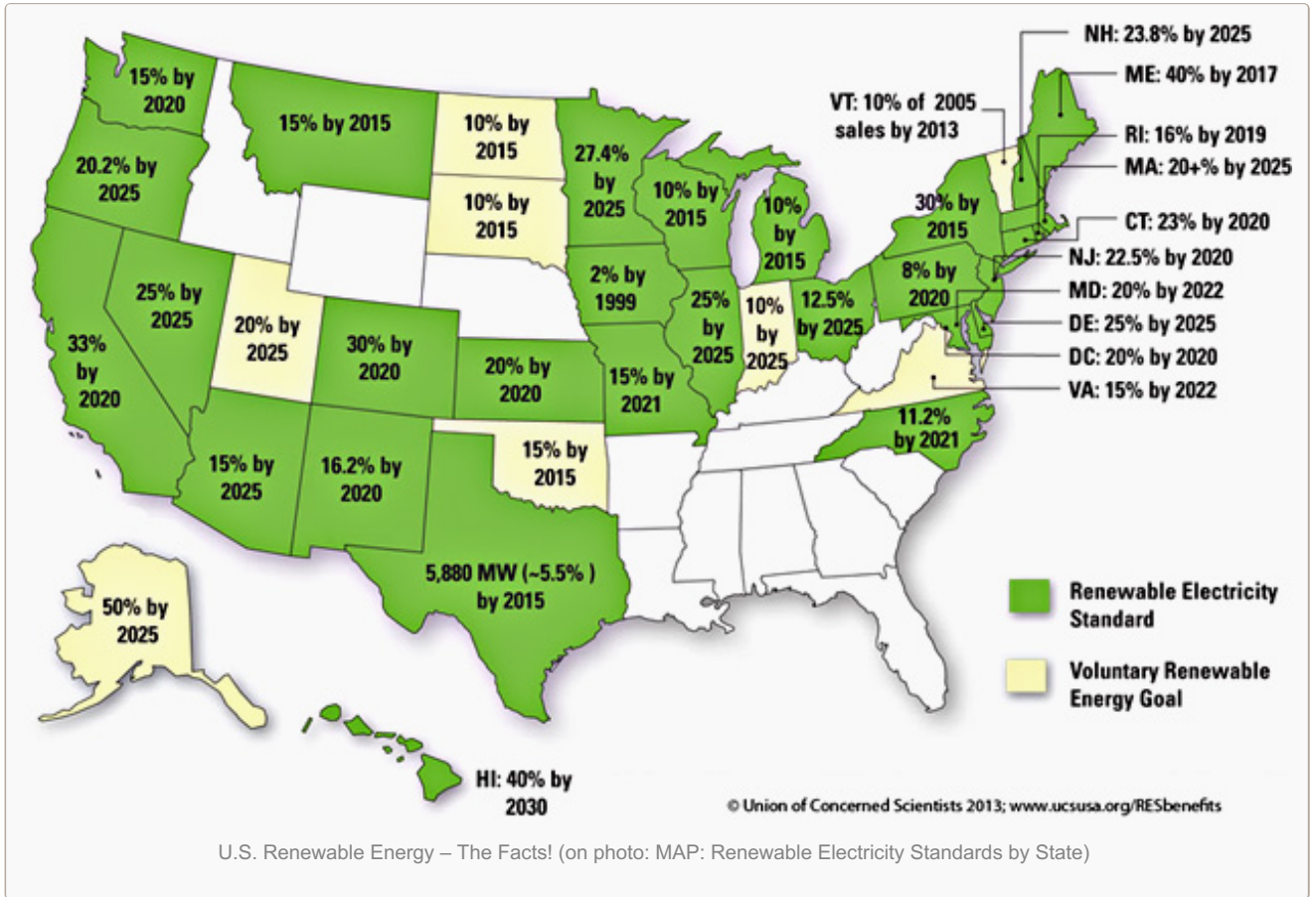


# U.S. Renewable Energy – The Facts!

Edvard



## Nation's energy

About **82%** of the nation's energy comes from fossil fuels, **8%** from nuclear, and **9% from renewable sources**. Wind is the fastest growing renewable source, but contributes **only 1%** of total energy used in the U.S.

*The examples below illustrate the progress and potential of U.S. renewable energy:*

## Wind Resources

U.S. onshore wind resources have the potential to generate almost **10,500 GW of electricity**, 175 times more than the current installed capacity of 60 GW.

In 2012, the U.S. installed 13.1 GW of wind capacity, a 28% increase from 2011. Future estimates range from 80 GW to almost **400 GW by 2050**.

Based on the average U.S. electricity fuel mix, a one MW wind turbine can displace 1,800 tons of CO<sub>2</sub> emissions per year. With a wind power capacity of 300 GW, 825 million metric tons of CO<sub>2</sub> emissions could be avoided annually.

**Wind turbines emit no emissions** in producing electricity but are not without impacts, such as bat and bird kills, land use, noise pollution, and aesthetics.

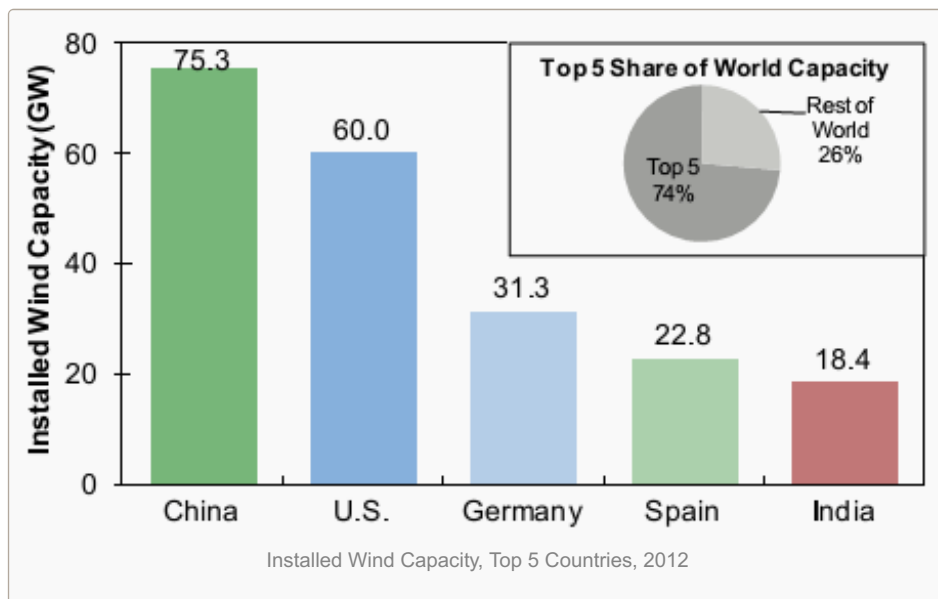
## Installed Wind Capacity, Top 5 Countries, 2012

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### Solar Resources

Assuming intermediate efficiency, solar photovoltaic (PV) modules covering **0.6% of U.S. land area** could meet national electricity demand.

The cost of PV modules, a large part of system cost, fell 62% from 2008 to 2011. U.S. market share of cell and module production dropped from 30% to 7% between 2000 and 2010.



In 2012, the commercial sector installed 1,043 MW, utility sector installed 1,781 MW, and residential sector installed 488 MW of PV power, raising total installed capacity to 7.2 GW.

The U.S. Department of Energy's SunShot Initiative aims to reduce the price of solar energy 75% from 2010 to 2020, which is projected to lead to 27% of U.S. electricity demand met by solar technology and a 28% decrease in electricity sector greenhouse gas emissions by 2050.

While solar PV modules produce no emissions during operation, toxic substances (e.g., cadmium and selenium) are used in manufacturing PV technologies.

## U.S. Photovoltaic Installations, 2000-2012

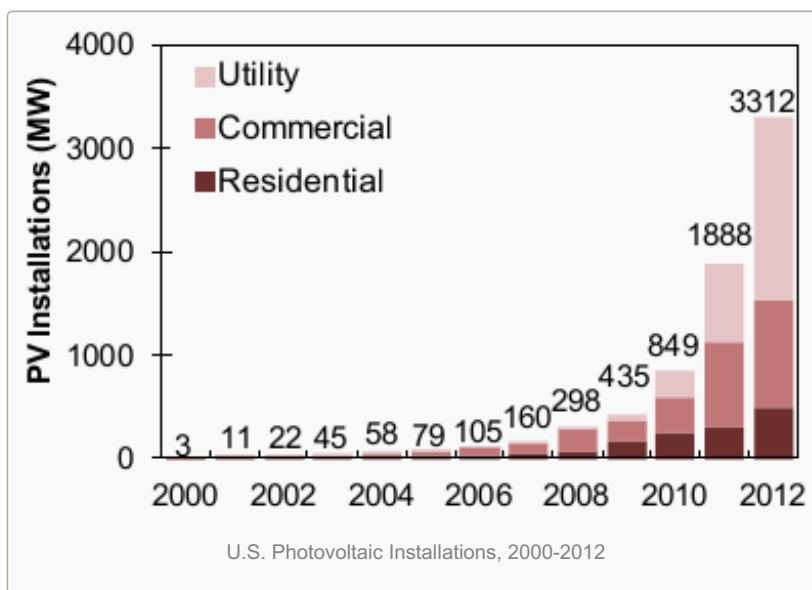
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### Biomass Resources

Wood, mostly as pulp, paper, and paperboard industry waste products, accounts for 46% of **total biomass energy consumption**. Waste—municipal solid waste, landfill gas, sludge, tires, and agricultural by-products—accounts for an additional 11%.

Biomass has **low net CO<sub>2</sub> emissions** in comparison to fossil fuels. At combustion, it releases only the CO<sub>2</sub> it previously removed from the atmosphere, although additional emissions are associated with processing, but it requires 124 acres of land to generate one GWh of energy per year.<sup>12</sup>

U.S. ethanol production is projected to reach 37 million gallons per day in 2040.



## U.S. Biomass Consumption: Historic and Projected

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### Geothermal and Hydrothermal

Hydrothermal resources, i.e., steam and hot water, are available primarily in the western U.S., Alaska, and Hawaii, yet [geothermal heat pumps](#) can be used almost anywhere to extract heat from the shallow ground, which stays at relatively constant temperatures year-round.

U.S. geothermal power offsets the emission of 22 million metric tons of CO<sub>2</sub>, 200,000 tons of nitrogen oxides, and 110,000 tons of particulate matter from coal-powered plants each year. Some geothermal facilities produce solid waste such as salts and minerals that must be disposed of in approved sites, but some byproducts can be recovered and recycled.

Electricity generated from geothermal power plants is projected to increase from 17 billion kWh in 2011 to 56 billion kWh in 2040.

### Geothermal Installed Capacity, Top 5 Countries, 2010

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### Hydroelectric Power

In the U.S., net electricity generation from conventional hydropower peaked in 1997 at 356 TWh. After a decade of production well below 300 TWh, electricity generated from hydropower reached 325 TWh in 2011.

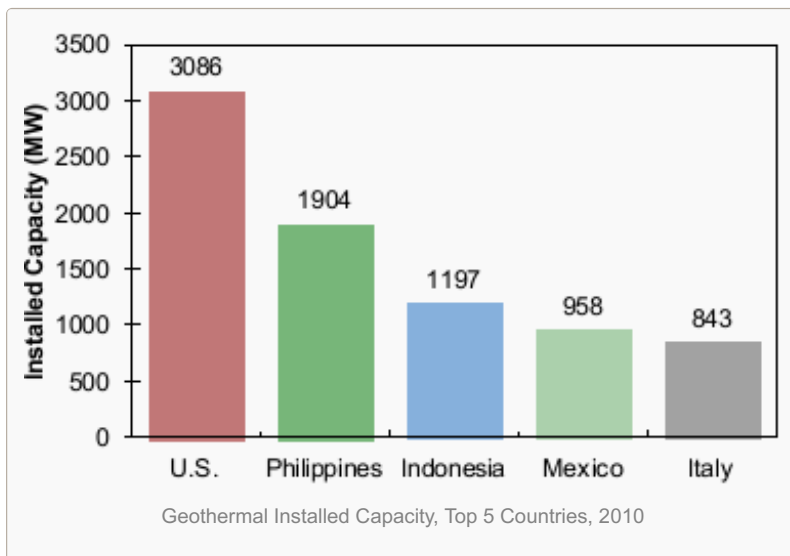
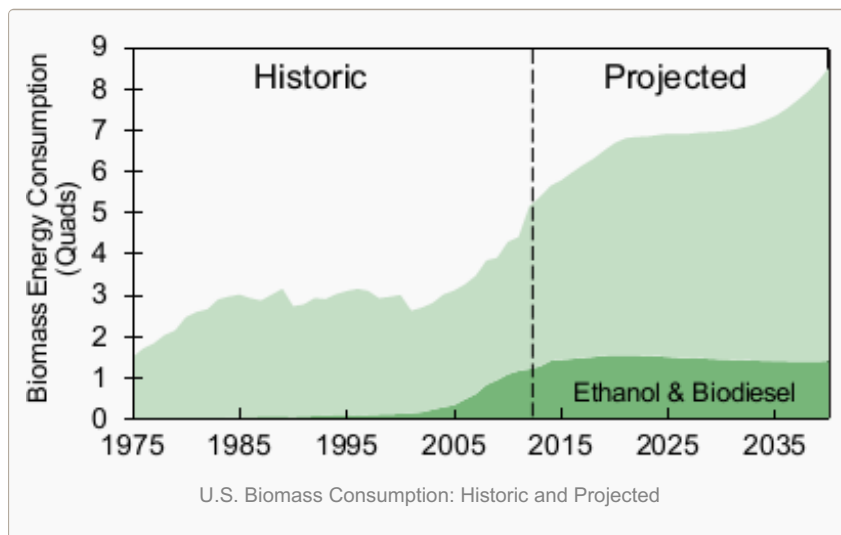
While electricity generated from hydropower is virtually emission free, significant levels of methane and CO<sub>2</sub> may be emitted through the decomposition of vegetation that is flooded by the dam.

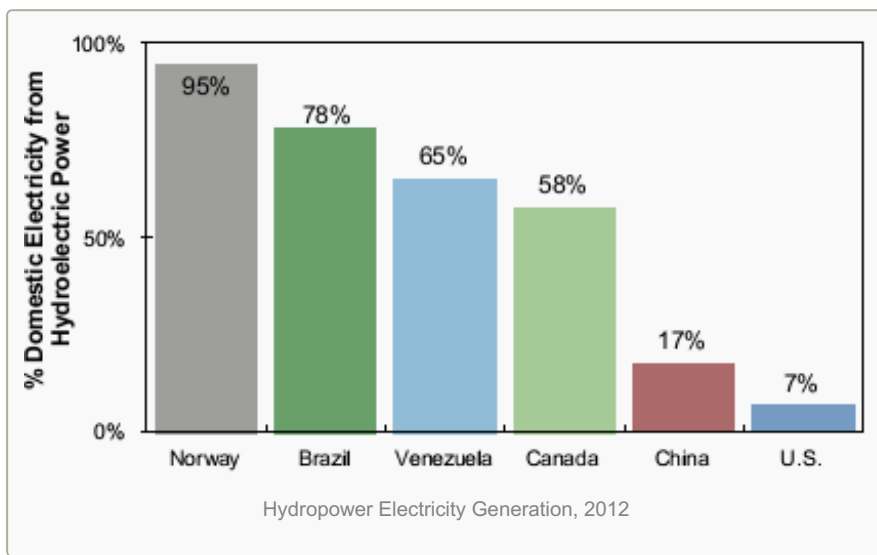
Other environmental concerns include fish injury and mortality, habitat degradation, and water quality impairment.

**“Fish-friendly” turbines** and **smaller dams** help mitigate some of these problems.

### Hydropower Electricity Generation, 2012

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**Reference:** Center for Sustainable Systems, University of Michigan. 2013. "U.S. Renewable Energy Factsheet." Pub. No. CSS03-12

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