CHAPTER 6

6.0 ALTERNATIVES

6.1. Introduction

As described in Chapter 2, TVA originally developed five resource planning strategies and a set of portfolios, corresponding to the seven scenarios, associated with each strategy. An additional strategy and scenario were developed following the release of the Draft IRP and EIS. These strategies are the basis for the alternatives in this EIS. This chapter describes the portfolios (resource plans) associated with each strategy, the results of the strategy screening process, and the strategies retained as alternatives for further consideration. This chapter also summarizes the environmental impacts of the alternatives.

6.2. Strategies and Associated Resource Plans

Following is a summary of the resource portfolio developed for each of the strategies. In the resource portfolio descriptions below, capacity additions and reductions are quantified in MW and energy additions and reductions are quantified in GWh.

All of the resource portfolios include the John Sevier Combined Cycle Plant, scheduled for completion in 2012, and Watts Bar Nuclear Plant, scheduled for completion in 2013. These two plants are not included in the discussions of nuclear and gas-fired supply additions in the following strategy descriptions.

The Recommended Planning Direction (Strategy R) was developed in a different manner than Strategies A-E. Its development involved the use of a bounded optimization analysis, in which the capacity planning model was allowed to select from the levels of EEDR, renewable additions, and coal capacity idled shown in Table 6-1. The other attributes of this strategy were the same as those of Strategy C. See Final IRP Sections 6.6, 8.1-3 for a more detailed description of the development of the Strategy R.

Table 6-1. Levels of EEDR, renewable additions, and coal capacity idled tested in the development of Strategy R.

Component	Range Tested				
EEDR Reductions by 2020	2,100 MW & 5,900 annual GWh		3,600 MW & 11,400 annual GWh		5,100 MW & 14,400 annual GWh
Renewable Additions in MW	1,500 by 2020	2,500 by 2020	2,500 by 2029	3,500 by 2020	3,500 by 2029
Coal Capacity Idled by 2017 in MW	2,400	3,200	4,000		4,700

6.2.1. Strategy B – Baseline Plan Resource Portfolio

The Baseline Plan Resource Portfolio is essentially a continuation of TVA's current power planning approach with the defined inputs of EEDR reductions of 2,100 MW and 5,900 GWh by 2020, renewables additions of 1,300 MW and 4,600 GWh by 2020, coal plant reductions of 2,000 MW by 2017, and no energy storage additions. The primary sources of new generation are nuclear and gas-fired capacity. Transmission upgrades are necessary to support new gas,

nuclear, and coal-fired capacity and to maintain system reliability. Following is a summary of the portfolio attributes.

- Energy Efficiency / Demand Response—316 MW of capacity providing 550 GWh of energy reductions in 2010, growing to 2,900 MW providing 7,290 GWh in 2029
- Renewable Resources—1,330 MW of wind PPAs by 2015 providing 4570 GWh annually; PPAs continue through 2029
- Energy Storage—No additions
- Purchased Power—Purchased power decreases as existing PPAs expire; new PPAs limited to 900 MW
- Coal—Idling of 2,415 MW of capacity by 2017; coal units added in only one scenario, consisting of two IGCC coal units with CCS technology in 2025 and 2029
- Nuclear—Bellefonte Units 1&2 added in six scenarios; Bellefonte Units 3&4 added in two scenarios for total of four nuclear units in two scenarios
- Gas-Fired Supply (self-build)—Gas capacity added in most scenarios to meet remaining supply needs, ranging from 11,600 MW by 2029 for highest load scenario to no additional capacity in the lowest load scenario.

6.2.2. Strategy A - Limited Change in Current Resource Portfolio

Under the Limited Change in Current Resource Portfolio, TVA would continue to operate its existing generating facilities as long as possible, continue with the committed EEDR programs and additions of renewable capacity, and rely on power purchases to meet the remainder of its capacity needs. Defined model inputs include annual EEDR reductions of 1,940 MW and 4,725 GWh by 2020, renewables additions of 1,300 MW and 4,600 GWh by 2020, and no coal plant reductions or energy storage additions. The primary source of the purchased power under most scenarios is natural gas. This strategy would require transmission line upgrades to connect to the sources of the purchased power to the TVA grid. Following is a summary of the portfolio attributes.

- Energy Efficiency / Demand Response—316 MW of capacity providing 550 GWh of energy reductions in 2010, growing to 2,200 MW providing 5,600 GWh in 2029
- Renewable Resources—1,330 MW of wind PPAs by 2015 providing 4,570 GWh annually; PPAs continue through 2029
- Energy Storage—No additions
- Purchased Power—Purchased power increases through new market purchases as contracts expire and to close future capacity and demand gaps
- Coal—No capacity idled and no new additions
- Nuclear—No new additions after Watts Bar Unit 2
- Gas-Fired Supply (self-build)—No new additions beyond those currently approved.

6.2.3. Strategy C - Diversity Focused Resource Portfolio

The Diversity Focused Resource Portfolio includes an increase in EEDR programs and renewable energy additions over Strategy B. Defined model inputs include annual EEDR reductions of 3,600 MW and 11,400 GWh by 2020, renewables additions of 2,500 MW and 9,600 GWh by 2020, 3,000 MW of coal capacity idled by 2017, and a pumped storage unit. Nuclear, coal, and gas-fired plants are options to meet demand. The Strategy C portfolio contains coal capacity of almost 3,400 MW idled under all scenarios and new nuclear units under all but the two scenarios with the lowest load growth. The primary source of new generation to meet future electricity needs is nuclear and gas-fired capacity. Transmission

upgrades would be necessary to support new renewable, gas, nuclear and coal-fired capacity, and TVA could also participate in interregional project to transmit renewable energy. Following is a summary of the portfolio attributes.

- Energy Efficiency / Demand Response—377 MW of capacity providing 705 GWh of energy reductions in 2010, growing to 5,300 MW providing 7,300 GWh in 2029
- Renewable Resources—1,760 MW of capacity providing 6,700 GWh by 2015 and increasing to 2,340 MW providing 8,600 GWh by 2029
- Energy Storage—850 MW of new pumped hydro storage
- Purchased Power—Purchased power decreases as existing PPAs expire; new PPAs for up to 900 MW in three scenarios
- Coal—Idling of 3,252 MW of capacity by 2017; additions of two IGCC plants with CCS under one scenario
- Nuclear—Bellefonte Units 1&2 added in six scenarios; Bellefonte Units 3&4 added in one scenario for total of four nuclear units in this scenario
- Gas-Fired Supply (self-build)—Gas capacity added in most scenarios, ranging from 8,200 MW by 2029 for highest load scenario to no additional capacity in the two lowest load scenarios.

6.2.4. Strategy D - Nuclear Focused Resource Portfolio

The Nuclear Focused Resource Portfolio includes an increase in EEDR programs and the same renewable energy additions as Strategy C. Defined model inputs include annual EEDR reductions of 4,000 MW and 8,900 GWh by 2020, the largest (7,000 MW) amount of coal capacity idled by 2017, and a pumped storage unit. In the resulting portfolio, new generation is predominantly by renewables, nuclear and gas-fired plants. Transmission upgrades would be necessary to support new renewables, gas, nuclear and coal-fired capacity, and TVA could also participate in interregional project to transmit renewable energy. Following is a summary of the portfolio attributes.

- Energy Efficiency / Demand Response—1,529 MW of capacity providing 1,490 GWh of energy reductions in 2010, growing to 7,320 MW providing 16,500 GWh in 2029
- Renewable Resources—1,760 MW of capacity providing 6,700 GWh by 2015 and increasing to 2,340 MW providing 8,600 GWh by 2029
- Energy Storage—850 MW of new pumped hydro storage
- Purchased Power—Purchased power decreases as existing PPAs expire; new PPAs for up to 900 MW in four scenarios
- Coal—Idling of 6,972 MW of capacity by 2017; additions of two IGCC plants with CCS and one supercritical PC plant with CCS between 2025 and 2029 under one scenario
- Nuclear—Bellefonte Units 1&2 added in six scenarios; Bellefonte Units 3&4 added in two scenario for total of four nuclear units in these two scenarios
- Gas-Fired Supply (self-build)—Gas capacity added in most scenarios, ranging from 8,100 MW by 2029 for highest load scenario to no additional capacity in the lowest load scenario.

6.2.5. Strategy E - EEDR and Renewables Focused Resource Portfolio

The EEDR and Renewables Focused Resource Portfolio includes the largest amounts of both EEDR programs and renewable energy. The amount of coal plant layups is less than Strategy

D but more than A, B, and C. Defined model inputs include annual EEDR reductions of 5,900 MW and 14,400 GWh by 2020, 3,500 MW and 12,000 GWh of renewable resources by 2020, 5,000 MW of coal capacity idled by 2017, and no new energy storage. In the resulting portfolio, new generation is predominantly by renewables, nuclear and gas-fired plants. A high level of transmission upgrades would be necessary to support new renewable, gas, nuclear and coal-fired capacity, and TVA could also participate in interregional project to transmit renewable energy. Following is a summary of the portfolio attributes.

- Energy Efficiency / Demand Response—318 MW of capacity providing 798 GWh of energy reductions in 2010, growing to 6,950 MW providing 16,300 GWh in 2029
- Renewable Resources—2,250 MW of renewable resources capacity providing 8,300 GWh by 2015; 3,590 MW providing 12,580 GWh by 2029
- Energy Storage—no additions
- Purchased Power—Purchases beyond current contracts and contract extensions limited to 900 MW; small additions under three scenarios
- Coal—Idling of 4,730 MW of capacity by 2017; no additions
- Nuclear—Four scenarios with Bellefonte Units 1&2 starting in 2022 and one scenario with Bellefonte Units 1, 2 and 3 starting in 2022; no nuclear additions in three scenarios
- Gas-Fired Supply (self-build)—Gas capacity added in five scenarios, ranging up to 10,800 MW in highest load scenario to no additional capacity in three scenarios.

6.2.6. Strategy R - Recommended Planning Direction

Strategy R includes an increase in EEDR programs and renewable energy additions over Strategy B. Based on the results of the bounded optimization analysis, EEDR reductions were set at 3,600 MW and 11,400 GWh by 2020, renewables additions at 2,500 MW by 2020, and coal capacity idled at 4,000 MW by 2017. The Strategy R portfolio contains new nuclear units under all but the two scenarios with the lowest load growth. The primary source of new generation to meet future electricity needs is nuclear and gas-fired capacity. Transmission upgrades would be necessary to support new renewable, gas, nuclear and coal-fired capacity, and TVA could also participate in interregional project to transmit renewable energy. Following is a summary of the portfolio attributes.

- Energy Efficiency / Demand Response—range of 2,100-5,100 MW and 4,700-14,400 GWh by 2020, with 3,600 of capacity by 2020 growing to 4,638 MW in 2029 assumed in portfolios
- Renewable Resources—range of 1,500-3,500 MW by 2020, with 1,854 MW of capacity providing 2,294 GWh by 2015 and 2,500 MW providing 3,600 GWh by 2029 assumed in portfolios
- Energy Storage—850 MW of new pumped hydro storage
- Purchased Power—Purchased power decreases as existing PPAs expire; new PPAs in five scenarios
- Coal—range of capacity idled of 2,400-4,700 MW by 2017, with idling of 4,000 MW of current units by 2017 assumed in portfolios; additions of two IGCC plants with CCS under one scenario
- Nuclear—Bellefonte Units 1&2 added in six scenarios; Bellefonte Units 3&4 added in one scenario for total of four nuclear units in this scenario

- Gas-Fired Supply (self-build)—Gas capacity added in most scenarios, ranging from 2,900 MW by 2029 for highest load scenario to no additional capacity in the two lowest load scenarios.

6.3. Strategy and Portfolio Evaluation

The metrics used to evaluate the cost and financial risk attributes, economic development attributes, and a set of environmental attributes are described in Section 2.6 and IRP Chapter 6. Following are the raw values for these metrics for each of the 35 portfolios developed for the original Strategies A-E and Scenarios 1-7 (Tables 6-2 and 6-3).

Table 6-2. Cost and financial metrics for the 35 resource portfolios and averages for each Strategies A-E.

		Scenario							
	Strategy	1	2	3	4	5	6	7	Average
PVRR (2010 billion $)	A	180	137	116	139	135	109	134	136
	B	173	134	114	136	133	107	133	133
	C	170	133	115	136	133	106	131	132
	D	180	141	121	145	141	110	139	140
	E	173	135	118	139	135	108	134	134
Short-term Rates ($/MWh, level 2011-2018)	A	76.82	75.92	78.42	74.47	75.75	77.31	74.97	76.24
	B	78.67	76.22	76.22	75.88	77.04	74.91	75.72	76.38
	C	79.95	76.73	78.93	77.25	76.99	77.11	77.35	77.76
	D	84.51	88.31	82.78	82.19	83.50	80.44	81.80	82.66
	E	80.41	79.29	82.05	77.91	79.40	79.82	78.52	79.64
Risk/Benefit Ratio	A	1.45	1.36	0.91	1.27	1.26	0.99	1.25	1.21
	B	1.41	1.24	0.97	1.16	1.18	1.00	1.18	1.16
	C	1.38	1.28	0.89	1.13	1.16	0.91	1.14	1.13
	D	1.40	1.22	1.00	1.21	1.17	0.96	1.18	1.16
	E	1.40	1.23	0.91	1.17	1.16	0.89	1.14	1.13
Risk Ratio	A	0.25	0.22	0.09	0.19	0.18	0.13	0.17	0.18
	B	0.24	0.20	0.10	0.16	0.16	0.14	0.16	0.16
	C	0.23	0.20	0.08	0.15	0.16	0.12	0.15	0.16
	D	0.23	0.19	0.10	0.17	0.16	0.11	0.15	0.16
	E	0.24	0.19	0.08	0.17	0.16	0.11	0.15	0.16

Table 6-3. Environmental and economic development metrics for the 35 resource portfolios and averages for Strategies A-E.

		Scenario							
	Strategy	1	2	3	4	5	6	7	Average
Air Impact (Total 2010-2028 CO_2 emissions in million tons)	A	2,054	1,719	1,402	1,775	1,723	1,190	1,767	1,661
	B	1,774	1,461	1,317	1,518	1,480	1,138	1,533	1,460
	C	1,673	1,418	1,210	1,408	1,422	1,035	1,427	1,370
	D	1,468	1,170	1,058	1,256	1,204	962	1,249	1,195
	E	1,613	1,299	1,106	1,410	1,303	959	1,352	1,292
Water Impact (ordinal ranking of scenarios based on need for cooling of steam generating plants)									Final Strategy Rank
	A	3	4	5	4	4	5	4	4
	B	5	5	4	5	5	4	5	5
	C	4	3	3	3	3	3	3	3
	D	2	2	1	2	1	1	1	1
	E	1	1	2	1	2	2	2	2
Waste (ordinal ranking of scenarios based on total handling costs)									Final Strategy Rank
	A	3	4	5	3	4	4	3	4
	B	5	5	4	5	5	5	5	5
	C	4	3	3	4	3	3	4	3
	D	1	1	1	1	1	1	1	1
	E	2	2	2	2	2	2	2	2
Total Employment (percent change from Strategy B, Scenario 7)	A	+0.1					-0.4		
	B	+1.0					-0.3		
	C	+0.9					+0.2		
	D	+1.2					-0.1		
	E	+0.8					+0.3		
Growth in Personal Income (percent change from Strategy B, Scenario 7)	A	+0.1					-0.4		
	B	+0.8					-0.3		
	C	+0.6					+0.1		
	D	+1.0					-0.2		
	E	+0.6					+0.2		

The raw values for these metrics were then converted into ranking scores as described in Final IRP Section 6,3 for ease in their interpretation. Final IRP Section 7.2 displays the scorecards containing the ranking scores for each original strategy. The cost and risk ranking metrics were combined into a single ranking metric score (see EIS Section 2.6) for each of the seven portfolios associated with each planning strategy. The seven ranking metric scores for each original planning strategy were then summed and used to rank the strategies (Table 6-4). The maximum possible score for a strategy is 700.

Table 6-4. Original planning strategies ranked by their total ranking metric scores for cost and financial risk factors.

Rank	Planning Strategy	Ranking Metric Score
1	C - Diversity Focused Resource Portfolio	693
2	E - EEDR and Renewables Focused Resource Portfolio	690
3	B - Baseline Plan Resource Portfolio	675
4	D - Nuclear Focused Resource Portfolio	668
5	A - Limited Change in Current Resource Portfolio	657

The two highest ranked strategies (C and E) have very similar scores for the cost and risk ranking factors. Strategy B ranks in the middle of the range, separated by 15 points from Strategy E. Strategies D and A rank lowest. The 3-point difference between the highest ranked strategies C and E is not statistically significant. Strategy C has the highest scores for PVRR and both risk metrics of all portfolios, and strategies A and B are essentially tied for the highest score for short-term rate impacts.

Planning strategies D has the best (i.e., lowest) score for the environmental metrics and A and B have the worst scores. Strategy C is in the middle of the range. Strategy A performed poorly due to the continued operation of all of the coal plants, the likely reliance on natural gas for most future capacity additions through PPAs, and small amount of EEDR. Strategy B performed poorly due to the large future reliance on coal, nuclear, and gas-fueled generation and relatively small amount of EEDR. The other four strategies all have coal units idled, larger amounts of EEDR, and, under most scenarios, nuclear capacity additions; these factors result in their lower CO_2 emissions and non-nuclear waste generation. The rank order of all six strategies, from best to worst, is D, E, R, C, A, and B.

The ranking of the strategies by the two economic development metrics was similar. Strategies B and D performed similarly and had greatest increases in total employment and personal income under the high-growth scenario. Strategies C, E, and R also performed similarly. Strategy A was consistently the lowest ranked.

Strategy R was ranked in the same manner as Strategies A-E, using the scores for the original seven scenarios as well as the Scenario 8 - Reference Case: Great Recession Impacts Recovery. Ranking metric scores were also developed for Strategies B, C, and E under Scenario 8. When ranked for all eight scenarios, each strategy has a maximum possible score of 800; these scores are listed in Table 6-5.

Table 6-5. Planning Strategies B, C, E, and R ranked by their total ranking metric scores for cost and financial risk factors.

Rank	Planning Strategy	Ranking Metric Score
1	R - Recommended Planning Direction	785
2	C - Diversity Focused Resource Portfolio	783
3	E - EEDR and Renewables Focused Resource Portfolio	782
4	B - Baseline Plan Resource Portfolio	762

6.4. Strategies and Alternatives

Based on the evaluations described in the preceding section, TVA eliminated strategies A and D from further consideration. The retained Strategy B (Baseline Plan Resource Portfolio) is a continuation of TVA's current planning strategy and this represents the No Action Alternative. The three retained alternative strategies representing the Action Alternatives are Strategy C - Diversity Focused Resource Portfolio, Strategy E - EEDR and Renewables Focused Resource Portfolio, and Strategy R - Recommended Planning Direction.

In order to better evaluate the retained strategies B, C, E, and R, the individual scenario-specific portfolios that comprise each strategy were examined more closely. Within each of the four strategies, the portfolios and resulting capacity expansion plans tended to be similar for the paired scenarios 1 (Economy Recovers Dramatically) and 4 (Game-Changing Technology), for scenarios 2 (Environmental Focus is a National Priority) and 5 (Energy Independence), and for scenarios 3 (Prolonged Economic Malaise) and 6 (Carbon Legislation Creates Economic Downturn). The Scenario 7 (Reference Case: Spring 2010) and Scenario 8 (Reference Case: Great Recession Impacts Recovery) portfolios also tended to be similar. Based on the results of this examination, the portfolios associated with scenarios 1, 2, 3, 7, and 8 have been retained for further consideration. The following Tables 6-6, 6-7, 6-8, and 6-9 list the defined amounts of EEDR, new renewable generation, and coal capacity idled and the generating capacity additions for each alternative strategy. The alternative strategies would also require varying amounts of new transmission system construction and upgrades to existing transmission facilities.

6.5. Preferred Alternative

The preferred alternative strategy is Strategy R - Recommended Planning Direction. This strategy has the highest total ranking metric score of the four alternative strategy (Table 6-5), indicating that it performs well across the range of range of scenarios. It performs best in six of the eight tested scenarios for total plan cost (PVRR) and best in five of the eight scenarios for the risk/benefit ratio metric. Based on the strategic metrics, it is the second best performing strategy, behind Strategy C. This is primarily due to the differences in the environmental stewardship metrics; the differences in the economic impact metrics among the four strategies are negligible. See Final IRP Section 8.3.3 for additional comparisons among the alternative strategies.

Table 6-6. The No Action Alternative - Strategy B - Baseline Plan Resource Portfolio. All listed capacities are in MW.

Year	Defined Model Inputs			Capacity Additions by Scenario				
	EEDR[1]	Renew-ables[2]	Coal Idling[3]	SC1	SC2	SC3	SC7	SC8
2010	229	35	-	PPAs & Acquisitions				
2011	385	48	(226)					
2012	384	137	(226)	CC - 880	CC - 880	CC - 880	CC - 880	CC - 880
2013	610	155	(935)	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180
2014	1,363	155	(935)	CT - 621 CT - 828 GL CT - 170				
2015	1,496	160	(2,415)	CT - 828 CC - 910	GL CT - 170[4]		CT - 621, GL CT - 170	GL CT - 170
2016	1,622	160	(2,415)	CT - 828			CT - 621	MKT
2017	1,751	160	(2,415)	CT - 828			CT - 828	MKT
2018	1,881	160	(2,415)	BLN1 - 1,250			BLN1 - 1,250	BLN1 - 1,250
2019	2,012	160	(2,415)	CT - 828	BLN1 - 1,250			MKT
2020	2,124	160	(2,415)	BLN2 - 1,250			BLN2 - 1,250	BLN2 - 1,250
2021	2,216	160	(2,415)	CC - 910	BLN2 - 1,250			
2022	2,294	160	(2,415)	CT - 828, CC - 910			CC - 910	CC - 910
2023	2,362	160	(2,415)	CT - 828			CT - 828	CT - 621
2024	2,429	160	(2,415)	BLN3 - 1,117				CT - 828
2025	2,470	160	(2,415)	IGCC - 490	BLN3 - 1,117		CT - 828	
2026	2,495	160	(2,415)	BLN4 - 1,117				CT - 828
2027	2,509	160	(2,415)	CT - 828	BLN4 - 1,117		CT - 828	
2028	2,516	160	(2,415)	CC - 910		CT - 828		CT - 828
2029	2,520	160	(2,415)	IGCC - 490, CT - 621	CT - 621		CC - 910	CT - 621 MW

[1]Peak load impact in MW
[2]Firm capacity at the summer peak
[3]Cumulative capacity of coal units to be idled
[4]Upgrade of Gleason CT plant from 360 to 530 MW

Table 6-7. Action Alternative - Strategy C - Diversity Focused Resource Portfolio. All listed capacities are in MW.

Year	Defined Model Inputs			Capacity Additions by Scenario				
	EEDR[1]	Renew-ables[2]	Coal Idling[3]	SC1	SC2	SC3	SC7	SC8
2010	298	35	-	PPAs & Acquisitions				
2011	389	48	(226)					
2012	770	146	(226)	CC - 880	CC - 880	CC - 880	CC - 880	CC - 880
2013	1,334	286	(935)	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180
2014	1,596	442	(935)	CT - 621				
2015	2,069	515	(3,252)	CT - 828, GL CT 170[4], CC - 910			CT - 621, GL CT - 170	GL CT - 170
2016	2,537	528	(3,252)	CT - 828				
2017	2,828	715	(3,252)					
2018	3,116	768	(3,252)	BLN 1 - 1,250			BLN1 - 1,250	
2019	3,395	822	(3,252)					
2020	3,627	883	(3,252)	BLN2 - 1,250, PSH - 850	PSH - 850	PSH - 850	BLN2 - 1,250, PSH - 850	PSH - 850
2021	3,817	896	(3,252)	CT - 828				
2022	3,985	911	(3,252)	CC - 910	BLN1 - 1,250			BLN1 - 1,250
2023	4,143	922	(3,252)	CC - 910				
2024	4,295	935	(3,252)	BLN3 - 1,117	BLN2 - 1,250			BLN2 - 1,250
2025	4,412	942	(3,252)	IGCC - 490			CT - 828	
2026	4,502	947	(3,252)	BLN4 - 1,117				
2027	4,561	948	(3,252)	CT - 828			CC - 910	
2028	4,602	953	(3,252)	CT - 828				CT - 621 MW
2029	4,638	954	(3,252)	IGCC - 490, CT - 621	BLN3 - 1,117		CT - 621	CT - 828

[1]Peak load impact in MW
[2]Firm capacity at the summer peak
[3]Cumulative capacity of coal units to be idled
[4]Upgrade of Gleason CT plant from 360 to 530 MW

Table 6-8. Action Alternative - Strategy E - EEDR and Renewables Focused Resource Portfolio. All listed capacities are in MW.

Year	Defined Model Inputs			Capacity Additions by Scenario				
	EEDR[1]	Renew-ables[2]	Coal Idling[3]	SC1	SC2	SC3	SC7	SC8
2010	34	35	-	PPAs & Acquisitions				
2011	181	48	(226)					
2012	1,136	178	(226)	CC - 880	CC - 880	CC - 880	CC - 880	CC - 880
2013	1,664	314	(935)	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180
2014	2,431	493	(935)					
2015	3,479	580	(4,730)	GL CT - 170[4], CT - 621, CC (2) - 910			CT - 621, GL CT - 170	GL CT - 170
2016	3,843	616	(4,730)	CT - 828				
2017	4,183	846	(4,730)					
2018	4,504	921	(4,730)	CT - 828			CC - 910	
2019	4,811	994	(4,730)	CC - 910				
2020	5,074	1,060	(4,730)	CC - 910				
2021	5,353	1,074	(4,730)	CT - 621				
2022	5,460	1,094	(4,730)	BLN1 - 1,250	BLN1 - 1,250		BLN1 - 1,250	BLN1 - 1,250
2023	5,599	1,107	(4,730)	CT - 828				
2024	5,739	1,124	(4,730)	BLN2 - 1,250	BLN2 - 1,250		BLN2 - 1,250	BLN2 - 1,250
2025	5,815	1,133	(4,730)	CT - 828				
2026	5,893	1,142	(4,730)	CT - 828			CT - 828	CT - 621
2027	5,961	1,145	(4,730)	CT - 828				
2028	6,009	1,154	(4,730)	BLN3 - 1,117			CT - 621	CT - 621
2029	6,043	1,157	(4,730)	CT - 828			CT - 621	CT - 621

[1]Peak load impact (MW)
[2]Firm capacity at the summer peak (MW)
[3]Cumulative capacity (MW) of coal units to be idled
[4]Upgrade of Gleason CT plant from 360 to 530 MW

Table 6-9. Action Alternative Strategy R - Recommended Planning Direction. All listed capacities are in MW.

Year	Defined Model Inputs			Capacity Additions by Scenario				
	EEDR[1]	Renew-ables[2]	Coal Idling[3]	SC1	SC2	SC3	SC7	SC8
2010	298	39	-	PPAs & Acquisitions				
2011	389	53	(226)					
2012	770	168	(226)	CC - 880	CC - 880	CC - 880	CC - 880	CC - 880
2013	1,334	309	(935)	WBN2 - 1,180, PPAs	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180	WBN2 - 1,180
2014	1,596	465	(935)	CT - 828				
2015	2,069	538	(4,002)	GL CT - 170[4], CT - 621, CC - 910, PPAs			GL CT - 170, PPAs	GL CT-170, PPAs
2016	2,537	551	(4,002)	CT - 828			MKT	
2017	2,828	738	(4,002)	MKT			MKT	
2018	3,116	791	(4,002)	BLN1 - 1,250	BLN1 - 1,250		BLN1 - 1,250	
2019	3,395	845	(4,002)	MKT			MKT	MKT
2020	3,627	906	(4,002)	BLN2 - 1,250, PSH - 850	BLN2 - 1,250, PSH - 850	PSH - 850	BLN2 - 1,250, PSH - 850	BLN1 - 1,250, PSH - 850
2021	3,817	919	(4,002)	CC - 910				
2022	3,985	934	(4,002)	CC - 910, MKT				BLN2 - 1,250
2023	4,123	945	(4,002)	CT - 828, MKT			CT - 828	
2024	4,295	958	(4,002)	BLN3 - 1,117				
2025	4,412	965	(4,002)	IGCC - 490, MKT			CT - 621	
2026	4,412	970	(4,002)	BLN4 - 1,117			MKT	CT - 828
2027	4,561	970	(4,002)	CT - 828			CT - 828	MKT
2028	4,602	971	(4,002)	CT - 828			MKT	CT - 828
2029	4,638	977	(4,002)	CT - 828, IGCC - 490	CT - 828		CT - 828	CT - 621

[1]Peak load impact (MW)
[2]Firm capacity at the summer peak (MW)
[3]Cumulative capacity (MW) of coal units to be idled
[4]Upgrade of Gleason CT plant from 360 to 530 MW

6.6. Comparison of Environmental Impacts of the Alternatives

All of the alternative strategies have several common features that affect their anticipated environmental impacts. All strategies result in decreases in coal-fired generation and increases

in the reliance on renewable and EEDR resources. All strategies also add varying amounts of new nuclear and natural gas-fueled generation. Emissions of air pollutants and the intensity of greenhouse gas emissions decrease under all strategies.

The four alternative strategies result in significant long-term reductions in emissions of SO_2, NOx, and mercury. Strategy E has the greatest reduction and Strategy B has the least reduction, although the differences among the strategies are small. The total direct emissions of CO_2 during the planning period are greatest for Strategy E and least for Strategy B. For all alternative strategies, both annual direct CO_2 emissions and the CO_2 intensity decrease; as with total emissions, this decrease is greatest for Strategy E and least for Strategy B.

The volume of water used and water consumed by thermal generating facilities increase for the four alternative strategies. The increases in the volume of water used are mostly less than 5 percent and greatest for Strategy B and least for Strategy E. The percent increases in the volume of water consumed are considerably larger as new thermal facilities are anticipated to use closed-cycle cooling. Water consumption under strategies B and C is similar and greater than under Strategy E.

Coal consumption, and consequently its related fuel cycle impacts resulting from mining, processing, and transportation, decreases under all of the alternative strategies. These decreases, and the resulting decreases in fuel cycle impacts, are greatest for Strategy E and least for Strategy B. Nuclear fuel cycle impacts are similar for strategies B, C, and R, which are all greater than those of Strategy E. Natural gas fuel cycle impacts are somewhat greater for Strategy E than for strategies B, C, and R.

The production of coal ash decreases under all strategies, and the decrease is proportional to the amount of coal capacity idled. Consequently, ash production impacts would be greatest under Strategy B and least under Strategy E. The production of scrubber waste, and the impacts associated with its disposal, increases the most under Strategy B and the least under Strategy E. The amount of radioactive waste produced increases under all alternative strategies in proportion to the nuclear generating capacity added. The amounts are somewhat greater for strategies B, C, and R than for Strategy E.

Land requirements for implementing the alternative strategies, and thus the potential for affecting land resources, vary with the capacity and types of new generating facilities. Excluding renewable generation, the land area required for generating facility construction is greatest for Strategy C (average of 1,674 acres for the four scenarios), followed by Strategy R (1,525 acres), Strategy B (1,059 acres), and Strategy E (755 acres). The 750 acres required for a pumped storage facility. included in Strategies C and R, is the largest component of the facility land requirements. When renewable generation is included, the land requirements are greatest for Strategy E and least for Strategy B. Life-cycle land requirements, which include land required for fuel production and processing, as well as buffer areas around facilities, are greatest for Strategy E and least for Strategy B.