



# JCSP 2008

## Economic Transmission Development

March 2, 2009  
FERC Technical Conference, AD09-4-000  
*Integrating Renewable Resources into  
the Wholesale Electric Grid*

Mr. Clair Moeller  
Midwest ISO – Vice President,  
Transmission Asset Management

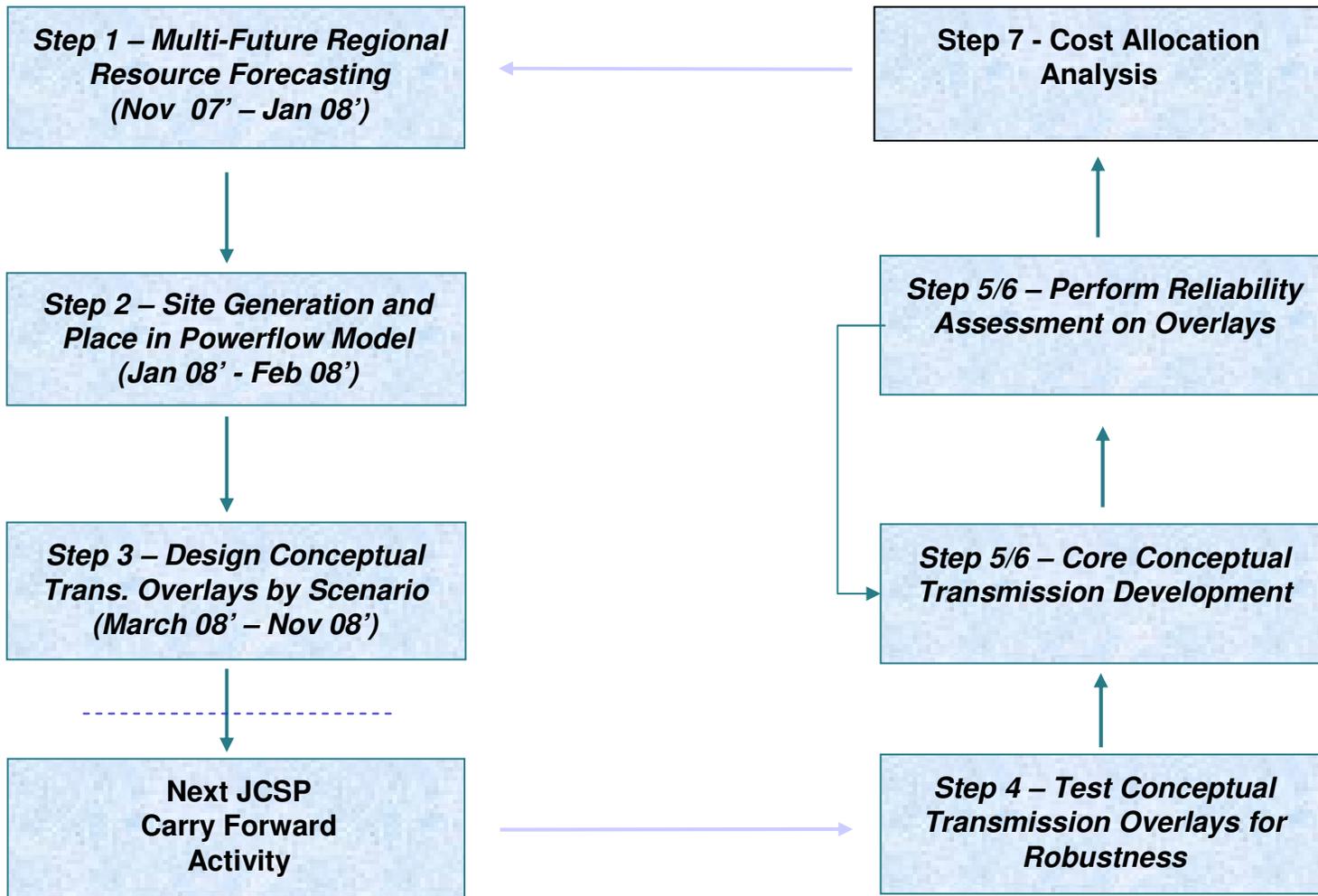


# Joint Planning Initiatives

- ▶ Joint Coordinated System Plan (JCSP 2008)
  - Midwest ISO
  - SPP
  - PJM
  - TVA
  - MAPP
  - Other Interested parties
- ▶ Performed in Coordination with DOE Eastern Wind Integration Transmission Study (EWITS)
- ▶ Reference Future
  - Models the Status Quo. This future models the power system as it exists today with reference values and trends based on recent historical data while preserving existing standards for resource adequacy, existing renewable mandates and environmental legislation.
- ▶ 20% Wind Mandate Future
  - Requires 20% of the energy consumption come from wind by 2024. Regional Capacity Factors of new units applied toward mandate, and 15% of Maximum Capacity counted toward Reserve Margin Calculations. Existing Wind mandates accounted for in Reference Future are applied to all futures.

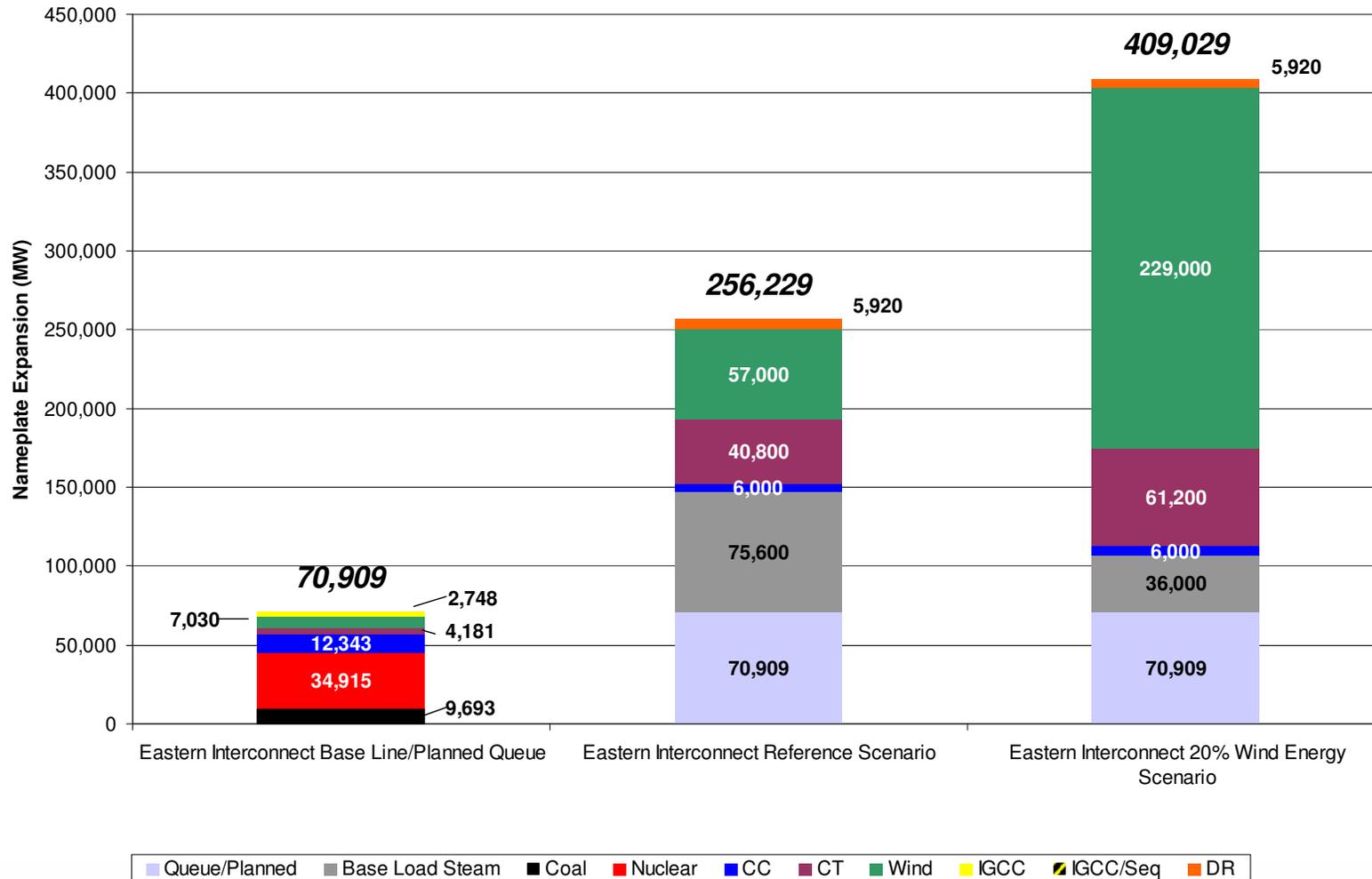


# JCSP Economic Assessment Process

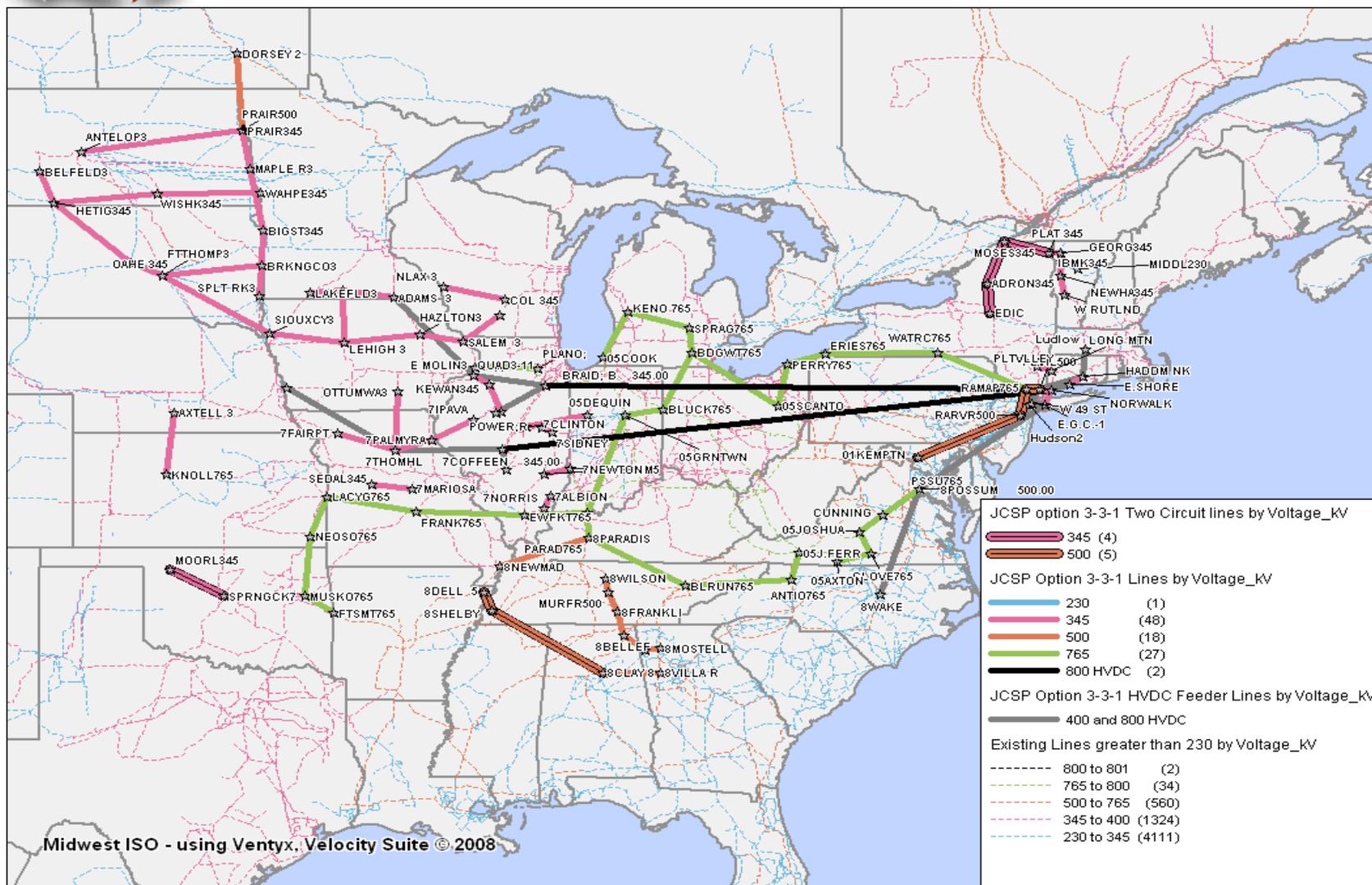


# Capacity Additions By Resource Type

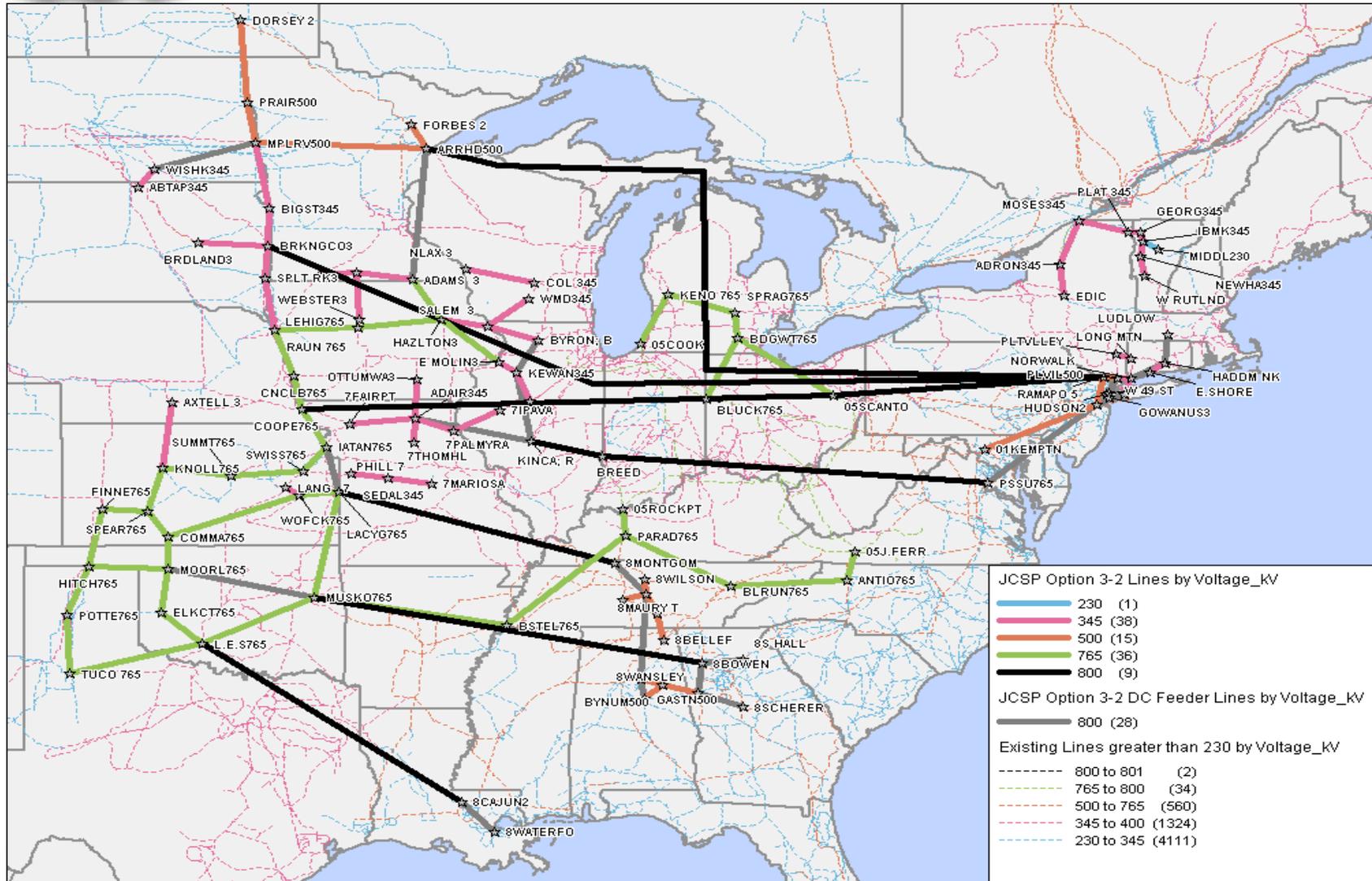
Generation Nameplate Expansion 2008-2024



# Reference Case - Overlay



# 20% Wind Energy - Overlay



# Highlights

## Reference Case

Cost: \$50 billion

B/C: 1.4\*

AC Line Miles (70%)

345kV – 3,400

500kV – 1,100

765kV – 2,600

DC Line Miles (30%)

400kV – 500

800kV – 2,400

Total –10,000 (approximate)

## 20 % Wind Energy Case

Cost: \$80 billion

B/C: 1.7\*

AC Line Miles (50%)

345 – 2,200

500 – 1,100

765 – 4,000

DC Line Miles (50%)

400 – 0

800 – 7,500

Total –15,000 (approximate)



\* Benefits and costs subject to substantial change

# Looking Forward

- ▶ Develop formal Charter
- ▶ Expand to include Regulators
- ▶ Name change to proposed Eastern Interconnection Transmission Assessment Group
- ▶ Expand the number of scenarios
- ▶ Request funding from participants to be able to explore a broader range of scenarios
- ▶ Perform reliability assessment on the overlays
- ▶ Refine costs and benefits



## Questions?

For additional information and future updates  
go to: <http://www.jcspstudy.org/>



		Reference Scenario		Wind Scenario	
			Percentage		Percentage
Transmission Overlay (Miles)	EHV AC (>=345kV)	7,109	71%	6,898	48%
	HV AC (<345kV)				
	HV DC	2,870	29%	7,582	52%
	<b>Total</b>	<b>9,979</b>	<b>100%</b>	<b>14,480</b>	<b>100%</b>
New Generation Expansion Capacity (MW)	Wind	58,000	31%	229,000	67%
	Base Load Steam	76,800	40%	37,200	11%
	Gas CT	49,200	26%	69,600	20%
	Gas CC	4,800	3%	4,800	1%
	Other Fossil	1,200	1%	1,200	0%
<b>Total</b>	<b>190,000</b>	<b>100%</b>	<b>341,800</b>	<b>100%</b>	
Energy Production (TWH)	Wind	242	6%	764	18%
	Base Load Steam	2,160	54%	1,741	42%
	Gas	210	5%	301	7%
	Other	1,356	34%	1,371	33%
	<b>Total</b>	<b>3,968</b>	<b>100%</b>	<b>4,177</b>	<b>100%</b>
Transmission Capital Cost (2024 million \$)	Transmission - overlay	42,159		72,825	
	Transmission – substations	6,401		7,074	
Overnight Construction Costs for Capacity Added through 2024 (2024 million \$)	Generation – Wind	176,009	26%	648,813	62%
	Generation – Base Load Steam	250,882	37%	134,401	13%
	Generation – Gas	68,317	10%	87,861	8%
	Generation – Other	179,138	27%	179,138	17%
	<b>Total</b>	<b>674,346</b>	<b>100%</b>	<b>1,050,213</b>	<b>100%</b>
2024 Production Cost and Savings (2024 million \$)	<b>Total Energy Production Cost</b>	<b>104,294</b>		<b>85,167</b>	
	<b>Total Production Cost Savings from Constrained Case</b>	<b>10,624</b>		<b>20,362</b>	