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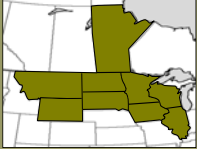
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Energy Scenarios for the Upper Midwest


Presentation to North Dakota Energy Development and Transmission Committee





Great Plains Institute
Bismarck, ND
April 17, 2008

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Why was this model created?


- Circular conversations about energy and climate policy in Powering the Plains lacked an analytical framework.
- Researchers at University of Minnesota interested in comprehensive research regarding options for a climate-friendly energy system transition.



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Research Team




Faculty

- Kenneth H. Keller – Center for Science and Technology Policy, UM
- Steven J. Taff – Department of Applied Economics, UM


Research Assistants



- Kathryn Jones – UM, Minnesota Environmental Initiative
- Brendan Jordan – UM, Great Plains Institute

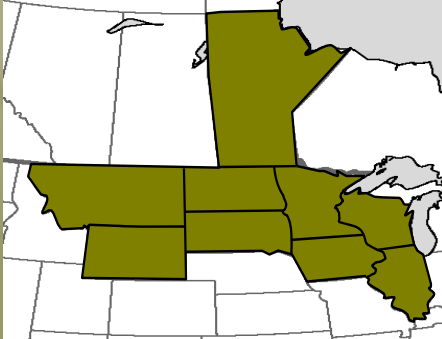
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Components


- State-level CO₂ inventory
- The model
- Policy/roadmap development – PTP
- Outreach

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The Study Region




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Bringing the Challenge Home

Our strategic vulnerabilities

- Most coal-dependent power sector, coupled with petroleum-intensive agriculture and transportation sectors

Our strategic resource advantages:

- World class wind and biomass potential
- Most coal reserves and majority of current U.S. supply in close proximity to reservoirs for geologic storage of CO₂
- Political clout

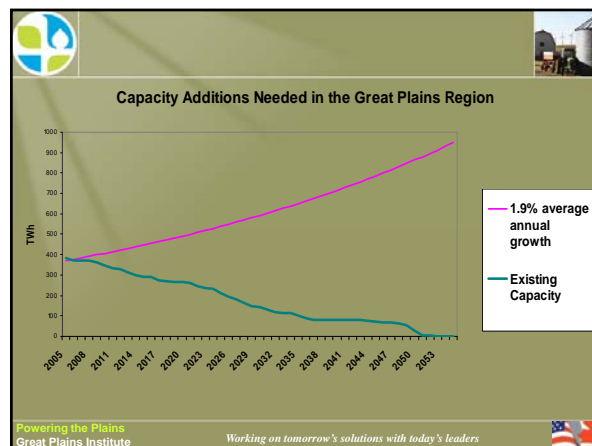
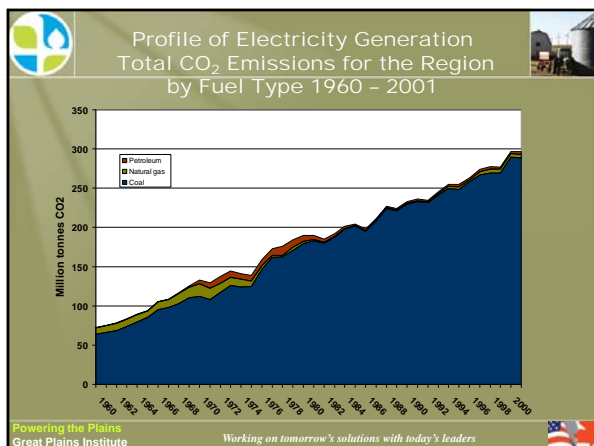
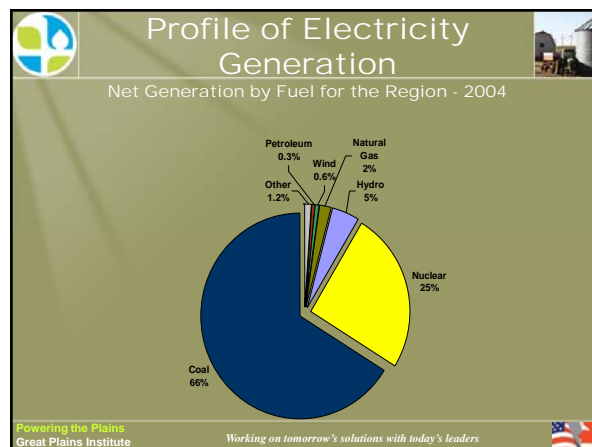
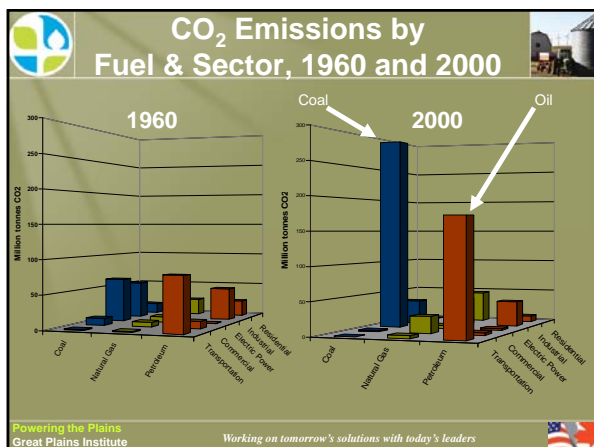
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Regional Energy Inventory

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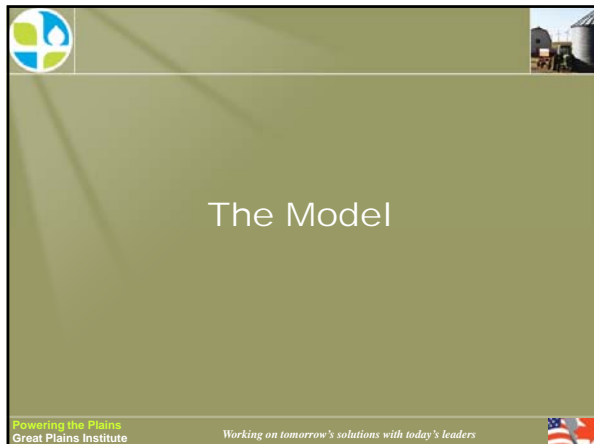
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Slide 9

MSOffice1 Suggest inserting "Coal" and "Oil" with arrows on left-hand side as well. I have always found this visual to be very striking, but hard to understand. Your arrows really make it more understandable; including them on the left will draw attention to the dramatic increases in those two sectors for our region

, 5/19/2006



Model Basics

- System dynamics model
- “User-friendly”
 - Transparent
 - Real-time
 - Flexible
- An ideal model for the policy process

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Project Goal

- To develop scenarios for an 80% reduction in CO₂ emissions from 1990 levels by 2050 in the upper Midwest region.
- 1990 emissions = 558 x 10⁶ metric tons CO₂
- 20% of 1990 emissions = 112 x 10⁶ metric tons CO₂

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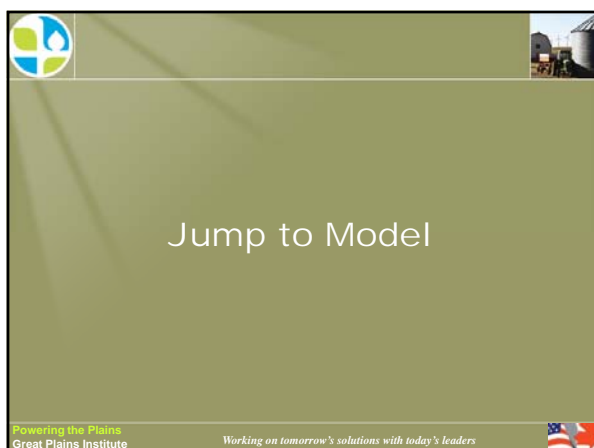
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How the model works

- Meets demand
- Uses available energy resources and technologies
- Minimizes cost
- Minimized CO₂ emissions
- Changes in the energy system based on changes in policy


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Main Scenario Conclusions

1. We can meet electricity needs AND reduce CO₂ emissions 80% by 2055 without significant additional cost.
2. This requires significant efficiency and low- and zero-carbon energy investment over 50 years.




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Slide 18

MSOffice3 Rolf and I discussed having perhaps two slides with "pearls of wisdom", one for each sector, or something along those lines. The conclusions needs somewhat more detail than this.

, 5/19/2006




Many options exist...




- Different policy paths to the same solution,
- Different technology mixes meet the CO₂/energy cost/energy supply challenge.

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What's next?



- A new model is under development:
 - Larger Midwestern region
 - Adds transportation and natural gas
 - Included non-CO₂ greenhouse gases
- New model will follow old model principles:
 - Transparent
 - Real-time
 - Flexible

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Thank You!



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