

Preliminary Metrics (Revised)

Scenario Analysis – Update on Metrics

Presentation of Metrics

- Extensive list of metrics makes presentation format critical
 - Many metrics must be presented
 - Metrics convey important information about each scenario
 - Metrics include
 - Direct results of simulations
 - Simulation results combined with other information
 - Implications of input assumptions
 - Metrics' ability to provide useful information to stakeholders depends, in part, on having the information be clear and reasonably easy to read
- All metrics expected to be quantified, but certain metrics may require additional time and effort

Plenary Session Review of Metric Formats

- There are many potential ways to present metrics.
 - ISO has attempted to develop some approaches.
 - Stakeholders may have other good / better ideas.
 - ISO seeks input on how to present the information in subsequent meetings and in the final report
- Following are examples of potential metric formats
 - Focus on communication of relative merits
 - Identifying “winners” and “losers” not the objective of these metrics

Metrics Overview Summary

Economic	Reliability	Environmental
Systemwide production costs ^(a) (billion \$)	Systemwide energy mix (MWh; % MWh by fuel)	Systemwide emissions of SO _x and NO _x (k tons)
Energy supply duration curve for marginal clearing price	Systemwide capacity mix (MW by fuel)	Total systemwide NO _x emissions for the 10 highest peak-load summer days (tons)
Annual revenue requirement for expansion resources ^(b) (billion \$; \$/kW-year)	Total units of fossil fuel burned (Quadrillion Btus consumed; MWh of production)	Systemwide emissions of CO ₂ (million tons)
Net electric energy revenues for expansion resources (million \$; \$/kW-year)	Exposure to fuel-supply disruption (MW) (operable capacity analysis)	Mercury emissions—total and compared with regulations (lb; lb/MWh)
Load-serving entity (LSE) expense for wholesale electric energy based on hourly New England marginal clearing price (billion \$; \$/MWh)		Water use (gal)
Generic capital cost for expansion (\$/kW)		Amount of incremental land used (acres)
Generic transmission expansion cost (\$/scenario; \$/MW-hour)		Renewable energy contribution (MWh;% MWh)
Generic distribution expansion cost (\$/MW-hour)		
Cost for generic expansion of gas-delivery system (\$)		

(a) The systemwide production cost is the sum of the annual production costs (i.e., the fuel and emissions-related operating costs) for every resource to produce power in each hour of the simulated year.

(b) The annual revenue requirement (capital cost X the annual revenue requirement rate) captures all non-fuel-related costs including the recovery of capital costs, other operating costs, taxes, and other expenses.

Energy Duration Curves

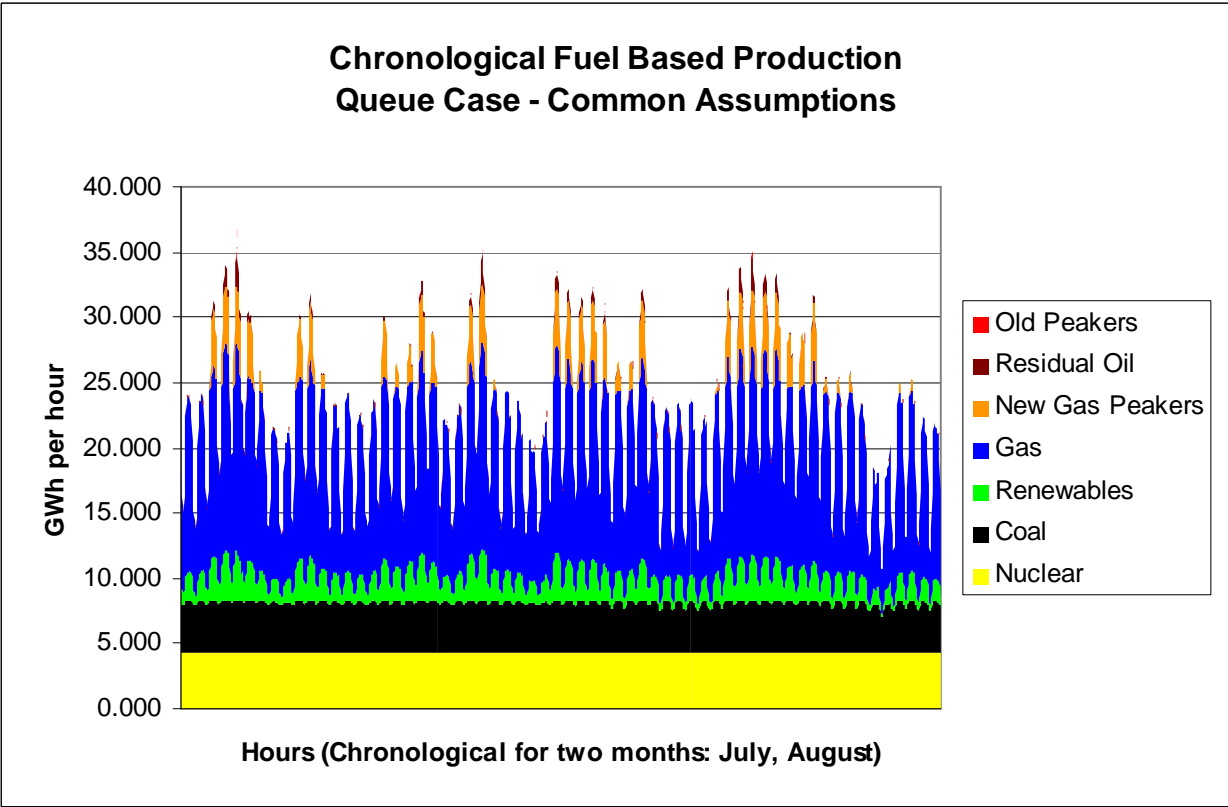
Energy Production Graphs

- Following graphs show energy production by fuel category
 - Hourly chronological for two months July and August
 - Annual energy production duration curves
- All seven scenarios shown with “common assumptions”
- Order is arranged in conceptual dispatch order
 - Lowest dispatch cost toward bottom
 - Highest dispatch cost toward top
 - Renewables are shown between the coal and gas categories
- Annual energy production duration curves are not chronological
 - Effect of maintenance outages can be seen
 - Hourly details (8760 hours) are blurred on these powerpoint slides

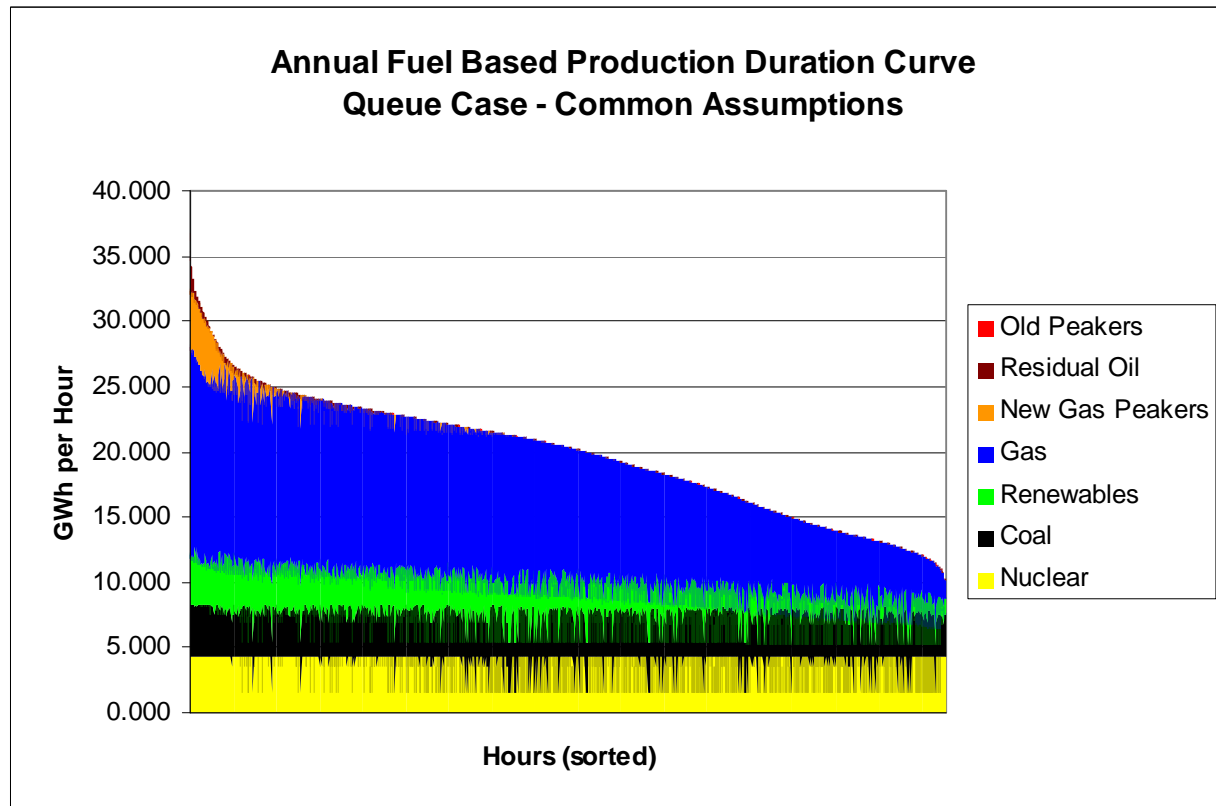
Fuel Categories Shown

Nuclear	All nuclear units
Coal	All coal units
Renewables	Hydro, Wind, Photovoltaics, Biomass, Combined Heat and Power, Landfill Gas, EE/DR
Gas	All natural gas (except new gas peakers)
New Gas Peakers	All new gas peakers
Residual Oil	All residual oil fired resources
Other	Mostly old peakers fueled by distillate oil

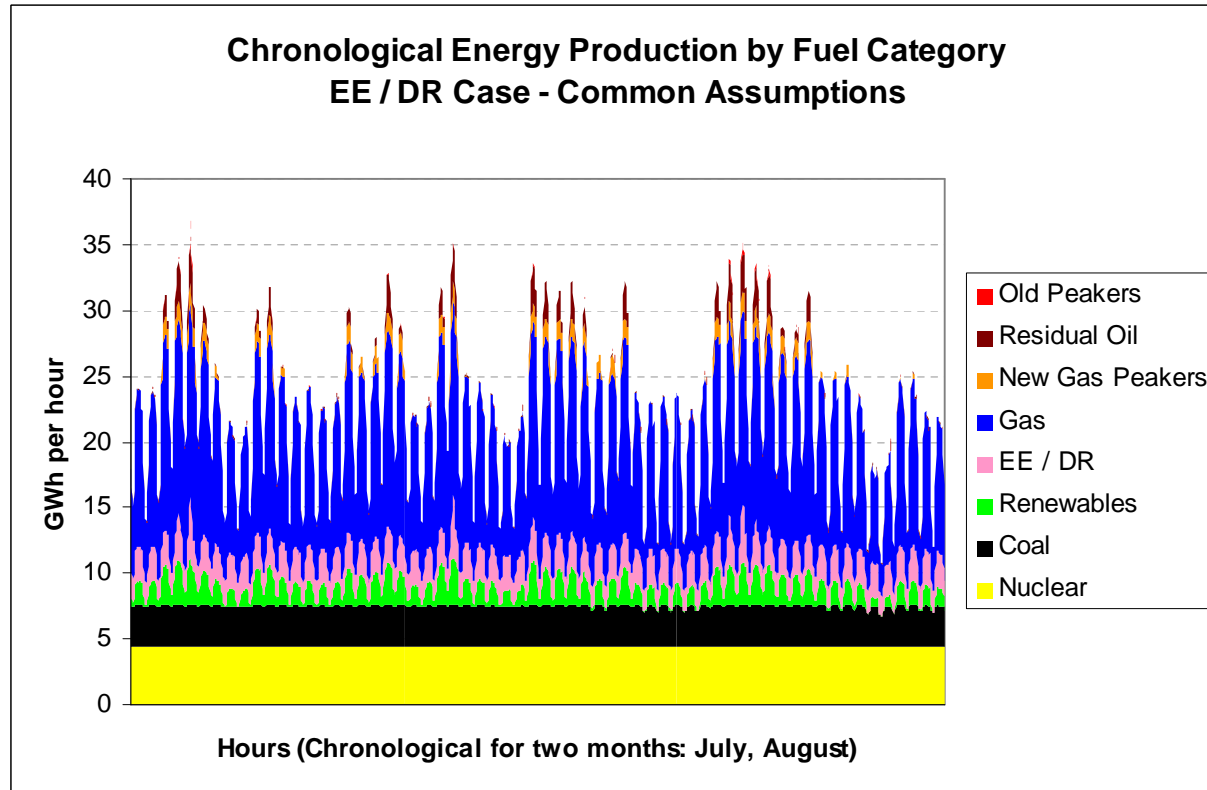
Summer Chronological GWh: Queue



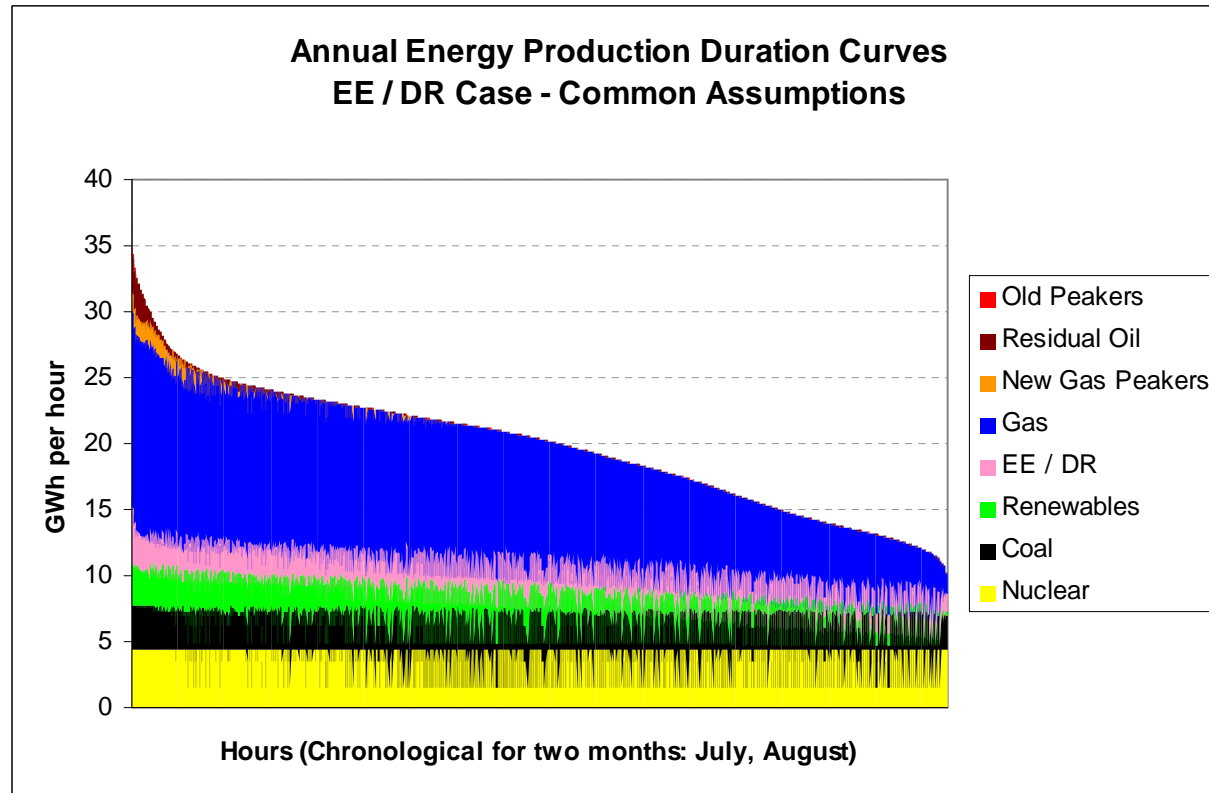
Annual Energy Duration Curves: Queue



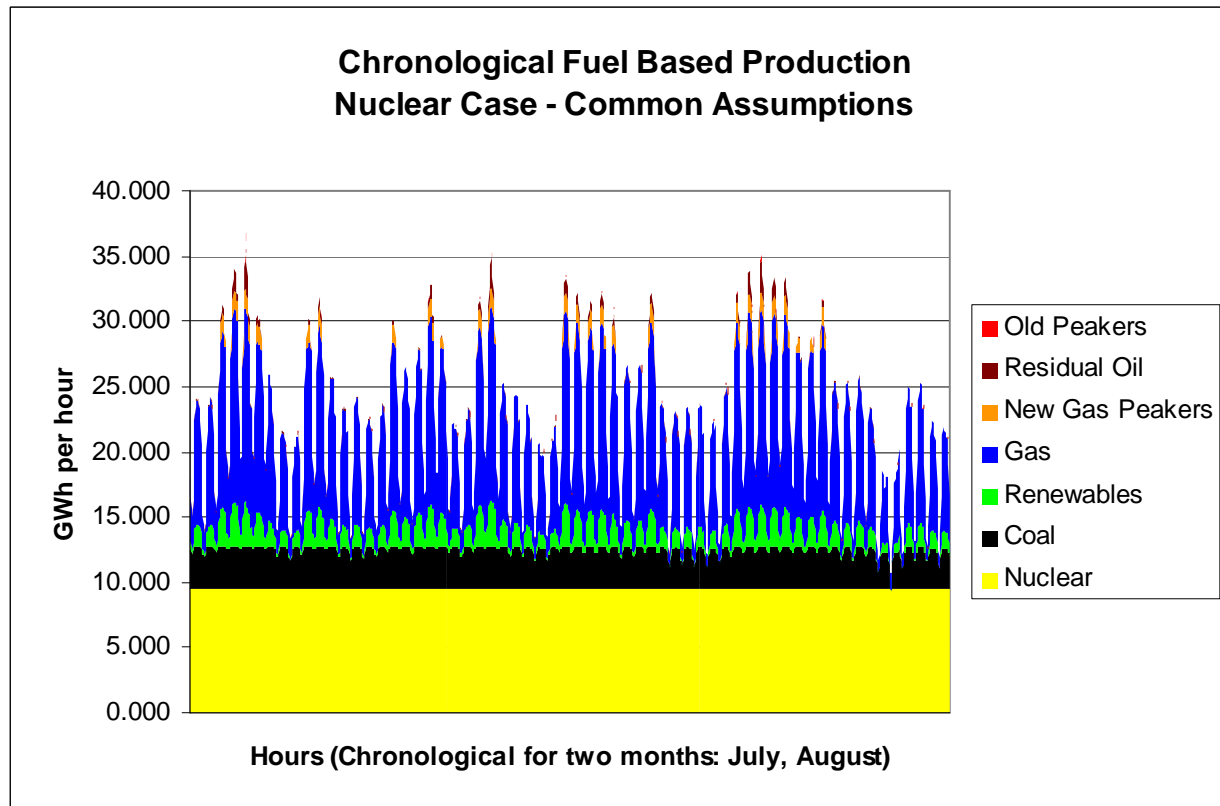
Summer Chronological GWh: EE / DR



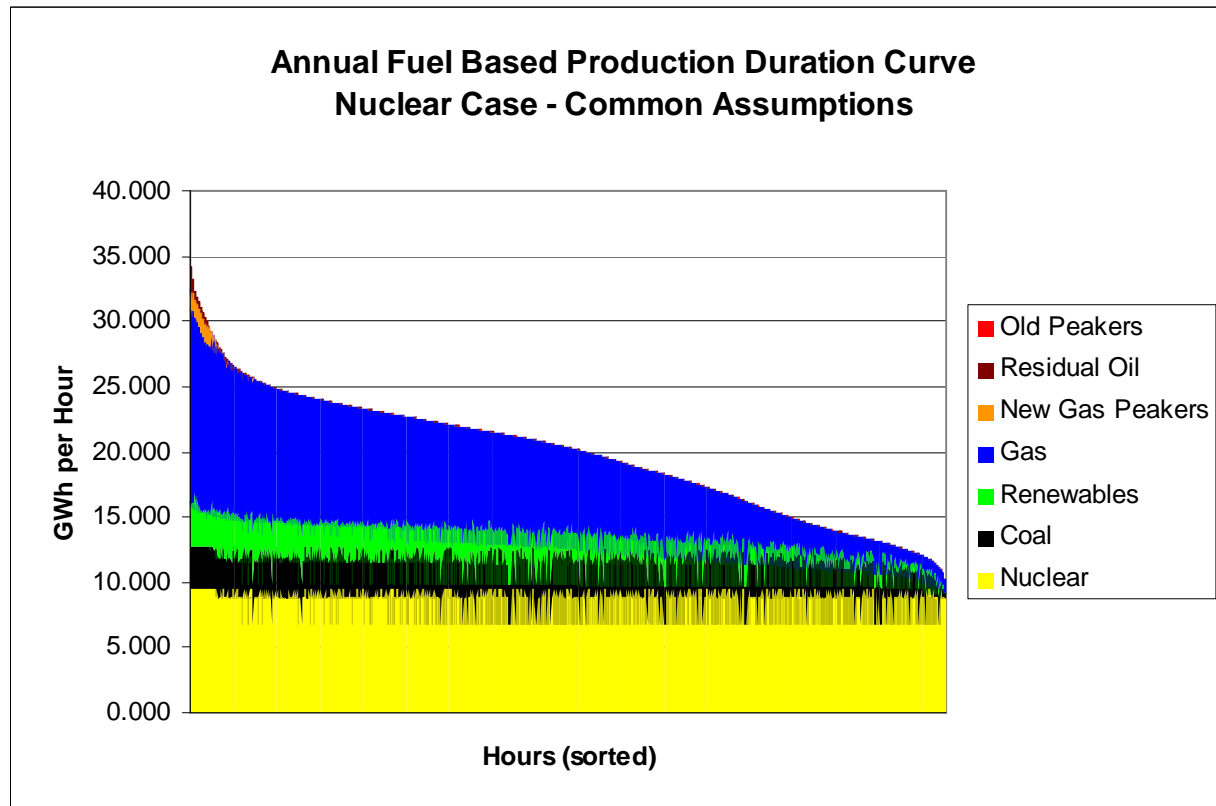
Annual Energy Duration Curves: EE / DR



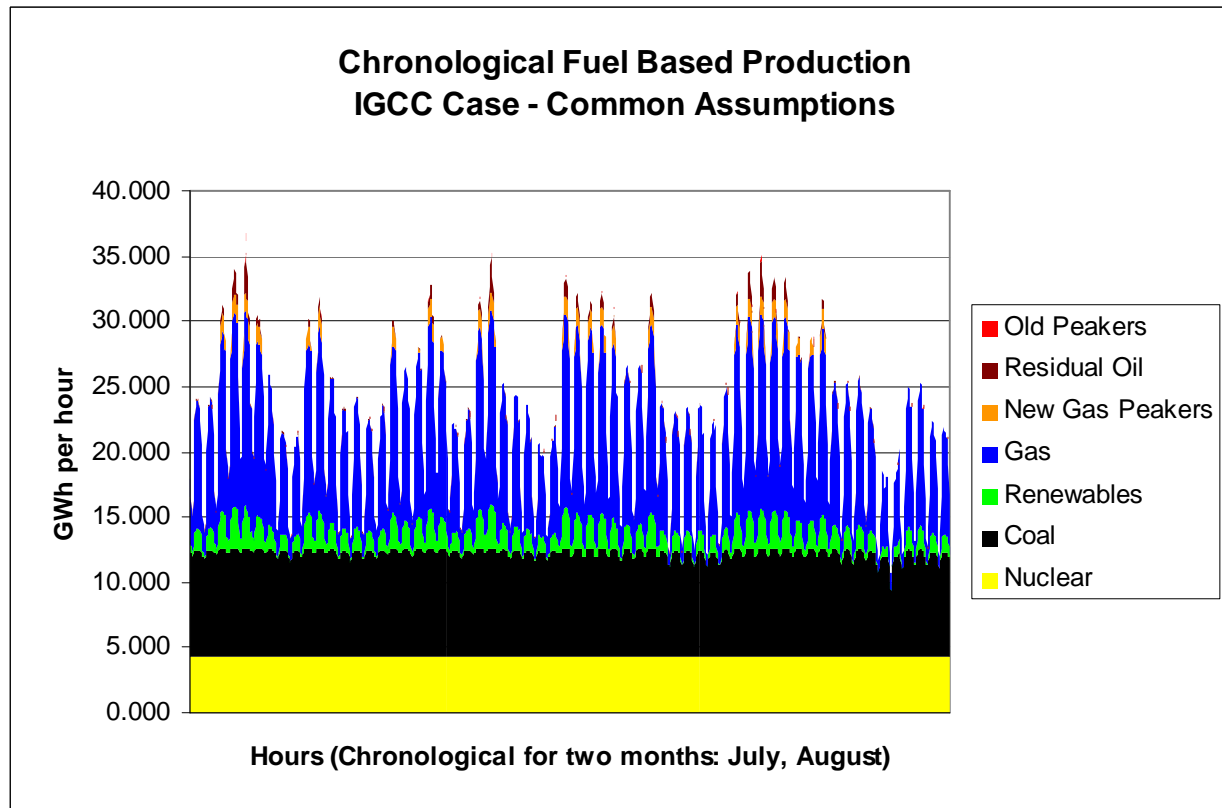
Summer Chronological GWh: Nuclear



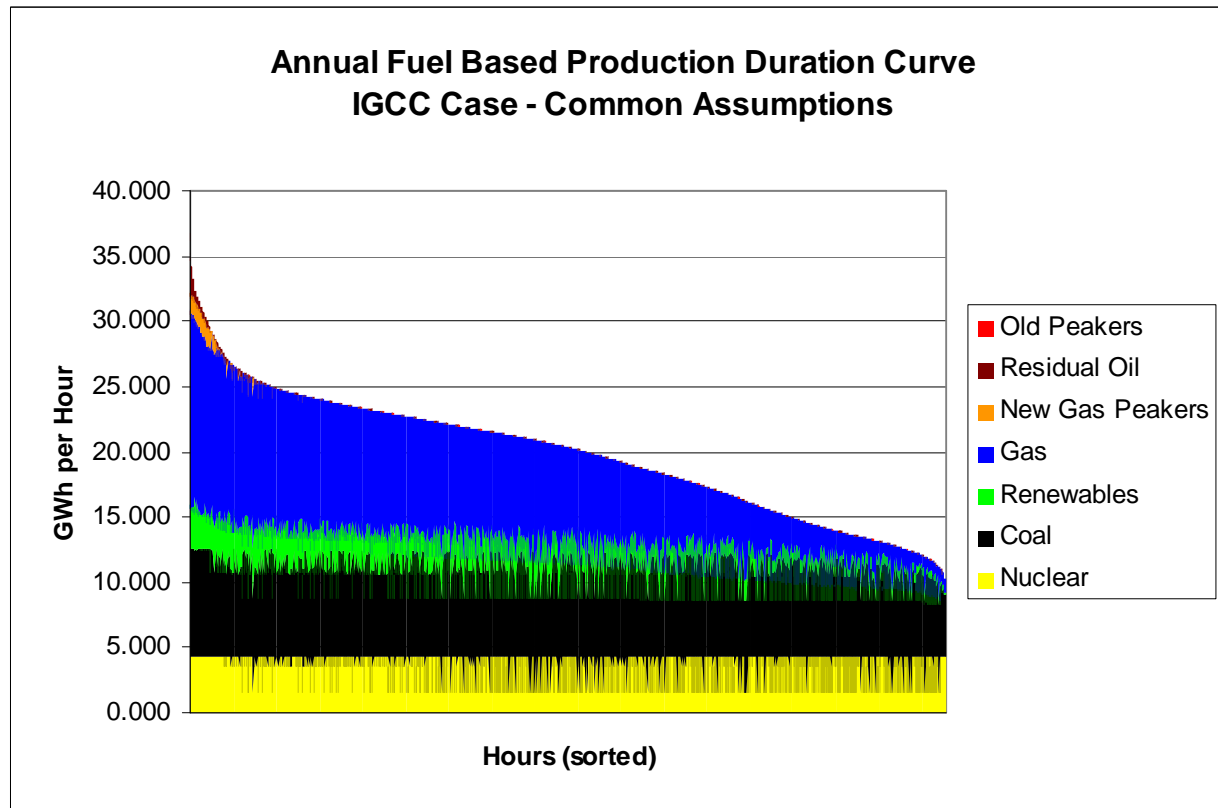
Annual Energy Duration Curves: Nuclear



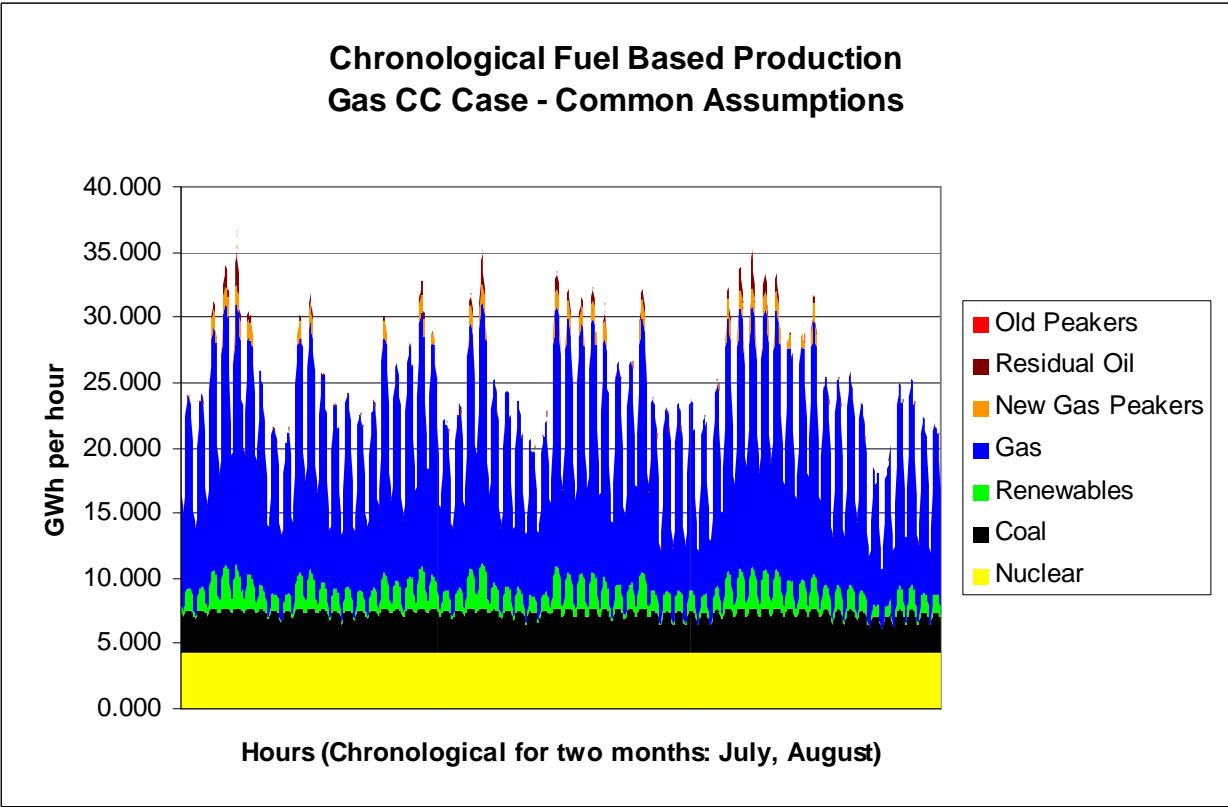
Summer Chronological GWh: IGCC



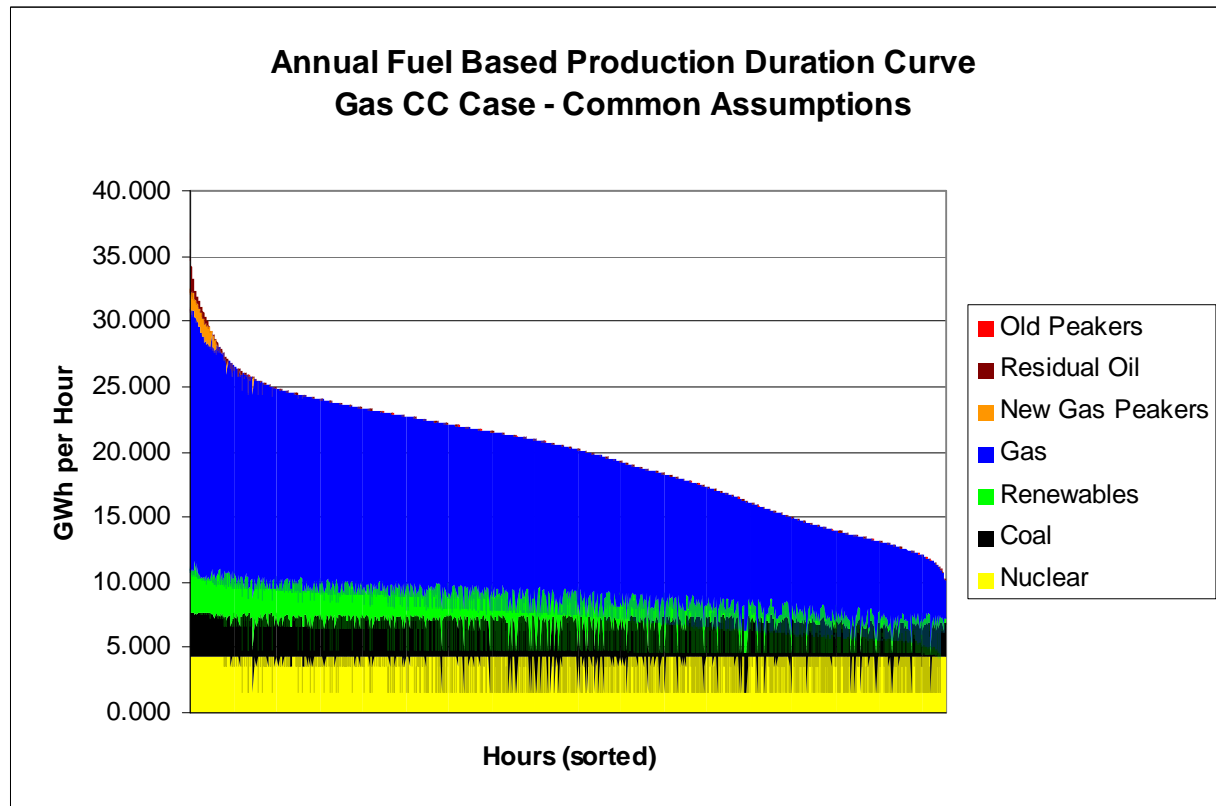
Annual Energy Duration Curves: IGCC



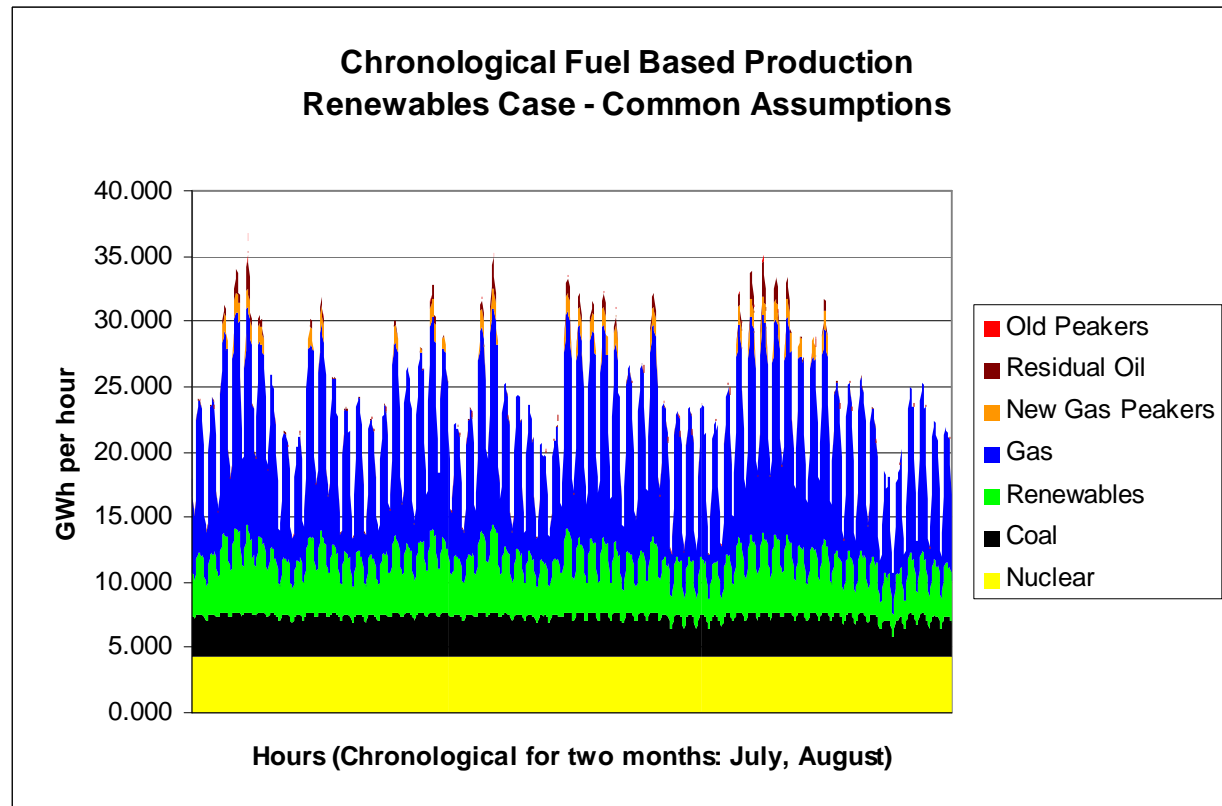
Summer Chronological GWh: Gas CC



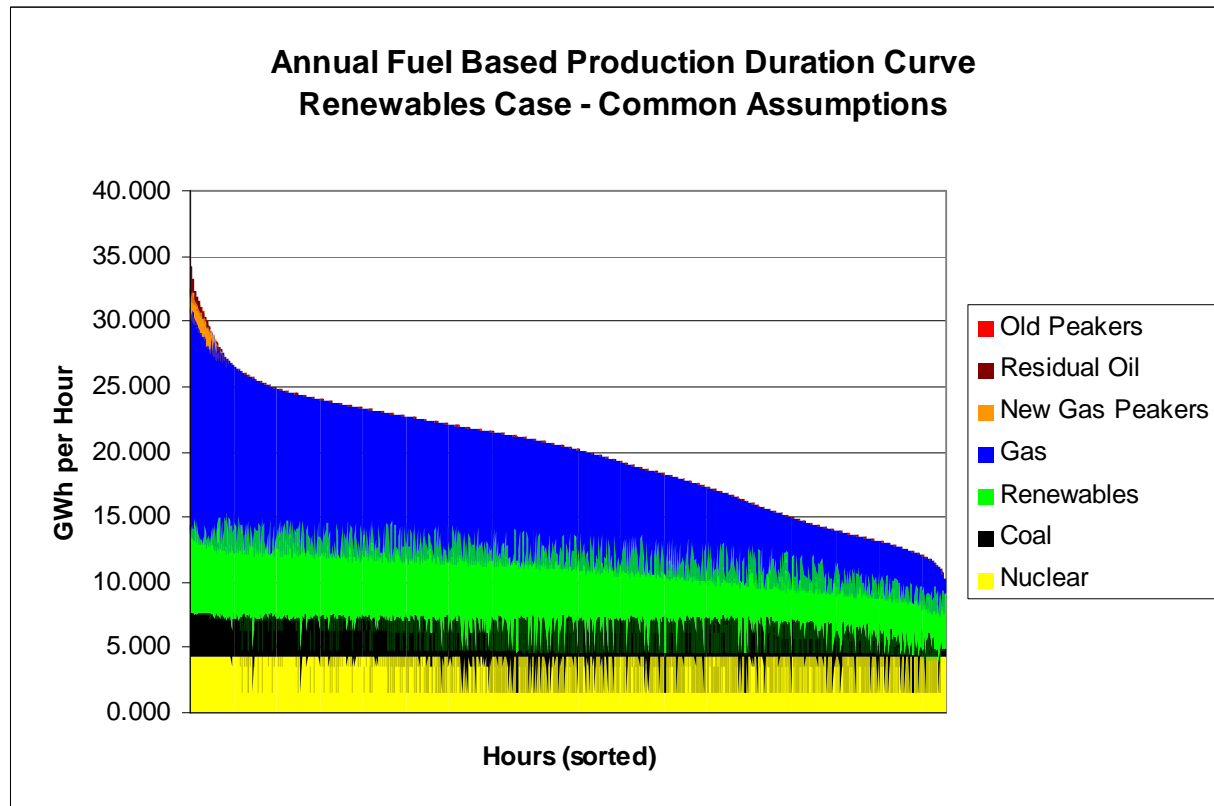
Annual Energy Duration Curves: Gas CC



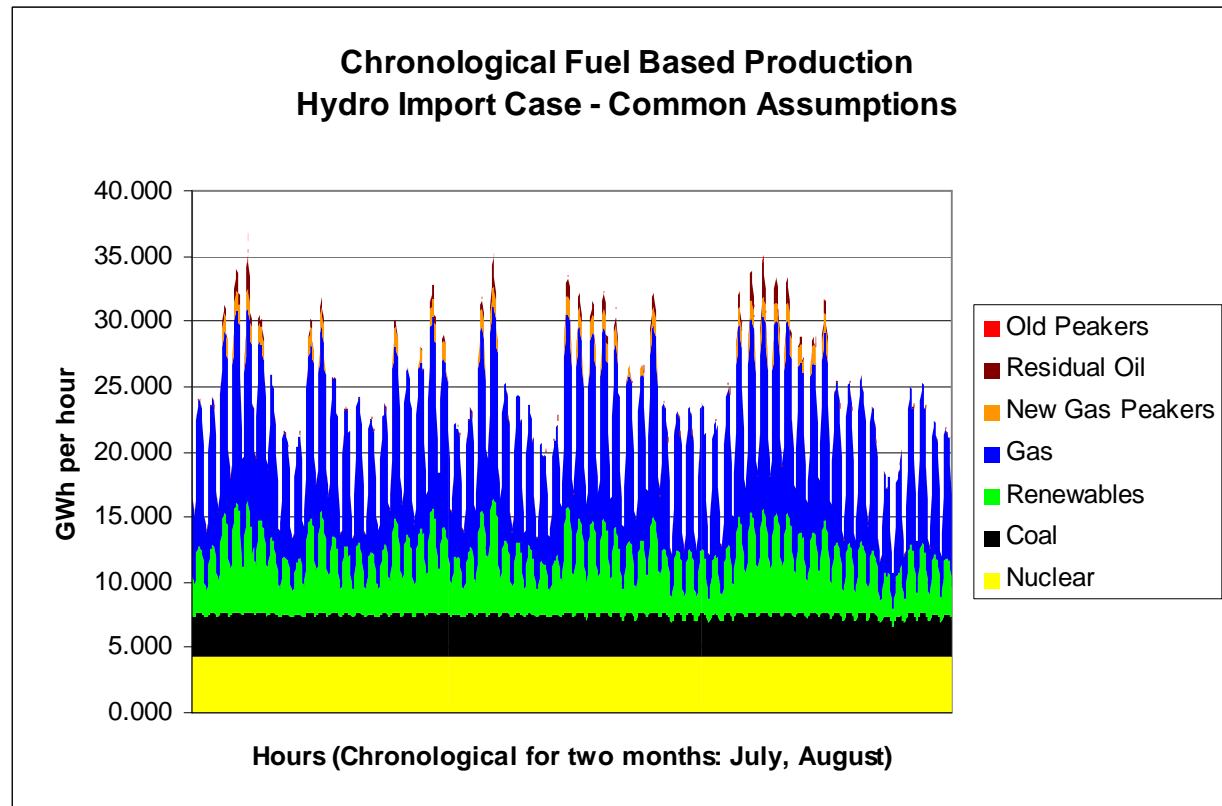
Summer Chronological GWh: Renewables



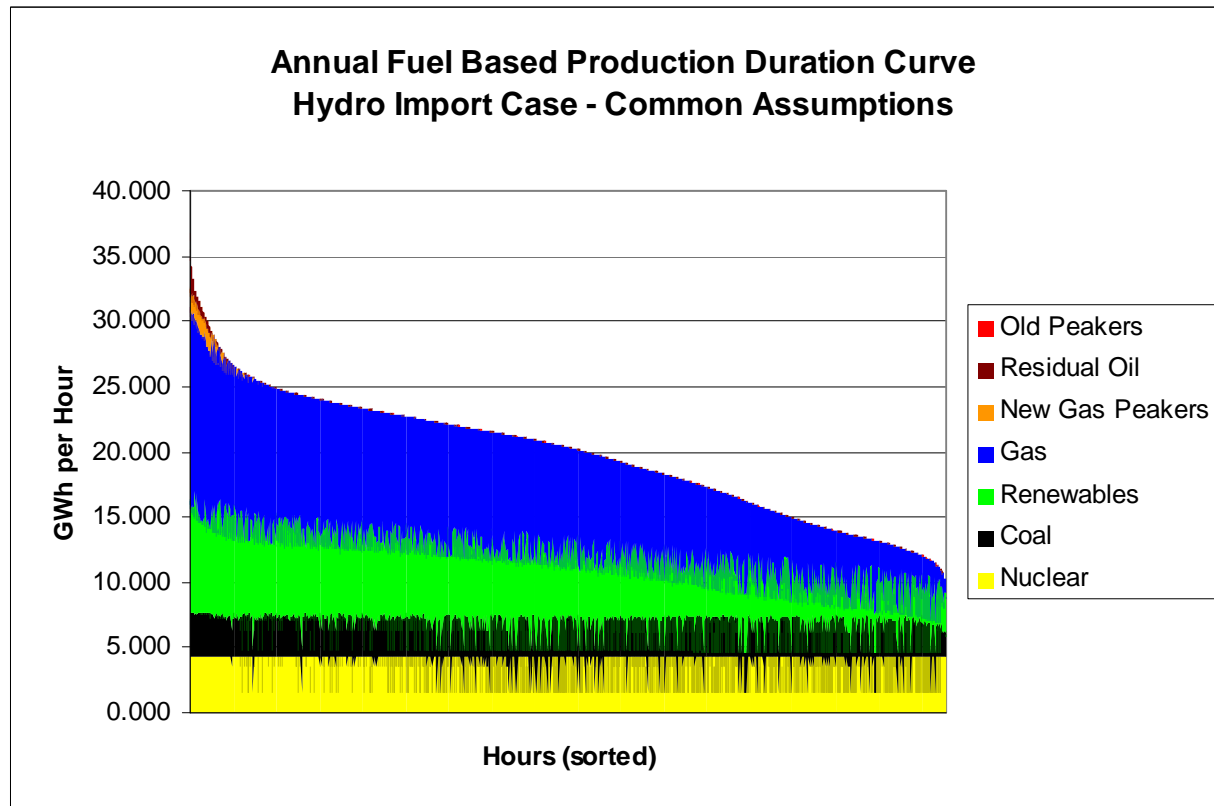
Annual Energy Duration Curves: Renewables



Summer Chronological GWh: Hydro Import



Annual Energy Duration Curves: Hydro Import



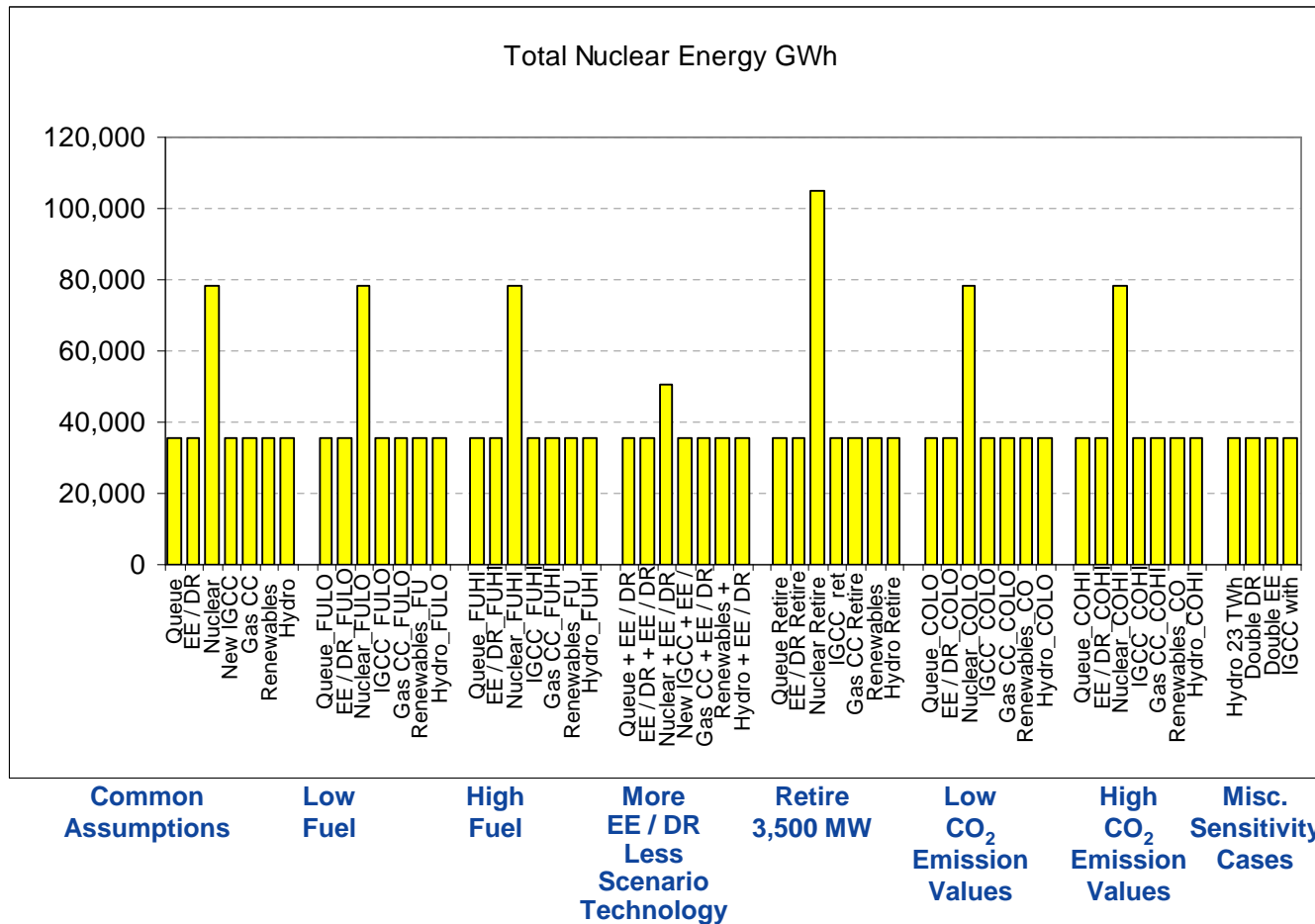
Energy Production by Fuel Category or Load Response Category (GWh)

GWh Energy Production by Fuel Category

- Following slides show the energy production in each scenario and sensitivity case.
 - Seven scenarios
 - Seven common sensitivity cases for each scenario
 - Four miscellaneous sensitivity cases
 - Total 53 cases for each metric (or category)

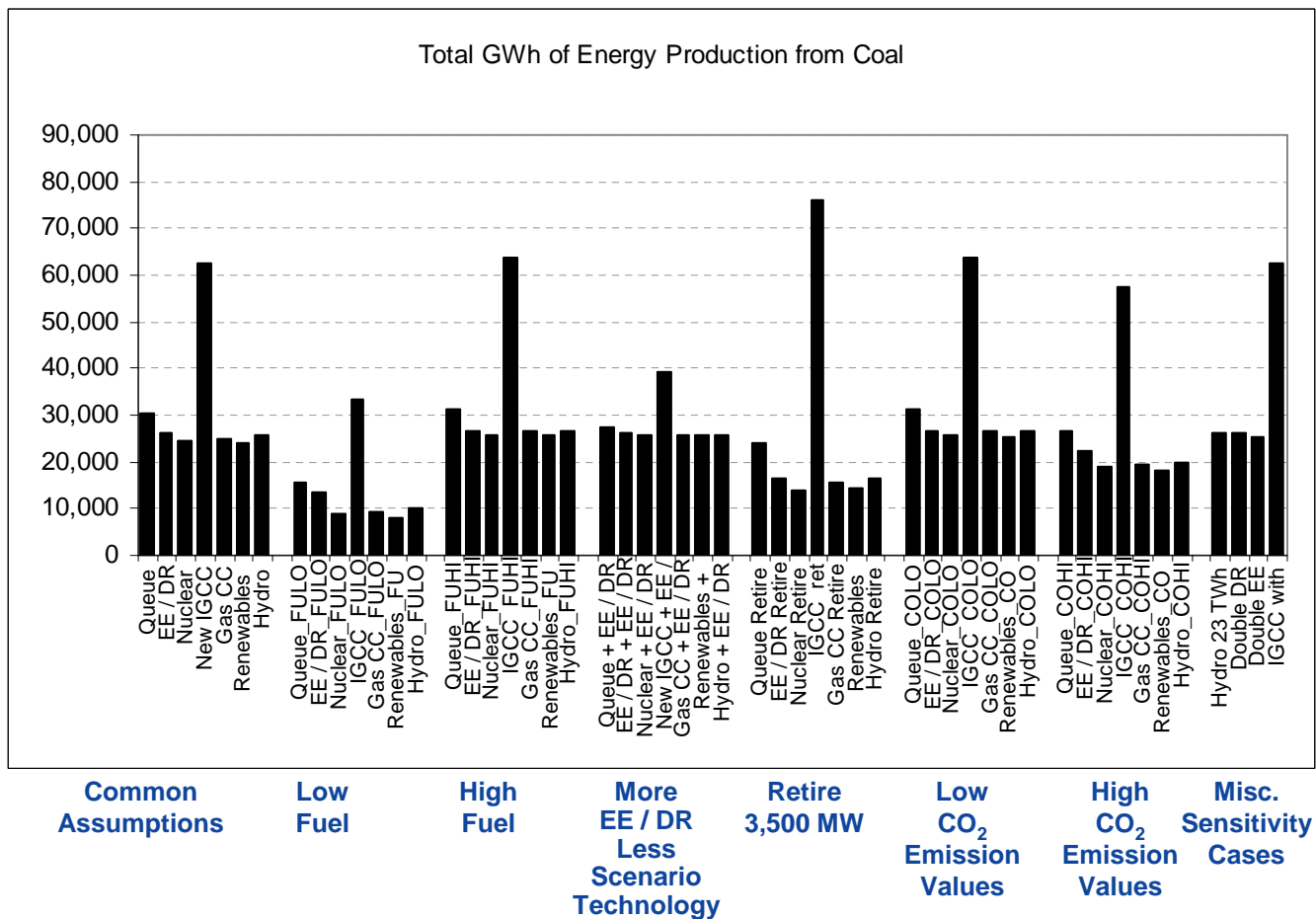
Total GWh: Nuclear

Grouped by Sensitivity



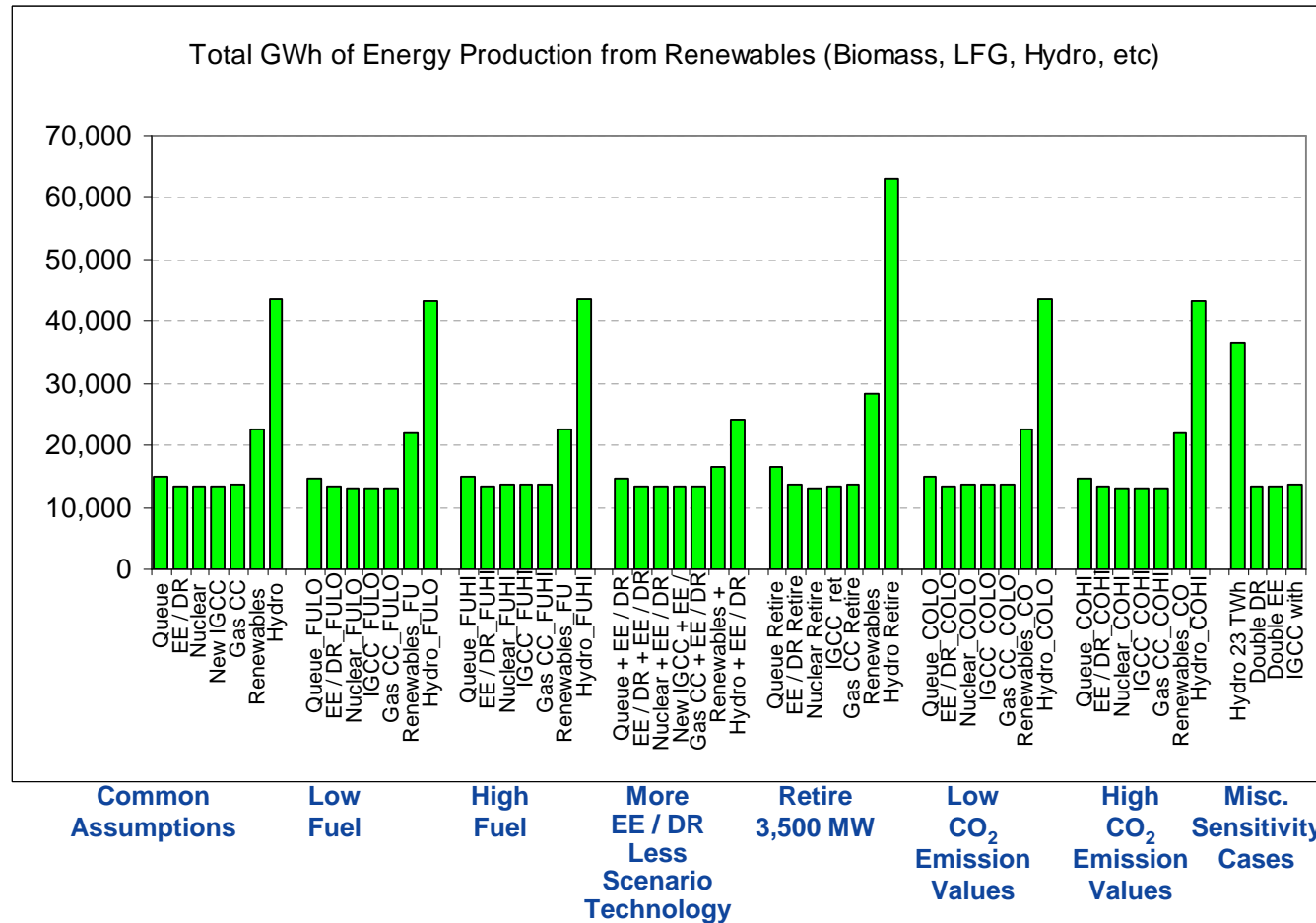
Total GWh: Coal

Grouped by Sensitivity



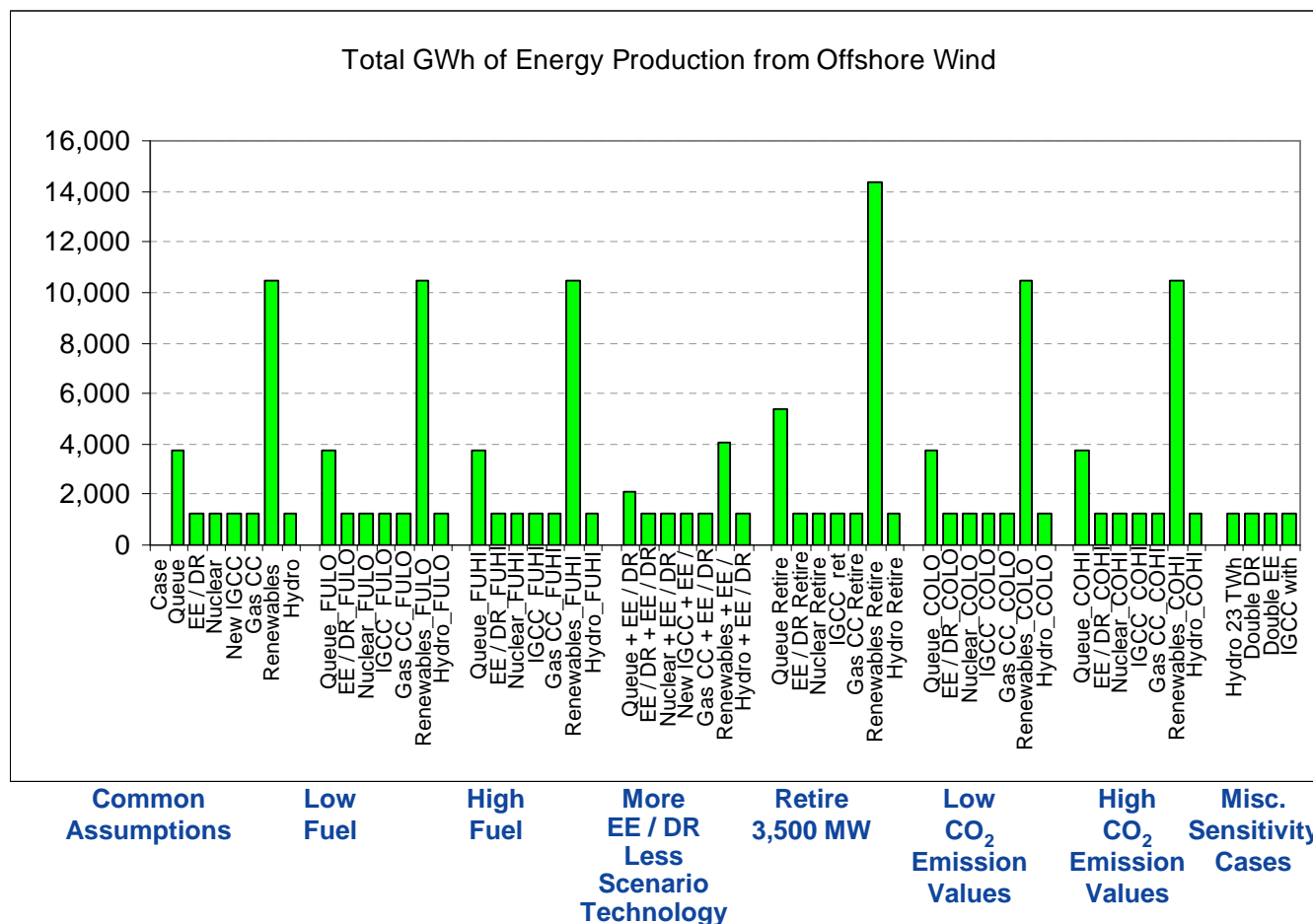
Total GWh: Renewables w/o Wind and PV

Grouped by Sensitivity



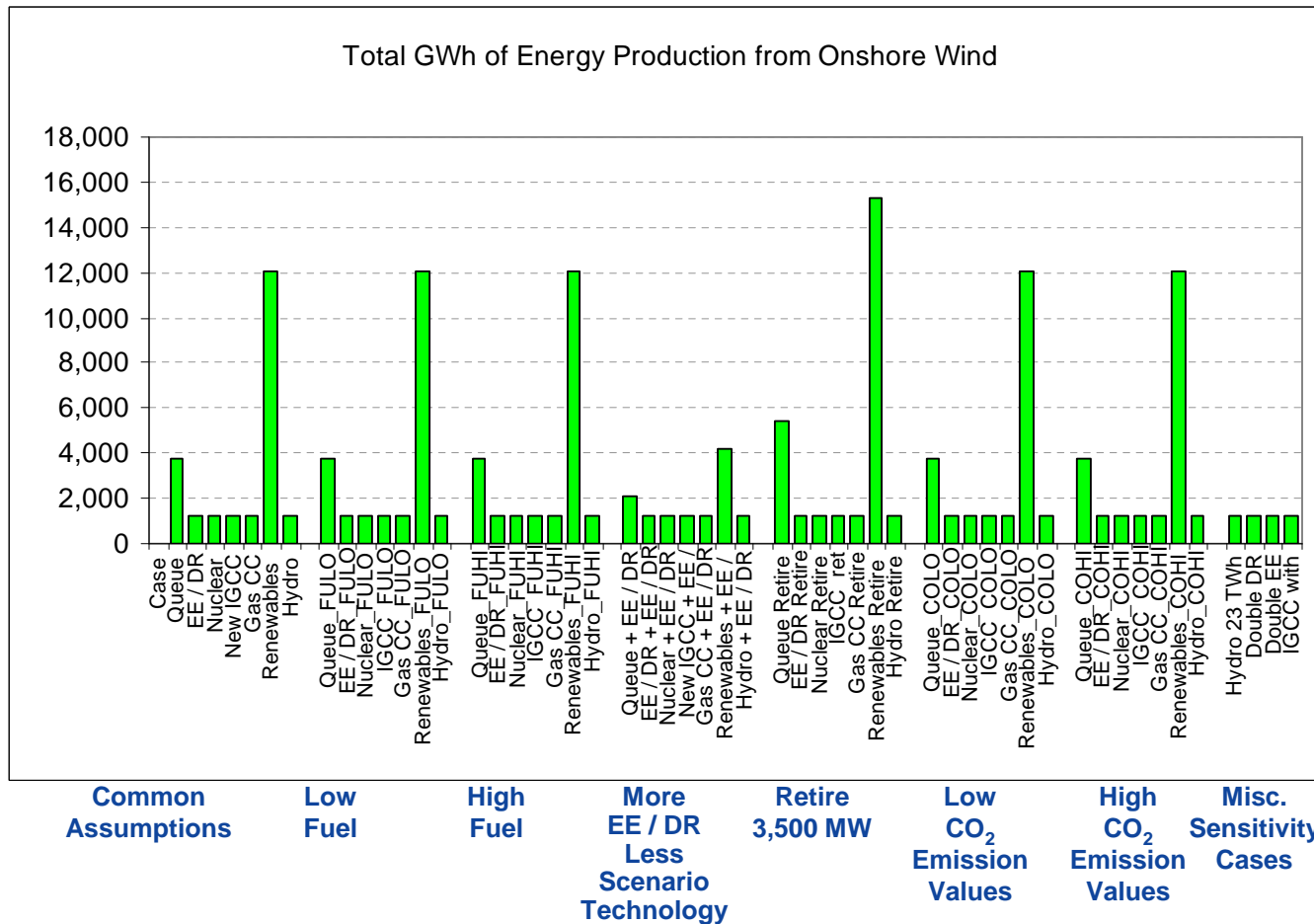
Total GWh: Offshore Wind

Grouped by Sensitivity



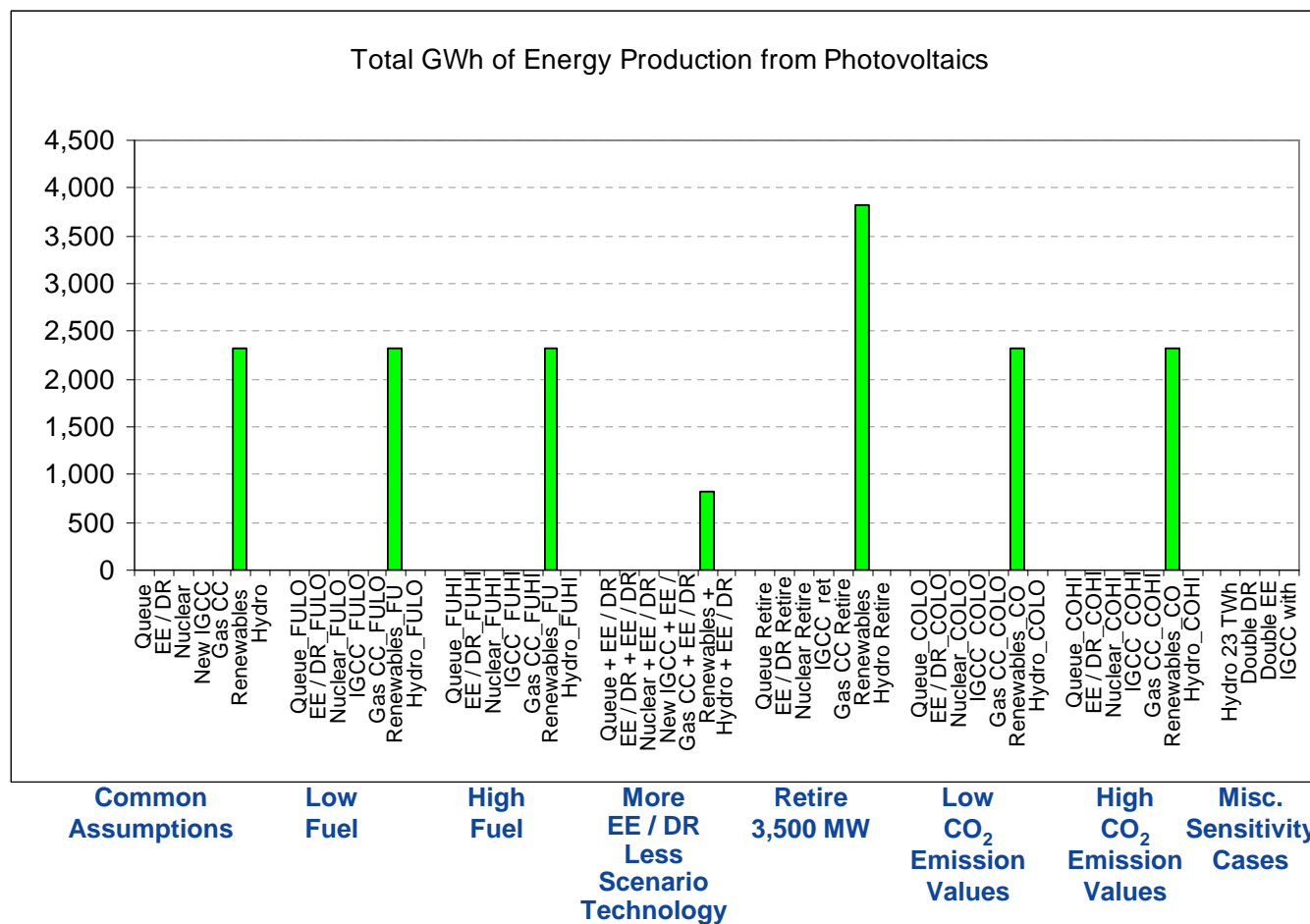
Total GWh: Onshore Wind

Grouped by Sensitivity



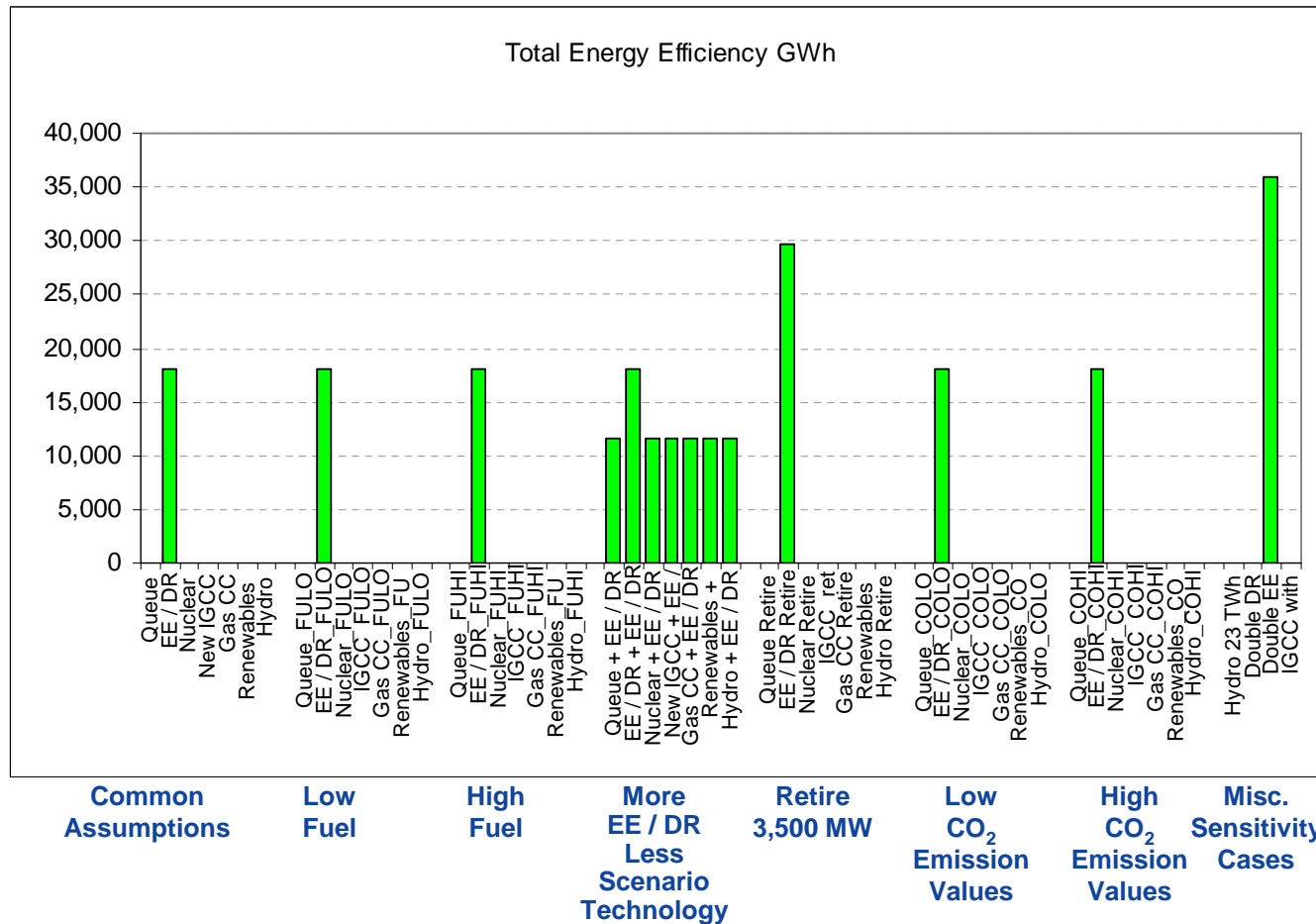
Total GWh: Photovoltaics

Grouped by Sensitivity



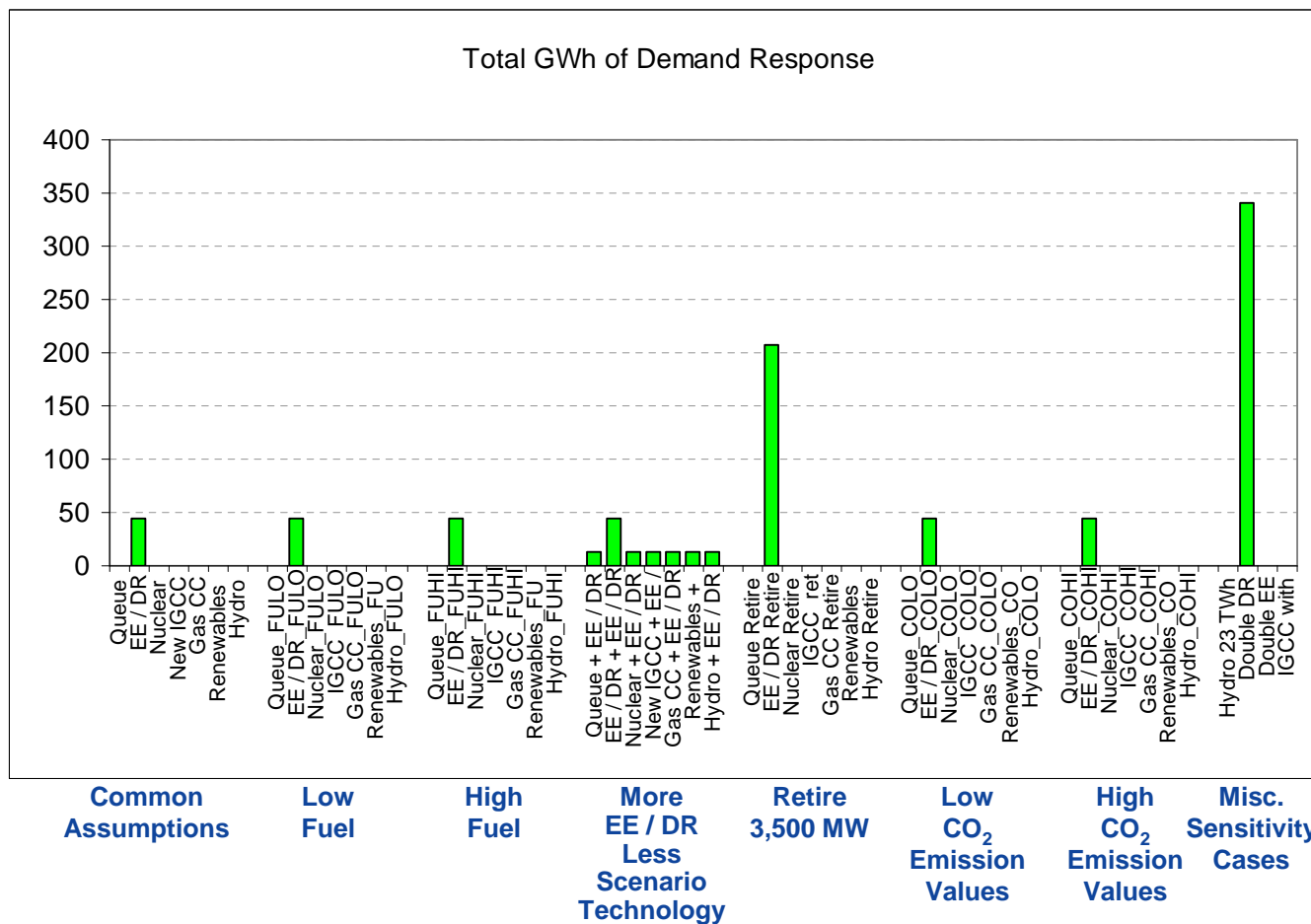
Total GWh: Energy Efficiency

Grouped by Sensitivity



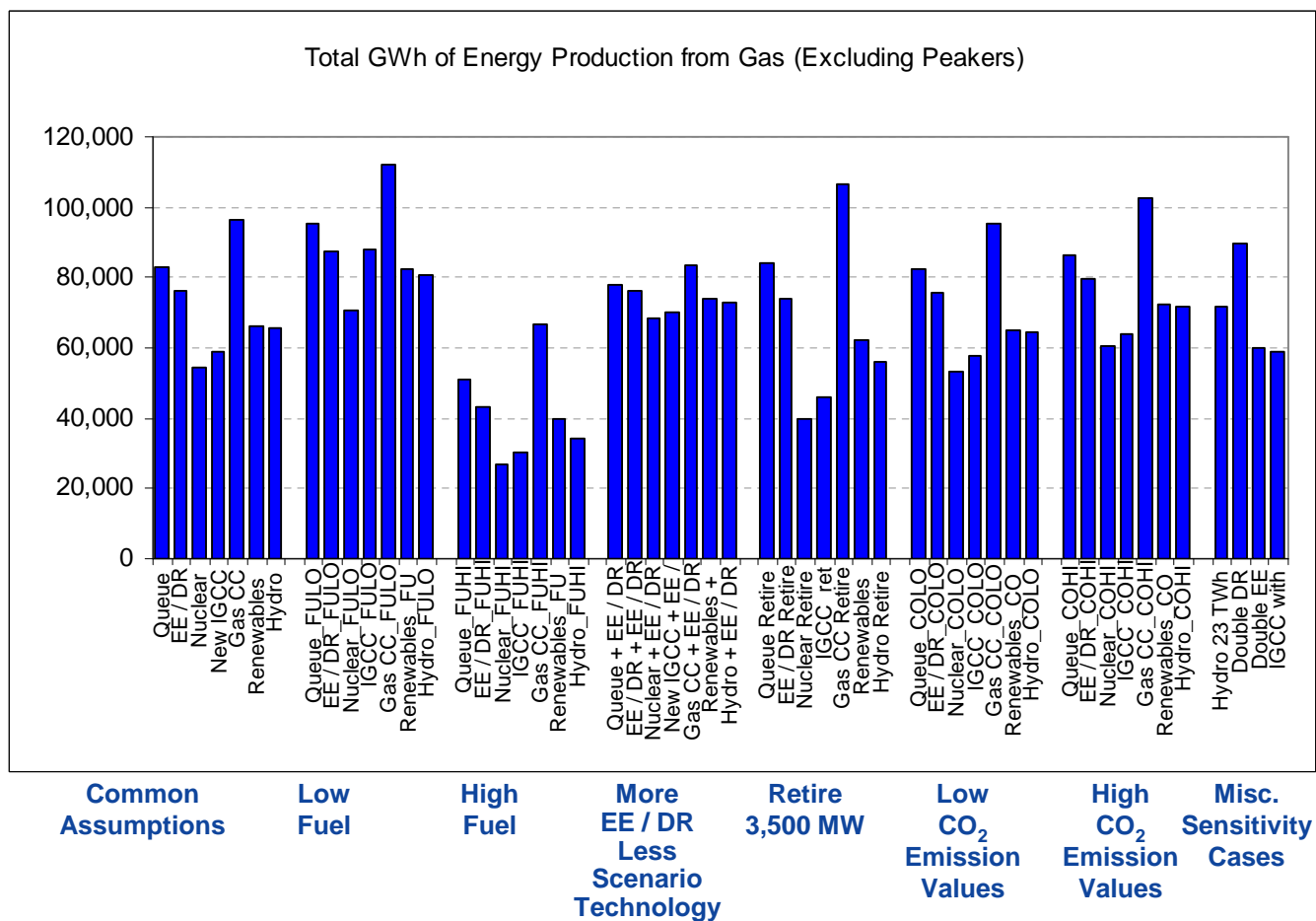
Total GWh: Demand Response

Grouped by Sensitivity



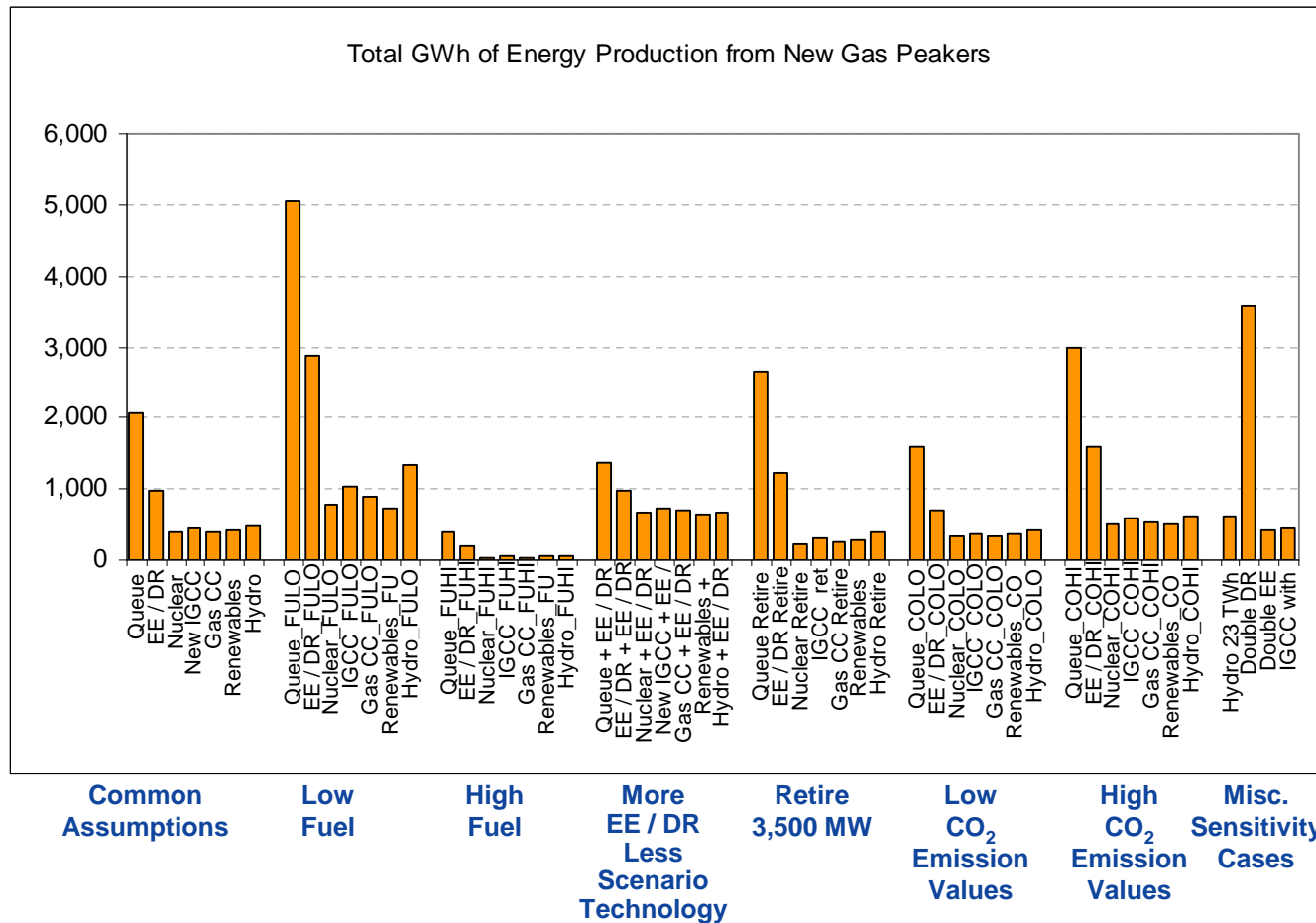
Total GWh: Gas

Grouped by Sensitivity



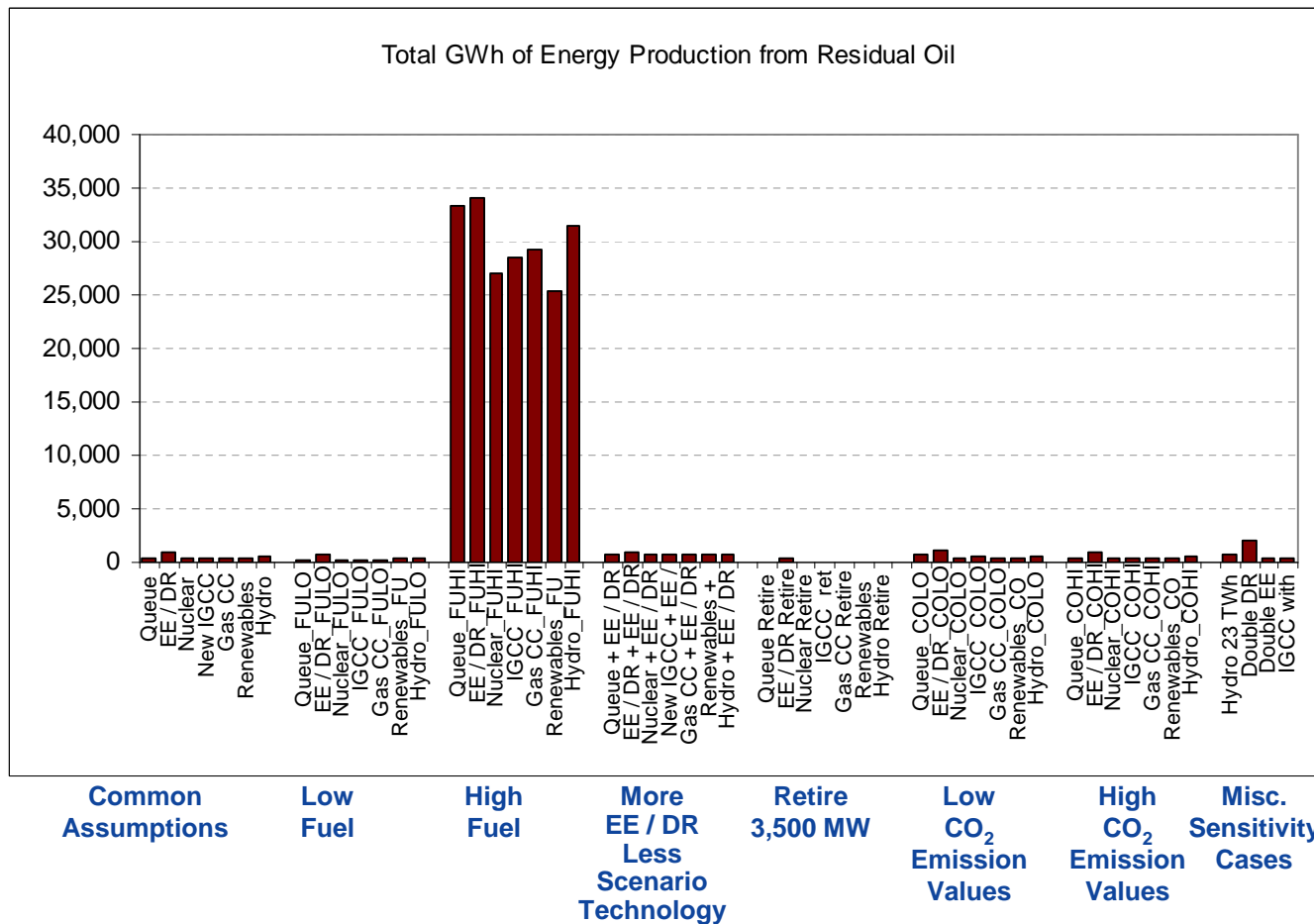
Total GWh: From New Gas Peakers

Grouped by Sensitivity



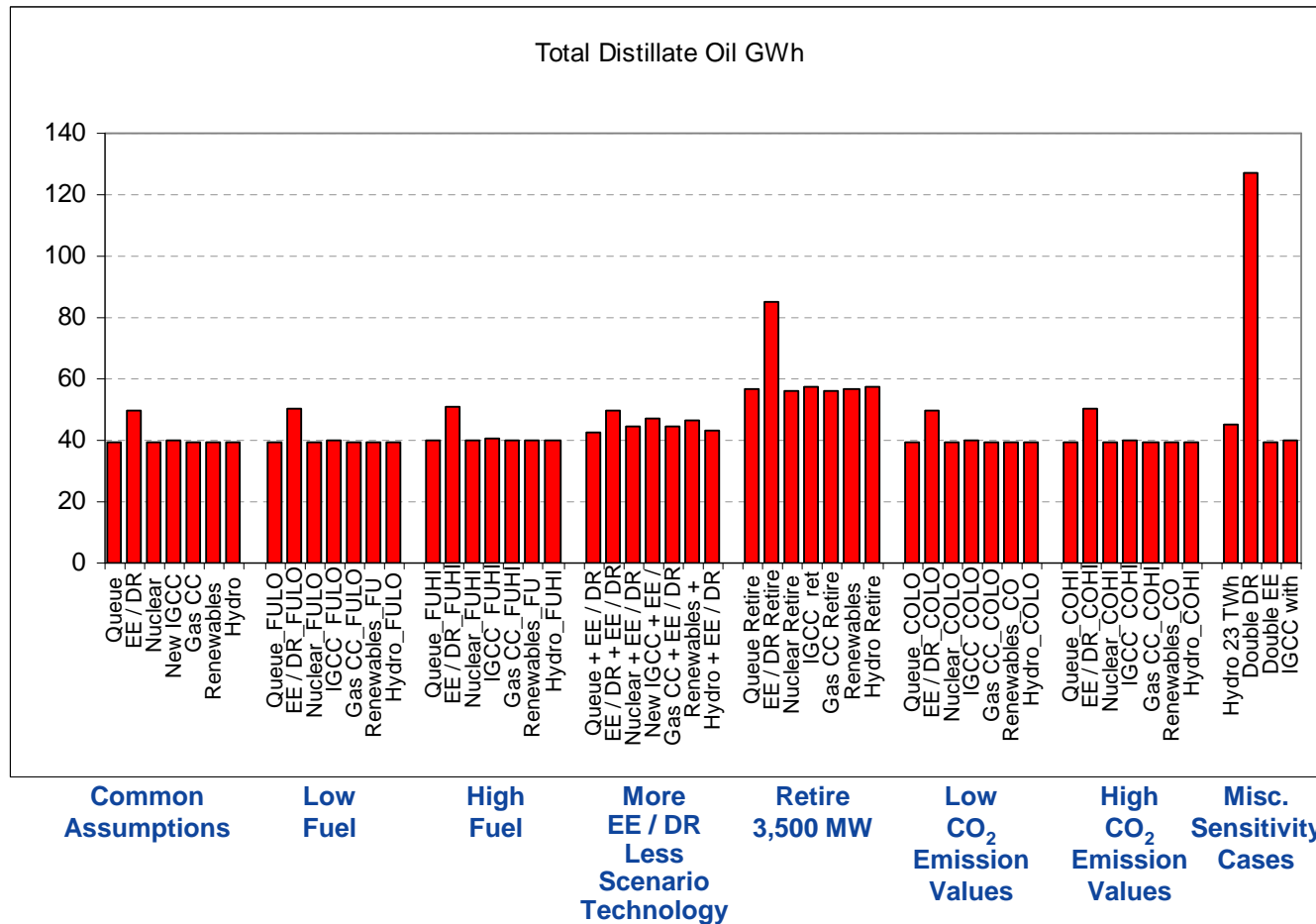
Total GWh: Residual Oil

Grouped by Sensitivity



Total GWh: Distillate Fuel Oil

Grouped by Sensitivity



Total GWh: Nuclear

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	35,596	35,596	35,596	35,596			35,596	35,596	35,596		
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	35,596	35,596	35,596	35,596	35,596	35,596	35,596	35,596	35,596		
1 Nuclear — 5,400 MW	78,191	78,190	78,190	50,585			104,837	78,179	78,194		
2 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	35,596	35,596	35,596	35,596			35,596	35,596	35,596	35,596	
3 Natural gas (combined cycle) — 5,400 MW	35,596	35,596	35,596	35,596			35,596	35,596	35,596		
4 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	35,595	35,564	35,595	35,596			35,566	35,591	35,596		
5 Increased imports of hydro and other low-emission resources — 30 TWh of imports	35,596	35,596	35,596	35,596			35,596	35,596	35,596		35,596
6											
7											

Total GWh: Coal

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	30,482	15,817	31,131	27,600			24,009	31,178	26,773		
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	26,056	13,411	26,625	26,056	25,491	26,313	16,686	26,671	22,362		
Nuclear — 5,400 MW	24,502	8,820	25,610	25,755			13,989	25,660	19,054		
Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	62,716	33,491	63,730	39,095			76,194	63,792	57,673	62,679	
Natural gas (combined cycle) — 5,400 MW	25,011	9,325	26,493	25,805			15,711	26,516	19,502		
Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	23,942	7,826	25,674	25,766			14,178	25,285	18,217		
Increased imports of hydro and other low-emission resources — 30 TWh of imports	25,767	9,974	26,521	25,978			16,337	26,595	20,030		26,016

Total GWh: Renewables w/o Wind and PV

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon— Allowance Prices	High Carbon— Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	14,918	14,648	14,914	14,588			16,690	14,902	14,636		
1											
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	13,505	13,245	13,491	13,505	13,489	13,510	13,530	13,497	13,225		
2											
3 Nuclear — 5,400 MW	13,484	13,110	13,577	13,494			12,917	13,527	13,050		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	13,516	13,135	13,589	13,512			13,478	13,535	13,125	13,540	
5 Natural gas (combined cycle) — 5,400 MW	13,541	13,143	13,611	13,518			13,589	13,560	13,102		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	22,534	22,074	22,639	16,686			28,326	22,595	22,035		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	43,575	43,250	43,571	24,082			63,139	43,564	43,196		36,553

Total GWh: Offshore Wind

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	3,771	3,771	3,771	2,119			5,415	3,771	3,771		
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	1,226	1,226	1,226	1,226	1,226	1,226	1,226	1,226	1,226		
Nuclear — 5,400 MW	1,226	1,226	1,226	1,226			1,226	1,226	1,226		
Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	1,226	1,226	1,226	1,226			1,226	1,226	1,226	1,226	
Natural gas (combined cycle) — 5,400 MW	1,226	1,226	1,226	1,226			1,226	1,226	1,226		
Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	10,495	10,495	10,495	4,035			14,376	10,495	10,495		
Increased imports of hydro and other low-emission resources — 30 TWh of imports	1,226	1,226	1,226	1,226			1,226	1,226	1,226		1,226

Total GWh: Onshore Wind

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	3,771	3,771	3,771	2,119			5,415	3,771	3,771		
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	1,226	1,226	1,226	1,226	1,226	1,226	1,226	1,226	1,226		
Nuclear — 5,400 MW	1,226	1,226	1,226	1,226			1,226	1,226	1,226		
Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	1,226	1,226	1,226	1,226			1,226	1,226	1,226	1,226	
Natural gas (combined cycle) — 5,400 MW	1,226	1,226	1,226	1,226			1,226	1,226	1,226		
Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	12,022	12,022	12,022	4,227			15,288	12,022	12,022		
Increased imports of hydro and other low-emission resources — 30 TWh of imports	1,226	1,226	1,226	1,226			1,226	1,226	1,226		1,226

Total GWh: Photovoltaics

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon— Allowance Prices	High Carbon— Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	0	0	0	0			0	0	0		
1											
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	0	0	0	0	0	0	0	0	0		
2											
3 Nuclear — 5,400 MW	0	0	0	0			0	0	0		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	0	0	0	0			0	0	0	0	
5 Natural gas (combined cycle) — 5,400 MW	0	0	0	0			0	0	0		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	2,321	2,321	2,321	815			3,825	2,321	2,321		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	0	0	0	0			0	0	0		0

Total GWh: Energy Efficiency

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	0	0	0	11,669			0	0	0		
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	18,005	18,005	18,005	18,005	36,009	0	29,674	18,005	18,005		
Nuclear — 5,400 MW	0	0	0	11,669			0	0	0		
Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	0	0	0	11,669			0	0	0	0	
Natural gas (combined cycle) — 5,400 MW	0	0	0	11,669			0	0	0		
Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	0	0	0	11,669			0	0	0		
Increased imports of hydro and other low-emission resources — 30 TWh of imports	0	0	0	11,669			0	0	0		0

Total GWh: Demand Response

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	0	0	0	13			0	0	0		
1											
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	45	45	45	45	0	342	207	45	45		
2											
3 Nuclear — 5,400 MW	0	0	0	13			0	0	0		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	0	0	0	13			0	0	0	0	
5 Natural gas (combined cycle) — 5,400 MW	0	0	0	13			0	0	0		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	0	0	0	13			0	0	0		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	0	0	0	13			0	0	0		0

Total GWh: Gas (Except New Peakers)

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	82,916	95,122	51,061	78,162			84,165	82,329	86,100		
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	76,318	87,568	43,379	76,318	60,023	89,957	74,168	75,773	79,756		
Nuclear — 5,400 MW	54,640	70,483	27,174	68,633			39,610	53,449	60,455		
Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	58,877	87,989	30,153	70,172			45,987	57,763	64,205	58,895	
Natural gas (combined cycle) — 5,400 MW	96,666	112,422	66,631	83,530			106,451	95,115	102,521		
Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	66,265	82,634	39,849	73,764			62,152	64,888	72,432		
Increased imports of hydro and other low-emission resources — 30 TWh of imports	65,528	80,904	34,294	72,719			56,002	64,711	71,523		72,023

Total GWh: Gas for New Peakers

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon— Allowance Prices	High Carbon— Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	2,057	5,049	387	1,354			2,664	1,590	2,987		
1											
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	990	2,878	200	990	406	3,568	1,234	705	1,589		
2											
3 Nuclear — 5,400 MW	381	782	32	663			235	325	489		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	438	1,024	42	734			296	359	589	438	
5 Natural gas (combined cycle) — 5,400 MW	398	886	32	688			243	329	532		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	408	737	42	631			292	355	491		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	477	1,331	49	667			389	413	618		603

Total GWh: Residual Oil

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	437	153	33,319	712			17	796	336		
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	962	718	34,124	962	462	2,119	369	1,178	917		
Nuclear — 5,400 MW	323	138	27,033	662			20	392	302		
Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	384	202	28,495	698			36	485	365	387	
Natural gas (combined cycle) — 5,400 MW	330	153	29,243	677			20	433	304		
Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	393	282	25,400	714			36	437	385		
Increased imports of hydro and other low-emission resources — 30 TWh of imports	542	422	31,458	754			43	594	544		682

Total GWh: Distillate Fuel Oil

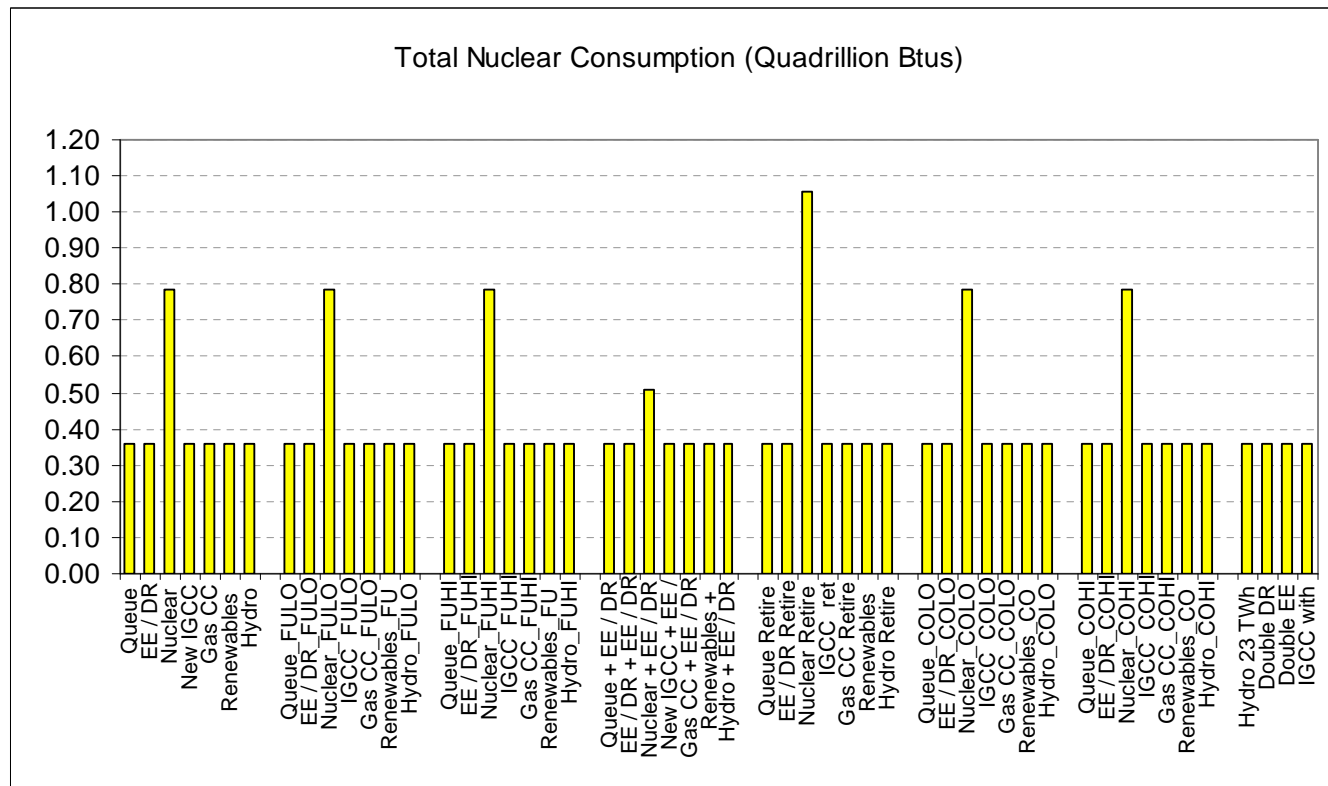
	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon- Allowance Prices	High Carbon- Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	40	39	40	43			57	40	40		
1											
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	50	50	51	50	39	127	85	50	50		
2											
3 Nuclear — 5,400 MW	39	39	40	44			56	39	39		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	40	40	41	47			57	40	40	40	
5 Natural gas (combined cycle) — 5,400 MW	40	39	40	44			56	40	39		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	39	39	40	47			57	39	39		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	39	39	40	43			57	39	39		45

Fuel Consumption (Quads – Billion MBtu Consumed)

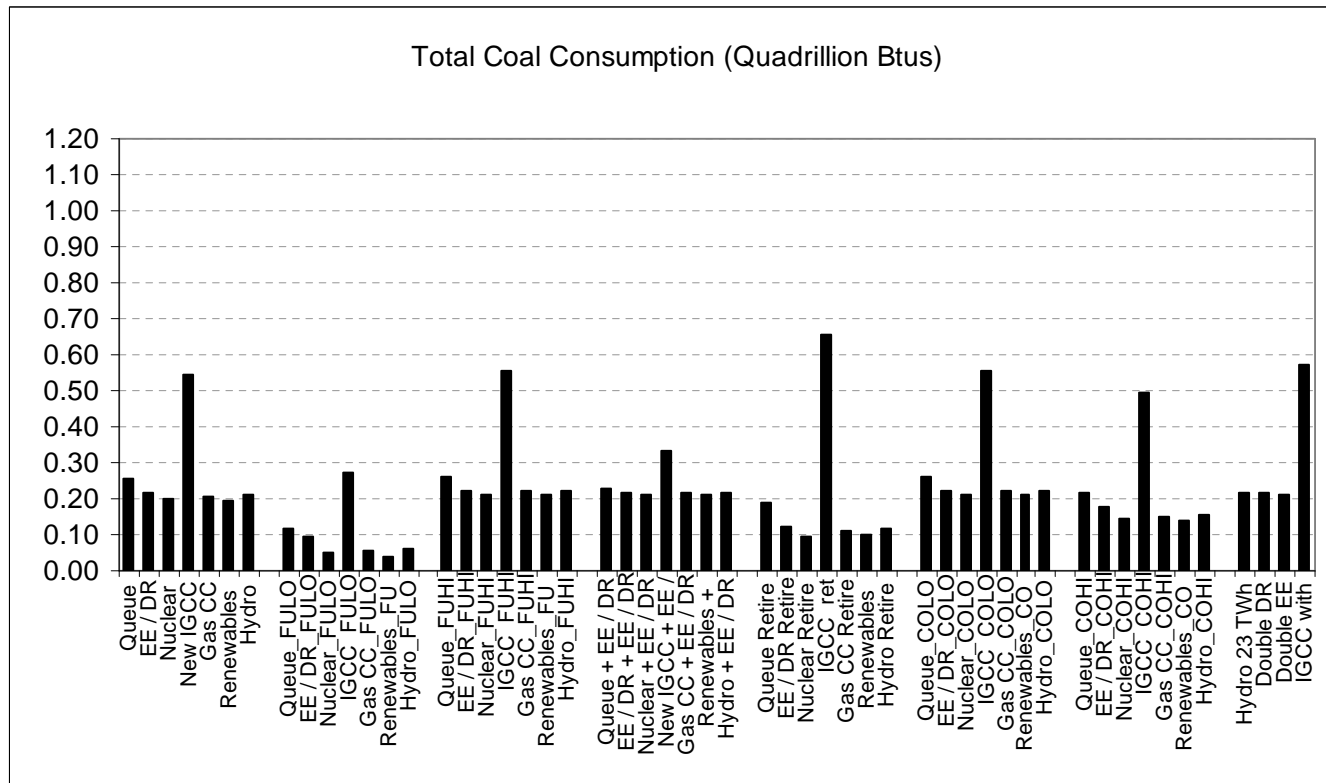
Fuel Consumption for Energy Production

- Previous section showed MWh
- This shows similar composite information in terms of fuel consumption
 - Fuel consumption expressed in terms of Quads (Quadrillion Btus)
 - One Quad = One Billion MBtus
 - One Quad \approx 45 Million tons of coal
 - One Quad \approx 160 Million BBL of Oil
- Takes into account heat rate differences between resources

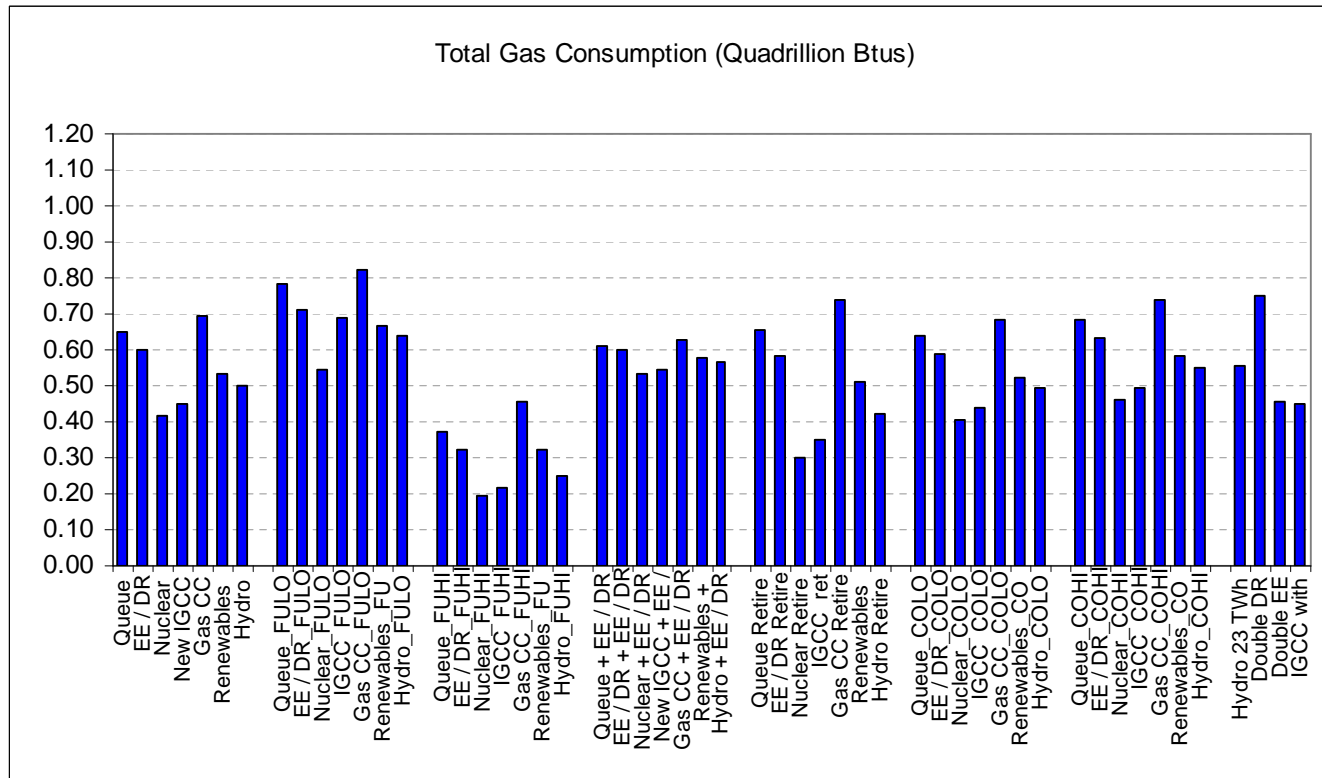
Total Nuclear Energy Consumed Quads



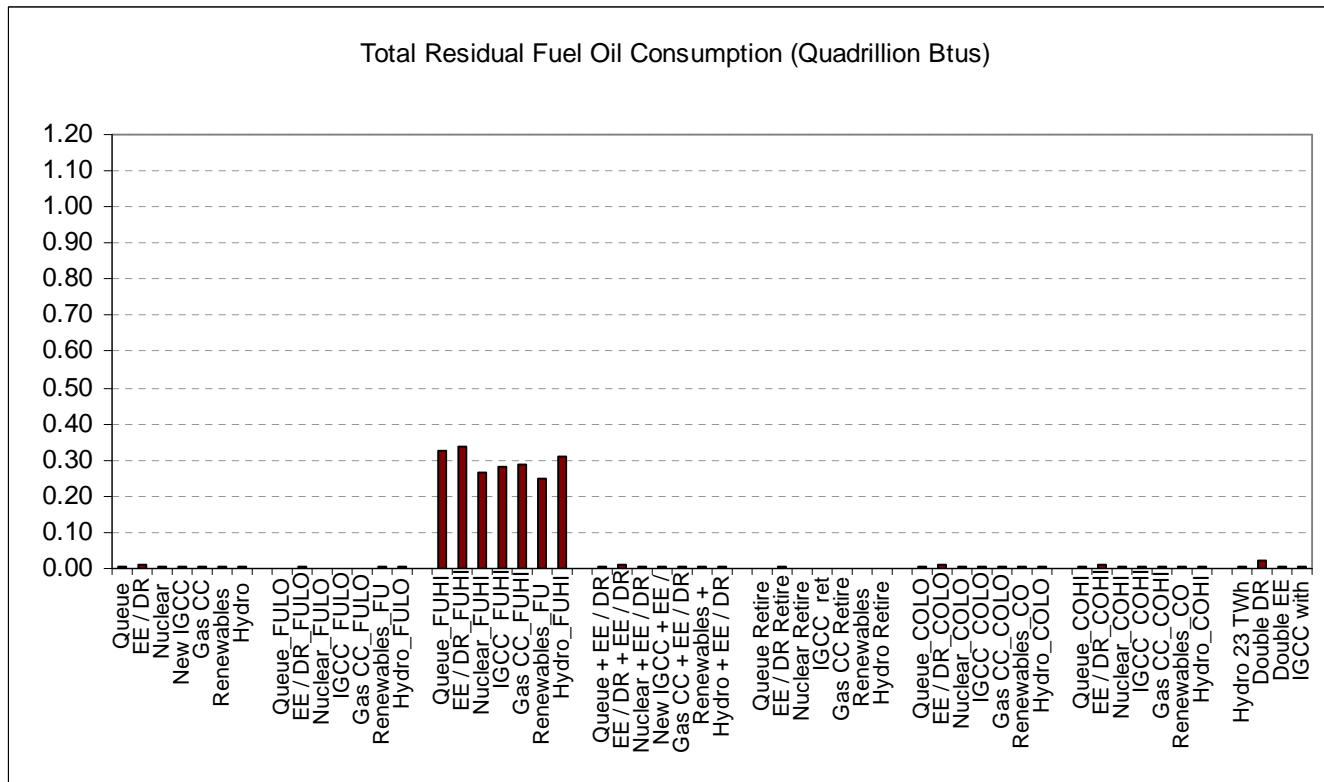
Total Coal Energy Consumed Quads



Total Gas Energy Consumed Quads



Total Residual Fuel Oil Consumed Quads



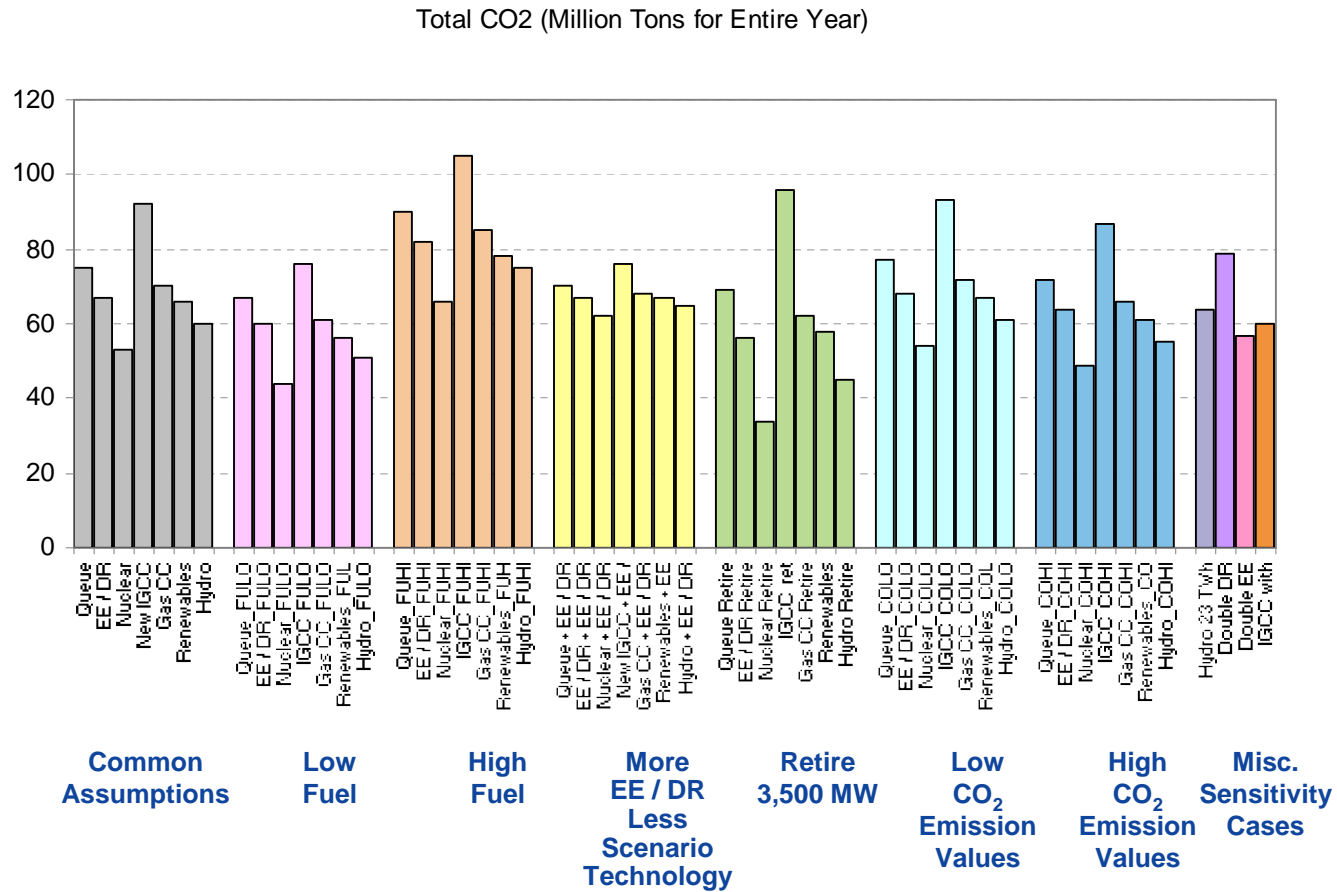
Environmental Emissions

Overview

- NO_x, CO₂ and SO₂ emissions shown for New England
- NO_x emissions are a critical concern to air regulators
- NO_x emissions are typically
 - Disproportionately higher on high load days
 - Difficult to control for short term excursions
- Emission by fuel type used is informative
 - Gas subdivided into “Gas” and “Gas for Only New Peakers”
- Analysis provided here includes
 - Chronological NO_x emissions for July and August
 - Peak load months
 - Excursions easily seen due to narrow spikes
 - Peak Day NO_x Emission Profile
 - Shows trend across all hours of peak NO_x day

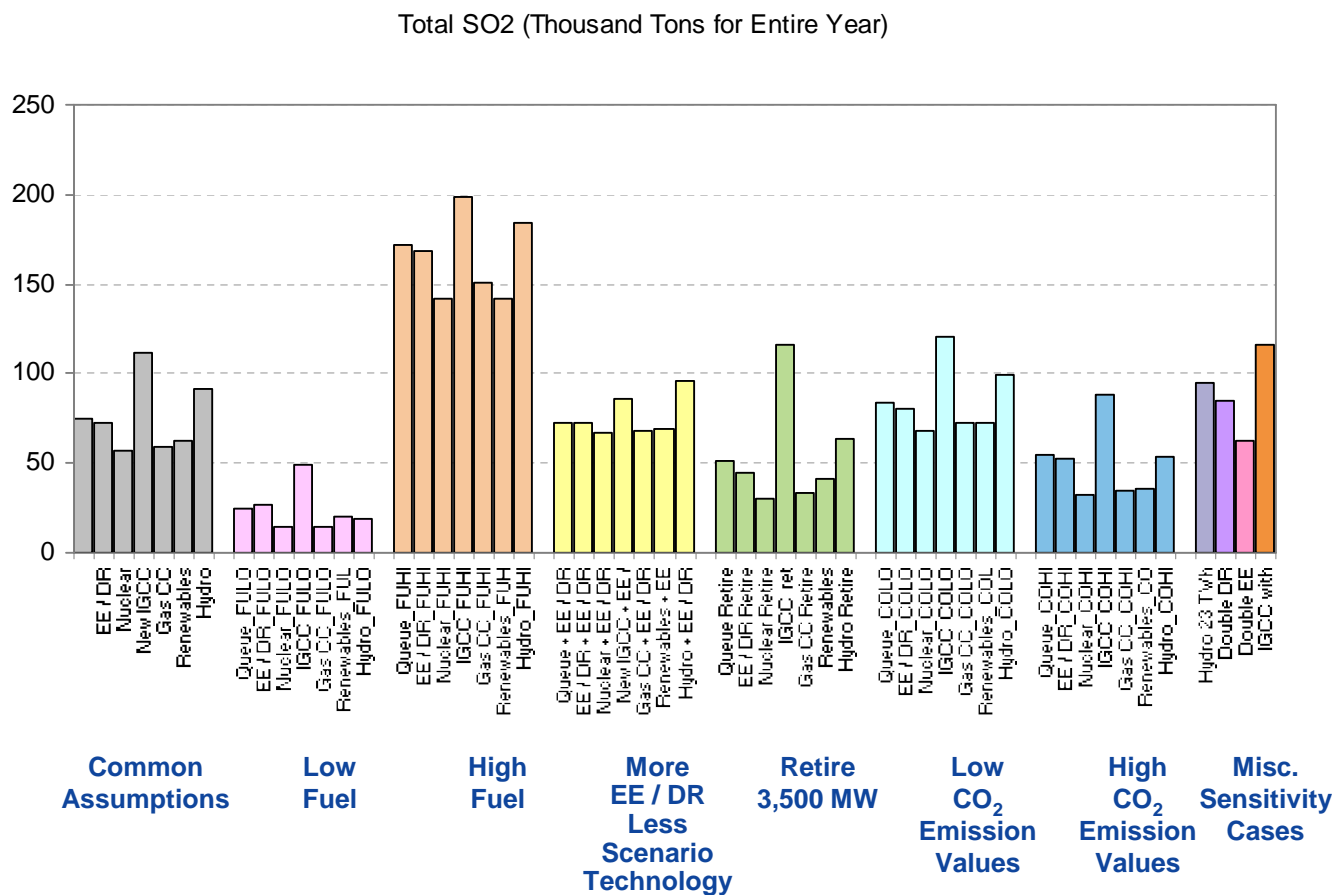
Total CO2 (Million Tons)

Grouped by Sensitivity



Total SO2 (Thousand Tons)

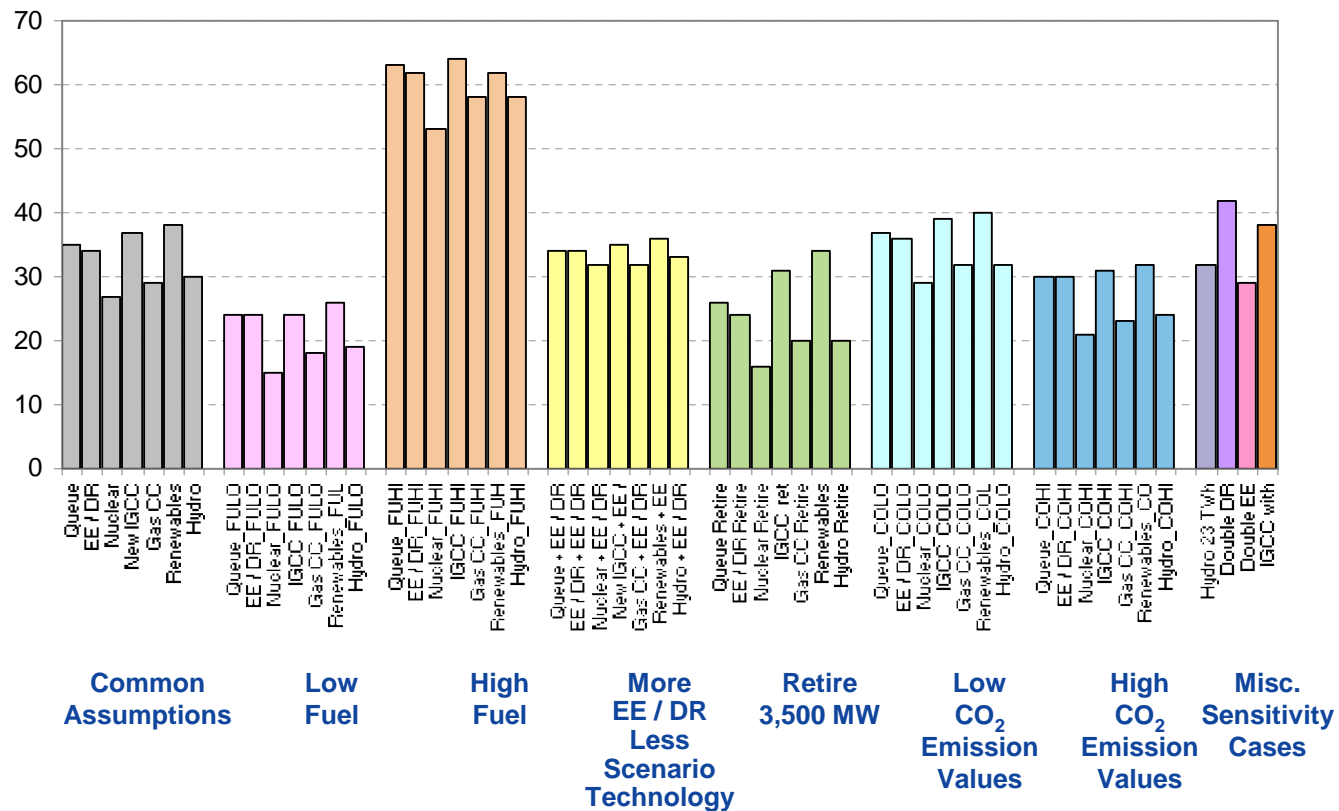
Grouped by Sensitivity



NOx Emissions (Thousand Tons)

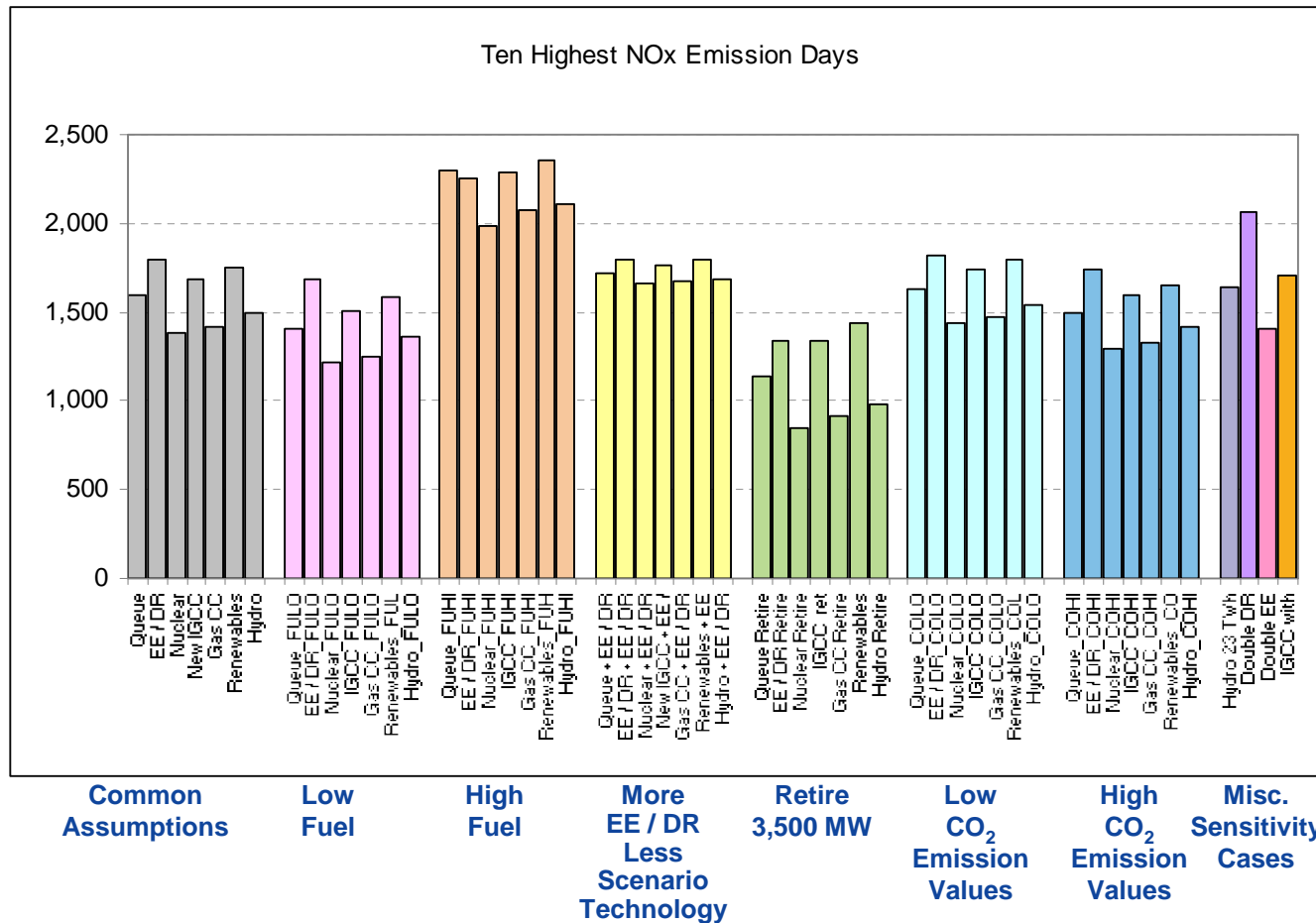
Grouped by Sensitivity

Total Nox (Thousand Tons for Entire Year)



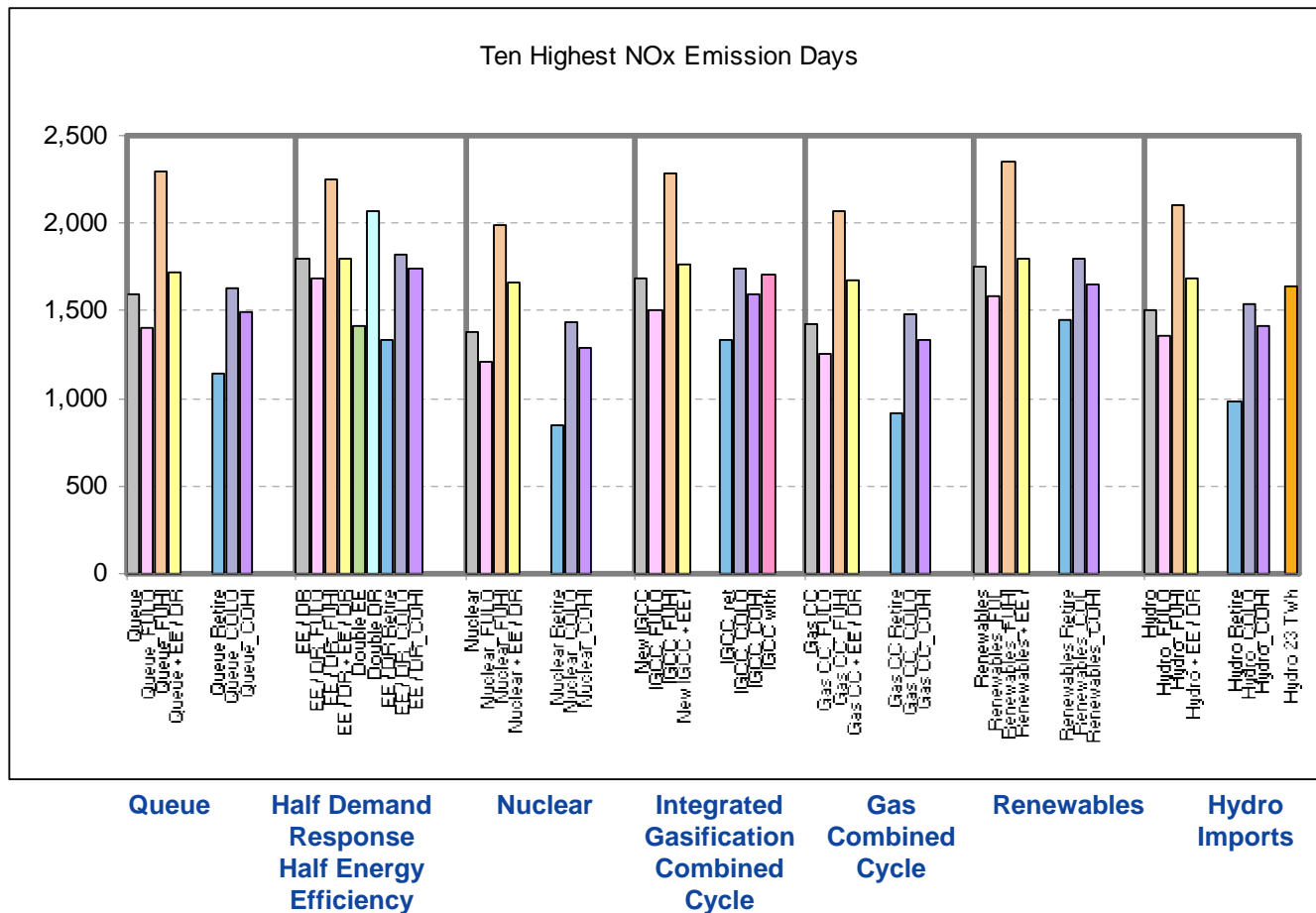
Sum of Top Ten Days NOx Emissions (Tons)

Grouped by Sensitivity



Sum of Top Ten Days NOx Emissions (Tons)

Grouped by Scenario



Total Emission: CO₂ (Million Tons)

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon-Allowance Prices	High Carbon-Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
1 Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	75	67	90	70			69	77	72		
2 Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	67	60	82	67	57	79	56	68	64		
3 Nuclear — 5,400 MW	53	44	66	62			34	54	49		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	92	76	105	76			96	93	87	60	
5 Natural gas (combined cycle) — 5,400 MW	70	61	85	68			62	72	66		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	66	56	78	67			58	67	61		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	60	51	75	65			45	61	55		64

Total Emissions: SO₂ (Thousand Tons)

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon-Allowance Prices	High Carbon-Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
1 Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	75	25	172	73			51	84	55		
2 Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	72	27	168	72	62	85	45	80	52		
3 Nuclear — 5,400 MW	57	14	142	67			30	68	32		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	112	49	199	86			116	121	88	116	
5 Natural gas (combined cycle) — 5,400 MW	59	15	151	68			33	72	35		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	62	20	142	69			41	73	36		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	91	19	184	96			64	99	54		95

Total Emissions: NO_x (Thousand Tons)

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon-Allowance Prices	High Carbon-Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
1 Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	35	24	63	34			26	37	30		
2 Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	34	24	62	34	29	42	24	36	30		
3 Nuclear — 5,400 MW	27	15	53	32			16	29	21		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	37	24	64	35			31	39	31	38	
5 Natural gas (combined cycle) — 5,400 MW	29	18	58	32			20	32	23		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	38	26	62	36			34	40	32		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	30	19	58	33			20	32	24		32

Sum of Top Ten Days NOx Emissions

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon-Allowance Prices	High Carbon-Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	1,592	1,404	2,296	1,715			1,142	1,629	1,499		
Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	1,798	1,683	2,252	1,798	1,410	2,064	1,335	1,824	1,737		
Nuclear — 5,400 MW	1,383	1,213	1,989	1,658			849	1,437	1,293		
Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	1,685	1,508	2,285	1,767			1,334	1,737	1,597	1,708	
Natural gas (combined cycle) — 5,400 MW	1,423	1,253	2,072	1,672			915	1,477	1,333		
Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	1,748	1,584	2,351	1,794			1,444	1,795	1,657		
Increased imports of hydro and other low-emission resources — 30 TWh of imports	1,501	1,359	2,107	1,682			988	1,535	1,413		1,644

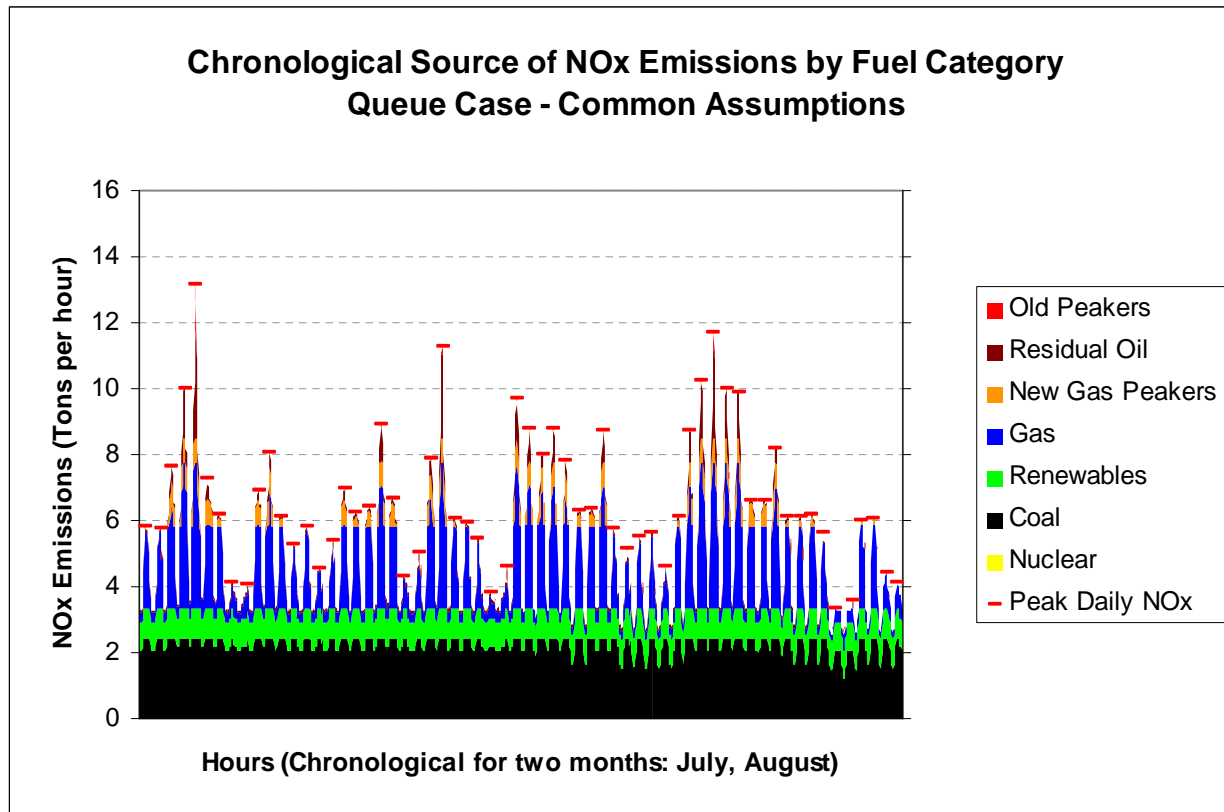
Total Emissions: Mercury (pounds)

	A	C	B	D	E	F	G	I	H	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon-Allowance Prices	High Carbon-Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
1 Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	1,403	627	1,441	1,260			1,029	1,441	1,205		
2 Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	1,188	506	1,221		1,150	1,199	671	1,221	985		
3 Nuclear — 5,400 MW	1,095	270	1,161	1,172			534	1,166	803		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	2,992	1,485	3,053	1,832			3,608	3,053	2,712	3,146	
5 Natural gas (combined cycle) — 5,400 MW	1,128	297	1,210	1,177			622	1,210	825		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	1,067	215	1,161	1,172			539	1,150	754		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	1,172	330	1,216	1,183			649	1,221	858		1,183

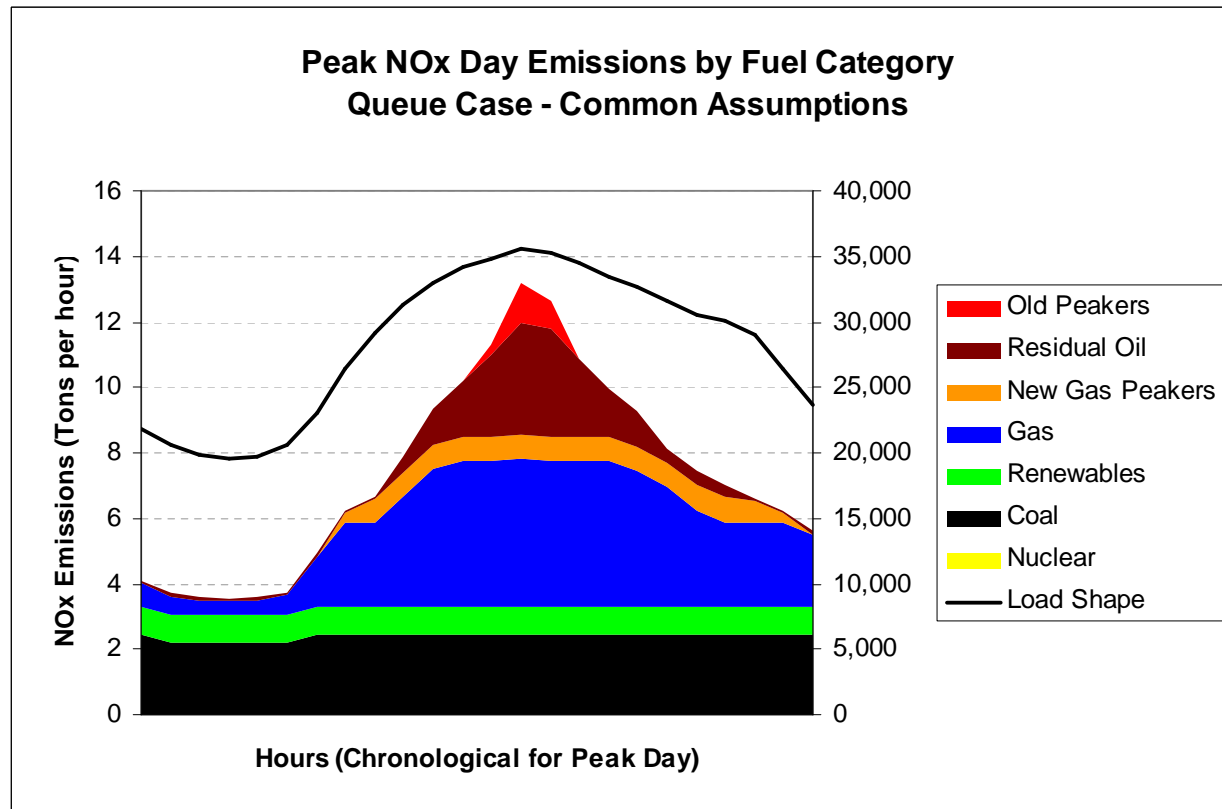
Based on Coal Consumption and 5.5 lb of Mercury per Trillion Btus (or 5500 lb per “Quad” of coal consumed)

Summer Hourly NOx: Queue Case

Graphs do not show narrow, short duration excursions well. Red line used to show peak hourly NOx for each day

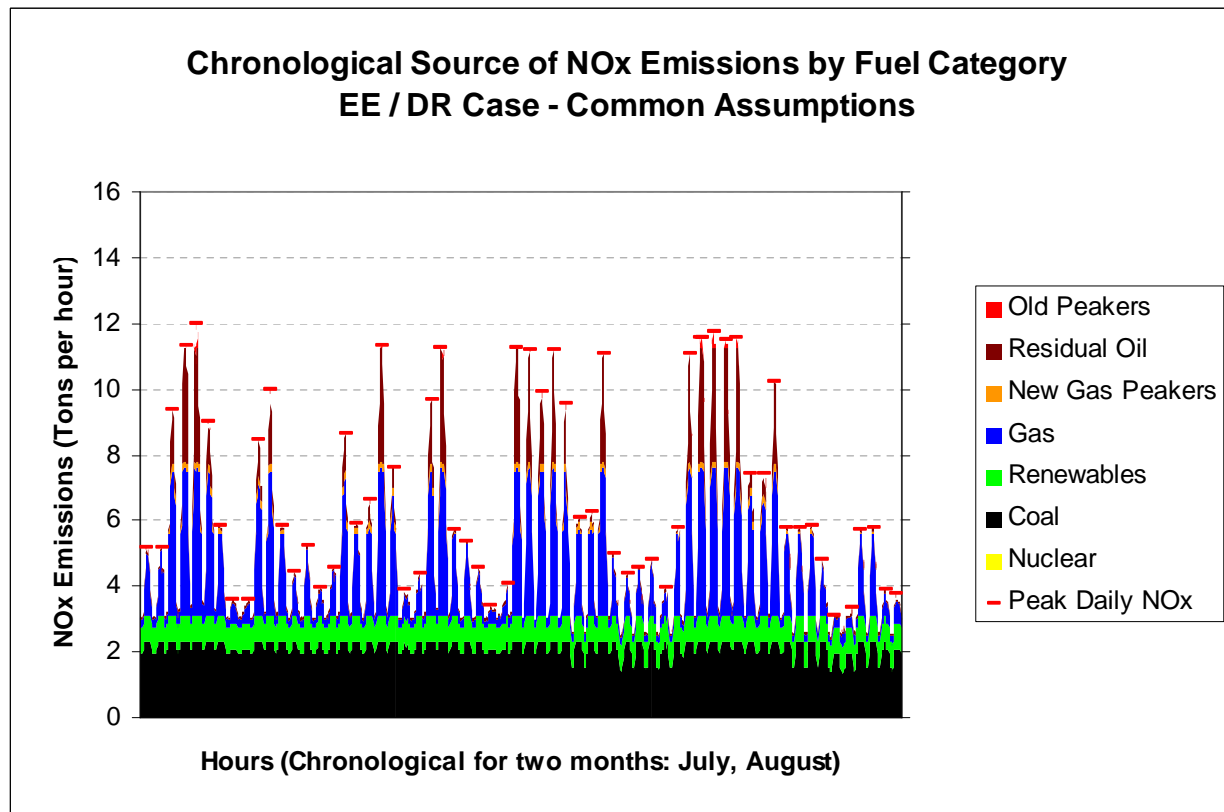


Peak NOx Day: Queue Case

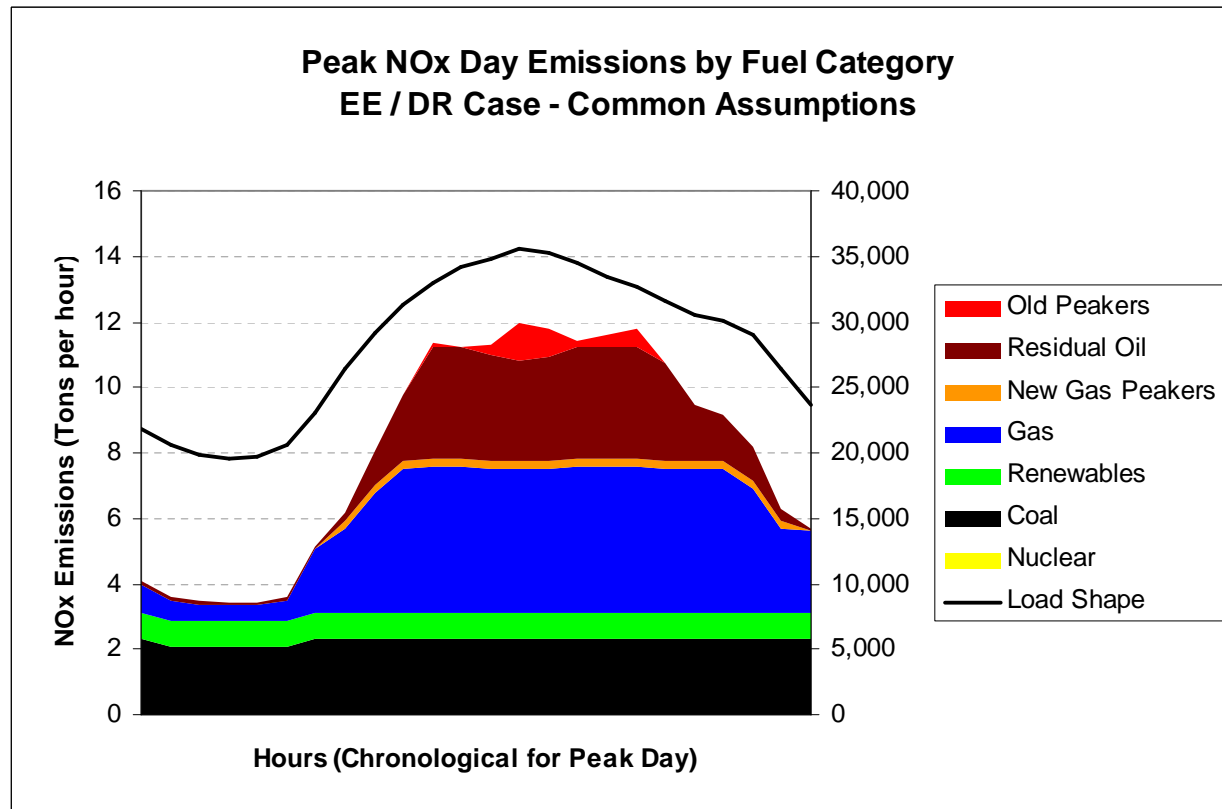


Summer Hourly NOx: EE / DR Case

Graphs do not show narrow, short duration excursions well. Red line used to show peak hourly NOx for each day

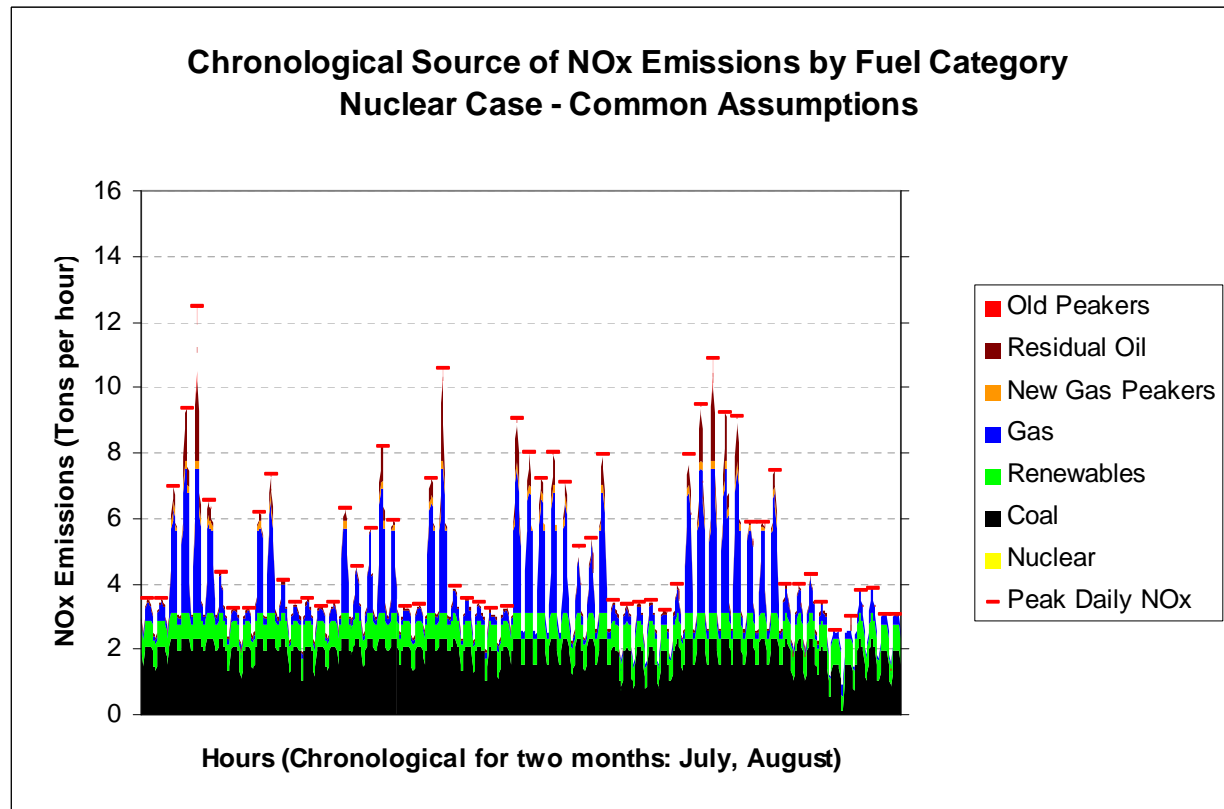


Peak NOx Day: EE / DR Case

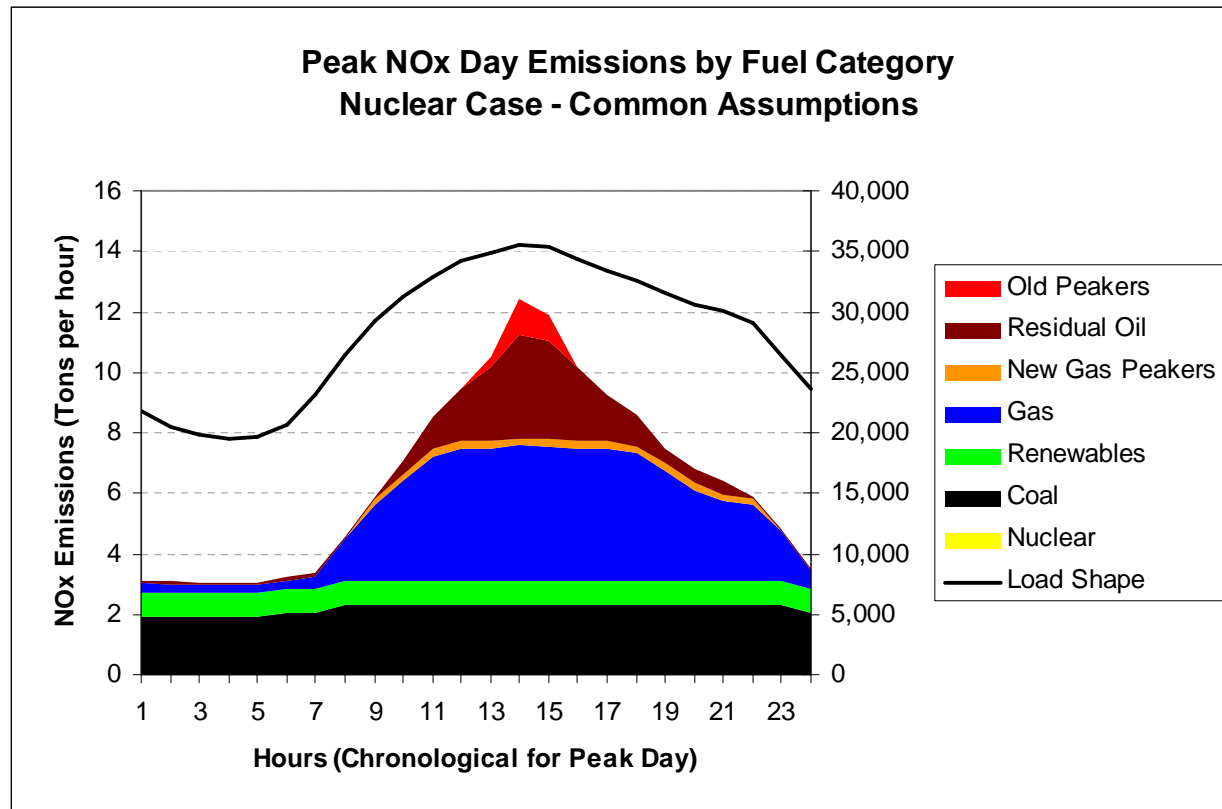


Summer Hourly NOx: Nuclear Case

Graphs do not show narrow, short duration excursions well. Red line used to show peak hourly NOx for each day

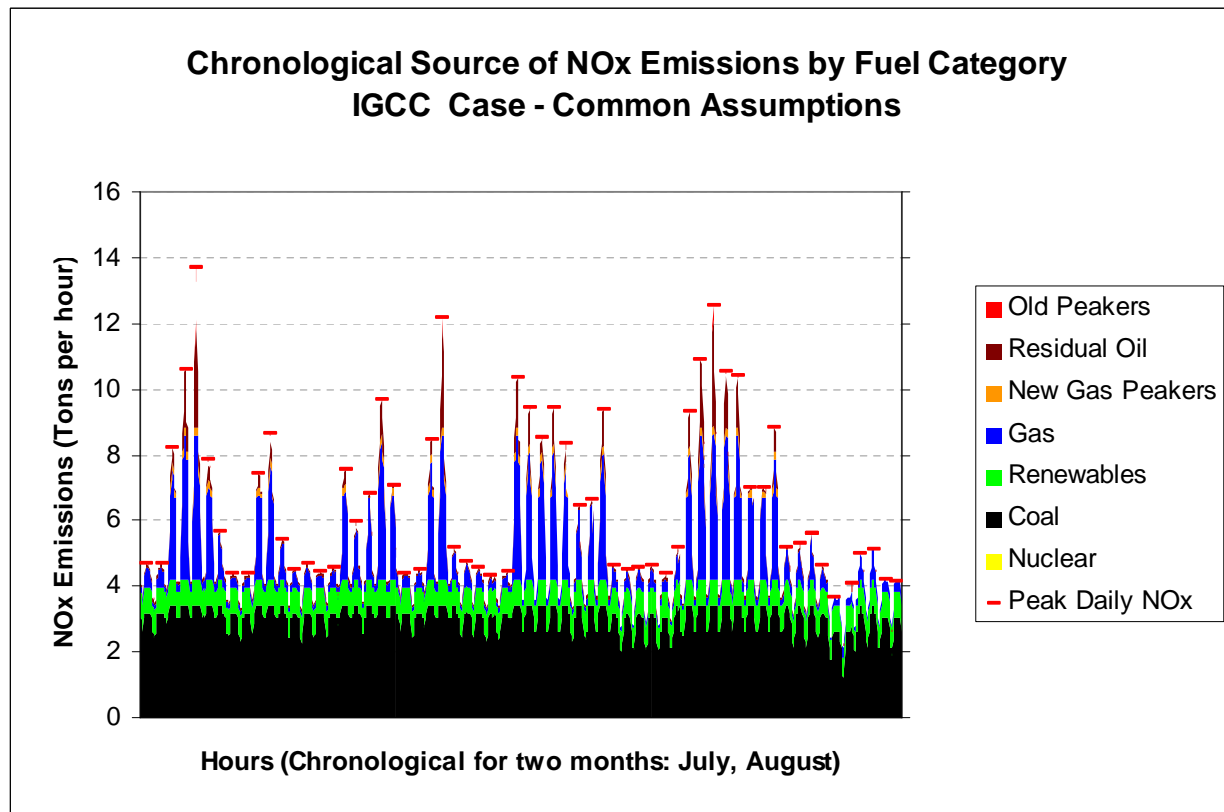


Peak NOx Day: Nuclear Case

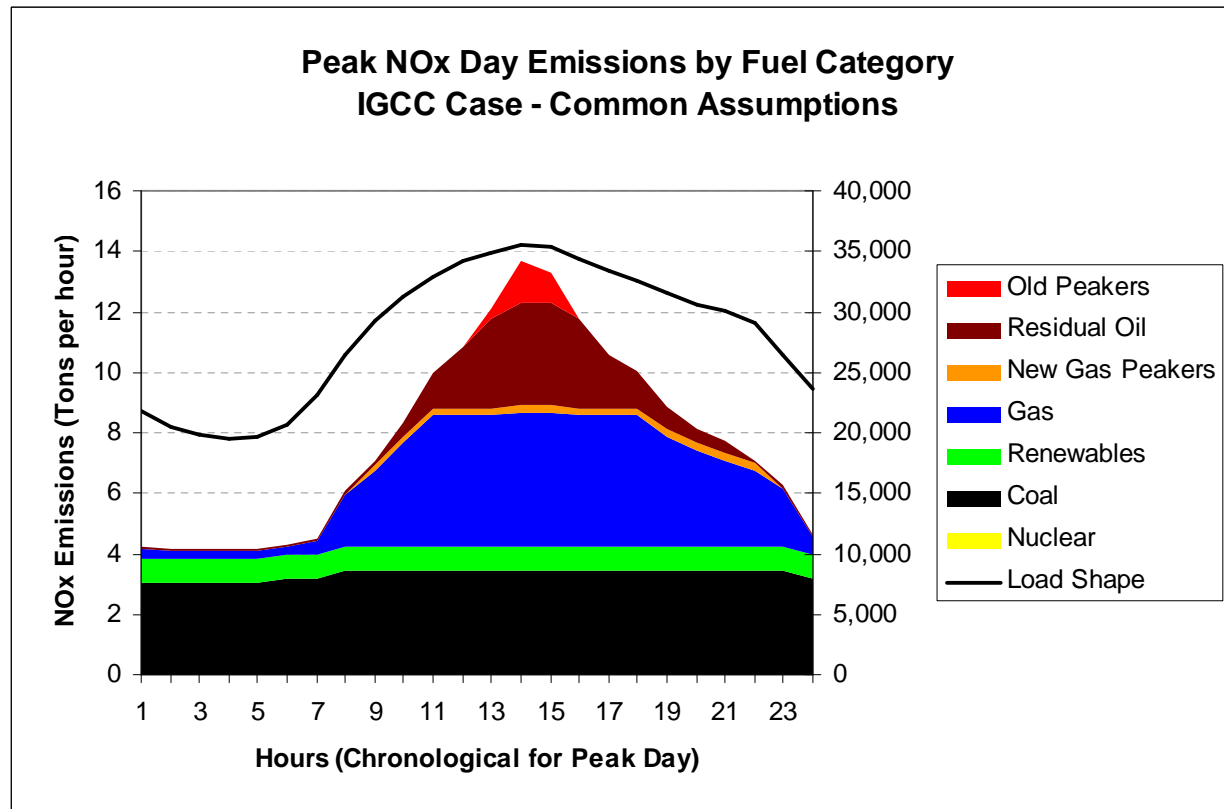


Summer Hourly NOx: IGCC Case

Graphs do not show narrow, short duration excursions well. Red line used to show peak hourly NOx for each day

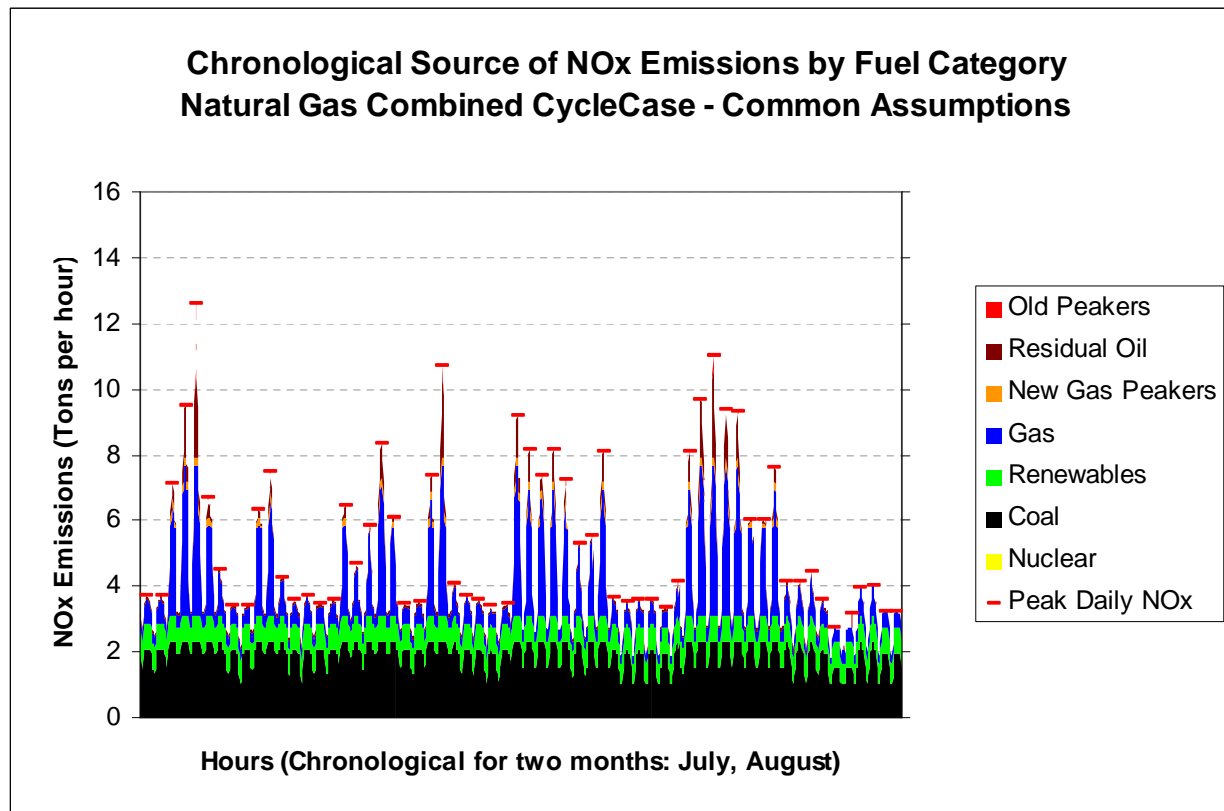


Peak NOx Day: IGCC Case

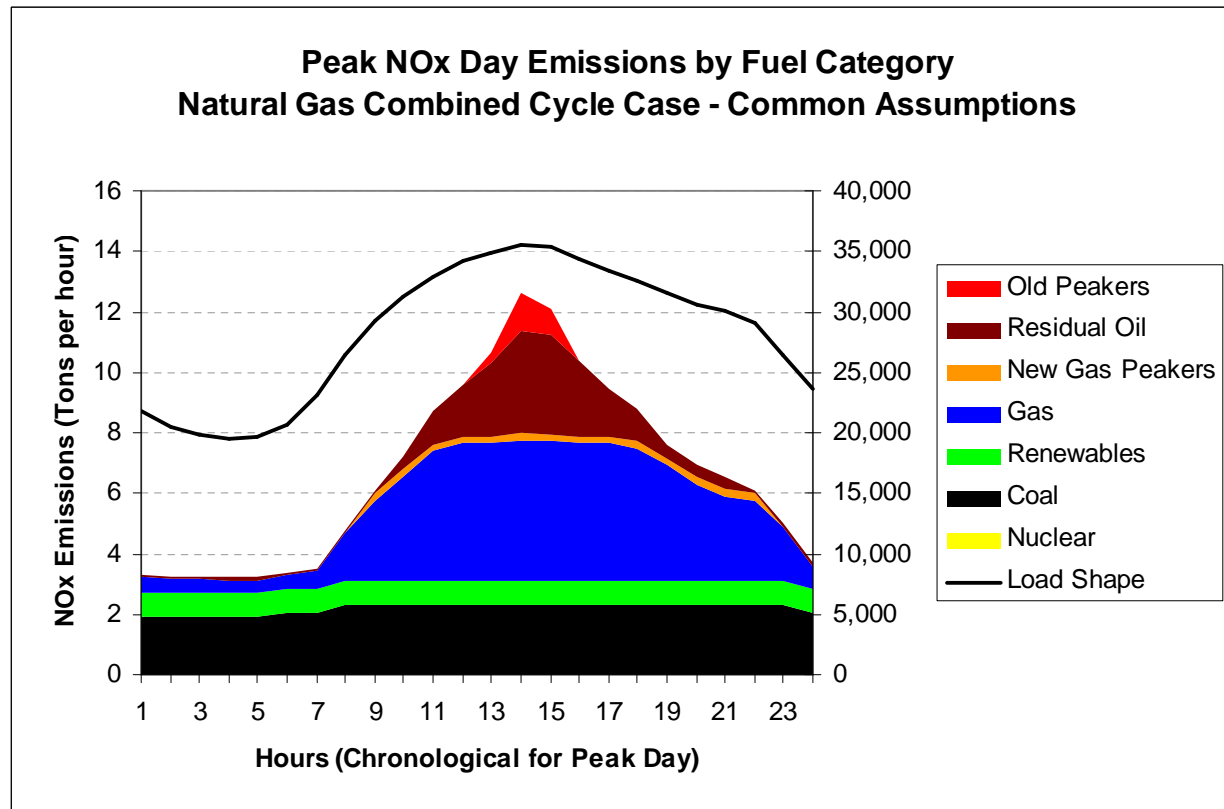


Summer Hourly NOx: Gas CC Case

Graphs do not show narrow, short duration excursions well. Red line used to show peak hourly NOx for each day

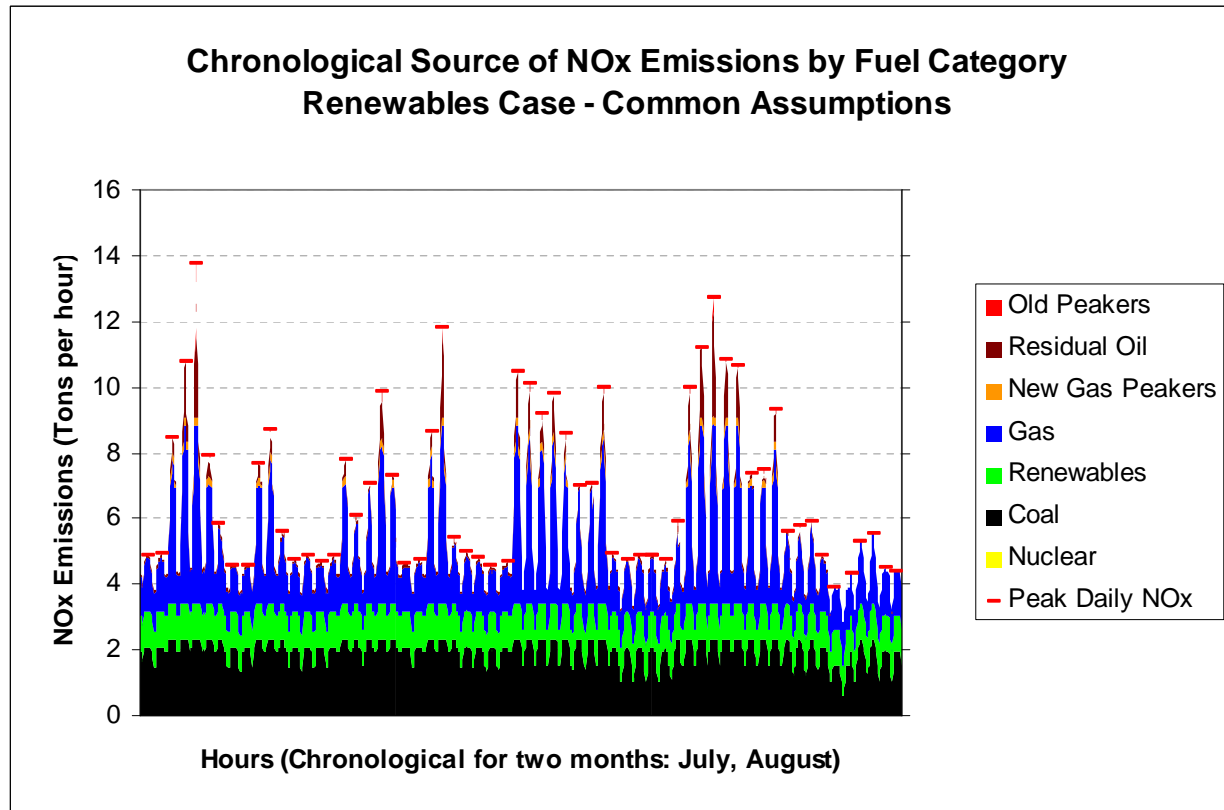


Peak NOx Day: Gas CC Case

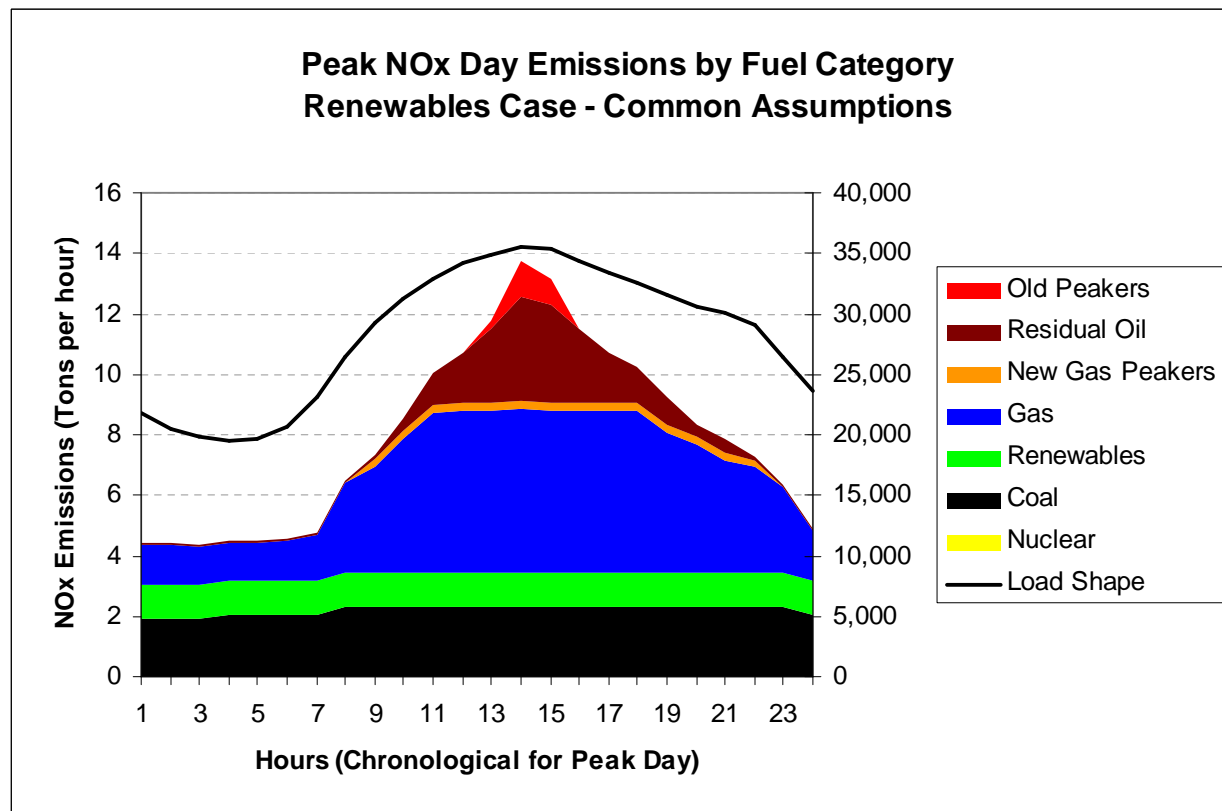


Summer Hourly NOx: Renewables Case

Graphs do not show narrow, short duration excursions well. Red line used to show peak hourly NOx for each day

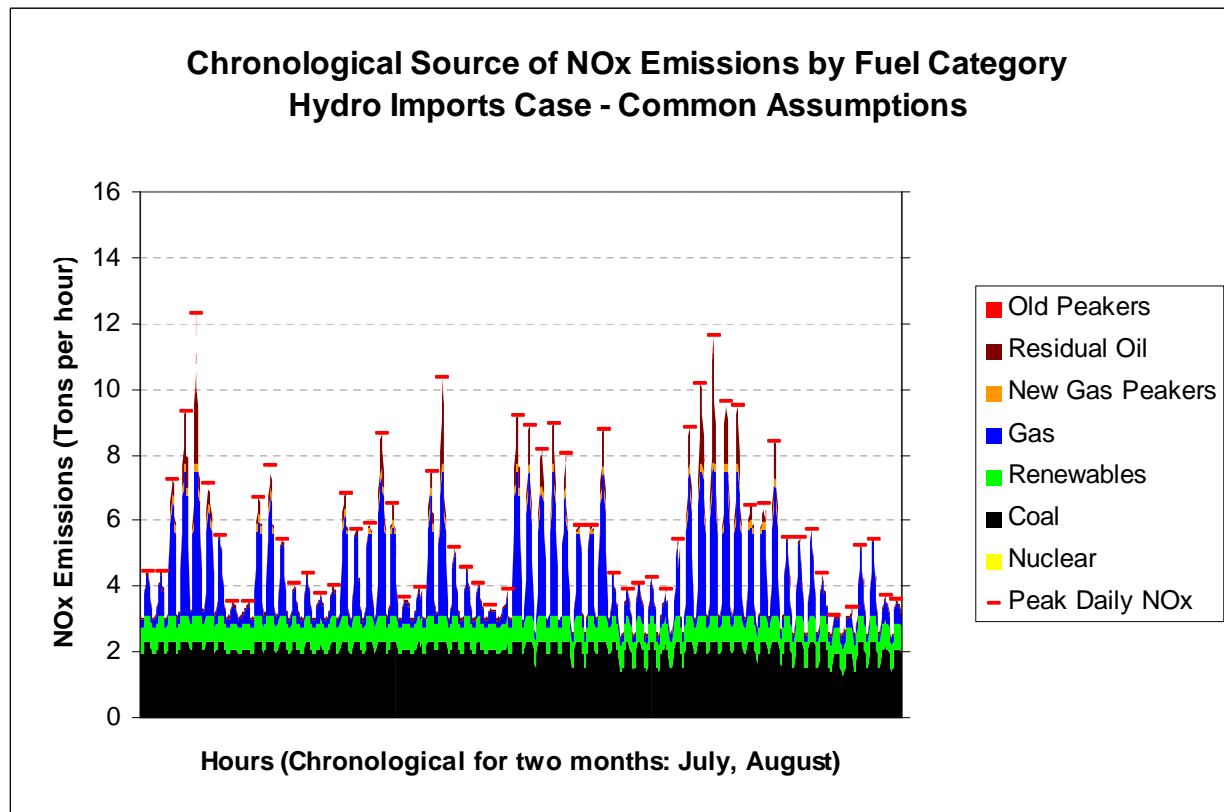


Peak NOx Day: Renewables Case

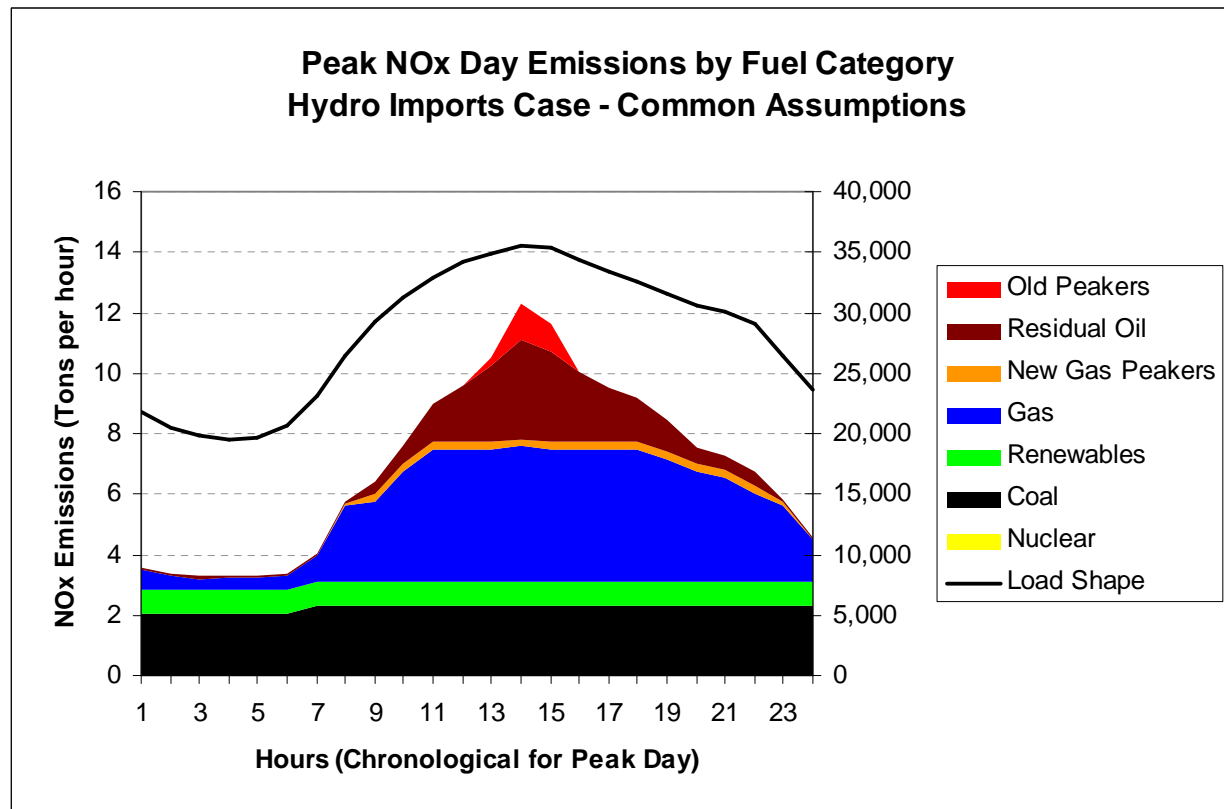


Summer Hourly NOx: Hydro Import Case

Graphs do not show narrow, short duration excursions well. Red line used to show peak hourly NOx for each day



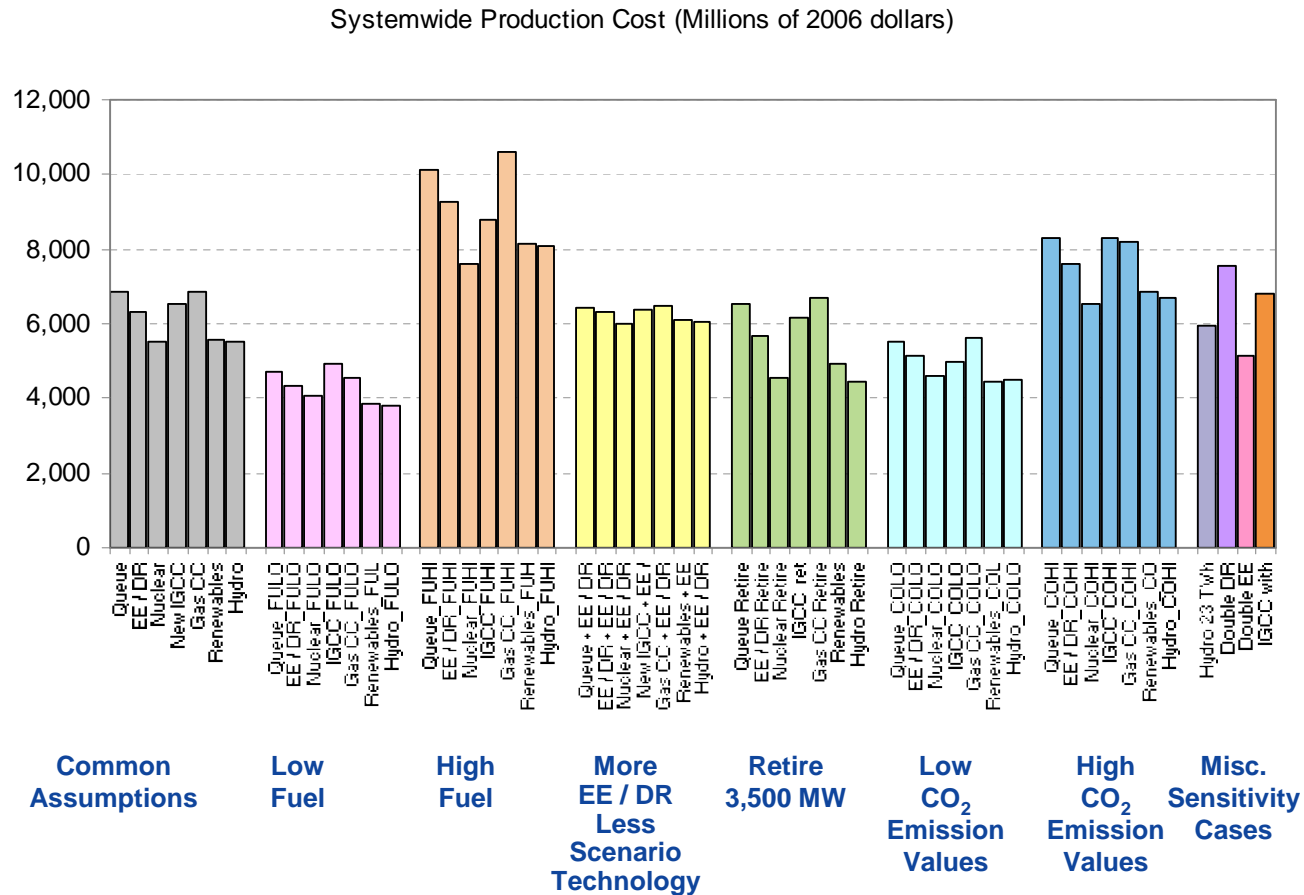
Peak NOx Day: Hydro Import Case



Economic Metrics

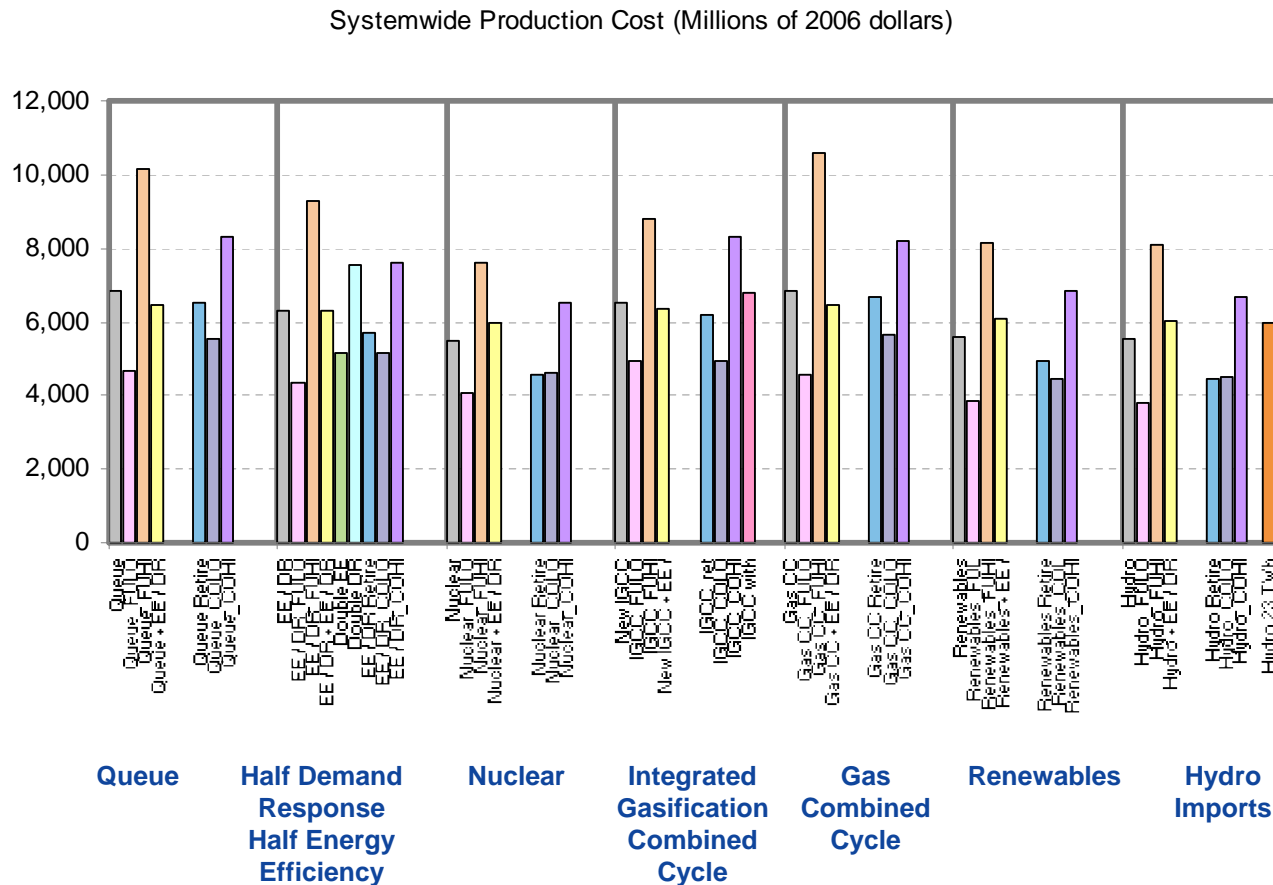
Systemwide Production Cost (\$ Million)

Grouped by Sensitivity



Systemwide Production Cost (\$ Million)

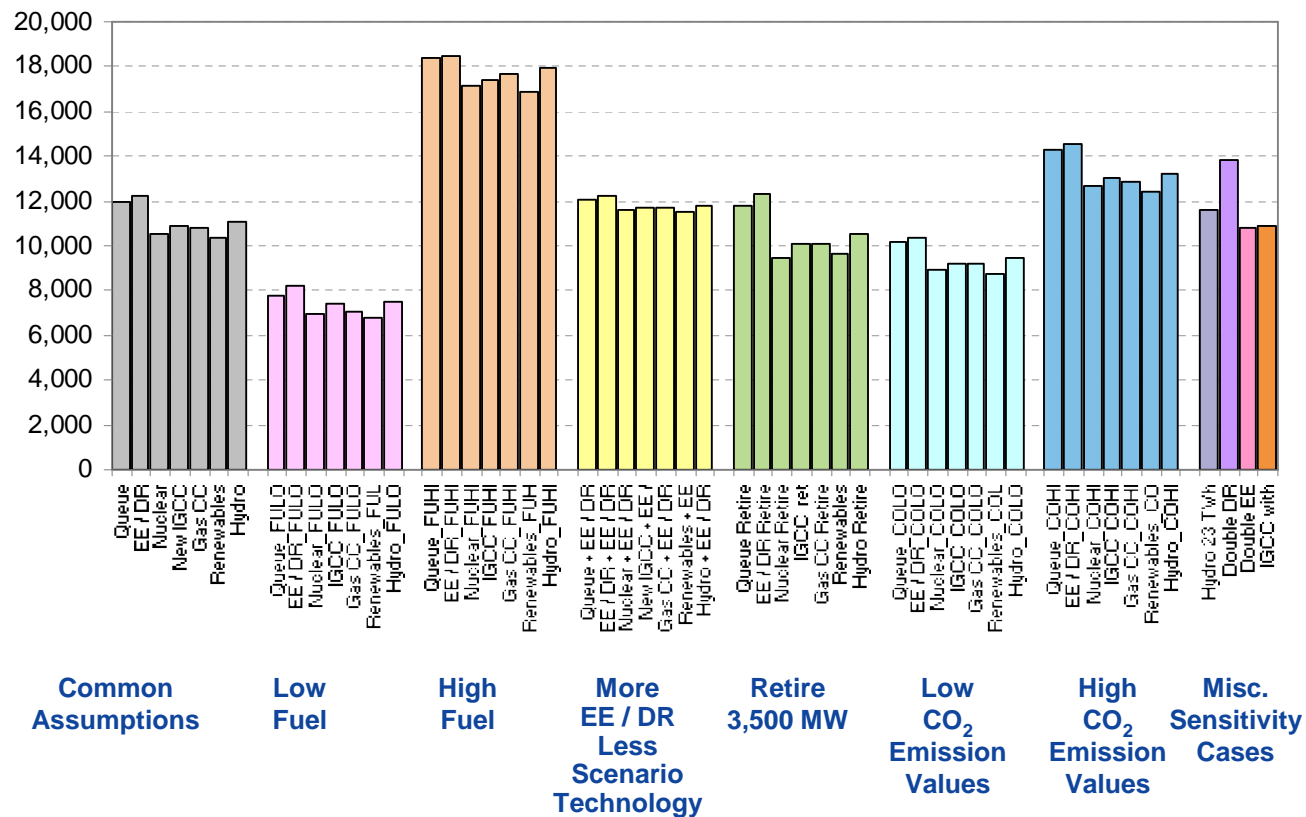
Grouped by Scenario



LSE Expense For Wholesale Electric Energy (\$ Million)

Grouped by Sensitivity

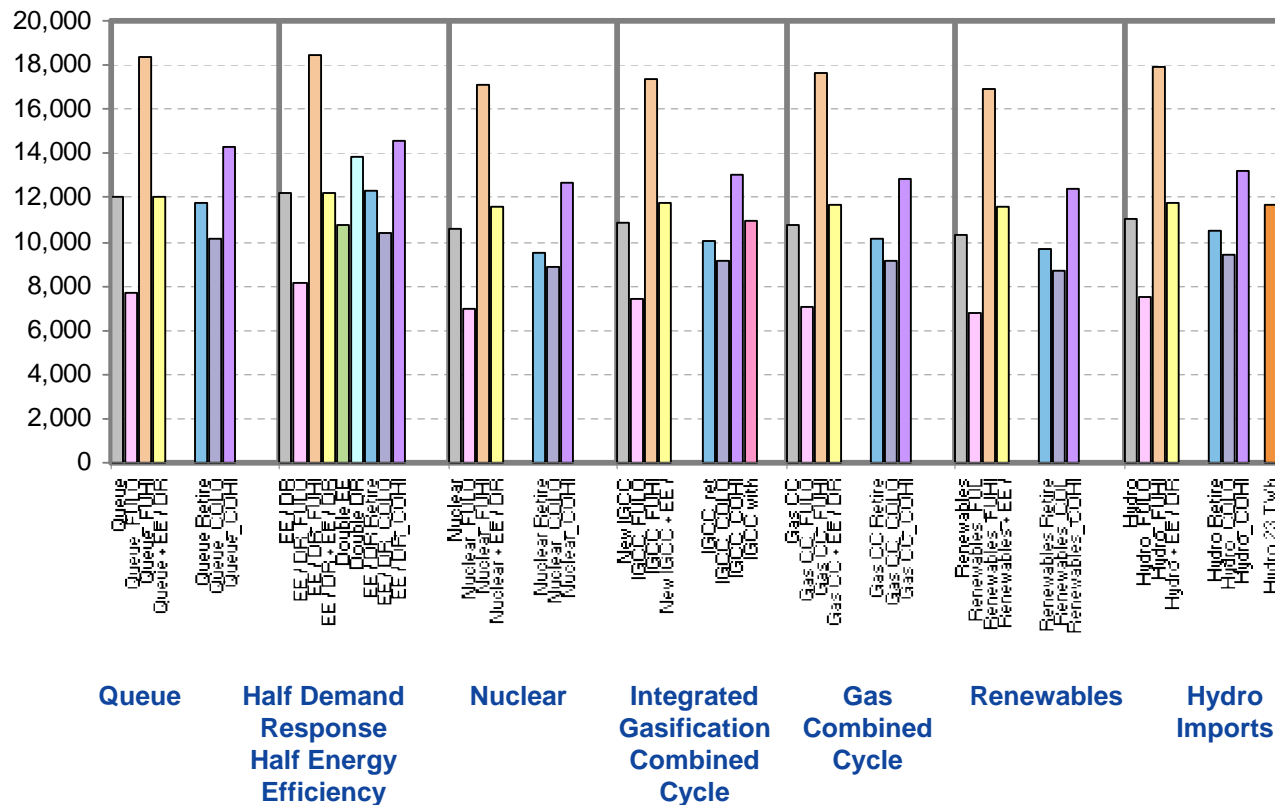
LSE Expense for Wholesale Electric Energy (Millions of 2006 dollars)



LSE Expense For Wholesale Electric Energy (\$ Million)

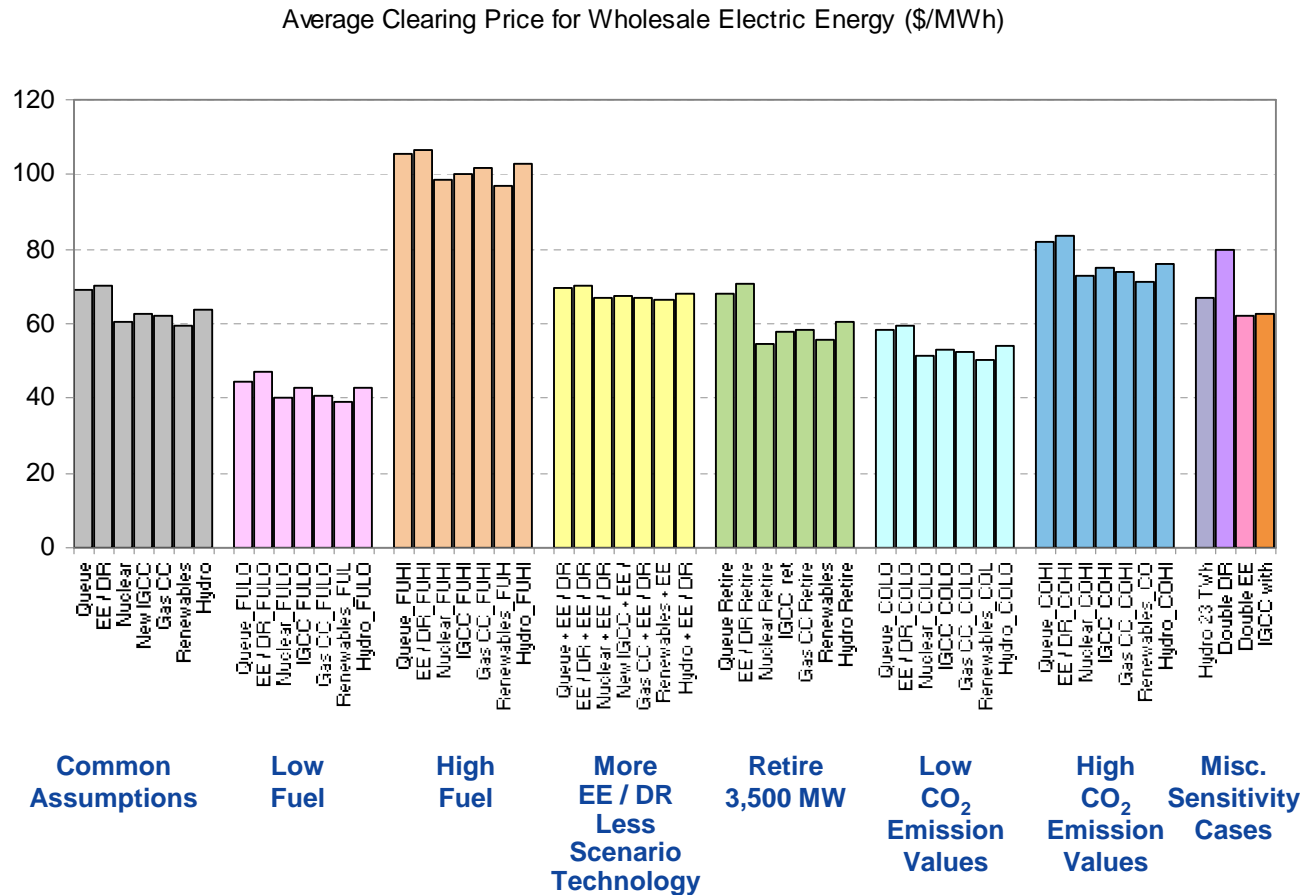
Grouped by Scenario

LSE Expense for Wholesale Electric Energy (Millions of 2006 dollars)



Average Clearing Price For Wholesale Electric Energy (\$/MWh)

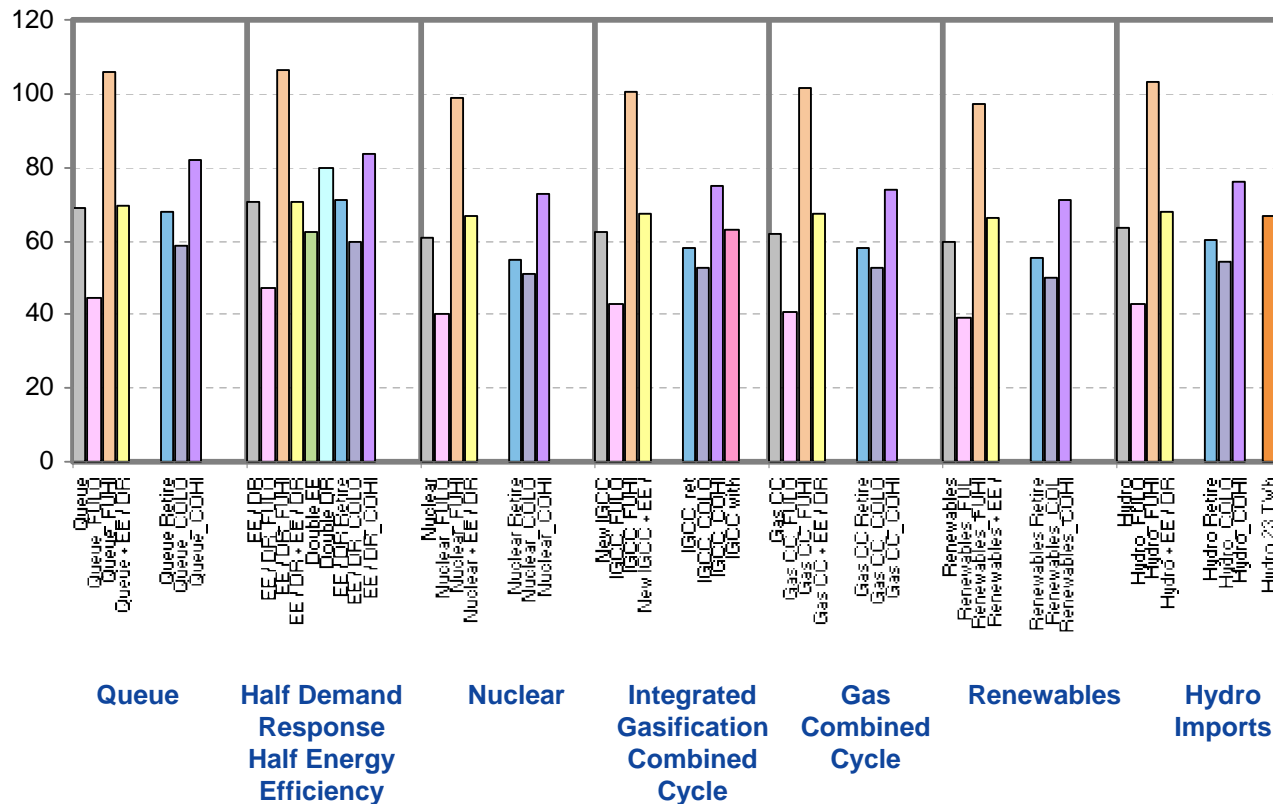
Grouped by Sensitivity



Average Clearing Price For Wholesale Electric Energy (\$/MWh)

Grouped by Scenario

Average Clearing Price for Wholesale Electric Energy (\$/MWh)



Average Clearing Price For Wholesale Electric Energy (\$/MWh)

	A	B	C	D	E	F	G	H	I	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon-Allowance Prices	High Carbon-Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
1 Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	69	45	106	69			68	58	82		
2 Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	70	47	106	70	62	80	71	60	84		
3 Nuclear — 5,400 MW	61	40	99	67			55	51	73		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	63	43	100	68			58	53	75	63	
5 Natural gas (combined cycle) — 5,400 MW	62	41	102	67			58	53	74		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	60	39	97	66			56	50	71		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	64	43	103	68			60	54	76		67

Systemwide Production Cost (\$ Million)

	A	B	C	D	E	F	G	H	I	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon-Allowance Prices	High Carbon-Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
1 Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	6,833	4,693	10,131	6,443			6,540	5,543	8,310		
2 Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	6,298	4,330	9,292	6,298	5,148	7,563	5,693	5,146	7,613		
3 Nuclear — 5,400 MW	5,502	4,054	7,593	5,995			4,554	4,591	6,519		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	6,525	4,917	8,791	6,362			6,167	4,959	8,316	6,798	
5 Natural gas (combined cycle) — 5,400 MW	6,846	4,550	10,595	6,473			6,699	5,639	8,207		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	5,569	3,882	8,152	6,084			4,946	4,438	6,841		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	5,522	3,814	8,069	6,029			4,457	4,495	6,681		5,963

LSE Expense For Wholesale Electric Energy (\$ Million)

	A	B	C	D	E	F	G	H	I	J	K
Scenarios — incremental 8,000 MW All cases have the same 2,600 MW of resources reflecting proposals in the ISO queue as of 9/30/06.	Common Assumptions	Low Gas/Oil Fuel Prices	High Gas/Oil Fuel Prices	Replace 3,500 MW of the Scenario Technology with 1,750 MW of Energy Efficiency (EE) and 1,750 MW of Demand Response (DR)	Replace 2,700 MW of DR with 2,700 MW of EE	Replace 2,700 MW of EE with 2,700 MW of DR	Retire 3,500 MW and Replace with Scenario Technology	Low Carbon-Allowance Prices	High Carbon-Allowance Prices	For Coal with Carbon Sequestration	Decreased Imports of Low-Emission Resources (-7 TWh)
1 Queue Mix — combination of currently proposed resources; 5,400 MW blend reflecting the fuel mix exhibited recently by the market	11,997	7,736	18,380	12,074			11,783	10,162	14,261		
2 Demand-side resources — an additional 2,700 MW of DR and 2,700 MW of EE	12,235	8,174	18,496	12,235	10,811	13,878	12,321	10,363	14,554		
3 Nuclear — 5,400 MW	10,566	6,998	17,134	11,602			9,488	8,911	12,648		
4 Advanced technology coal (IGCC) — 5,400 MW without carbon sequestration	10,895	7,451	17,420	11,740			10,090	9,184	13,030	10,909	
5 Natural gas (combined cycle) — 5,400 MW	10,767	7,098	17,689	11,669			10,124	9,165	12,847		
6 Renewables — 5,400 MW, including a combo of on- and offshore wind, hydro, biomass, landfill gas, combined heat and power, fuel cells, photovoltaics; 1/8 each	10,344	6,826	16,890	11,547			9,669	8,721	12,387		
7 Increased imports of hydro and other low-emission resources — 30 TWh of imports	11,085	7,474	17,917	11,800			10,494	9,425	13,239		11,630

Annual Revenue Comparisons

Purpose of Comparison

- Purpose is to show
 - Range of contributions to annual revenue requirements from net revenues from energy production
 - Comparison to range of annual total non-fuel and non-environmental allowance cost requirements that a “scenario technology” may need
 - Annual revenue requirement rate provides allowances for
 - Return of, and return on, investment
 - Taxes
 - Fixed O&M (except nuclear where this was included as “fuel” cost)
 - Other
 - Revenue shortfalls for “scenario technologies” deployed is an indicator of need for other sources of revenue
- Not a definitive economic comparison
- Not a simulation of market dynamics over multiple years

Annual Revenue Comparisons

- Net Energy Market Revenues are:
 - Hourly clearing price minus
 - Fuel cost
 - Environmental emissions adders
- Excluded revenue streams
 - Forward Capacity Markets revenues
 - Forward Reserve Markets revenues
 - Ancillary Services Market revenues
 - Renewable Energy Credit (REC) revenues
 - Clean Energy Funds
 - Tax Incentives
 - Subsidies

What's included

- Capital cost ranges for scenario technology
 - Lower Bound
 - Lower capital cost estimate
 - With the 15 percent Annual Revenue Requirement Rate factor
 - Upper Bound
 - Higher capital cost estimate
 - With the 25 percent Annual Revenue Requirement Rate factor
 - Transmission interconnection included as part of technology capital cost
- Major scenario transmission expansion was considered a network expansion cost to the Load Serving Entities

Capital Cost Estimates

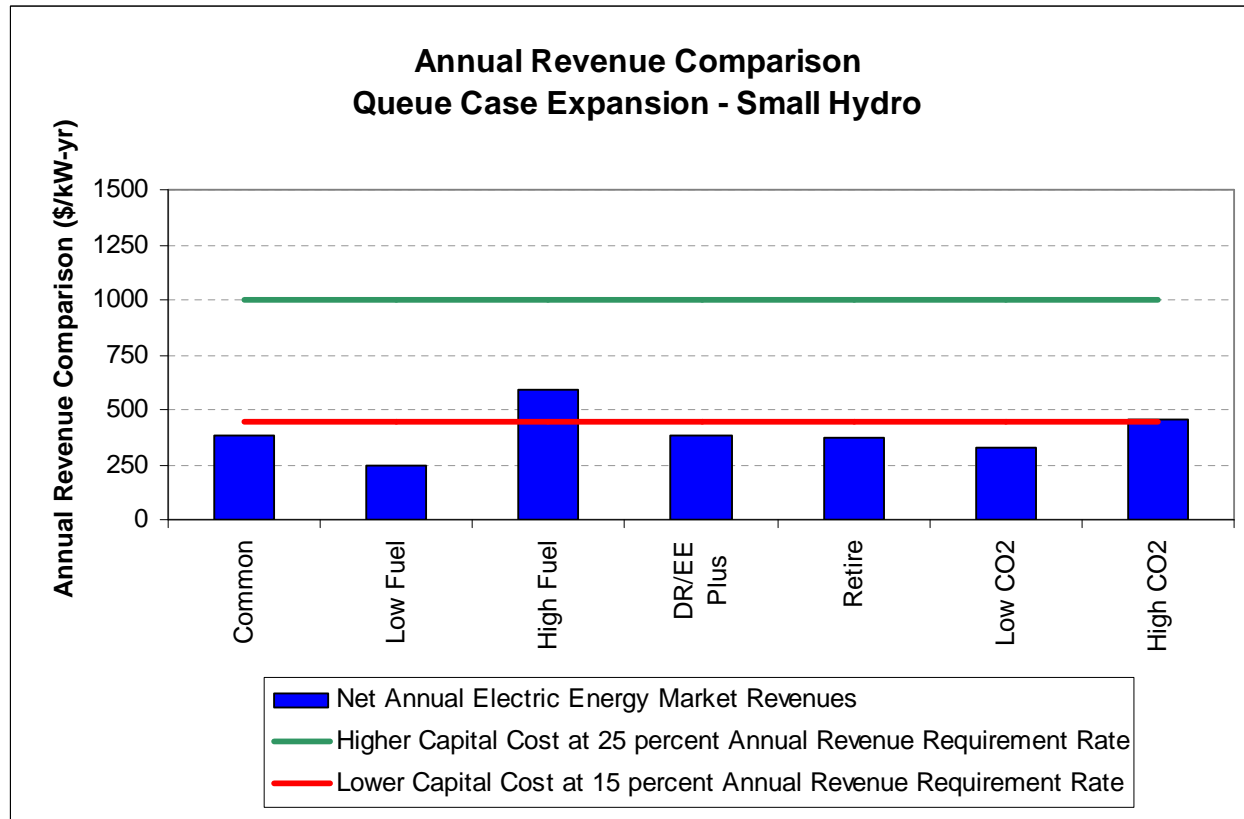
- Range of capital cost for each technology
 - Based on stakeholder input
 - Uncertainty in cost of new construction in New England
- Wind capital cost for 675 MW of “needed capacity”
 - Initial assumption is 100 percent mechanical availability
 - Assume one MW of FCM “qualified capacity” provides one MW of “needed capacity”
 - Must install 4 or 5 MWs to get one MW of “needed capacity”
 - 19 percent FCM “qualified capacity” for offshore
 - 26 percent FCM “qualified capacity” for offshore
 - Based on analysis of 2005 historical wind patterns
 - Final adjustment to estimate the number of “nameplate” MW to be bought accounts for assumed 90 percent mechanical availability
 - Similar approach for photovoltaics

Queue Case: Small Hydro

Queue Case Technologies

=> **Small Hydro**

- Biomass
- Gas CC
- IGCC
- New CT
- Fuel Cell
- Queue Wind

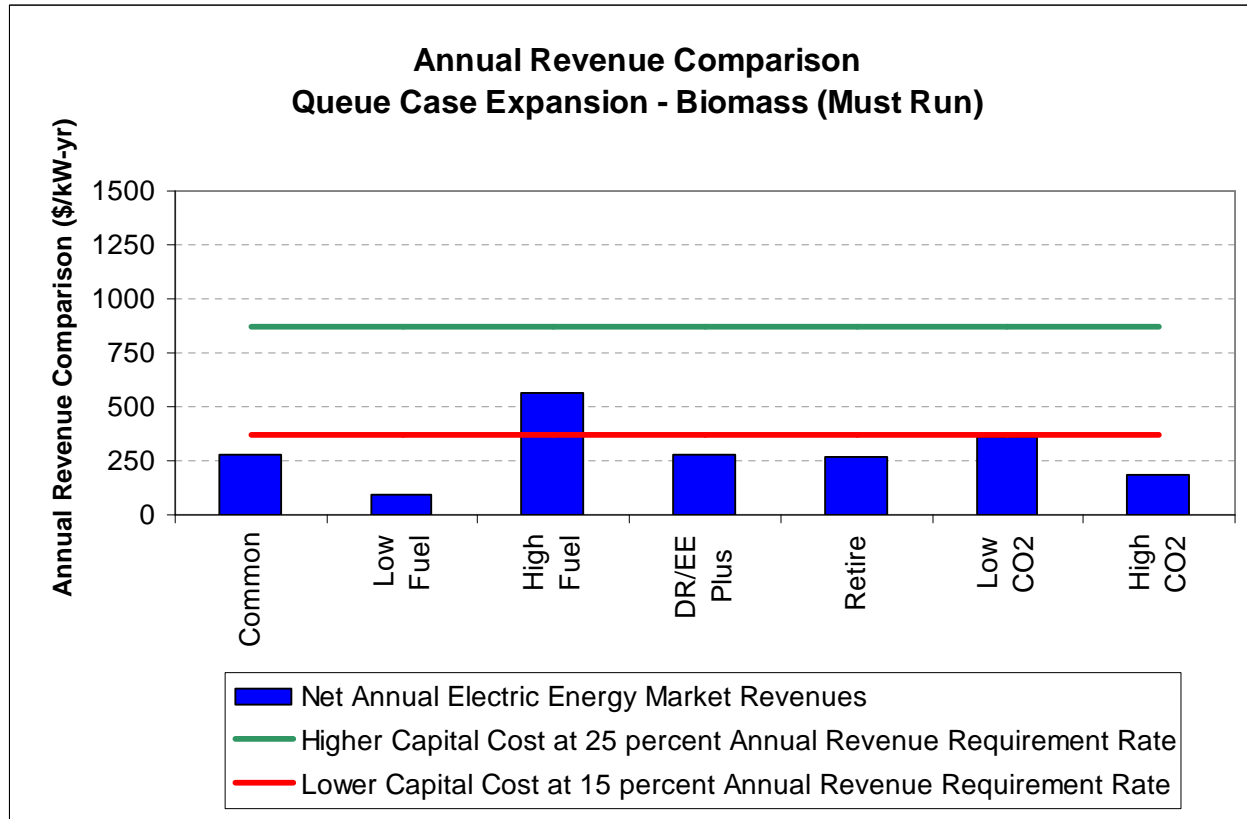


Lower Capital Cost: \$3000/kW
Higher Capital Cost: \$4000/kW

Queue Case: Biomass

Queue Case Technologies

Small Hydro
 => **Biomass**
 Gas CC
 IGCC
 New CT
 Fuel Cell
 Queue Wind

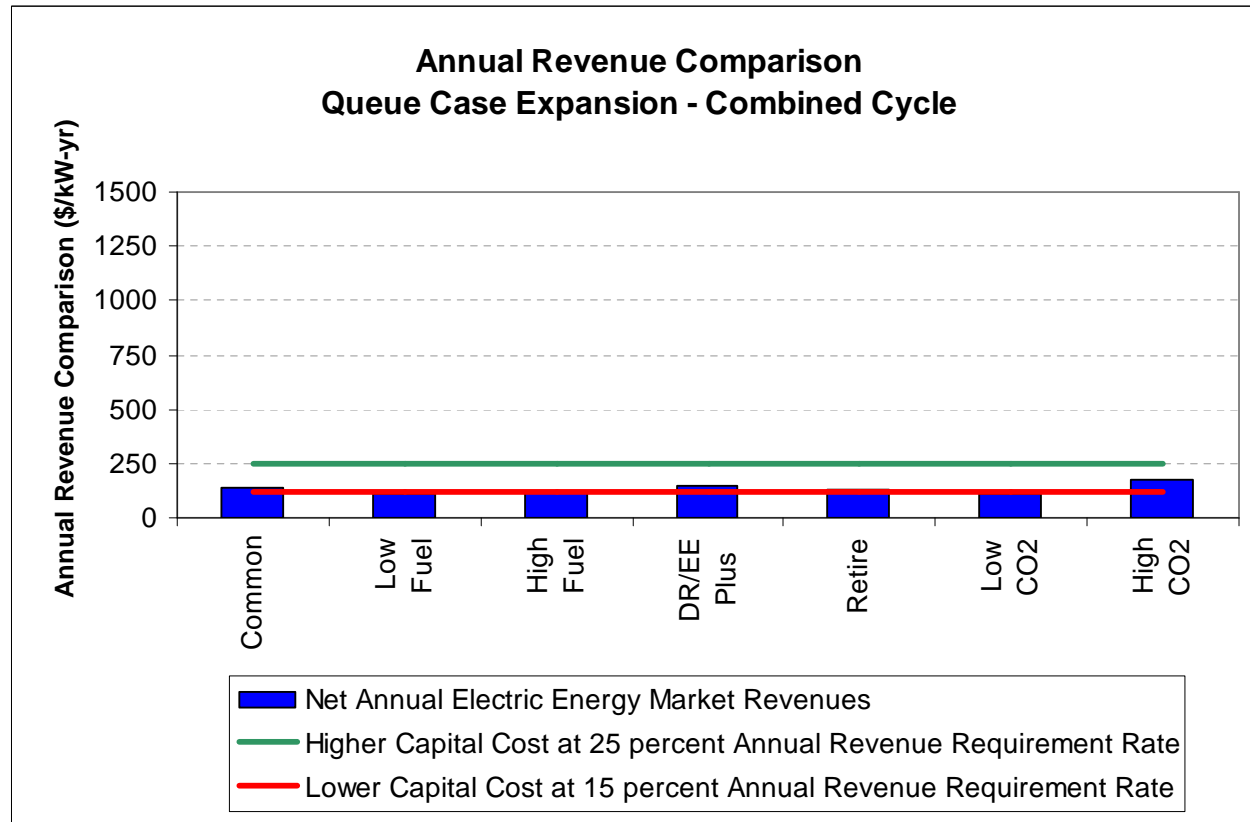


Lower Capital Cost: \$2500/kW
Higher Capital Cost: \$3500/kW

Queue Case: Combined Cycle

Queue Case Technologies

Small Hydro
 Biomass
 => Gas CC
 IGCC
 New CT
 Fuel Cell
 Queue Wind

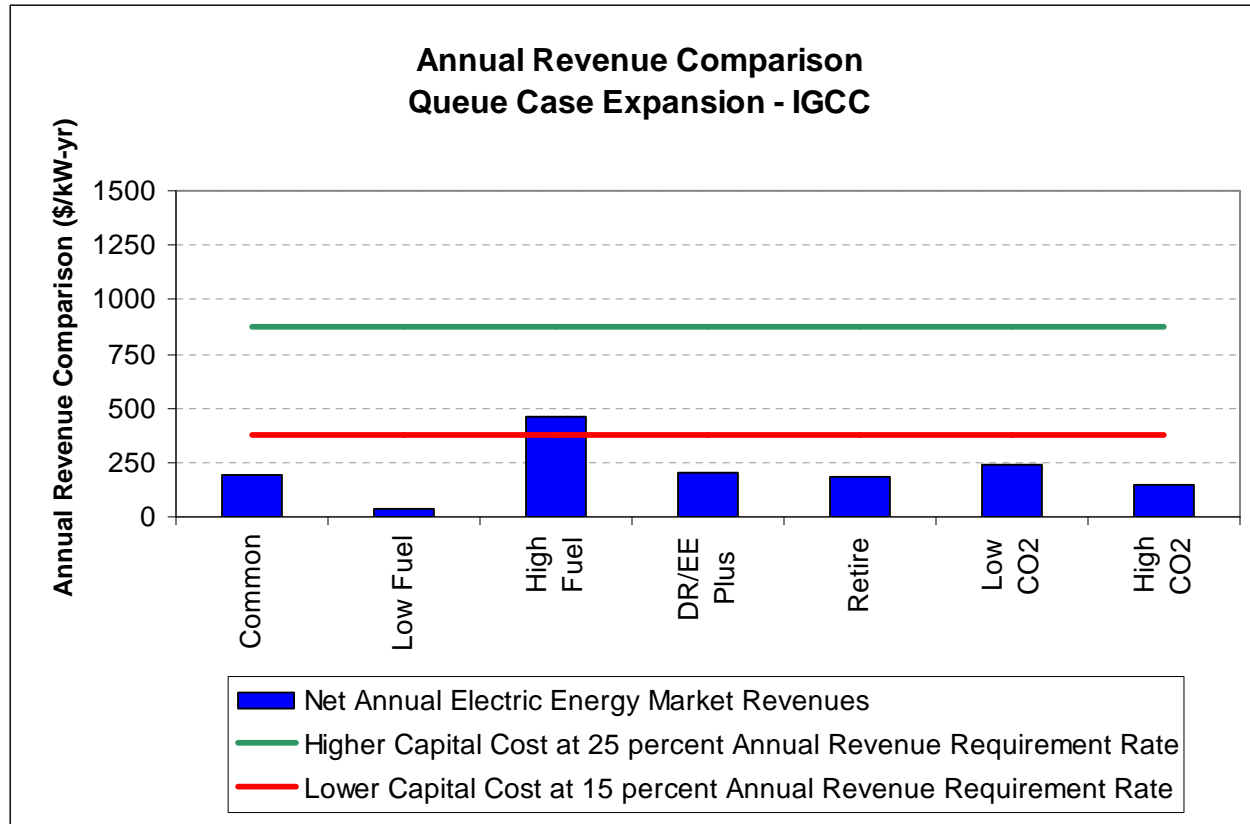


Lower Capital Cost: \$ 800/kW
Higher Capital Cost: \$1000/kW

Queue Case: IGCC Resource

Queue Case Technologies

Small Hydro
 Biomass
 Gas CC
 => **IGCC**
 New CT
 Fuel Cell
 Queue Wind

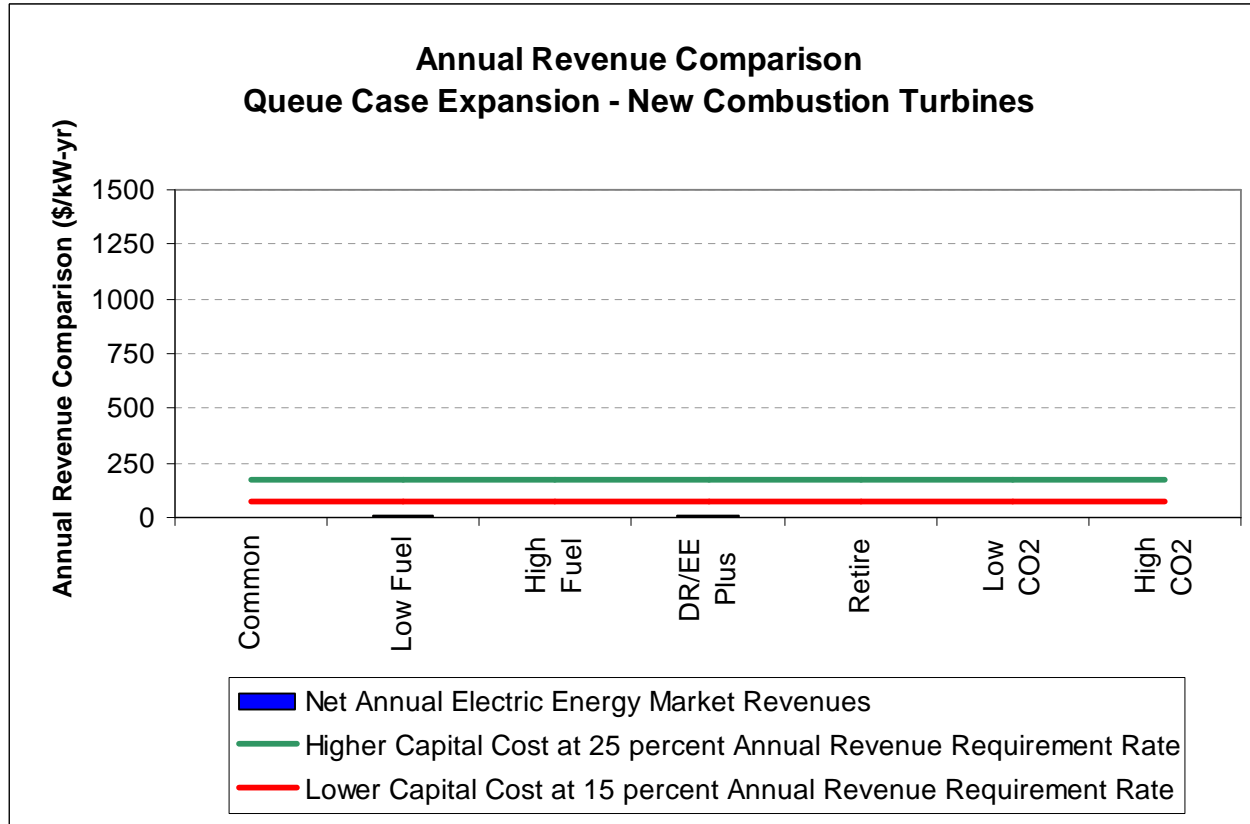


Lower Capital Cost: \$2500/kW
Higher Capital Cost: \$3500/kW

Queue Case: Combustion Turbines

Queue Case Technologies

Small Hydro
 Biomass
 Gas CC
 IGCC
 => **New CT**
 Fuel Cell
 Queue Wind

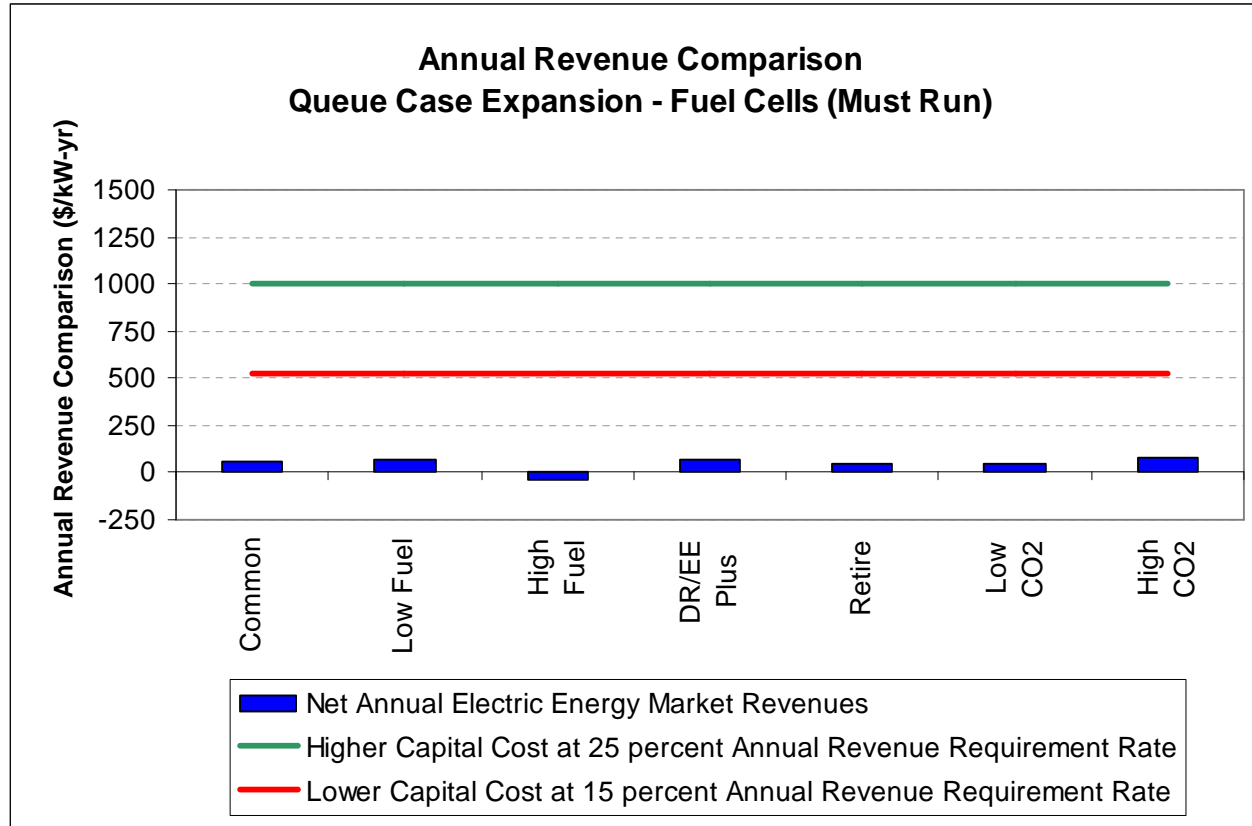


Lower Capital Cost: \$ 500/kW
Higher Capital Cost: \$ 700/kW

Queue Case: Fuel Cells

Queue Case Technologies

Small Hydro
 Biomass
 Gas CC
 IGCC
 New CT
 => **Fuel Cell**
 Queue Wind



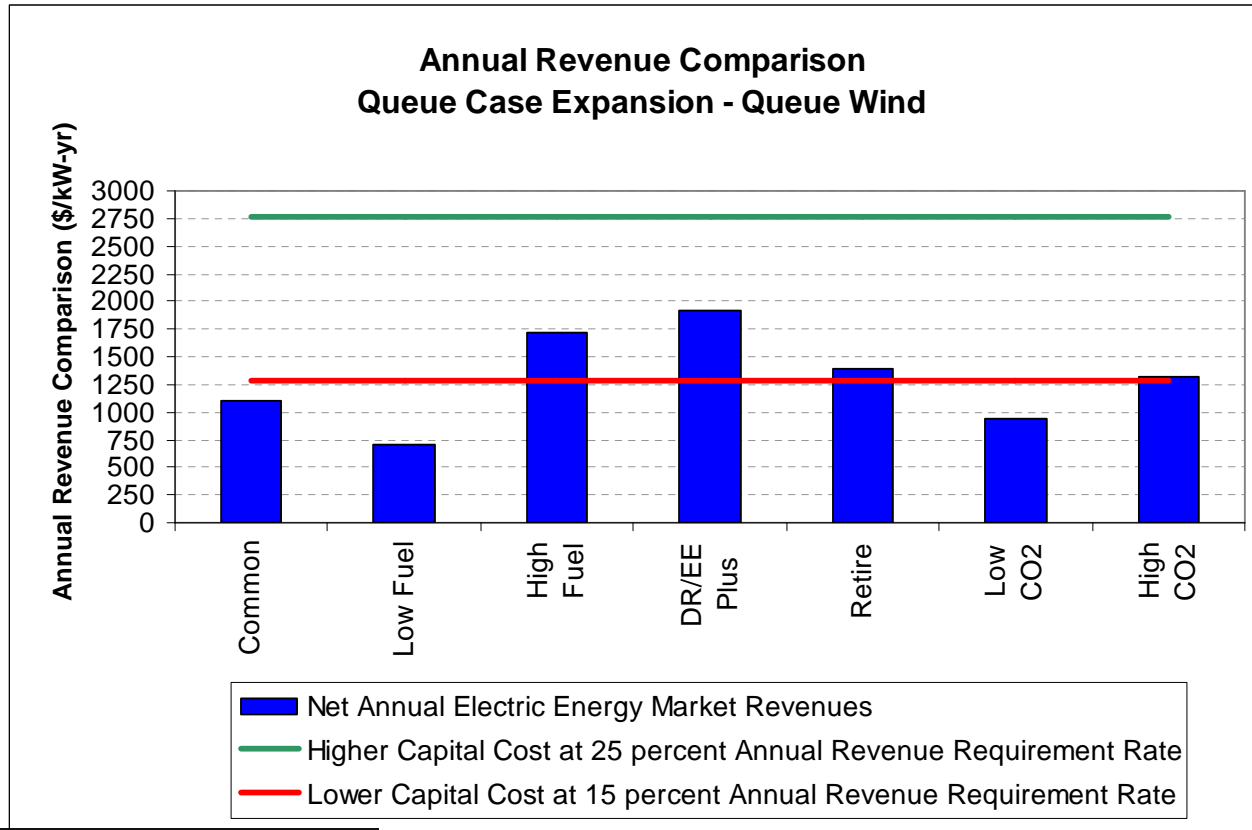
Lower Capital Cost: \$3500/kW
Higher Capital Cost: \$4000/kW

Queue Case: Queue Wind

Queue Case Technologies

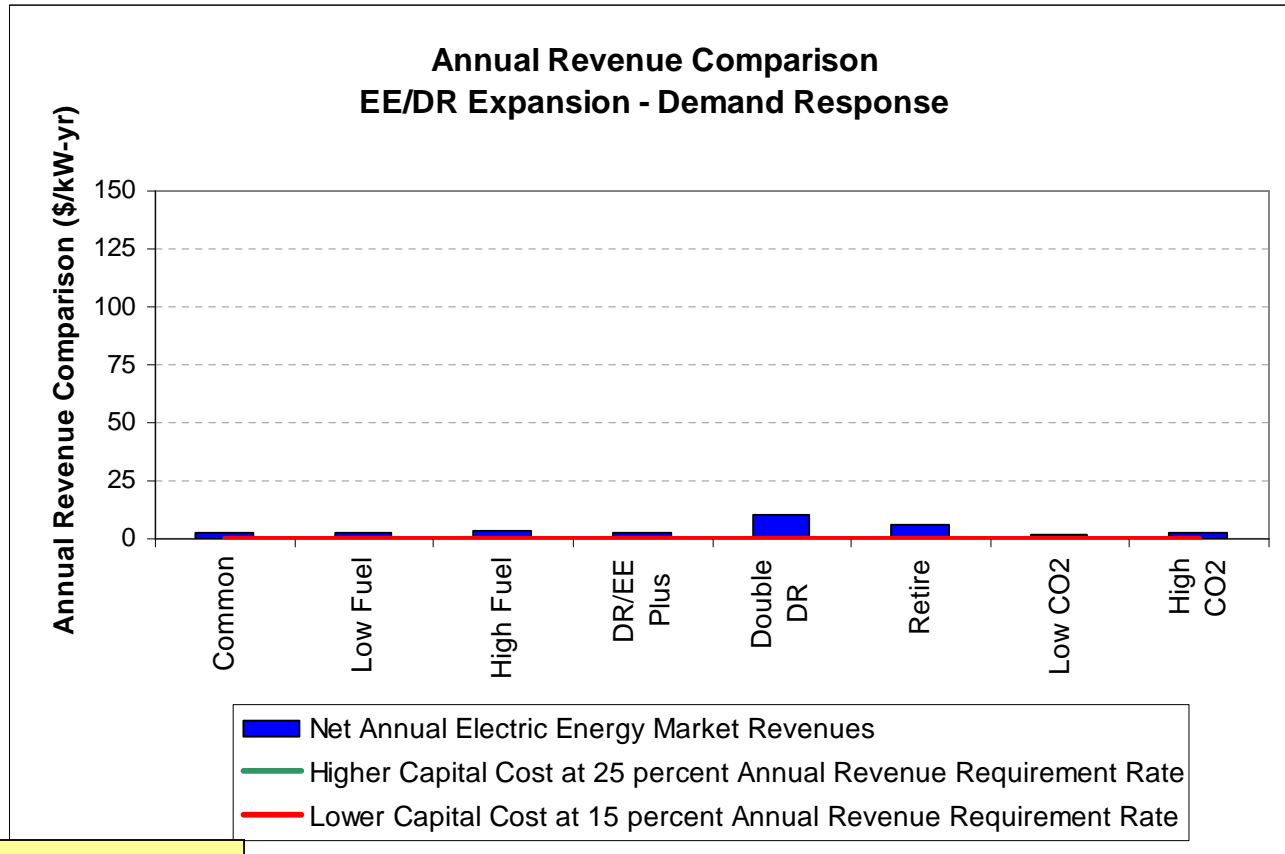
Small Hydro
 Biomass
 Gas CC
 IGCC
 New CT
 Fuel Cell

=> Queue Wind



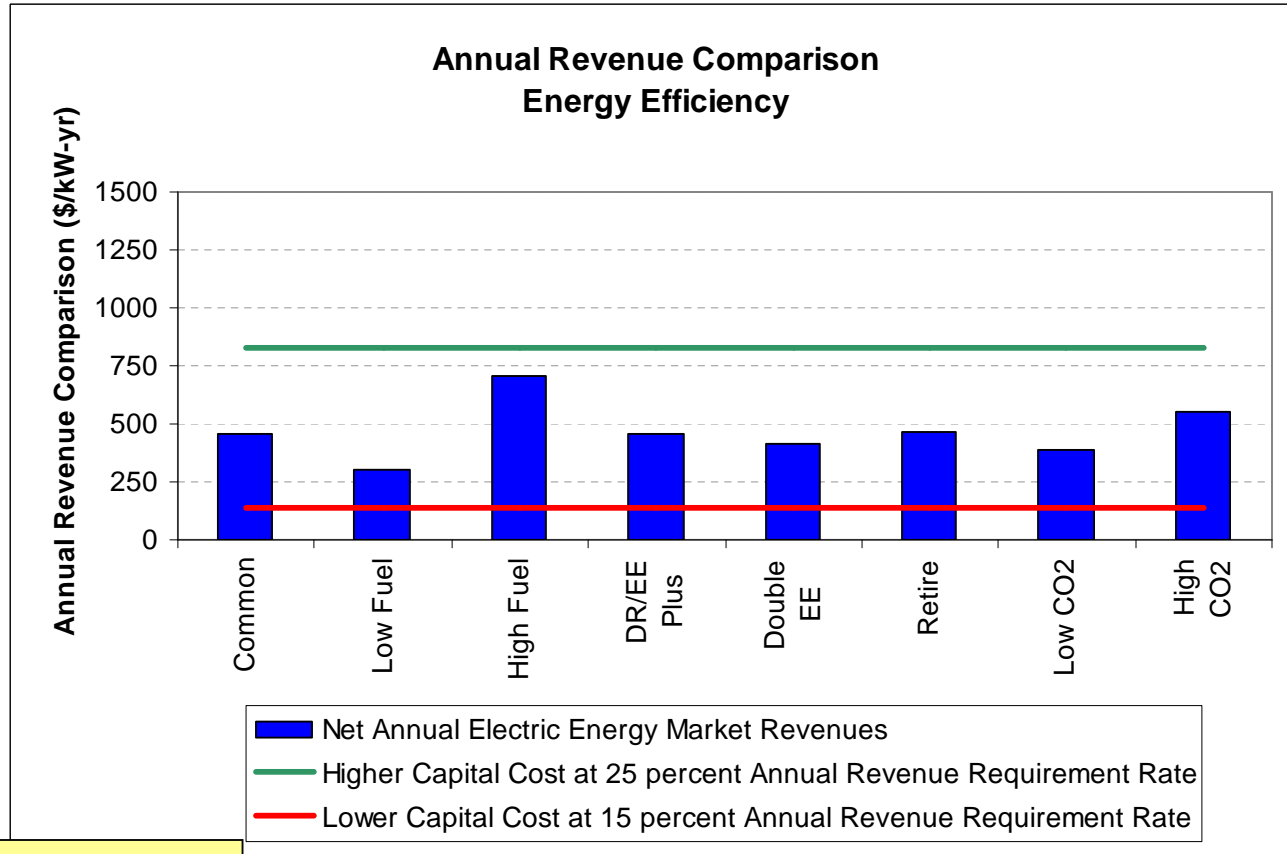
Lower Capital Cost: \$ 8577/Needed-kW
Higher Capital Cost: \$11080/Needed-kW

EE/DR Expansion: Demand Response



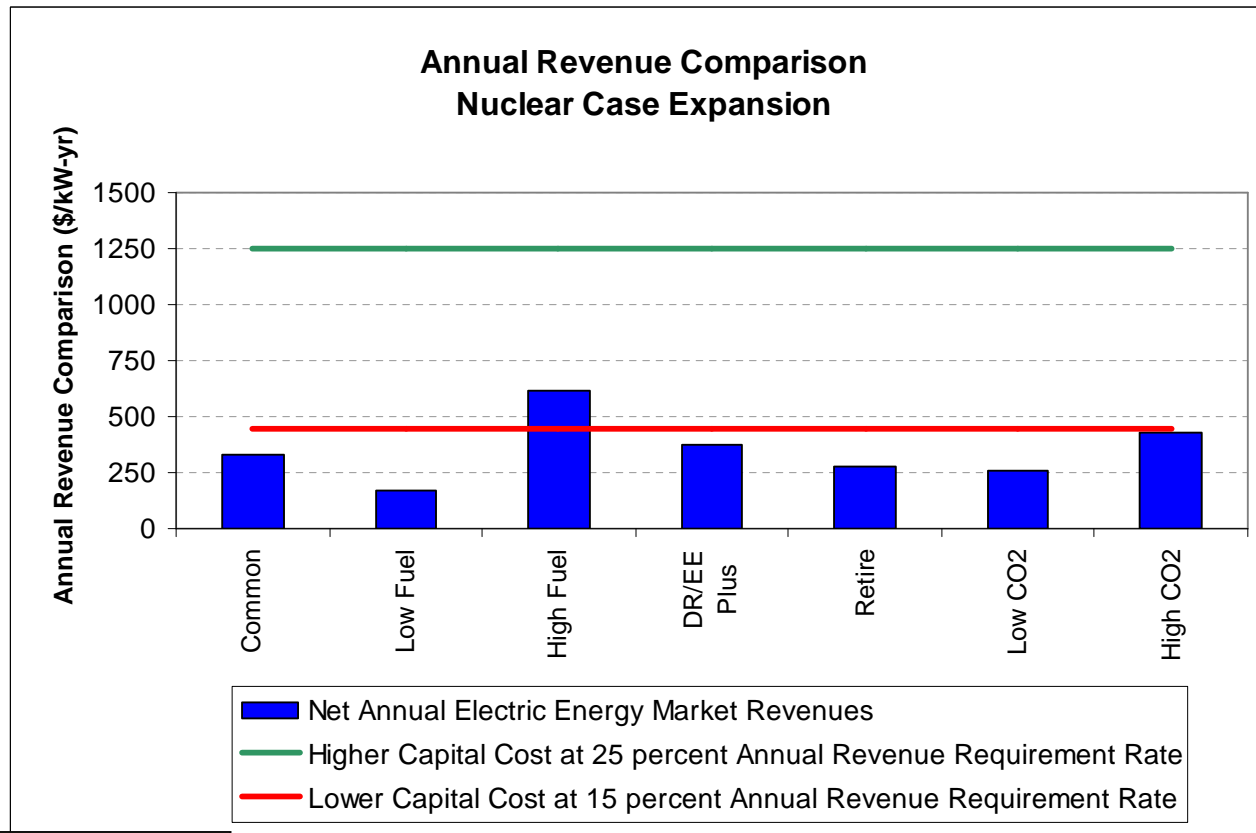
Lower Capital Cost: \$ zero/kW
Higher Capital Cost: \$ zero/kW

EE/DR Expansion: Energy Efficiency



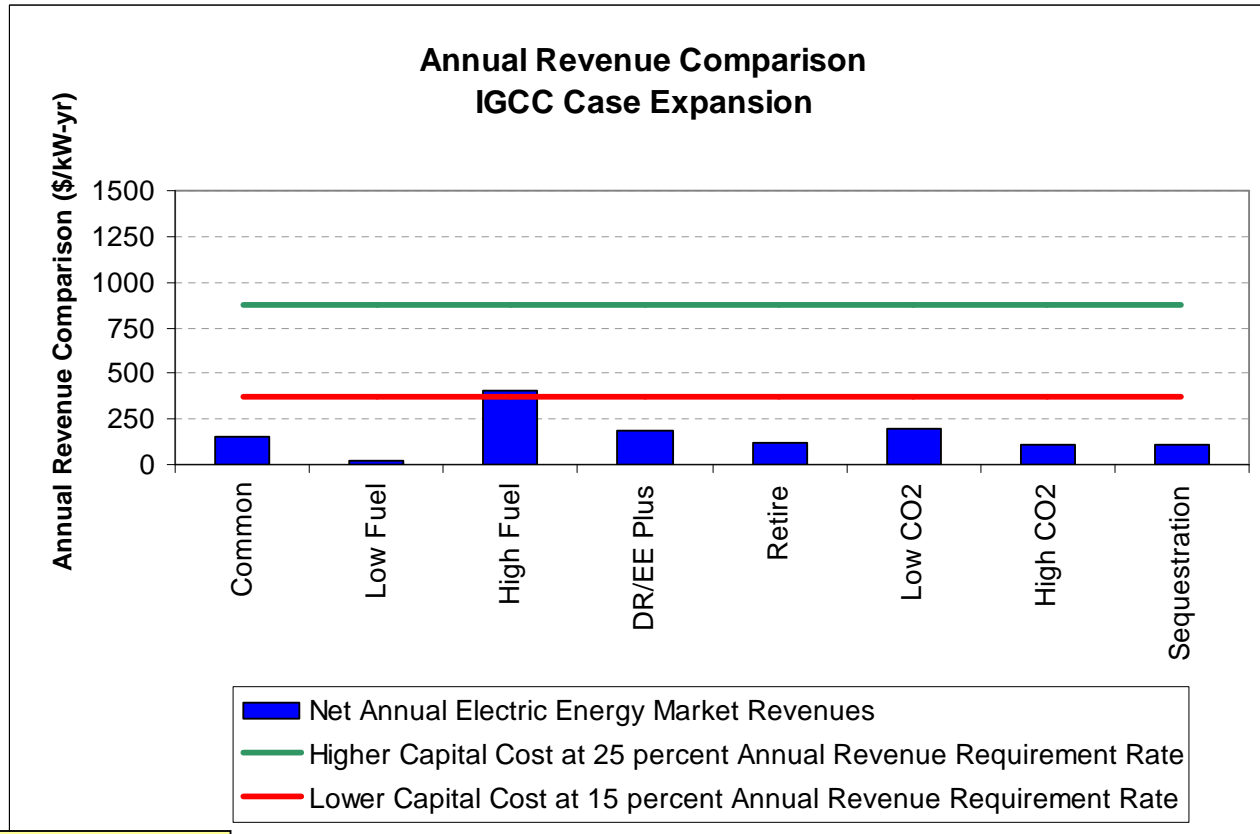
Lower Capital Cost: \$ 920/kW
Higher Capital Cost: \$3300/kW

Nuclear Expansion: Nuclear



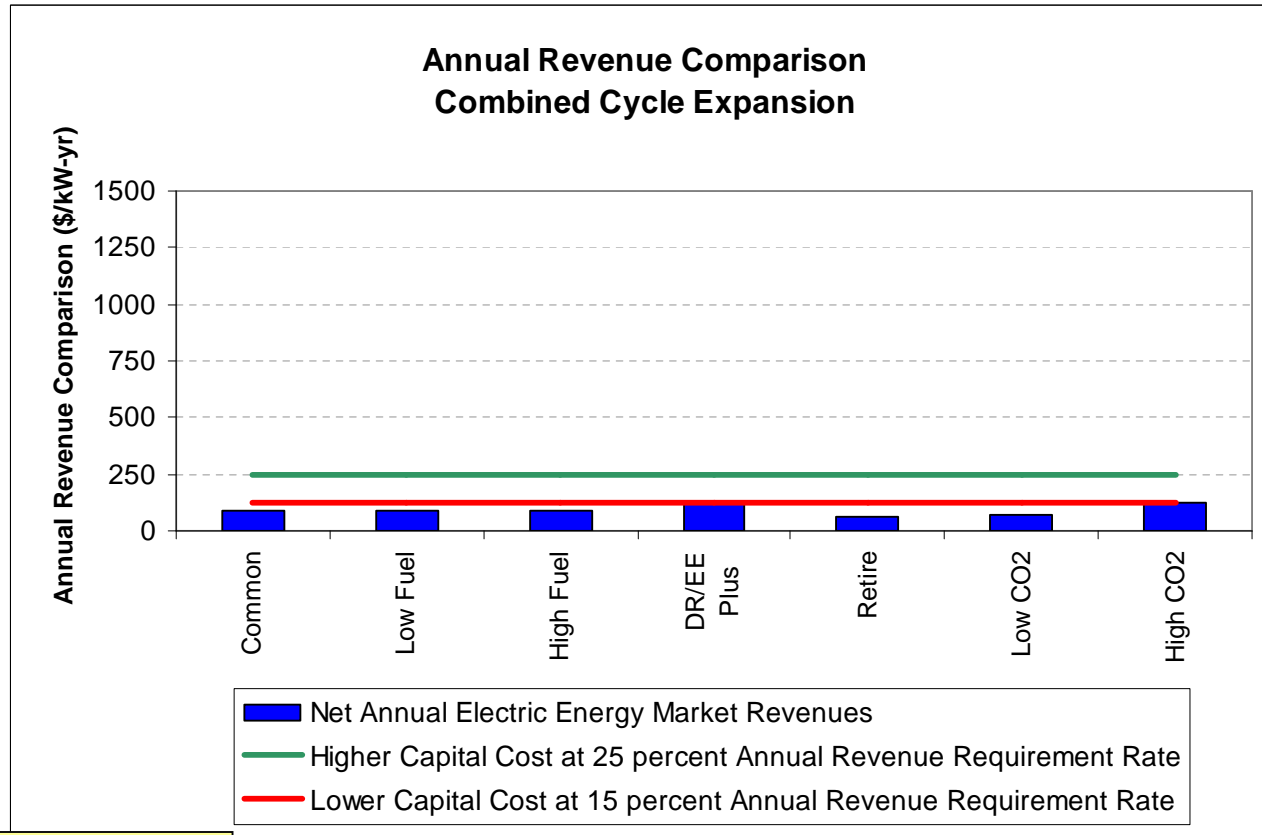
Lower Capital Cost: \$3000/kW
Higher Capital Cost: \$5000/kW

IGCC Expansion Case: IGCC



Lower Capital Cost: \$2500/kW
Higher Capital Cost: \$3500/kW

Combined Cycle Expansion



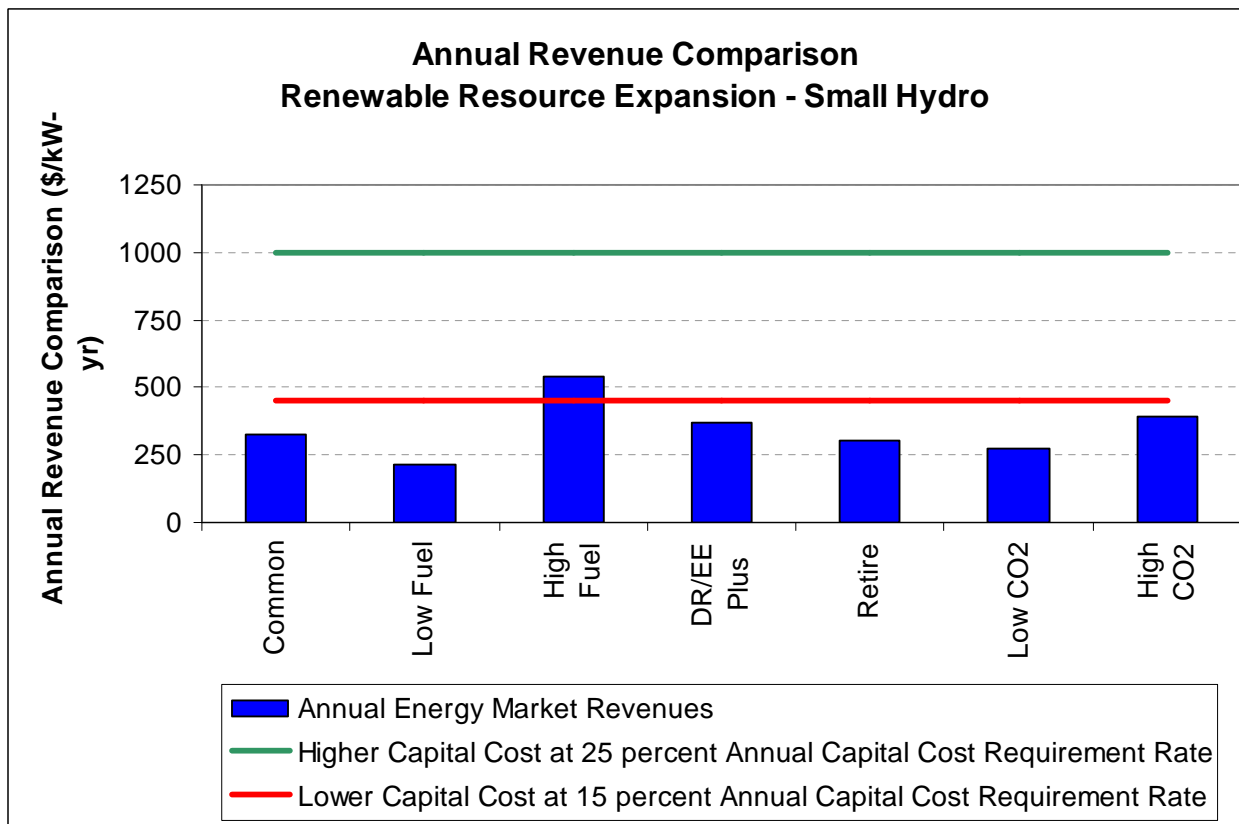
Lower Capital Cost: \$ 800/kW
Higher Capital Cost: \$1000/kW

Renewable Resources: Small Hydro

Renewable Case Technologies

=> **Small Hydro**

- CHP
- Biomass
- Fuel Cells
- Landfill Gas
- Photovoltaic
- Onshore Wind
- Offshore Wind



Lower Capital Cost: \$3000/kW
Higher Capital Cost: \$4000/kW

Renewable Resources: CHP

Renewable Case Technologies

Small Hydro

=> **CHP**

Biomass

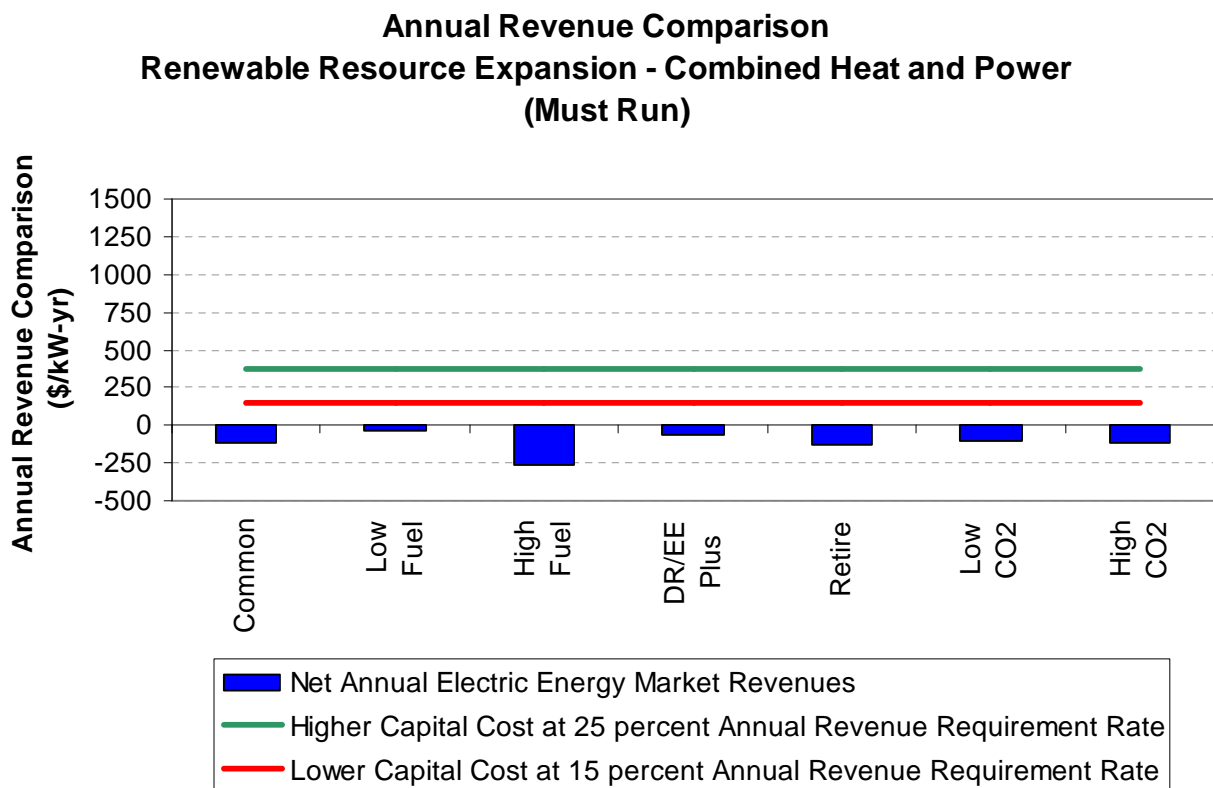
Fuel Cells

Landfill Gas

Photovoltaic

Onshore Wind

Offshore Wind



Lower Capital Cost: \$1000/kW
Higher Capital Cost: \$1500/kW

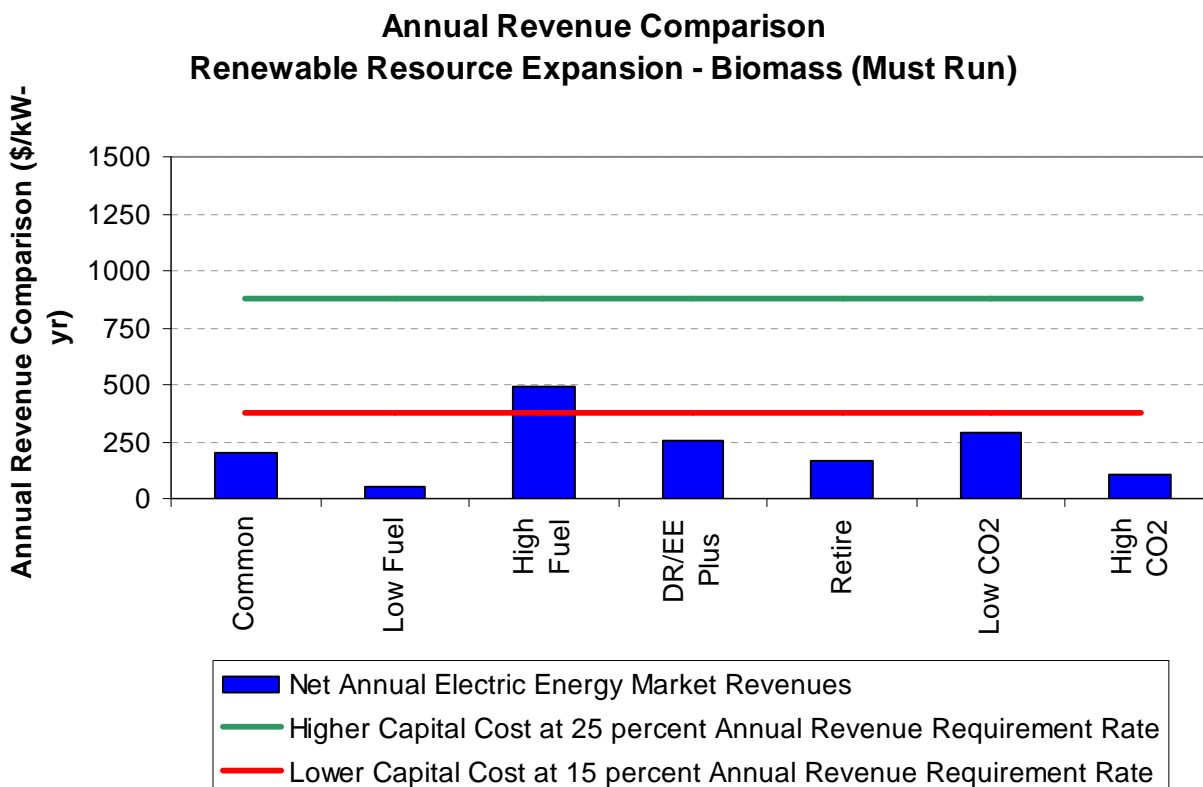
Renewable Resources: Biomass

Renewable Case Technologies

Small Hydro
CHP

=> **Biomass**

Fuel Cells
Landfill Gas
Photovoltaic
Onshore Wind
Offshore Wind

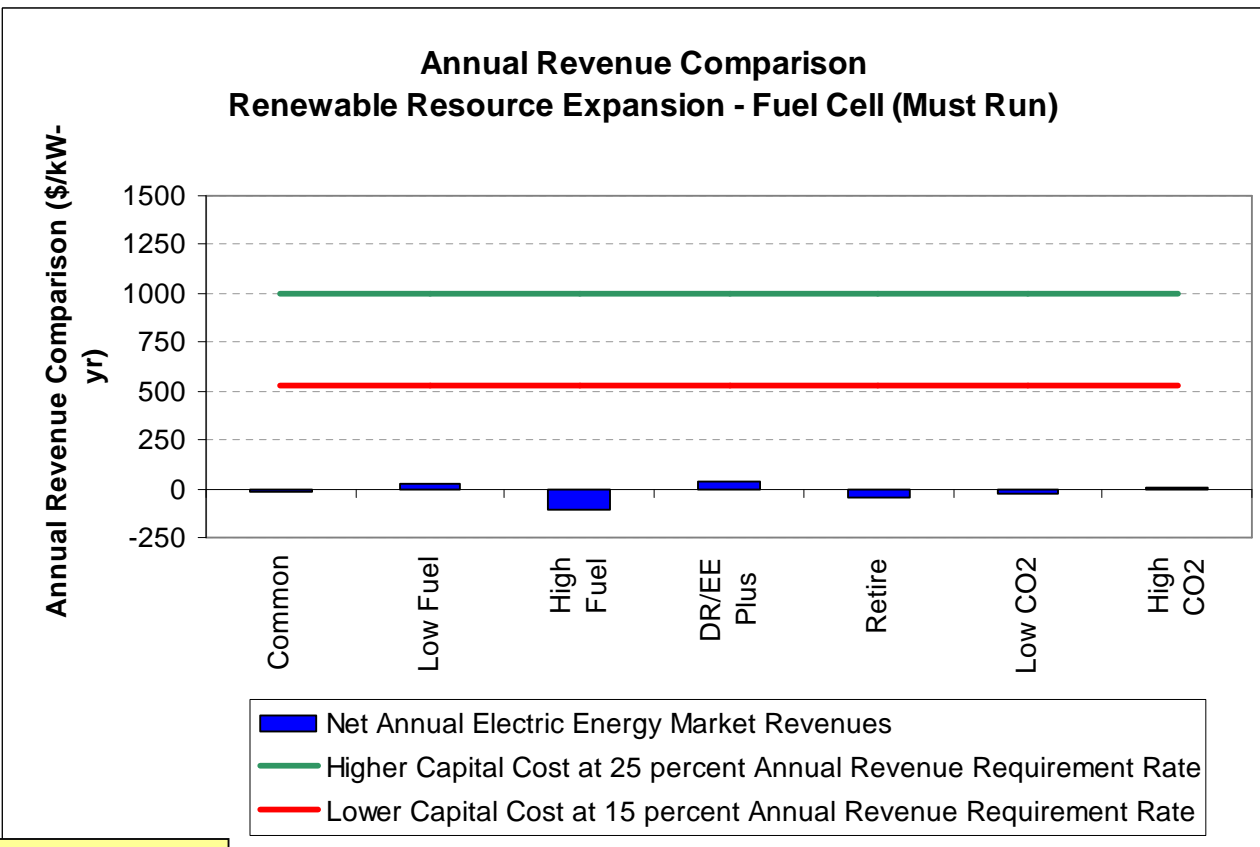


Lower Capital Cost: \$2500/kW
Higher Capital Cost: \$3500/kW

Renewable Resources: Fuel Cells

Renewable Case Technologies

- => Small Hydro
- CHP
- Biomass
- => **Fuel Cells**
- Landfill Gas
- Photovoltaic
- Onshore Wind
- Offshore Wind

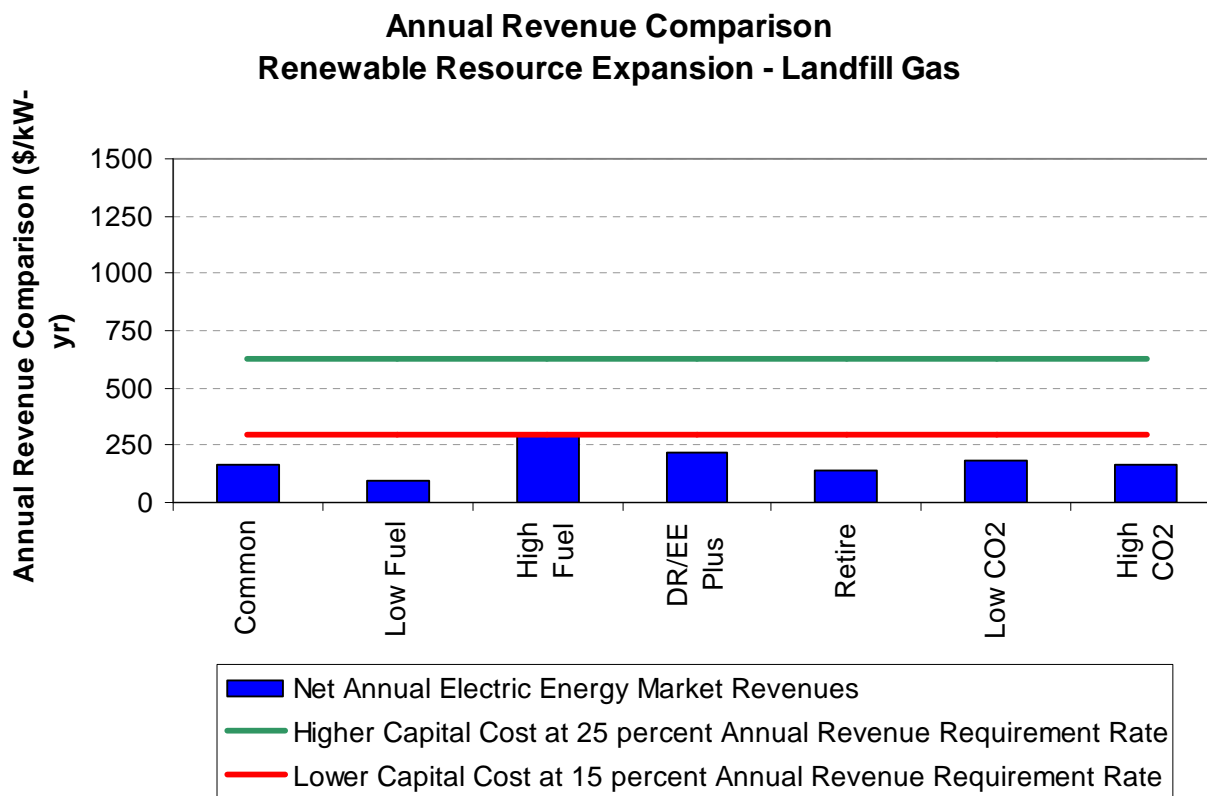


Lower Capital Cost: \$3500/kW
Higher Capital Cost: \$4000/kW

Renewable Resources: Landfill Gas

Renewable Case Technologies

- => Small Hydro
- CHP
- Biomass
- Fuel Cells
- => **Landfill Gas**
- Photovoltaic
- Onshore Wind
- Offshore Wind

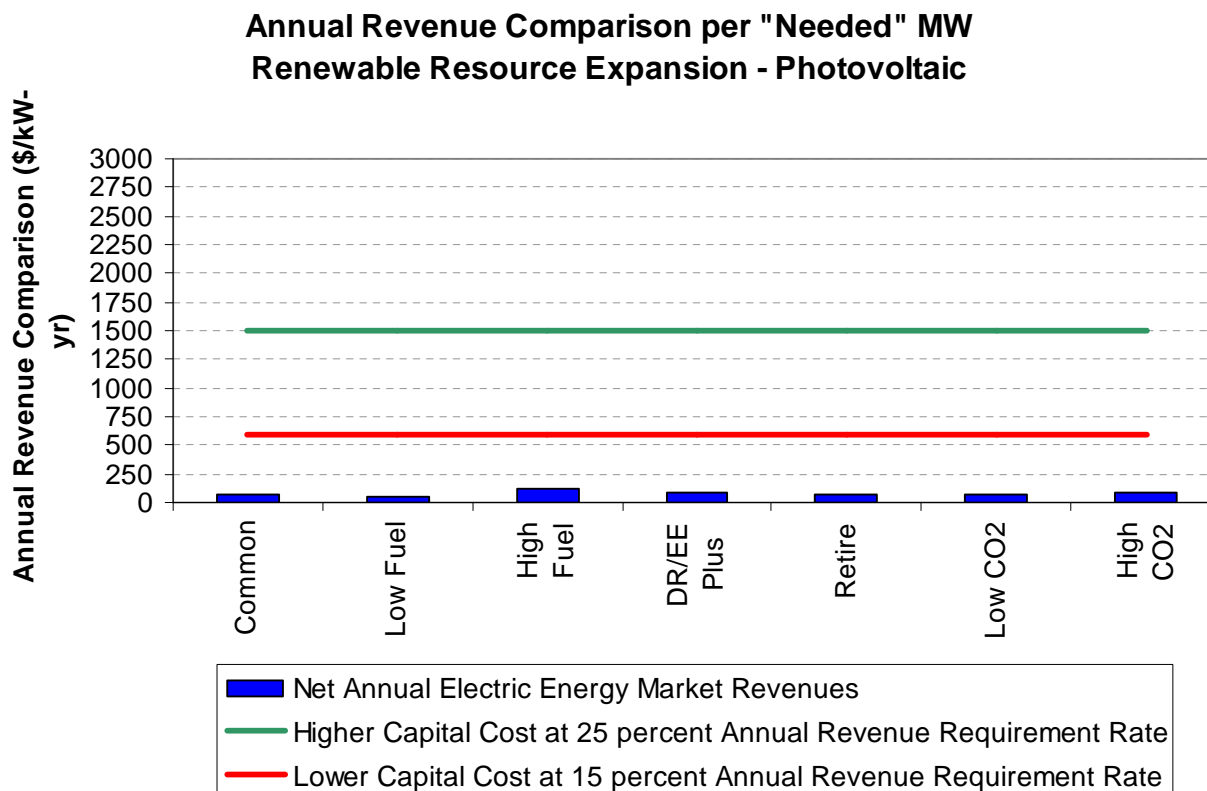


Lower Capital Cost: \$2000/kW
Higher Capital Cost: \$2500/kW

Renewable Resources: Photovoltaic

Renewable Case Technologies

- => Small Hydro
- CHP
- Biomass
- Fuel Cells
- Landfill Gas
- => **Photovoltaic**
- Onshore Wind
- Offshore Wind

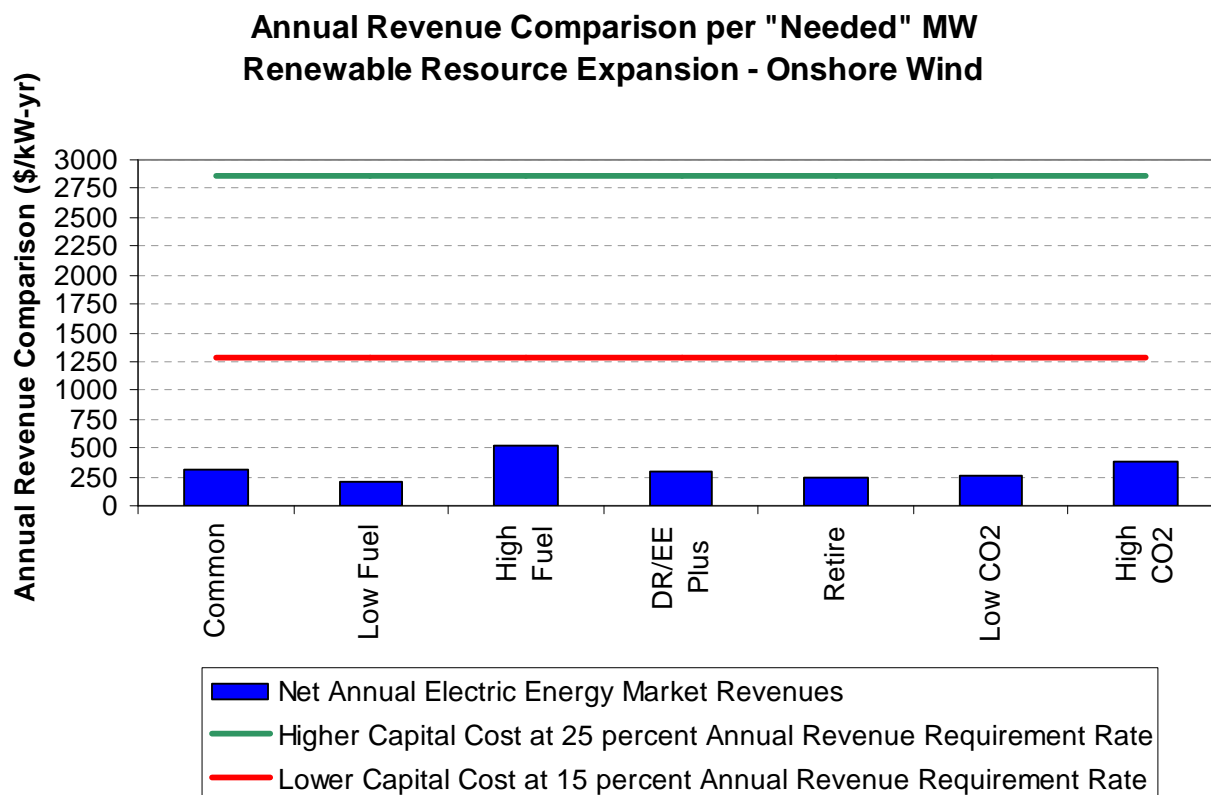


Lower Capital Cost: \$4000/kW
Higher Capital Cost: \$6000/kW

Renewable Resources: Onshore Wind

Renewable Case Technologies

- Small Hydro
- CHP
- Biomass
- Fuel Cells
- Landfill Gas
- Photovoltaic
- => Onshore Wind**
- Offshore Wind

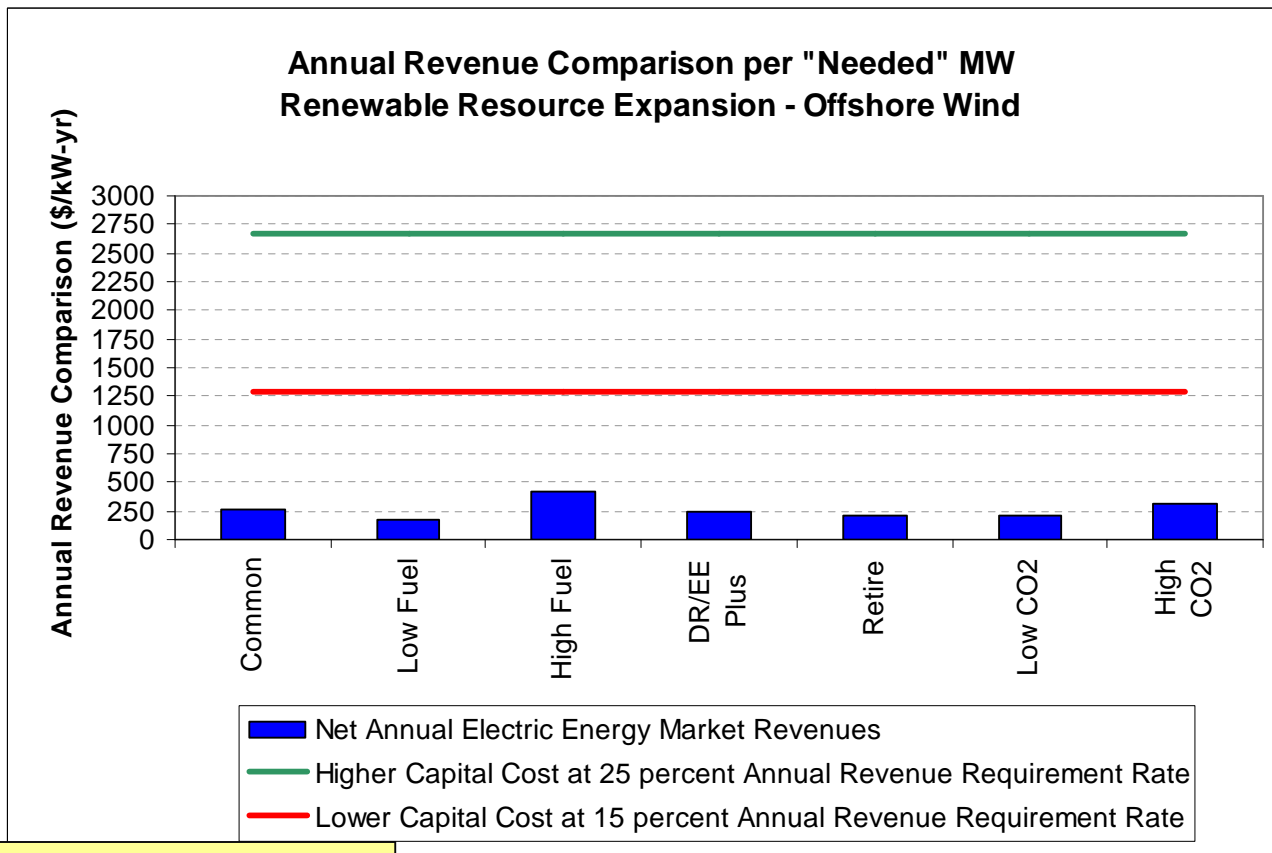


Lower Capital Cost: \$ 8,601/Needed-kW
Higher Capital Cost: \$11,468/Needed-kW

Renewable Resources: Offshore Wind

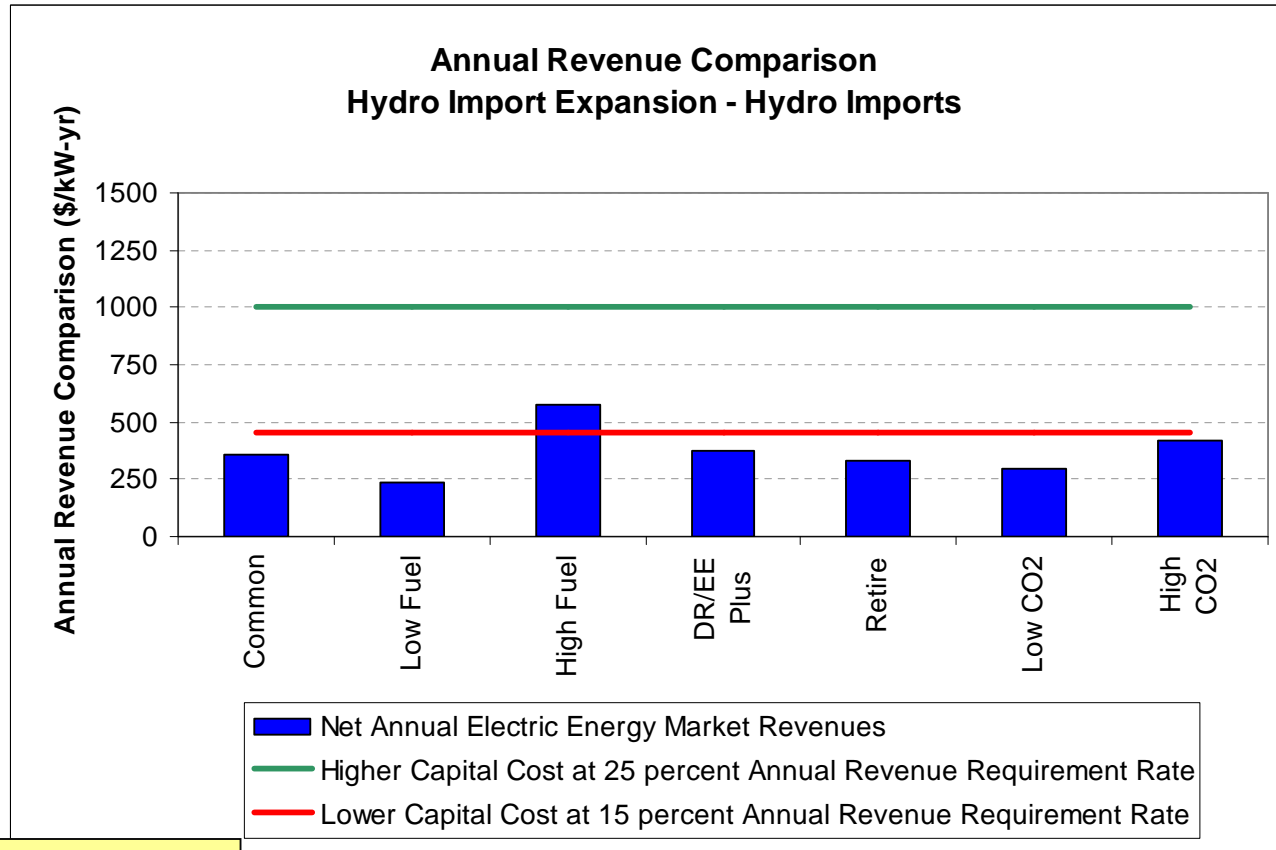
Renewable Case Technologies

- Small Hydro
- CHP
- Biomass
- Fuel Cells
- Landfill Gas
- Photovoltaic
- Onshore Wind
- => Offshore Wind**



Lower Capital Cost: \$ 8,553/Needed-kW
Higher Capital Cost: \$10,691/Needed-kW

Hydro Import Case: Hydro Imports



Lower Capital Cost: \$3000/kW
Higher Capital Cost: \$4000/kW

