Indiana Electricity Projections and Renewable Energy

Presented by:
David Nderitu & Marco Velástegui
State Utility Forecasting Group
Purdue University

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Indiana Statewide Association of Rural Electric Coops

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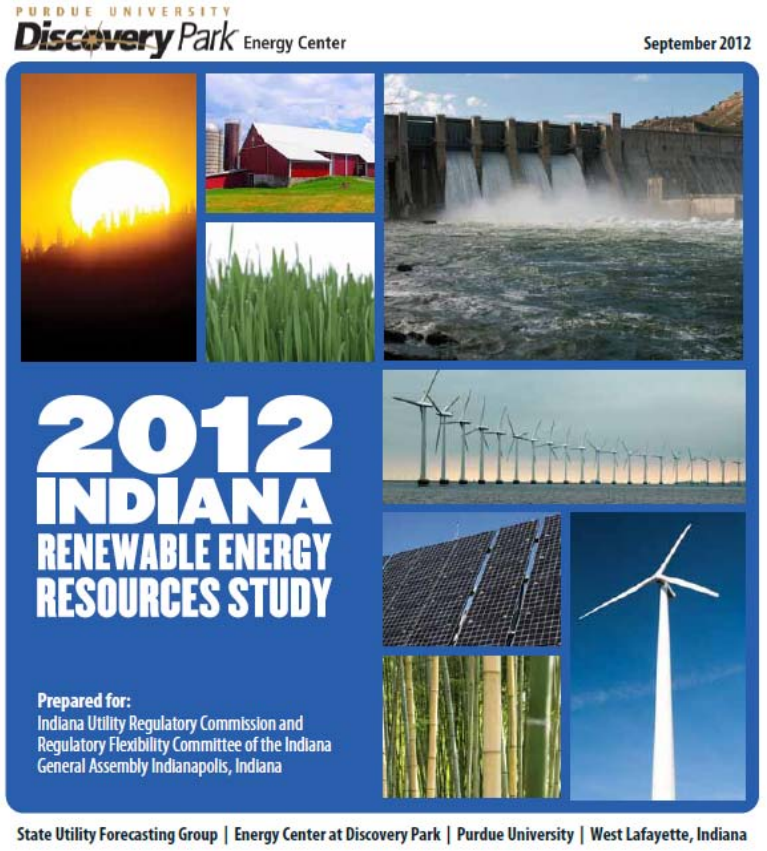
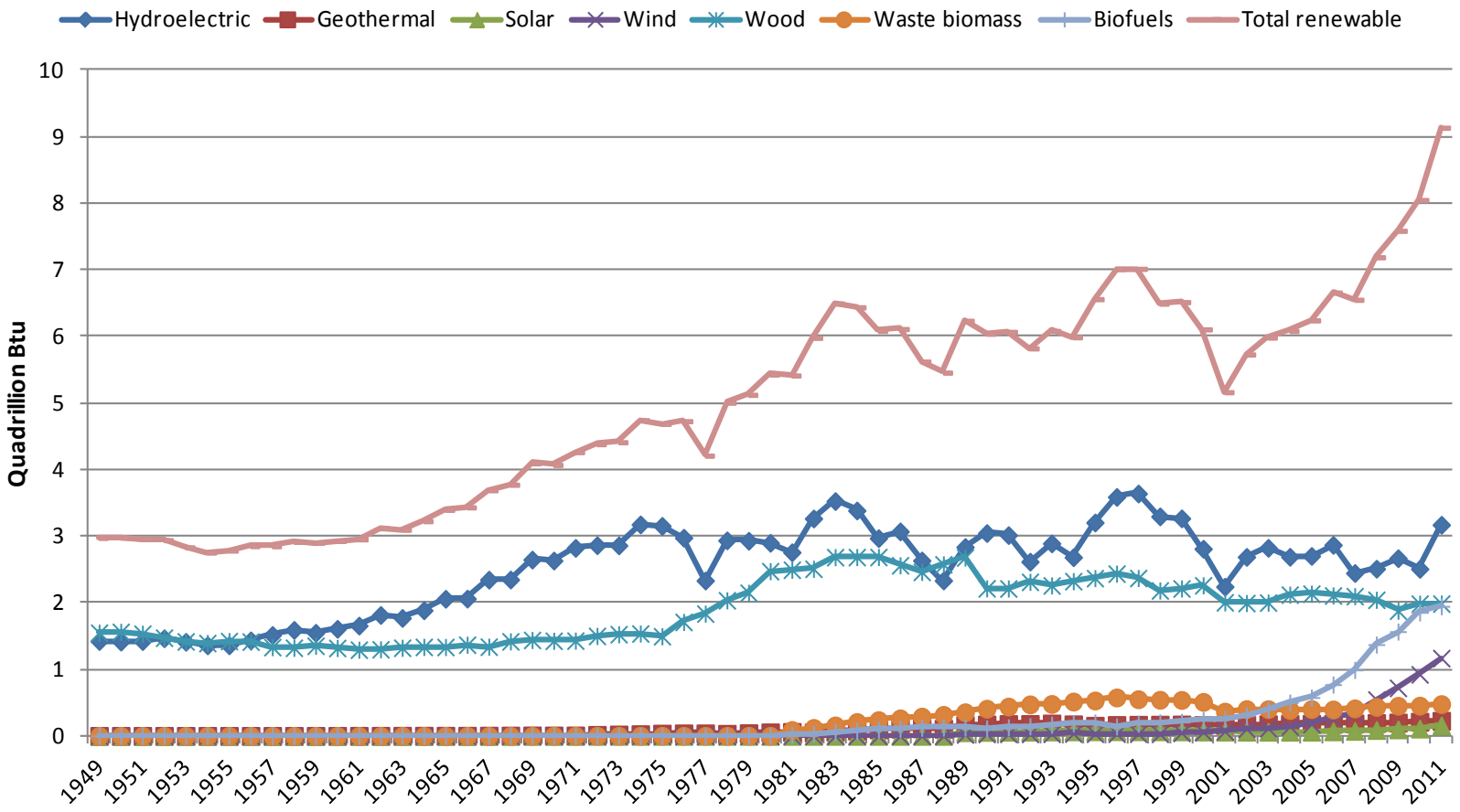
2012 Renewable Resources Study

- Renewable energy trends
- Barriers to development
- Individual renewable resources
  - Wind
  - Energy crops
  - Organic waste
  - Solar thermal
  - Photovoltaics
  - Hydropower

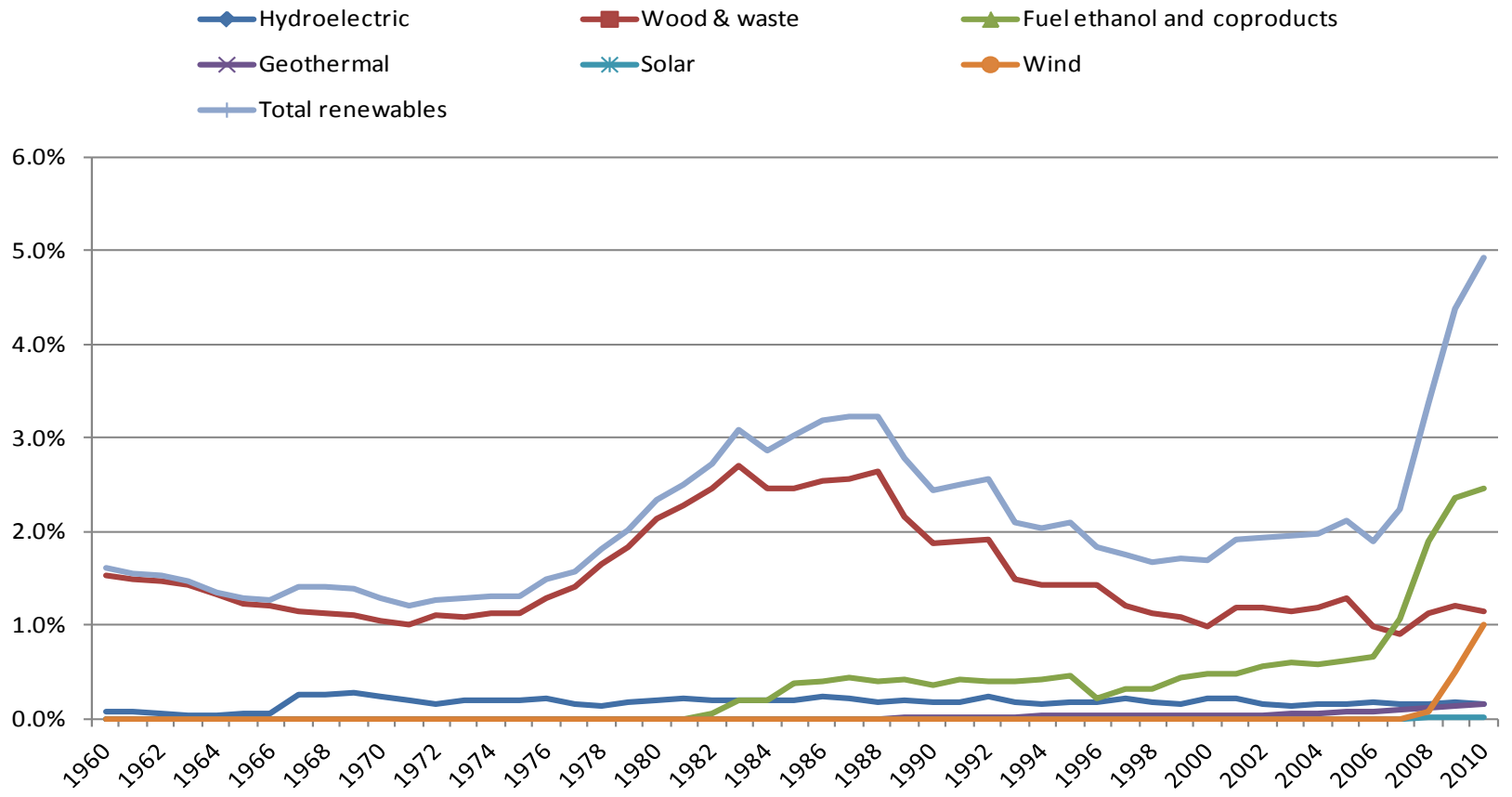


Renewables Share of U.S. Energy Consumption



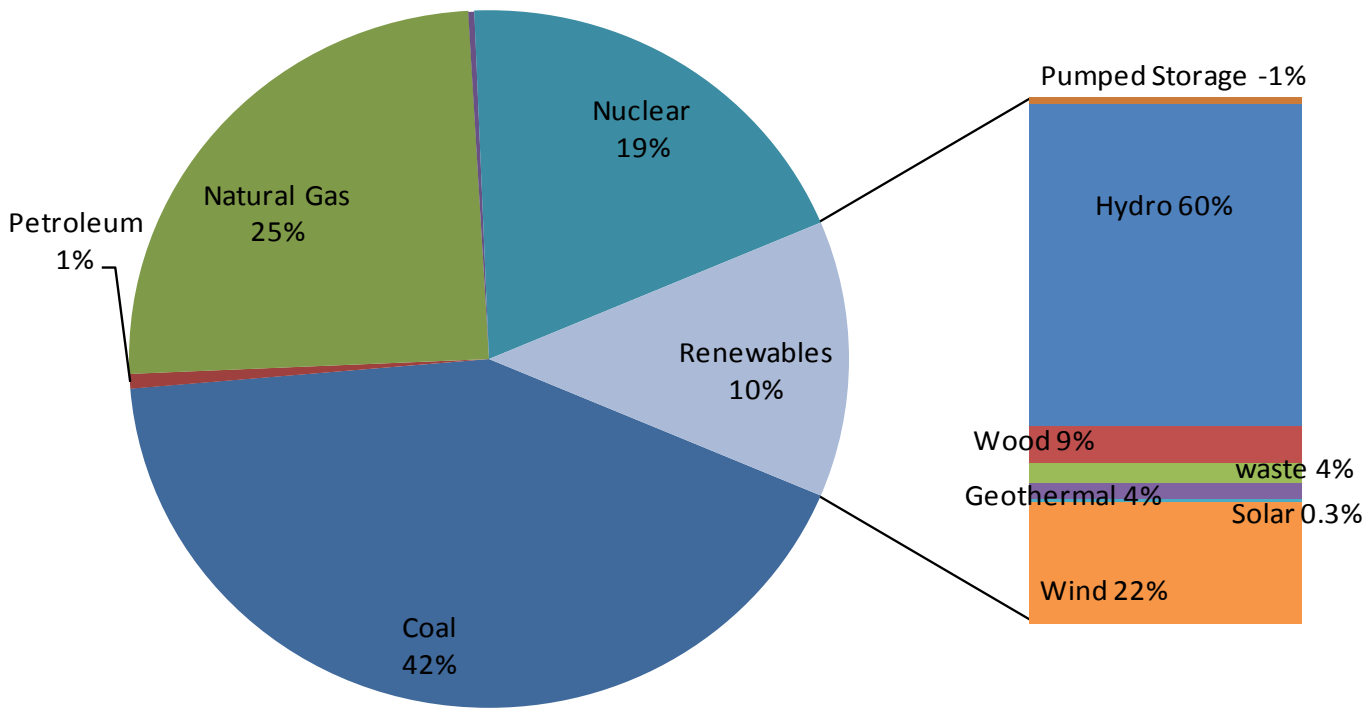
Source: Energy Information Administration (EIA)

Renewables Share of Indiana Energy Consumption



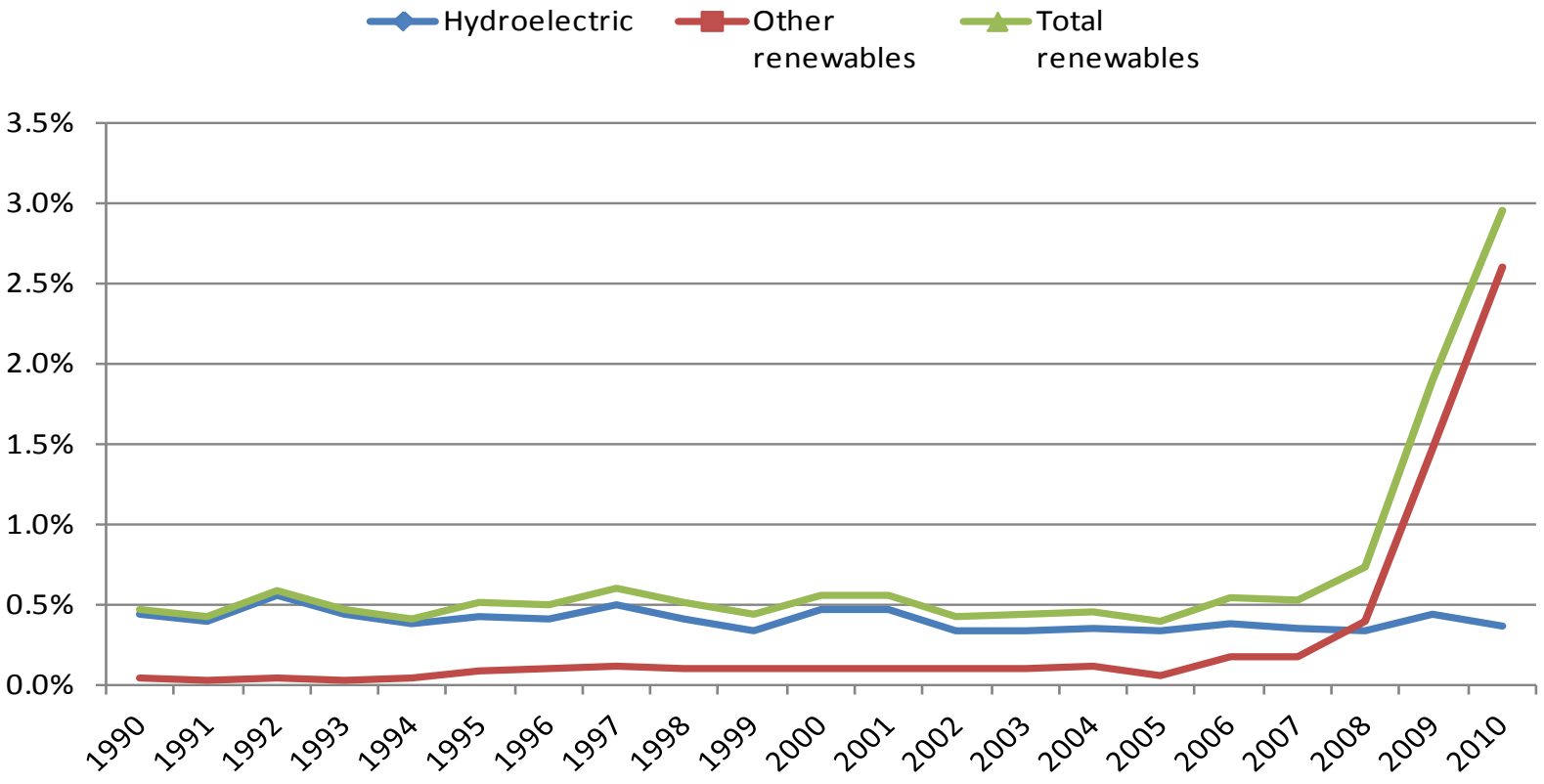
Source: EIA

2011 U.S. Electricity Generation by Energy Source



Source: EIA

Renewables Share of Indiana Electricity Generation

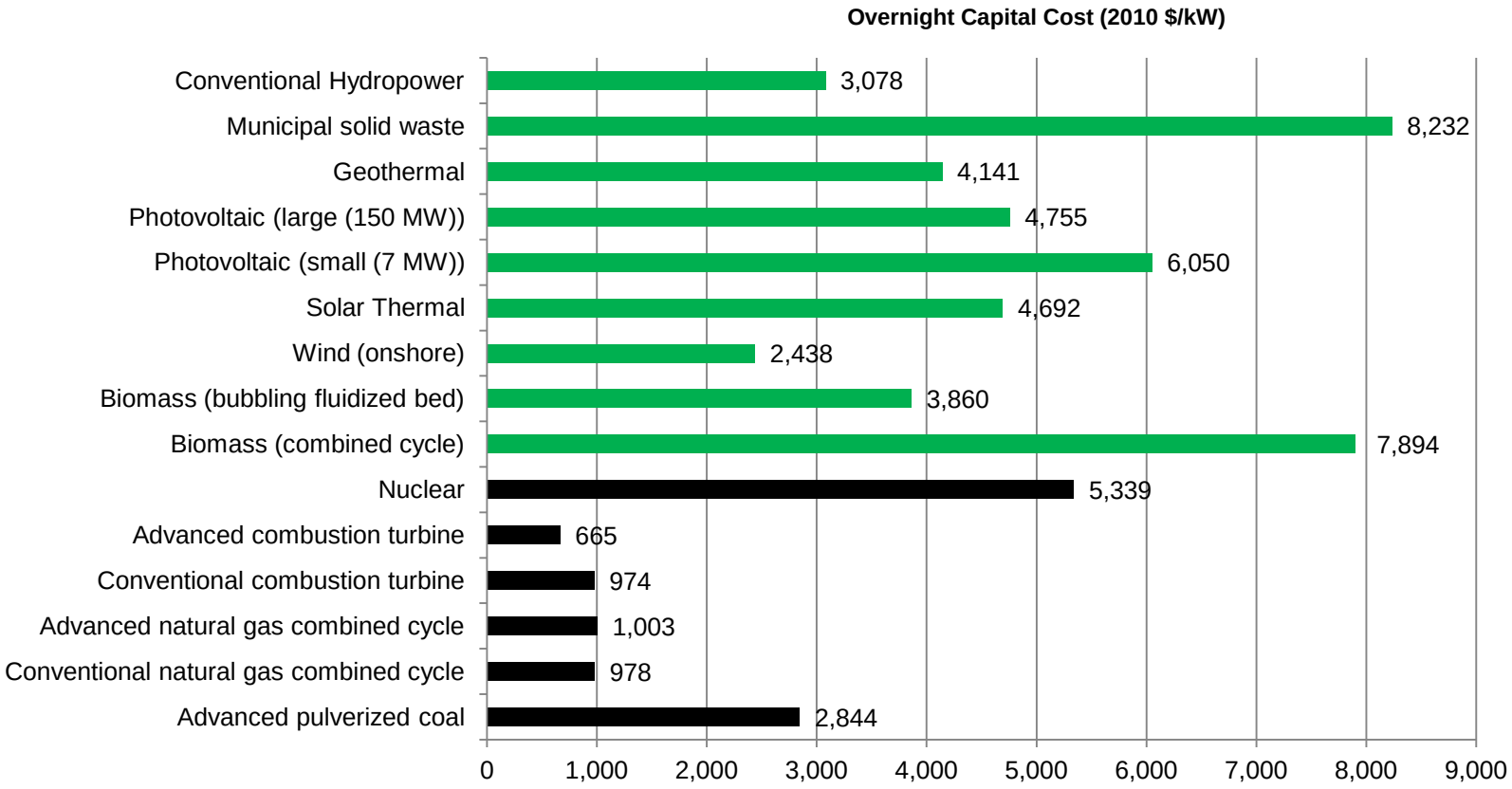


Source: EIA

Barriers to Renewables

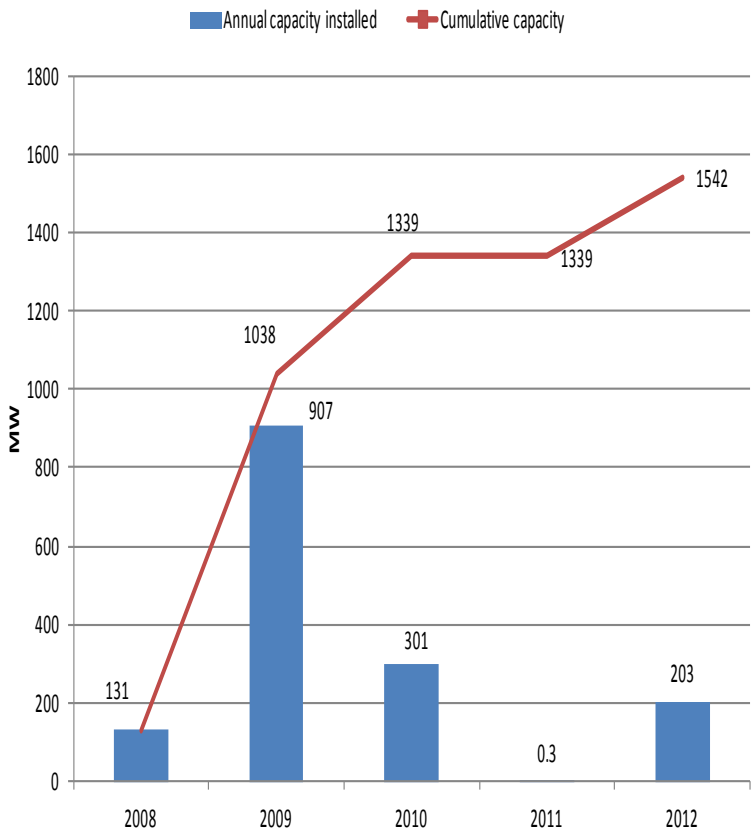
- Major barrier is cost
  - Most renewable technologies have high capital costs
  - According to EIA Indiana's average electric rate in 2010 was 7.67 cents/kWh vs. the national average of 9.83 cents/kWh
- Limited availability for some resources
  - Solar/photovoltaics, hydropower
- Intermittency for some resources
  - Solar/photovoltaics, wind

Capital Costs for Various Generation Sources

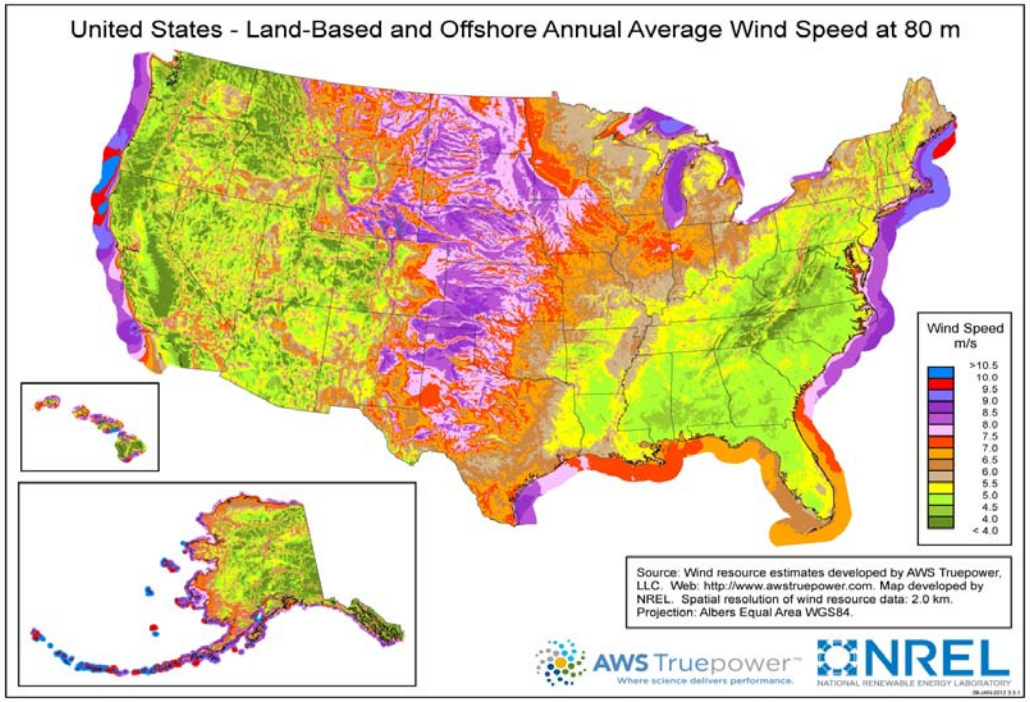


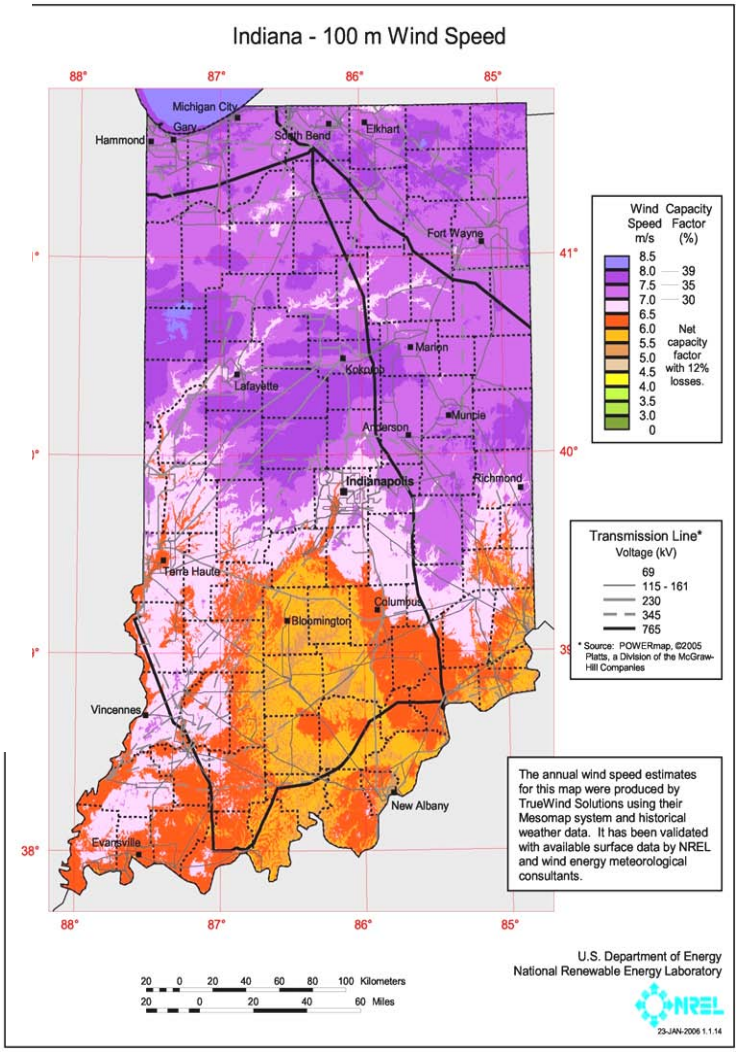
Data source: EIA

Wind



Win Farm	MW	County	Year	Owner
Fowler Ridge	600	Benton	2009	BP, Sempra, Dominion
Meadow Lake	501	White	2009 2010	Horizon (EDP)
Wildcat	200	Tipton, Madison	2012	E.ON
Benton County	131	Benton	2008	Orion
Hoosier	106	Benton	2009	enXco


United States - Land-Based and Offshore Annual Average Wind Speed at 80 m
Wind Speed m/s
>10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
< 4.0
Source: Wind resource estimates developed by AWS Truepower, LLC. Web: http://www.awstruepower.com. Map developed by NREL. Spatial resolution of wind resource data: 2.0 km. Projection: Albers Equal Area WGS84.
AWS Truepower
Where science delivers performance.
NREL
NATIONAL RENEWABLE ENERGY LABORATORY


Indiana - 100 m Wind Speed
88°
87°
86°
85°
41°
40°
39°
38°
Michigan City
Gary
Hammond
South Bend
Elkhart
Fort Wayne
Marion
Kokomo
Lafayette
Muncie
Anderson
Indianapolis
Richmond
Terre Haute
Columbus
Bloomington
Vincennes
New Albany
Evansville
Wind Speed m/s
Capacity Factor (%)
8.5
8.0 — 39
7.5 — 35
7.0 — 30
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
0
Net capacity factor with 12% losses.
Transmission Line*
Voltage (kV)
69
115 - 161
230
345
765
* Source: POWERmap, ©2005 Platts, a Division of the McGraw-Hill Companies
The annual wind speed 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.
20 0 20 40 60 80 100 Kilometers
20 0 20 40 60 Miles
U.S. Department of Energy
National Renewable Energy Laboratory
NREL
23-JAN-2006 1.1.14

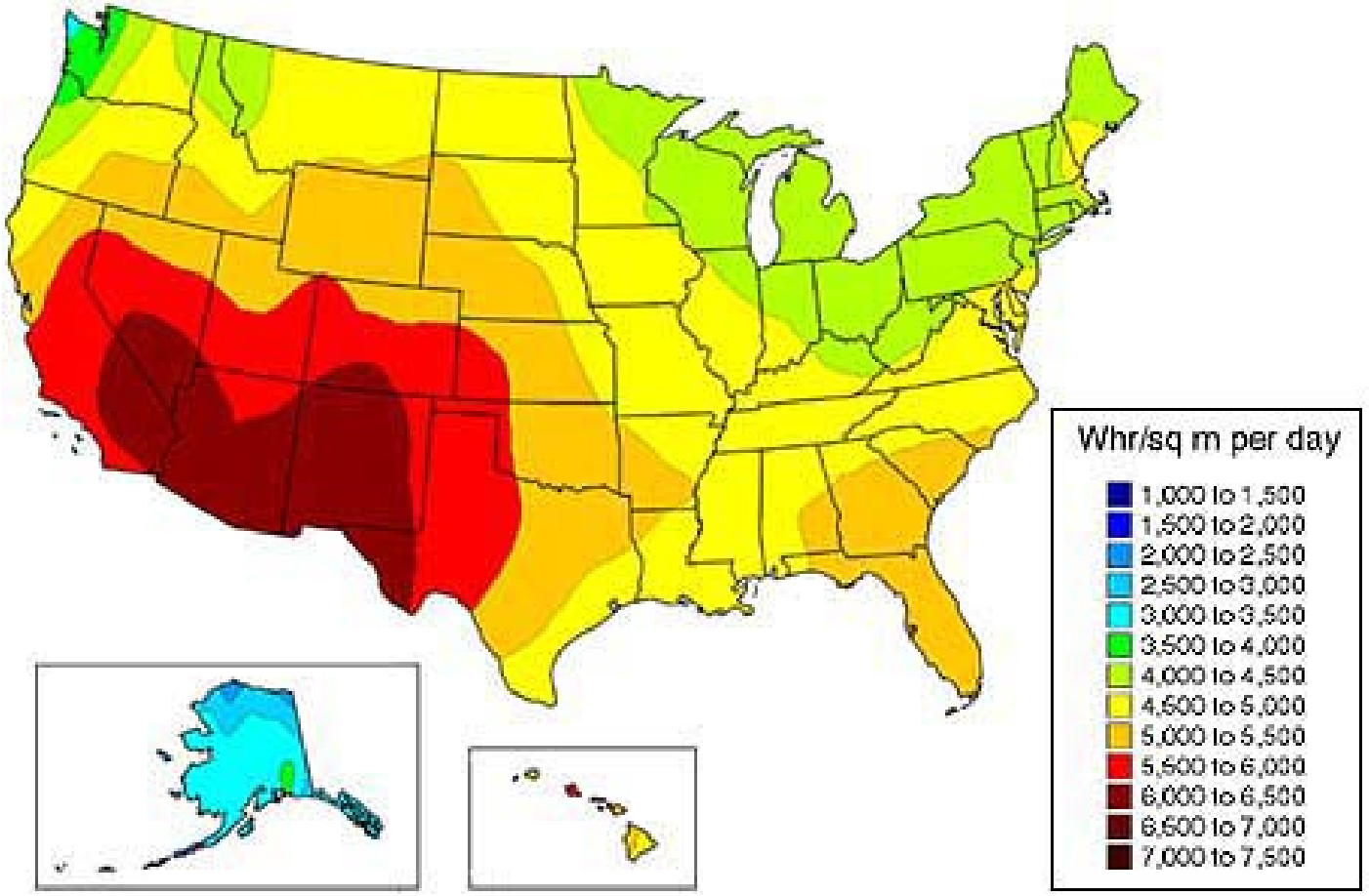
Energy Crops

- Transportation fuels
  - Ethanol
  - Biodiesel
- Other possibilities
  - Fast growing hardwood trees (hybrid poplar/willow)
  - Grasses (switchgrass)
- Barriers to be overcome
  - Other high-value uses for the land
  - Harvesting and transportation costs
  - Price of competing fossil fuels

Organic Waste Biomass

- Until the recent increase in ethanol production, this resource was the largest source of renewable energy in Indiana
  - Primarily due to the use of wood waste
- It is the 3rd largest source of renewable electricity generation in the state
  - Landfill gas
  - Municipal solid waste
  - Animal waste biogas
  - Wastewater treatment

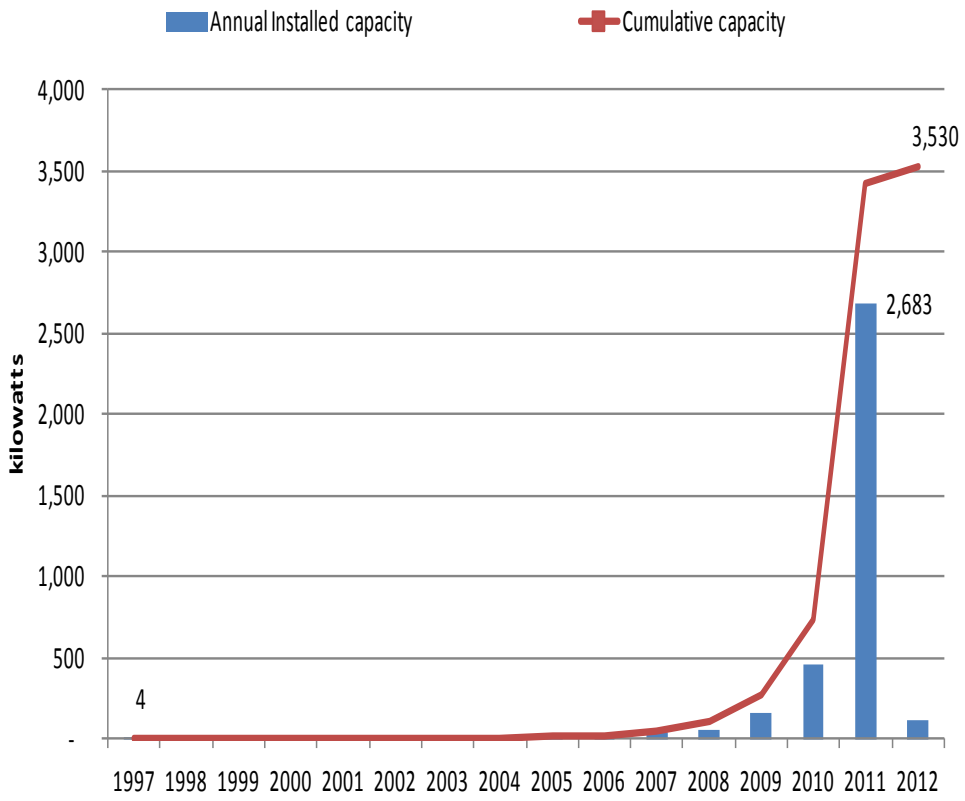
Solar Thermal



Solar resource for a flat-plate collector

Source: DOE

Photovoltaic



Photovoltaic capacity in Indiana

188 installations (total 3.5 MW)

- Fort Harrison (2 MW)
- Metal Pro Roofing (186 kW)
- Johnson Melloh (100 kW)
- Proposed at Indy airport (10 MW)

Source: National Renewable Energy Laboratory

Hydroelectric Power

- Indiana has 73 MW of hydroelectric generating capacity.
  - mostly run-of-the-river (no dam)
  - 2nd largest source of renewable electricity
- American Municipal Power is constructing an 84 MW facility at the Cannelton Locks on the Ohio River
  - expected to be operational in Fall 2014

Further Information

State Utility Forecasting Group

765-494-4223

sufg@ecn.purdue.edu

http://www.purdue.edu/dp/energy/SUFG/

David Nderitu

765-494-4243

nderitu@purdue.edu