Winds of Change
The Electric Infrastructure Challenge

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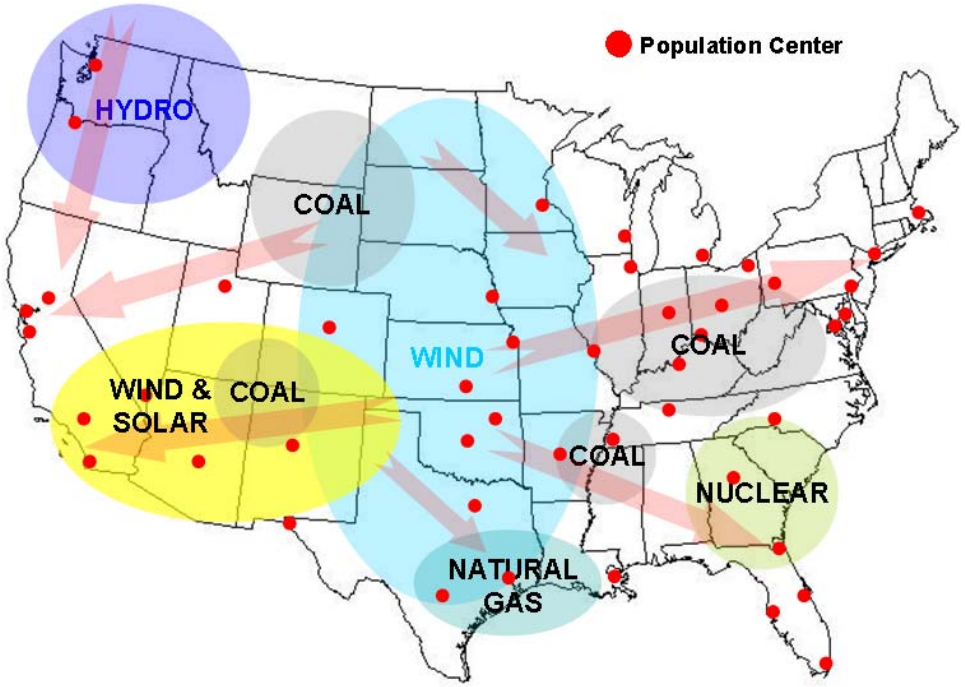
Role of Electric Transmission

- Transmission serves as:
  - Physical connection point for generators
  - Transportation system for delivery of energy to load
  - The platform for energy markets

- Constraints on the transmission system can:
  - Limit the development of new generation and particularly renewable development
  - Limit competition among generators and choices for serving load
  - Create price volatility in energy markets
  - Decrease system reliability

National Landscape

- Aging transmission infrastructure in need of renewal
- Policy changes causing dramatic shifts in the generation profile
- Optimal use of renewable and fossil fuels is constrained due to insufficient transmission infrastructure
- Traditional uses of the transmission grid have changed
- Conventional planning processes are rapidly becoming obsolete



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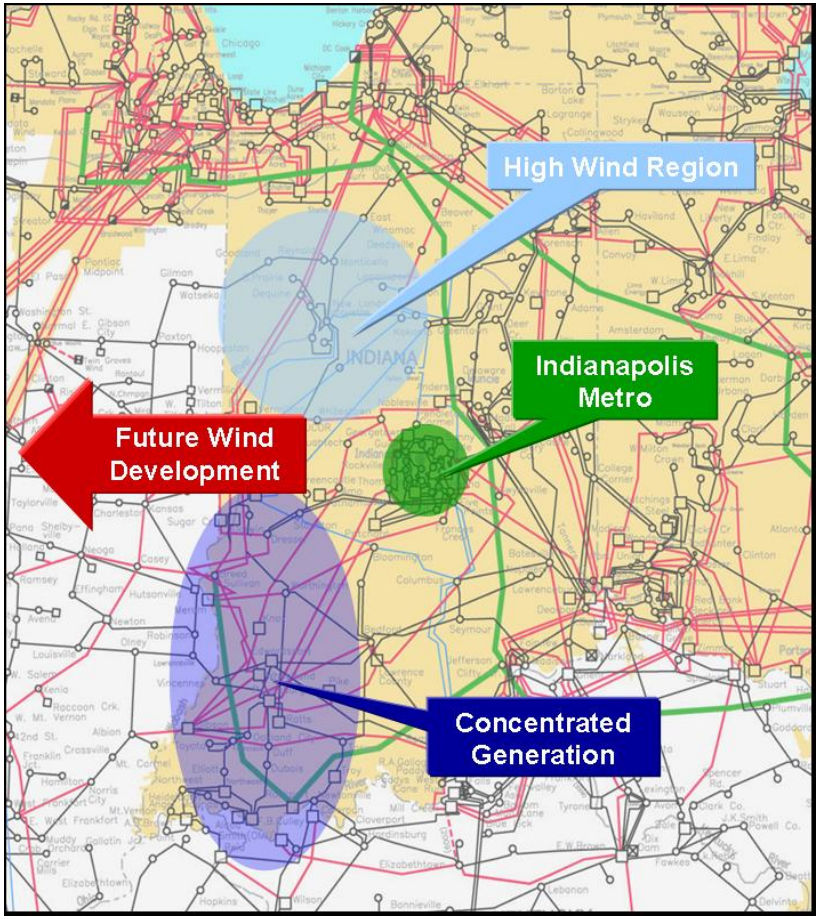
Indiana Example: Changing System Demands

- Site selection of new generation is resource-dependent
  - IGCC/CCS
  - Wind
  - Nuclear
- Location of new resources will impact power flow patterns on the transmission system
- Transmission planning must consider:
  - Resource integration
  - Reliability impact
  - Market impact
  - Demand-side variations
  - Changing and uncertain conditions



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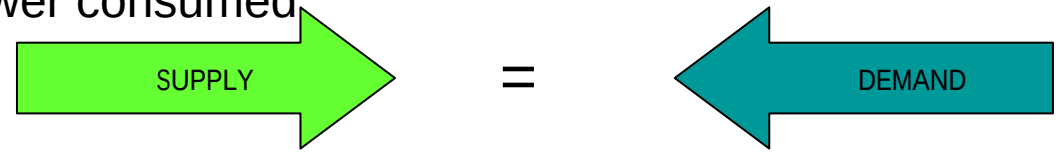
A Primer on “The Grid”

Theory vs. Reality

- **The Balance of Power…..**
  - Amount of power generated in an electric system *equals* the amount of power consumed



- **In Theory….** *the electric transmission grid would consist of an interconnected network of high-voltage transmission lines that span North America, tying together and moving large amounts of power from the source of generation to the consumers of power.*

- **In Reality….***Our present system is ill-equipped to integrate large scale wind resources. Wind resources are often located in areas of the country where there is little or no transmission infrastructure.*

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The Challenge: “Impact of Wind Interconnection on Transmission Performance”

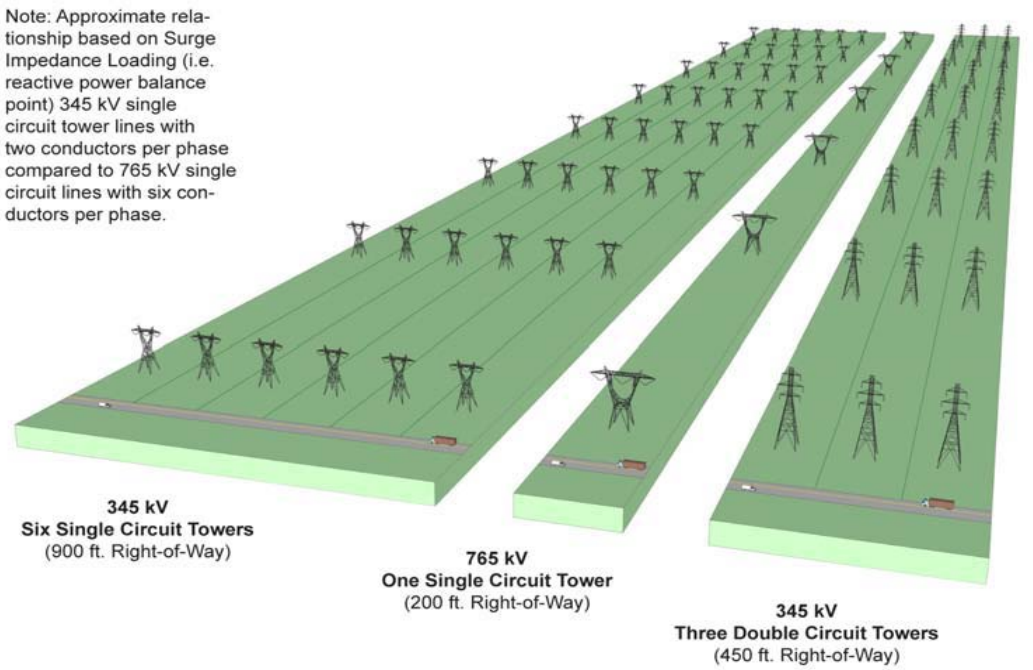
- Transmission planning is generation-neutral and systems must be adaptable to an uncertain future

- Expand extra-high voltage (EHV) transmission to:
  - Reach new resources
  - Ensure long-term reliability and flexibility
  - Enhance market efficiency

- Renew existing facilities to:
  - Maximize utilization of existing lines
  - Refurbish facilities in poor physical condition

Meeting the Challenge: Building Transmission "Smarter"

- Use higher voltage and higher capacity lines to make best use of new rights-of-way
- Use higher voltage lines and more efficient equipment to reduce energy losses
- Apply "Smart Grid" technologies to the transmission system



Voltage selection significantly affects performance, cost and the environment.

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Changing the Way we *Plan….*

- Long term planning horizon 20-30 years
- Focus must be *within and between* planning regions with a common platform particularly for EHV planning
- Transmission planning needs to “anticipate” rather than “react” to problems
- Broader system benefits need to be considered and accounted for:
  - Reliability benefits beyond the short term least cost solution (that moves a problem from today to tomorrow)
  - Economic benefits
  - Operational flexibility and loss savings
- Once need is determined, EHV projects should be encouraged to come into service as soon as possible, rather than targeting a specified date

Creating a foundation for efficient and cost effective transmission solutions….

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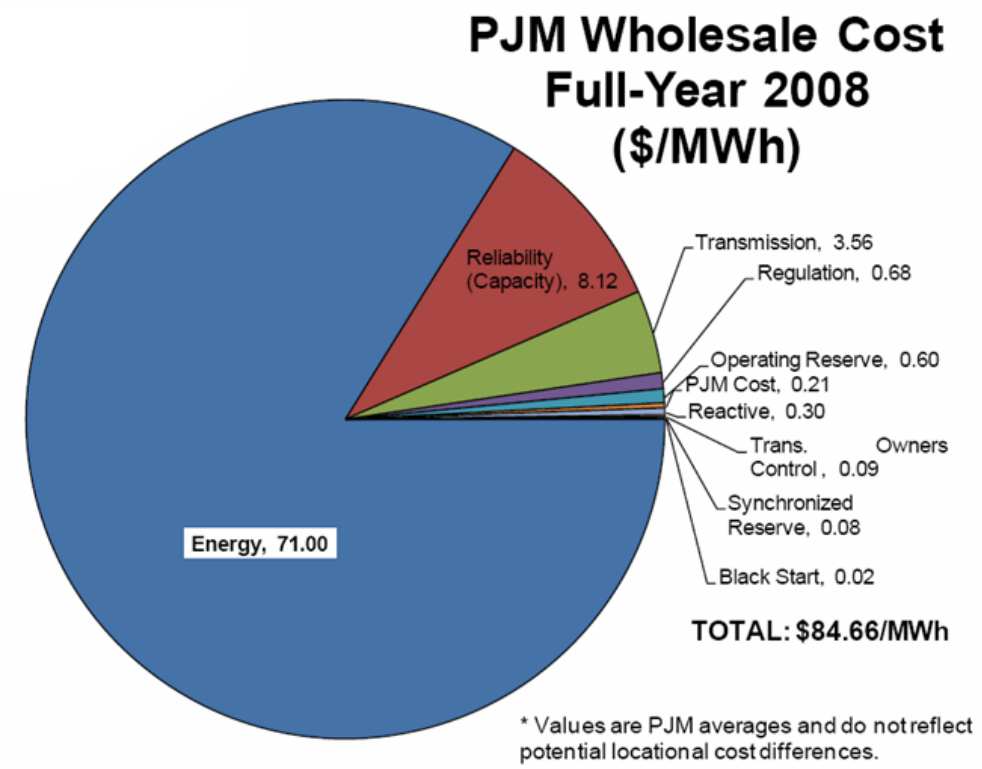
Transmission Cost Responsibility

- RTOs determine cost-allocation methodologies, which differ from region to region
- Wide variety of methodologies, from “beneficiary pays” to “postage stamp”
  - Determining “who benefits” is complex, can change over time, and is often met with objection and debate
- Methodologies for large backbone projects are ill-designed to accommodate projects that must be built to meet our energy goals
  - Large projects benefiting large regions should be shared broadly among all customers

Transmission Cost Responsibility

- Transmission represents a very small part of the customer bill
  - Substantial investments in transmission have a small impact
- Transmission expansion facilitates lower delivered energy costs due to:
  - Increased competition and less constrained markets
  - Reduced energy losses
- Studies often show transmission can pay for itself



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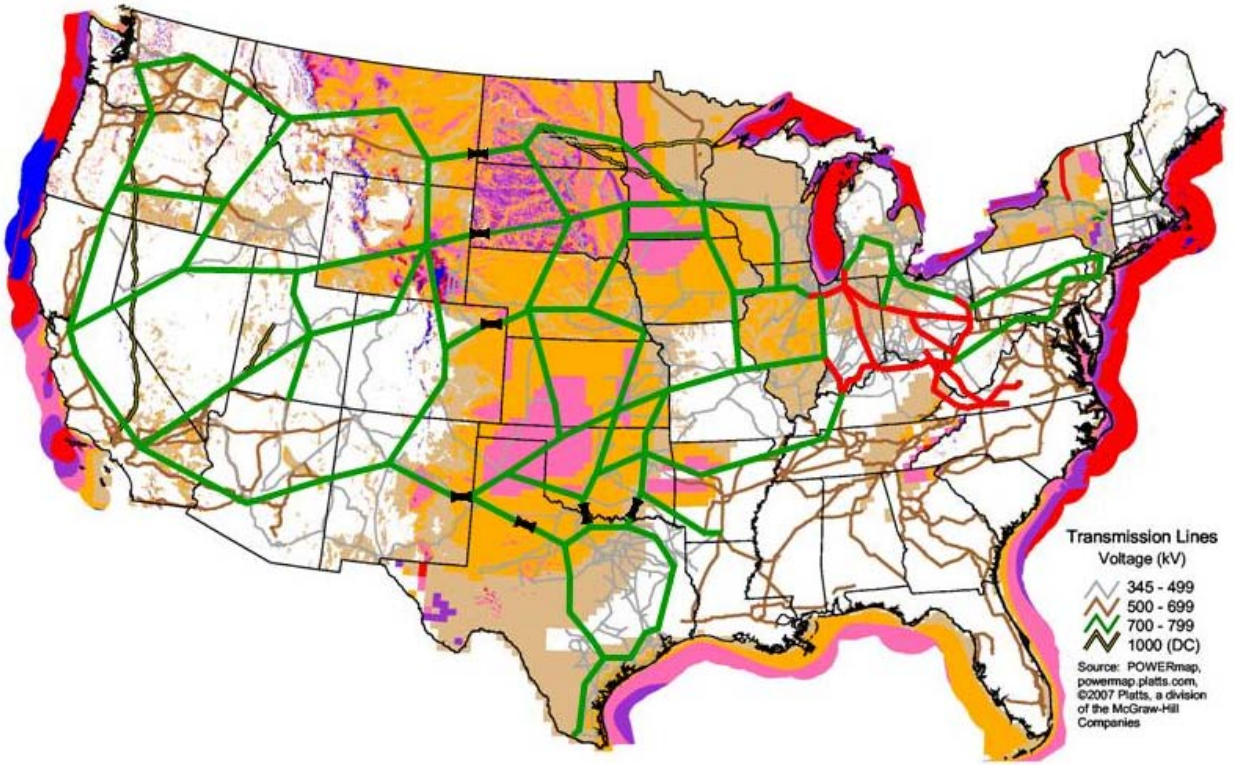
Transmission Development Benefits

- Reduced congestion and fluctuations in energy prices
- Enhanced reliability, mitigating risk of blackouts
- Integration of renewable and other new generation
- Projects driven by cost/benefit analyses, ensuring customer value
- Long-term investments that help create jobs

Vision for Interstate Transmission

- U.S. developed interstate highway versus “just in time” upgrades to the existing roads:
  - Interstate commerce flourished with increased access and mobility
  - National security and safety were enhanced
  - Local U.S. routes were upgraded to serve local needs; some routes were retired



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3 Key Points...

- Evolving energy policies are changing the generation mix and the way the transmission system is used
- Both expanding and refurbishing the transmission system are critical to meeting energy goals and mitigating price volatility is needed to ensure flexibility of the system
- Customers across broad regions that will share in the benefits of new EHV transmission facilities should share in the costs