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Scenario Examples

Technical Workshop on Evaluating Demand Forecasts and
Least-Cost Expansion Plans

Lusaka, Zambia

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Eastern Interconnection Planning Scenarios

- 8 “futures” were developed for the Eastern Interconnection, which is roughly the eastern 2/3 of the U.S. and Canada.
 - based on a consistent set of assumptions on technologies, policies, and costs
 - each future was designed to be different from the others and was intended to model how the industry may evolve over time
- Each future had additional sensitivities.
 - designed to change a single input from the base future



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Alternative Futures

Future	Label	Definitions
1	BAU	Business as usual scenario
2	CO ₂ /N	High CO ₂ cost scenario, national implementation
3	CO ₂ /R	High CO ₂ cost scenario, regional implementation
4	EE/DR	Aggressive energy efficiency (EE), demand response (DR), and distributed generation (DG)
5	RPS/N	National renewable portfolio standard (RPS), national implementation
6	RPS/R	National RPS, regional implementation
7	NUC	Nuclear resurgence
8	CO ₂ +	High CO ₂ costs scenario with aggressive EE, DR, DG, and nationally implemented RPS



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Sensitivities

Sensitivities	Future 1: BAU	Future 2: CO ₂ /N	Future 3: CO ₂ /R	Future 4: EE/DR	Future 5: RPS/N	Future 6: RPS/R	Future 7: NUC	Future 8: CO ₂ +
Expand transmission	√	√	√		√	√	√	√
+/- Load growth	√	√	√		√	√	√	
+/- Gas price	√	√	√		√	√		√
+/- Renewable cost or deploy	√	√	√		√	√		√
Delay regulations	√							
CO2 Cost Adjust		√	√				√	√
PHEV variations				√	√	√		
Extra EE savings				√				
Clean Energy Standard					√	√		
Small Modular Reactors							√	
Higher RPS limits								√



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Scenarios Used for Transmission Plans

- Generation expansion plans were developed for all futures and sensitivities.
- Three of those were selected as scenarios for the development of transmission plans.
 - Scenario 1 was based on the combined policies of Future 8.
 - Scenario 2 was based on a regionally implemented renewable portfolio standard from Future 6.
 - Scenario 3 was based on a sensitivity from the business as usual in Future 1.



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Transmission Costs by Scenario

- Scenarios 1 and 2 had significantly higher transmission build costs due to the larger wind generation capacity.

	All Costs in \$2010 Billions											
	Total Scenario Costs		Generation Interconnection Project Costs		Constraint Relief Project Costs						Voltage Support Project Costs	
					Total		Task 7		Task 8			
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Scenario 1	\$81.75	\$115.16	\$38.95	\$60.16	\$42.41	\$54.41	\$39.35	\$50.76	\$3.06	\$3.65	\$0.38	\$0.59
Scenario 2	\$55.06	\$79.67	\$44.68	\$63.98	\$10.33	\$15.59	\$9.26	\$14.22	\$1.07	\$1.38	\$0.06	\$0.10
Scenario 3	\$12.27	\$18.50	\$5.18	\$9.50	\$6.95	\$8.81	\$5.84	\$7.39	\$1.11	\$1.42	\$0.13	\$0.18



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Generation Capital Costs by Scenario

Fuel Type	Total Cost (2010\$ B)	Total Cost (2010\$ B)	Total Cost (2010\$ B)
	S1	S2	S3
Biomass	\$5.8	\$72.2	\$9.1
CC	\$105.5	\$31.5	\$61.6
CT	\$4.0	\$15.4	\$10.0
Coal	\$0.0	\$0.2	\$0.0
Geo-Thermal	\$0.0	\$0.0	\$0.0
Hydro	\$15.3	\$20.2	\$2.2
LFG	\$7.0	\$7.0	\$6.4
Nuclear	\$143.8	\$11.8	\$11.4
Pumped Storage	\$0.0	\$0.0	\$0.0
PV	\$23.2	\$25.7	\$25.2
Solar	\$0.2	\$0.2	\$0.2
STOG	\$0.3	\$0.8	\$0.8
Steam Wood	\$1.3	\$1.3	\$0.4
Wind	\$554.0	\$321.0	\$107.3
IGCC	\$0.0	\$0.0	\$0.0
Wind OFFS	\$7.6	\$172.0	\$7.6
Total EI	\$ 868.1	\$ 679.4	\$ 242.3

- Scenarios 1 and 2 have higher generation capital costs as well.



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Scenarios From AES Indiana's IRP

- No Environmental Action
 - Relaxed environmental regulation and no subsidies for renewables
- Current Trends
 - Most likely future environmental regulations including the recently extended tax credits for renewables
- Aggressive Environmental
 - Carbon tax starting in 2028 and additional extension of tax credit for renewables
- Decarbonized Economy
 - Renewable portfolio standard requiring most generation coming from renewables



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Scenario Parameters From AES Indiana IRP

Scenario	Load	Electric vehicles	Distributed PV	Natural gas price	NOx price	Tax credits	CO2 price
No Environmental Action	Low	Low	Low	Base	Low	Expire	None
Current Trends	Base	Base	Base	Base	Base	Extend for 5 years	Base
Aggressive Environmental	High	High	High	High	High	Extend for 10 years	High
Decarbonized Economy	High	Very high	High	Base	High	Extend indefinitely	None*

* Instead of a CO2 price, a RPS starting at 11% and growing to 85% over 20 years is used.