Wind Energy Economic Benefits

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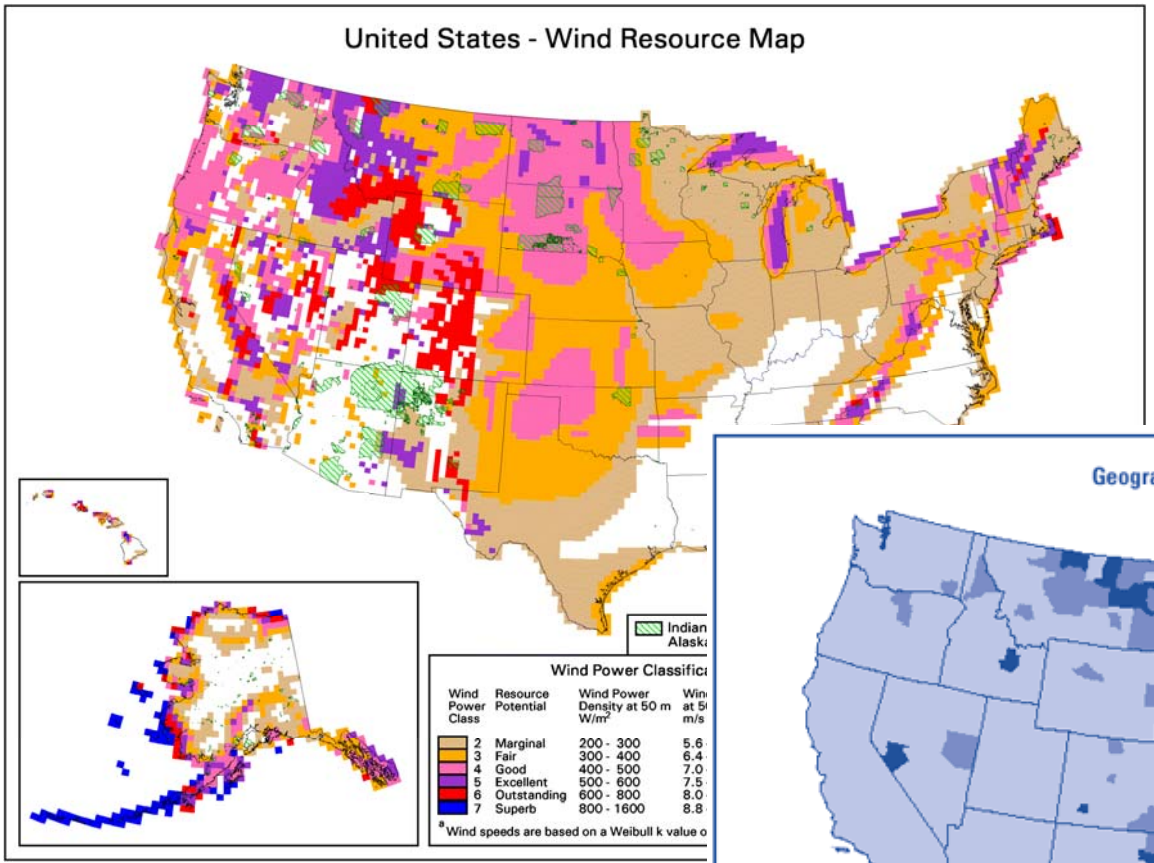
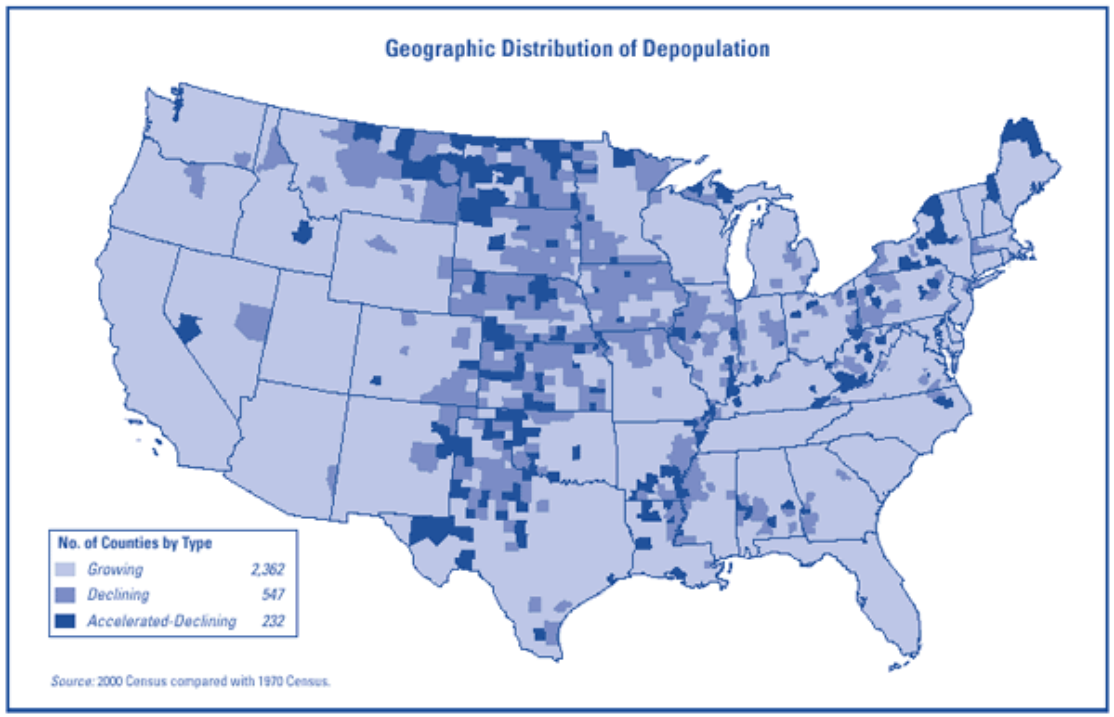
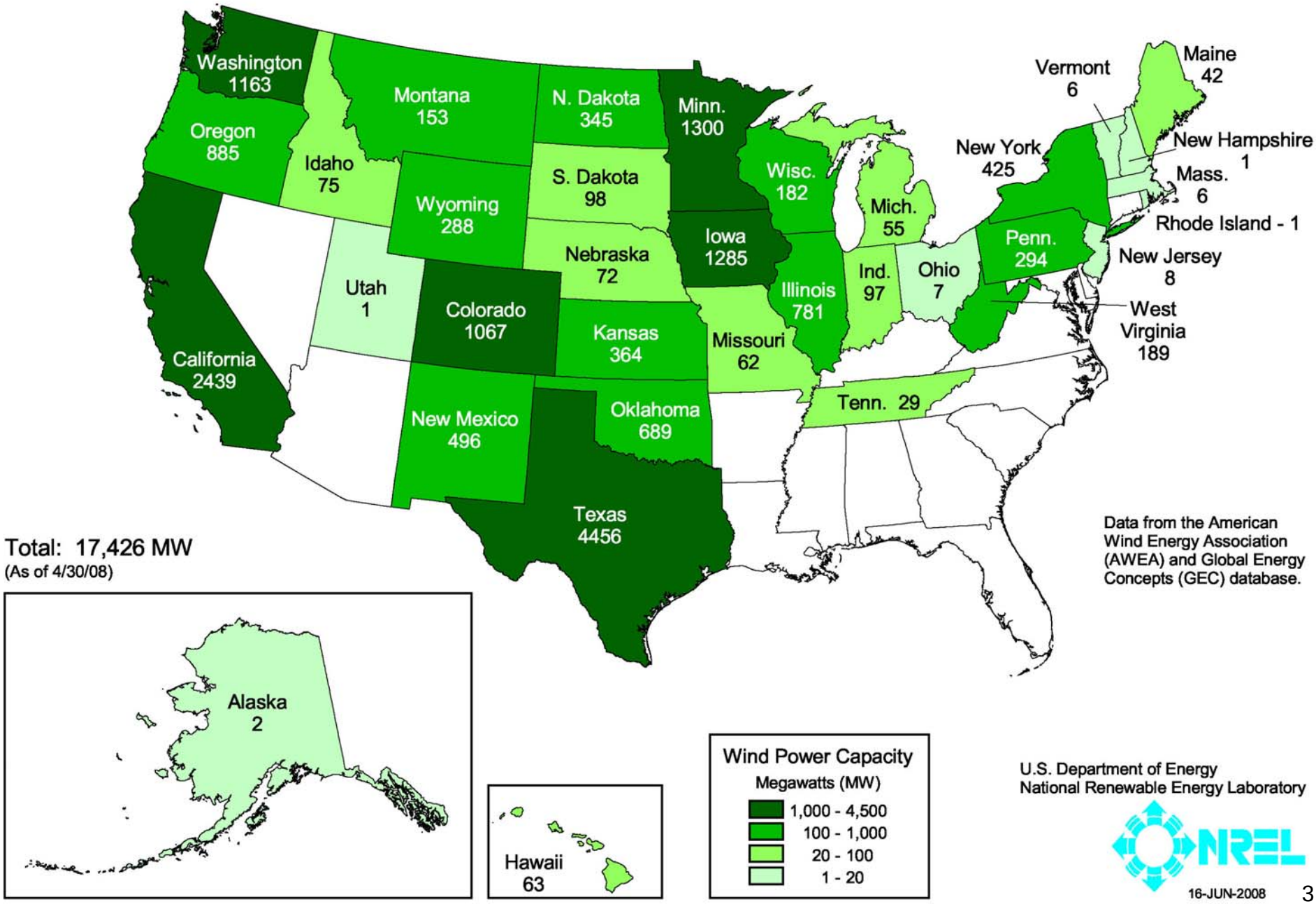
August 6, 2008

Windy Rural Areas Need Economic Development



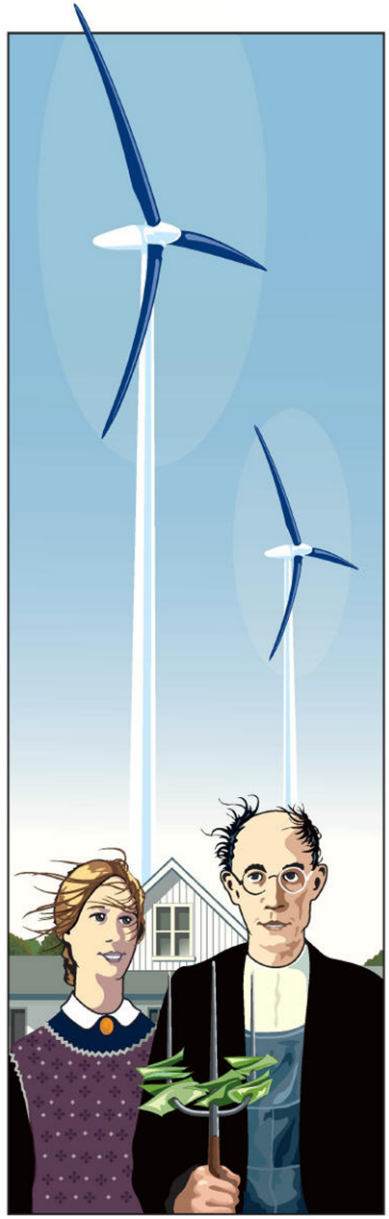


United States - Current Installed Wind Power Capacity (MW)



Economic Development Opportunities

- Land Lease Payments: 3-5% of gross revenue $3000-4000/MW/year
- Local property tax revenue: 100 MW often brings in on the order of $500K-$1 million/yr
- 80-100 jobs/ 100 MW during construction
- 6-8 permanent O&M jobs per 100 MW
- Local construction and service industry: Foundations, roads-- often done locally
- Investment as Equity Owners: production tax credit, accelerated depreciation, project revenues
- Manufacturing and Assembly plants expanding in U.S.-- single most significant economic development opportunity



Case Study: Iowa

240-MW Iowa wind project

- $640,000/yr in lease payments to farmers ($2,000/turbine/yr)
- $2M/yr in property taxes
- $5.5M/yr in O&M income
- **40 long-term O&M jobs**
- **200 short-term construction jobs**
- Doesn't include multiplier effect

South Dakota Wind Energy Center

- 40.5 MW (1.5-MW turbines)
- Landowner payments: $3,500-$4,000/year
- 100 – 125 workers during peak construction
- 3 fulltime O&M positions
- **Property taxes: $220,000/year**
- Sales and use tax: $1.2 million payable in 2003
- Located near Highmore, SD (population 808)
- Owned by FPL Energy
- Constructed in 2003

Peetz Table Wind Energy Center, CO

- 400.5 MW (1.5-MW turbines)
- Landowner payments: $2 million/year, $65 million over 30-year period
- 300 – 350 workers during peak construction (80% local)
- **16 – 18 O&M positions**
- Total annual tax payments: $2.3 million/year (10% of total county budget); $70 million over 30 years
- Located near Peetz, CO
- Owned by FPL Energy
- Constructed in 2007

Weatherford Wind Energy Center, OK

- 147 MW (1.5-MW turbines)
- **Landowner payments: $300,000 in annual lease payments**
- 150 workers during peak construction
- 6 fulltime O&M positions
- Property taxes: $17 million over 20 years
- Sawartzky Construction received $300,000 in revenue from the project
- Owned by FPL Energy
- Constructed in 2005

Wyoming Wind Energy Center

- 144 MW (1800-kW turbines)
- Landowner payments: $18 million over the life of the project
- 175 workers during peak construction (25% local)
- 8 fulltime O&M positions
- Property taxes: $1 million (2006/7)
- **50 Wyoming companies subcontracted during the construction period**
- Located in Uinta County, WY (population 20,213)
- Owned by FPL Energy
- Constructed in 2003

Direct jobs and parts during construction

Truck drivers,
crane operators

Wind Turbine Components

Earth moving, cement pouring

Management and support

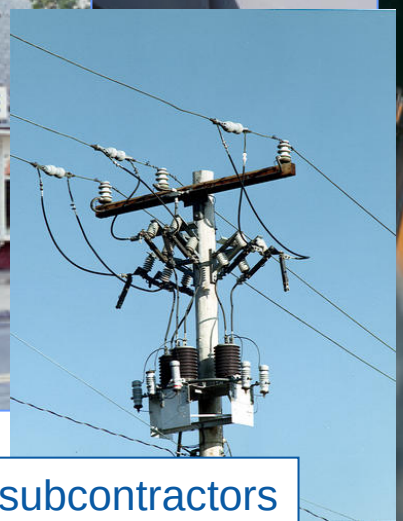
Construction

Direct wind project jobs during **operations**

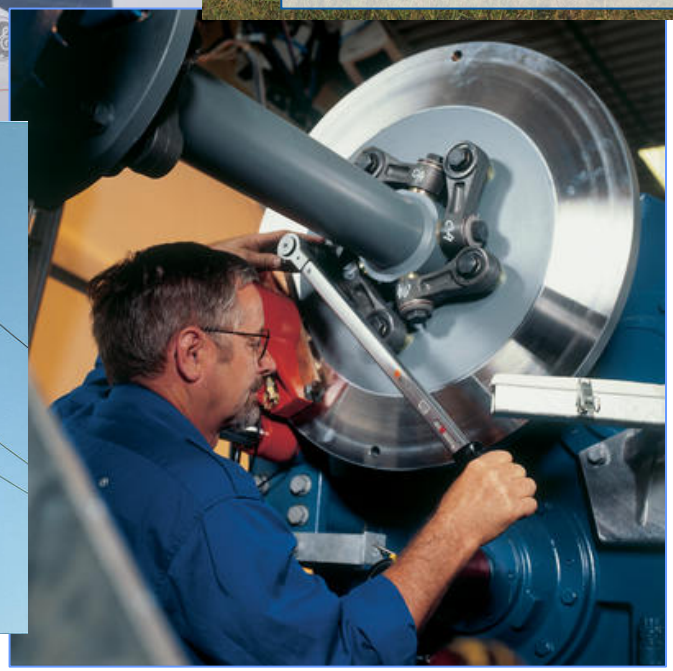
Operations and maintenance, management

Landowner royalties

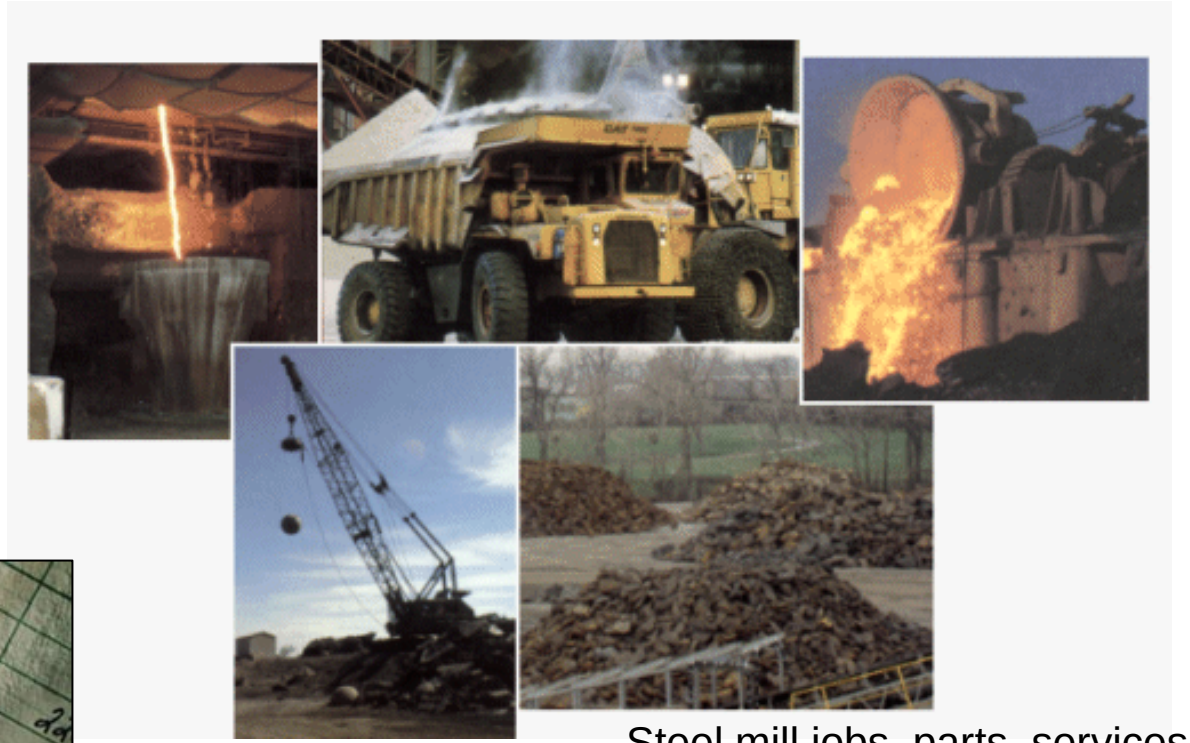
Parts and materials purchased



Utility services and subcontractors



Indirect jobs, services, materials



Steel mill jobs, parts, services

Photos: E.C.Levy, Inc, Detroit, MI

Wind subcomponent manufacturing and sales

Induced jobs, services, materials

Child care, grocery store, clothing, other retail, public transit, new cars, restaurants, medical services

Wind Energy's Economic impacts

On-site direct, off-site direct, Indirect, Induced

Wind energy's economic "ripple effect"

Direct Impacts

On-site	Off-site
Construction workers Management Administrative support	Boom truck & management, gas and gas station workers, blades and towers & workers
Cement truck drivers, road crews, maintenance workers	Hardware store purchases and workers, spare parts and their suppliers

Indirect Impacts

These are jobs in and payments made to supporting businesses, such as bankers financing the construction, contractor, manufacturers and equipment suppliers of subcomponents.

Induced Impacts

These jobs and earnings result from the spending by people directly and indirectly supported by the project, including benefits to grocery store clerks, retail salespeople and child care providers.

Missouri – Economic Impacts

from 1000 MW of new wind development

Wind energy's economic "ripple effect"

Direct Impacts

Payments to Landowners:
- $2.7 Million/yr

Local Property Tax Revenue:
- $8.7 Million/yr

Construction Phase:
- 1,550 new jobs
- $189 M to local economies

Operational Phase:
- 250 new long-term jobs
- $21 M/yr to local economies

Indirect & Induced Impacts

Construction Phase:
- 1,700 new jobs
- $160 M to local economies

Operational Phase:
- 250 local jobs
- $25 M/yr to local economies

Totals
(construction + 20yrs)

Total economic benefit = $1.3 billion

New local jobs during construction = 3,300

New local long-term jobs = 500

All jobs rounded to the nearest 50 jobs; All values greater than $10 million are rounded to the nearest million

Construction Phase = 1-2 years
Operational Phase = 20+ years

Midwest Governor's Association Member States - Economic Impacts Construction and Operations

From the 20% Scenario - 99 GW of wind development

Wind energy's economic "ripple effect"

Direct Impacts

Payments to Landowners:
- $263 Million/year

Local Property Tax Revenue:
- $805 Million/year

Construction Phase:
- 152,000 FTE jobs
- $ 19 Billion in economic activity

Operations (annual):
- 24,000 jobs
- $2.1 Billion in economic activity

Indirect & Induced Impacts

Construction Phase:
- 148,000 FTE jobs
- $13.6 Billion in economic activity

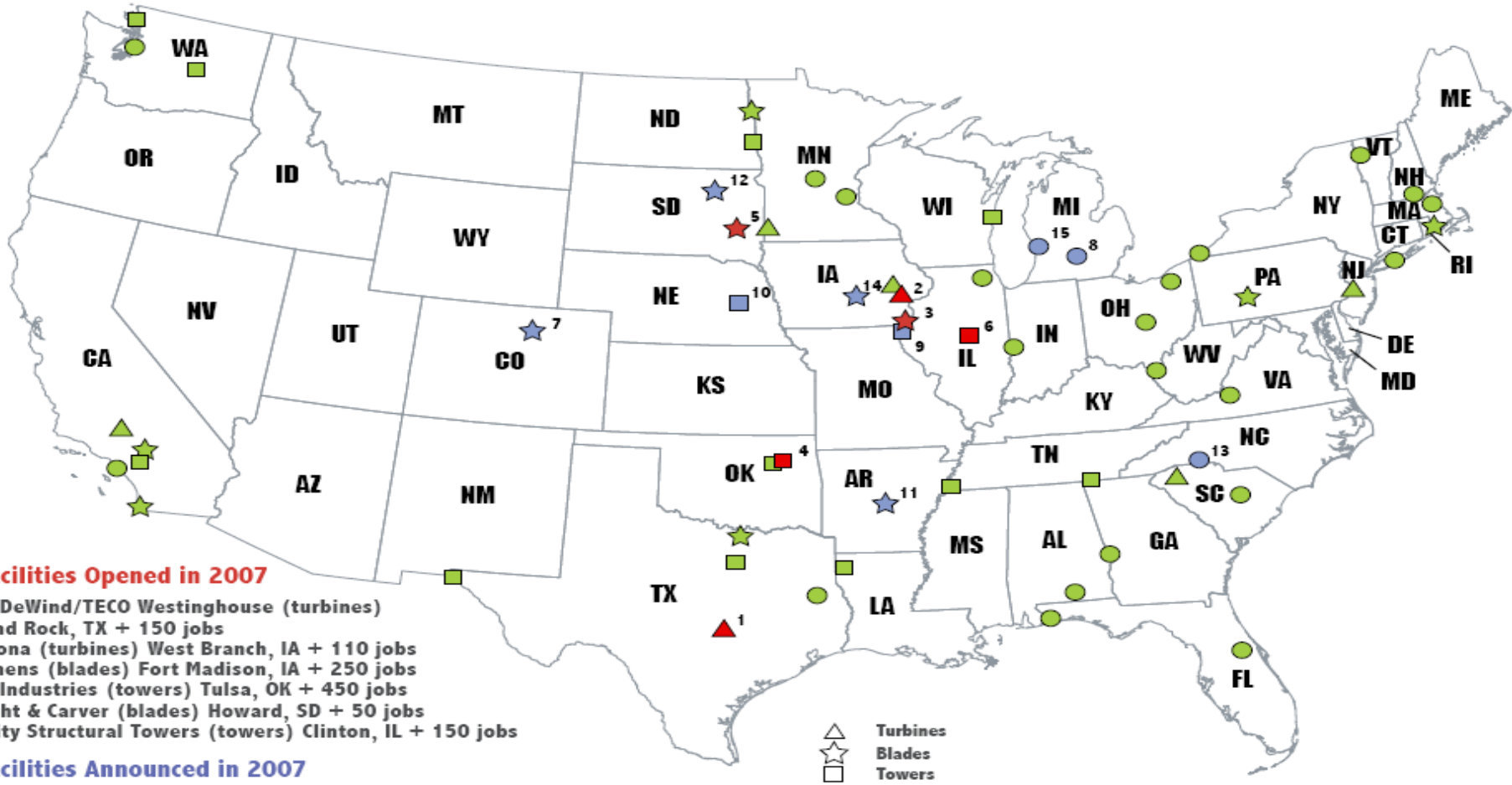
Operations:
- 21,000 FTE jobs
- $2.1 Billion in economic activity

Totals (construction + 20yrs)

- **Total economic benefit** = $115 Billion
- **Jobs during construction** = 300,000 FTE jobs
- **Operations jobs** =45,000 FTE jobs

Dollar values are constant 2007 dollars.

Soaring Demand Spurs Expansion of U.S. Wind Turbine Manufacturing



New Facilities Opened in 2007

1. CTC-DeWind/TECO Westinghouse (turbines) Round Rock, TX + 150 jobs
2. Acciona (turbines) West Branch, IA + 110 jobs
3. Siemens (blades) Fort Madison, IA + 250 jobs
4. DMI Industries (towers) Tulsa, OK + 450 jobs
5. Knight & Carver (blades) Howard, SD + 50 jobs
6. Trinity Structural Towers (towers) Clinton, IL + 150 jobs

New Facilities Announced in 2007

7. Vestas (blades) Windsor, CO + 650 jobs
8. Dowding Industries (turbine components) Eaton Rapids, MI + 200 jobs
9. Hendricks Industries (towers) Keokuk, IA + 350 jobs
10. Katana Summit (towers) Columbus, NE + 120 jobs
11. LM Glasfiber (blades) Little Rock, AR + 1,000 jobs
12. Molded Fiberglass (blades) Aberdeen, SD + 750 jobs
13. PPG Industries (fiberglass) Shelby, NC + not available
14. TPI Composites (blades) Newton, IA + 500 jobs
15. Genzink Steel (nacelles) Holland, MI + 10 jobs

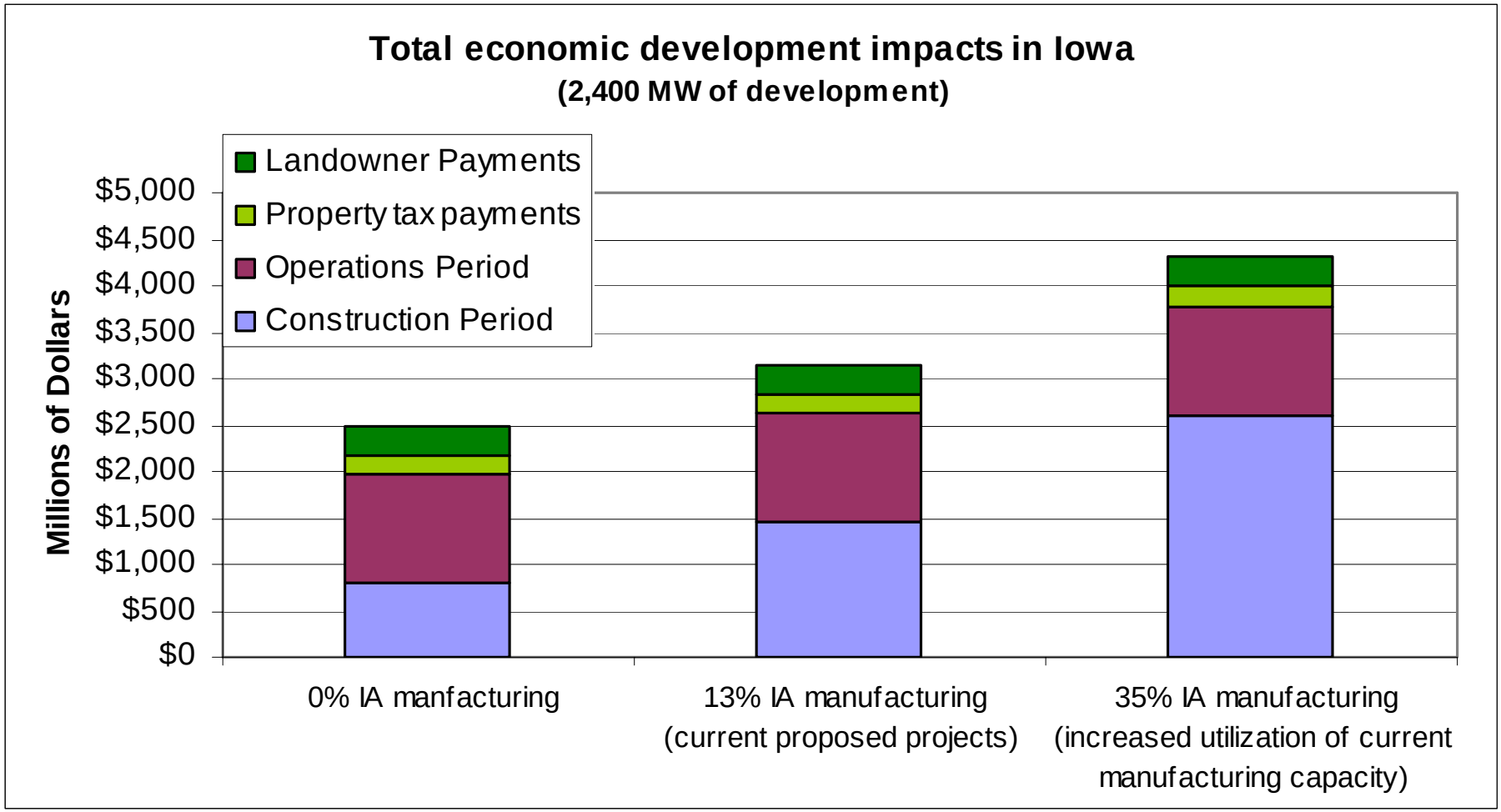
Turbines
Blades
Towers
Other
Existing facilities online prior to 2007
New facilities opened in 2007
New facilities announced in 2007

Note: Map is not intended to be exhaustive

Figure includes wind turbine and component manufacturing facilities, as well as other supply chain facilities, and excludes corporate headquarters and service-oriented facilities. The facilities highlighted here are not intended to be exhaustive. Those facilities designated as "turbines" may include turbine assembly as well as component manufacture including, in some cases, towers and blades.

This map was created by The National Renewable Energy Laboratory for the U.S. Department of Energy April 16, 2008

Manufacturing and Economic Development

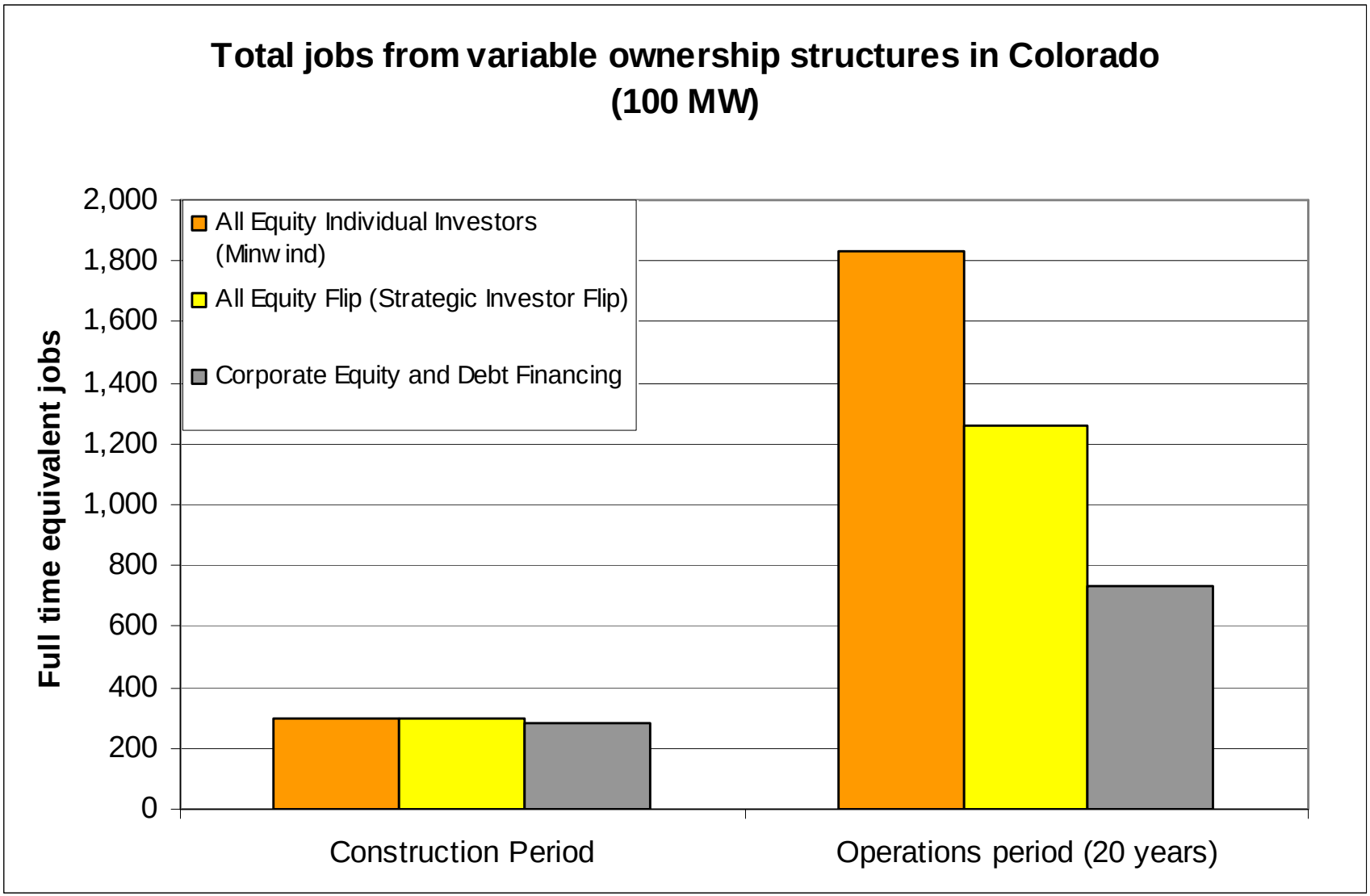


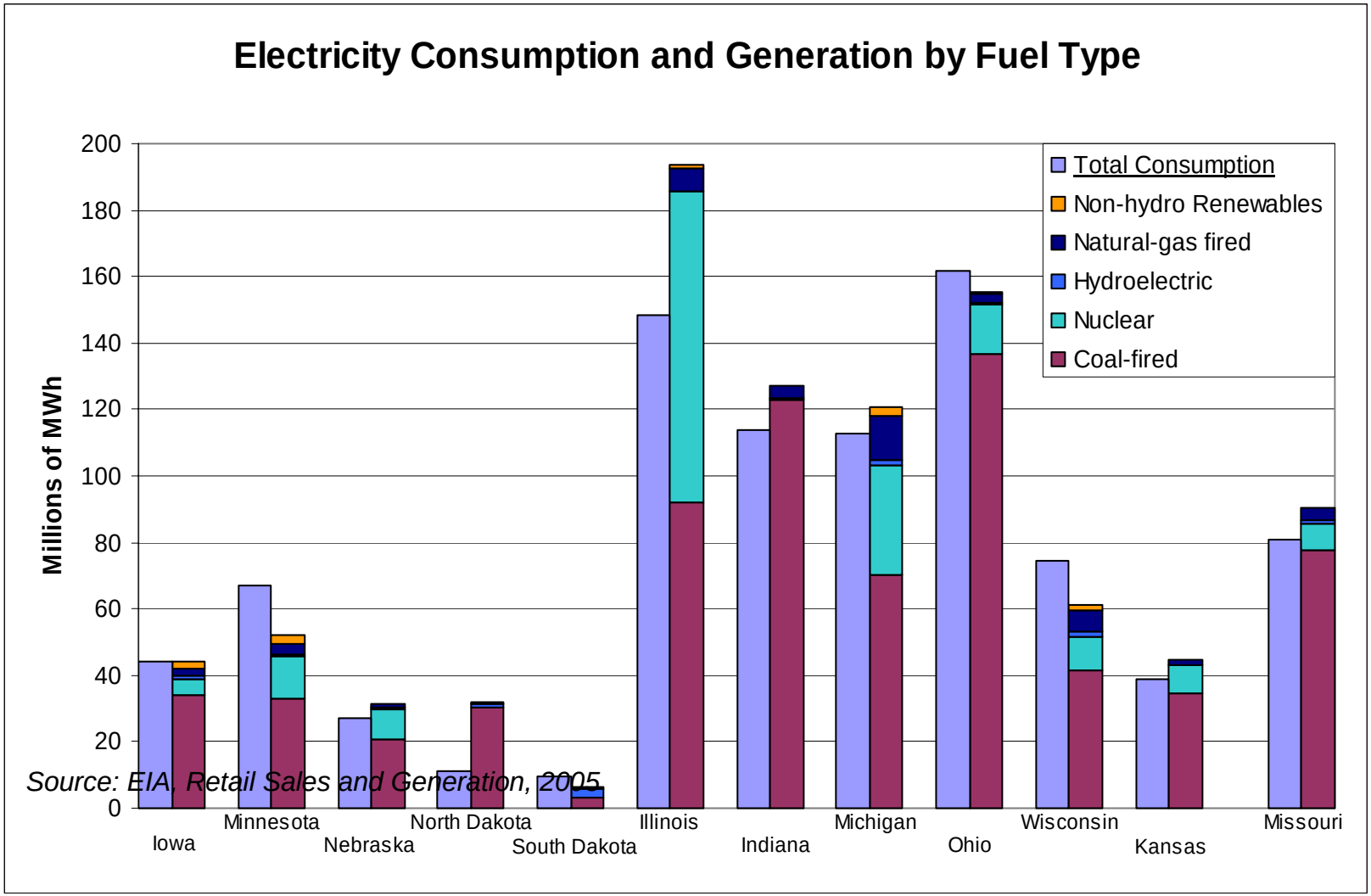
Local Ownership Models

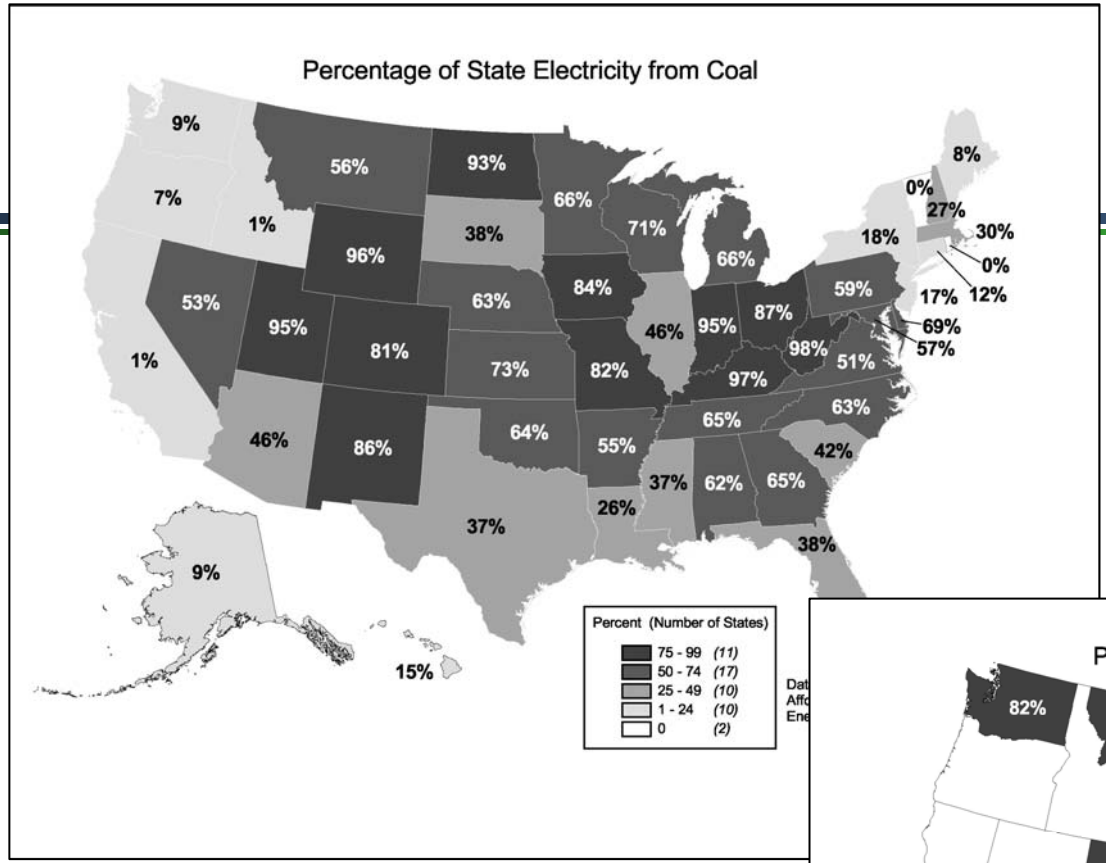
- Minnesota farmer cooperative (Minwind)
- FLIP structure
- Farmer-owned small wind
- Farmer-owned commercial-scale

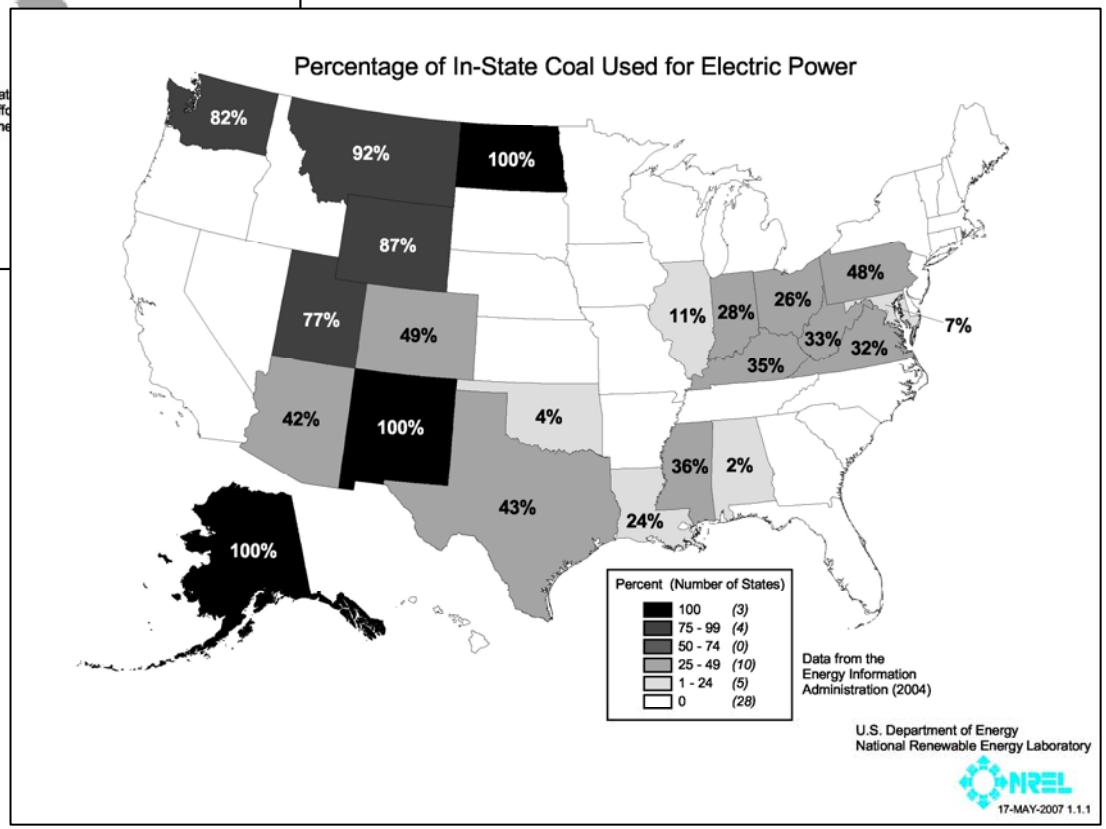
© L. Kennedy

Impacts of Local Ownership

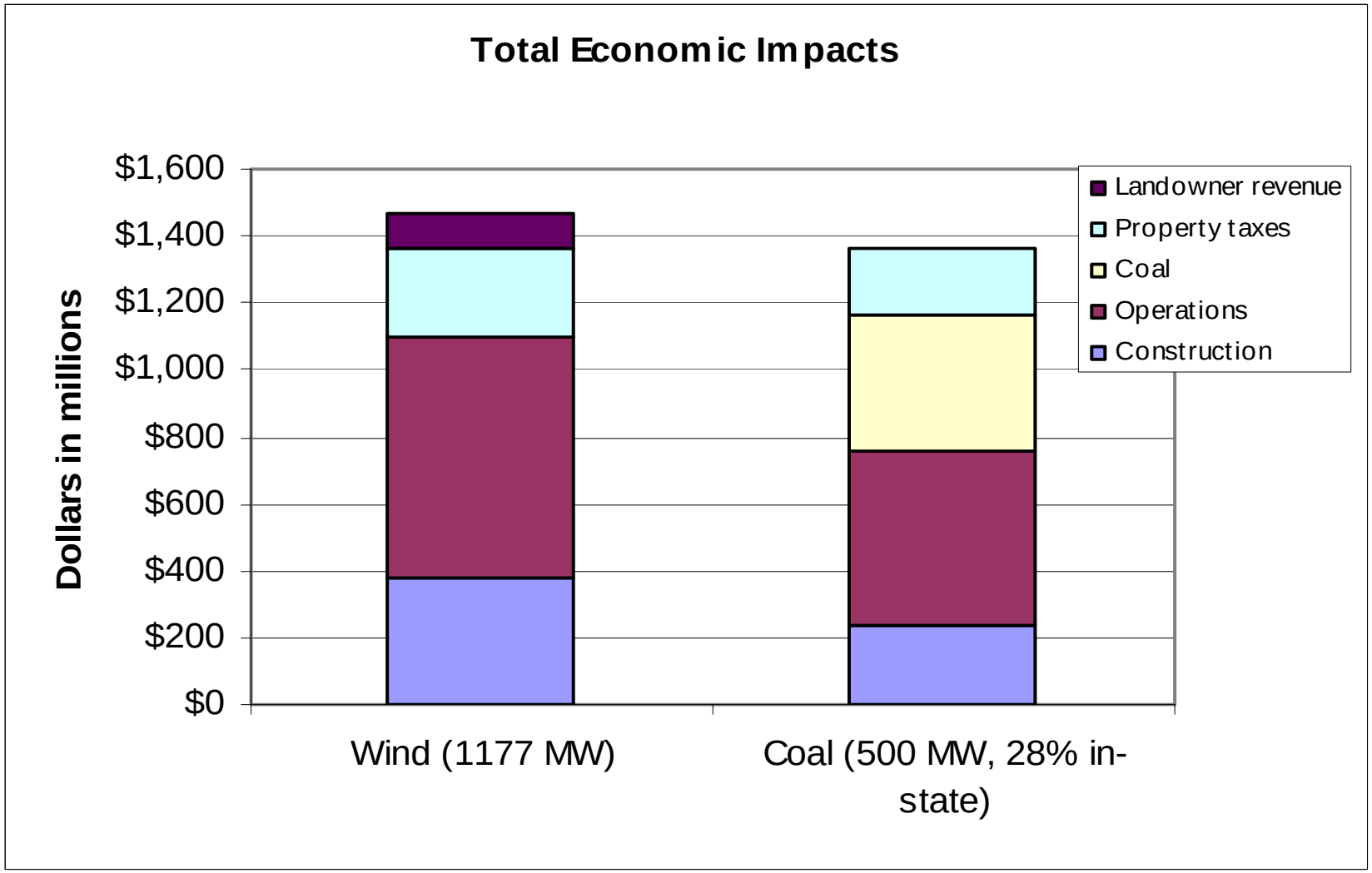



Electricity Consumption and Generation by Fuel Type
Millions of MWh
200
180
160
140
120
100
80
60
40
20
0
Total Consumption
Non-hydro Renewables
Natural-gas fired
Hydroelectric
Nuclear
Coal-fired
Iowa
Minnesota
Nebraska
North Dakota
South Dakota
Illinois
Indiana
Michigan
Ohio
Wisconsin
Kansas
Missouri
Source: EIA, Retail Sales and Generation, 2005


Percentage of State Electricity from Coal
9%
7%
1%
56%
93%
66%
71%
8%
0%
27%
30%
0%
12%
18%
17%
69%
57%
96%
38%
66%
53%
95%
81%
63%
84%
59%
87%
95%
46%
98%
51%
1%
73%
82%
97%
63%
65%
46%
86%
64%
55%
42%
37%
62%
65%
26%
37%
38%
9%
15%
Percent (Number of States)
75 - 99 (11)
50 - 74 (17)
25 - 49 (10)
1 - 24 (10)
0 (2)

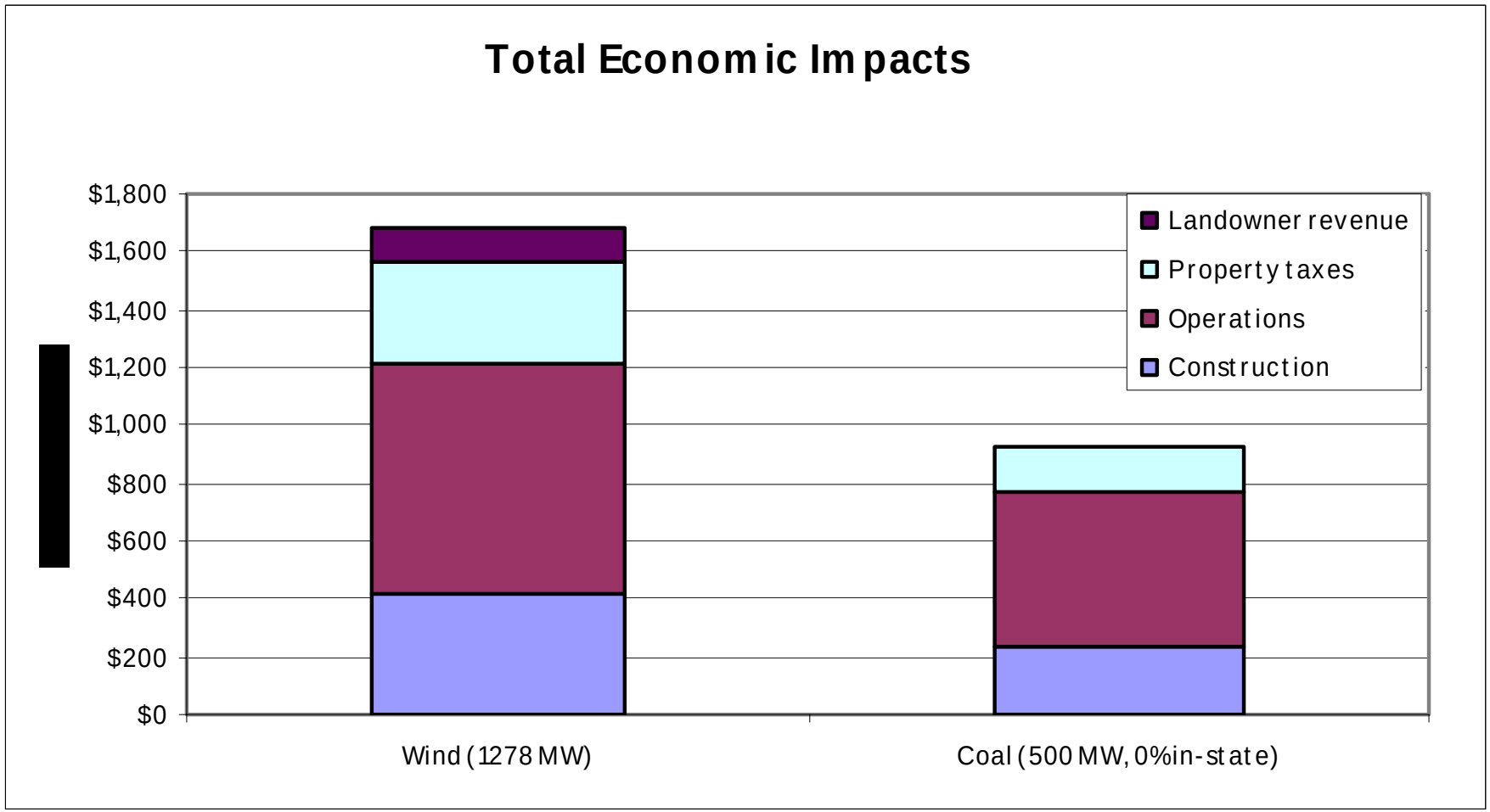

Percentage of In-State Coal Used for Electric Power
82%
92%
100%
87%
48%
11%
28%
26%
7%
77%
49%
33%
32%
35%
42%
100%
4%
36%
2%
43%
24%
100%
Percent (Number of States)
100 (3)
75 - 99 (4)
50 - 74 (0)
25 - 49 (10)
1 - 24 (5)
0 (28)
Data from the
Energy Information
Administration (2004)
U.S. Department of Energy
National Renewable Energy Laboratory
NREL
17-MAY-2007 1.1.1

Comparing wind and coal in Indiana



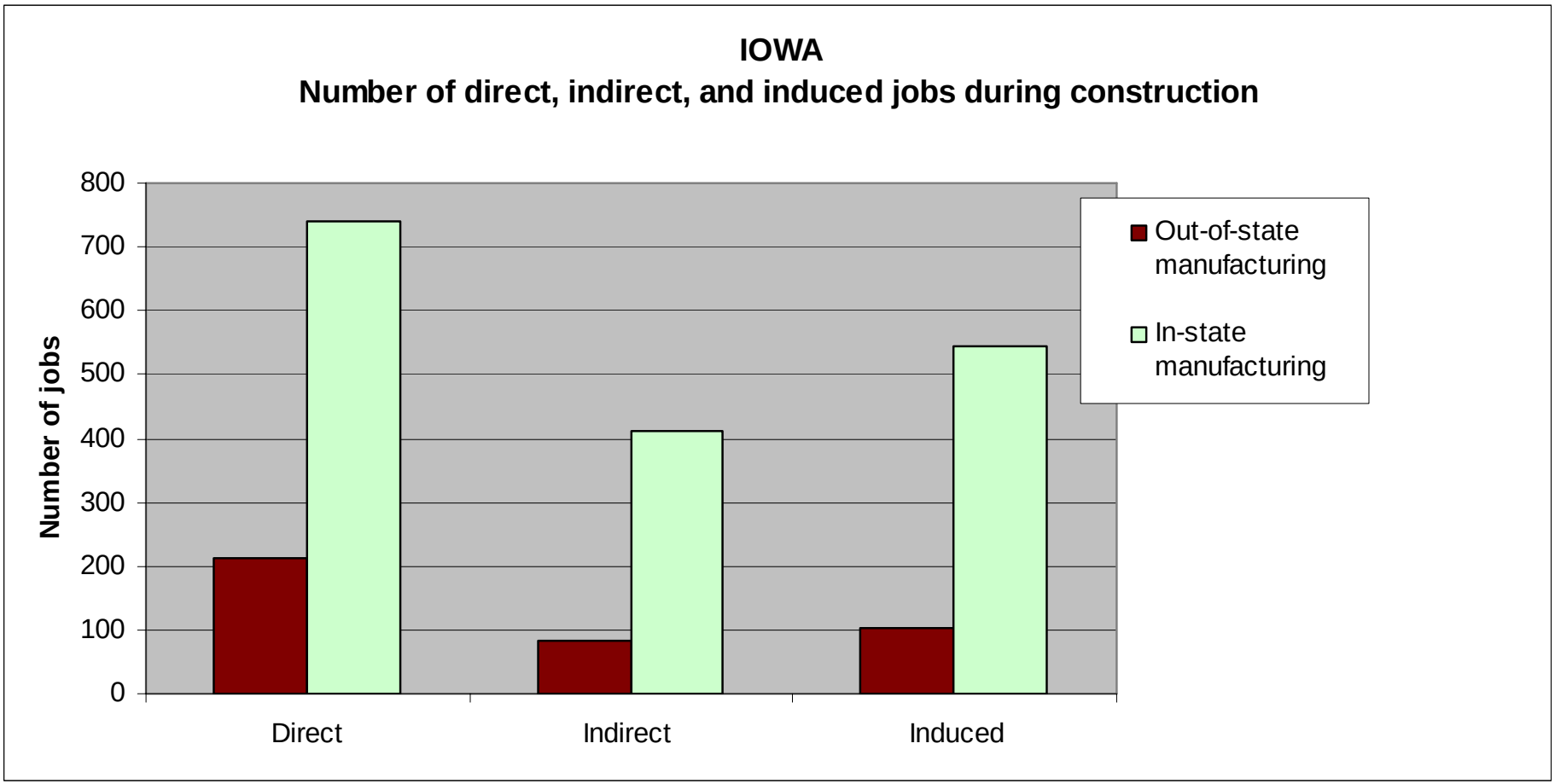
Constant 2007 dollars

Comparing wind and coal in Michigan

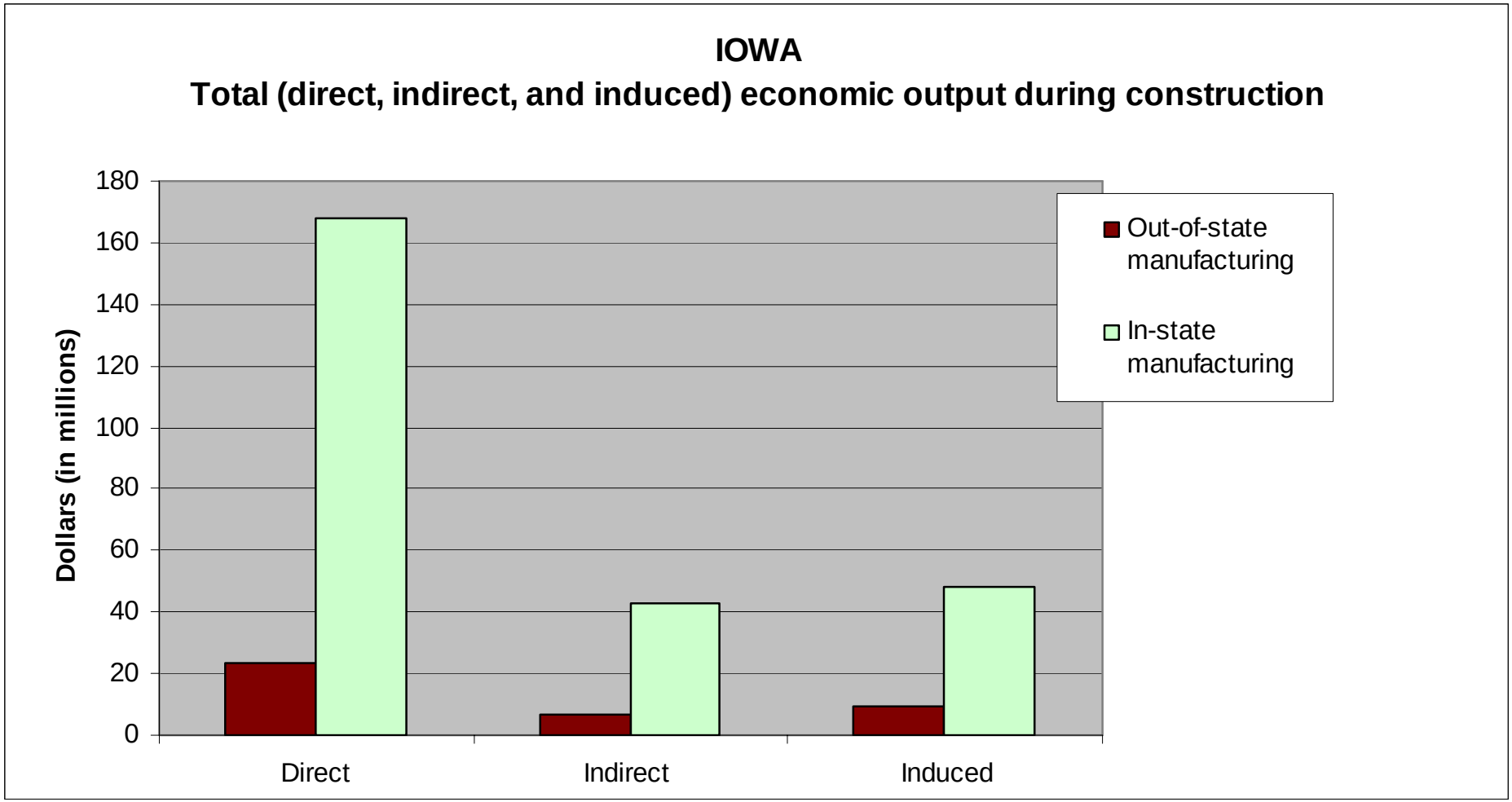


Constant 2007 dollars

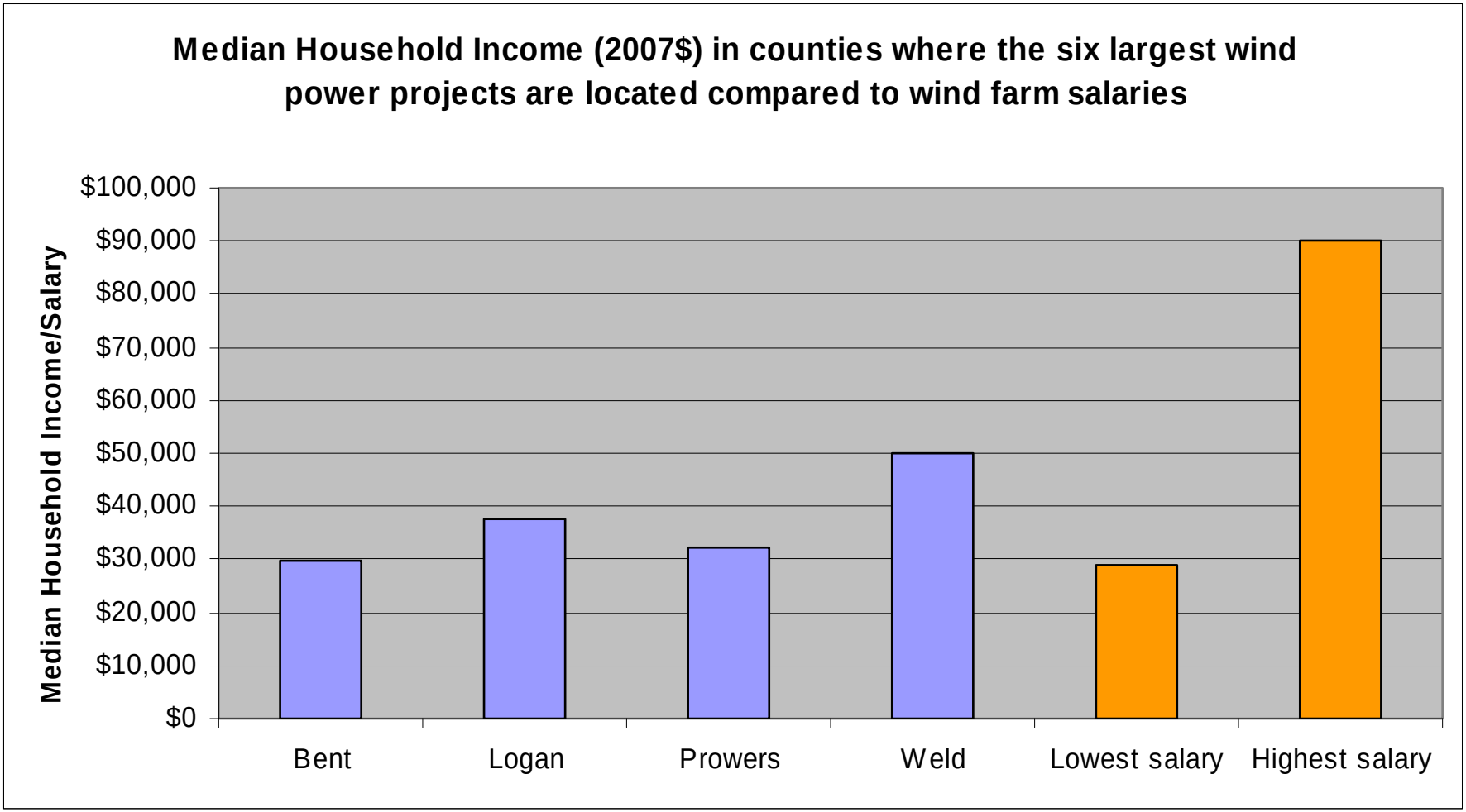
Potential Employment Impact of Installing a 100-MW Wind Farm Using In-state Turbines, Blades and Towers



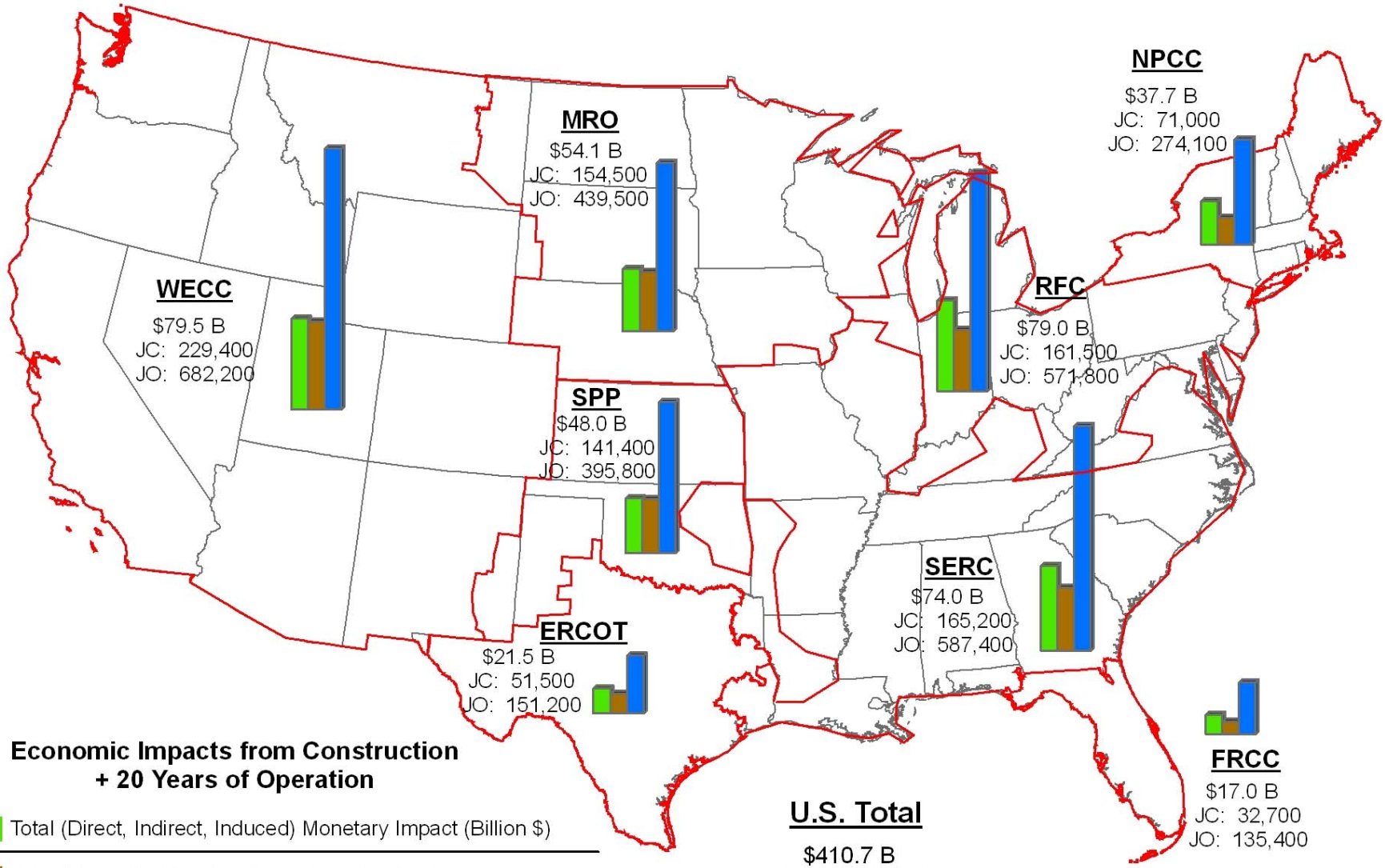
Potential Total Economic Impact of Installing a 100-MW Wind Farm Using In-state Turbines, Blades and Towers



Wind projects offer competitive salaries



20% Wind Electricity by 2030 - Economic Impacts by NERC Region



Economic Impacts from Construction + 20 Years of Operation

Total (Direct, Indirect, Induced) Monetary Impact (Billion $)

Jobs (JC): Jobs Created During Construction Period

Jobs (JO): Jobs in Job-Years Created During Operations Period

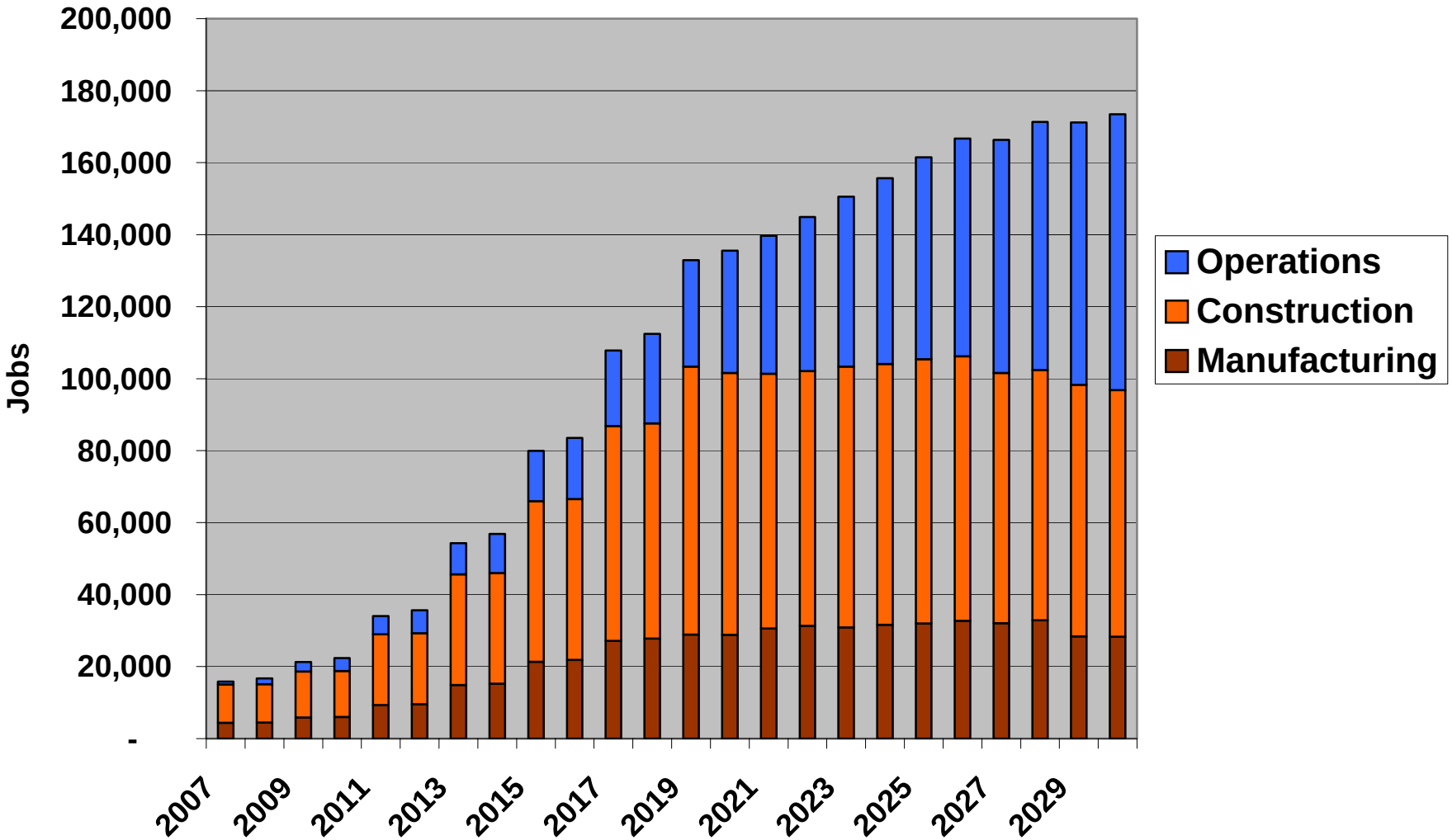
U.S. Total

$410.7 B
JC: 1,007,200
JO: 3,237,400

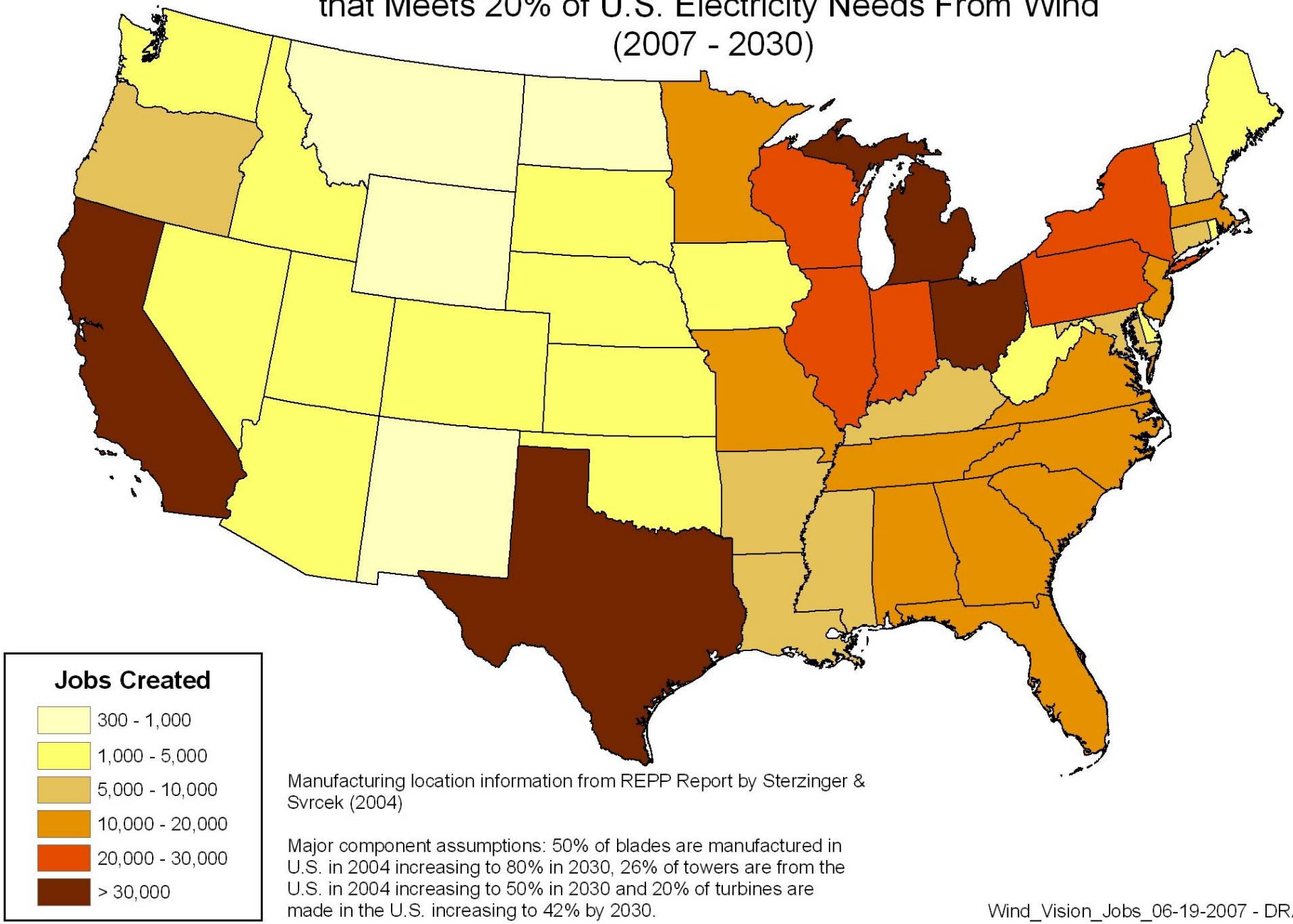
U.S. Department of Energy
National Renewable Energy Laboratory

Wind Vision case = 304 GW of wind capacity.
All job values rounded to the nearest 100.

20% Wind Vision Employment



Total Cumulative Manufacturing Jobs Created by Scenario that Meets 20% of U.S. Electricity Needs From Wind (2007 - 2030)



Manufacturing location information from REPP Report by Sterzinger & Svrcek (2004)

Major component assumptions: 50% of blades are manufactured in U.S. in 2004 increasing to 80% in 2030, 26% of towers are from the U.S. in 2004 increasing to 50% in 2030 and 20% of turbines are made in the U.S. increasing to 42% by 2030.

National (U.S.) – Economic Impacts

Cumulative impacts between 2007-2030 (NPV)

From the 20% Scenario- 300 GW new Onshore and Offshore development

Wind energy's economic "ripple effect"

Direct Impacts

Payments to Landowners:
- $317 M

Local Property Tax Revenue:
- $760 M

Construction Phase:
- 1.75 M FTE jobs
- $111 B to the US economy

Operational Phase:
- 1.16 M FTE jobs
- $26 B to the US economy

Indirect & Induced Impacts

Construction Phase:
- 4.46 M FTE jobs
- $247 B to the US economy

Operational Phase:
- 2.15 M FTE jobs
- $60 B to the US economy

Totals
(construction + 20yrs)

- **Total economic benefit** = $444 billion
- **New jobs during construction** = 6.2 M FTE jobs
- **New operations jobs** =3.3 M FTE jobs

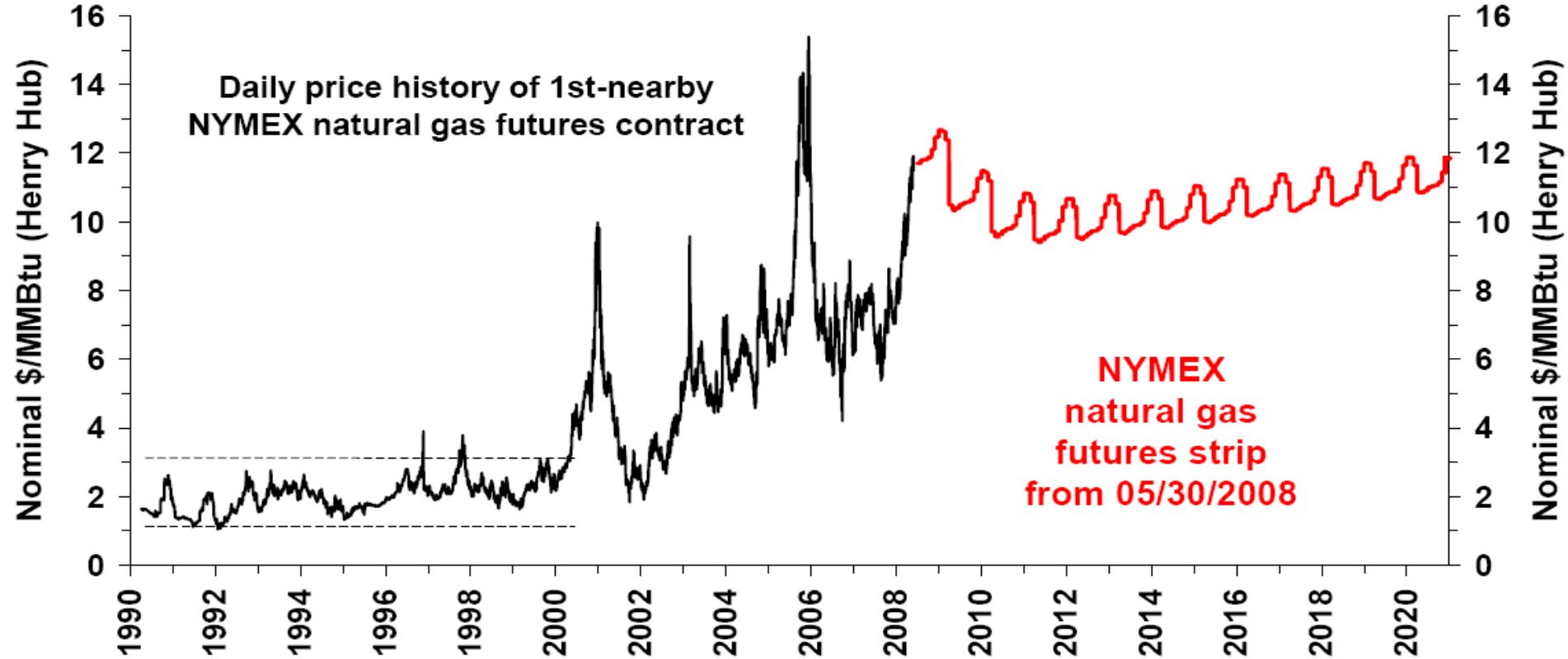
All monetary values are in 2006 dollars. Net present value (NPV) adjustments are made based on a discount rate of 7%

Construction Phase = 1-2 years

Results: Costs & Benefits

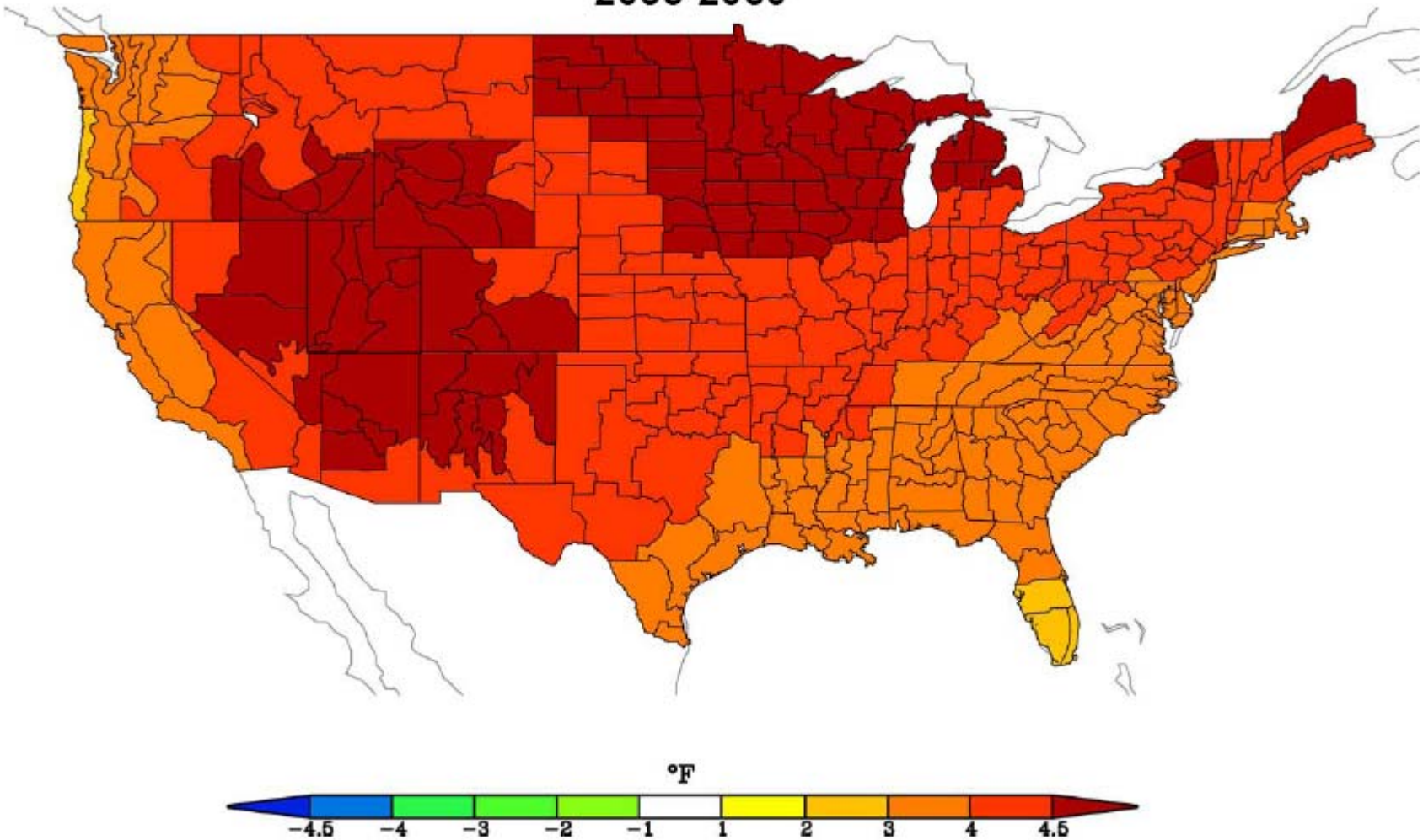
Incremental direct cost to society	**$43 billion**
Reductions in emissions of greenhouse gasses and other atmospheric pollutants	825 M tons (2030) **$98 billion**
Reductions in water consumption	8% total electric 17% in 2030
Jobs created and other economic benefits	140,000 direct $450 billion total
Reductions in natural gas use and price pressure	11% **$150 billion**
Net Benefits: $205B + Water savings	

Natural Gas – Historic Prices



Source: LBNL

Change in Annual Temperature
2035-2060



Source: NOAA

Carpe Ventem

www.windpoweringamerica.gov