

# The Goals for an Electricity Grid for the 21st Century: Where You Stand Depends Upon Where You Sit



**Sue Tierney**

**July 9, 2009**

**Aspen Institute Energy Policy Forum**

## **Our panel: Setting the table for the forum on transmission**

**Where you stand depends upon where you sit.....**

- Susan Tomasky
- John Podesta
- Rick Sergel
- Bill Hogan

### **My role on the panel:**

- Filling out some more of the “seating arrangements”

## Where you stand depends upon where you sit.... Characterizing transmission goals from different seats at the table

- The grid operator
- The economist
- The consumer advocate
- The environmentalist
- The green jobs advocate
- The technologist
- The national interest advocate
- The states' rights advocate
- The local land owner
- The Indian tribe
- The political scientist
- The mathematician



## Where you stand depends upon where you sit.... Characterizing transmission goals from different seats at the table

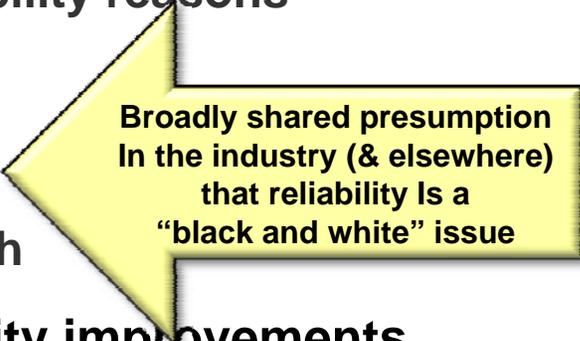
- In reality, most interested parties reflect a combination of these roles. For example,
  - A governor may have the same goals as the grid operator, the consumer advocate, the green jobs and states' rights advocates.
  - An organized RTO may have the same goals as the grid operator and the economist .
  - A congressman may have a variety of different goals at different times.



Like these chairs, the following characterizations are archetypes

## The grid operator's goal for transmission: Keeping the lights on

- **Various principles for reliability issues:**
  - **Bottom-up planning**
  - **Planning to meet industry reliability requirements –**
    - **Based on LOLL probabilities: is a standard violated?**
      - If yes, add transmission
      - If no, transmission is not needed for reliability reasons
    - **Not necessarily tied to:**
      - Economics of value of lost load
      - Expectations regarding economic dispatch
  - **Likely to lean in favor of socialization of reliability improvements**
    - **Implicit recognition: conditions change over time, as do beneficiaries**



Broadly shared presumption  
in the industry (& elsewhere)  
that reliability is a  
“black and white” issue

## The economist's goal for transmission: Making electric markets work better

- **Various principles for economic efficiency:**
  - **Transmission should be part of an industry structure that sends appropriate price signals for efficient investment & operations:**
    - Economic dispatch of generation based on bids to supply energy & AS
    - Prices & resource choices reflect effects of policy (e.g., carbon, RPS)
    - Locational prices for generation and loads
    - Transmission congestion contracts
    - Spot markets and bilateral contracts
    - Transmission planning provides information to market participants about future congestion patterns
    - Generation interconnections and economic upgrades supported by beneficiaries

Example:



Example:



## The consumer advocate's goal for transmission: Keeping rates low now, while keeping power flowing

- **Various principles to support consumers' interests:**
  - **Support for transmission planning & investment providing:**
    - Reliance on planning process with rigorous benefit/cost analysis
    - Robust, yet flexible system that provides consumers with reliable, stable and affordable electricity
    - Opportunity for consumer input into transmission plans
    - Regional variation in transmission approaches
    - Strong local regulation to assure affordable electricity
    - Resistance to lines that would equalize prices of low-cost regions with high-cost regions

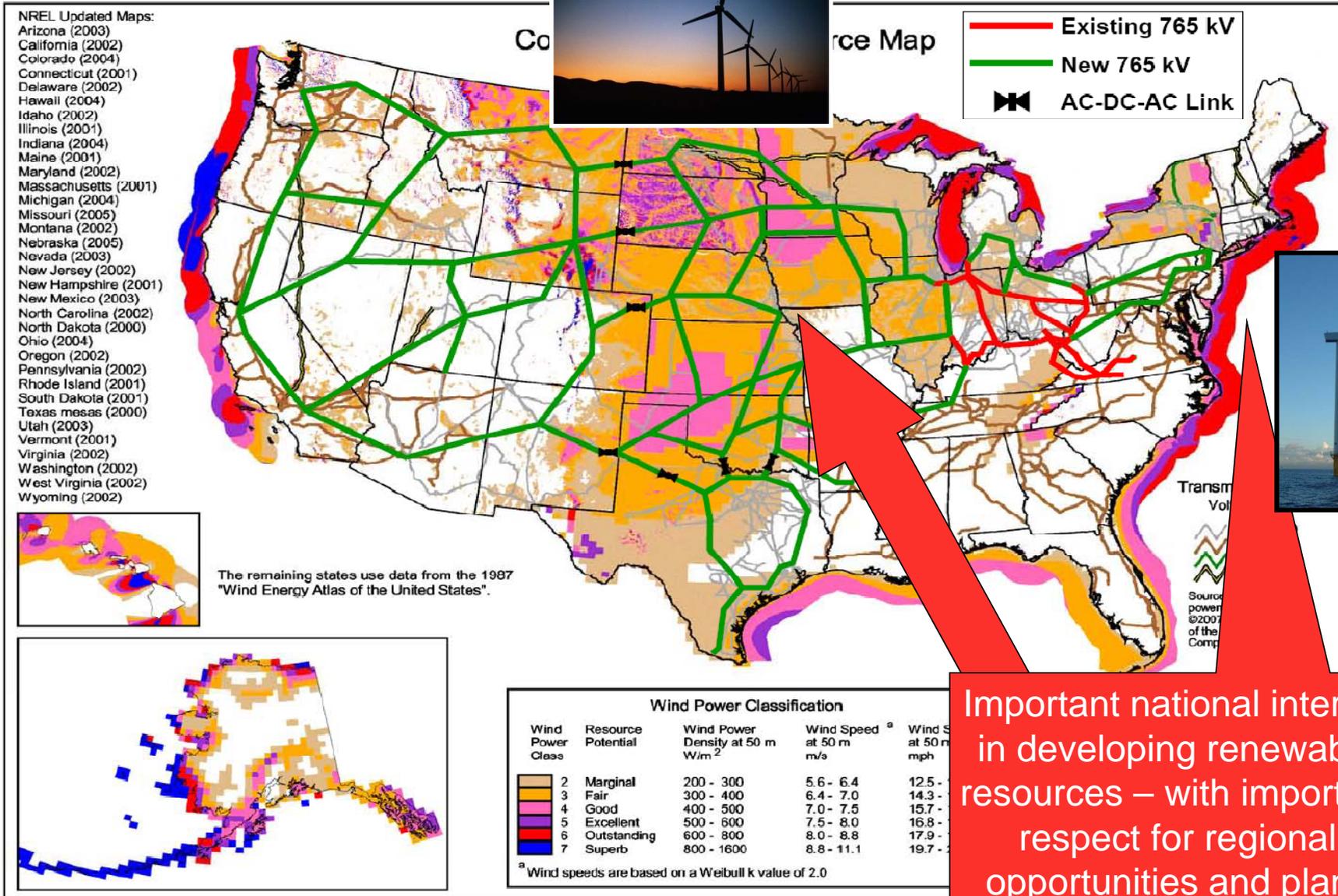
Example:



**Keeping the Power Flowing:**

## The environmentalist's goal for transmission: Combating climate change with more renewables

- **Various principles for positive environmental outcomes:**
  - **Support for transmission planning and investment to deliver generation from geographic areas rich in location-dependent low-carbon resources**
    - Reliance on pro-active, top-down planning for large regions that span areas with renewables and areas with large loads
    - Broad socialization of costs of investment supporting renewables' access to markets
    - Careful regard for environmentally sensitive areas in planning, siting, construction, operations of facilities
    - “You can't like renewables and not like transmission”
  - **That said, transmission planning should take into account energy efficiency, demand-response, and distributed generation**

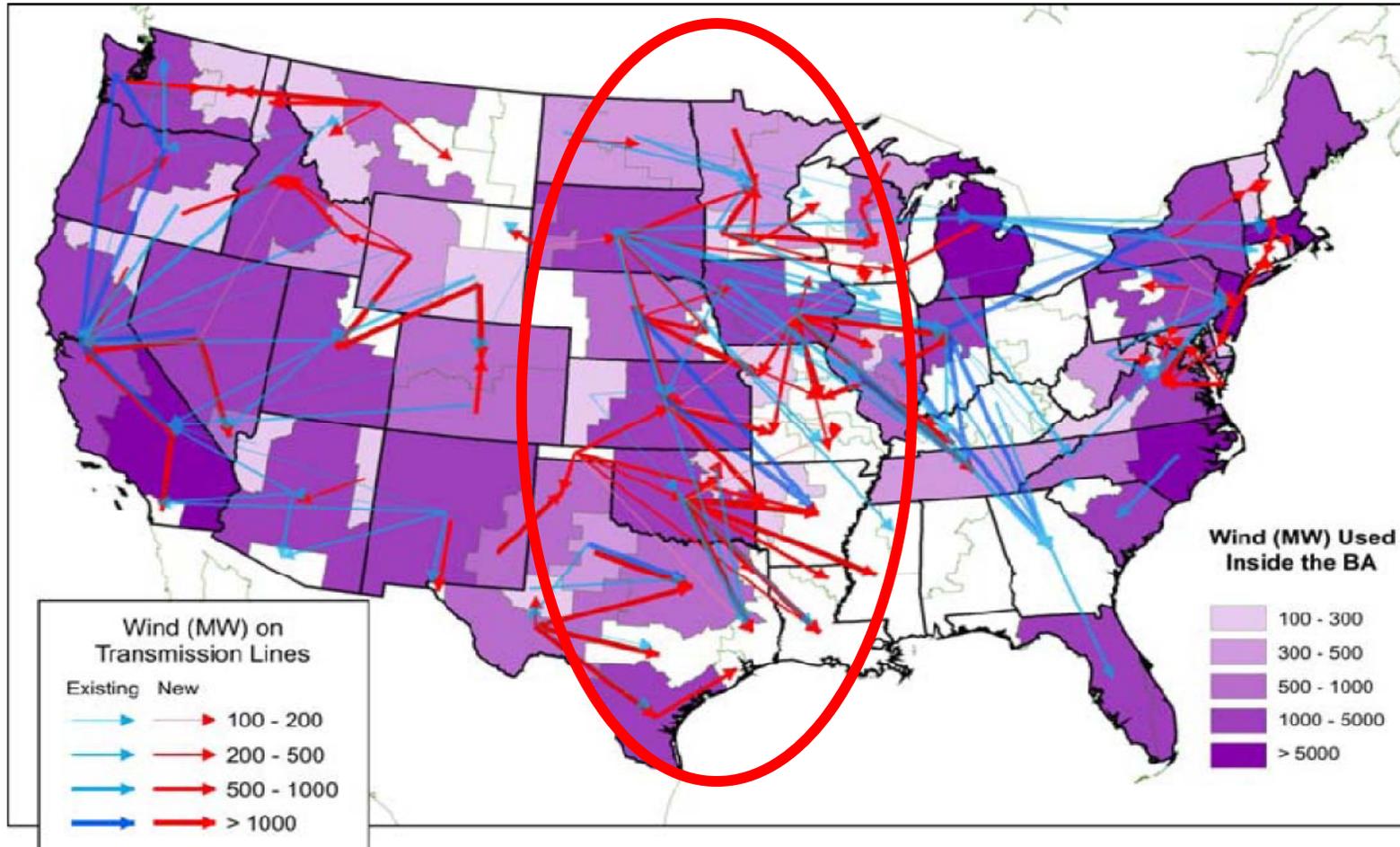


The remaining states use data from the 1987 "Wind Energy Atlas of the United States".

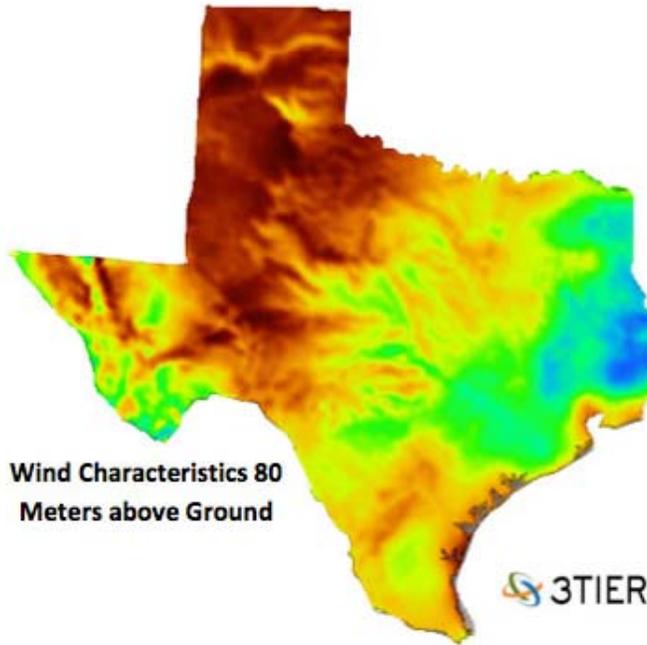
Important national interest in developing renewable resources – with important respect for regional opportunities and plans

# DOE's Study of Wind Energy: 20% by 2030

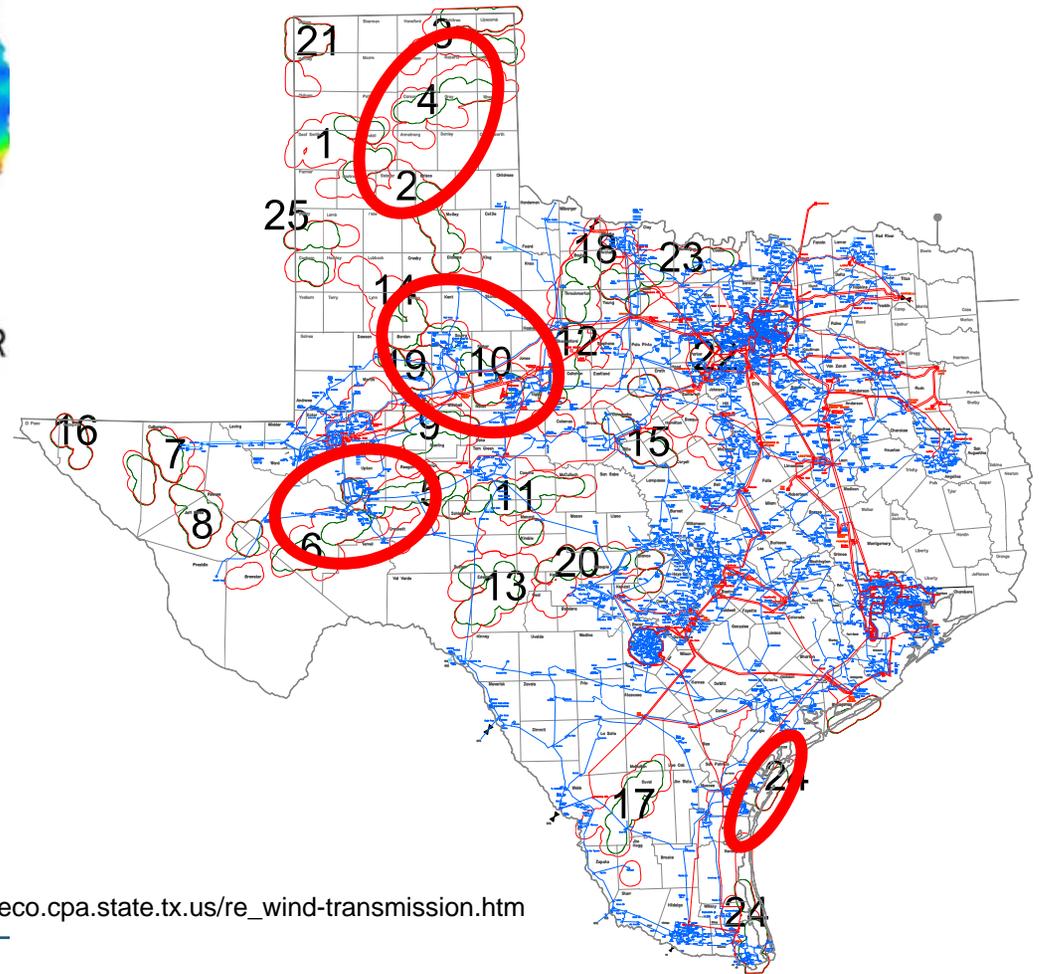
## What would it take?



Total Between Balancing Areas Transfer  $\geq 100$  MW (all power classes, land-based and offshore) in 2030. Wind power can be used locally within a Balancing Area (BA), represented by purple shading, or transferred out of the area on new or existing transmission lines, represented by red or blue arrows. Arrows originate and terminate at the centroid of the BA for visualization purposes; they

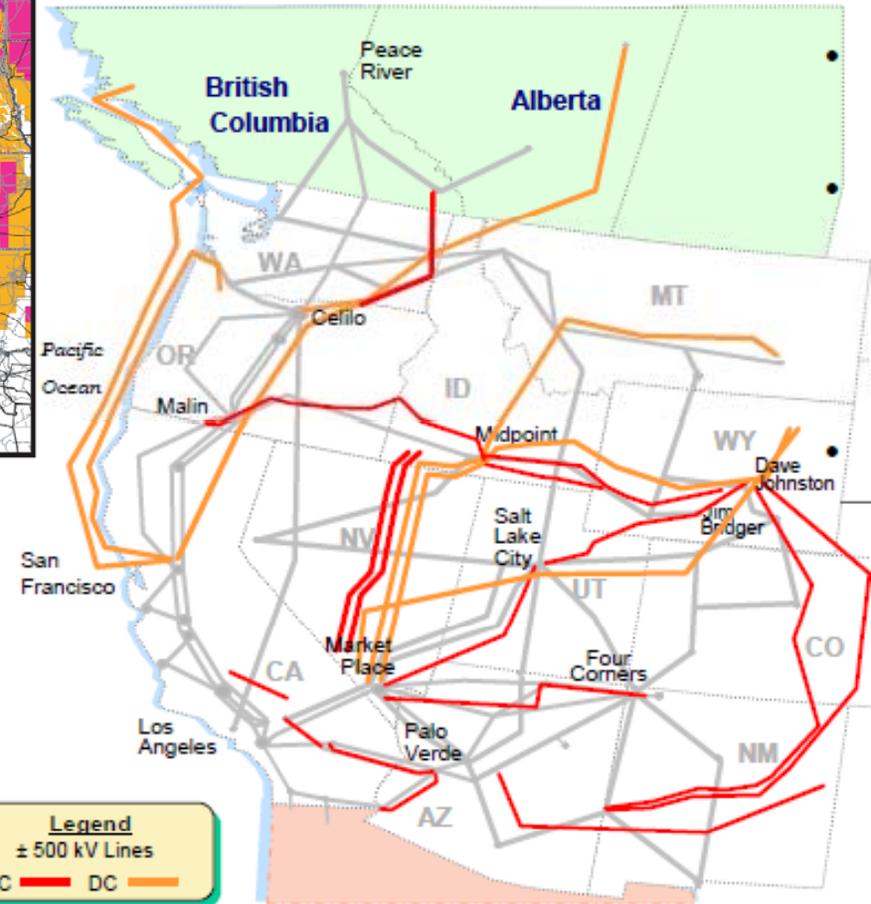
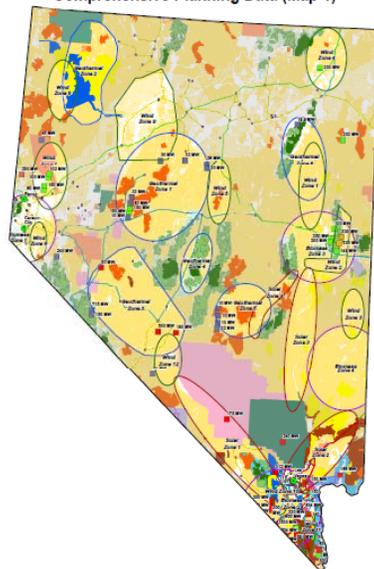
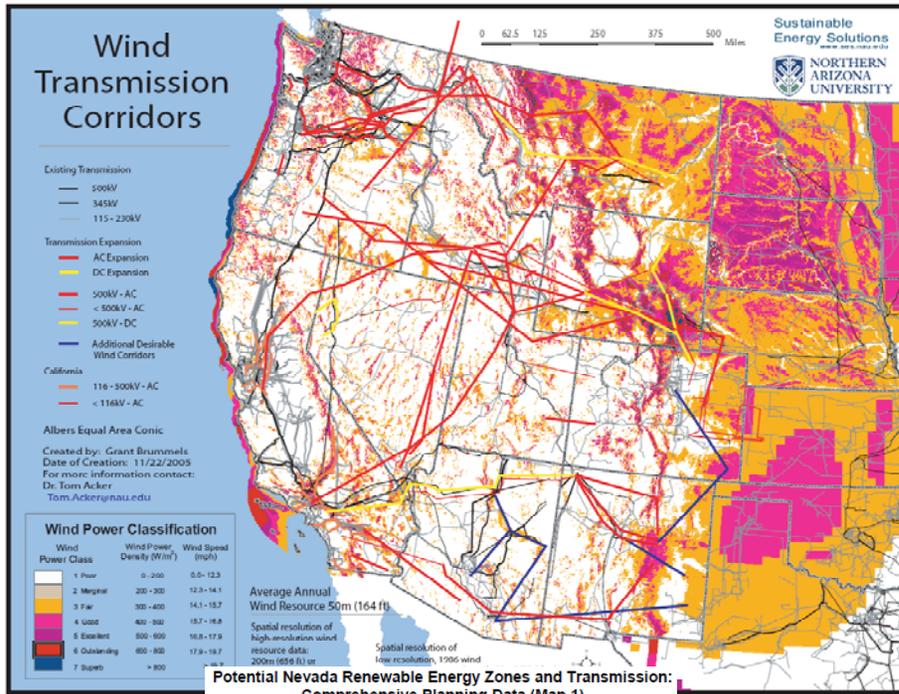


<http://www.windcoalition.org/policy/transmission>



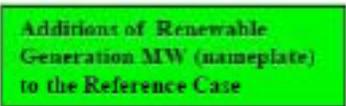
[http://www.seco.cpa.state.tx.us/re\\_wind-transmission.htm](http://www.seco.cpa.state.tx.us/re_wind-transmission.htm)

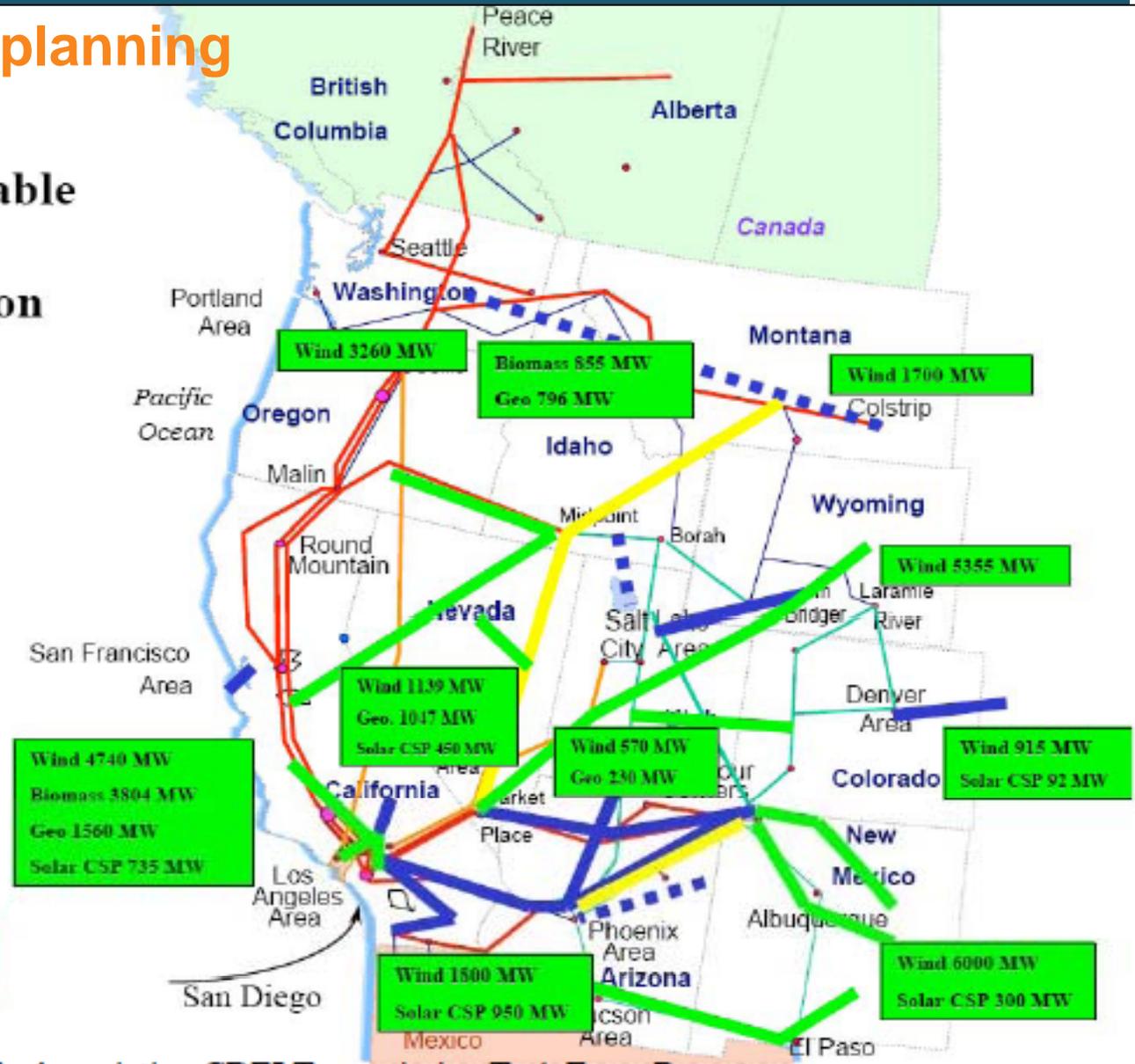
# Western planning for renewables & transmission



# More Western planning

## CDEAC High Renewable Scenario Transmission

-  Added Transmission-SSGWI Reference Case
-  Upgraded Transmission SSG-WI Reference Case
-  Added Transmission-CDEAC Reference
-  Added Transmission-CDEAC High Renewable
-  Additions of Renewable Generation MW (nameplate) to the Reference Case



Source: Western Governor's Association CDEI Transmission Task Force Report

## The green jobs advocate's goals for transmission: Getting people back to work in new energy jobs

- **Various principles for clean tech jobs:**
  - **The nation's vitality depends upon shifting to a green-tech energy system**
    - Relying on domestic, low-carbon energy supplies
    - Most of those supplies are located far away from customers
  - **Plan for transmission as part of a shift to low-carbon, domestic energy production systems**
    - Transmission is a relatively low-cost element of the overall set of costs within in the electric industry
    - We can't develop (and get jobs from) renewables without transmission
    - Err on the side of adding transmission



## Transmission and the economic recovery

### Vice President Joe Biden:

“Anything we put in this economic recovery plan has to be designed to create jobs, to stimulate the economy quickly, get jobs moving quickly. And it has to be for something that has a long-range impact on our economic health. Case in point, we want to spend a fair amount of money investing in a new smart grid. That is, the ability to transmit across high-tension wires in the minds of most people in the public, or underground in these wires, wind and solar energy. You can’t do that now. That would create tens of thousands of new jobs, high-paying jobs. It needs to be done and it will have a long-range payoff not just for next year and the following year, keeping the economy from nose-diving, begin to turn the nose of that downturn up, but it will also change our energy picture. It will deal with global warming.”

“...Case in point, we want to spend a fair amount of money investing in a new smart grid....”

“... the ability to transmit across high-tension wires ....wind and solar energy. ...That would create tens of thousands of new jobs, high-paying jobs...”

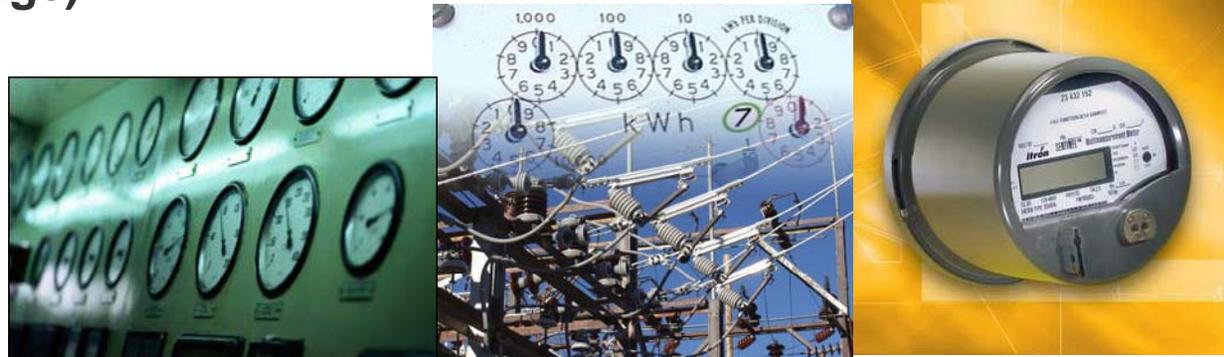
### ARRA funding for transmission enhance

\$4.5 b	Smart Grid
\$7.5 b	BPA and WAPA (add'l borrowing authority)
\$6.0 b	Renewables and transmission projects (add'l loan guarantees)



## The technologist's goal for transmission: Making it smart, nimble, robust, cool

- **Various principles for advanced technology:**
  - **Upgrade the grid in order to help transform America's energy economy, improving:**
    - Grid operator's ability to manage the reliability of the grid as the economy becomes even more
    - Consumers' ability to manage their energy use
    - The integration of various advanced technologies (e.g., PHEV, energy storage)



## The “smart, nimble, robust, cool” grid

### Wired Magazine: “Fix the Grid! 7 Ways to Transform America” (4-09):

▪ “....considering how wasteful, unresponsive, and just plain dumb the grid is, it isn’t surprising that outages – which have been increasing steadily over the last quarter century – cost us \$150 billion a year. The real shock is that the damn thing works at all.”

▪What we need the grid to do:

1. Generate electricity everywhere (e.g., including DG generation)
2. Deliver clean energy to distant cities.
3. Store power in super batteries.
4. Monitor electrons in real time.
5. Trade electricity like pork bellies.
6. Think negawatts, not megawatts.
7. Make conservation simple (and easy)



## “Smart Grid” technologies and systems (à la the NYT)



1. SOLAR PANELS AND WINDMILLS
2. "SMART APPLIANCES"
3. REMOTE CONTROL DEVICES
4. PLUG-IN HYBRID CARS
5. LOCALLY-GENERATE POWER AND SUPERCONDUCTING POWER LINES.
6. WIRELESS CHIPS
7. WEB AND MOBILE-PHONE INTERFACES
8. ENERGY STORAGE

## The national interest advocate's goals for transmission: Building a national highway for national needs

- **Various principles for “the national interest” in transmission:**
  - **Top down focus on national transmission needs**
    - Interconnection-wide planning
    - Facilitated (if not conducted) by federal entities – directly or indirectly
  - **Federal authority over:**
    - Siting of all high voltage lines (more than today's backstop authority)
    - Siting of transmission to support development of domestic energy resources (e.g., renewables, coal)
  - **Socialization of costs for “national need” transmission**
    - Established by FERC if supported through transmission tariffs (rolled into wide-area rate)
    - Established by Congress if supported through tax

## President Obama: interested in the electric grid



**“We will build ... electric grids  
....We will harness the sun and  
the winds....”**  
– Inaugural Address



**“We will soon lay down thousands  
of miles of power lines that can  
carry new energy to cities and  
towns across this country.”**  
– Joint Session of Congress, 2009

## Renewables and transmission – a major push from DC



“One of ... the most important infrastructure projects that we need is a whole new electricity grid. Because if we’re going to be serious about renewable energy, I want to be able to get wind power from North Dakota to population centers like Chicago.”

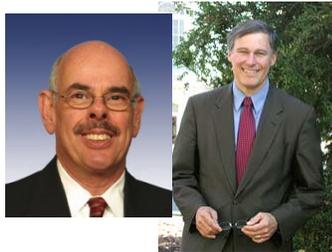
– Barack Obama



“We cannot let 231 state [utility] regulators hold up progress.” He argued that states should be given every opportunity to participate, but “there may come a time when the federal government will have to step in.”

– Harry Reid

[Hebert, Josef, “Placement of Power Grid is Debated”, *Boston Globe*, 2/24/09, p. A9]



"Chairman Waxman and Rep. Inslee clearly appreciate the critical role transmission plays in facilitating the achievement of the energy policy goals and objectives of the legislation, including the development of renewable, emissions free resources.

Unfortunately, they were unable in the limited time available to craft the needed provisions to be included in the bill."

– Joseph L. Welch, ITC

<http://sev.prnewswire.com/null/20090626/NY3898826062009-1.html>



U. S. DOE –  
Financial Assistance Funding Opportunity Announcement  
Recovery Act-Resource Assessment and Interconnection-Level  
Transmission Analysis & Planning, 2009

## The states' rights advocate's goals for transmission: Keeping local regulatory control

- **Various principles for states' rights & local control re: transmission:**
  - **Traditional view: role of transmission as part of utility regulation**
  - **Siting of transmission is essentially a state prerogative**
  - **Transmission system planning and expansion:**
    - First focus is on meeting the needs of local loads within the utility's footprint – optimization of generation and transmission
    - Problem solving: focus on adding the minimum required to satisfy the need
  - **The state may have economic development goals (e.g., renewables) – but wants users of energy to pay for transmission**
  - **More generally, transmission for others:**
    - Not if it raises local rates; only if paid for by others
    - Only if it also provides some benefit locally

# NARUC Resolution (3-2009) Resolution Re: Possible Federal Legislation Amending the FPA Addressing Expansion of Transmission Facilities

## Resolution Regarding Possible Federal Legislation Amending the Federal Power Act Addressing Expansion of Transmission Facilities

WHEREAS, the siting of electric transmission facilities has historically been subject to the exclusive jurisdiction of the States; and

WHEREAS, it is in the States' interests to ensure that adequate electric transmission facilities are constructed to meet the needs for economic and reliable utility service; and

WHEREAS, it continues to be the long-standing position of the National Association of Regulatory Utility Commissioners (NARUC) that Congress should not expand Federal authority over transmission siting either through amendments to the Federal Power Act or through other Federal legislation; and

WHEREAS, Section 216 to the Federal Power Act, enacted as part of the Energy Policy Act of 2005, grants the Federal Energy Regulatory Commission (FERC) with limited "backstop" transmission siting authority; and

WHEREAS, it is anticipated that within the next few months, Congress will be considering proposed legislation to amend the Federal Power Act that will provide FERC with expanded authority over the siting and construction of interstate transmission lines;

RESOLVED, that in connection with any proposed legislation that would expand FERC's current authority over the siting and construction of interstate transmission lines, the Commission recommends that Congress incorporate the following principles into such legislation:

- That any such additional authority granted to FERC by the legislation allow for primary siting authority to be exercised only in those cases where FERC's "backstop" siting authority be as limited in scope as possible;
  - That, in no event should FERC be granted any additional authority over the siting or construction of interstate transmission lines;
  - That, in no event should FERC be granted any additional authority to approve or disapprove the siting or construction of a transmission line that is not consistent with a regional transmission plan or other designated State siting authorities, and other applicable law;
  - That, in no event should FERC be granted any additional authority to approve or disapprove the siting or construction of a transmission line unless there is already in place either (1) a cost-allocation agreement for the proposed project that governs how the project will be financed and paid for; or (2) a cost-allocation methodology that covers the entire route of the proposed project;
  - That, in no event should any such legislation allow FERC to preempt State authority over the siting or construction of transmission lines, or environmental impacts under State authority, the interconnection to distribution facilities, or the siting or construction of transmission lines by affected stakeholders in state and/or regional planning processes; and
  - That, in no event should any such legislation preempt existing State authority to regulate the siting or construction of transmission lines.
- Sponsored by the Committee on Electricity, Adopted by the NARUC Executive Committee

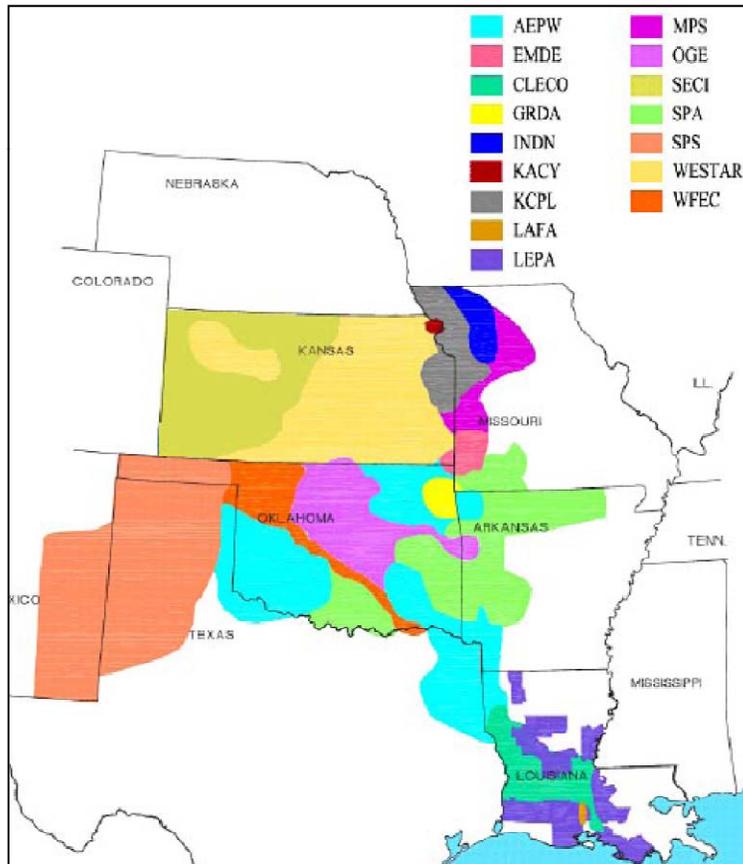
“...Congress should not expand federal authority over transmission siting....”

..any new federal law should “...allow for primary siting jurisdiction by the States” and in no event grant FERC “additional authority over the siting or construction of new intrastate transmission lines....”

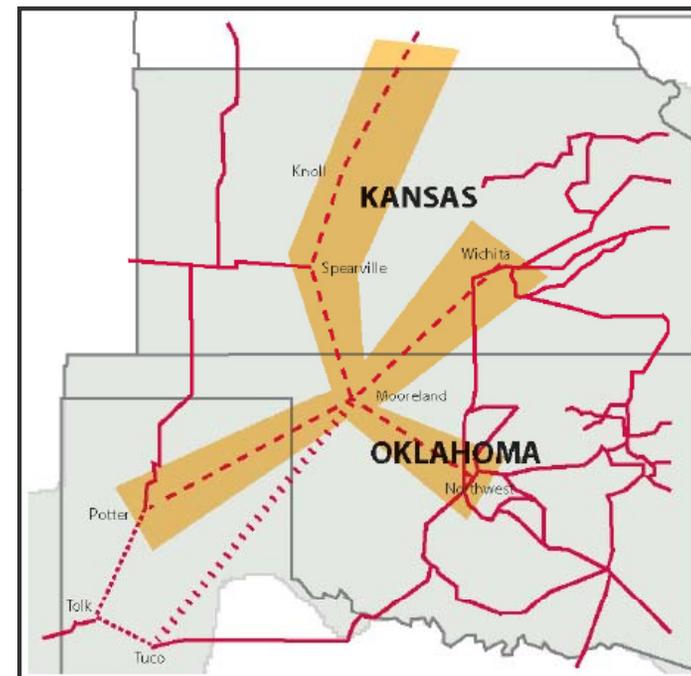
# Example: Southwest Power Pool States' support for high-voltage regional transmission

## SPP Footprint

Including Individual Balancing Authorities



## SPP "X Plan"



Sources: [http://www.spp.org/publications/SPP\\_Footprints.pdf](http://www.spp.org/publications/SPP_Footprints.pdf)  
[http://www.spp.org/publications/SPP\\_Wind\\_Integration\\_QA.pdf](http://www.spp.org/publications/SPP_Wind_Integration_QA.pdf) Janice Francis-Smith, "Southwest Power Pool transmission plan caught in Catch-22," *The Journal Record (Oklahoma City)*, Sep 17, 2007.  
[http://findarticles.com/p/articles/mi\\_qn4182/is\\_20070917/ai\\_n20503465](http://findarticles.com/p/articles/mi_qn4182/is_20070917/ai_n20503465)

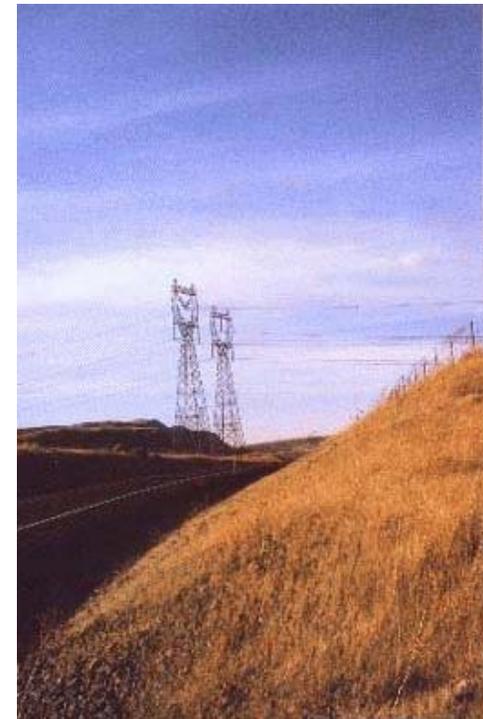
## The local land owner's goal for transmission: “NHNWNH”

- **Various principles for siting transmission:**
  - **It's ok to put it over there.**
  - **But not here, no way, no how.**
  - **If you're going to put it here, put it underground.**
  - **And if you're going to take my land by eminent domain, I want more than “fair market value” for the strip of acreage you're taking.**
  - **And I want to plug in and get whatever juice I need whenever I want it.**



## The Indian tribe's goal for transmission: Ensuring a piece of the action

- **Various principles for tribal self-determination and sovereignty:**
  - **Interactions with tribal lands and resources requires:**
    - **Meaningful consultation with tribal governments**
    - **Meaningful opportunities to participate as partners in the energy resource development opportunities, including transmission corridors**
    - **Meaningful compensation for use of tribal lands – tied to negotiating process that recognizes that tribal lands are different from privately held land**



## The political scientist's goal for transmission: Making sausage as well as is humanly possible

- **Various principles for political resolution of transmission issues:**
  - **At the end of the day, resolution of transmission issues (legislation, planning, siting, cost support) needs to account for the iron laws of politics:**
    - “All politics is local,” Tip O’Neill
    - “What’s good economics is bad politics; what’s bad economics is good politics.” Eugene Baer
  - **There is no single rationale that motivates political participants’ positions on transmission issues**
    - Positions of politicians may shift from one rationale to another over time, without any particular consistency among the various pieces of the position

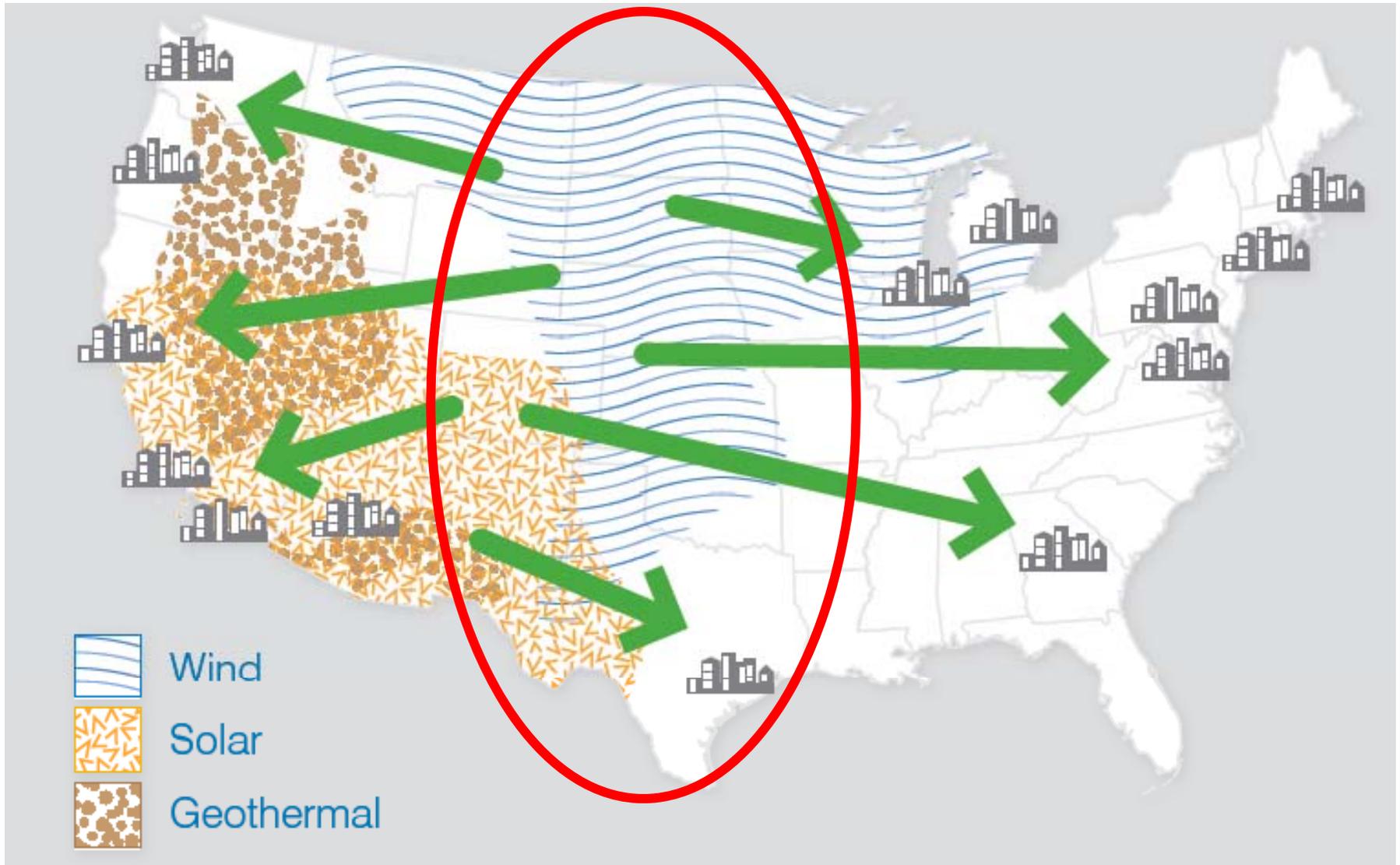
**WE'VE AGREED!  
IT'S TIME TO FINALLY SITE A WIND FARM  
AND PRODUCE MORE ELECTRCITY  
FROM RENEWABLE ENERGY!**



**BUT NOT TO  
MY  
DISTRICT!!**

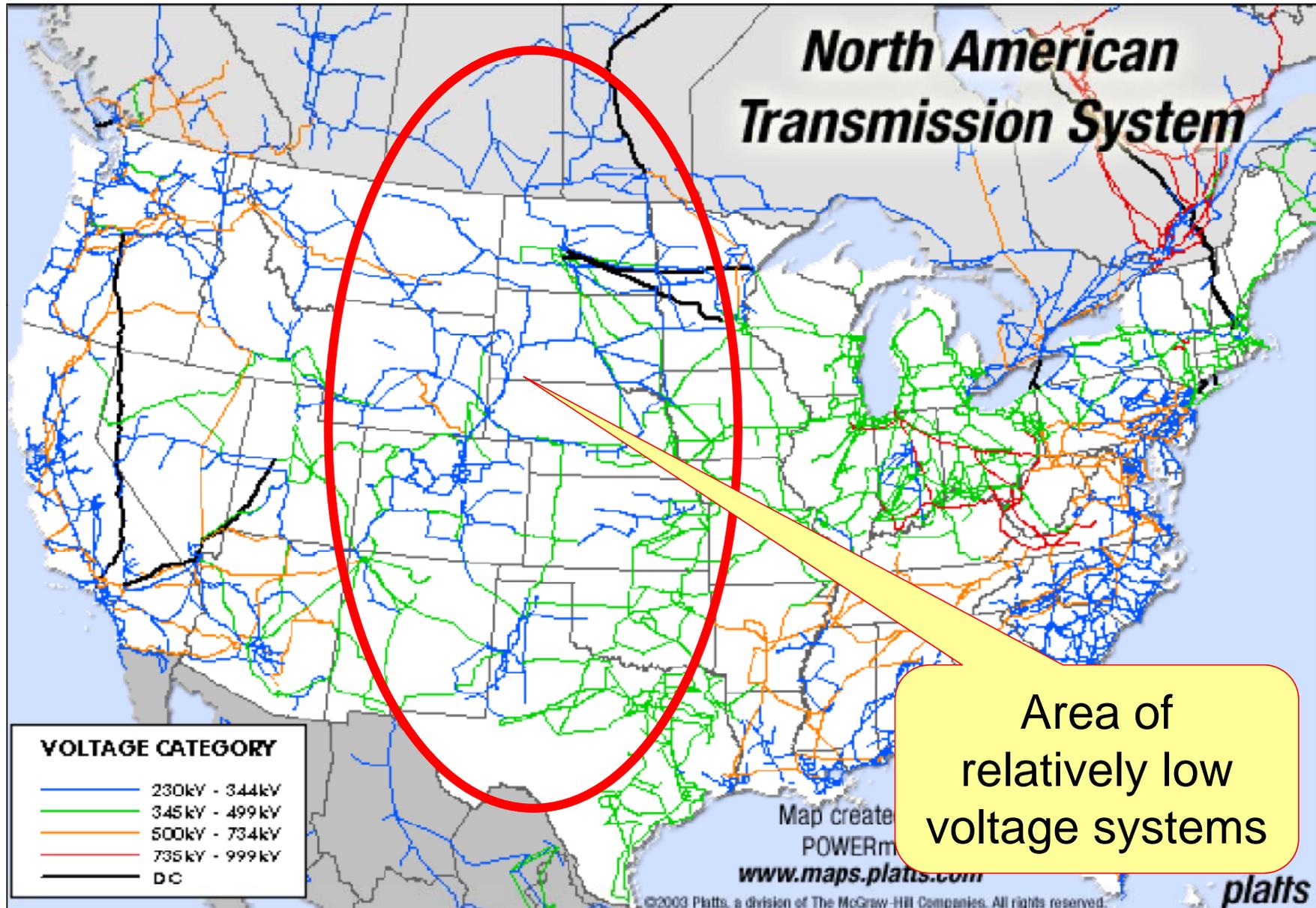


**WE'VE AGREED! IT'S TIME TO FINALLY  
ADD MORE POWER LINES TO BRING  
WIND POWER FROM THE PLAINS  
TO DISTANT CONSUMERS**

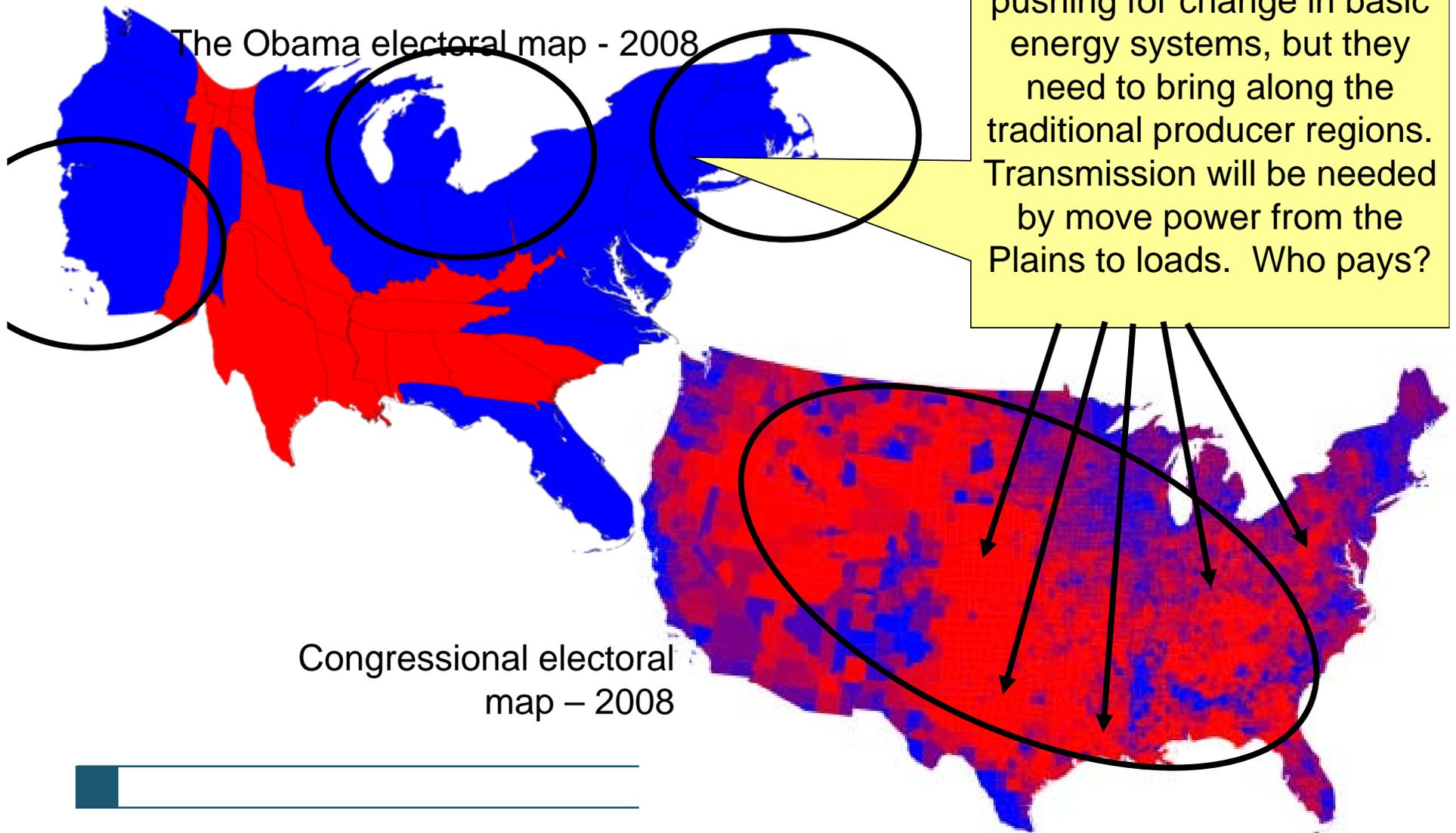


AWEA and SEIA, "Green Power Superhighways: Building a Path to America's Clean Energy Future," February 2009

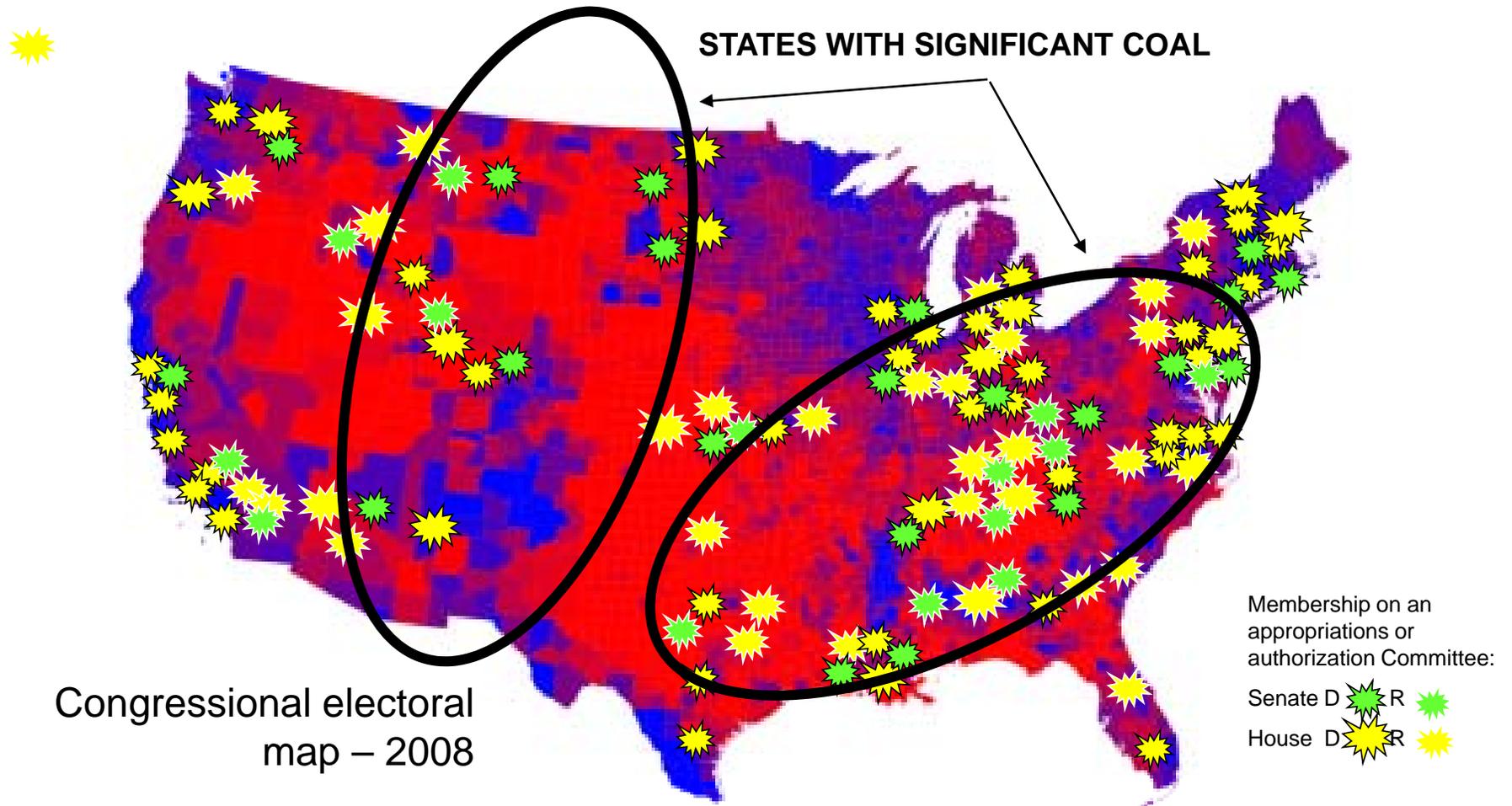
## A 21<sup>st</sup> Century Grid



## Washington support for “green energy”?

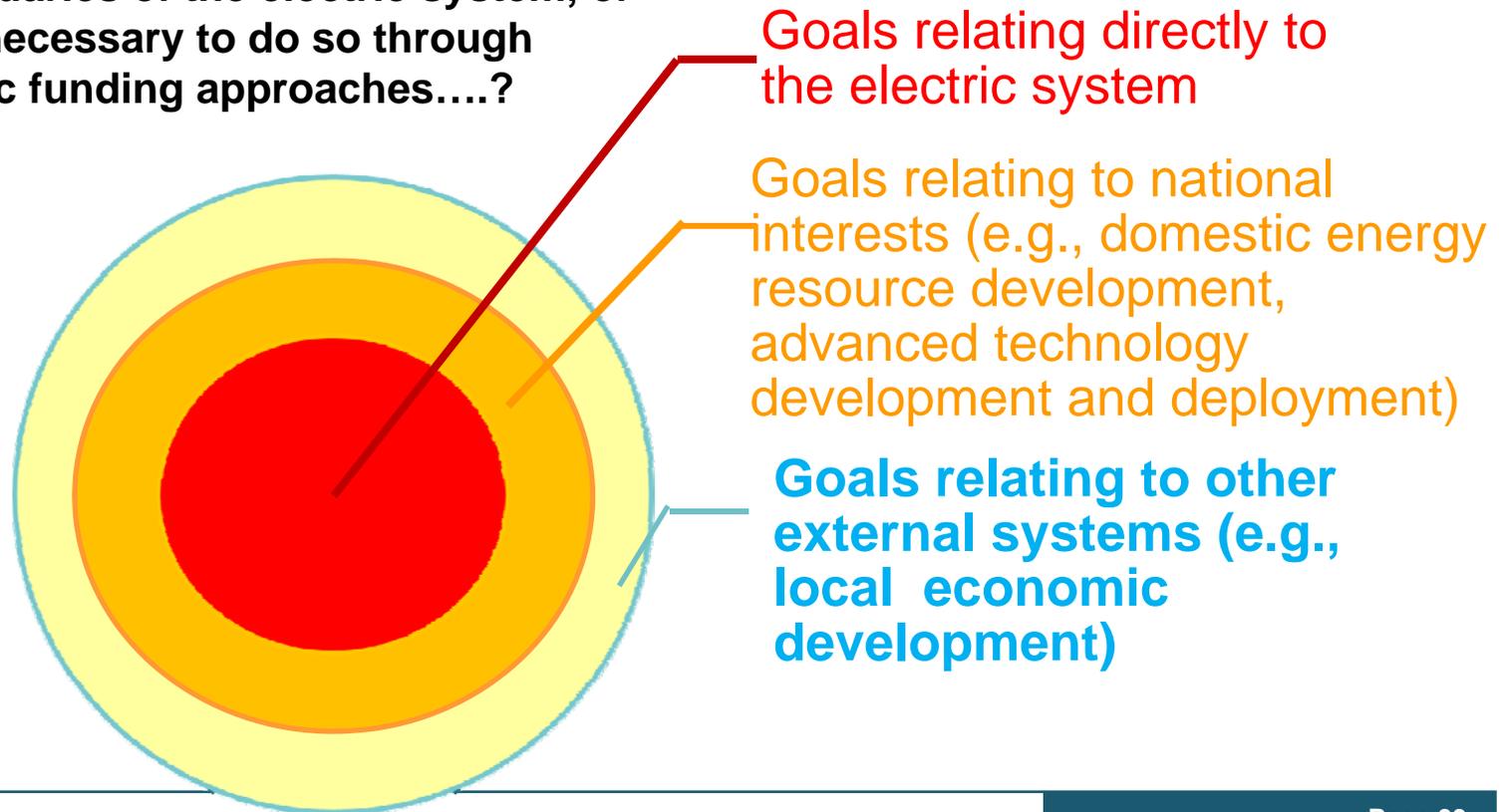


# Tough politics on carbon controls – with interesting implications for transmission deals?



## The mathematician's goal for transmission: Solving a simultaneous equation

- **Various principles for satisfying the array of others' goals?**
  - **Is it possible to do so within boundaries of the electric system, or is it necessary to do so through public funding approaches....?**



## A few questions for the mathematician:

- **Should we only think about electric transmission issues only from within the “electricity box” – electric reliability, electric markets, internal benefits/cost?**
- **Should we use policy affecting electricity (and electricity prices) to address certain other strategic (external) issues, like national security, or economic development, or climate policy?**
- **If the nation views transmission for domestic energy resources as a strategic issue, should it be paid for through electricity prices?**
  - If it’s so strategic, is it still a “service,” paid for by users of the service?
  - Why should electric regulators be adjudicating rates (since the beneficiaries and payers are not necessarily well aligned)?
  - If it’s a national issue, why socialize the costs within a single interconnection?
  - If a region wants to stimulate economic development (e.g., local jobs, taxes) with its renewable resources, should it also support transmission with its funds?

## A few questions for the mathematician:

- Can we find a way to give preference to transmitting electrons produced by renewable power? (?)
- To qualify as a renewable “feeder line,” is there any length limit?
- Should the federal government use public funding to support transmission tied to renewables on “public trust” federal lands?
- Is there something special about Western interstate commerce as opposed to Eastern interstate commerce that warrants a different treatment for transmission under an amended FPA?
  - Do the three interconnections really view themselves as regions?
- If consumers end up paying for high voltage transmission built to bring power from far away, how do they also get the zero-fuel-price energy benefits (especially in RTO markets with gas on the margin)?



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