

Interesting Renewable and Sustainable Energy Programs

Caroline Williams

Outline

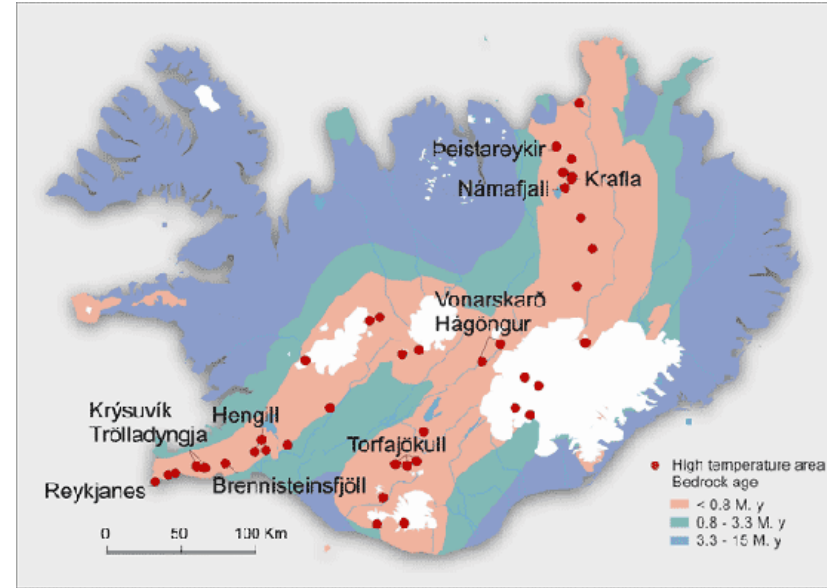
- Iceland
- Germany
- United States comparison

Iceland

- In the 1970's, more than 85% of Iceland's energy came from coal
- Now, 85% of total energy consumption comes from renewable sources
 - 65% geothermal
 - 20% hydroelectric
 - 15% fossil fuels
- Iceland consumes 55000 kWh/person
- Expects to be energy independent by 2050

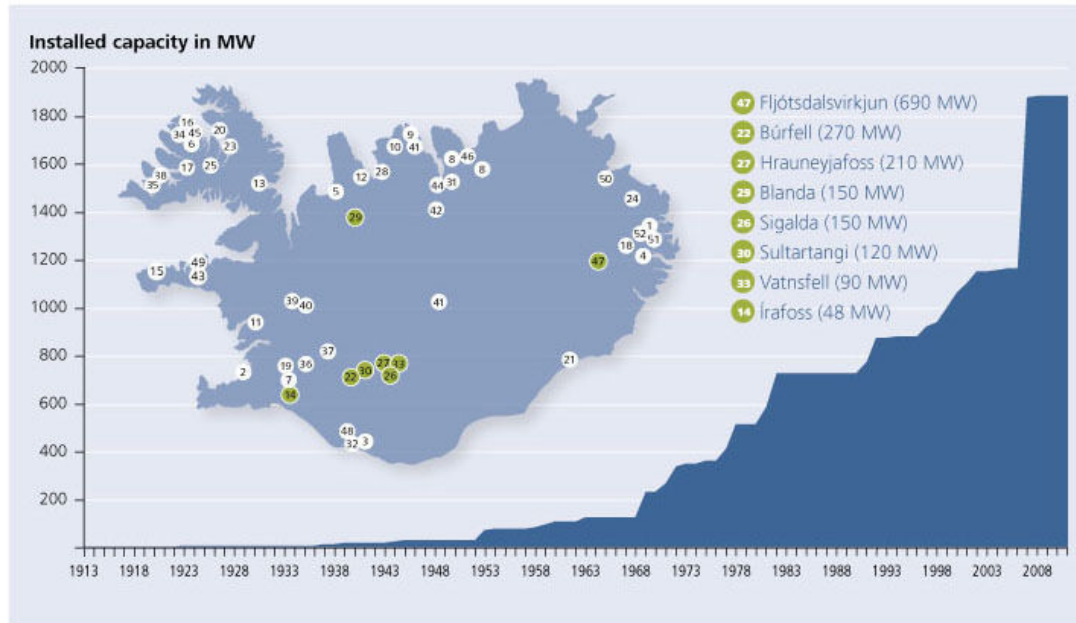
Geothermal

- Iceland is one of the most tectonically active places in the world
- Used to heat 89% of homes in Iceland
- Iceland never mandated renewable energy to be used.
- Switching to geothermal heating has saved \$8.2 billion
- Estimated 20 TWh could still be harnessed



Hydroelectric

- Icelandic government estimates that there is about 30 TWh of untapped hydropower
- Power output varies by the season due to precipitation levels



IceLink

- Approx 2 TWh are wasted per year
- High voltage direct current connector
- 1000 km long underwater cable
- Geared for Great Britain and other European countries to be less dependent on fossil fuels.



Germany

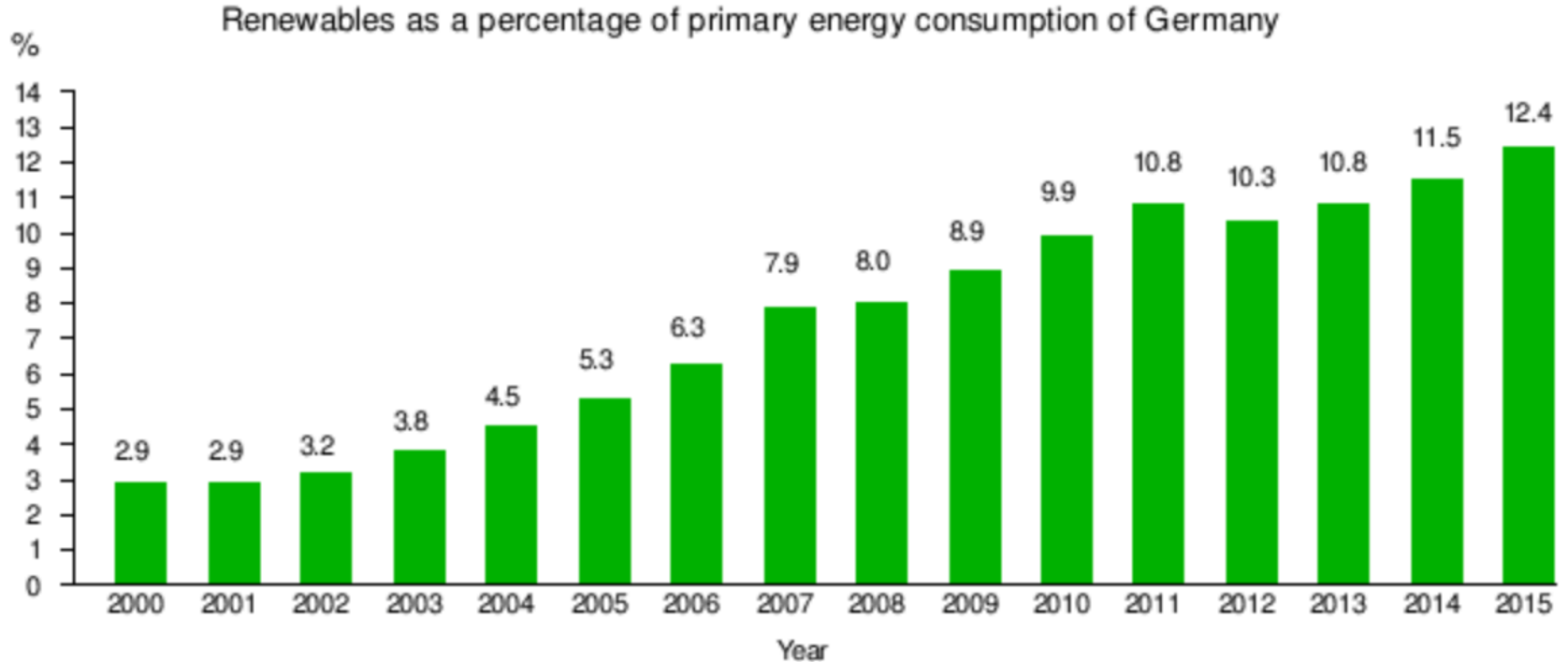
- Renewable energy accounts for 31% of electricity usage (but can reach a maximum of 74%)
- Biggest challenge is the intermittent supply of renewable energy
 - They combat this issue using a wide variety of energy sources and decentralized grid system

Energiewende

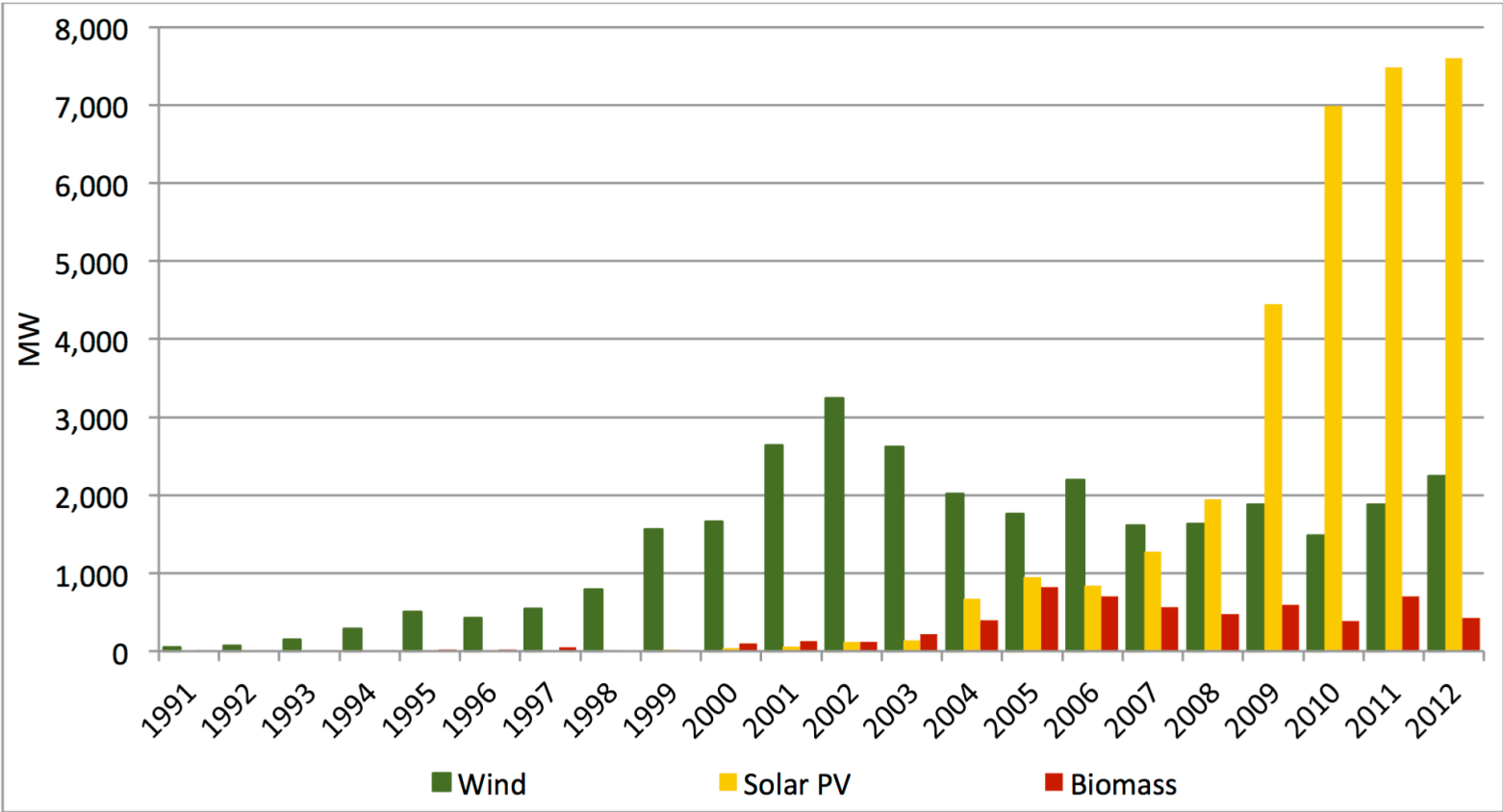
- Clean energy transition
- Using a decentralized grid
- 70% of the renewable energy is owned by farmers small- and medium-size businesses, cooperatives, green investment funds and community-owned utilities



Germany's Energy Growth



Annual renewable energy capacity additions in Germany, 1990-2012



Feed in Tariff (FIT)

- Incentive to produce renewable energy by promising a long term tariff per unit of energy
- Issues
 - Underestimated costs (\$412 billion)
 - Residential electricity prices have more than doubled (\$0.18 to \$0.38/kWh)
 - Reduced wholesale prices for producers
 - Decreases reliability

United States

- U.S. is producing 14% of its electricity from renewable resources
- Executive Order 13693
 - 30% of Federal energy use be from renewable sources by 2025
- Initiatives
 - SunShot – reducing the costs of solar
 - Wind Powering America

Conclusion

	Iceland	Germany	USA
% of electricity produced by renewable resources	100	34	14
Cost/kWh	\$0.05	\$0.38	\$0.13
Electricity consumption per capita (kWh)	50,613	6,602	12,077
Total electricity production (kWh/year)	17 billion	530 billion	4 trillion