Eastern Wind Integration and Transmission Results

Asia Pacific Partnership –

Wind Electric Generation and Grid Integration Workshop

Montreal, QC Canada

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Utility Wind Integration Group

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Executive Director
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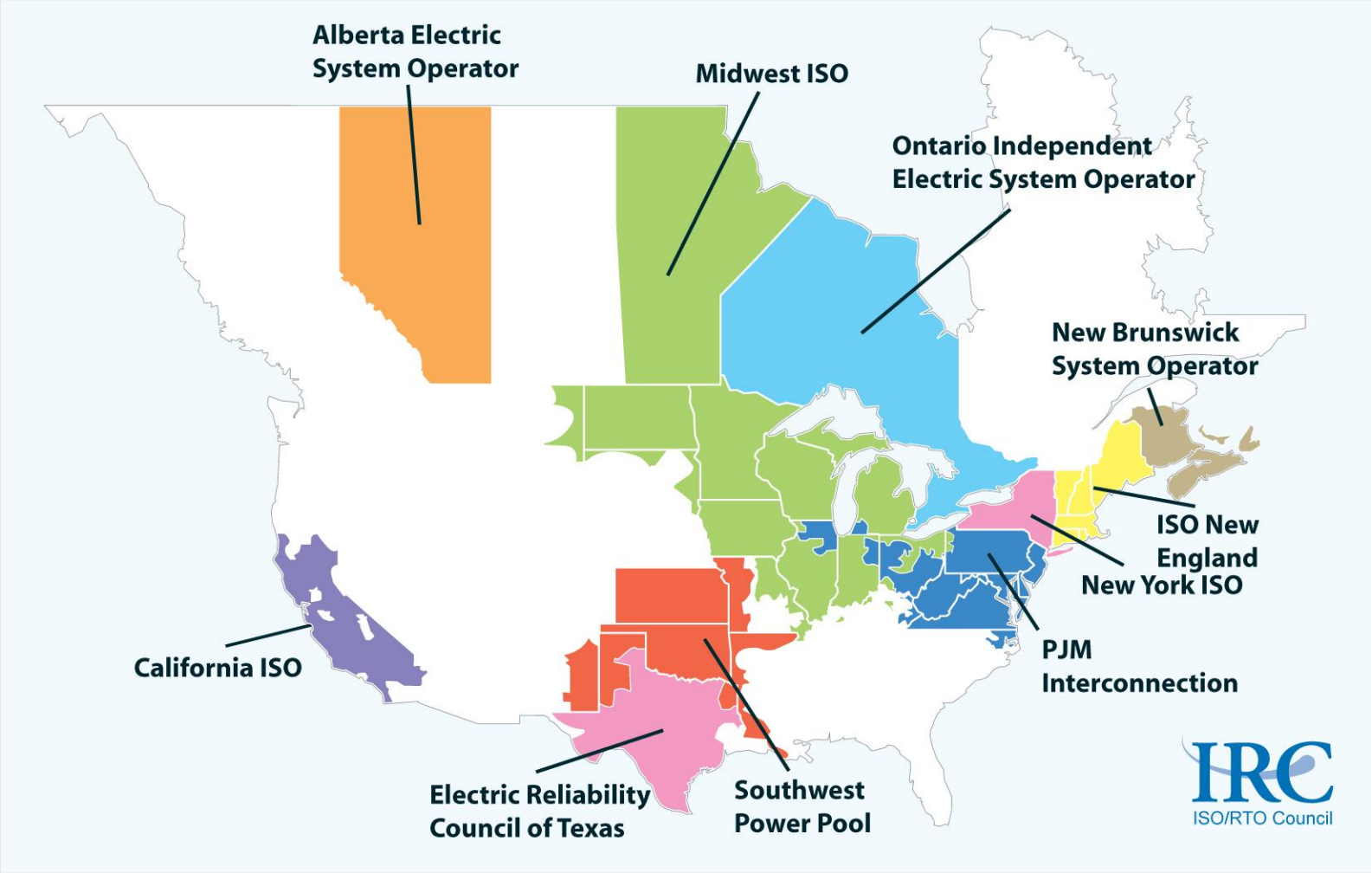
ISOs/RTOs in North America



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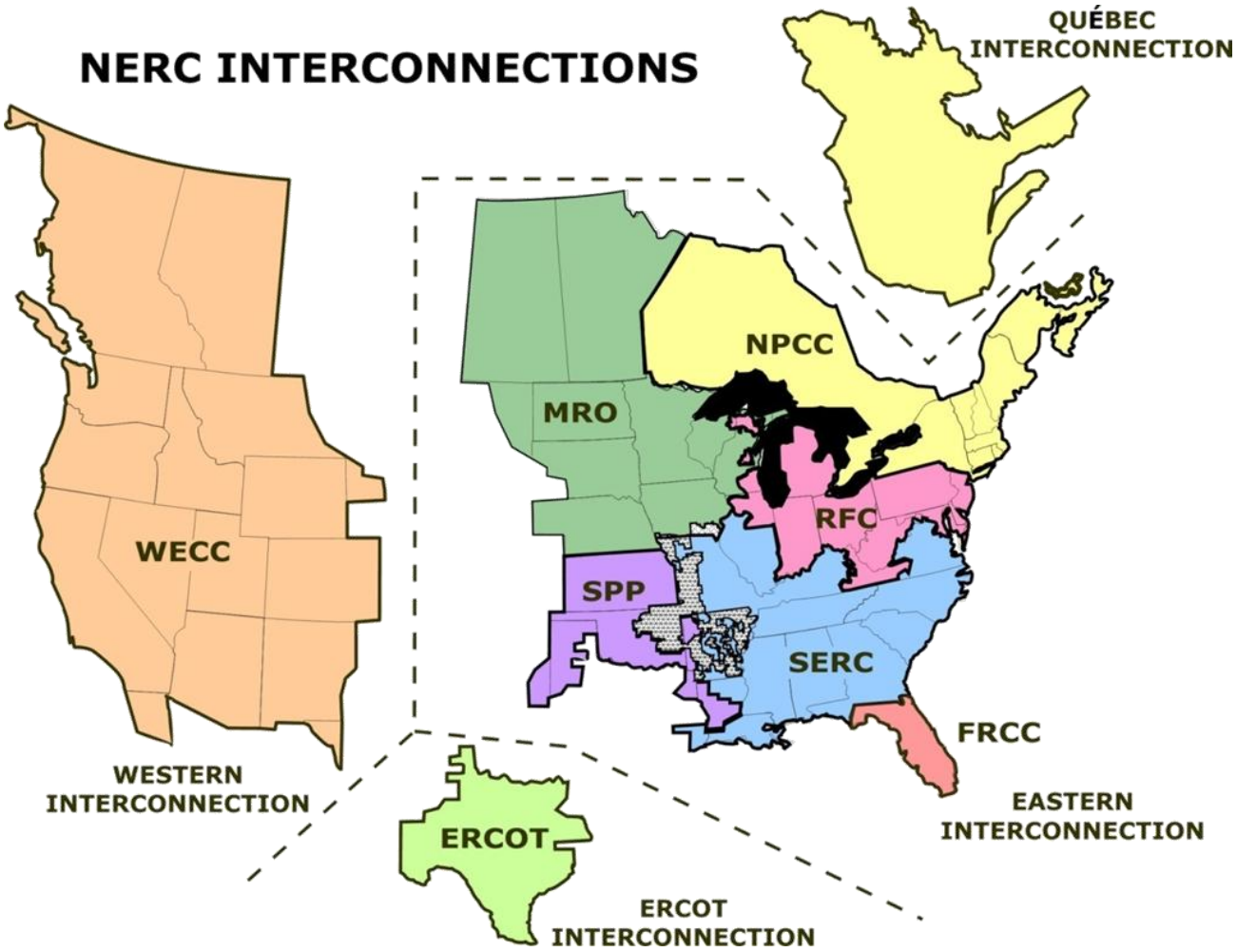
North American Interconnections



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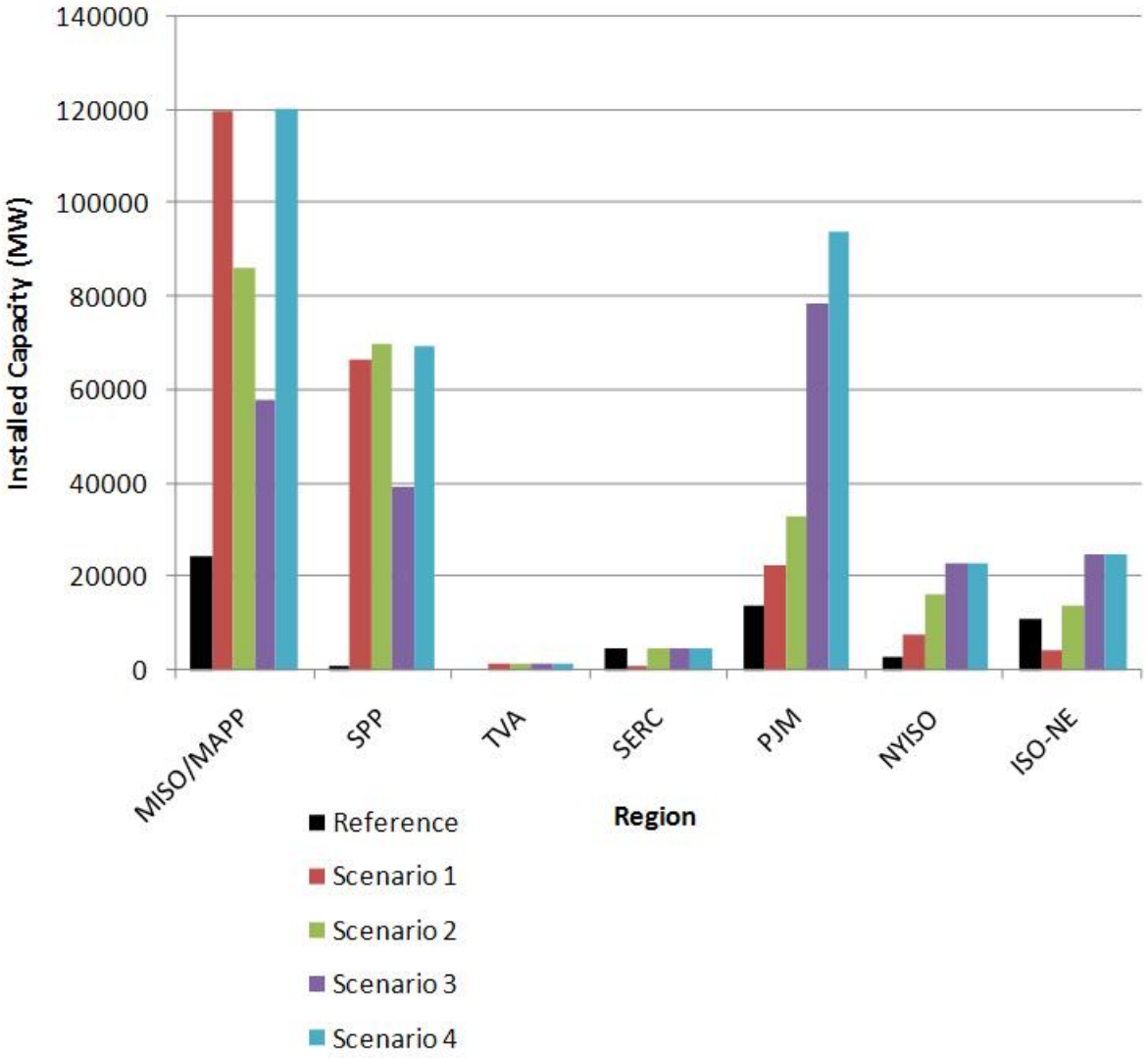
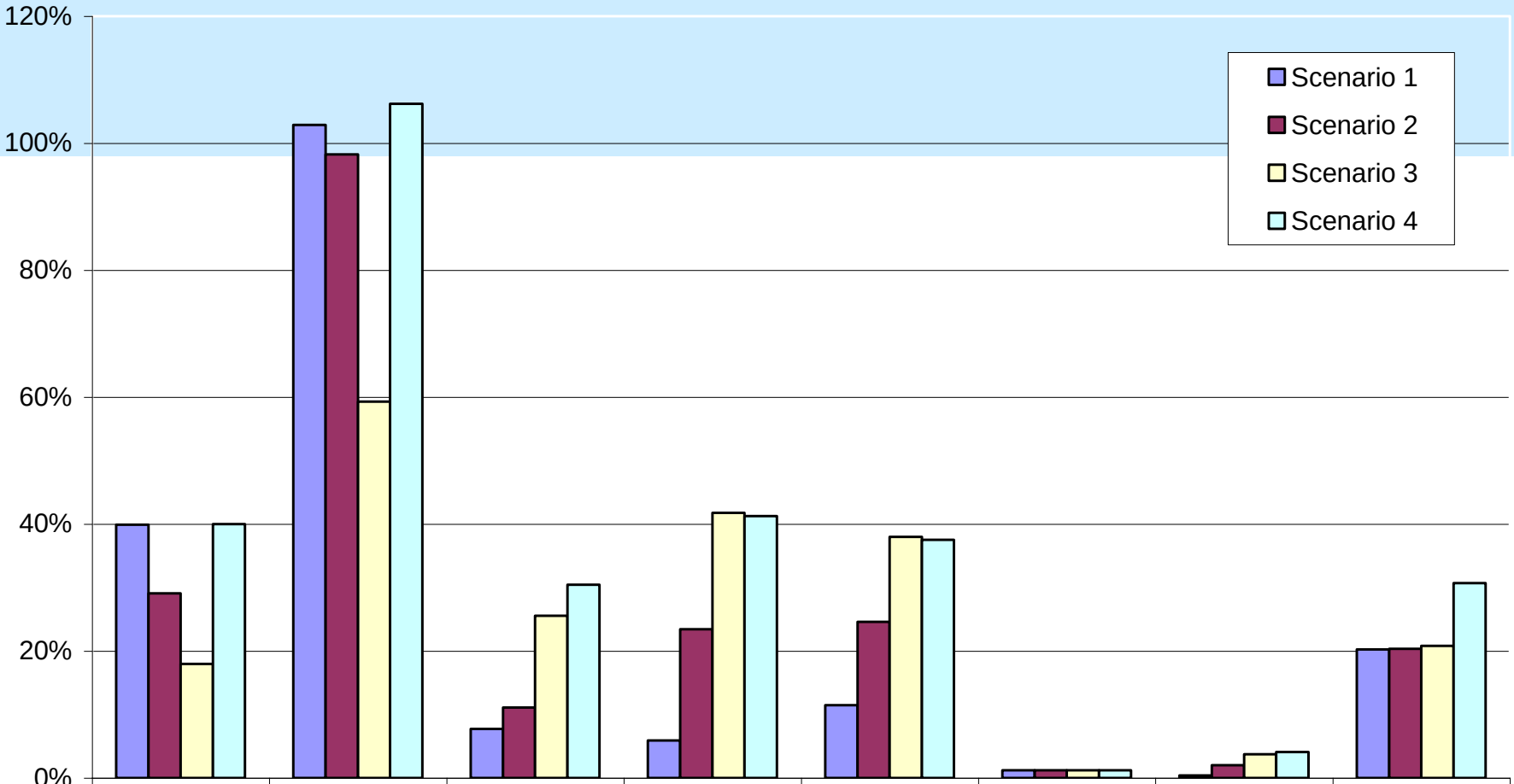
Eastern Wind Integration and Transmission Study (EWITS) Scenarios



EWITS Wind Penetrations by Scenario

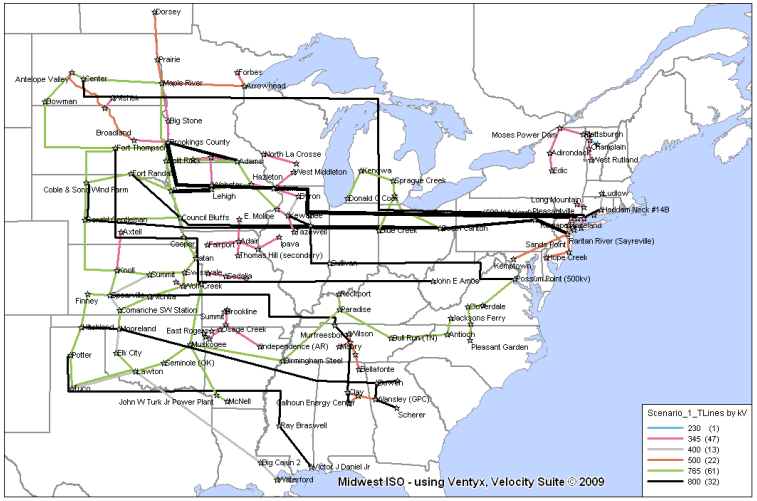


	MISO+MAPP	SPP	PJM	ISONE	NYISO	TVASUB	SERCNI	Total Footprint
Scenario 1	39.9%	102.9%	7.8%	5.9%	11.5%	1.2%	0.4%	20.3%
Scenario 2	29.1%	98.2%	11.1%	23.4%	24.6%	1.2%	2.0%	20.4%
Scenario 3	18.0%	59.3%	25.6%	41.8%	38.0%	1.2%	3.7%	20.8%
Scenario 4	40.0%	106.2%	30.5%	41.3%	37.5%	1.2%	4.1%	30.7%

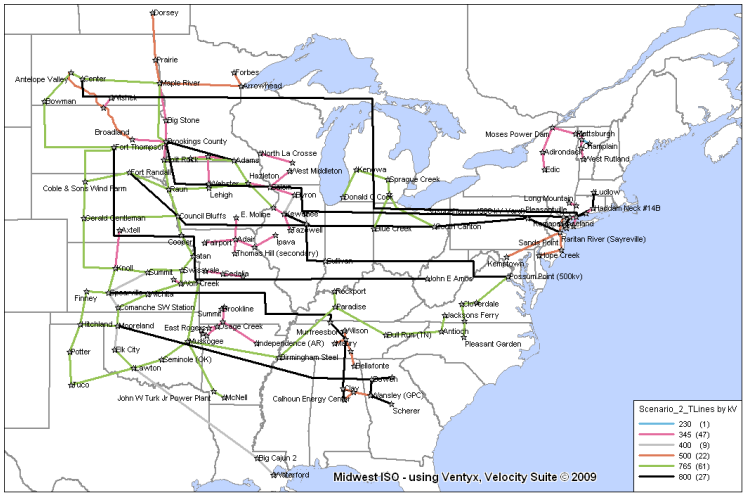
Region

Overlays for 4 Scenarios

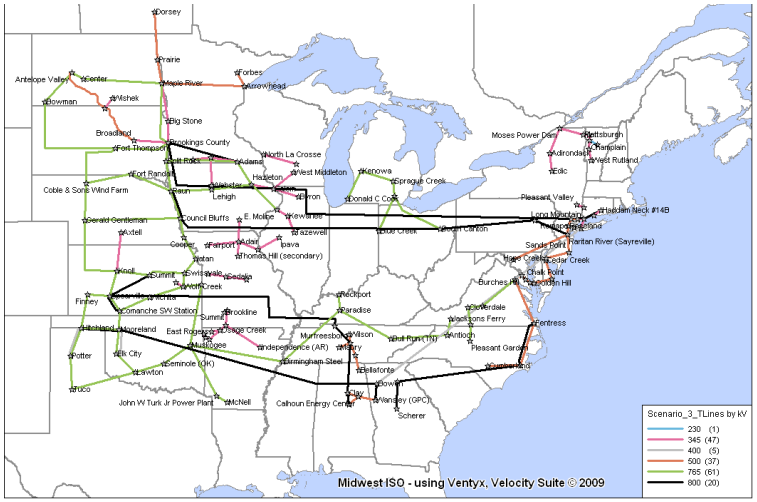
Scenario 1



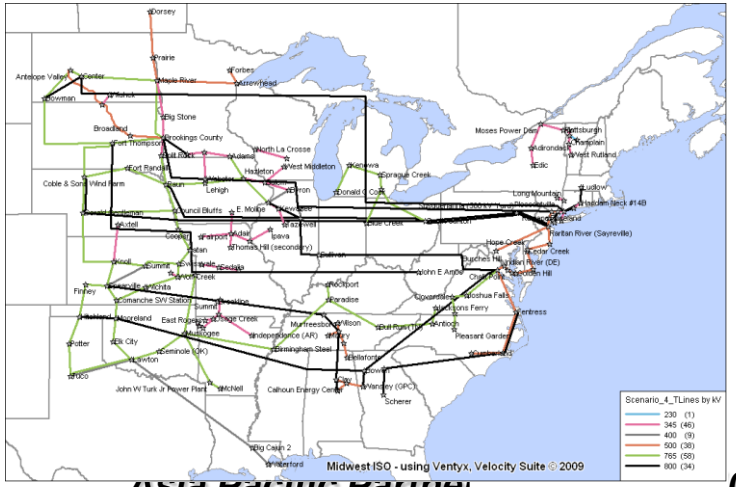
Scenario 2



Scenario 3



Scenario 4



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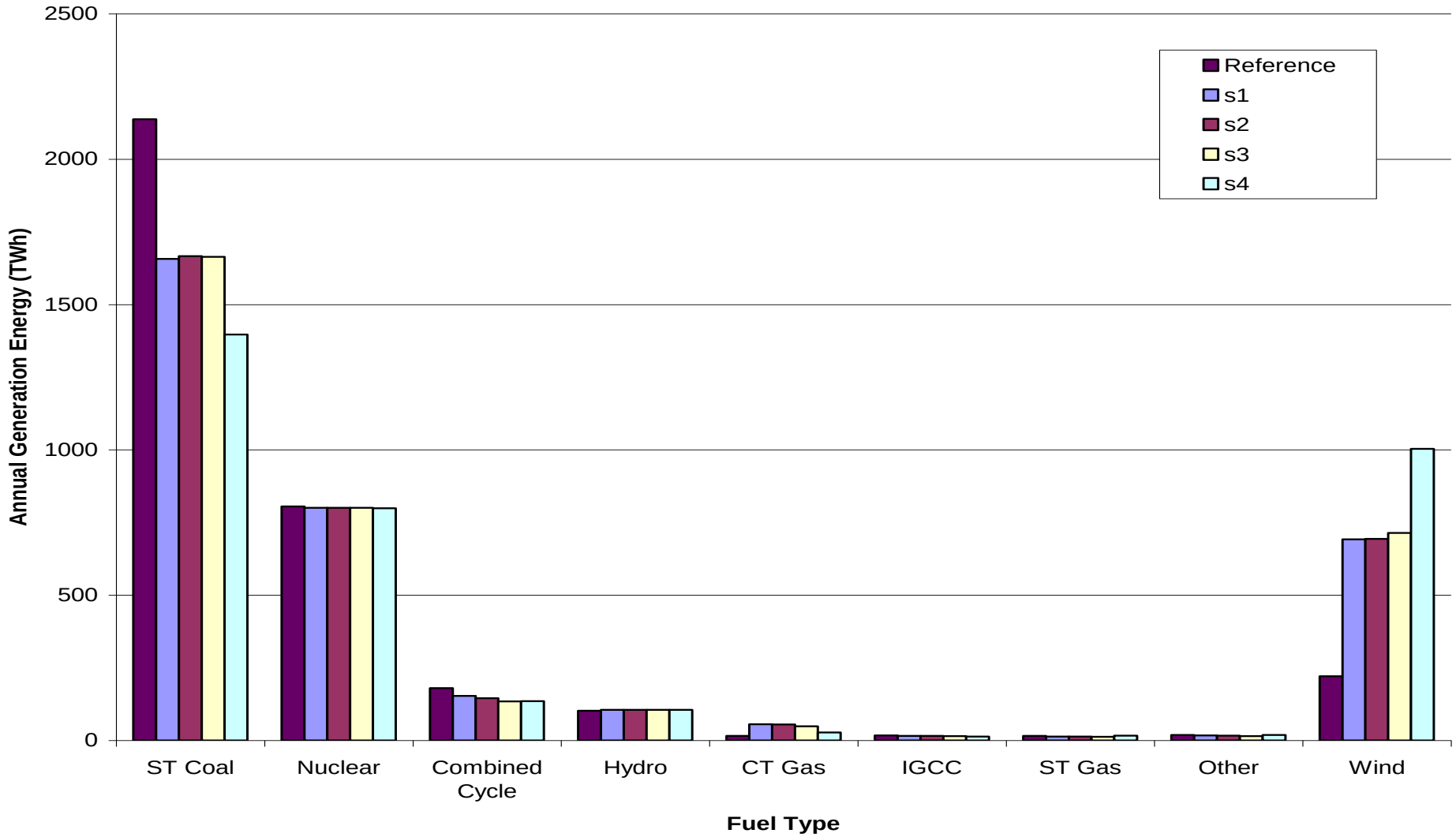
Generation Displaced



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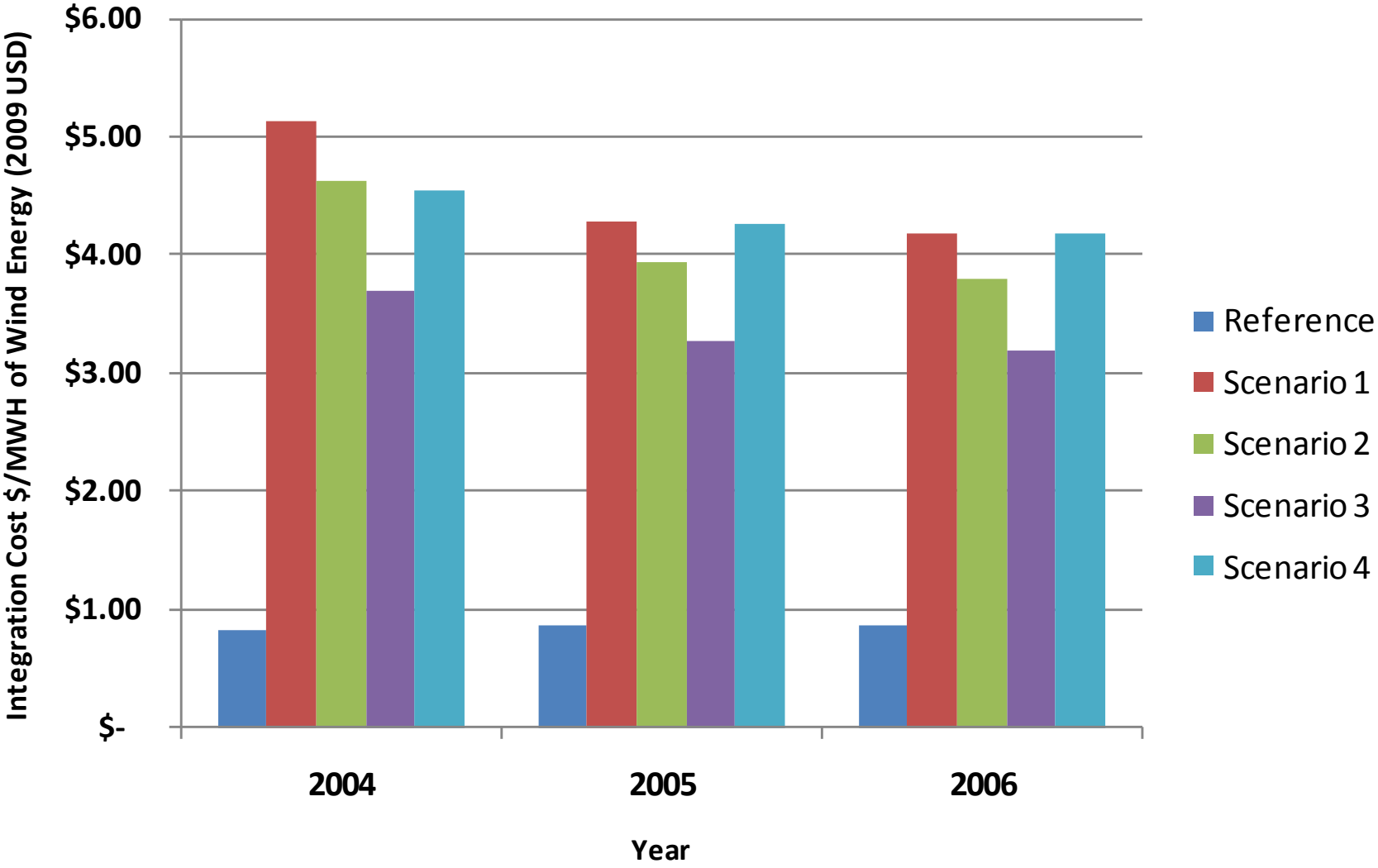
Wind Integration Costs



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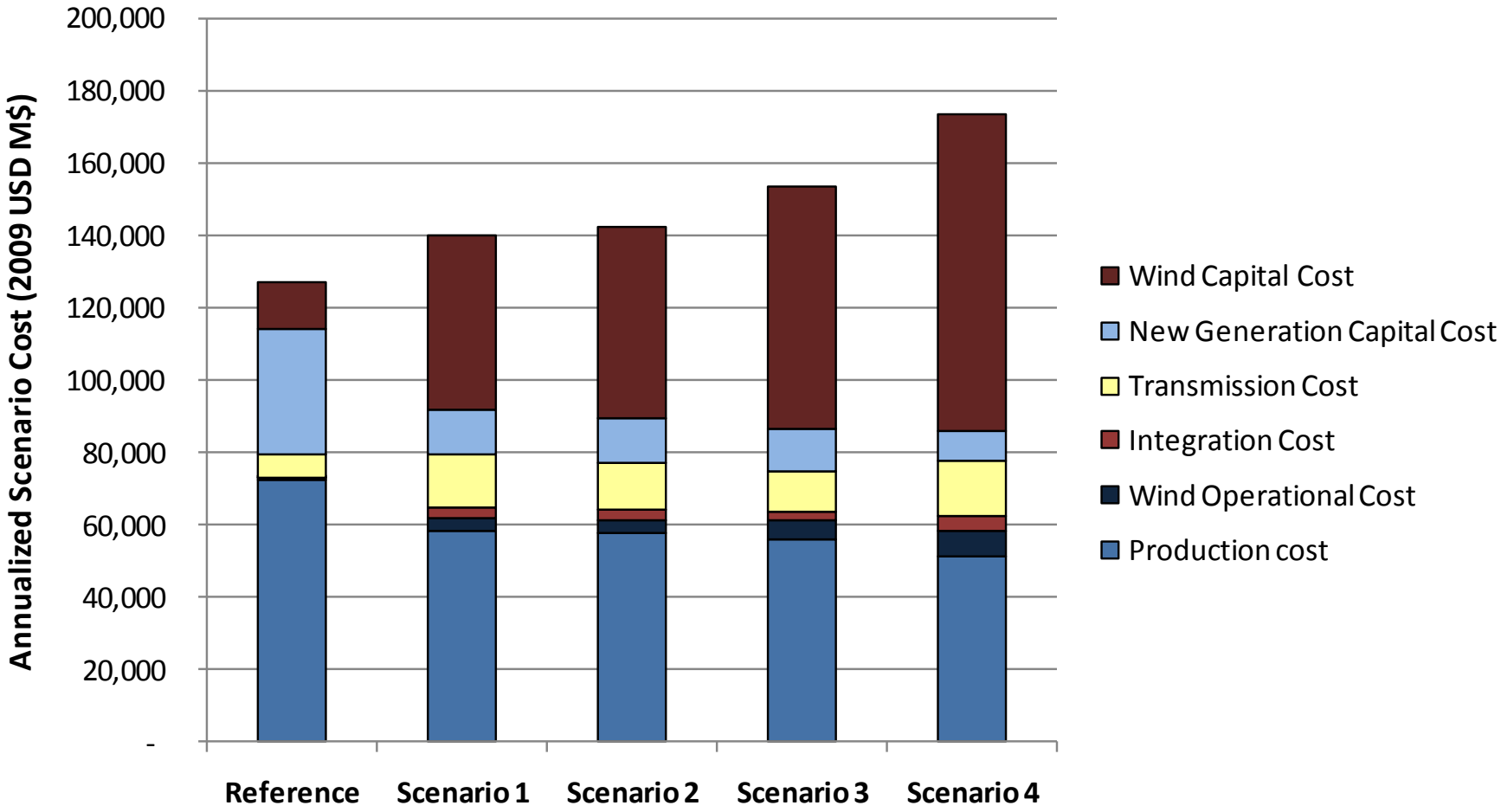
Total Scenario Cost



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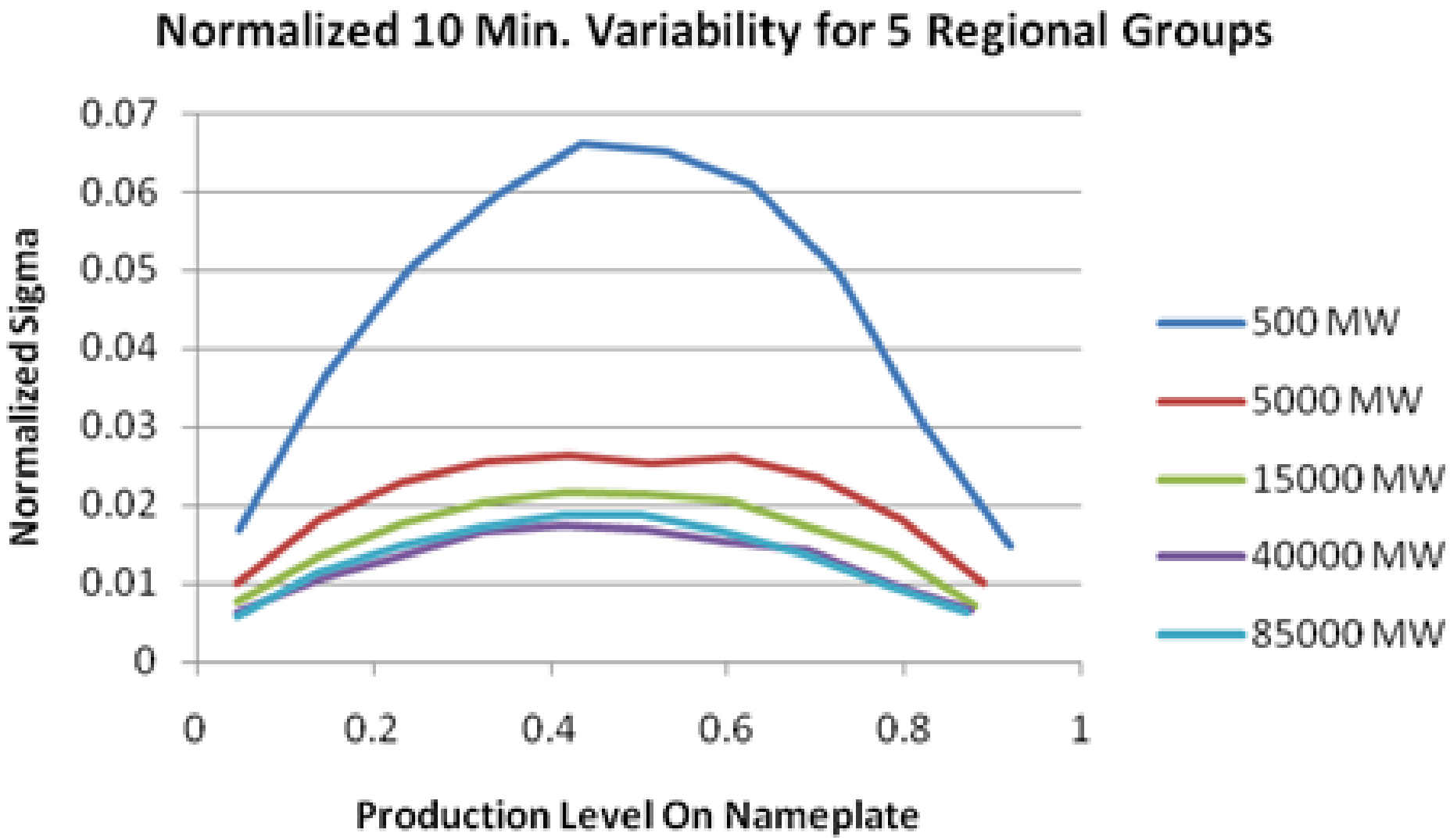
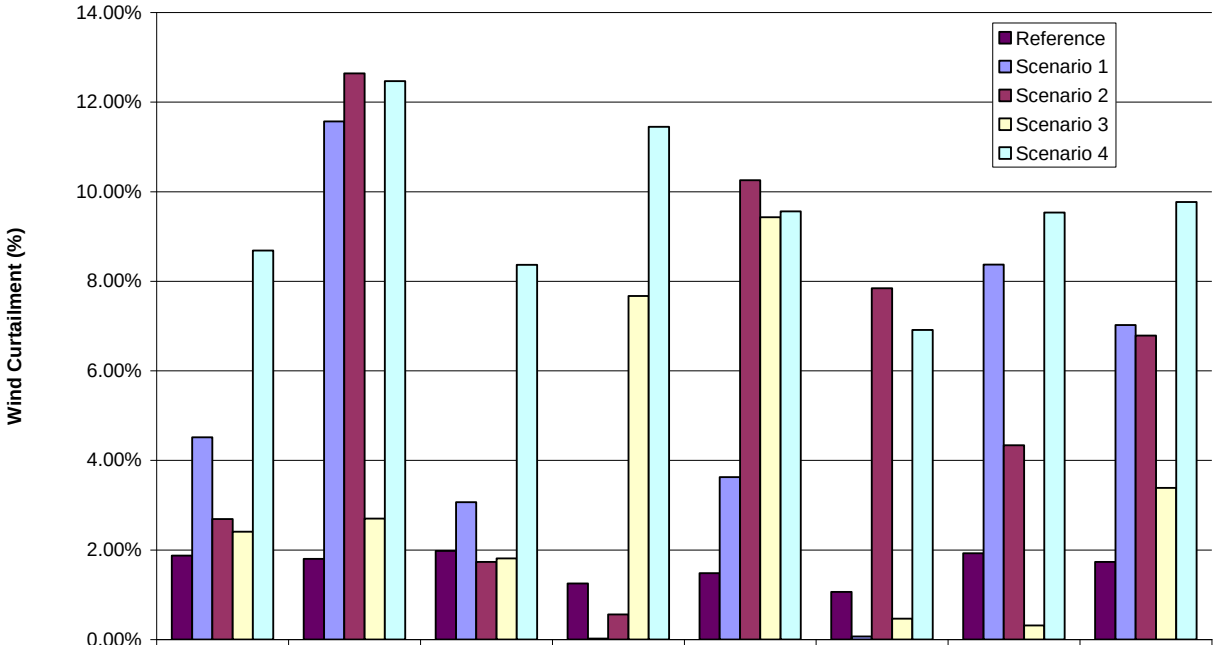
EWITS Variability With Aggregation Level



Curtailment by Scenario and Region

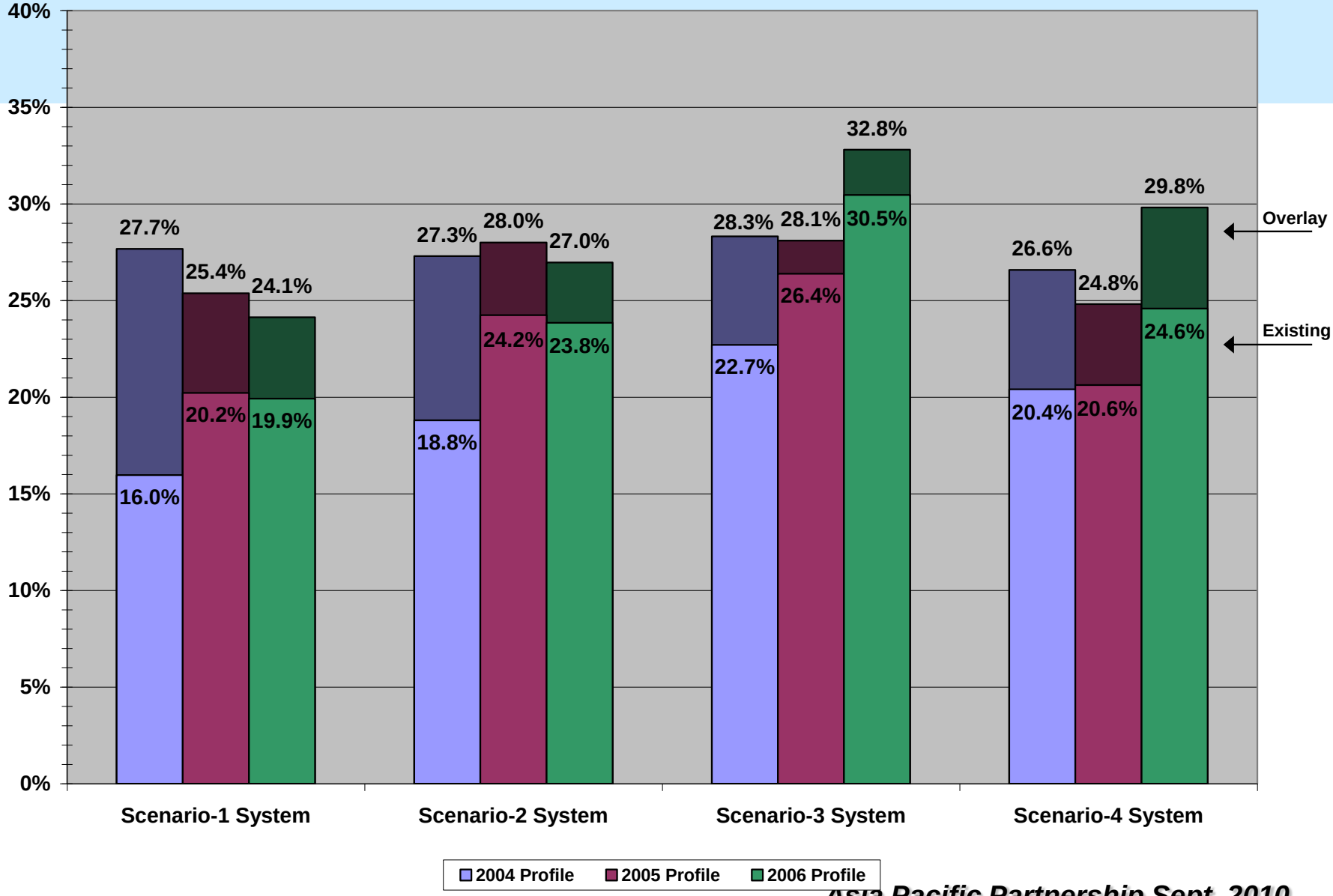
- Possible reasons for curtailment:
  - Transmission congestion
  - Minimum generation
  - Ramp/reserve limitations
- SPP curtailment high in all but S3
- "Local Wind" S3 has lowest curtailment across footprint
- Curtailment causes explored in sensitivity cases



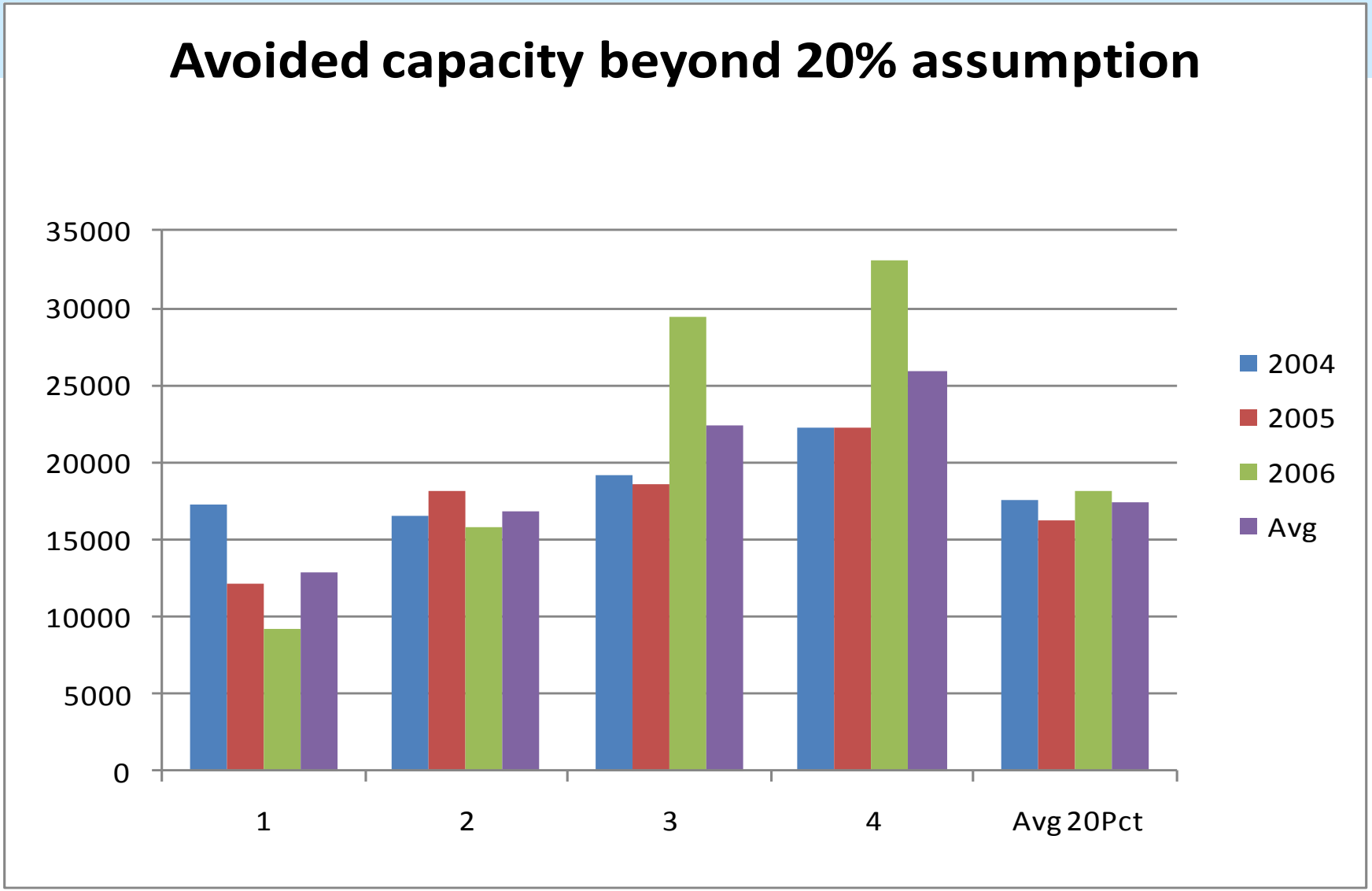
	MISO/MAPP	SPP	PJM	ISONE	NYISO	SERCNI	TVASUB	Total Footprint
Reference	1.87%	1.80%	1.98%	1.25%	1.48%	1.06%	1.93%	1.73%
Scenario 1	4.51%	11.57%	3.07%	0.02%	3.63%	0.07%	8.37%	7.02%
Scenario 2	2.69%	12.64%	1.73%	0.56%	10.25%	7.84%	4.34%	6.79%
Scenario 3	2.41%	2.70%	1.81%	7.67%	9.43%	0.47%	0.32%	3.39%
Scenario 4	8.69%	12.46%	8.37%	11.45%	9.56%	6.91%	9.53%	9.77%

Study System ELCC Scenarios (1 - 4)

Existing & Overlay Transmission Tie Limits - ELCC (%) {Shaded Area shows Increased ELCC of Overlay}



Wind with Transmission Can Reduce Other Generation Builds



System Planning and Operation Recommendations

- Perform detailed wind integration studies
- Deploy more flexible generation and load technologies
- Improve wind plant output forecasting tools
- Improve grid codes and wind plant models
- Aggregate wind plant output over large regions
- Improve balancing area cooperation and ACE sharing
- Recognize wind contributions to capacity value
- Create ongoing forums to share operating experience

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Transmission Planning Recommendations

- Develop adequate transmission capacity – can't meet RPS goals without it
- Comprehensive regional planning processes
- Reassessment of transmission cost allocation
  - Customers in remote regions can't afford it
  - load pays in the end
- More certainty of transmission cost recovery
- More robust and flexible "smart" grid to enable participation of load and PHEV

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National Transmission Policy

- National policy debate stimulated by two activities:
  - Success of Texas CREZ process
  - Growing recognition that RPS goals cannot be met without significant transmission build-out
- Three major transmission bills proposed in US Senate last year.
- All different, but all have three common elements:
  - Interconnection-wide transmission planning
  - High voltage backbone with broad cost allocation
  - Federal backstop siting authority
- Growing recognition of critical need for transmission

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Market Operation and Transmission Policy Recommendations

- Develop well-functioning day-ahead , hour-ahead, and real-time energy and price responsive load markets and expand access to those markets
- Adopt market rules and tariff provisions that are more appropriate to weather-driven resources
  - Elimination of imbalance penalties
  - Sub-hourly scheduling is critical
- Make better use of physically (in contrast with contractually) available transmission capacity
- Eliminate pancaked rates

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and the conclusion is…

- There are no fundamental technical barriers and the cost is moderate for the integration of 20% wind energy into the electrical system, but it will not be achieved with business as usual
- There needs to be a continuing evolution of transmission planning and system operation policy and market development for this to be achieved.

For More Information

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