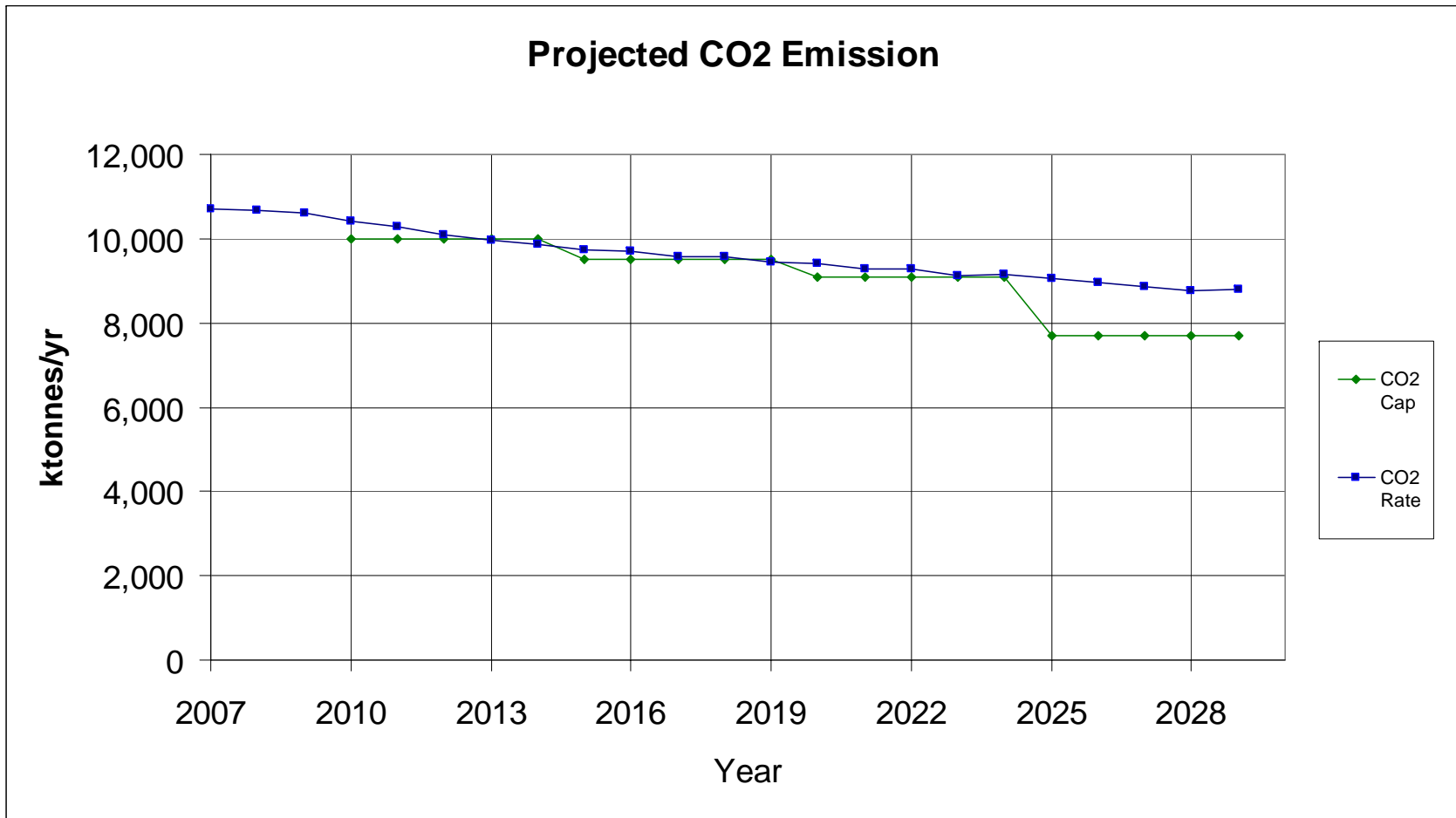
SO₂



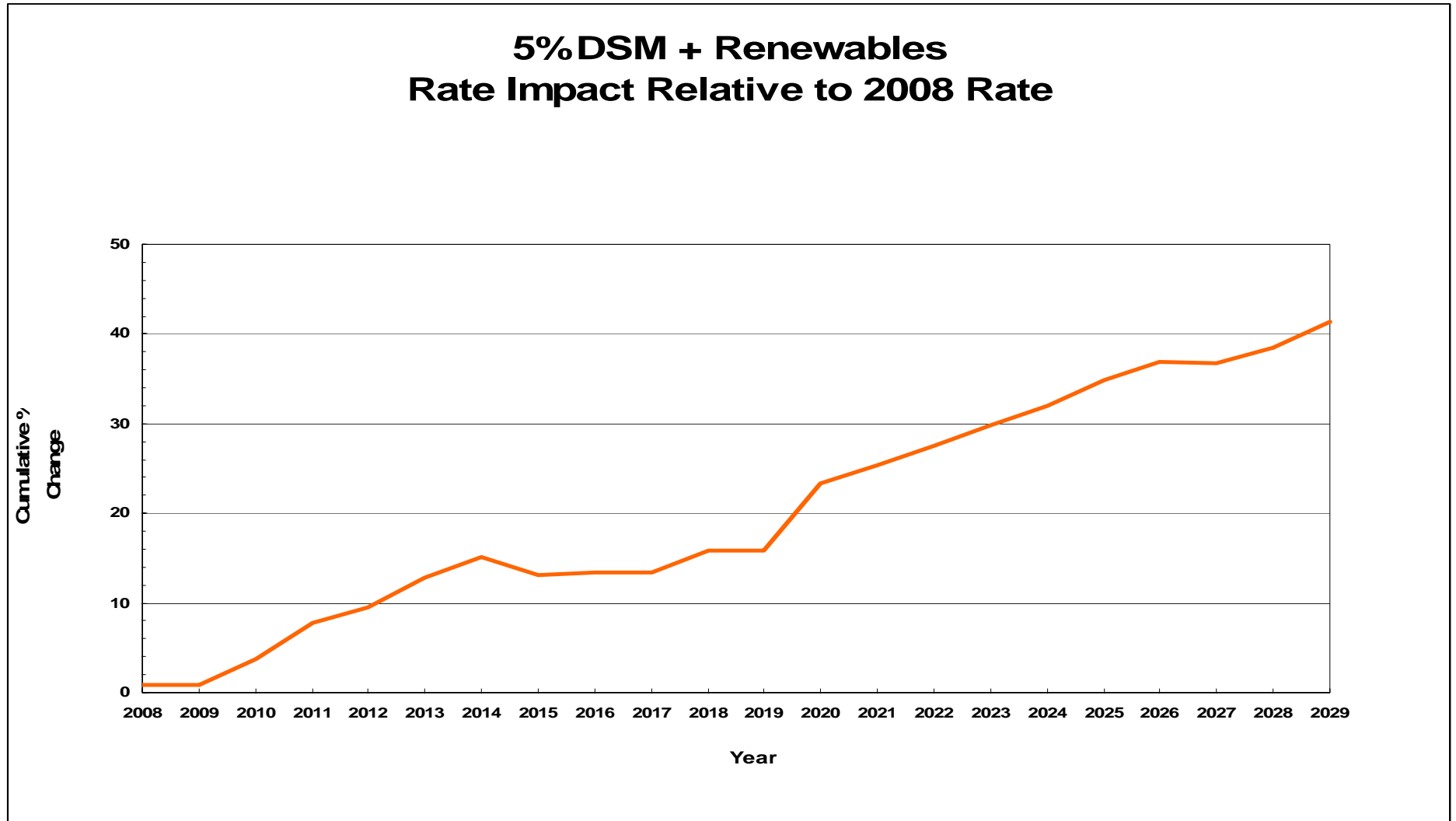
Emissions Trajectories: – Reference Case

5% Spend DSM & Renewables beyond RPS

CO2



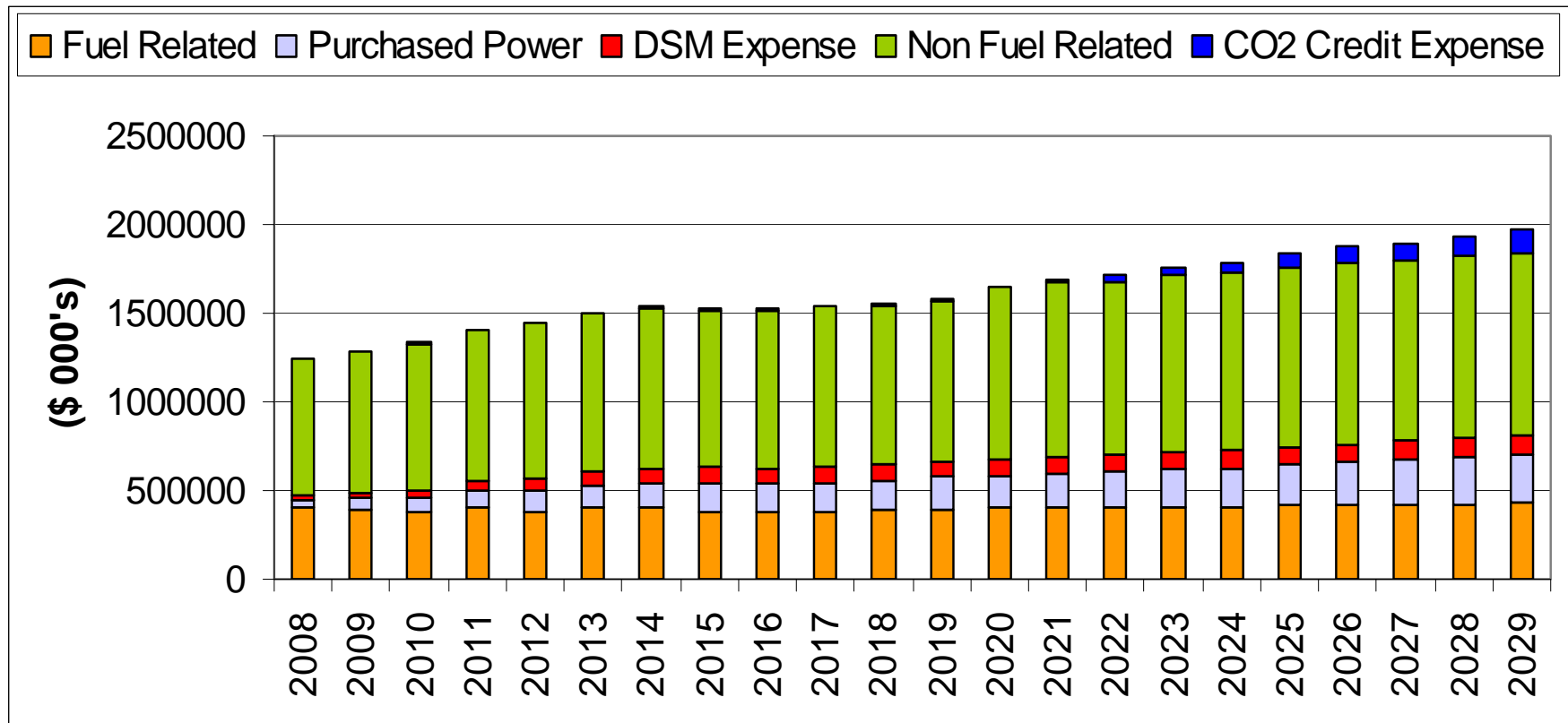
Cumulative Rate Effect



Rates are in nominal dollars. Rates are based on 2006 information and are shown for comparison between plans. Actual rates in any future year will be based on the revenue requirement at that time.

Annual Revenue Requirements

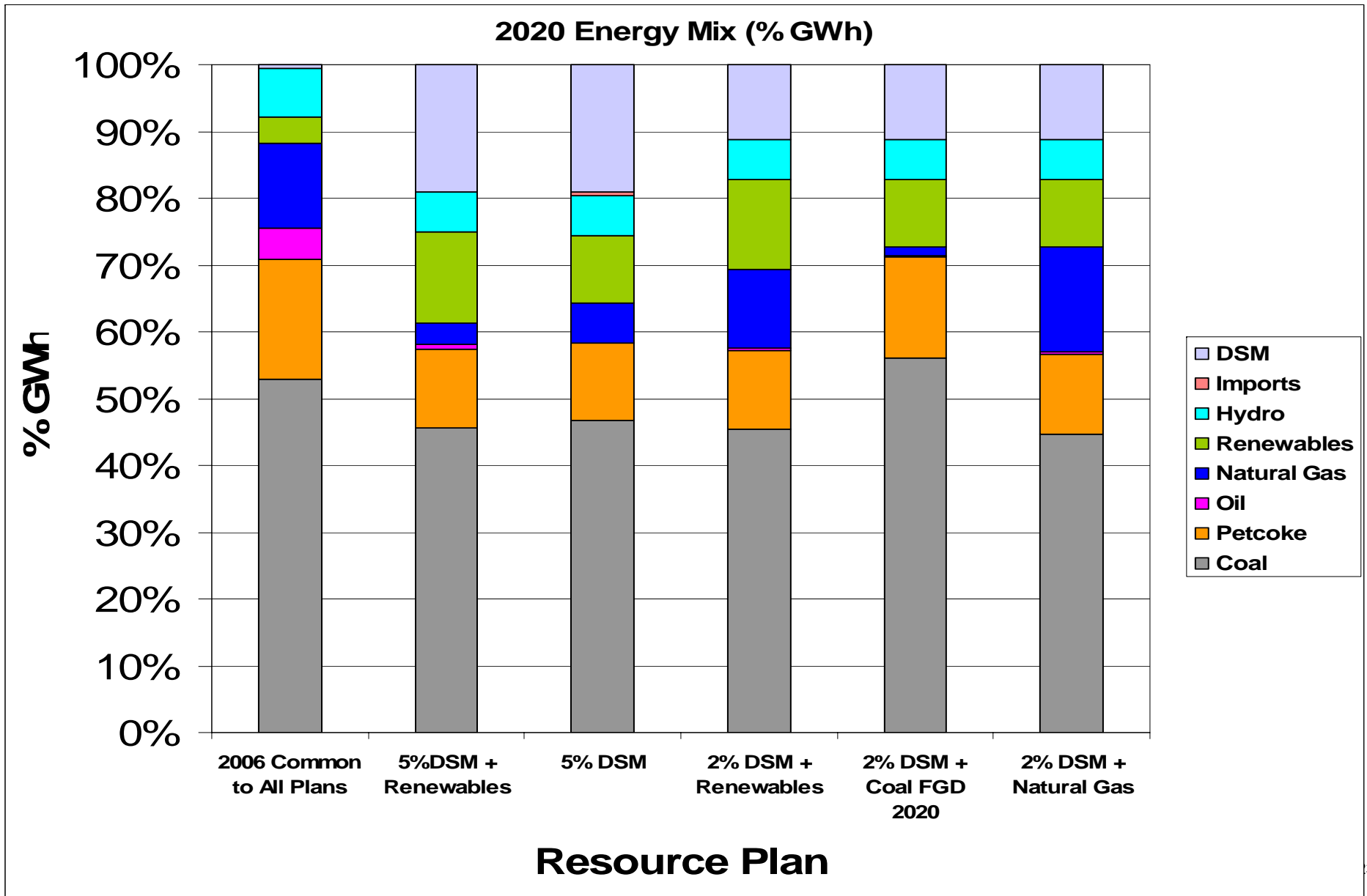
5% DSM + Renewables



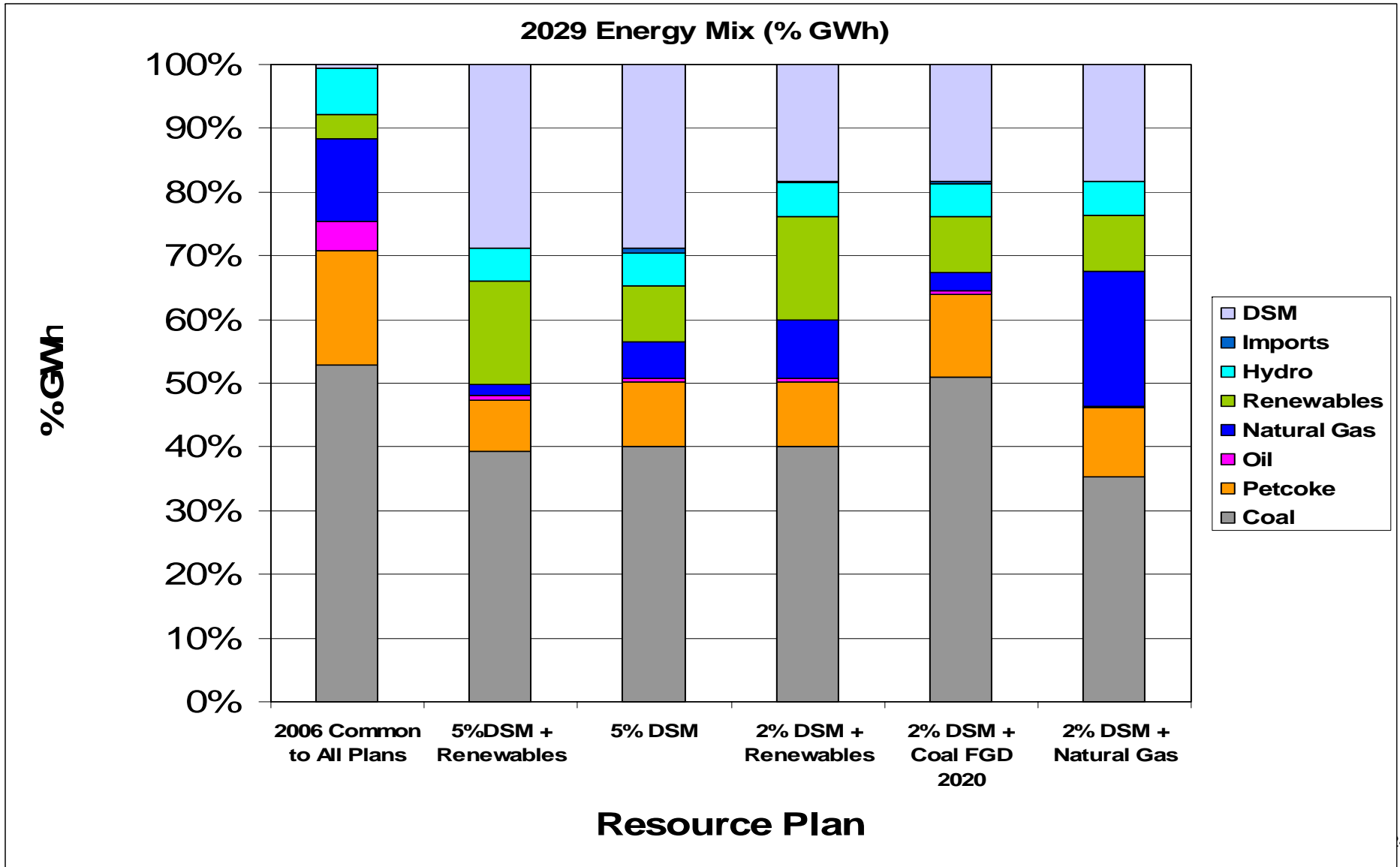
Note: Nominal dollars

Comparison of Candidate Plans to Reference Case

Comparison of Plans – Energy Mix @ 2020



Comparison of Plans – Energy Mix @ 2029



Plan Comparison

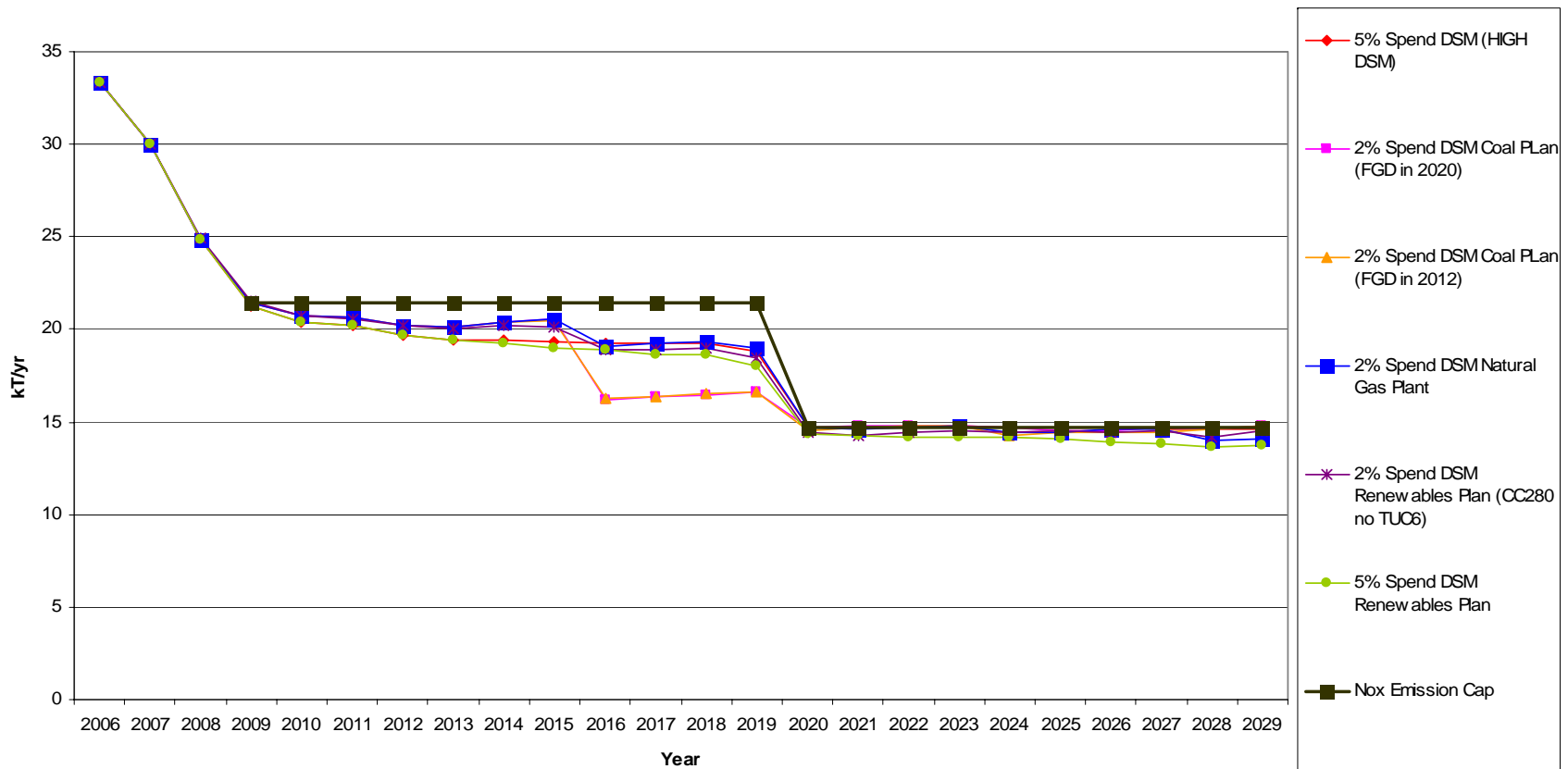
SO2 Emissions



Note: All plans are meeting the SO2 cap.

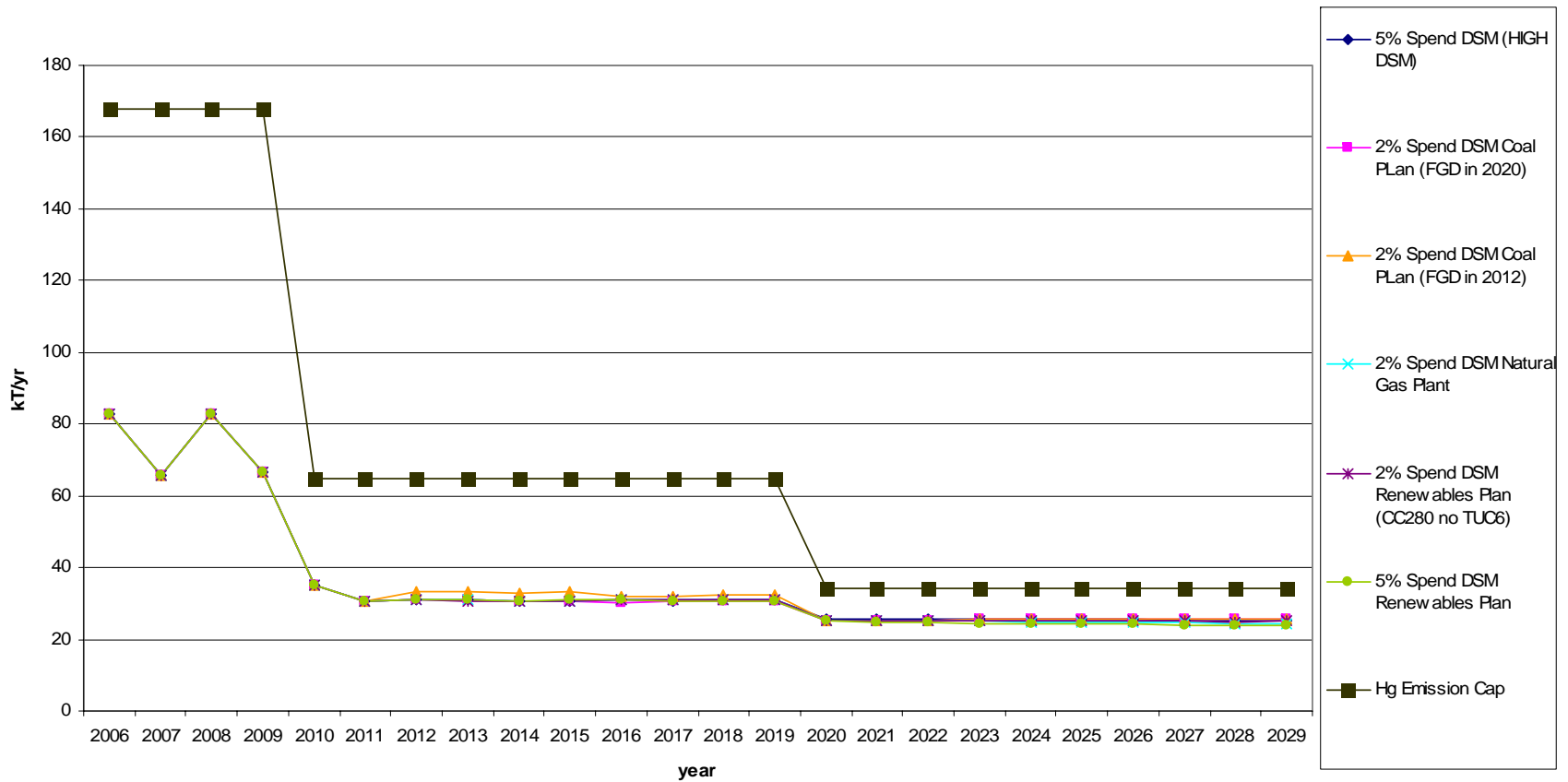
Plan Comparison

Nox Emissions



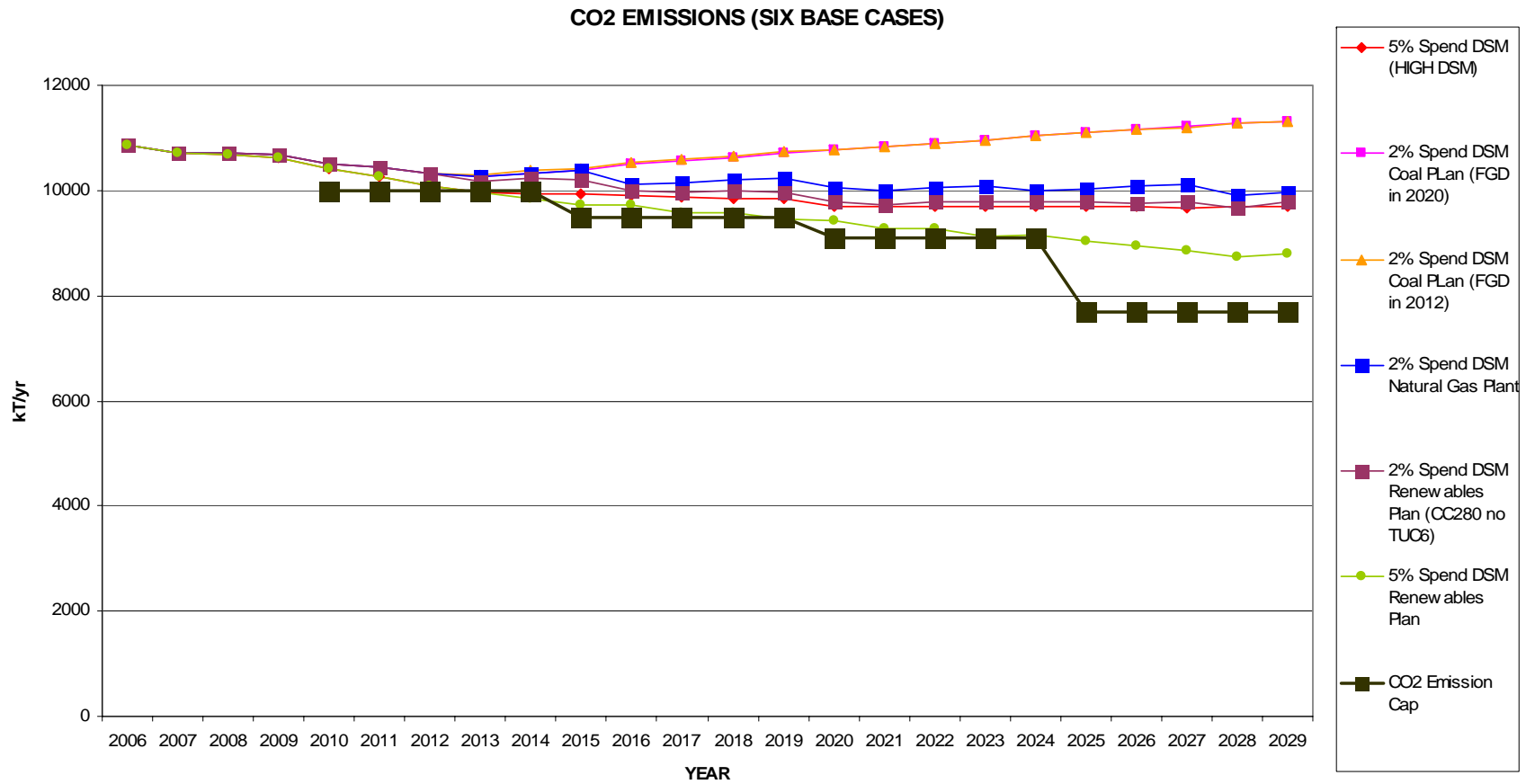
Plan Comparison

Hg Emissions

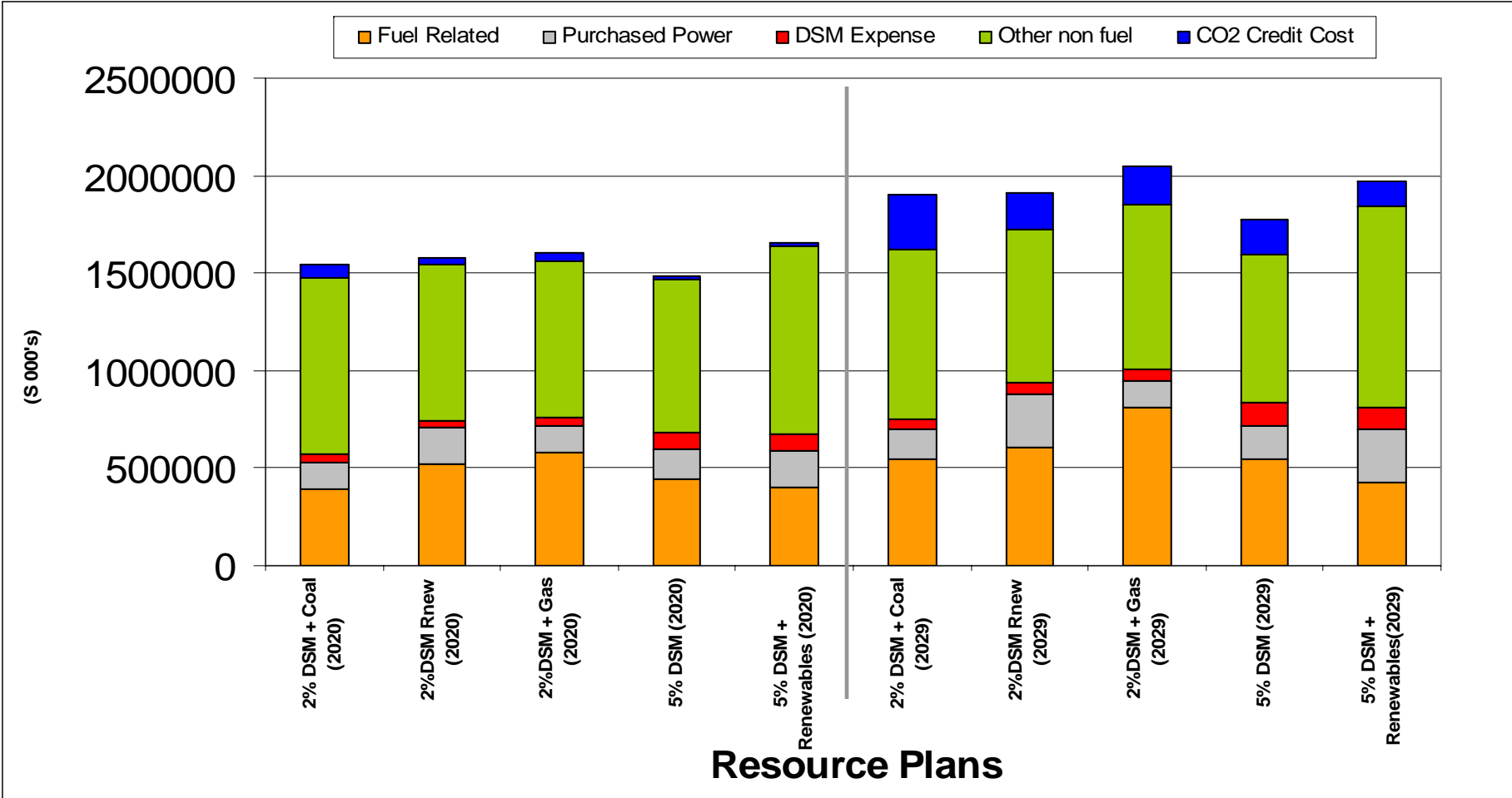


Plan Comparison

CO2 Emissions

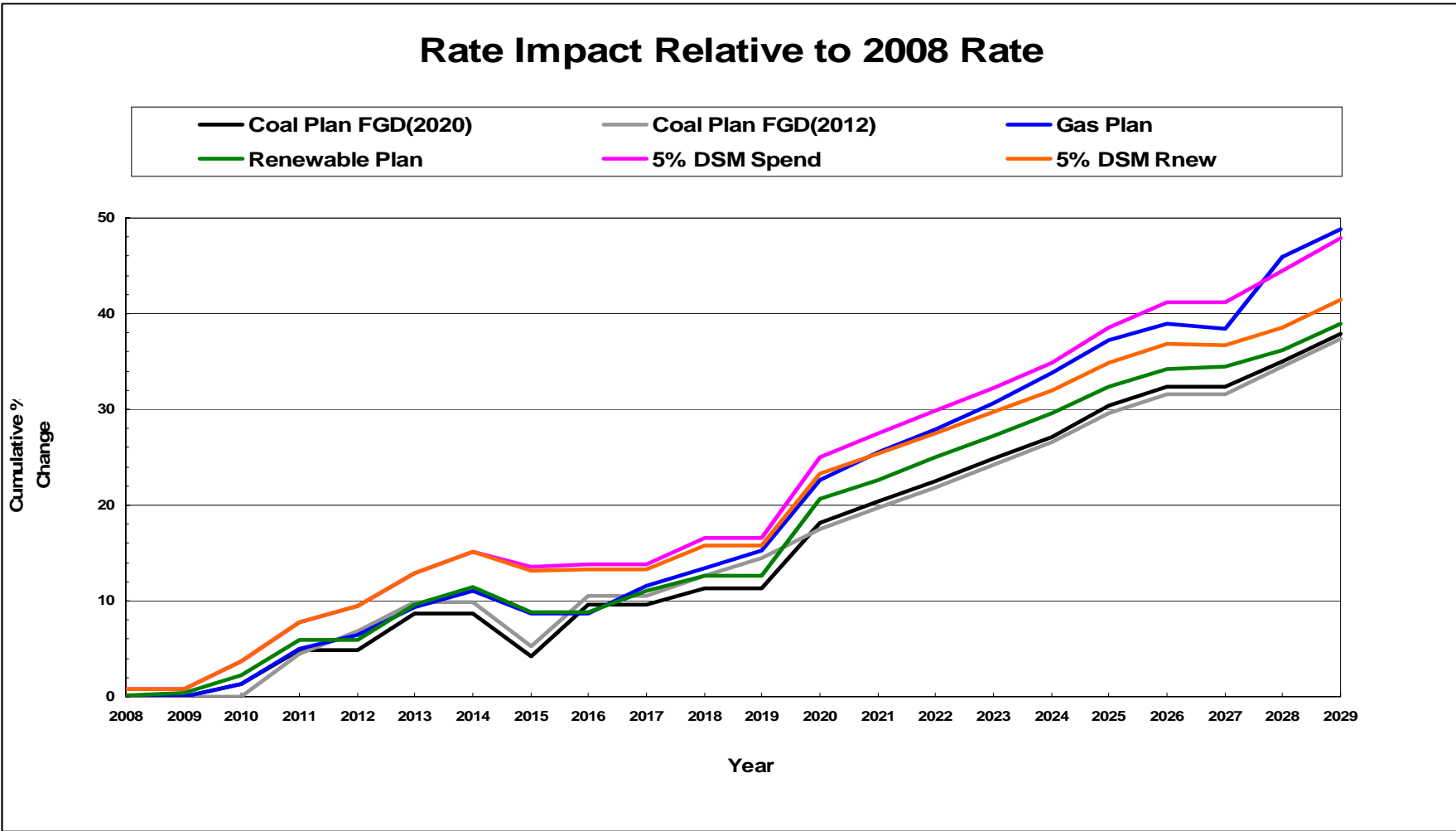


Annual Revenue Requirement Comparison 2020 & 2029



Note: Annual revenue requirements shown in nominal dollars. For detailed charts for each resource plan, see Appendix F

Rate Comparison



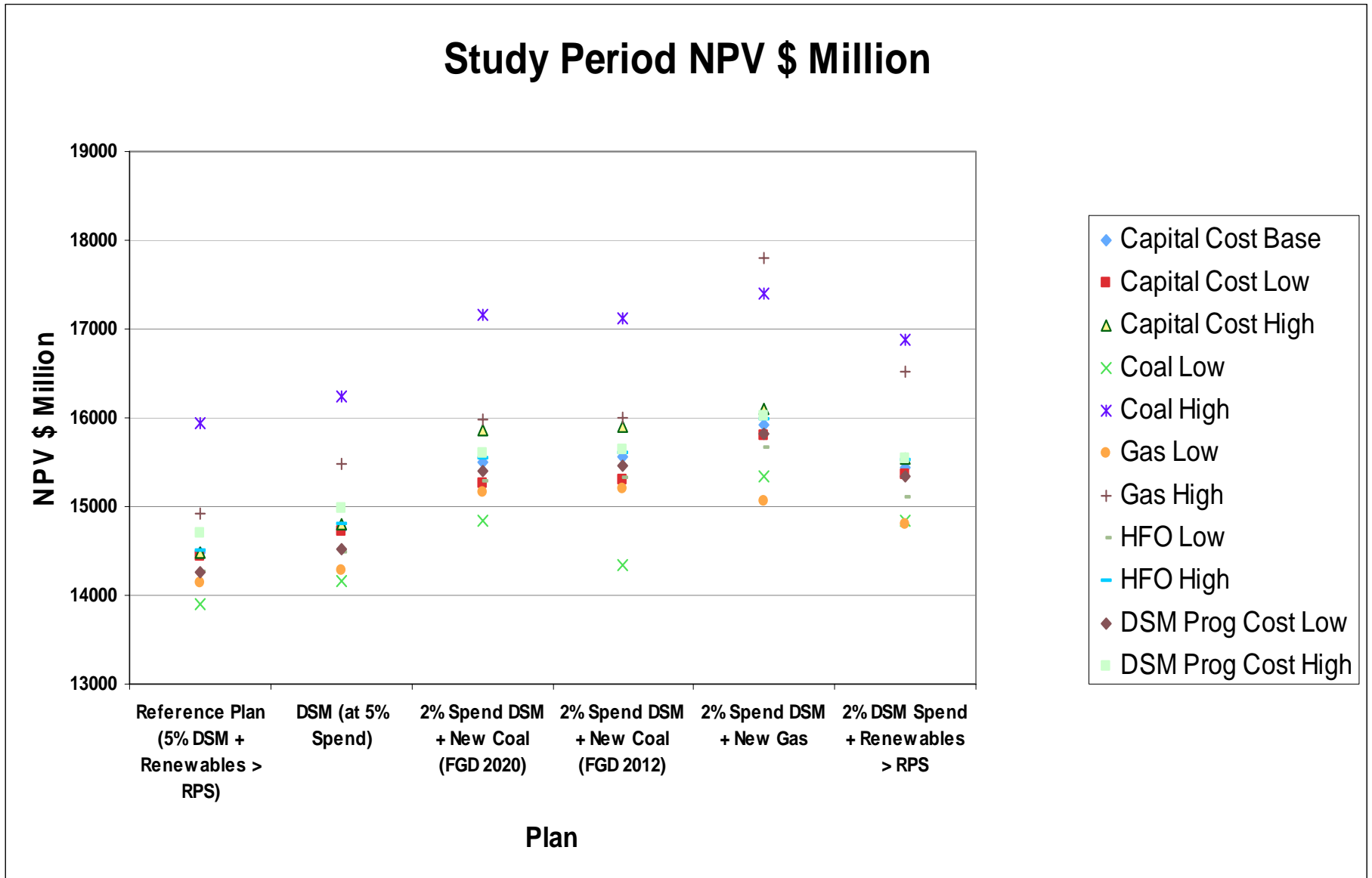
Rates are in nominal dollars. Rates are based on 2006 information and are shown for comparison among plans. Actual rates in any future year will be based on the revenue requirement at that time.

Sensitivities

SENSITIVITIES

- See Appendix G for tornado results
- Key Points:
 - All base plans most sensitive to fuel prices, CO₂ credit prices
 - Rank order of plans' NPV cost does not change with most sensitivities
 - In all cases the 5% DSM Spend + Renewables (“Reference”) and 5% Spend DSM (second rank) retain their order (#1, #2)
 - Other exceptions:
 - Under low capital cost, CO₂ credit prices or coal price assumptions the Coal Plans outrank the Renewables Plan
 - Under low gas price assumptions the Natural Gas Plan outranks the Coal Plans
 - Under high gas price assumptions the Coal Plans outrank the Renewables Plan

SENSITIVITIES



Worlds

Worlds

- Load- assessed the effect of the high load assumption on the resource plans.
- DSM- assessed DSM by varying timing of program start and magnitude of benefits.
- Environment- assessed low and high environmental constraints effect on resource plans
- Carbon- assessed a number of hard cap carbon worlds in addition to the environmental worlds listed above.

Results – Load Variation World

- High load and low load worlds were included in the list of items for analysis.
- Due to time constraints only one load variation world could be completed. High load was evaluated.
- Results build on the 5% DSM + Renewables plan by adding:
 - Two LM6000 in 2008 & 2009
 - Two 150 MW gas units (1 conversion of LMs) in 2013 & 2014
 - Two 400 MW coal units in 2016 & 2020

Environment

- SO₂, NO_x, Hg
- Highly constrained environmental assumptions are shown in Appendix H
- Worlds analysis investigated the effect of a range of constraints on either side of the most likely assumptions. Considering, how to meet the caps using:

Description of World	Plan Name
Large capacity additions and no renewables beyond the RPS	High Air Emissions (AE), Coal High AE, Gas
Renewables beyond the RPS and no large capacity additions	High AE, Renewables
Retirement of 1 or more coal units	High AE, Retire

Environmental Additions

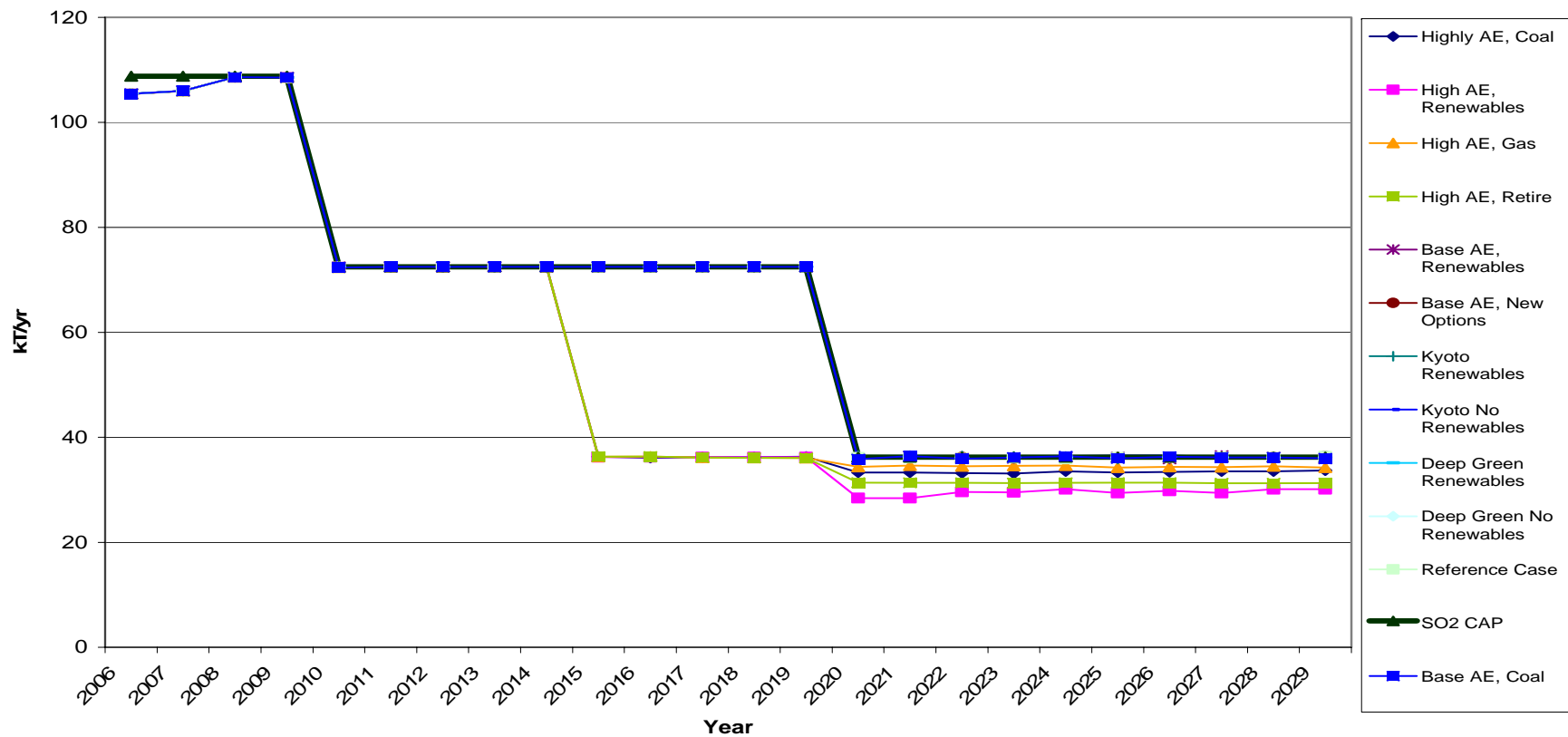
Under High Environmental Constraints

	Base Run # 20	Green P90	Green P90	Green P90	Green P90
	5% Spend DSM Renewables Plan	5% Spend DSM High AE, Coal	5% Spend DSM High AE, Renewables	5% Spend DSM High AE, Gas	5% Spend DSM High AE, Retire
2006	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)
2007	Lingan 2 LN (Jul) Lingan 4 LN (Jul)	Lingan 2 LN (Jul) Lingan 4 LN (Jul)	Lingan 2 LN (Jul) Lingan 4 LN (Jul)	Lingan 2 LN (Jul) Lingan 4 LN (Jul)	Lingan 2 LN (Jul) Lingan 4 LN (Jul)
2008	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul)
2009	Trenton 5 Baghouse (Jul)	Trenton 5 Baghouse (Jul)	Trenton 5 Baghouse (Jul)	Trenton 5 Baghouse (Jul)	Trenton 5 Baghouse (Jul)
2015			L3/L4 FGD		
2019	Trenton 6 LN (Oct)	Trenton 6 LN (Oct)	Trenton 6 LN (Oct)	Trenton 6 LN (Oct)	Trenton 6 LN (Oct)
2020	L1/L2 SCR, L1/L2 FGD	L1/L2 SCR, L3/L4 SCR	L1/L2 SCR/FGD, L3/L4 SCR	L1/L2 SCR, L3/L4 SCR PTSR,T6SR	L3/L4 SCR, PTSR,T6SR L1/L2 Retired
NPV 2006-29 (M\$)	\$12,497.0	\$15,051.5	\$14,794.5	\$15,066.5	\$15,142.6
Study Period (M\$) (includes End Effects)	\$14,479.9	\$17,694.8	\$17,336.5	\$17,791.4	\$17,901.8

Comparison of Plans under Highly Constrained Emissions

SO2 Emissions

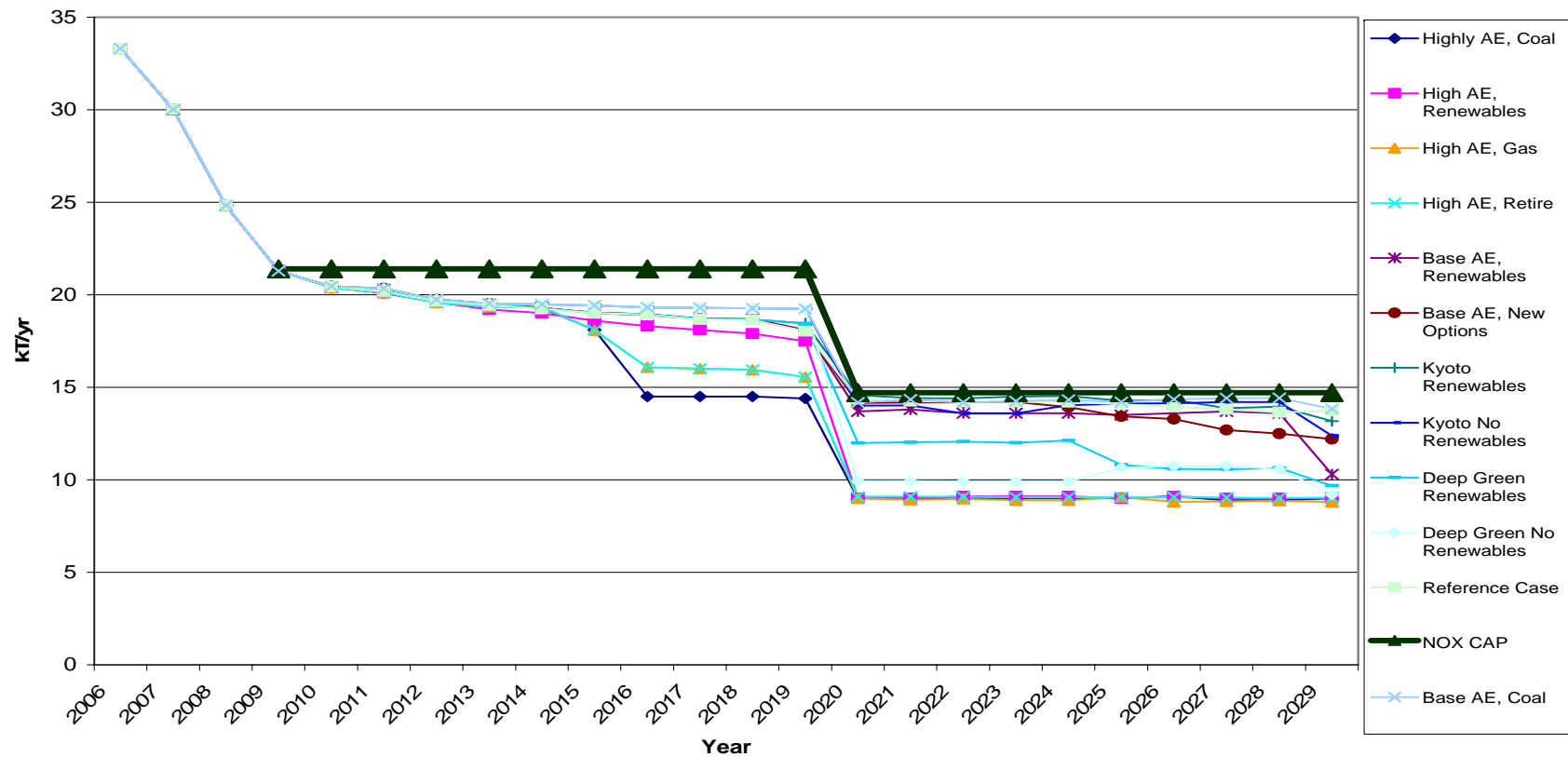
SO2 Emissions (Worlds 4-10)



Comparison of Plans under Highly Constrained Emissions

NOx Emissions

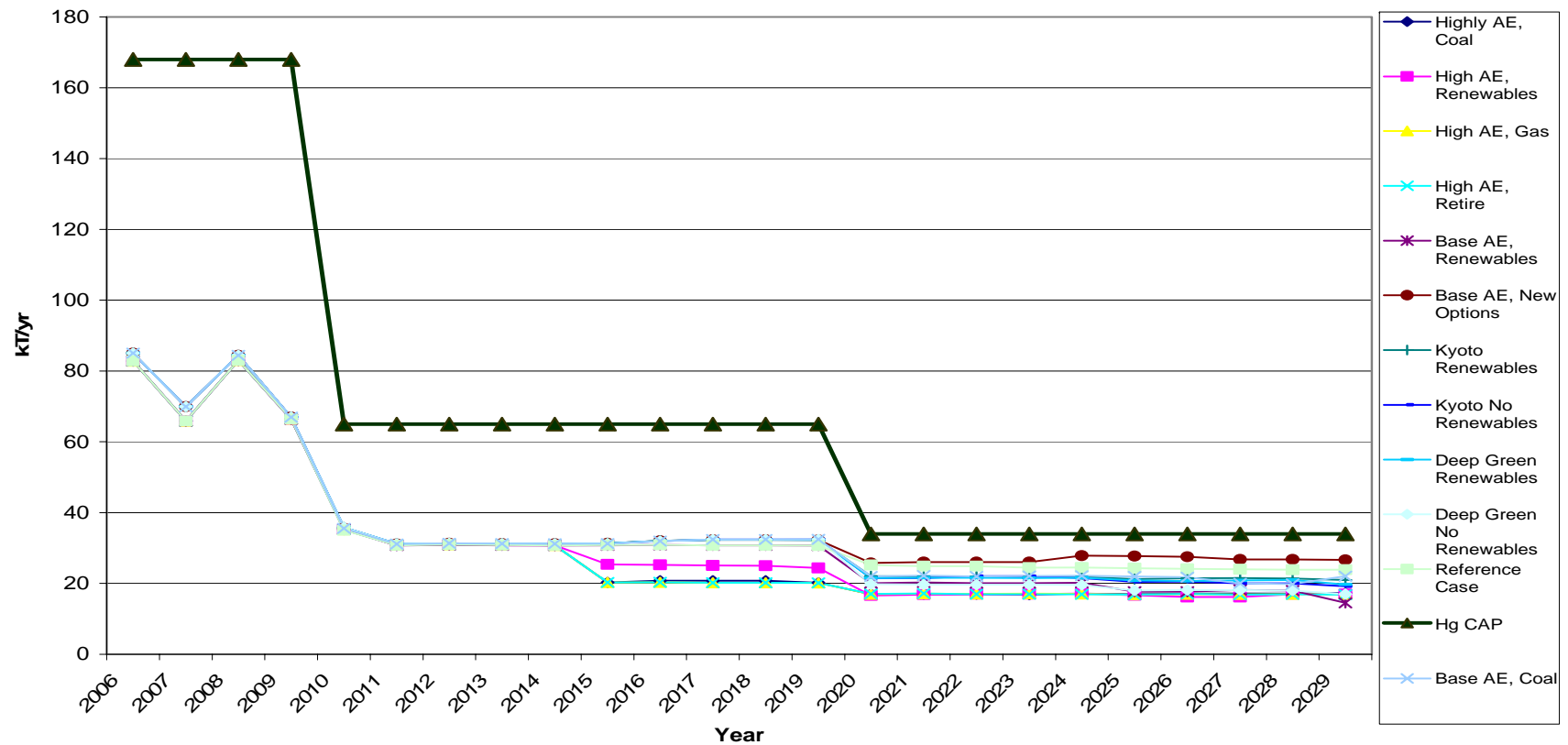
Nox Emissions (Worlds 4-10)



Comparison of Plans under Highly Constrained Emissions

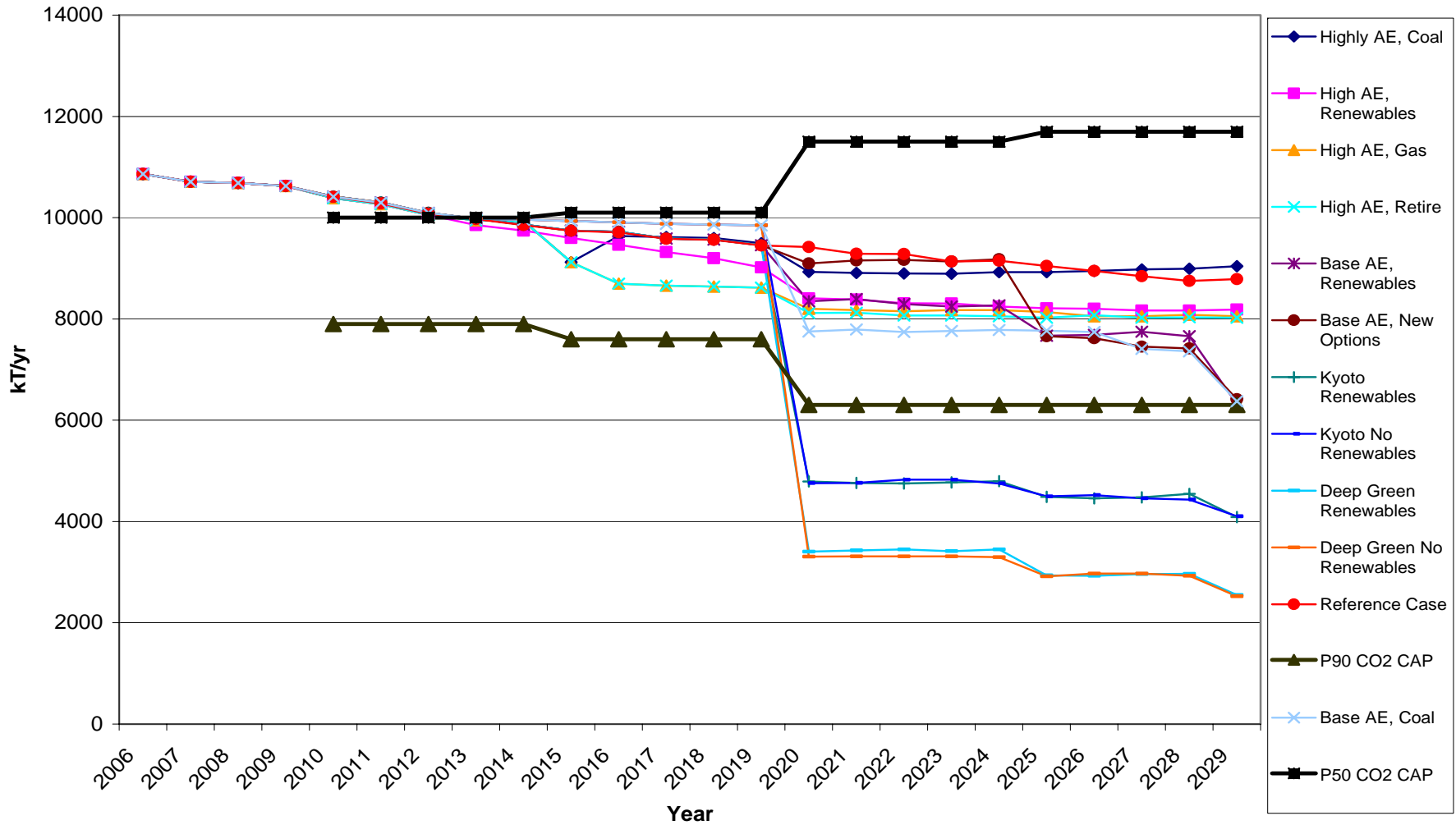
Hg Emissions

Hg Emissions (Worlds 4-10)



Comparison of Plans under Highly Constrained Emissions

CO2 Emissions (Worlds 4-10)



Note: Chart shows the effect of no restrictions on credits available

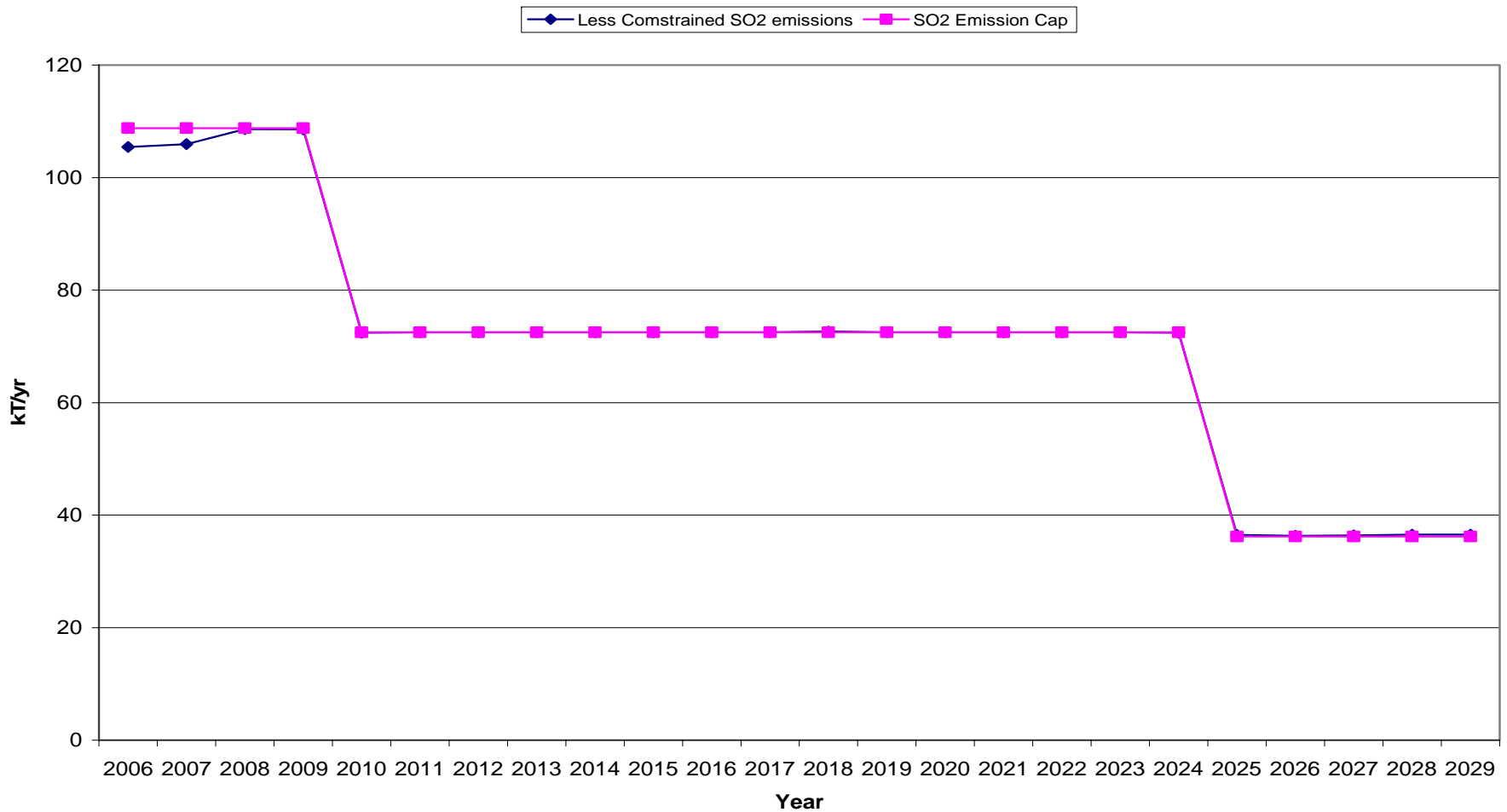
Environmental Additions

Under Less Constrained Environmental Emissions

- See Less Constrained Environmental Emissions in Appendix H (note they are less than the base assumptions, not less constrained than current constraints)
- The model was free to pick the optimal way to meet the new environmental caps.
- All additions up to 2019 are consistent with base assumption conclusions
- If less stringent environmental restrictions were effected, the choices in the next decade would still hold. Later years would require different choices.

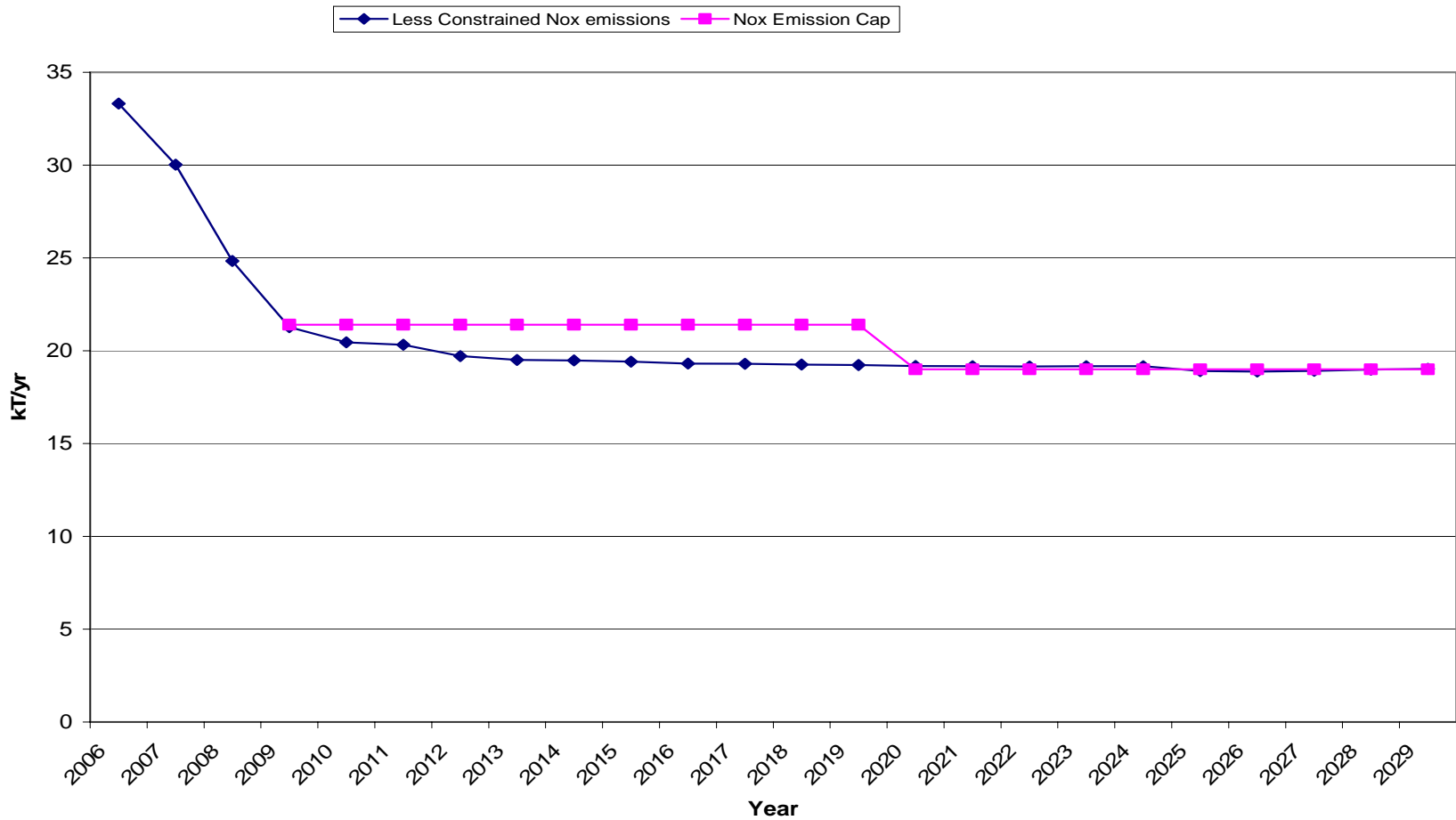
Plan Under Less Constrained Environmental Emissions

SO2 Emissions

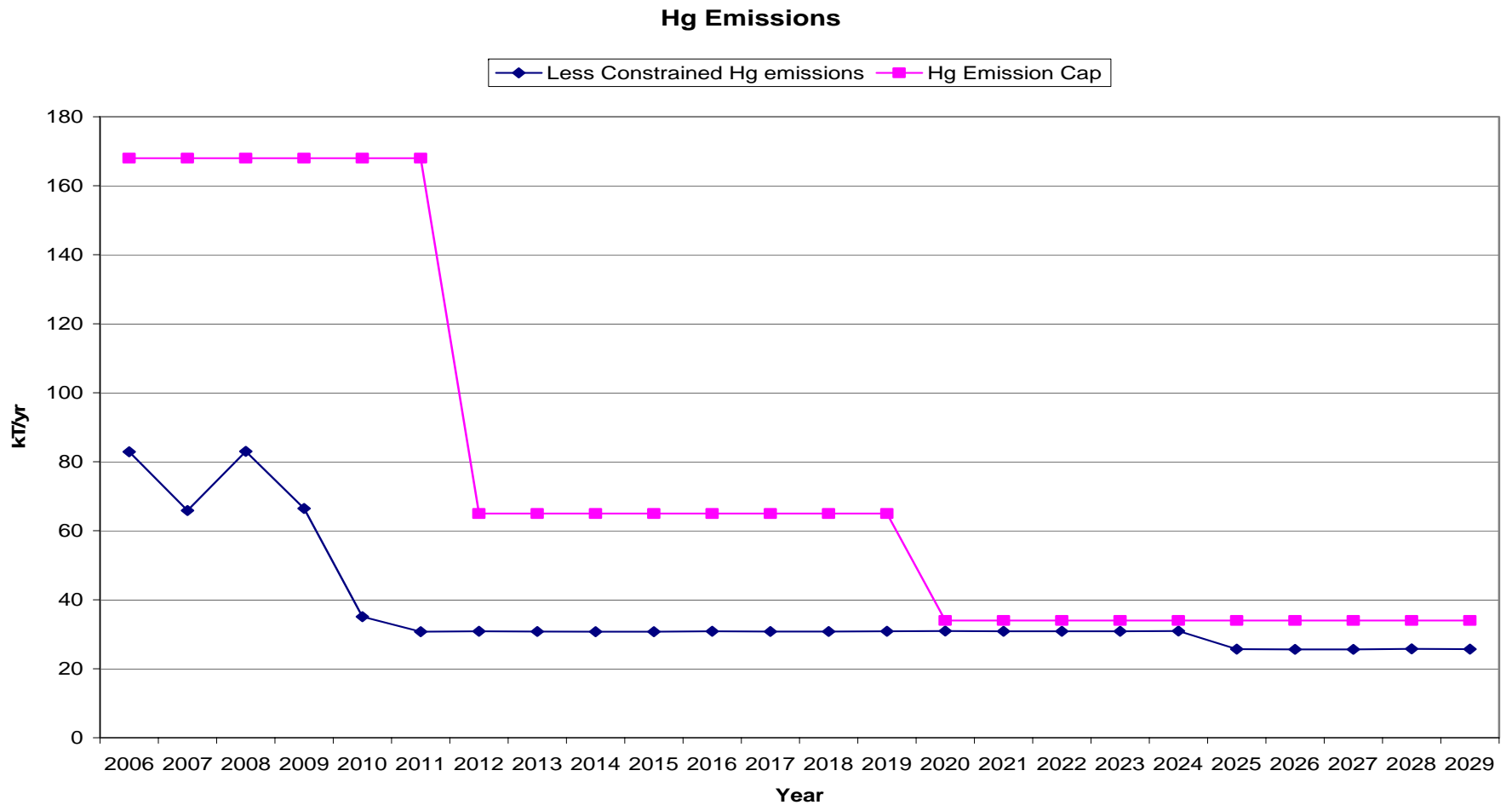


Plan Under Less Constrained Environmental Emissions

Nox Emissions

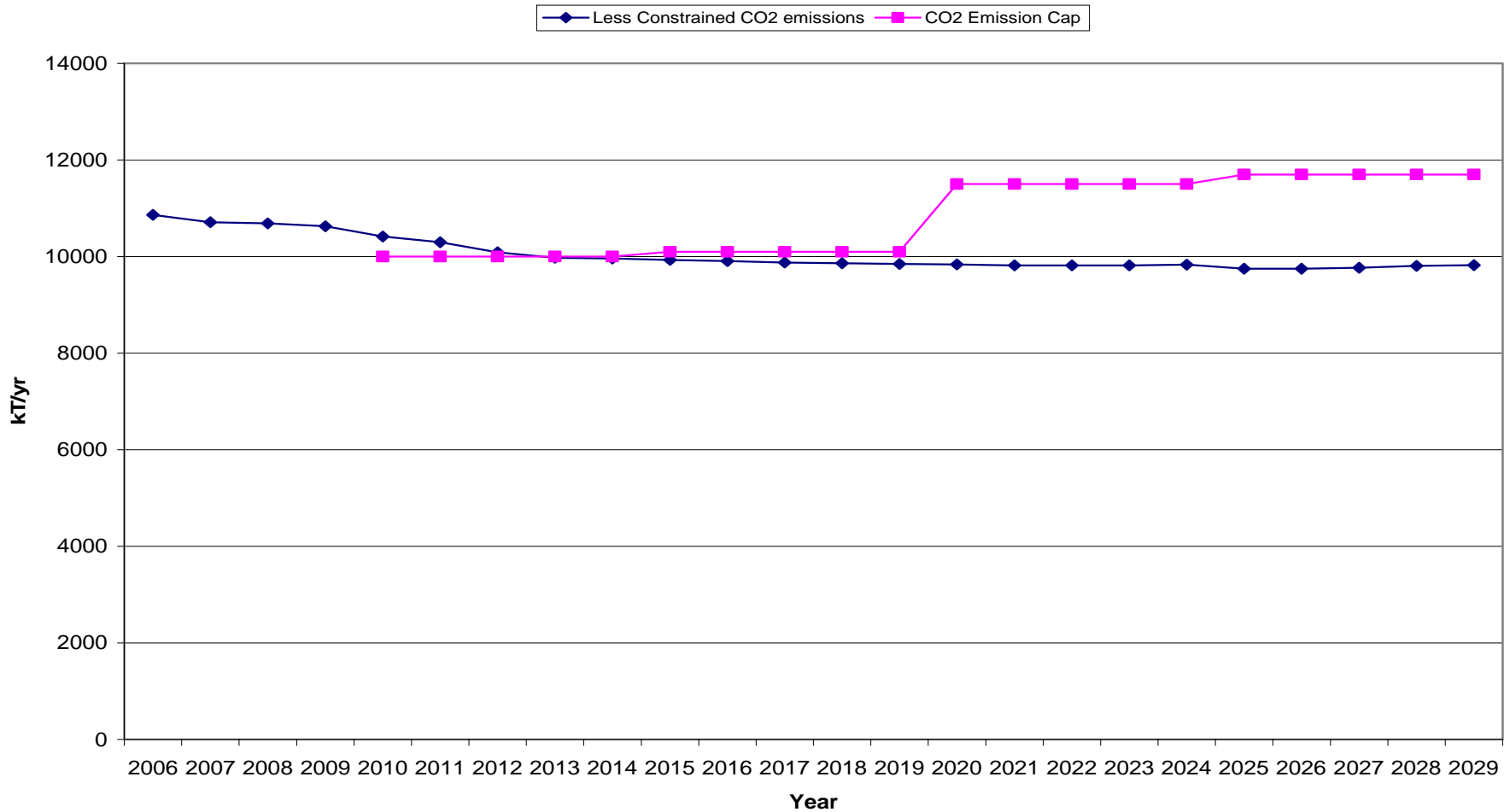


Plan Under Less Constrained Environmental Emissions



Plan Under Less Constrained Environmental Emissions

CO2 Emissions



Results – Environmental/Air Emission Constraints Variation Worlds

2007 IRP P10 and P90 Air Emission Constraints Worlds: SCHEDULE OF SUPPLY OR DSM MW's

	5% Spend DSM, Less Constrained Enviro Emissions	5% Spend DSM,High AE, Coal	5% Spend DSM, High AE, Renewables	5% Spend DSM,High AE, Gas	5% Spend DSM,High AE, Retire
New Resources 2008-2014					
DSM	256	256	256	256	256
TUC 6	50	50	50	50	50
LM 6000	0	0	0	0	0
Uprates	20	20	20	20	20
Hydro	4.3	4.3	4.3	4.3	4.3
RPS	166	166	166	166	166
Additional Wind	0	0	32	0	0
Subtotal	496.3	496.3	528.3	496.3	496.3
New Resources 2015-2029					
Additional Wind	0	0	160	0	0
Pulverized Coal	0	400	0	0	0
LM 6000	0	0	0	0	0
Combined Cycle	0	0	0	280	280
Retire Units	0	0	0	0	-300
DSM	857	857	857	857	857
Subtotal	857	1257	1017	1137	837
Total Supply or DSM MW's over planning period	1353.3	1753.3	1545.3	1633.3	1333.3

Conclusions from Environmental Worlds Analysis

- Common across all plans:
 - Point Tupper Low Nox 2008
 - Trenton 5 Low Nox 2008
 - Lingan 1 Low Nox 2008
 - Trenton 5 baghouse 2009
- Differences among plans
 - Lingan FGD timing
 - Trenton 6 Low Nox 2019 or not at all

Carbon Hard Cap Worlds:

- Three carbon constrained worlds examined
 - Base Assumptions with carbon credits constrained in 2020 and beyond
 - Kyoto carbon assumptions with all other assumptions at base level. Credits constrained in 2020
 - Deep green carbon assumptions with all other assumptions at base level. Credits constrained in 2020.

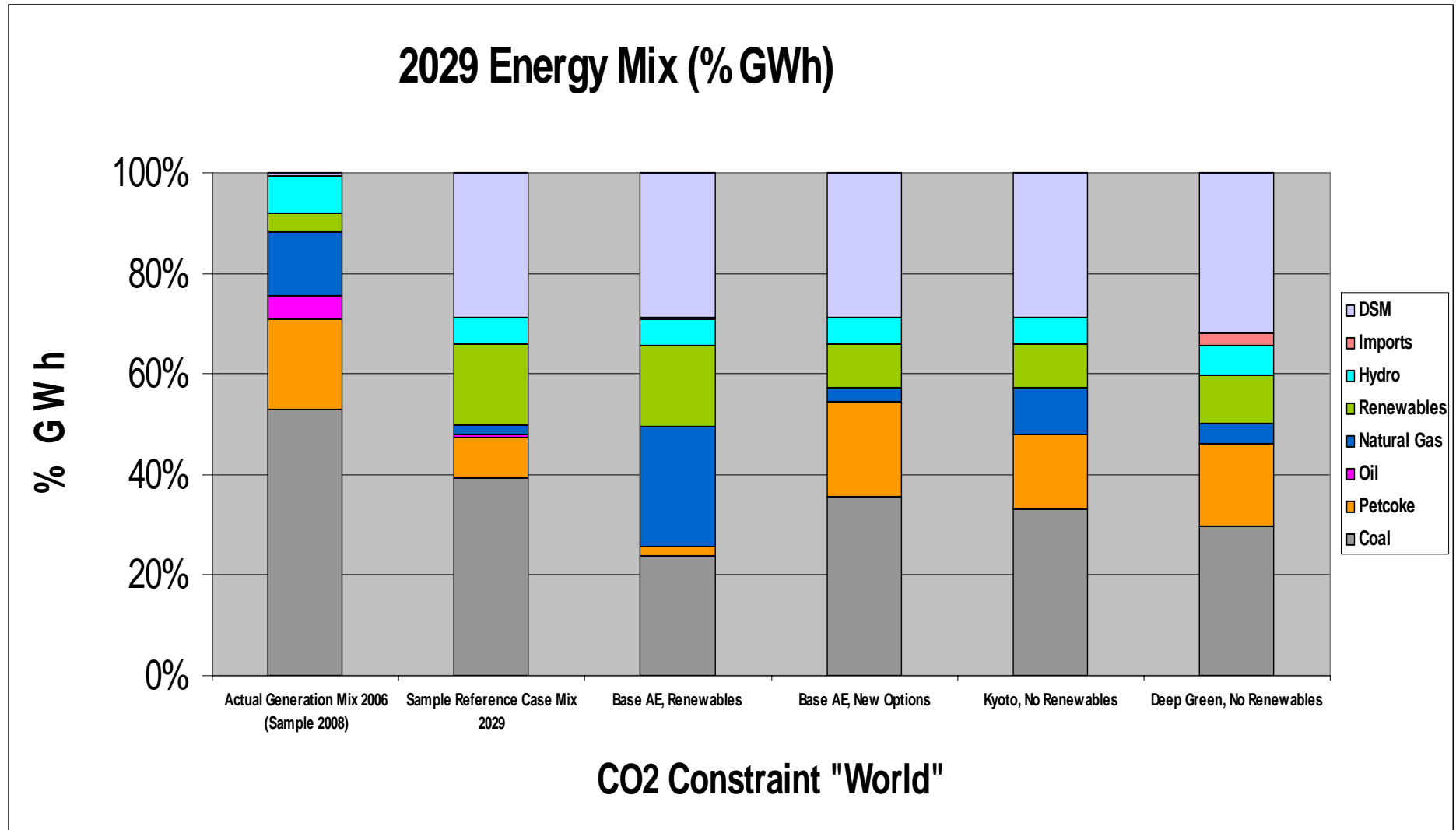
Case	Approximate Emissions (Million tonnes)				
	2010	2015	2020	2025	2030
Base	10.0	9.5	9.1	7.7	6.4
Kyoto	6.4	5.6	4.8	4.5	4.1
Deep Green World	6.44	4.93	3.43	2.95	2.53

New Options for Hard Caps

- To solve for Kyoto and Deep Green model required additional options. We added:
- All options carry significant uncertainty. Each requires additional investigation before costs, timing and feasibility could be confirmed.

Option	Comment	Cost
Purchase Power Agreement	300 MW firm	energy \$108/MW (esc 2% annually); capital = \$300M for tie-line upgrade
Carbon Sequestration – New	400MW	Capital \$1,378.8 M Incremental O&M: \$13.78M (esc 2% annually);
Carbon Sequestration – Retro Fit	300MW- Lingan (2 units)	capital cost =\$333M (to capture & sequester CO2) Incremental O&M = \$ 9.2 M (esc 2% annually)
Additional Gas	280CC	Consistent with IRP Assumptions
Offshore Wind	100 MW blocks, 35 MW firm	energy \$150/MWh - includes wind back-up @\$12/MWh (no escalation)
Biomass	20MW Unit, 85% CF	capital cost \$48 M annual O&M \$2.7M (esc 2% annually) fuel \$4.80/mmbtu (esc 2%)

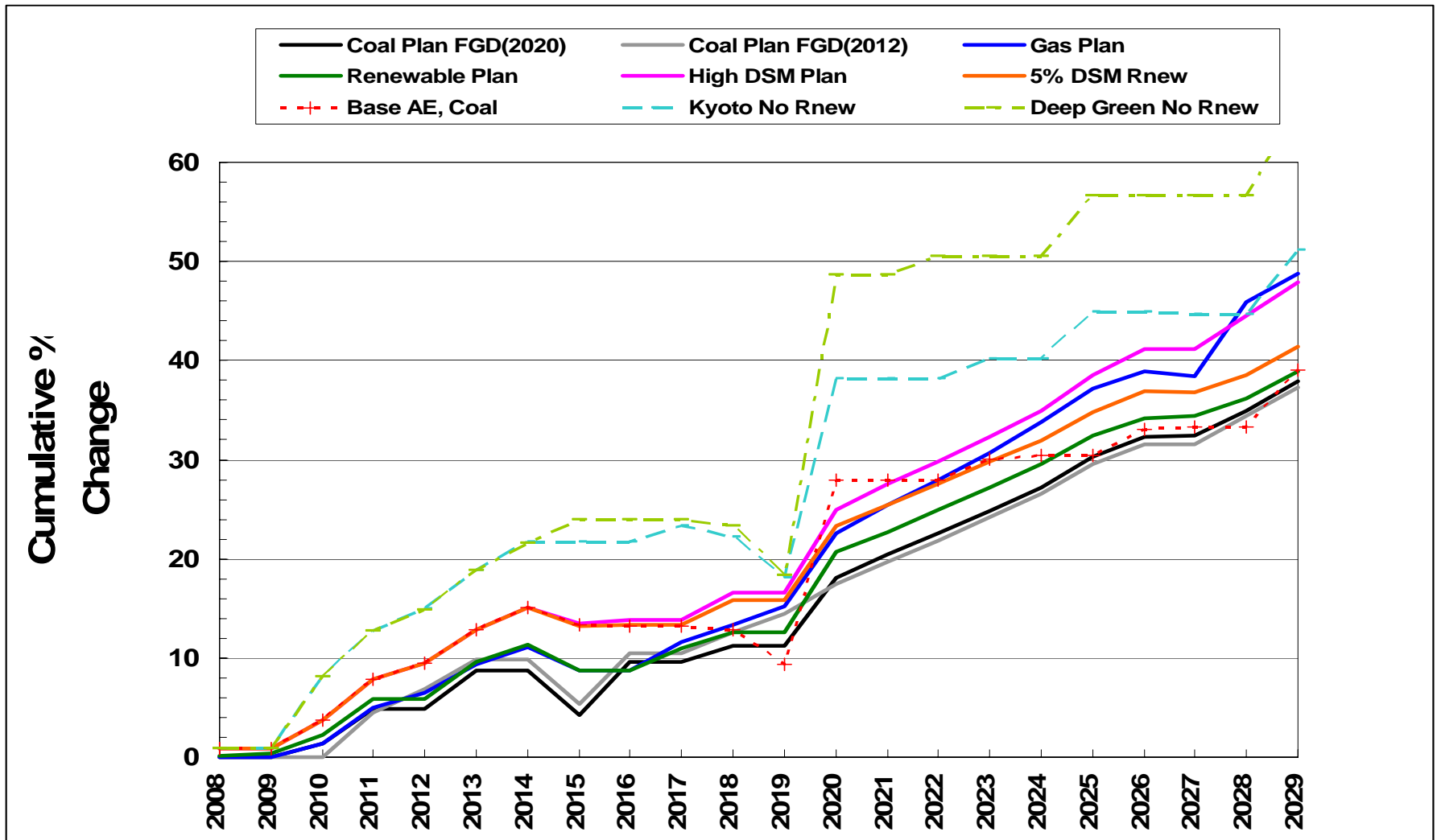
Comparison of CO2 Hard Cap Worlds – Energy Mix @ 2029



Detailed Energy Mix charts for each CO2 constraint world are available in Appendix I. Additional detail is provided in Appendix J

Rate Comparison

Carbon Worlds vs. Base Plans



Kyoto No Rnew and Deep Green No Rnew refer to the fact that no renewables beyond the RPS are included.

DSM Worlds

- Varied amount of DSM three ways:
 - Achieve program trajectory, but 2-year lag in costs & benefits realized
 - Achieve program trajectory, but -20% of benefits realized
 - Achieve program trajectory, with exception that Industrial pulp & paper contribution be minimized assuming associated upgrades have already been implemented at these plants

Results – DSM Variation Worlds

2007 IRP DSM Benefits Variation Worlds: SCHEDULE OF SUPPLY OR DSM MW's

	5% Spend DSM delay 2 years	2% Spend DSM Coal Plant (FGD in 2020) delay 2 years	2% Spend DSM + Renewables > RPS delay 2 years	5% Spend DSM -20% benefits	2% Spend DSM Coal Plant (FGD in 2020) -20% benefits	2% Spend DSM + Renewables > RPS -20% benefits	5% Spend DSM P&P DSM Out	2% Spend DSM Coal Plant (FGD in 2020) P&P DSM Out	2% Spend DSM + Renewables > RPS P&P DSM Out
New Resources 2008-2014									
DSM	147	84	84	205	117	117	221	126	126
TUC 6	50	50	50	0	50	50	0	50	50
LM 6000	0	49	0	0	0	0	0	0	0
Uprates	20	20	20	20	20	20	20	20	20
Hydro	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
RPS	166	166	166	166	166	166	166	166	166
Additional Wind			16			16			16
Subtotal	387.3	373.3	340.3	395.3	357.3	373.3	411.3	366.3	206.3
New Resources 2015-2029									
Additional Wind	0	0	144	0	0	144	0	0	144
Pulverized Coal	400	400	0	400	400	0	400	400	0
LM 6000	0	0	0	0	49	0	0	0	0
Combined Cycle	0	0	280	0	0	280	0	0	280
DSM	851	536	536	686	447	447	746	472	472
Subtotal	1251	936	960	1086	896	871	1146	872	896
Total SUPPLY OR DSM MW's over planning period	1638.3	1309.3	1300.3	1481.3	1253.3	1244.3	1557.3	1238.3	1102.3

Note: Additional detail is provided in Appendix K

Conclusions from DSM Analysis

- Amount of DSM:
 - Implement DSM program quickly and monitor progress as to benefits achieved
 - Refine MW/MWh to be expected from programs for future modeling update exercises
 - Common near-term investments across all cases:
 - Continued operation of Trenton 5 appears economic
 - Lingan Up-rates
 - Small Hydro additions
 - TUC6 required in most plans
 - Three cases (one base plan, two DSM Worlds) where this requirement varies:
 - » “2% DSM + Renewables beyond RPS” base plan, but varying DSM benefit for this plan requires TUC6
 - » Conversely, in the “5% DSM -20% Benefits” and “5% DSM, no pulp & paper contribution” worlds, TUC6 falls out due to these plans’ dispatch of subsequent larger generation

OTHER ANALYSIS

- FGD 2012 versus 2020: Key issue that drove initial IRP process
 - P50 fuel assumption favours FGD in 2020 versus 2012
 - I.e. Fuel switch to meet scheduled 2010 SO₂ reduction
 - P90 low sulphur coal with P50 or P10 pet coke, favours FGD 2012
 - P90 air emissions assumption favours FGD in 2015
 - April 26th Federal Regulatory Framework for Air Emissions contemplate alternative emissions caps and timing for SO₂. This has not been analyzed as part of the IRP. Additional analysis is required once the regulations are understood.

A comparison of NPVs is provided in Appendix L

Preliminary Conclusions & Actions

DSM

- Conclusion:
- Spending 5% of annual electric revenue appears to be economic.
- Actions Required:
 - Complete program design to maximize energy resource cost savings from investing 5% of annual electric revenue
 - Collect end-use market data to inform design and implementation
 - Seek recovery of costs
 - Implement programs and monitor results
 - Report in two years

Preliminary Conclusions & Actions

Renewables

- **Conclusions:**
 - Additional wind beyond the RPS appears to be economic
- **Actions Required:**
 - Conduct wind integration study to assess feasibility and costs of wind in Nova Scotia

Preliminary Conclusions & Actions

Supply Side

- Conclusions:
 - Most incremental near term supply and environmental additions appear economic and/or provide for risk mitigation to meet constraints
 - 5% spending of annual electric revenues on DSM may forego the need for additional large scale generation
- Actions:
- Near Term
 - File work orders supporting the appropriate additions
- Longer Term
 - Re-evaluate the need for major generation, once DSM programs have been in place and monitored for two years.

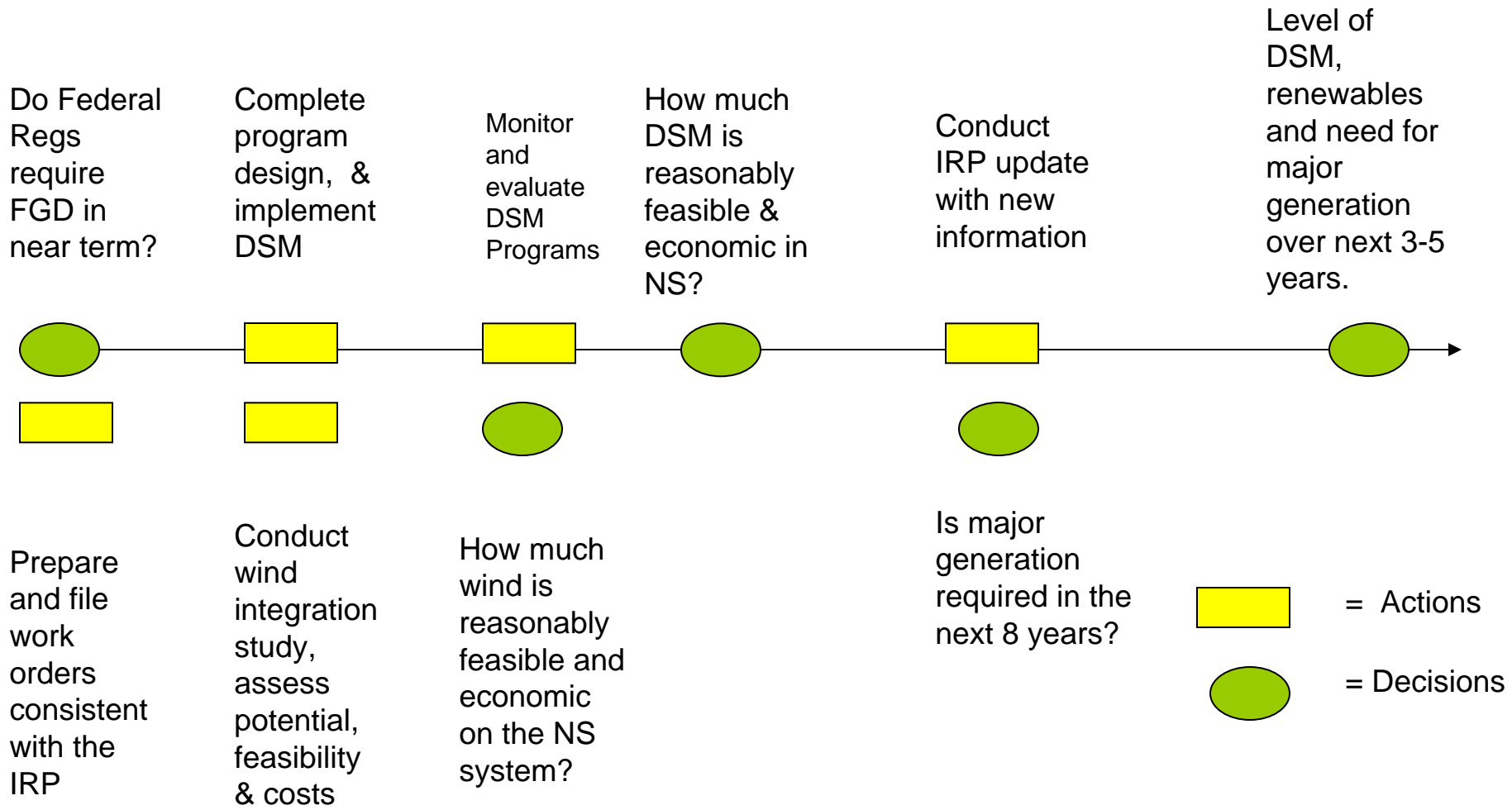
Preliminary Conclusions & Actions

Carbon Credits vs Physical Reductions

- **Conclusions:**
 - In the 2020 timeframe, physical reductions appear to be on par with the cost of purchasing credits.
 - Whether physical reductions or financial instruments are used to meet caps in 2020, neither affects the decisions required in the next 3-5 years.
- **Actions Required:**
 - There is considerable uncertainty surrounding the availability and feasibility of physical reductions technologies. The next 3-5 years should focus on gaining more certainty.
 - Purchase financial instruments if required to meet caps before technologies are available

Decision Tree

3-5 Year Time Line



Early Observations on an Action Plan

- Complete program design to maximize energy resource cost savings from investing 5% of annual electric revenue, apply to recover costs
- Implement DSM and monitor and record results for two years.
- Conduct wind integration study in NS to determine wind integration issues and costs of wind in NS.
- Refresh IRP assumptions in two years to reflect results of DSM programs and wind integration study. Determine at that time if a large generation unit is required in NS
- File work orders in support of short term environmental additions.
- File work orders in support of short term incremental supply options.
- Understand the federal regulations and their effect on NS electricity

NEXT STEPS

Technical Conference	May 23
Stakeholder Input on Results	June 13
Draft Report to Stakeholders	July 4
Stakeholder Comment on Report	July 11
Final Report Filed with UARB	July 25

Appendix

- Appendix A – Screening Curves pp 65-70
- Appendix B – Resource Plan Summary pp 71
- Appendix C – Resource Summary (MW) pp72
- Appendix D – Loads & Resources Ref. Case pp 73
- Appendix E – Energy & Loads & Resources pp74-85
- Appendix F – Annual Revenue Requirement pp86-89
- Appendix G – Sensitivities pp 90-93
- Appendix H – Environmental Assumptions pp 94-98
- Appendix H – Less Constrained Emissions pp 99
- Appendix I – Energy Hard Carbon Cap pp100-103
- Appendix J – Hard Cap Summaries pp 104-105
- Appendix K – DSM Worlds pp 105
- Appendix L – Synopsis of NPVs pp 107

Appendix A

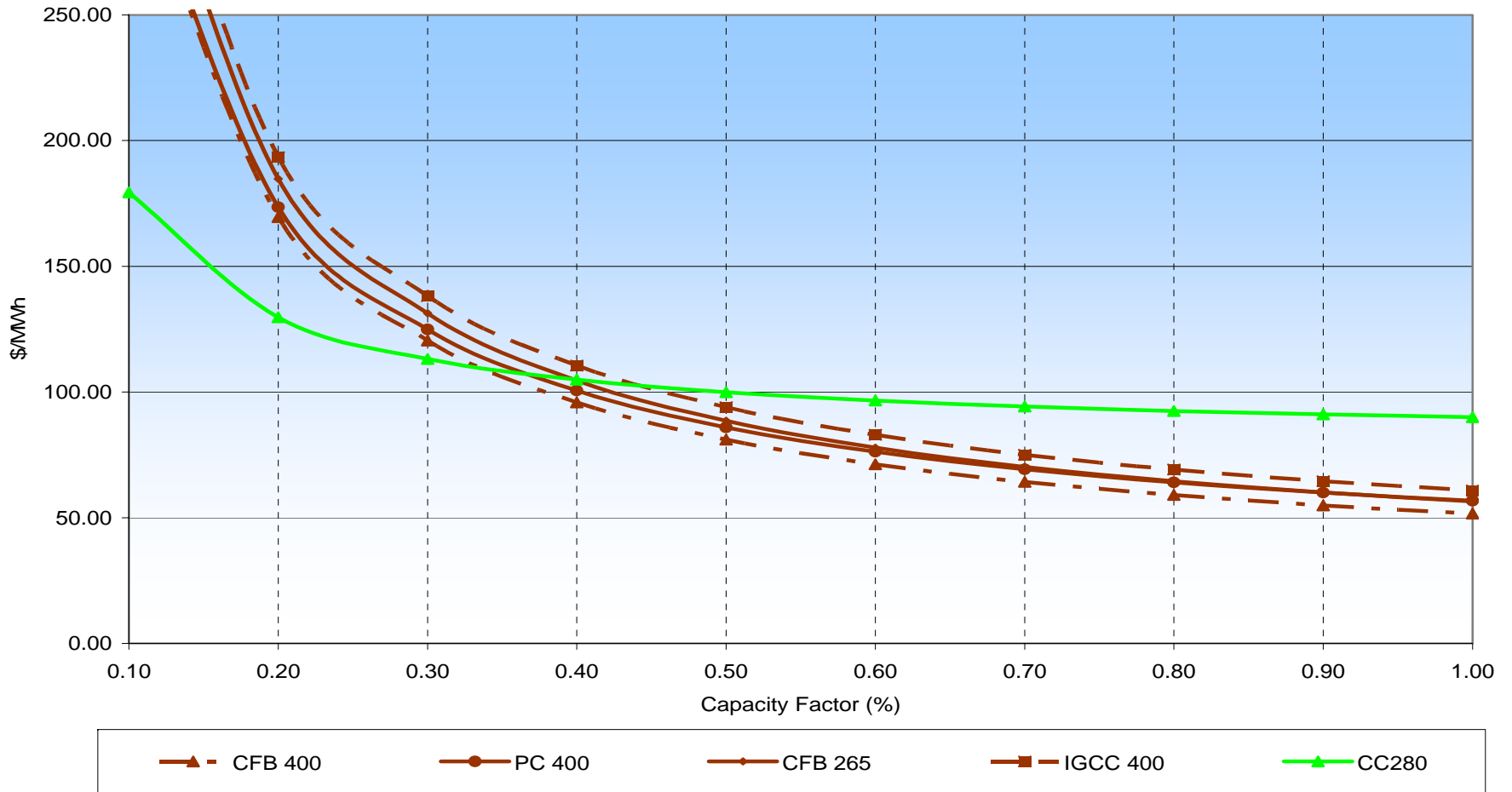
Screening Curves

- Generation Option Capital and Operating Costs - information from IRP basic assumptions, in 2006 dollars
- Fuel cost information - information from IRP basic assumptions fuel cost forecast, with fuel forecast levelized for the period used (ie. 40 years).
 - Where fuel cost information was needed beyond 2029, costs were adjusted using 2% inflation. Fuel blend is consistent with Strategist modeling.
- The **before tax** cost of capital was used. The before tax cost of capital rate used is 8.21%, the "most likely" from the IRP basic assumptions.
- The resulting net levelized \$/MWhr cost estimated is the **actual cost of production**, before application of tax effects, etc. As noted in the spreadsheet references, the calculation formulas and practices were taken from the book "Least-Cost Electric Utility Planning", by Harry G. Stoll.
- - For CO2 offset costs, the "most likely" cost curve from the IRP basic assumptions was used for the period 2010 to 2029. After 2029, the offset costs are escalated at 2% inflation.
- Screening curves are shown on the following pages.

Appendix A

Screening Curves

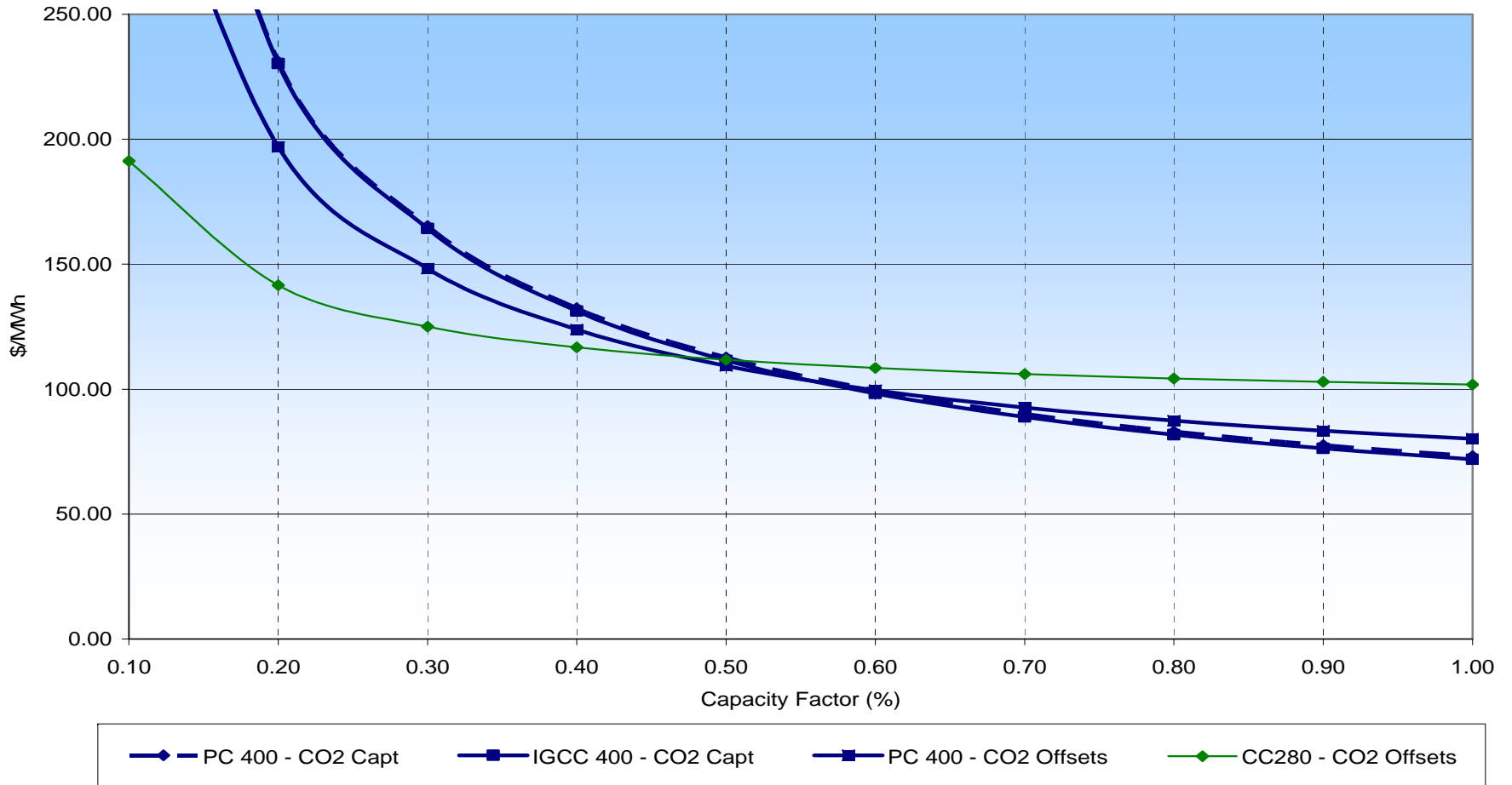
Levelized Generation Cost for Solid Fuel Technology Options Without CO2 Offset - High Side Bushing



Appendix A

Screening Curves

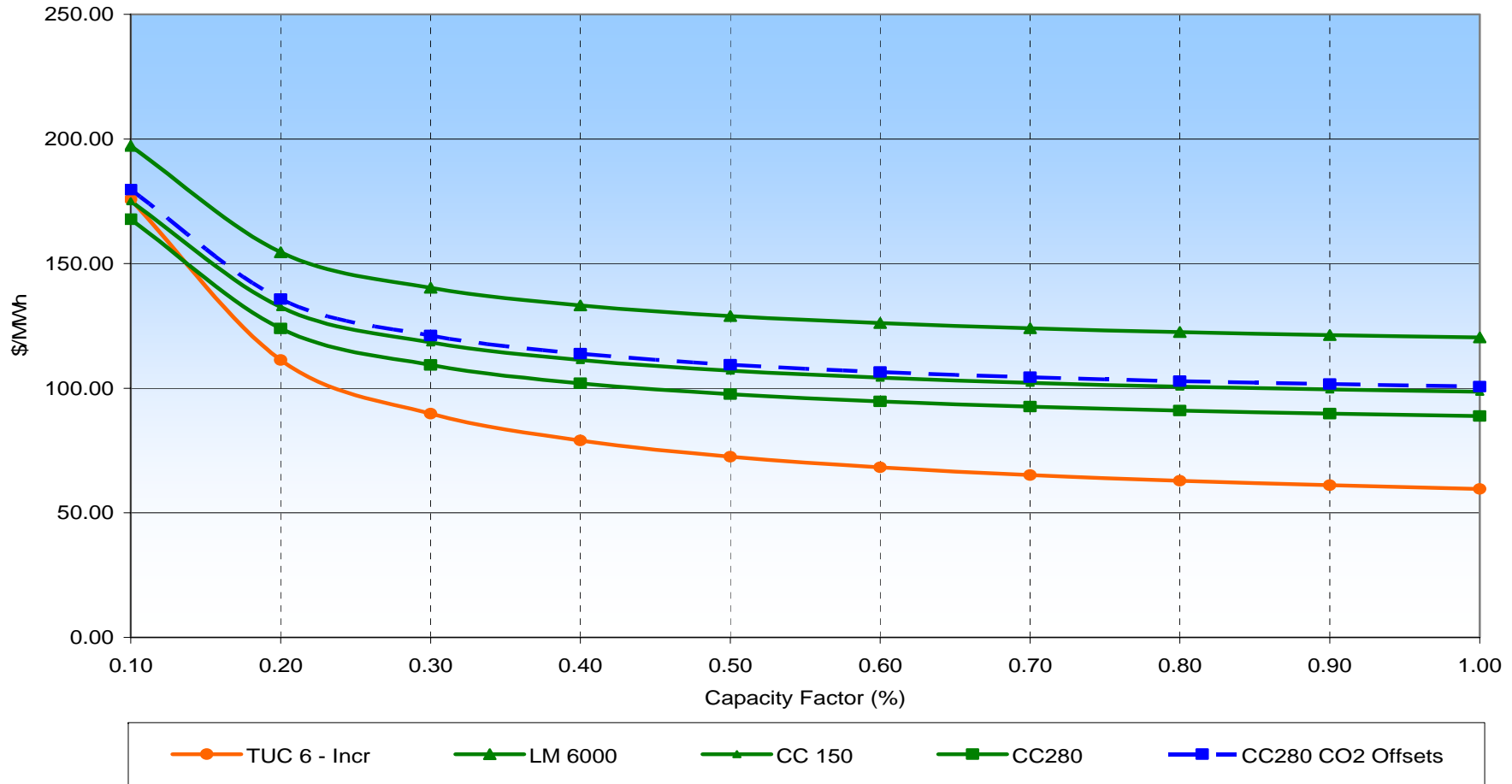
Levelized Generation Cost for Solid Fuel Technology Options with CO₂ Capture - High Side Bushing



Appendix A

Screening Curves

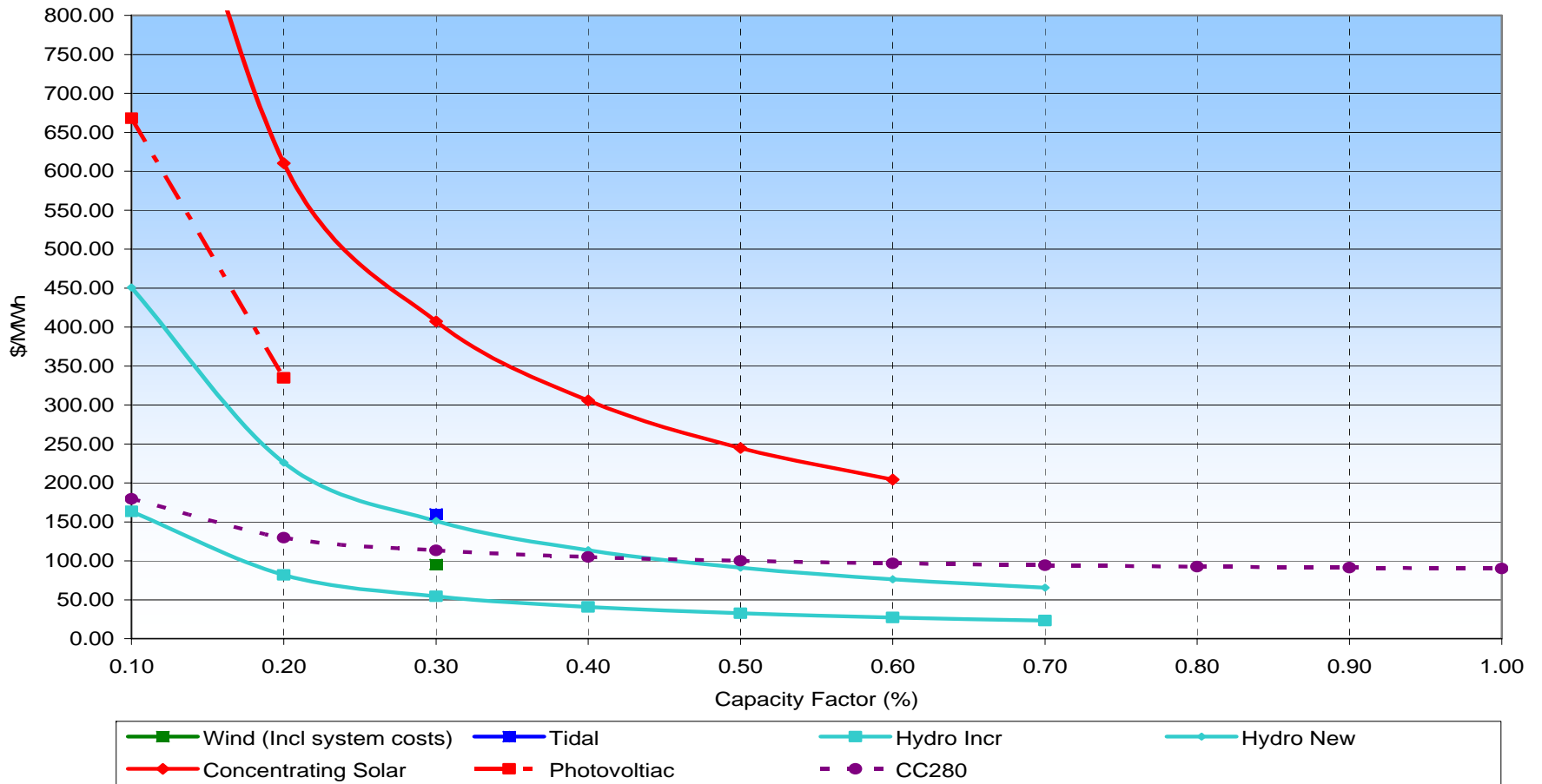
Comparison of Levelized Generation Cost for Natural Gas Technology Options - High Side Bushing



Appendix A

Screening Curves

Comparison of Levelized Generation Cost for Renewable Technology Options - High Side Bushing



Appendix B

6 Base Resource Plans: Summary

IRP Resource Plans (CO2 Credit Costs are included in the Unit Dispatch Costs)

Year	5% Spend DSM Renewables Plan	5% Spend DSM	2% Spend DSM Renewables Plan	2% Spend DSM Coal Plan (FGD in 2020)	2% Spend DSM Coal Plan (FGD in 2012)	2% Spend DSM Natural Gas Plan
2006	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)
2007	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)
2008	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 2% DSM_Com 2% DSM_Ind 2%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 2% DSM_Com 2% DSM_Ind 2%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 2% DSM_Com 2% DSM_Ind 2%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 2% DSM_Com 2% DSM_Ind 2%
2009	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)
2010	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)
2011	Lingan 1 +5MW (Jul)	Lingan 1 +5MW (Jul)			Lingan 3/4 FGD	
2012						
2013	RPS (166MW Firm total)	RPS (166MW Firm total)	RPS (166MW Firm total) Rnew 50 MW (16 MW firm)	RPS (166MW Firm total)	RPS (166MW Firm total)	RPS (166MW Firm total)
2014	Rnew 50 MW (16 MW firm)		Rnew 50 MW (16 MW firm)			
2015	Rnew 50 MW (16 MW firm)		CC (280MW)	PC 400MW (FGD,SCR,Tox)	PC 400MW (FGD,SCR,Tox)	CC (280MW)
2016			Rnew 50 MW (16 MW firm)			
2017	Rnew 50 MW (16 MW firm)					
2018						
2019	Trenton 6 LN (Oct) Rnew 50 MW (16 MW firm)	Trenton 6 LN (Oct)	Trenton 6 LN (Oct) Rnew 50 MW (16 MW firm)			Trenton 6 LN (Oct)
2020	L1/L2 SCR, L1/L2 FGD	L1/L2 SCR, L1/L2 FGD	L3/L4 SCR, L3/L4 FGD	L3/L4 SCR, L3/L4 FGD	Lingan 3/4 SCR	L3/L4 SCR, L3/L4 FGD
2021	Rnew 50 MW (16 MW firm)		Rnew 50 MW (16 MW firm)			
2022						
2023	Rnew 50 MW (16 MW firm)		Rnew 50 MW (16 MW firm)			
2024						
2025	Rnew 50 MW (16 MW firm)		Rnew 50 MW (16 MW firm)			
2026	Rnew 50 MW (16 MW firm)		Rnew 50 MW (16 MW firm)			
2027	Rnew 50 MW (16 MW firm)		Rnew 50 MW (16 MW firm)			
2028	Rnew 50 MW (16 MW firm)		Rnew 50 MW (16 MW firm)			CC (280MW)
2029						
Study Period (M\$) (includes End Effects)	\$14,479.9	\$14,747.7	\$15,435.2	\$15,503.7	\$15,551.4	\$15,925.4

Appendix C

6 Base Resource Plans

Summary MW

2007 IRP REFERENCE PLANS: SCHEDULE OF SUPPLY OR DSM MW's

	Comments: Why each is selected	Levelized Cost of the Incremental kWh	"Reference" 5% Spend DSM + Renewables > RPS	5% Spend DSM	2% Spend DSM + Renewables > RPS	2% Spend DSM Coal Plant (FGD in 2020)	2% Spend DSM Coal Plan (FGD in 2012)	2% Spend DSM Natural Gas
New Resources 2008-2014								
DSM	Cheapest alternative	~\$0.061-0.063/kWh	256	256	146	146	146	146
TUC 6	Improved heat rate, additional capacity	~\$0.065/kWh	50	50	0	50	50	50
LM 6000	N/A	~\$0.125/kWh						
Uprates	Affordable capital, minimal incremental OM&G/fuel	~ \$0.014/kWh	20	20	20	20	20	20
Hydro	Affordable capital, minimal incremental OM&G/fuel	~ \$0.035/kWh	4.3	4.3	4.3	4.3	4.3	4.3
RPS	Fixed	~\$0.09/kWh	166	166	166	166	166	166
Additional Wind	Economic energy	~\$0.09/kWh	16		16			
		SUBTOTAL	512.3	496.3	352.3	386.3	386.3	386.3
New Resources 2015-2029								
Additional Wind	Economic energy	~\$0.09/kWh	144		144			
Pulverized Coal	Economic energy	~\$0.064/kWh				400	400	
LM 6000	N/A	~\$0.125/kWh						
Combined Cycle	Economic energy	~\$0.093/kWh			280			560
DSM	Cheapest alternative	~\$0.061-0.063/kWh	857	857	559	559	559	559
		SUBTOTAL	1001	857	983	959	959	1119
		TOTAL SUPPLY OR DSM MW's OVER PLANNING PERIOD	1513.3	1353.3	1335.3	1345.3	1345.3	1505.3

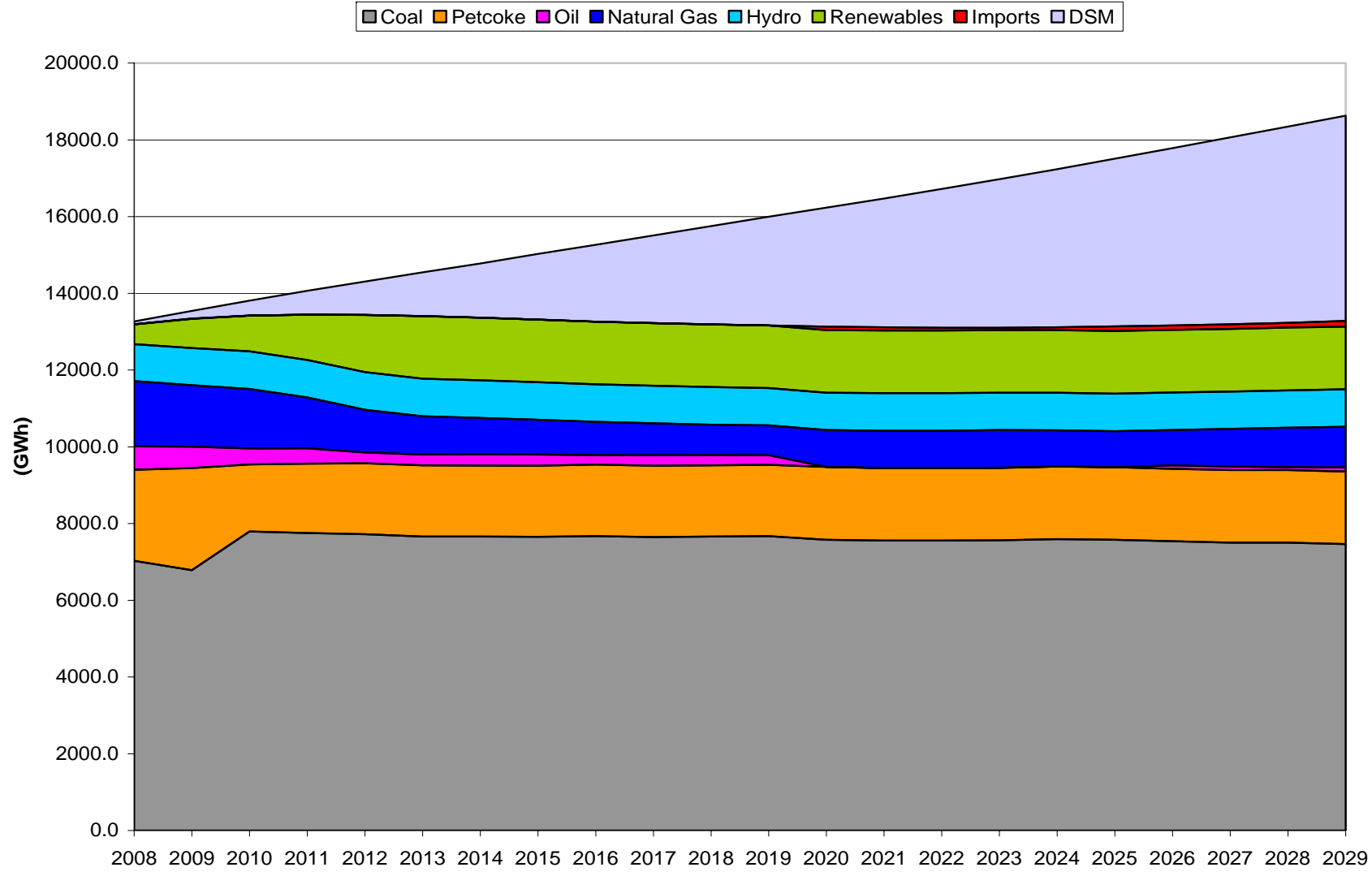
Appendix D

Loads & Resources – Reference Case “5% Spend DSM & Renewables beyond RPS”

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Peak Firm Load	1,927	1,973	2,019	2,061	2,101	2,141	2,181	2,224	2,264	2,306	2,347	2,391	2,432	2,473	2,517	2,561	2,608	2,656	2,705	2,754	2,805	2,856	
Peak Firm Less DSM	1,916	1,943	1,959	1,960	1,954	1,942	1,925	1,909	1,890	1,874	1,858	1,845	1,829	1,814	1,802	1,790	1,781	1,772	1,764	1,756	1,750	1,743	
DSM	11	30	60	101	147	199	256	315	374	432	489	546	603	659	715	771	827	884	941	998	1,055	1,113	
RM Required	460	466	470	470	469	466	462	458	454	450	446	443	439	435	432	430	427	425	423	422	420	418	
Required MWs	2,299	2,332	2,351	2,352	2,345	2,331	2,310	2,290	2,268	2,249	2,229	2,214	2,195	2,177	2,162	2,148	2,137	2,127	2,117	2,108	2,100	2,092	
Existing MWs	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	
Additions MWs																							
TUC6		51.9																					
LIN 1 Uprate				5																			
LIN 2 Uprate		5																					
LIN 3 Uprate			5																				
LIN 4 Uprate		5																					
Hydros		4.3																					
RPS	4.7	28.8	27.8	19.2	28.8	38.7																	
Additional Wind							16	16		16		16		16		16		16	16	16	16		
FGD													-8										
Total Annual Additions	4.7	95	32.8	24.2	28.8	38.7	16	16	0	16	0	16	-8	16	0	16	0	16	16	16	16	16	0
Total Cumulative Additions	4.7	99.7	132.5	156.7	185.5	224.2	240.2	256.2	256.2	272.2	272.2	288.2	280.2	296.2	296.2	312.2	312.2	328.2	344.2	360.2	376.2	376.2	
Total Firm Capacity	2338.7	2433.7	2466.5	2490.7	2519.5	2558.2	2574.2	2590.2	2590.2	2606.2	2606.2	2622.2	2614.2	2630.2	2630.2	2646.2	2646.2	2662.2	2678.2	2694.2	2710.2	2710.2	
Surplus (Deficit) MWs above RM	40	102	116	138	175	227	264	300	322	357	377	408	419	453	468	498	509	536	561	586	610	619	
Reserve Margin %	22%	25%	26%	27%	29%	32%	34%	36%	37%	39%	40%	42%	43%	45%	46%	48%	49%	50%	52%	53%	55%	55%	

Appendix E

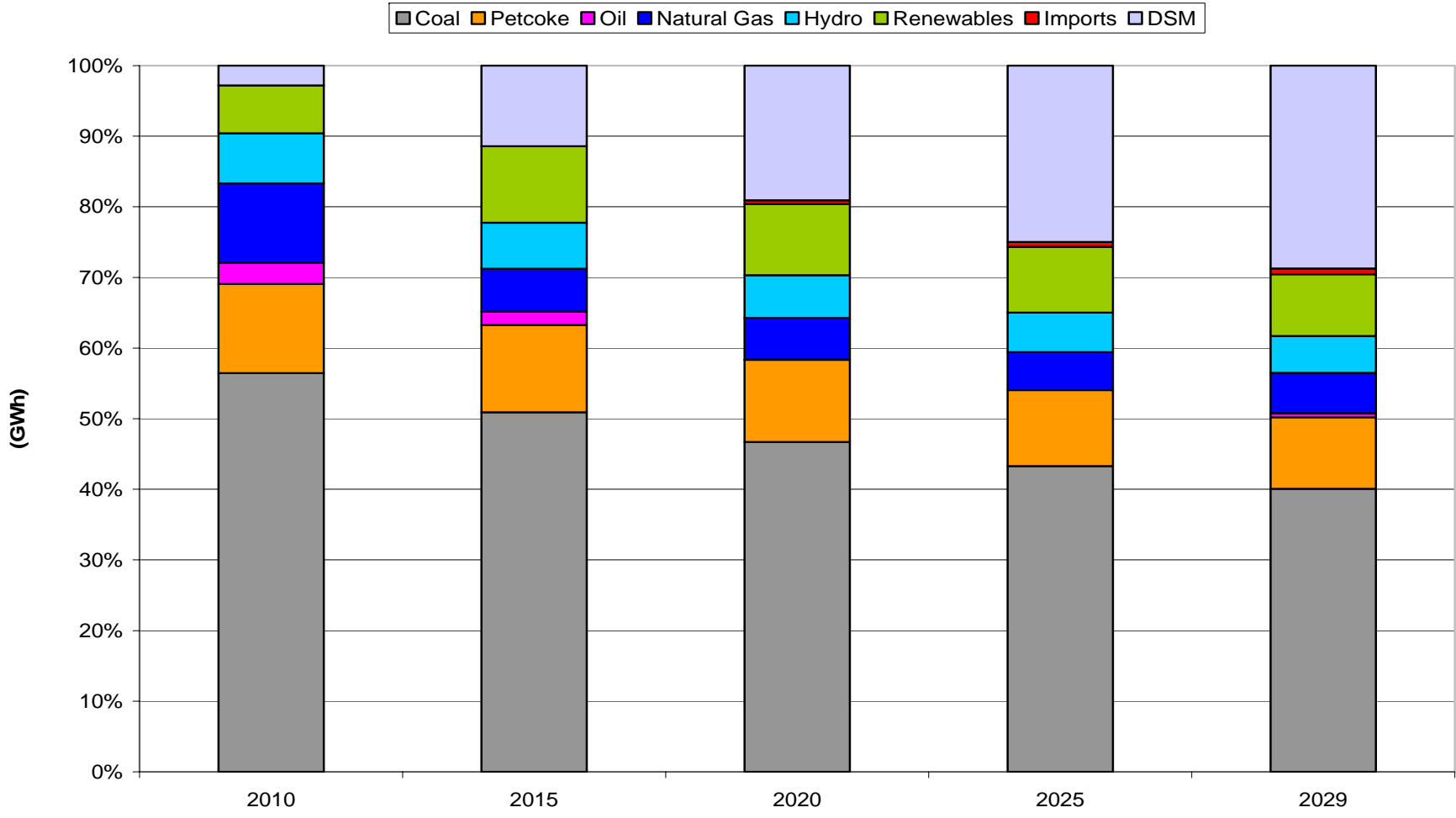
Energy 5% Spend DSM



Appendix E

Energy 5% Spend DSM

Future Generation 5% DSM



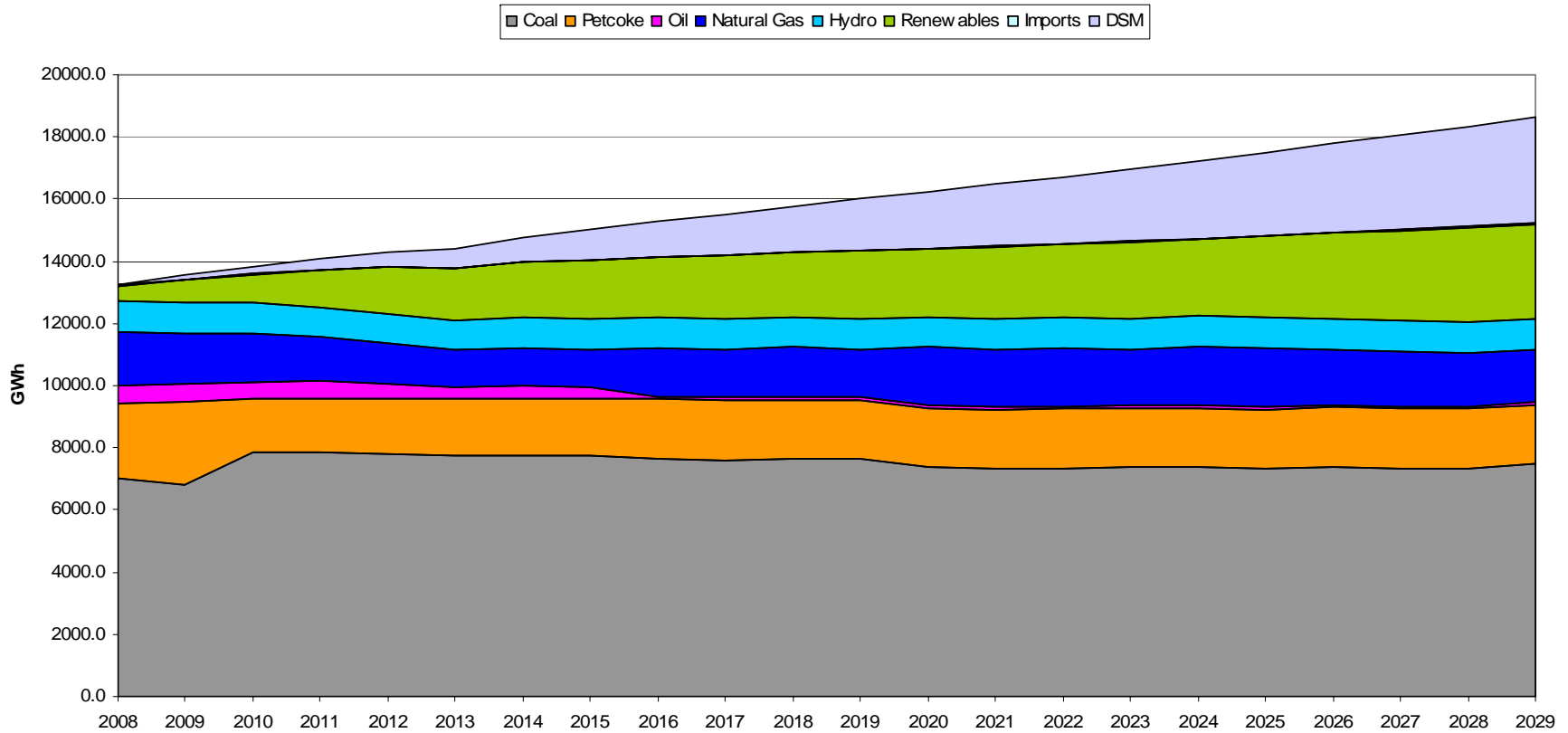
Loads & Resources

5% DSM

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Peak Firm Load (MW)	1,927	1,973	2,019	2,061	2,101	2,141	2,181	2,224	2,264	2,306	2,347	2,391	2,432	2,473	2,517	2,561	2,608	2,656	2,705	2,754	2,805	2,856
Peak Firm Less DSM	1,919	1,951	1,975	1,988	1,995	1,999	1,998	1,999	1,998	1,999	2,000	2,004	2,005	2,006	2,011	2,015	2,022	2,030	2,039	2,047	2,056	2,066
DSM Firm	8	22	44	73	106	142	183	225	266	307	347	387	427	467	506	546	586	626	666	707	749	790
RM Required (MW)	460	468	474	477	479	480	480	480	479	480	480	481	481	481	483	484	485	487	489	491	494	496
Required MWs	2,302	2,342	2,371	2,386	2,395	2,399	2,398	2,399	2,397	2,399	2,399	2,404	2,406	2,407	2,413	2,418	2,427	2,436	2,446	2,456	2,468	2,479
Existing MWs	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334
Additions MWs																						
TUC6			51.9																			
LIN 1 Uprate					5																	
LIN 2 Uprate			5																			
LIN 3 Uprate				5																		
LIN 4 Uprate			5																			
Hydros			4.3																			
RPS	4.7	28.8	27.8	19.2	28.8	38.7																
Additional Wind																						
FGD													-8									
Total Annual Additions	4.7	28.8	94	24.2	33.8	38.7	0	0	0	0	0	0	-8	0	0	0	0	0	0	0	0	0
Total Cumulative Additions	4.7	33.5	127.5	151.7	185.5	224.2	224.2	224.2	224.2	224.2	224.2	224.2	216.2	216.2	216.2	216.2	216.2	216.2	216.2	216.2	216.2	216.2
Total Firm Capacity (MW)	2338.7	2367.5	2461.5	2485.7	2519.5	2558.2	2558.2	2558.2	2558.2	2558.2	2558.2	2558.2	2550.2	2550.2	2550.2	2550.2	2550.2	2550.2	2550.2	2550.2	2550.2	2550.2
Surplus (Deficit) MWs above RM	36	26	91	100	125	160	160	159	161	160	159	154	144	143	138	132	124	114	104	94	82	72
Reserve Margin %	22%	21%	25%	25%	26%	28%	28%	28%	28%	28%	28%	28%	27%	27%	27%	27%	26%	26%	25%	25%	24%	23%

Appendix E

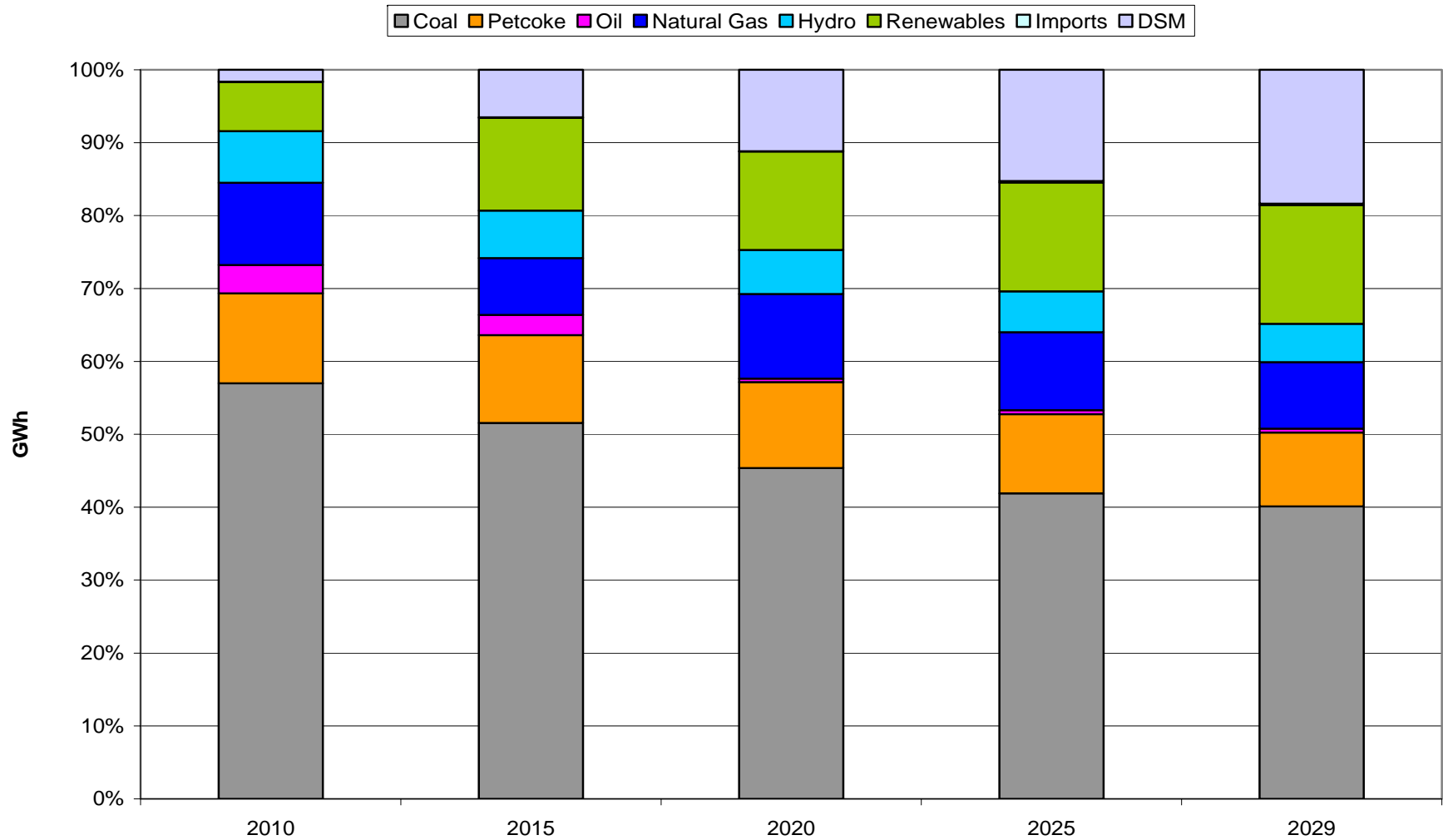
Energy 2% DSM + Renewables



Appendix E

Energy 2% DSM + Renewables

2% DSM + Renewables



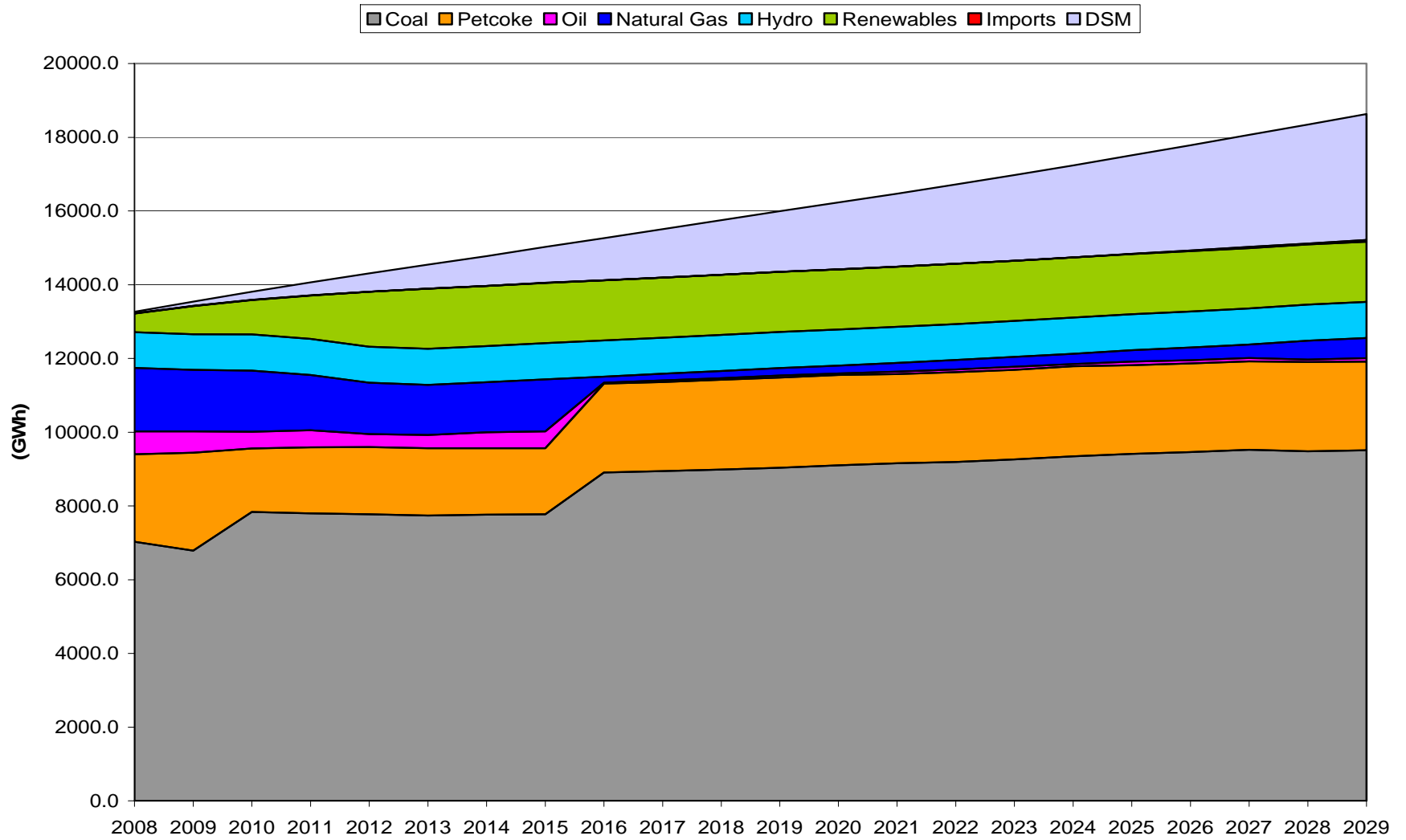
Loads & Resources

2% DSM + Renewables

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Peak Firm Load (MW)	1,927	1,973	2,019	2,061	2,101	2,141	2,181	2,224	2,264	2,306	2,347	2,391	2,432	2,473	2,517	2,561	2,608	2,656	2,705	2,754	2,805	2,856
Peak Firm Less DSM	1,922	1,961	1,994	2,020	2,041	2,060	2,077	2,095	2,112	2,130	2,148	2,168	2,186	2,203	2,224	2,244	2,267	2,291	2,315	2,338	2,364	2,388
DSM Firm	4.7	12.3	24.9	41.5	60.3	81.3	104.4	128.5	152.3	175.9	199.3	222.7	246.1	269.5	293.1	316.9	341.0	365.5	390.3	415.5	441.3	467.6
RM Required (MW)	461	471	479	485	490	494	498	503	507	511	515	520	525	529	534	539	544	550	556	561	567	573
Required MWs	2,307	2,353	2,393	2,423	2,449	2,472	2,492	2,515	2,534	2,556	2,577	2,602	2,623	2,644	2,669	2,693	2,720	2,749	2,778	2,806	2,836	2,866
Existing MWs	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334
Additions MWs																						
TUC6																						
LIN 1 Uprate				5																		
LIN 2 Uprate			5																			
LIN 3 Uprate				5																		
LIN 4 Uprate			5																			
Hydros			4.3																			
RPS	4.7	28.8	27.8	19.2	28.8	38.7																
Additional Wind						16		16		16		16		16		16		16	16	16	16	16
Combined Cycle									280													
FGD													-8									
Total Annual Additions	4.7	28.8	42.1	29.2	28.8	54.7	0	16	280	16	0	16	-8	16	0	16	0	16	16	16	16	0
Total Cumulative Additions	4.7	33.5	75.6	104.8	133.6	188.3	188.3	204.3	484.3	500.3	500.3	516.3	508.3	524.3	524.3	540.3	540.3	556.3	572.3	588.3	604.3	604.3
Total Firm Capacity (MW)	2338.7	2367.5	2409.6	2438.8	2467.6	2522.3	2522.3	2538.3	2818.3	2834.3	2834.3	2850.3	2842.3	2858.3	2858.3	2874.3	2874.3	2890.3	2906.3	2922.3	2938.3	2938.3
Surplus (Deficit) MWs above RM	32	15	17	15	19	51	30	24	284	278	257	248	219	214	190	181	154	142	129	116	102	72
Reserve Margin %	22%	21%	21%	21%	21%	22%	21%	21%	33%	33%	32%	31%	30%	30%	29%	28%	27%	26%	26%	25%	24%	23%

Appendix E

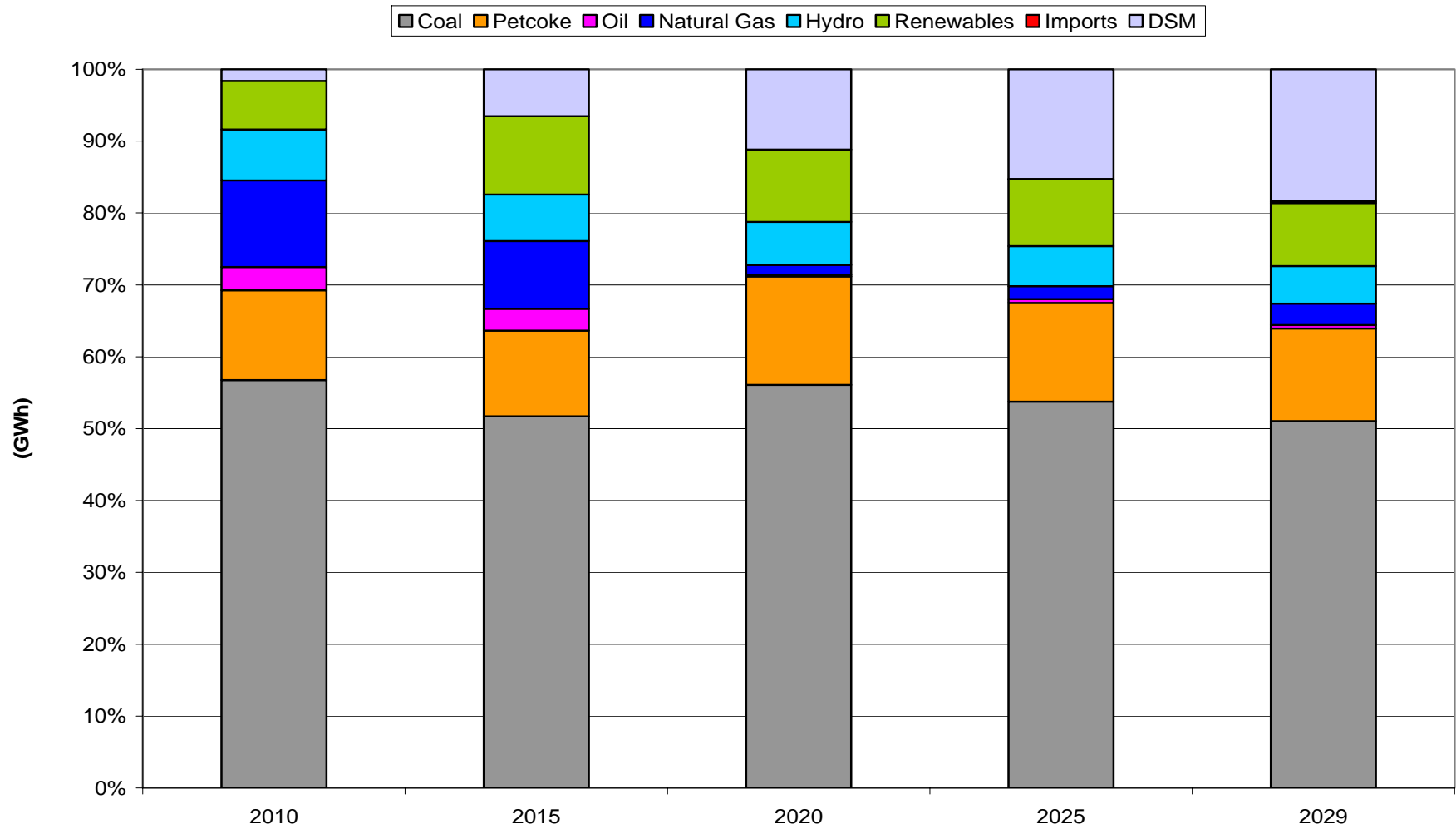
Energy 2% *DSM* + Coal



Appendix E

Energy 2% DSM + Coal

2% DSM Coal Plan (FGD 2020)



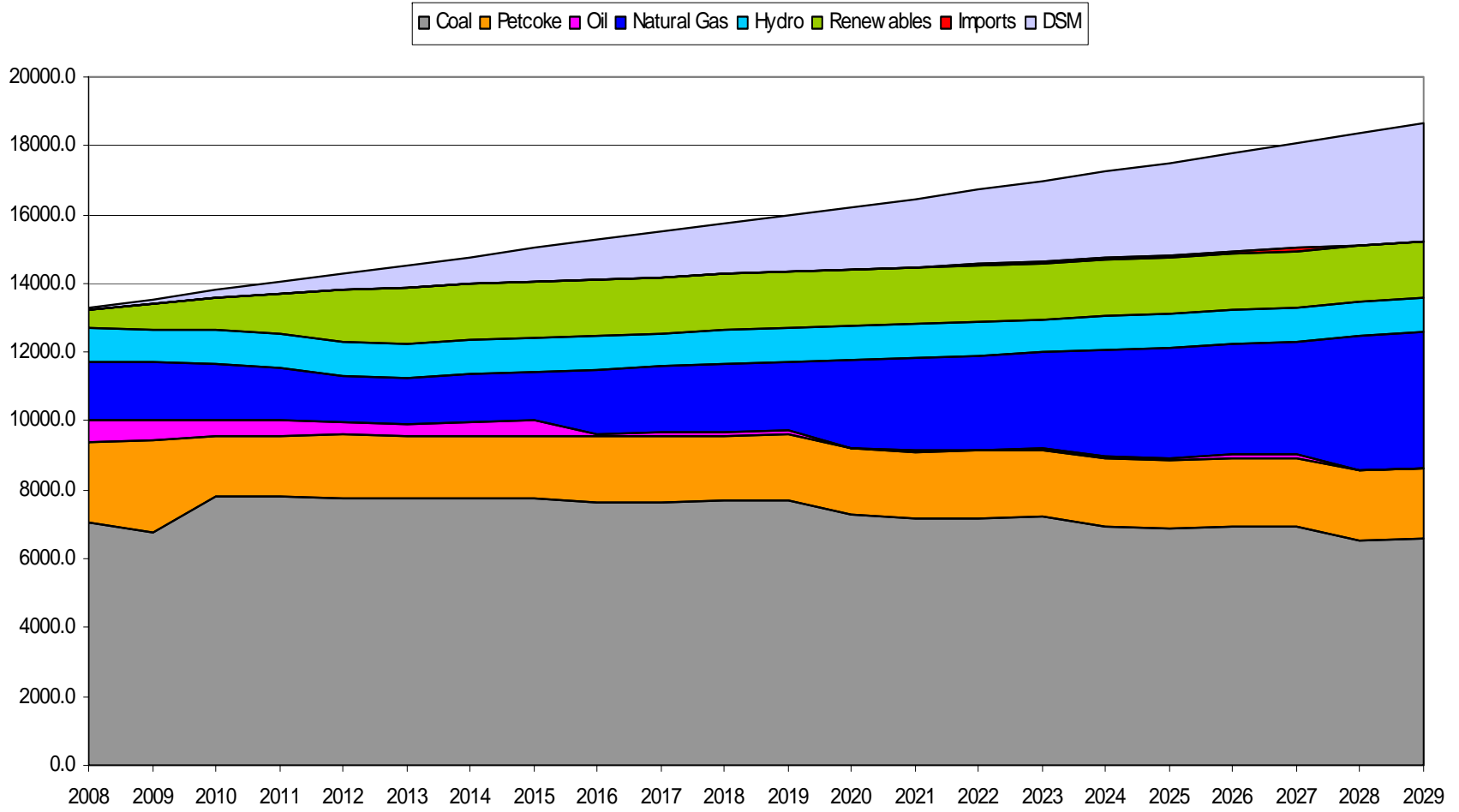
Loads & Resources

2% DSM + Coal

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Peak Firm Load (MW)	1,927	1,973	2,019	2,061	2,101	2,141	2,181	2,224	2,264	2,306	2,347	2,391	2,432	2,473	2,517	2,561	2,608	2,656	2,705	2,754	2,805	2,856
Peak Firm Less DSM	1,922	1,961	1,994	2,020	2,041	2,060	2,077	2,095	2,112	2,130	2,148	2,168	2,186	2,203	2,224	2,244	2,267	2,291	2,315	2,338	2,364	2,388
DSM Firm	4.7	12.3	24.9	41.5	60.3	81.3	104.4	128.5	152.3	175.9	199.3	222.7	246.1	269.5	293.1	316.9	341.0	365.5	390.3	415.5	441.3	467.6
RM Required (MW)	461	471	479	485	490	494	498	503	507	511	515	520	525	529	534	539	544	550	556	561	567	573
Required MWs	2,307	2,353	2,393	2,423	2,449	2,472	2,492	2,515	2,534	2,556	2,577	2,602	2,623	2,644	2,669	2,693	2,720	2,749	2,778	2,806	2,836	2,866
Existing MWs	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334
Additions MWs																						
TUC6			51.9																			
LIN 1 Uprate				5																		
LIN 2 Uprate			5																			
LIN 3 Uprate				5																		
LIN 4 Uprate				5																		
Hydros			4.3																			
RPS	4.7	28.8	27.8	19.2	28.8	38.7																
PC Coal									400													
FGD													-8									
Total Annual Additions	4.7	28.8	94	29.2	28.8	38.7	0	0	400	0	0	0	-8	0	0	0	0	0	0	0	0	0
Total Cumulative Additions	4.7	33.5	127.5	156.7	185.5	224.2	224.2	224.2	624.2	624.2	624.2	624.2	616.2	616.2	616.2	616.2	616.2	616.2	616.2	616.2	616.2	616.2
Total Firm Capacity (MW)	2338.7	2367.5	2461.5	2490.7	2519.5	2558.2	2558.2	2558.2	2958.2	2958.2	2958.2	2958.2	2950.2	2950.2	2950.2	2950.2	2950.2	2950.2	2950.2	2950.2	2950.2	2950.2
Surplus (Deficit) MWs above RM	32	15	69	67	71	87	66	44	424	402	381	356	327	306	282	257	230	202	173	144	114	84
Reserve Margin %	22%	21%	23%	23%	23%	24%	23%	22%	40%	39%	38%	36%	35%	34%	33%	31%	30%	29%	27%	26%	25%	24%

Appendix E

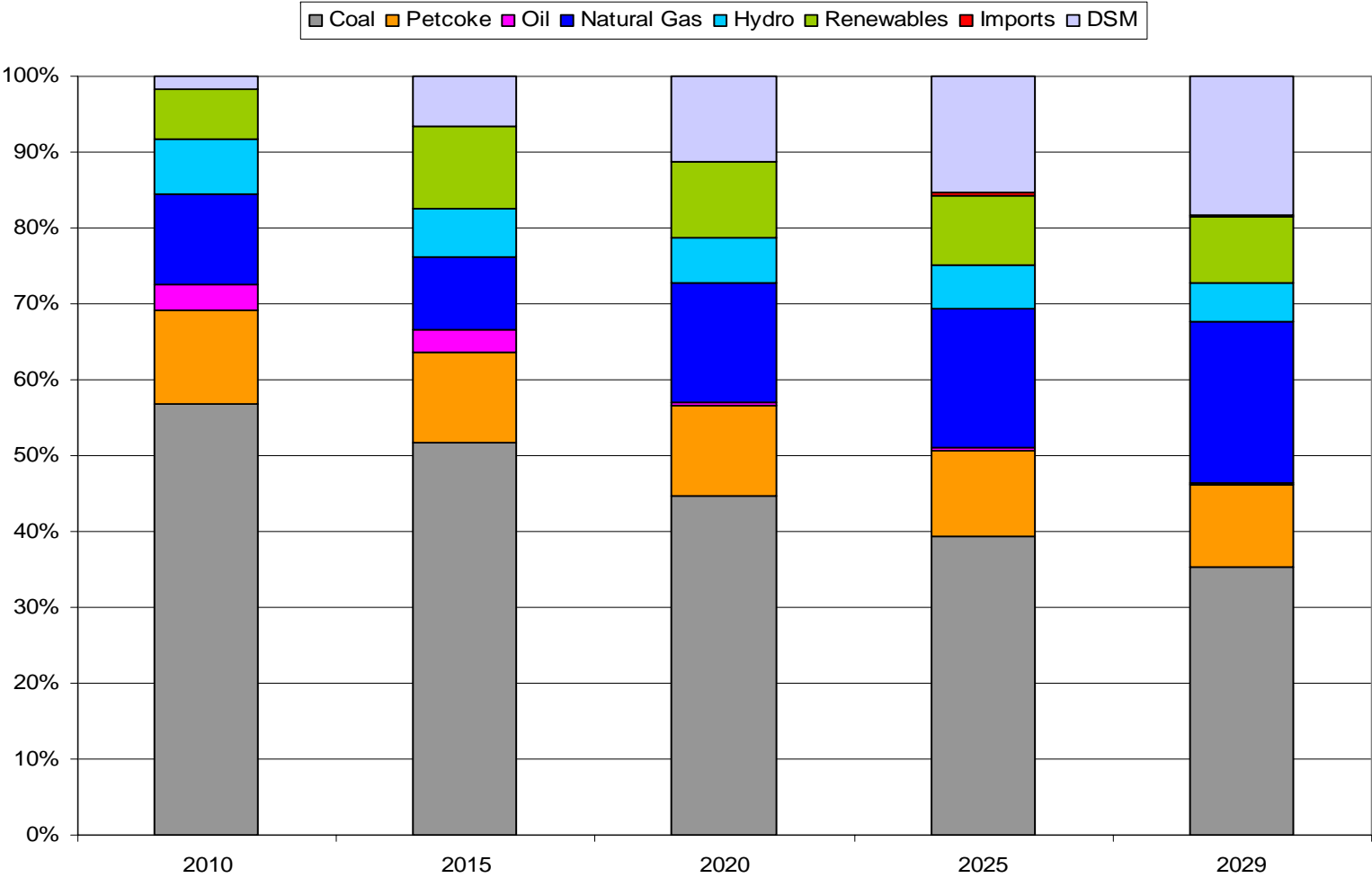
Energy 2% *DSM* + *Natural Gas*



Appendix E

Energy 2% *DSM* + Natural Gas

2% DSM and Natural Gas Plan



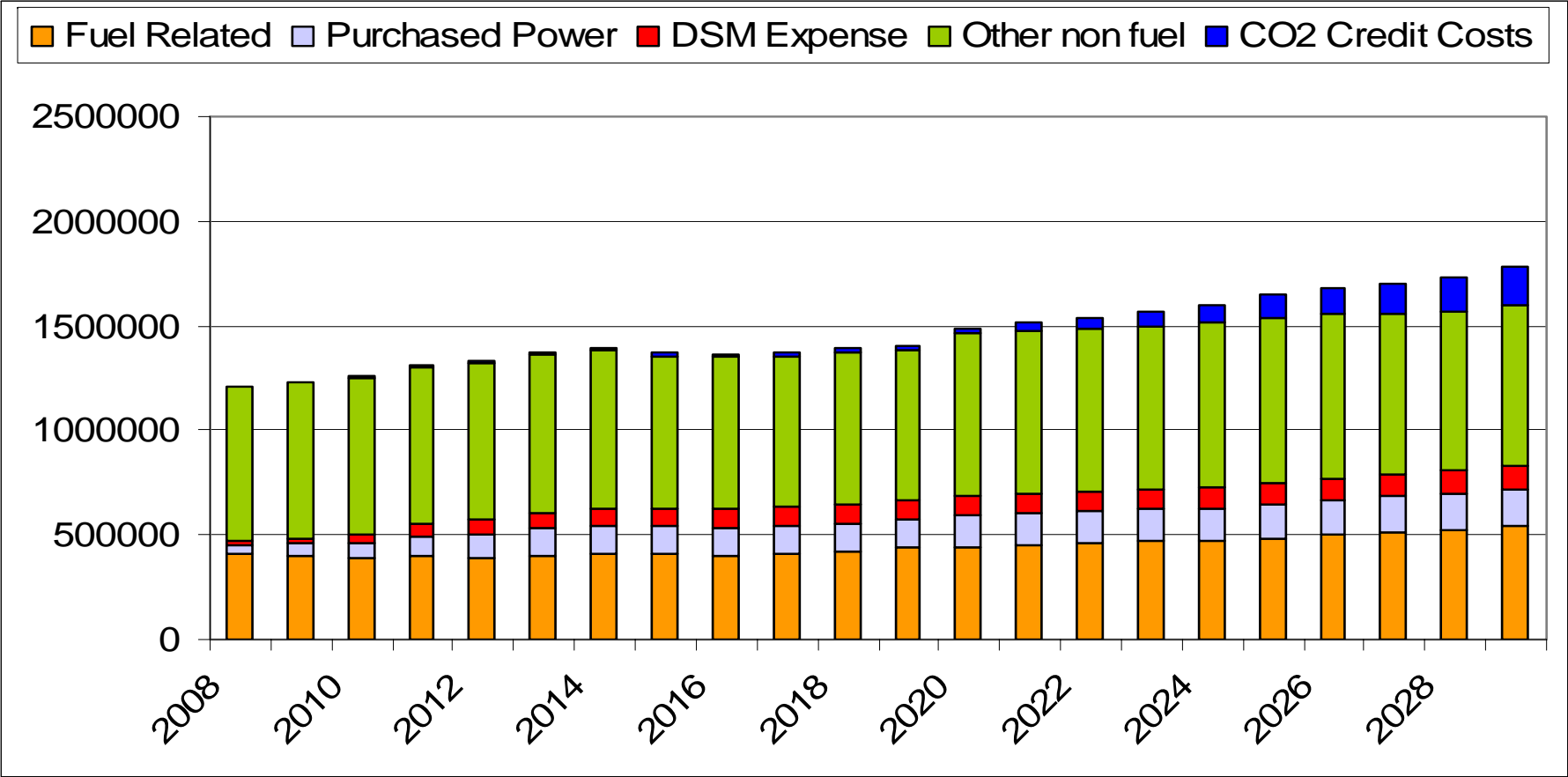
Loads & Resources

2% DSM + Natural Gas

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Peak Firm Load (MW)	1,927	1,973	2,019	2,061	2,101	2,141	2,181	2,224	2,264	2,306	2,347	2,391	2,432	2,473	2,517	2,561	2,608	2,656	2,705	2,754	2,805	2,856
Peak Firm Less DSM	1,922	1,961	1,994	2,020	2,041	2,060	2,077	2,095	2,112	2,130	2,148	2,168	2,186	2,203	2,224	2,244	2,267	2,291	2,315	2,338	2,364	2,388
DSM Firm	4.7	12.3	24.9	41.5	60.3	81.3	104.4	128.5	152.3	175.9	199.3	222.7	246.1	269.5	293.1	316.9	341.0	365.5	390.3	415.5	441.3	467.6
RM Required (MW)	461	471	479	485	490	494	498	503	507	511	515	520	525	529	534	539	544	550	556	561	567	573
Required MWs	2,307	2,353	2,393	2,423	2,449	2,472	2,492	2,515	2,534	2,556	2,577	2,602	2,623	2,644	2,669	2,693	2,720	2,749	2,778	2,806	2,836	2,866
Existing MWs	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334	2334
Additions MWs																						
TUC6			51.9																			
LIN 1 Uprate				5																		
LIN 2 Uprate			5																			
LIN 3 Uprate				5																		
LIN 4 Uprate			5																			
Hydros			4.3																			
RPS	4.7	28.8	27.8	19.2	28.8	38.7																
Additional Wind																						
Combined Cycle									280												280	
FGD													-8									
Total Annual Additions	4.7	28.8	94	29.2	28.8	38.7	0	0	280	0	0	0	-8	0	0	0	0	0	0	0	280	0
Total Cumulative Additions	4.7	33.5	127.5	156.7	185.5	224.2	224.2	224.2	504.2	504.2	504.2	504.2	496.2	496.2	496.2	496.2	496.2	496.2	496.2	496.2	776.2	776.2
Total Firm Capacity (MW)	2338.7	2367.5	2461.5	2490.7	2519.5	2558.2	2558.2	2558.2	2838.2	2838.2	2838.2	2838.2	2830.2	2830.2	2830.2	2830.2	2830.2	2830.2	2830.2	2830.2	3110.2	3110.2
Surplus (Deficit) MWs above RM	32	15	69	67	71	87	66	44	304	282	261	236	207	186	162	137	110	82	53	24	274	244
Reserve Margin %	22%	21%	23%	23%	23%	24%	23%	22%	34%	33%	32%	31%	29%	28%	27%	26%	25%	24%	22%	21%	32%	30%

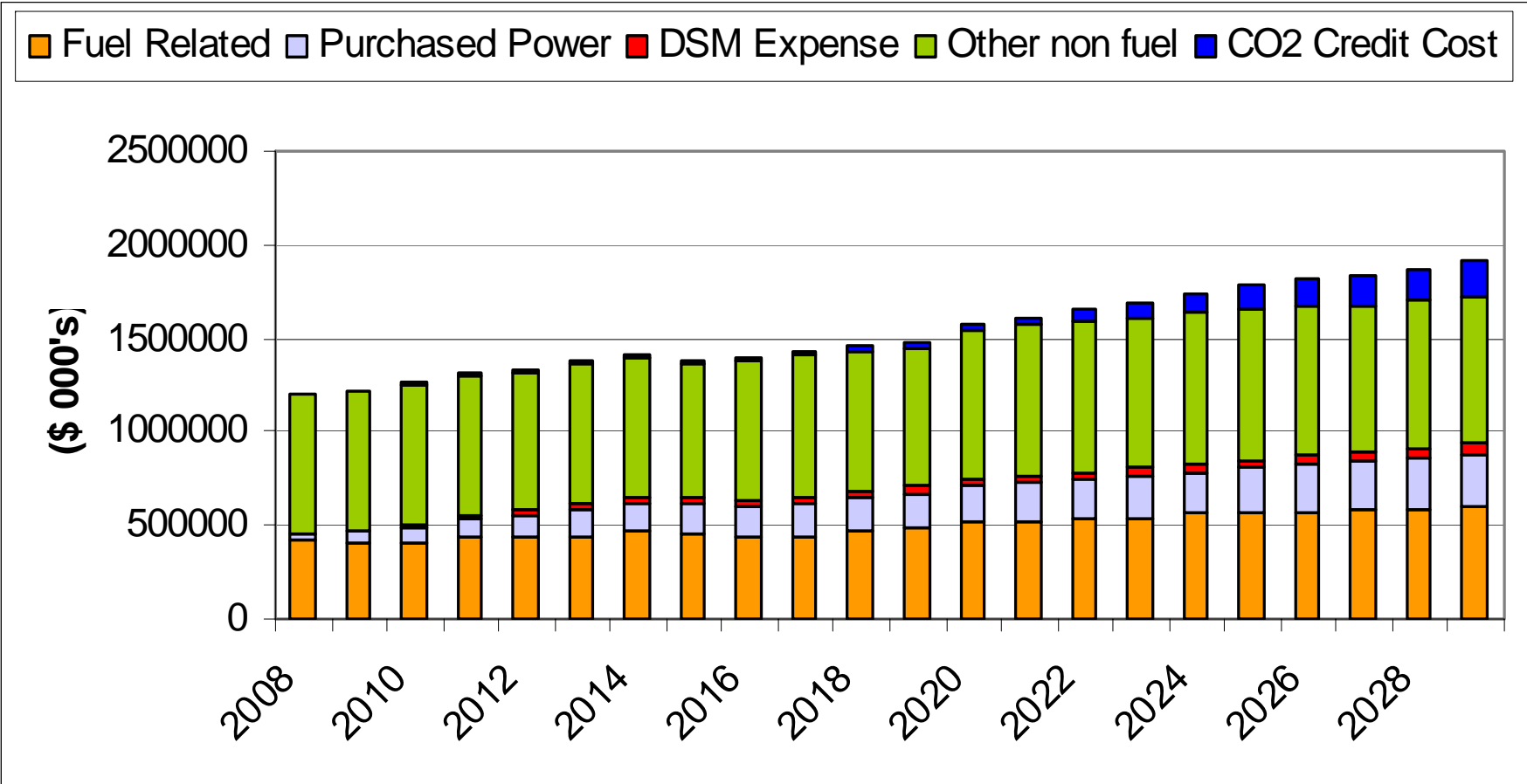
Appendix F

Annual Revenue Requirements 5% DSM



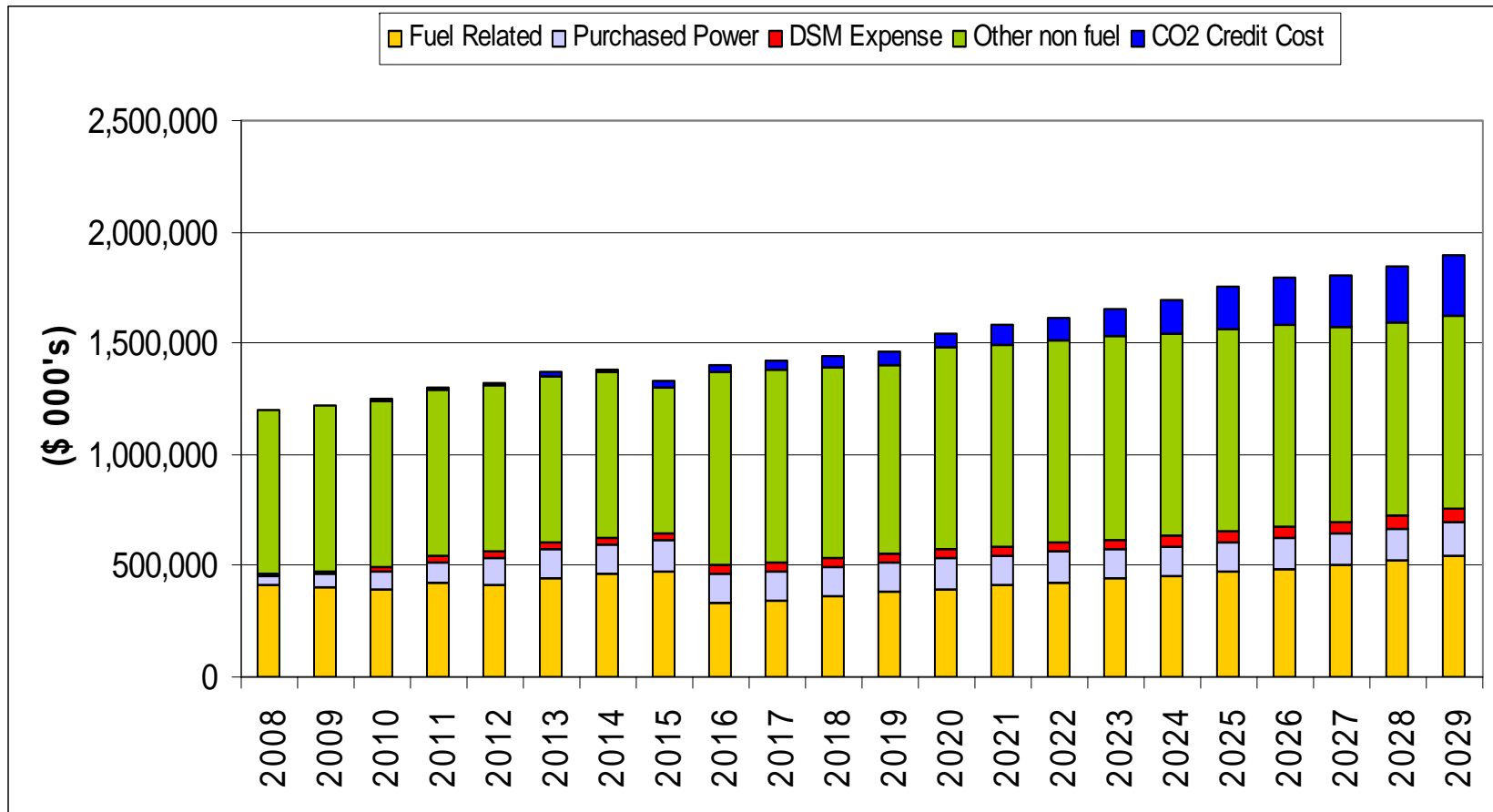
Appendix F

Annual Revenue Requirements 2% DSM + Renewable



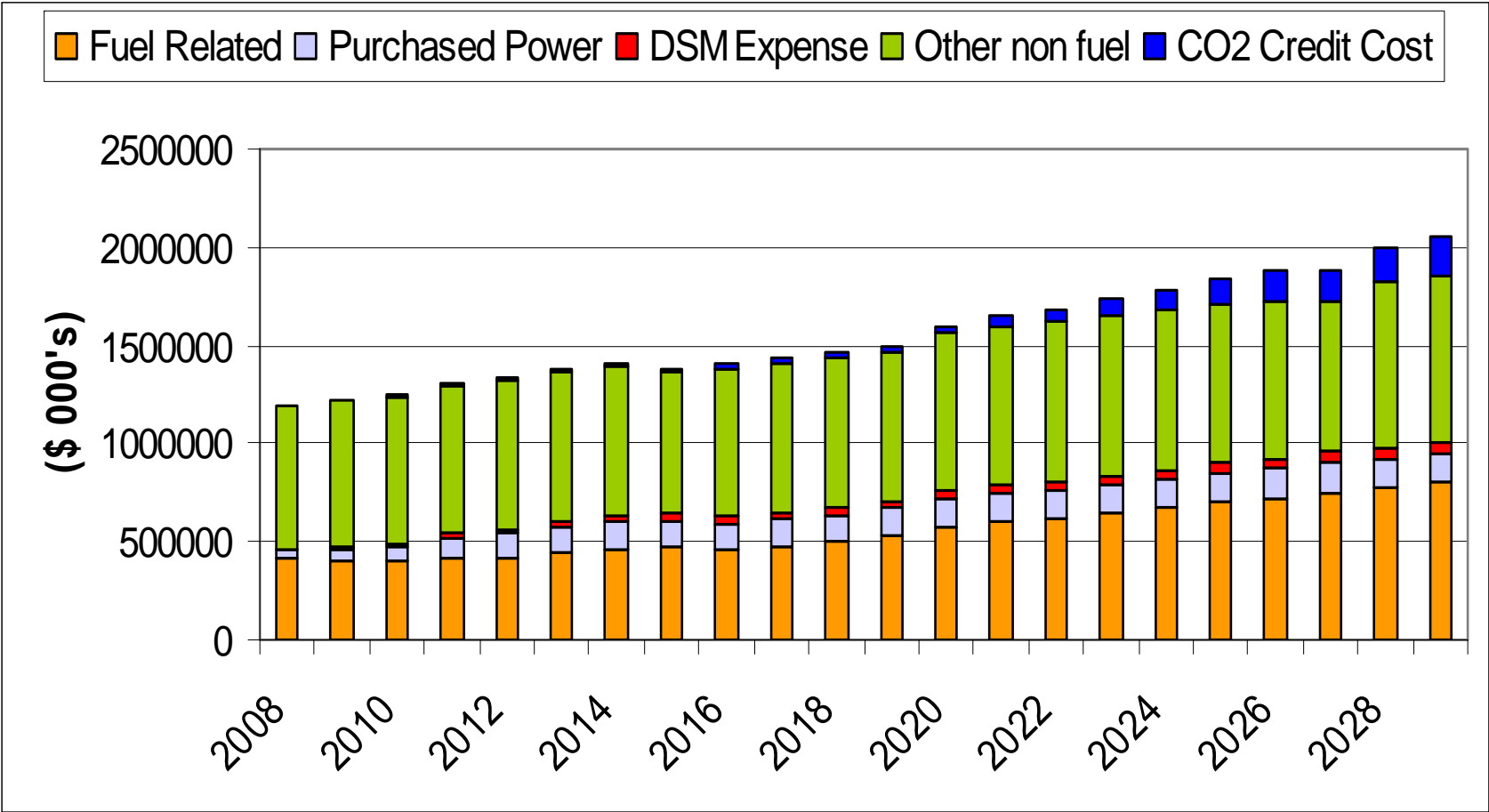
Appendix F

Annual Revenue Requirements *2% DSM + Coal*



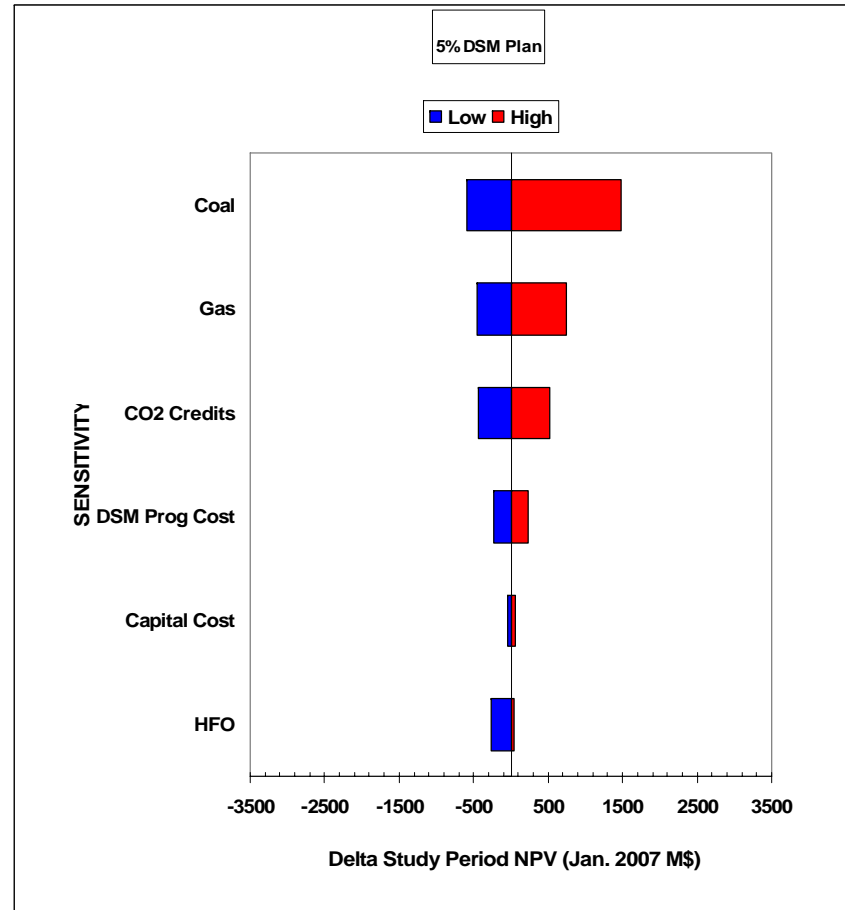
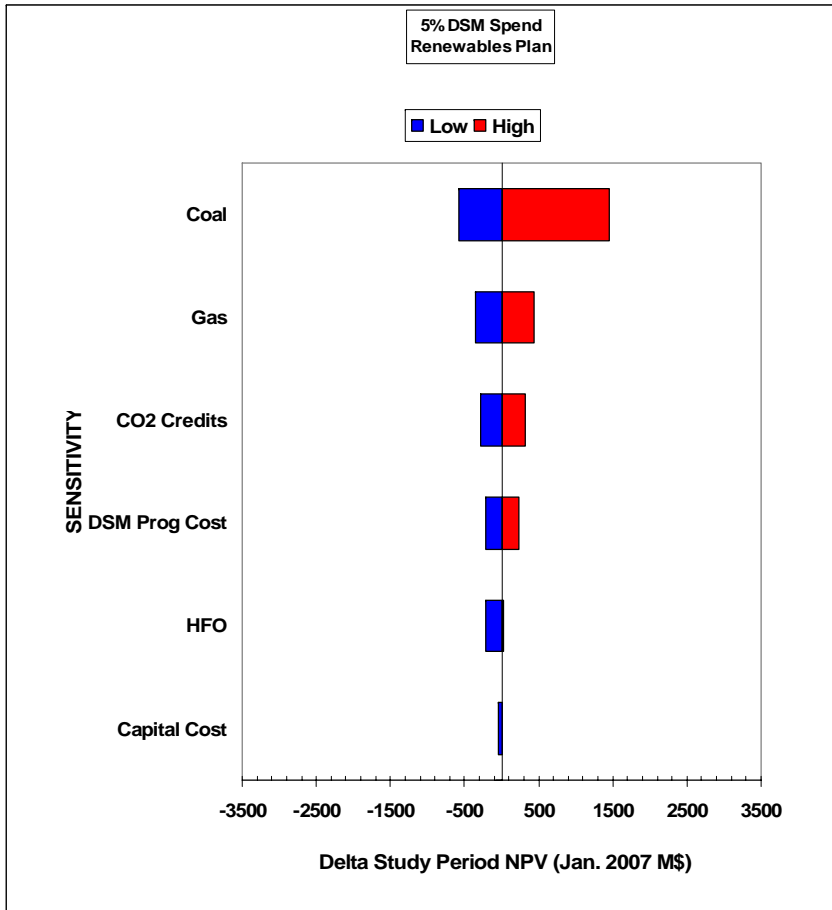
Appendix F

Annual Revenue Requirements *2% DSM Gas Plan*



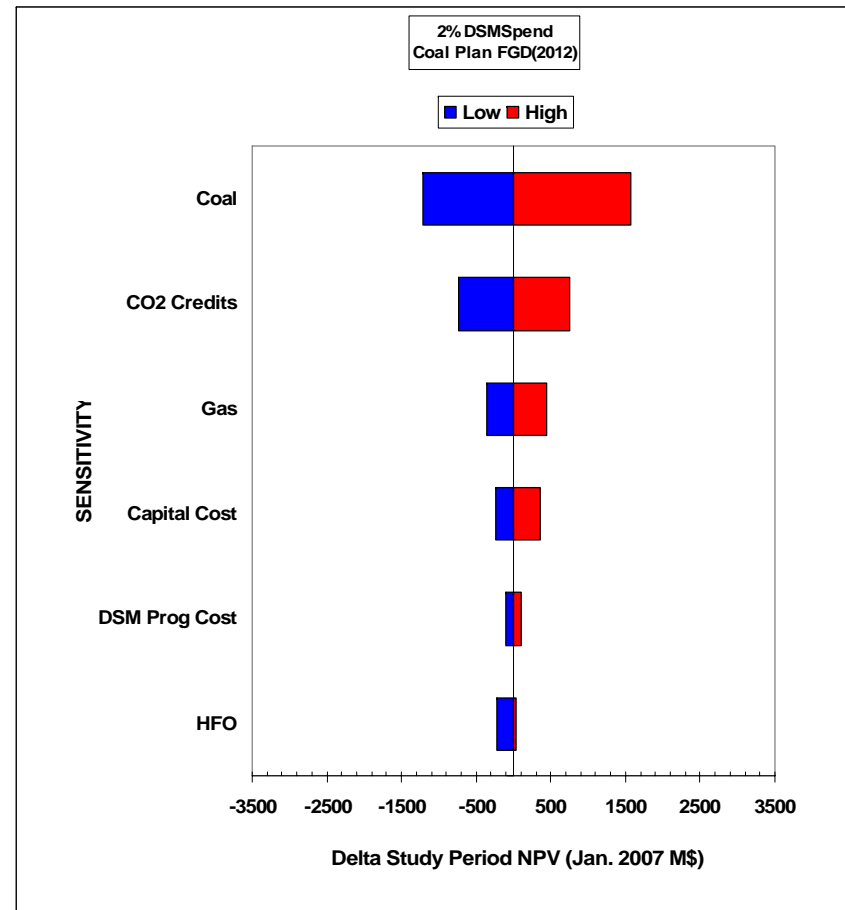
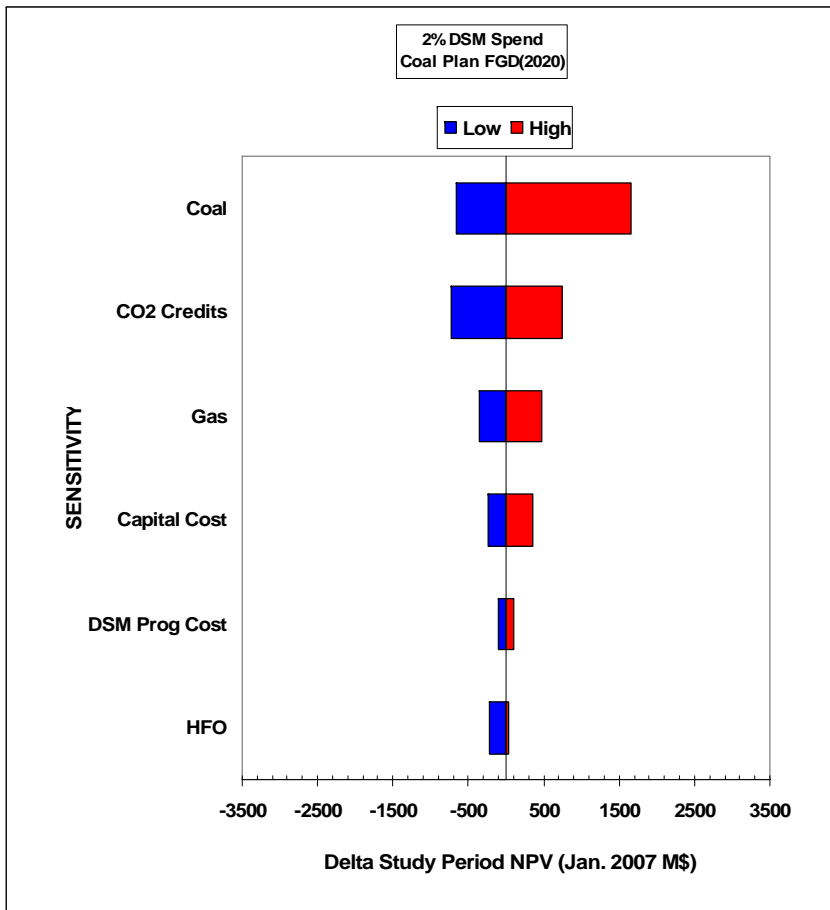
Appendix G

Sensitivities



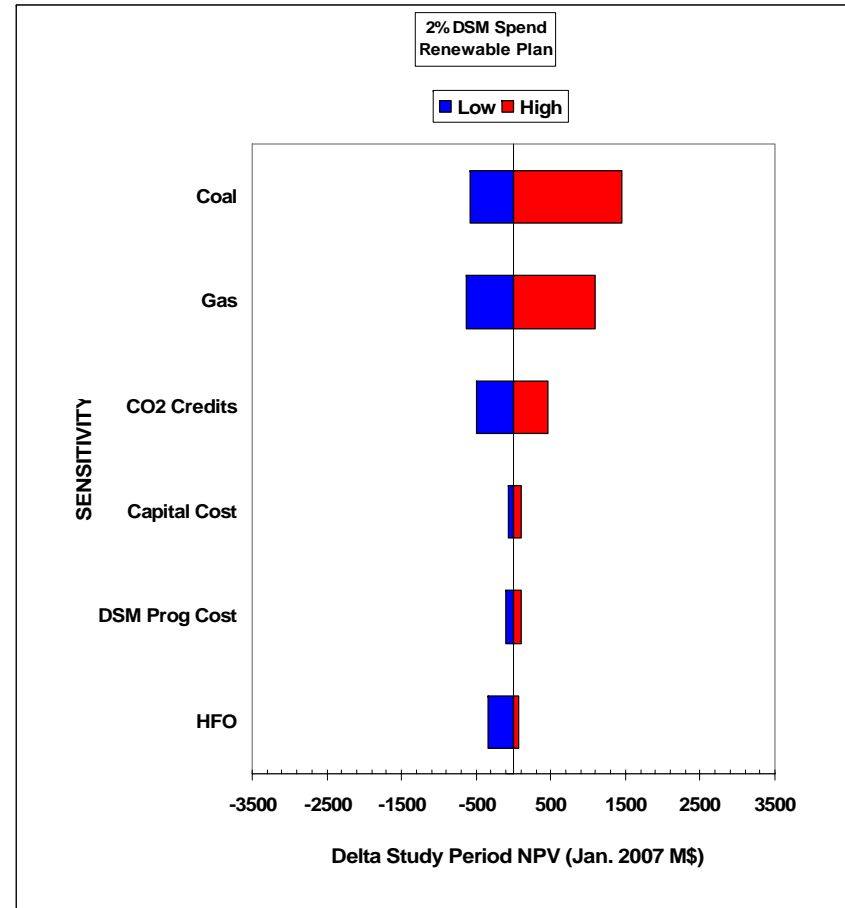
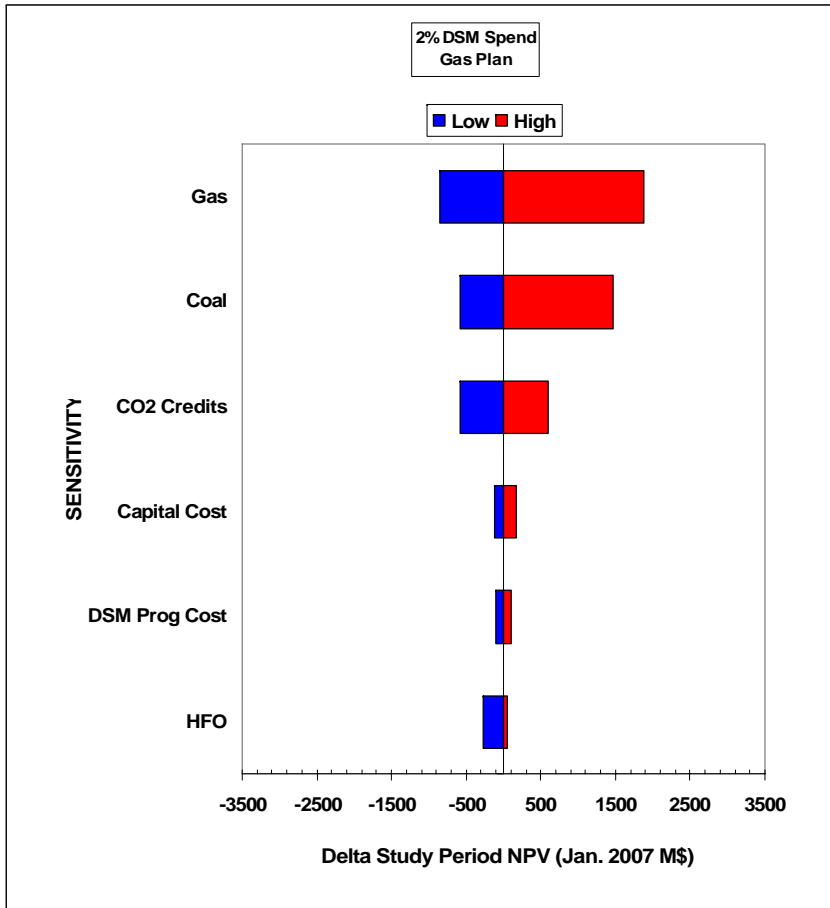
Appendix G

Sensitivities



Appendix G

Sensitivities



Appendix G

SENSITIVITIES

BASE PLAN CASE =>		5% DSM Spend Reference Plan ("Reference")	5% DSM Spend DSM Plan	2% DSM Spend Renewable Plan	2% DSM Spend Coal Plan FGD(2020)	2% DSM Spend Coal Plan FGD(2012)	2% DSM Spend Gas Plan
SENSITIVITY =>		Study Period NPV (M\$)	Study Period NPV (M\$)	Study Period NPV (M\$)	Study Period NPV (M\$)	Study Period NPV (M\$)	Study Period NPV (M\$)
Reference	Base	14480	14748	15435	15504	15551	15925
Capital Cost	Low	14442	14710	15362	15269	15308	15809
	High	14490	14801	15544	15853	15910	16097
CO2 Credits ⁽¹⁾ (with CO2 Cap)	Low	11082	11199	11830	11662	11705	12228
	High	11683	12155	12784	13137	13181	13404
Coal	Low	13899	14153	14848	14847	14342	15338
	High	15938	16234	16888	17161	17119	17394
Gas	Low	14133	14287	14799	15151	15192	15066
	High	14924	15486	16526	15981	15991	17803
HFO	Low	14259	14478	15100	15283	15322	15657
	High	14509	14797	15511	15544	15593	15974
Disc Rate	Low	12418	12624	13161	13208	13257	13208
	High	17425	17786	18696	18801	18844	19397
DSM Prog Cost	Low	14260	14521	15337	15405	15454	15828
	High	14707	14975	15533	15602	15649	16023

Note:

(1) CO2 Credits Sensitivity Cases include a Base CO2 cap (allowance) starting in 2010 while all other Reference and Sensitivities do not include a CO2 cap. In all other cases, the model includes the cost of purchasing credits from 0.

Appendix H

IRP Basic Assumptions
Environmental

SO₂

Case	Reduction
Base	50% reduction from 2010 cap by 2020 (to 36,200 t/yr)
Low	50% reduction from 2010 cap by 2025 (to 36,200 t/yr)
High	50% reduction from 2010 cap by 2015 (to 36,200 t/yr); HFO max 1% S in 2015.

Appendix H

IRP Basic Assumptions Environmental

NO_x

Case	Reduction
Base	30% reduction from 2009 cap by 2020 (to 14,700 t/yr)
Low	10% reduction from 2009 cap by 2020 (to 19,000 t/yr)
High	60% reduction from 2009 cap by 2020 (to 9,000 t/yr)

Appendix H

IRP Basic Assumptions Environmental

Mercury

Case	Reduction
Base	- 65 kg/yr. cap in 2010 - 34 kg/yr. cap in 2020 (80% reduction from 2005 cap)
Low	- 65 kg/yr. cap in 2012 - 34 kg/yr. cap in 2020 (80% reduction from 2005 cap)
High	- 65 kg/yr. cap in 2010 - 17 kg/yr. cap in 2020 (90% reduction from 2005 cap)

Appendix H

IRP Basic Assumptions Environmental

Estimated CO₂/Greenhouse Gases Emissions

Case	Approximate Emissions (Million tonnes)				
	2010	2015	2020	2025	2030
Low	10.0	10.1	11.5	11.7	12.6
Base	10.0	9.5	9.1	7.7	6.4
High	7.9	7.6	6.3	6.3	4.5
Kyoto (sensitivity)	6.4	5.6	4.8*	4.5	4.1
Deep Green	6.4	4.9	3.4*	2.9	2.5

**Assume credits no longer available*

1990 CO₂ emissions ~ 6.85M t

Current (2006) CO₂ emissions ~ 10M t/year

Appendix H

IRP Basic Assumptions
Environmental

CO₂ / Greenhouse Gases

Assumed Cost of Offsets (2006\$US / tonne CO₂)			
Year	Base	Low	High
2010	11.50	3.00	17.50
2015	18.50	4.50	32.50
2020	23.50	6.50	41.50
2025	30.00	8.50	53.00

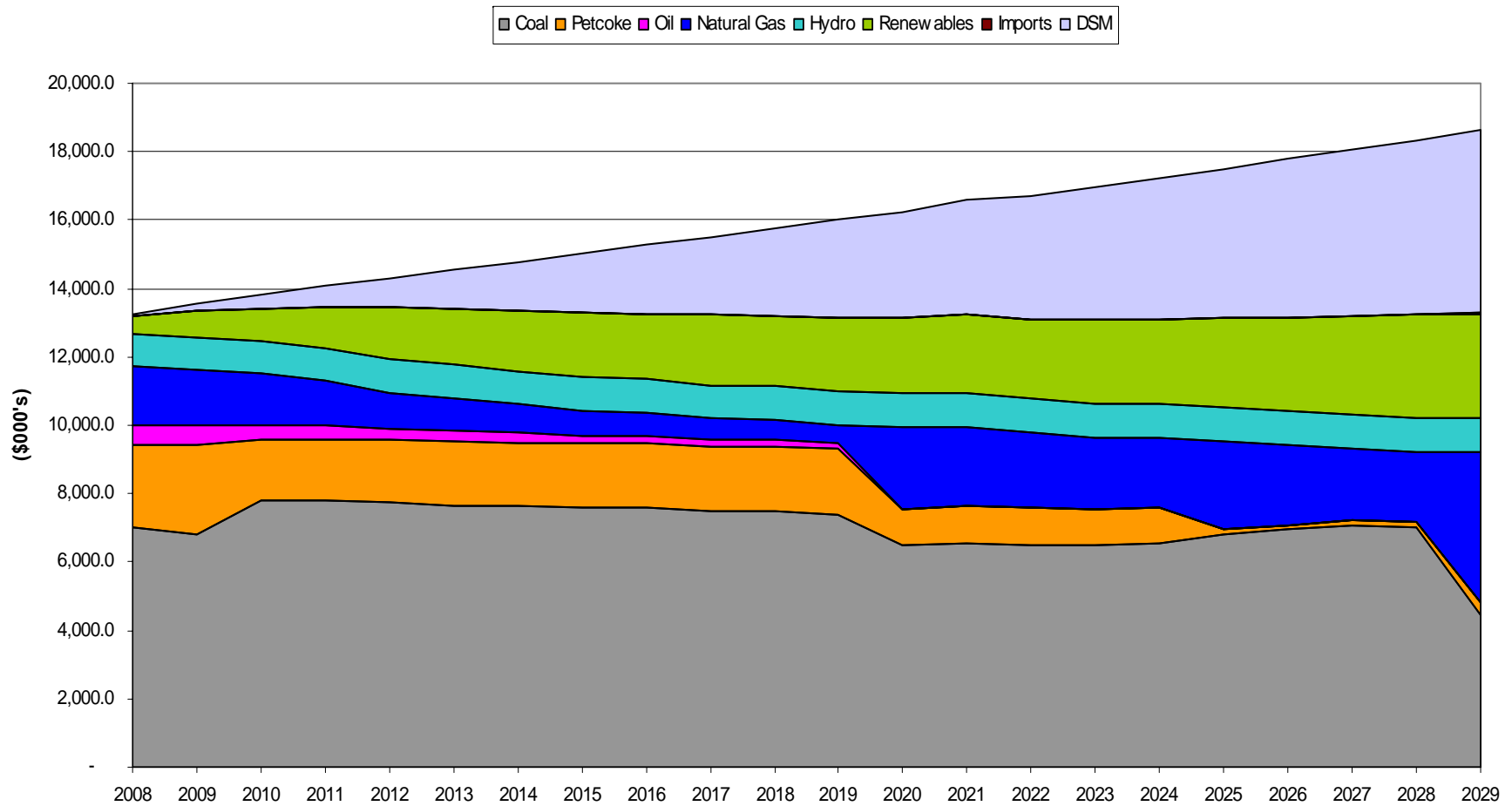
Appendix H

Summary Plan Comparison *Least Constrained Emissions*

Year	World #3	Run #20
	5% Spend DSM Low Air Emissions	5% Spend DSM
2006	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)
2007	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)
2008	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%
2009	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)
2010	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)
2011	Lingan 1 +5MW (Jul)	Lingan 1 +5MW (Jul)
2012		
2013	RPS (166MW Firm total)	RPS (166MW Firm total)
2014		
2015		
2016		
2017		
2018		
2019		Trenton 6 LN (Oct)
2020		L1/L2 SCR, L1/L2 FGD
2021		
2022		
2023		
2024		
2025	L3/L4 FGD	
2026		
2027		
2028		
2029		
NPV 2006-29 (M\$)	\$10,352.3	\$12,643.8
Study Period (M\$)		
(includes End Effects)	\$11,921.7	\$14,747.7

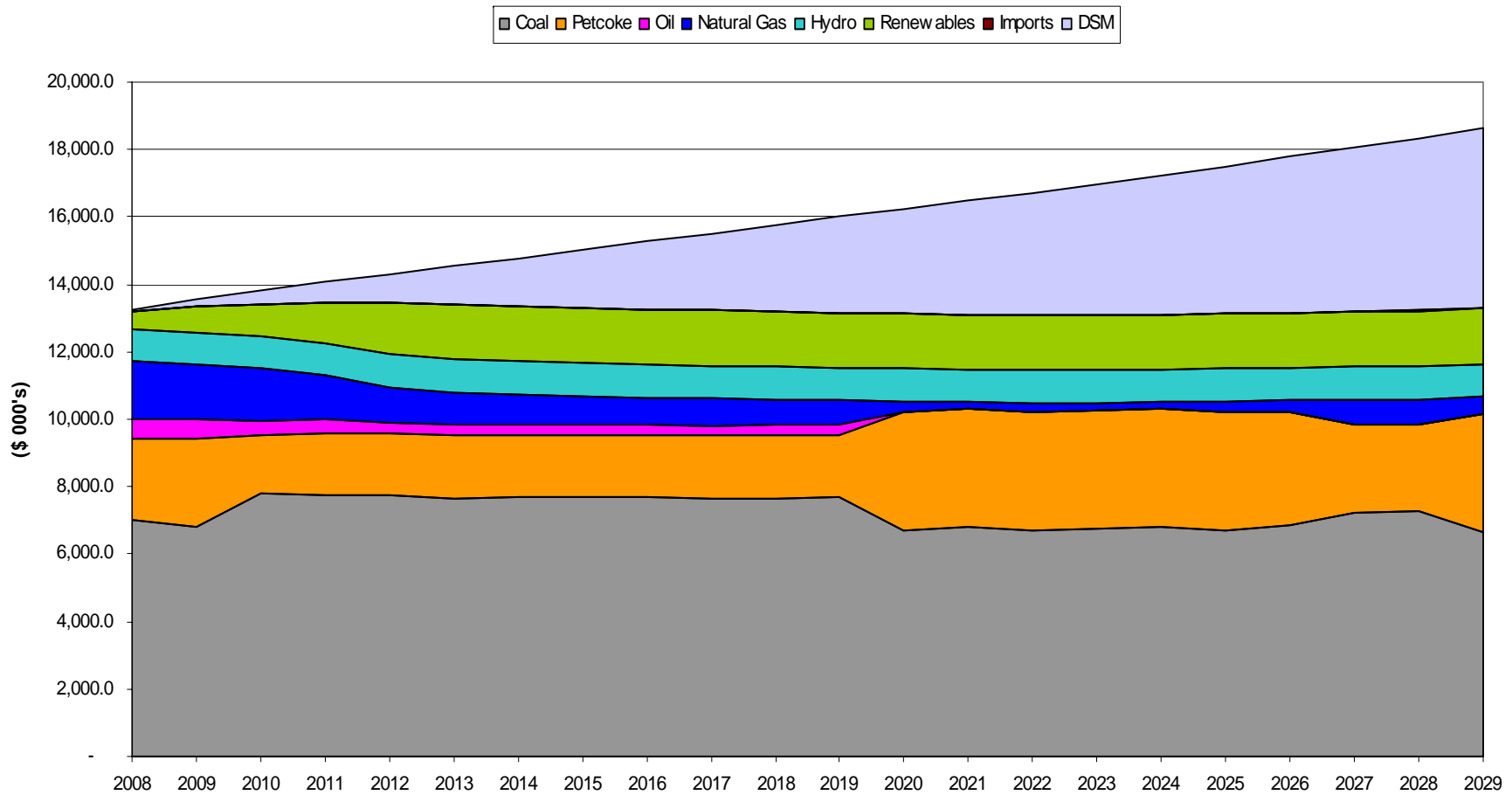
Appendix I

Energy: Base Assumptions (existing options) Credits Constrained 2020



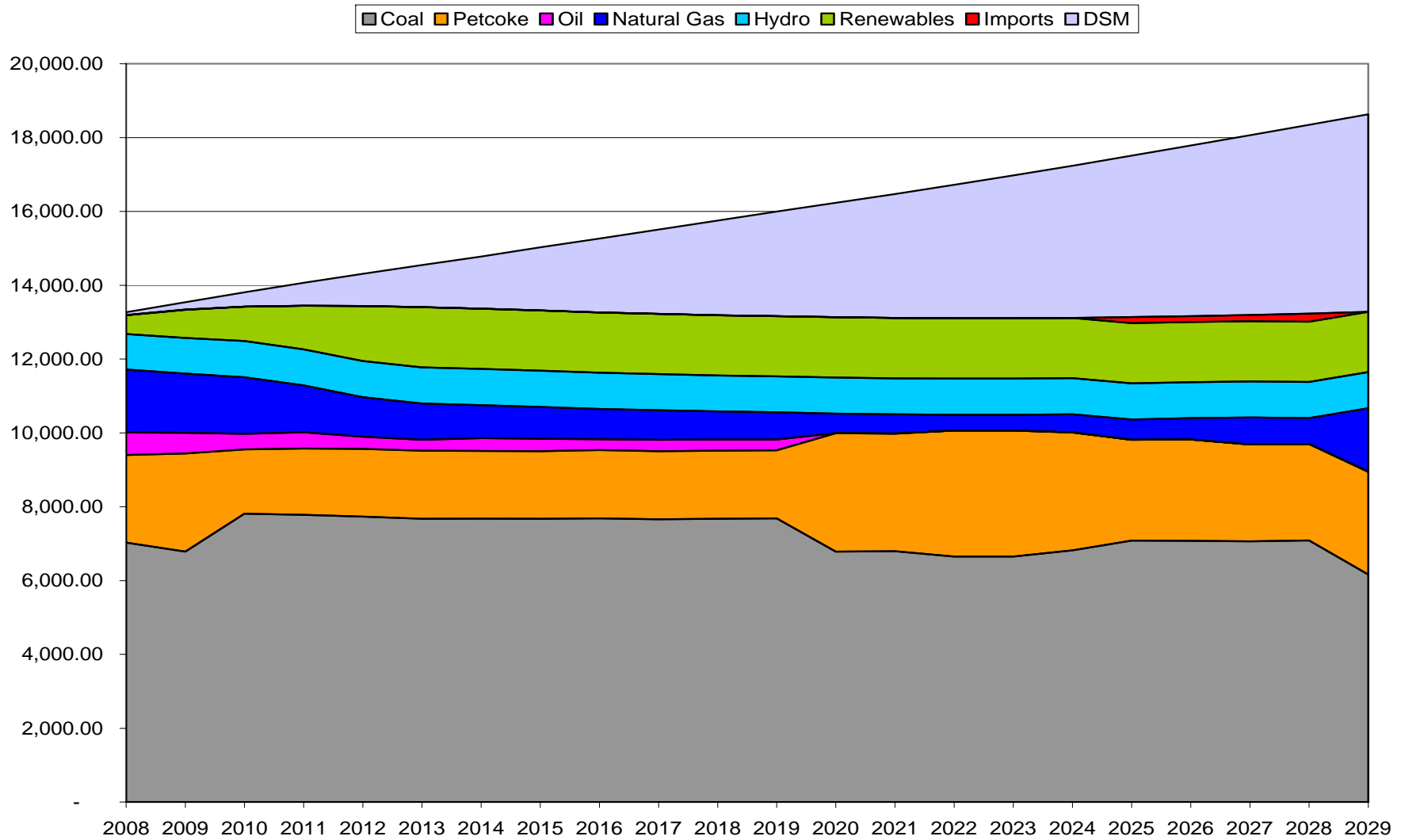
Appendix I

Energy: Base Assumptions (new options- non renew) Credits Constrained 2020



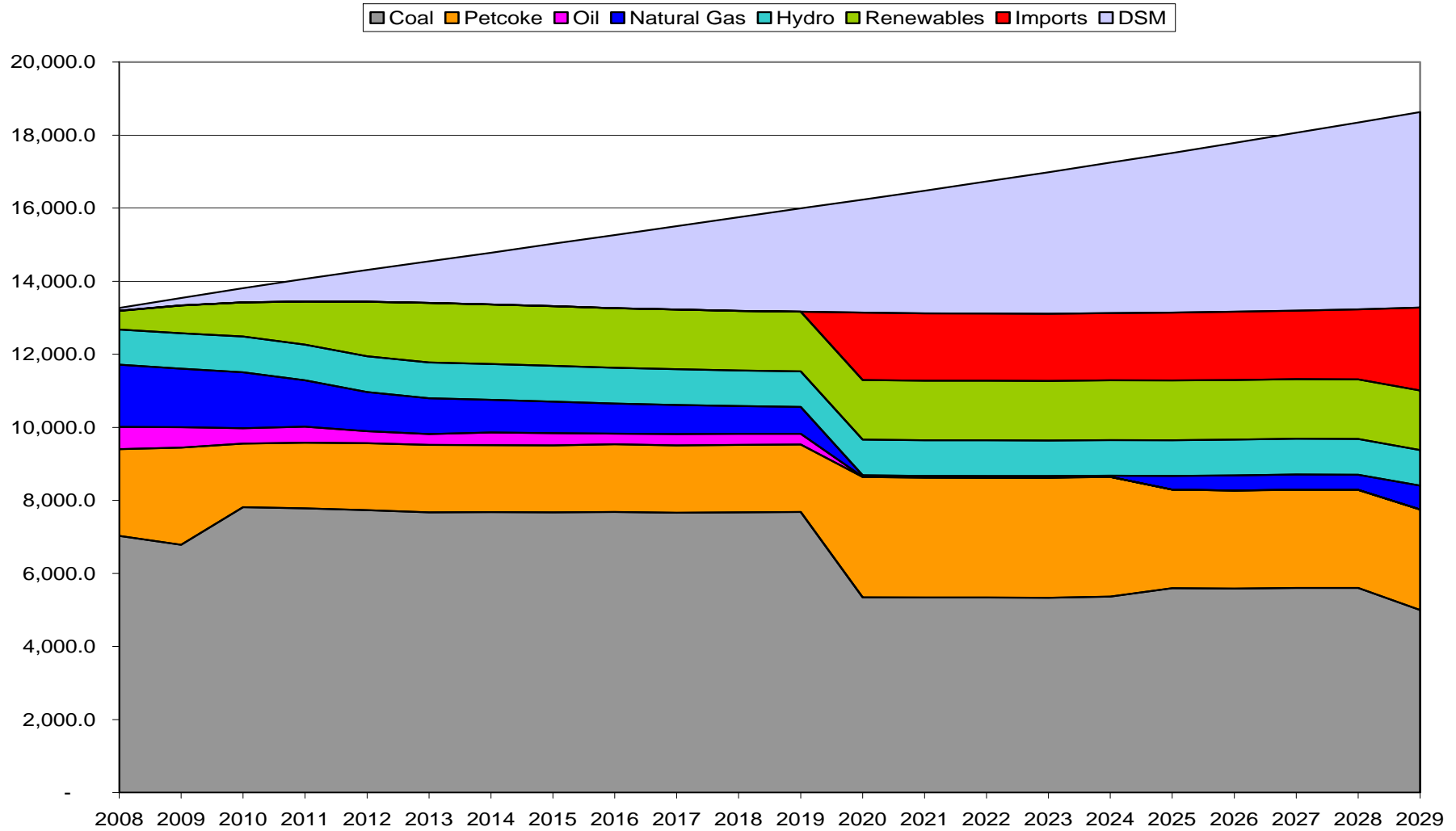
Appendix I

Energy: Kyoto Scenario – Credits constrained in 2020



Appendix I

Energy: Deep Green Scenario – Credits constrained in 2020



Appendix J

Carbon Hard Cap Worlds

Year	Run #20	Run #7	Run #8	Run #8A	without Renewables beyond RPS	
	5% Spend DSM Renewables Plan	5% Spend DSM Base CO2 Existing Options	5% Spend DSM Base CO2 New & Existing Options Renewables Beyond RPS	5% Spend DSM Base CO2 New & Existing Options NO Renewables Beyond RPS	World #9A	World #10A
					5% Spend DSM Kyoto Case CO2 Credit Constrain 2020	5% Spend DSM Deep Green Case CO2 Credit Constrain 2020
2006	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)
2007	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)
2008	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5%
2009	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)
2010	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)
2011	Lingan 1 +5MW (Jul)	Lingan 1 +5MW (Jul)	Lingan 1 +5MW (Jul)	Lingan 1 +5MW (Jul)		
2012						
2013	RPS (166MW Firm total)	RPS (166MW Firm total)	RPS (166MW Firm total)	RPS (166MW Firm total)	RPS (166MW Firm total)	RPS (166MW Firm total)
2014	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)			
2015	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)			
2016						
2017	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)			
2018						
2019	Trenton 6 LN (Oct) Rnew 50 MW (16 MW firm)	Trenton 6 LN (Oct) Rnew 50 MW (16 MW firm)	Trenton 6 LN (Oct) Rnew 50 MW (16 MW firm)			
2020	L1/L2 SCR, L1/L2 FGD	CC (280MW)	L1/L2 SCR, L1/L2 FGD	IGCY 400MW	L1/L2 CC, L3/L4 CC IGCY 400MW	L1/L2 CC, L3/L4 CC IGCY 400MW, PPA 300MW
2021	Rnew 50 MW (16 MW firm)		Rnew 50 MW (16 MW firm)			
2022		Rnew 50 MW (16 MW firm)				
2023	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)			
2024			Biomass (20MW)			
2025	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm) L3/L4 CC (carbon capture)			
2026	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)			
2027	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm) R100 100 MW (35 MW firm)			
2028	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)	Rnew 50 MW (16 MW firm)			
2029		CC (280MW)	R100 100 MW (35 MW firm)	L3/L4 CC (carbon capture)	CC (280MW)	
NPV 2006-29 (M\$)	\$12,497.0	\$12,643.7	\$12,579.0	\$12,680.4	\$12,763.9	\$12,992.9
(includes End Effects)	\$14,479.9	\$14,981.8	\$14,645.6	\$14,857.6	\$15,002.0	\$15,298.2

Appendix J

Results – Carbon Constraint Worlds

2007 IRP CO2 Credit Constrained Worlds: SCHEDULE OF SUPPLY OR DSM MW's

	5% Spend DSM Plan, Base CO2 Credit Constrained @ 2020 run with "existing" options	5% Spend DSM Plan, Base CO2 Credit Constrained @ 2020 run with "new" options	5% Spend DSM Plan No Renewables > RPS, Base CO2 Credit Constrained @ 2020 run with "new" options	5% Spend DSM Pan, Kyoto Level Cap CO2 Credit Constrained @ 2020 A	5% Spend DSM Pan, Kyoto Level Cap CO2 Credit Constrained @ 2020 B	5% Spend DSM Pan, Kyoto Level Cap CO2 Credit Constrained @ 2020 C	5% Spend DSM Pan, Kyoto Level Cap CO2 Credit Constrained @ 2020 D	5% Spend DSM Pan, No Renewables >RPS, Kyoto Level Cap CO2 Credit Constrained @ 2020 E	5% Spend DSM Pan, Deep Green Level Cao CO2 Credit Constrained @ 2020 A	5% Spend DSM Pan, Deep Green Level Cao CO2 Credit Constrained @ 2020 B	5% Spend DSM Pan, Deep Green Level Cao CO2 Credit Constrained @ 2020 C	5% Spend DSM Pan No Renewables > RPS, Deep Green Level Cao CO2 Credit Constrained @ 2020 D
New Resources 2008-2014												
DSM	256	256	256	256	256	256	256	256	256	256	256	256
TUC 6	50	50	50	50	50	50	50	50	50	50	50	50
LM 6000	0	0	0	0	0	0	0	0	0	0	0	0
Upgrades	20	20	20	20	20	20	20	20	20	20	20	20
Hydro	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
RPS	166	166	166	166	166	166	166	166	166	166	166	166
Additional Wind	16	16	0	16	16	16	16	0	16	16	16	0
Subtotal	512.3	512.3	496.3	512.3	512.3	512.3	512.3	496.3	512.3	512.3	512.3	496.3
New Resources 2015-2029												
Additional Wind	144	144	0	144	144	144	144	0	144	144	144	0
Offshore Wind	0	64	0	32	96	32	0	0	64	96	128	0
Pulverized Coal	0	0	0	0	0	0	400	0	0	0	0	0
LM 6000	0	0	0	0	0	0	0	0	0	0	0	0
Biomass	0	20	0	0	20	0	0	0	20	0	0	0
PPA + 300 MW Tie-line	0	0	0	300	0	0	0	0	0	0	300	300
IGCC	0	0	400	0	0	400	0	400	400	400	0	400
Combined Cycle	560	0	0	0	280	0	0	280	0	280	280	0
DSM	857	857	857	857	857	857	857	857	857	857	857	857
Subtotal	1561	1085	1257	1333	1397	1433	1401	1537	1485	1777	1709	1557
Total New & Avoided MW's over planning period												
	2073.3	1597.3	1753.3	1845.3	1909.3	1945.3	1913.3	2033.3	1997.3	2289.3	2221.3	2053.3

Appendix K: DSM Variation Worlds

Year	5% DSM Delay 2 Years	2% DSM Delay 2 Years Coal Plan (FGD in 2020)	2% DSM - Delay 2 Years Renewables Plan	5% DSM -20% Benefits	2% DSM -20% Benefits Coal Plan (FGD in 2020)	2% DSM -20% Benefits Renewables Plan	5% DSM Stora Portion of DSM Removed from Ind. Sector	2% DSM - Coal (FGD 2020) Stora Portion of DSM Removed from Ind. Sector	2% DSM - Renewables Plan Stora Portion of DSM Removed from Ind. Sector	
2006	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	Lingan 3 LN (Jul)	
2007	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	Lingan 2 LN (Jul) Lingan 4 LN (Jul) Burnside 1 (33 MW) (Jan)	
2008	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% (-20%) DSM_Com 5% (-20%) DSM_Ind 5% (-20%)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 2% (-20%) DSM_Com 2% (-20%) DSM_Ind 2% (-20%)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 2% (-20%) DSM_Com 2% (-20%) DSM_Ind 2% (-20%)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5% (Stora Out)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 2% DSM_Com 2% DSM_Ind 2% (Stora Out)	Pt Tupper LN (Jul) Trenton 5LN (Nov) Lingan 1 LN (Jul) DSM_Res 2% DSM_Com 2% DSM_Ind 2% (Stora Out)	
2009	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)	Trenton 5 Baghouse (Jul) TUC 6 (Dec) Lingan 2 +5MW (Jul) Lingan 4 +5MW (Jul) Nictaux (2.5 MW) (Oct) Marsh F. (1.8 MW) (Oct)
2010	Lingan 3 +5MW (Jul) DSM_Res 5% DSM_Com 5% DSM_Ind 5% RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) DSM_Res 2% DSM_Com 2% DSM_Ind 2% RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) DSM_Res 2% DSM_Com 2% DSM_Ind 2% RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)	Lingan 3 +5MW (Jul) Lingan 1 +5MW (Jul) RPS (79 MW Firm total)	
2011	Lingan 1 +5MW (Jul)			Lingan 1 +5MW (Jul)			Lingan 1 +5MW (Jul)			
2012										
2013	RPS (166MW Firm total)	RPS (166MW Firm total) LM6000 (49MW)	RPS (166MW Firm total) Rnew 50 MW (16 MW firm)	RPS (166MW Firm total)	RPS (166MW Firm total)	RPS (166MW Firm total) Rnew 50 MW (16 MW firm)	RPS (166MW Firm total)	RPS (166MW Firm total)	RPS (166MW Firm total) Rnew 50 MW (16 MW firm)	
2014			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)	
2015			CC (280MW)	PC 400MW (FGD,SCR,Tox)	PC 400MW (FGD,SCR,Tox)	CC (280MW)	PC 400MW (FGD,SCR,Tox)	PC 400MW (FGD,SCR,Tox)	CC (280MW)	
2016	PC 400MW (FGD,SCR,Tox)	PC 400MW (FGD,SCR,Tox)	Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)	
2017										
2018										
2019		Trenton 6 LN (Oct)	Trenton 6 LN (Oct) Rnew 50 MW (16 MW firm)	Trenton 6 LN (Oct)	Trenton 6 LN (Oct)	Trenton 6 LN (Oct) Rnew 50 MW (16 MW firm)	Trenton 6 LN (Oct)	Trenton 6 LN (Oct)	Trenton 6 LN (Oct) Rnew 50 MW (16 MW firm)	
2020		L3/L4 SCR, L3/L4 FGD	L3/L4 SCR, L3/L4 FGD Rnew 50 MW (16 MW firm)	L3/L4 FGD	L3/L4 SCR, L3/L4 FGD	L3/L4 SCR, L3/L4 FGD Rnew 50 MW (16 MW firm)	L3/L4 FGD	L3/L4 SCR, L3/L4 FGD	L3/L4 SCR, L3/L4 FGD Rnew 50 MW (16 MW firm)	
2021										
2022										
2023			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)	
2024										
2025			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)	
2026			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)	
2027			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)	
2028			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)			Rnew 50 MW (16 MW firm)	
2029					LM6000 (49MW)					
Study Period (M\$) (includes End Effects)	\$15,129.8	\$15,771.5	\$15,719.3	\$15,418.6	\$15,956.6	\$15,907.5	\$15,138.0	\$15,765.0	\$15,749.3	

Appendix L

Synopsis of all Plan's and World's NPVs

Resource Plan	World's Analysis	DSM Spending Level	Plan Type	Comments	Study Period NPV	Delta to Reference Case
Base Plans	Run #20	5% Spend DSM	Renewables beyond RPS	Reference Case	\$14,479.9	
		5% Spend DSM			\$14,747.7	\$267.8
		2% Spend DSM	Coal Plan	FGD in 2020	\$15,503.7	\$1,023.8
		2% Spend DSM	Coal Plan	FGD in 2012	\$15,551.4	\$1,071.5
		2% Spend DSM	Natural Gas Plan		\$15,925.4	\$1,445.5
		2% Spend DSM	Renewables beyond RPS	CC280, No TUC 6	\$15,435.2	\$955.3
High Load	Run #2	5% Spend DSM	Renewables beyond RPS	RPS advanced 1 year	\$19,029.0	\$4,549.1
Low Air Emissions	Run #3	5% Spend DSM		Low air emission limits and CO2 credit costs	\$11,921.7	-\$2,558.2
High Air Emissions (High air emission limits and CO2 credit costs)	Run #4	5% Spend DSM	Coal Plan	No FGD	\$17,694.8	\$3,214.9
	Run #5	5% Spend DSM	Renewables beyond RPS		\$17,336.5	\$2,856.6
	Run #6A	5% Spend DSM	Natural Gas Plan		\$17,791.4	\$3,311.5
	Run #6B	5% Spend DSM	Natural Gas Plan	Option to retire existitng units	\$17,901.8	\$3,421.9
Base CO2 Limits (CO2 Credit Constrained starting in 2020)	Run #7	5% Spend DSM	Renewables beyond RPS	Existing Options	\$14,981.8	\$501.9
	Run #8	5% Spend DSM	Renewables beyond RPS	Existing Options & New CO2 Mitigation Options	\$14,645.6	\$165.7
	Run #8A	5% Spend DSM		Existing Options & New CO2 Mitigation Options	\$14,857.6	\$377.7
Kyoto Case CO2 Limits (CO2 Credit Constrained starting in 2020)	Run #9	5% Spend DSM	Renewables beyond RPS	Existing Options & New CO2 Mitigation Options	\$14,714.0	\$234.1
	Run #9A	5% Spend DSM		Existing Options & New CO2 Mitigation Options	\$15,002.0	\$522.1
Deep Green Case CO2 Limits (CO2 Credit Constrained starting in 2020)	Run #10	5% Spend DSM	Renewables beyond RPS	Existing Options & New CO2 Mitigation Options	\$14,976.1	\$496.2
	Run #10A	5% Spend DSM		Existing Options & New CO2 Mitigation Options	\$15,298.2	\$818.3
DSM Delayed 2 Years	Run #11	5% Spend DSM			\$15,129.8	\$649.9
	Run #12	2% Spend DSM	Coal Plan		\$15,771.5	\$1,291.6
	Run #13	2% Spend DSM	Renewables beyond RPS	TUC 6	\$15,719.3	\$1,239.4
DSM -20% Benefits	Run #14	5% Spend DSM			\$15,418.6	\$938.7
	Run #15	2% Spend DSM	Coal Plan		\$15,956.6	\$1,476.7
	Run #16	2% Spend DSM	Renewables beyond RPS	TUC 6	\$15,907.5	\$1,427.6
Remove Stora Portion of DSM	Run #17	5% Spend DSM			\$15,138.1	\$658.2
	Run #18	2% Spend DSM	Coal Plan		\$15,765.0	\$1,285.1
	Run #19	2% Spend DSM	Renewables beyond RPS	TUC 6	\$15,749.3	\$1,269.4

Note: Runs 4-6b include high CO2 credit costs. Run 3 includes low CO2 credit costs. All other worlds include base CO2 credit costs. This differences contribute significantly to the difference in the NPV values.