

# High Capacity Interregional Transmission Design Benefits, Risks and Possible Paths Forward



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## Objective

- ✦ To identify and explore possible socio-economic/political paths to building a high capacity interregional or inter-connection wide transmission as a single integrated system to provide economic and environmental benefits to the nation
- ✦ To lay out essential elements that must be addressed in the continued dialogue on this topic

## Assumed Future

- ✦ A very high percentage of future generation investment will be low GHG-emitting technologies
- ✦ A significant shift from fossil-fired technologies to low-GHG emitting renewable technologies
- ✦ Significant variation in the cost of supplied energy for each renewable and also from one renewable to another
- ✦ Reasonable, but not high distributed generation growth

## Importance for the Future Grid

- ✦ Relieves the interregional transmission grid constraints for the nation's electricity supply to meet the growing needs of economy in a cost effective and sustainable manner
- ✦ Enables more economic build out of renewables
  - Provides access to regions with rich and effective renewable production based on matured technology, known cost and characteristics
  - Encourage renewable growth in regions with promising quality renewable production
- ✦ Strengthens system resilience
  - The ability of the system to face a catastrophic event with minimal consequence, continued operation, and quick recovery
  - Post-event nodal energy price fluctuation is an indicator of energy infrastructure resilience
- ✦ Facilitate CO<sub>2</sub> emission reduction

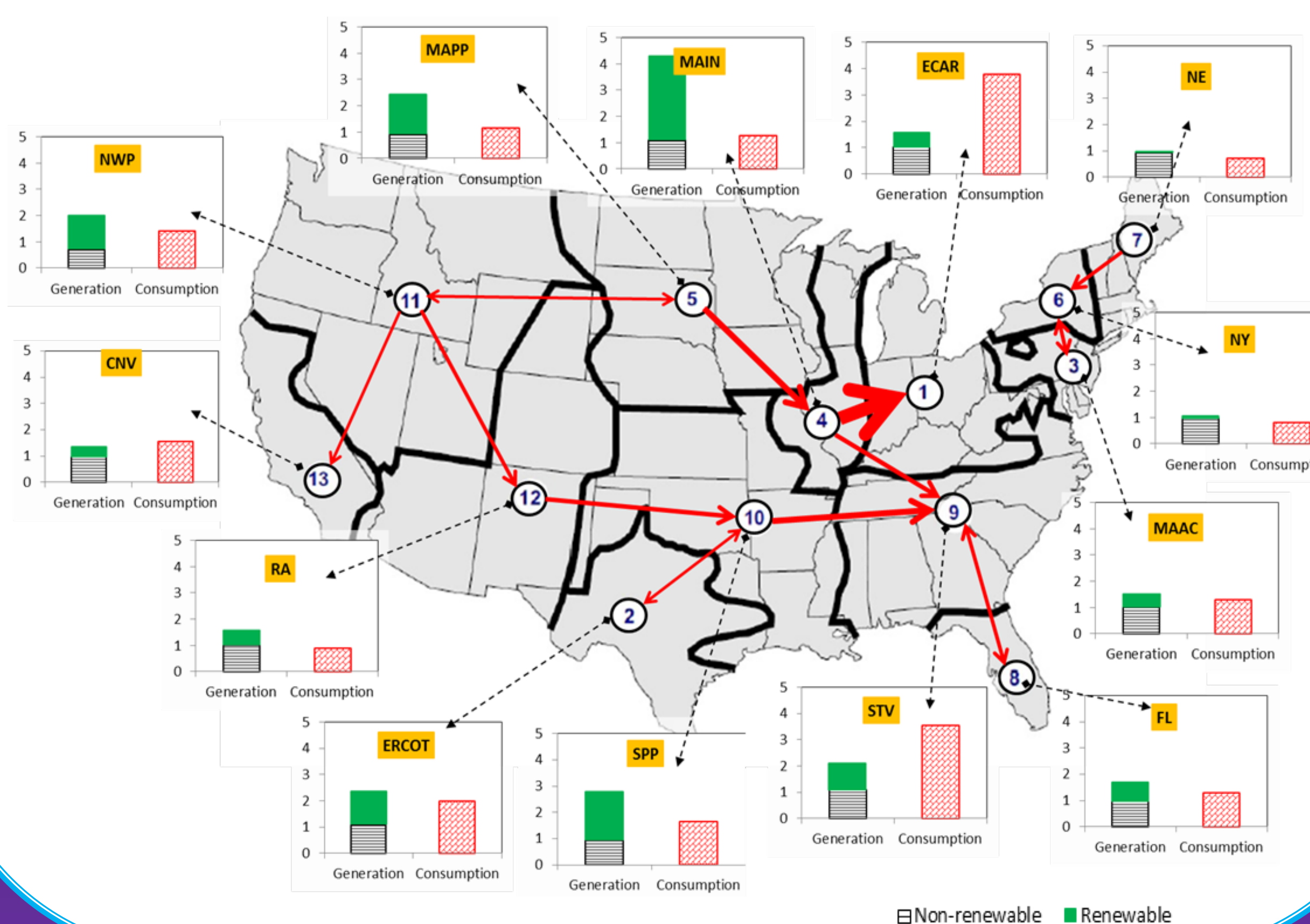
## Principal Issues Addressed

### Illustrations of Potential Benefits

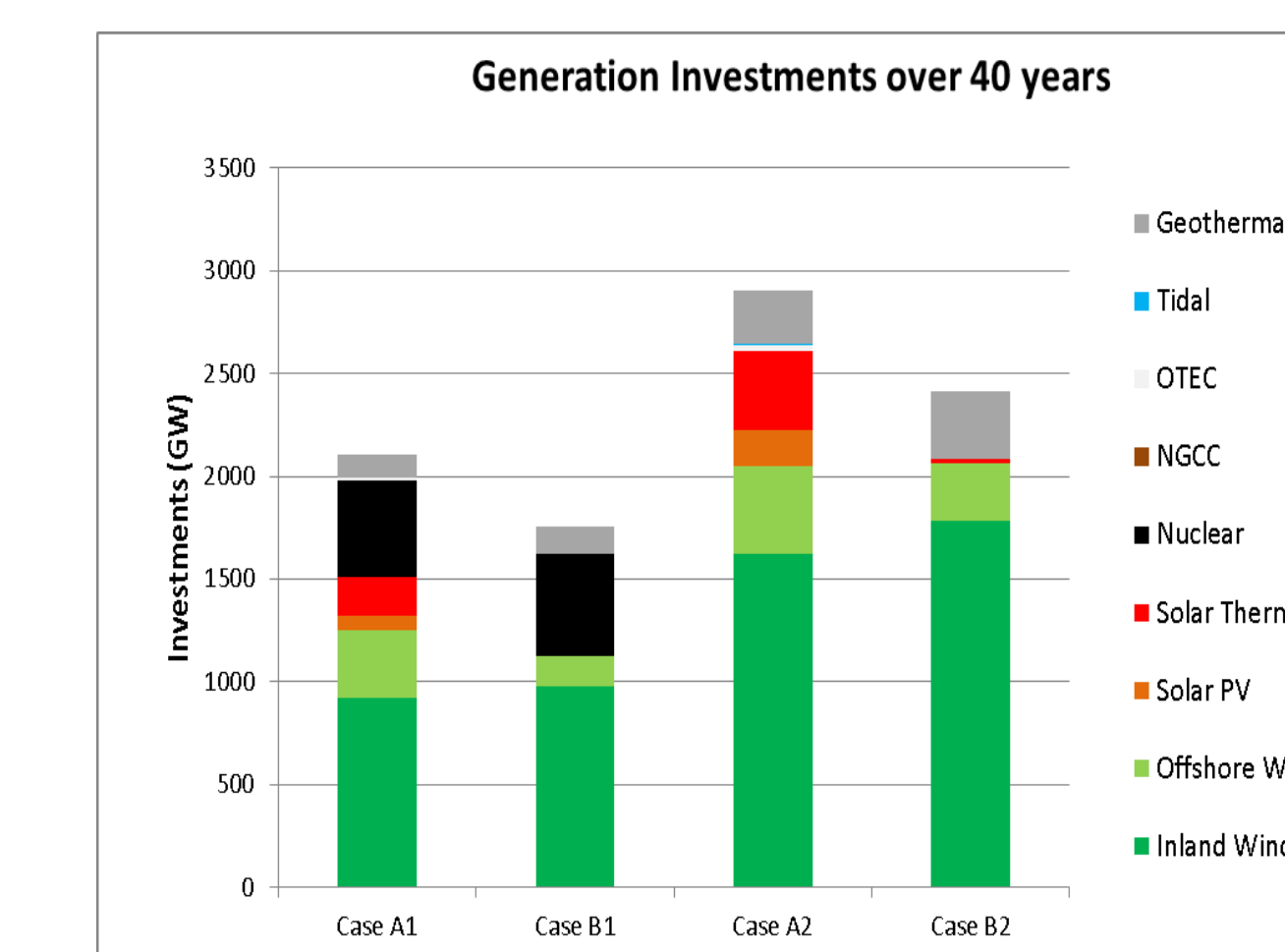
- ✦ For a given demand growth, inter-regional transmission expansion enables minimum cost generation portfolio that realizes savings over an extended period, say 40 years, relative to that of a minimum cost generation portfolio that results without the transmission overlay. This savings increases as the portfolio moves towards all renewables
- ✦ This minimum cost solutions is always better and consistent for any all renewable future portfolios under transmission expansion case, since interregional transmission facilitates accessing low cost renewables.

| Cases | Case Description                   | Transmission      | Cost (Billion \$) |
|-------|------------------------------------|-------------------|-------------------|
| A1    | Mostly Renewable, Geothermal Light | Fixed             | 5013.12           |
| B1    |                                    | Expanded          | 4773.96           |
|       |                                    | <b>Difference</b> | <b>239.16</b>     |
| A2    | All Renewable, Geothermal Light    | Fixed             | 5517.83           |
| B2    |                                    | Expanded          | 5059.38           |
|       |                                    | <b>Difference</b> | <b>458.45</b>     |
| A3    | All Renewable, No Geothermal       | Fixed             | 5328.11           |
| B3    |                                    | Expanded          | 5053.70           |
|       |                                    | <b>Difference</b> | <b>274.41</b>     |
| A4    | All Renewable, Geothermal Heavy    | Fixed             | 5457.63           |
| B4    |                                    | Expanded          | 4965.48           |
|       |                                    | <b>Difference</b> | <b>492.15</b>     |

- ✦ Under Case B1, inter-regional transmission investments over 40 year planning period facilitates cheap renewable growth in west and transfer it to load centers in the east

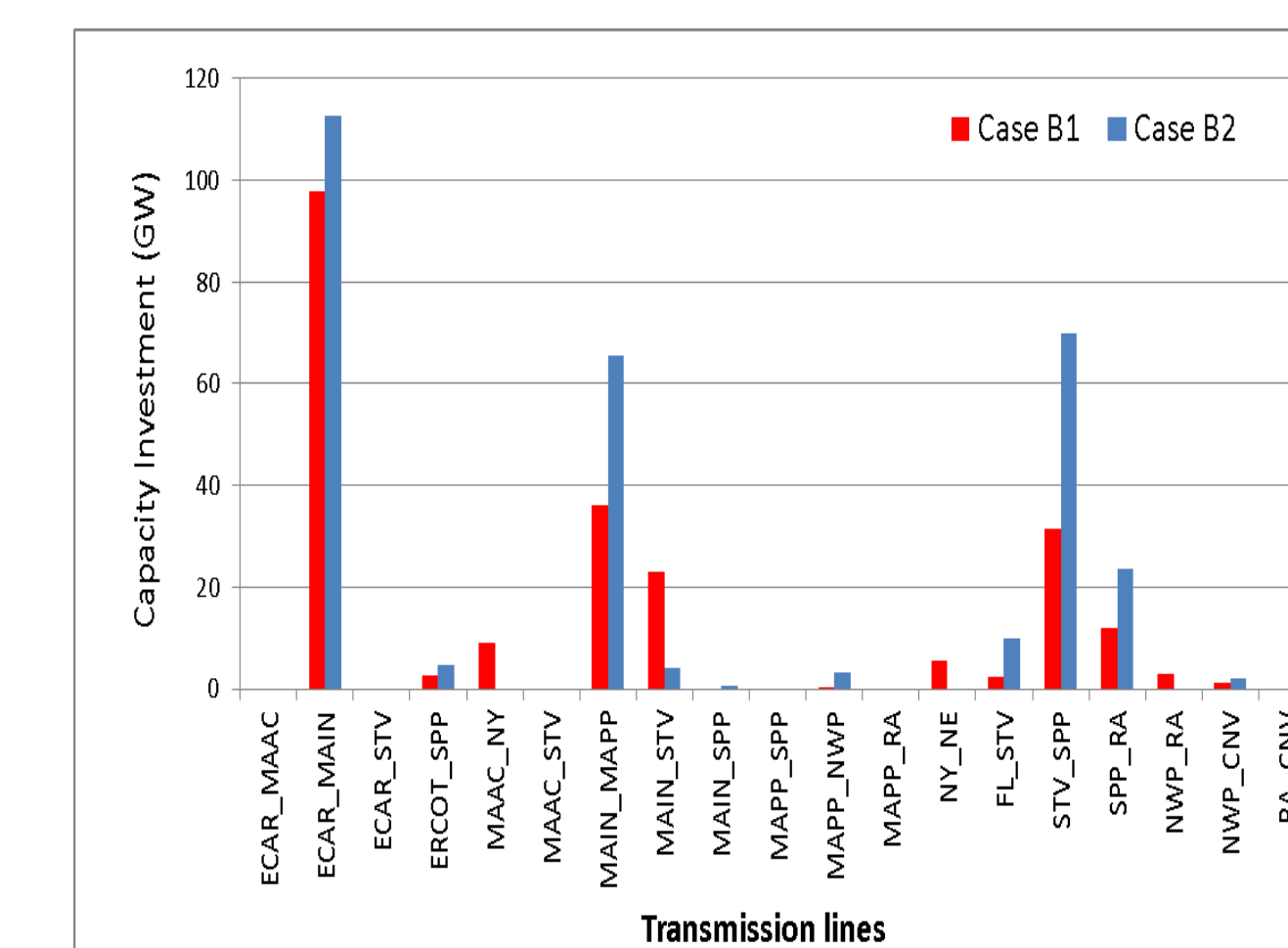


## Principal Issues Addressed



The decreased generation capacity of Cases B (1 & 2) relative to Cases A shows that the expanded transmission of Case B enables use of wind with higher capacity factor relative to Case A

- ✦ Transmission Invested is more for Case B2 than for B1, which allowed to build locationally unconstrained generation
- ✦ In Case B2, it is more economical to build the more cost-effective but distant generation and the required transmission



## Risks and Impediments

- ✦ Localized decision making
- ✦ Influence of local economic development policies
- ✦ Cost allocation
- ✦ Market impacts of transmission investment
- ✦ Difficulty of obtaining right-of-way
- ✦ Future scenarios which lower the need for transmission
  - High DG penetration
  - High non-renewable penetration
- ✦ Dependence on technology improvement

## Possible Paths

- ✦ Market driven investment
- ✦ Federal initiative
- ✦ Increased coordination
  - Government, industry and advocacy groups