Global Energy Diversification and Relevance for Indiana

Sanya Carley, Ph.D.
Associate Professor
School of Public and Environmental Affairs
Indiana University
An atlas of pollution: the world in carbon dioxide emissions

North America 6.41m Down 6.9%
Central & South America 1.220m Down 0.7%
Africa 1.122m Down 3.1%

World 30.398m Down 0.3%
Levelized Cost of Electricity from Utility-Scale Renewable Sources, 2010-2014
Weighted Average Cost of Electricity by Region, 2013/2014
Renewable energy support policies

Technological improvements

Increased renewable energy deployment

Renewable energy cost reductions

Increased renewable energy deployment
Global Solar PV Module Prices and Deployment Rates, 2000-2014
Renewable energy support policies

Technological improvements

Increased renewable energy deployment

Renewable energy cost reductions

Increased renewable energy deployment
Feed-in Tariff (FIT)
Renewable Portfolio Standard (RPS)

2010
- Coal: 80%
- Natural Gas: 17%
- Wind: 2%
- Solar: 1%

2025
- Coal: 30%
- Natural Gas: 20%
- Wind: 40%
- Solar: 10%
Feed-in Tariffs
Renewable Portfolio Standards
What Drives Renewable Energy Deployment?

Divide all countries into groups based on Gross National Income per capita

- **Lowest tertile GNI per capita**
  - e.g., Afghanistan, Bangladesh, Sierra Leone, Vietnam

- **Middle tertile GNI per capita**
  - e.g., Belize, China, Ecuador, South Africa, Thailand

- **Highest tertile GNI per capita**
  - e.g., Australia, Denmark, Israel, Japan, U.S.
What Drives Renewable Energy Deployment?

- RPS Policies
- Healthy Capital Markets

Highest Tertile GNI per capita Countries
What Drives Renewable Energy Deployment?

- FIT Policies
- Political Factors
e.g., more liberal executive leadership; fossil fuel industries’ influence
- Other subsidies
  including Clean Development Mechanism support

Medium Tertile GNI per capita Countries
What Drives Renewable Energy Deployment?

Political Factors
e.g., more liberal executive leadership; fossil fuel industries’ influence; and political freedom

Other subsidies
including Clean Development Mechanism support

Economic Conditions

Low Tertile GNI per capita Countries
What Type of Renewable Energy Growth?

Hydroelectric vs. Other Renewable Energy Growth, 1990 and 2010

Lowest Tertile
Medium Tertile
Highest Tertile
Highest Tertile Countries, 2010

- Non-renewable Energy: 82%
- Renewable Energy: 18%
  - Hydroelectricity: 13%
  - Wind: 3%
  - Biomass: 2%
  - Solar: 3%
  - Geothermal: 2%
Lowest Tertile Countries, 2010

- Non-renewable Energy: 76%
- Renewable Energy: 24%
  - Hydroelectricity: 22%
  - Wind
  - Biomass and Solar
  - Geothermal
Indiana Net Electricity Generation by Source, Jan. 2015

- Petroleum-Fired
- Natural Gas-Fired
- Coal-Fired
- Hydroelectric
- Other Renewables

Source: Energy Information Administration, Electric Power Monthly
Indiana

Non-renewable Energy 97%

Renewable Energy 3%

Wind 2%

MSW/Landfill

Hydroelectric

1,743 MW of wind

SCHOOL OF PUBLIC AND ENVIRONMENTAL AFFAIRS
INDIANA UNIVERSITY
Renewable Portfolio Standard Policies
www.dsireusa.org / March 2015

29 States + Washington DC + 2 territories have a Renewable Portfolio Standard
(8 states and 2 territories have renewable portfolio goals)

WA: 15% x 2020*
OR: 25% x 2025* (large utilities)
CA: 33% x 2020
AZ: 15% x 2025*
NV: 25% x 2025*
MT: 15% x 2015
ND: 10% x 2015
SD: 10% x 2015
UT: 20% x 2025†
CO: 30% by 2020 (IOUs) †
KS: 20% x 2020
IA: 105 MW
MO: 15% x 2021
IL: 26% x 2026
IN: 12.5% x 2026†
MI: 10% x 2015†
WI: 10% x 2015†
OH: 12.5% x 2026
VA: 15% x 2025†
NC: 12.5% x 2021 (IOUs)
TN: 20% x 2020
KY: 12% x 2020
SC: 2% 2021
MD: 20% x 2022
DE: 25% x 2026*
DC: 20% x 2020

TX: 5,880 MW x 2015*

HI: 40% x 2030

ME: 40% x 2017
NH: 24.8 x 2025
VT: 20% x 2017
MA: 15% x 2020 (new resources)
6.03% x 2016 (existing resources)
RI: 14.5% x 2019
CT: 27% x 2020
NJ: 20.38% RE x 2020 + 4.1% solar by 2027
PA: 18% x 2021†

Includes non-renewable alternative resources
Extra credit for solar or customer-sited renewables
Renewable Portfolio Standard Policies
www.dsireusa.org / March 2015

Renewable portfolio goal
† Includes non-renewable alternative resources
* Extra credit for solar or customer-sited renewables

29 States + Washington DC + 2 territories have a Renewable Portfolio Standard
(8 states and 2 territories have renewable portfolio goals)
Solar
Thank you!

Contact information:  
Sanya Carley 
scarley@Indiana.edu 
812-856-0920
Source of Images by Slide Number (all others generated by the presenter)

1. www.nature.nps.gov
6, 23, and 24. Images generated by presenter from IEA country-level data; www.iea.org
12. www.uswitch.com
26 and 27: www.eia.gov
28 and 29: www.dsireusa.org
30. www.indianapublicmedia.org