



Wind for Schools



Larry Flowers

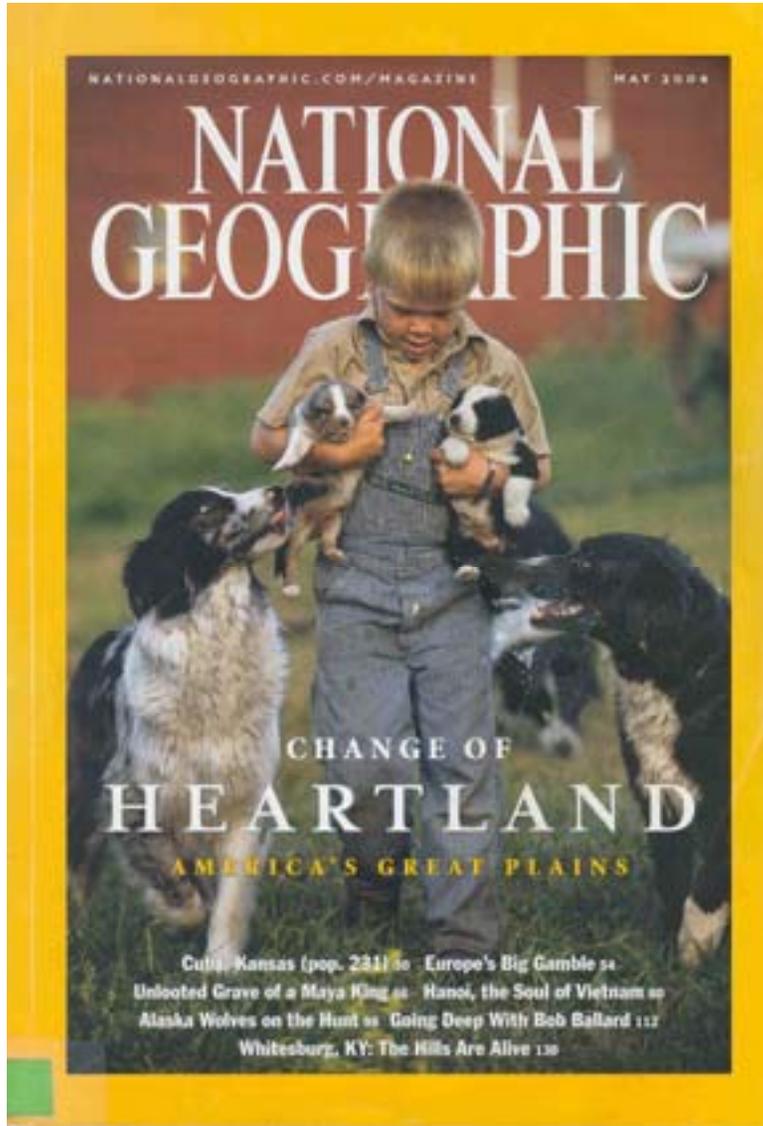
National Renewable Energy Laboratory

National Green Power Marketing Conference

October 25, 2005

Austin, Texas

The Depopulation of the Great Plains

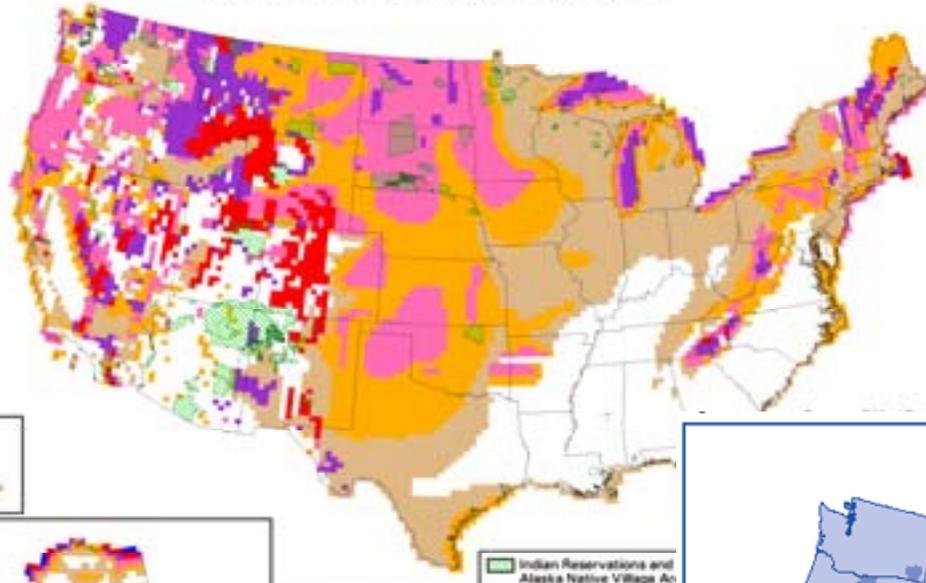


“When you lose the school,” said a retired teacher, “you’ve lost the town.”



Windy Rural Areas Need Economic Development

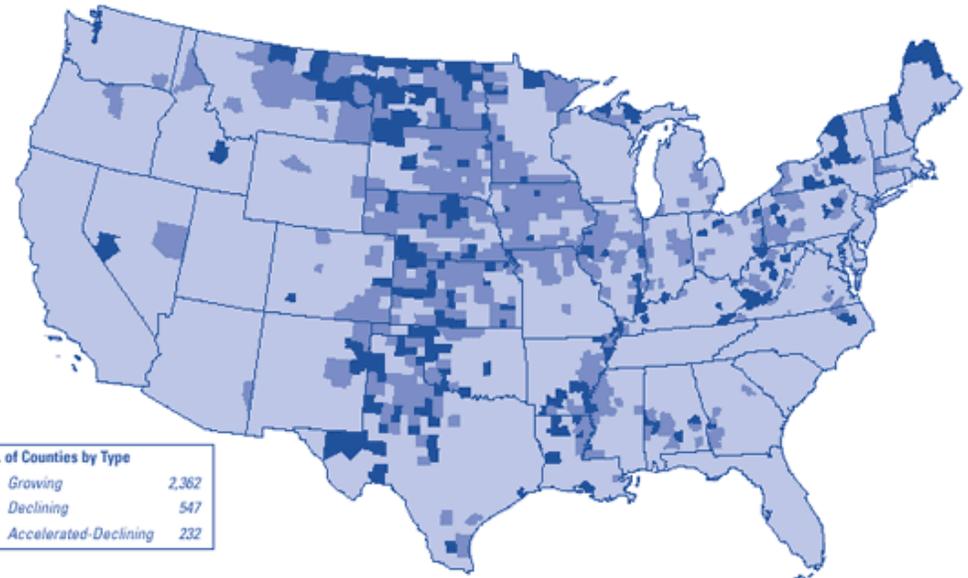
United States - Wind Resource Map



Wind Power Class	Resource Potential	Wind Power Density at 50 m, W/m ²	Wind Speed ^a at 50 m, m/s	Wind Spd at 50 m, mph
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15
4	Good	400 - 500	7.0 - 7.5	15.7 - 16
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19
7	Superb	800 - 1800	8.8 - 11.1	19.7 - 24

^a Wind speeds are based on a Weibull k value of 2.0

Geographic Distribution of Depopulation

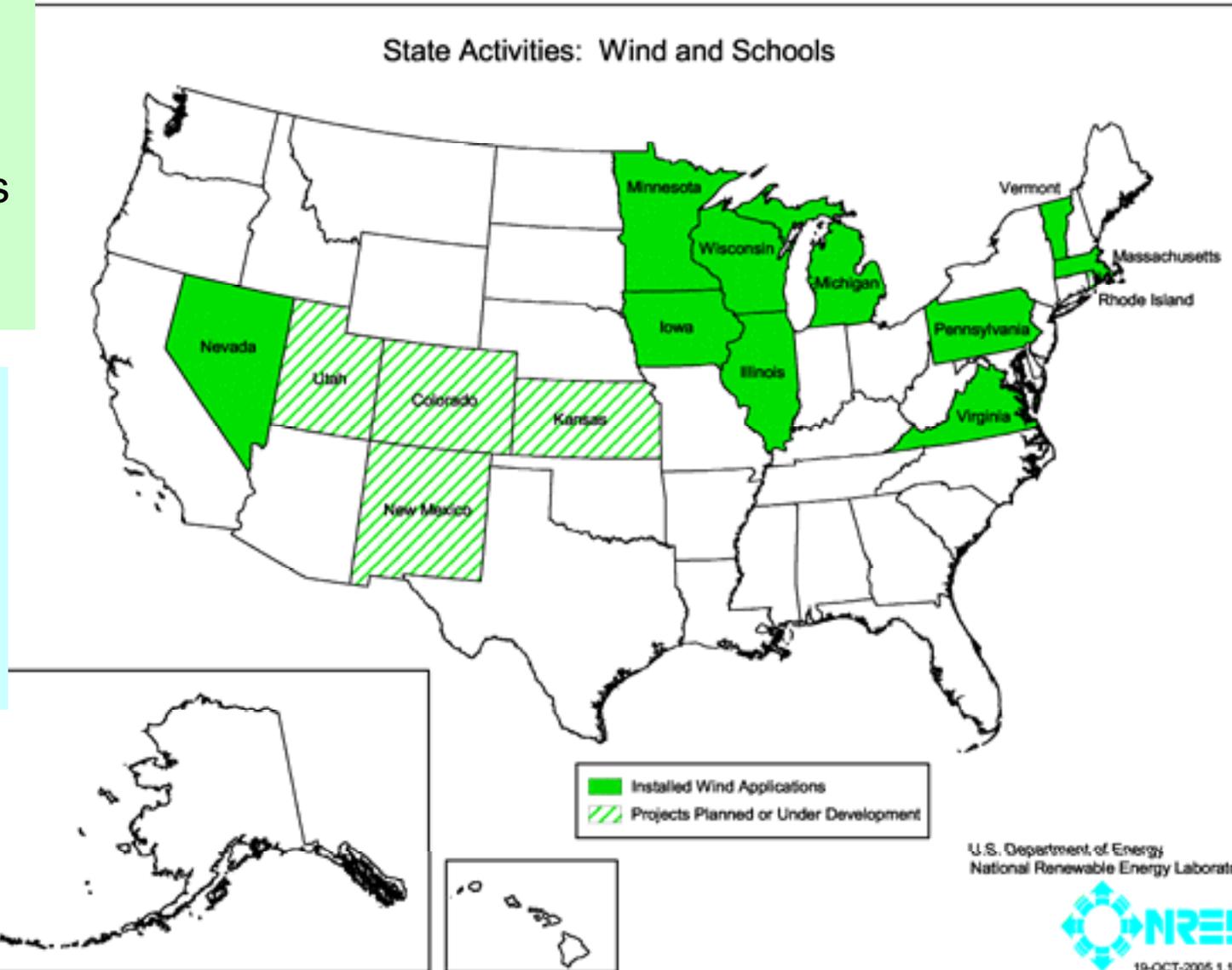


Source: 2000 Census compared with 1970 Census.

Wind for Rural Schools

About 30% of the nation's 94,000 K-12 public schools are rural.

They serve 27% of the 47M K-12 public school students



Rural School and Community Wind Energy Project Drivers

Rural School Wind Energy Projects

- School is often the largest load in the community
- Community support
- Low cost grants and loans
- Generates local interest in Wind Energy
- Curricula/ science projects
- Several application/ownership options
- Focus on the energy future

Community Wind Energy projects

- Local ownership means local economic development benefits



School Wind Projects across the U.S.



Spirit Lake, IA



Holland, MI



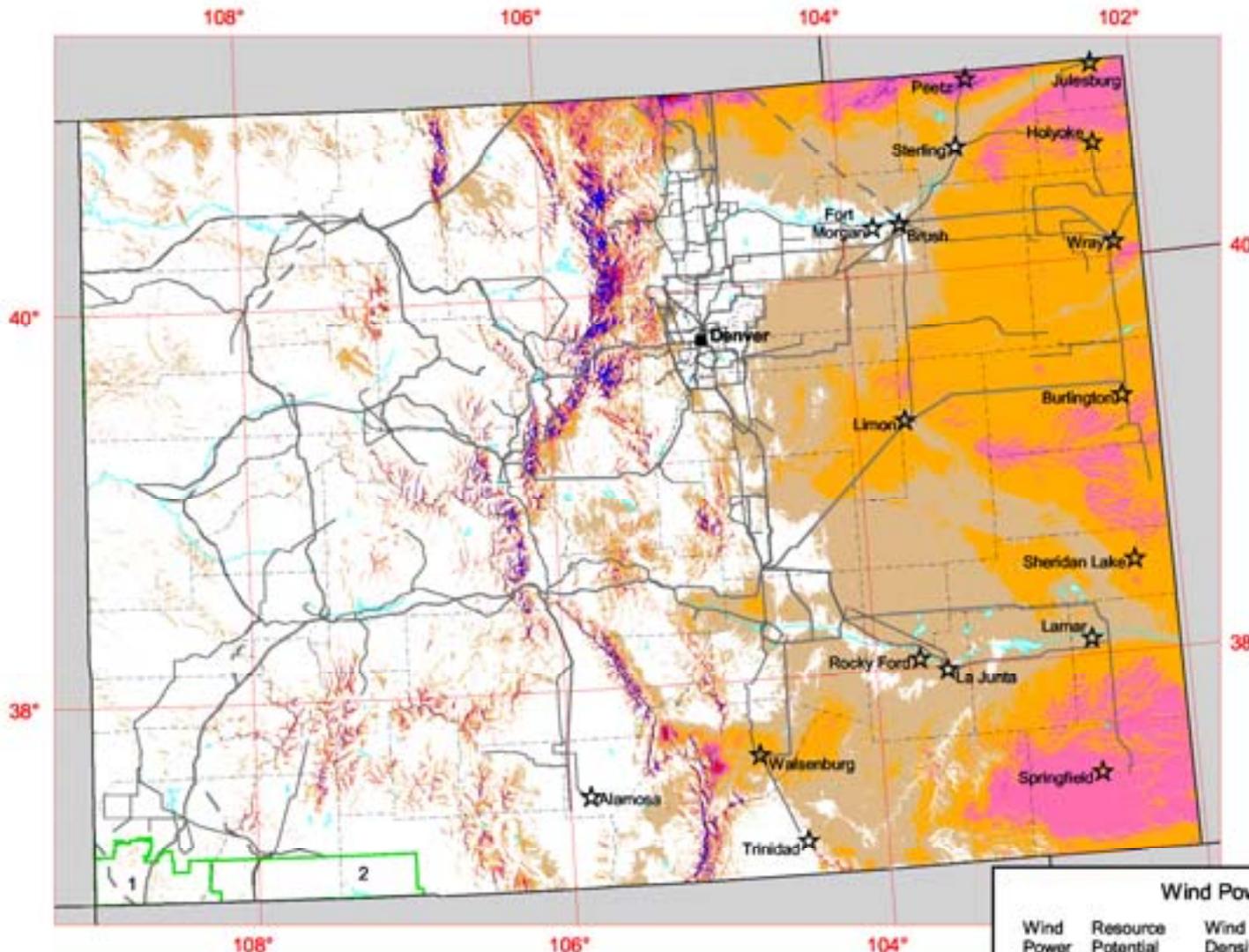
Beverly, MA



Eldora, IA

Colorado

Wind and Schools



Transmission Line*
Voltage (kV)

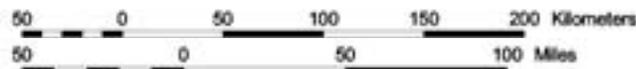
- 115 - 161
- 230
- - 345

* Source: POWERmap, ©2003
Platts, a Division of the
McGraw-Hill Companies

The annual wind power estimates for this map were produced by TrueWind Solutions using their Mesomap system and historical weather data. It has been validated with available surface data by NREL and wind energy meteorological consultants.

Wind Power Classification				
Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed ^a at 50 m m/s	Wind Speed ^a at 50 m mph
1	Poor	0 - 200	0.0 - 5.9	0.0 - 13.2
2	Marginal	200 - 300	5.9 - 6.7	13.2 - 15.0
3	Fair	300 - 400	6.7 - 7.4	15.0 - 16.6
4	Good	400 - 500	7.4 - 7.9	16.6 - 17.7
5	Excellent	500 - 600	7.9 - 8.4	17.7 - 18.8
6	Outstanding	600 - 800	8.4 - 9.3	18.8 - 20.8
7	Superb	> 800	> 9.3	> 20.8

^a Wind speeds are based on a Weibull k of 2.0 at 1500 m elevation.



Indian Reservation

- 1 Ute Mountain
- 2 Southern Ute



U.S. Department of Energy
National Renewable Energy Laboratory



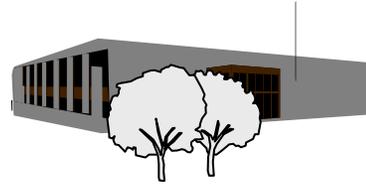
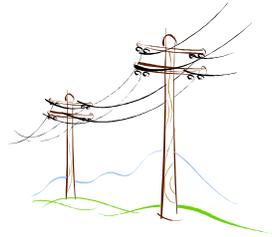
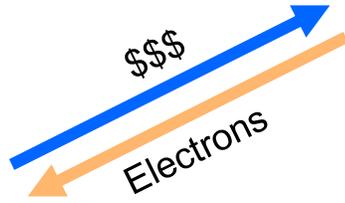
Wind for Schools Pilot Project

- Contacted 17 schools on the eastern plains of Colorado
- Reviewed utility bills
- Performed initial financial analysis
- Presented results to local wind development committees
 - School board
 - City government
 - Local utility
 - Economic development interests
 - Other interested parties (ESCOs, farmers, Ag Extension agents)

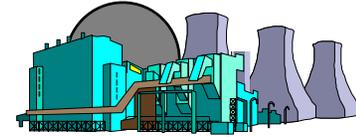
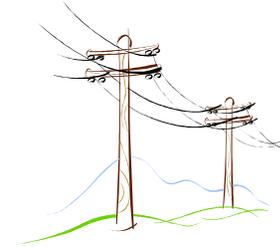




Rural School



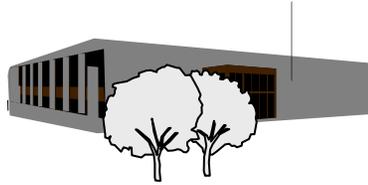
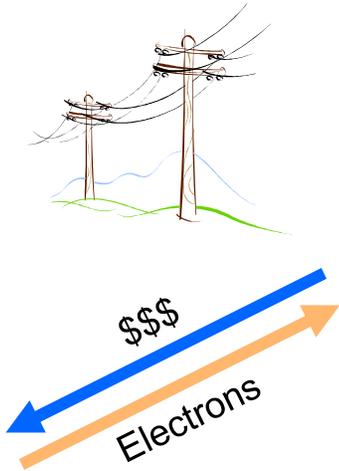
Local Muni or RE Co-op



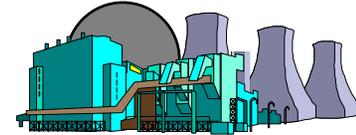
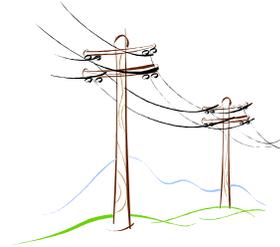
G&T Co-op or IOU



Rural School



Local Muni or RE Co-op



G&T Co-op or IOU

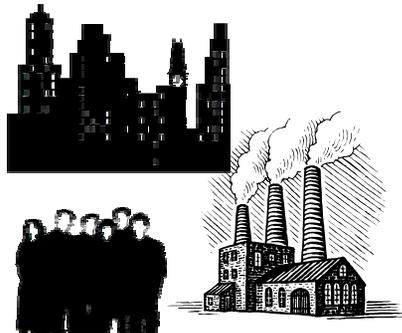
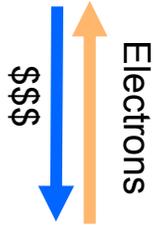


Community

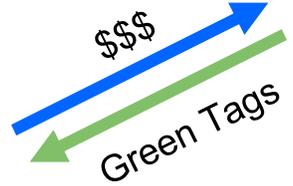


COMMUNITY ENERGY
Pursuing the Sustainable Energy

Green Tag Marketer



Cities, Industries, Individuals



Marketing Campaign



Community Wind

Lessons Learned

- Schools like the “Wind for Schools” concept
- There is a long learning curve/education process
- The project represents a substantial change/effort over multiple years; it can’t be successful without a champion
- Wind energy development is complex: appearance of financial risk
- Rural schools are often connected to a RE Co-op
 - low avoided cost
 - Net metering not welcomed
- Demand charge tariff can be a disincentive
- Favorable policies make a big difference
- Public and private grant funding is available
- Organizing a school wind project represents a melting pot of community activity and opinions
- Science teachers are interested in wind curricula

Keys to Success



{ Grants
Electrons
Green Tags



Carpe Ventem
www.windpoweringamerica.gov