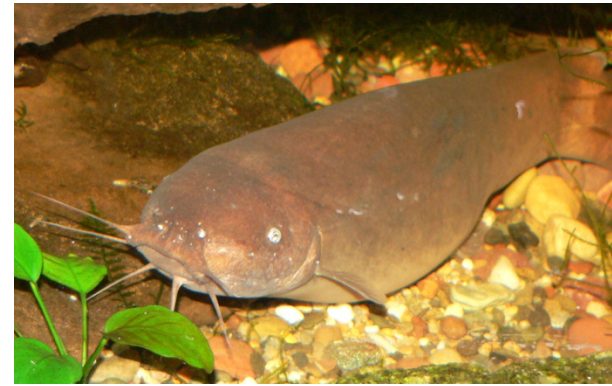


History of Electricity

The background of the slide is a photograph of a night sky filled with numerous bright, jagged lightning bolts striking down. Below the lightning, a city skyline is visible with various lights and structures, including what appears to be a bridge or a large building. The lights from the city are reflected on a body of water in the foreground.

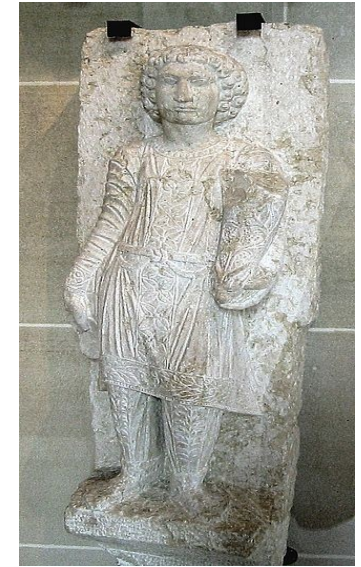
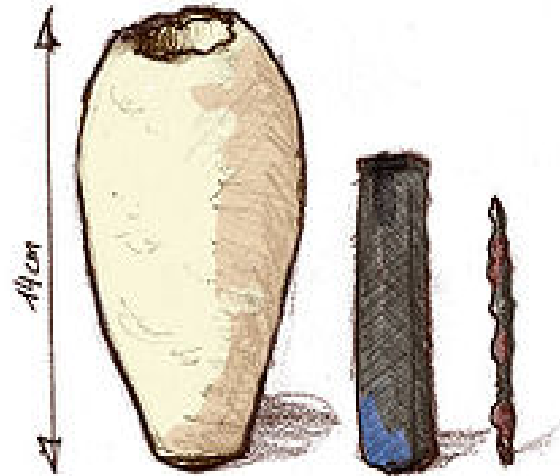
**Mohammad Avestan
Rohith Anand Varikoti**

- ❑ Ancient Egyptian (2750 BCE) were aware of shocks from electric fish
Thunderer of the Nile (protectors" of all other fish)
- ❑ Electric fish were again reported millennia later by ancient Greek, Roman and Arabic naturalists and physicians.
- ❑ They attested to the numbing effect of electric shocks delivered by catfish and electric rays, and knew that such shocks could travel along conducting objects
- ❑ Ancient cultures around the Mediterranean knew that certain objects, such as rods of amber, could be rubbed with cat's fur to attract light objects like feathers



❖ Thales of Miletus made a series of observations on static electricity around 600 BCE

❖ The Parthians (old Persia, (247 BC - 224 AD)) may have had knowledge of electroplating, based on the 1936 discovery of the Baghdad Battery, which resembles a



Young man with Parthian costume. Palmyra, Syria, 1st half of the 3rd century AD.

❖ the earliest and nearest approach to the discovery of the identity of lightning, and electricity from any other source, is to be attributed to the Arabs, who before the 15th century had the Arabic word for lightning (raad) applied to the electric ray

❑ Electricity would remain little more than an intellectual curiosity for millennia until 1600

❑ The English scientist **William Gilbert (father of electricity and magnetism)** made a careful study of **electricity and magnetism**, distinguishing the **lodestone** effect from static electricity produced by **rubbing amber**. He coined the New Latin word

❑ Further work was conducted by **Otto von Guericke**, **Robert Boyle**, **Stephen Gray** and **C. F. du Fay**. In the 18th century



Most people give credit to Benjamin Franklin for discovering electricity.

In 1752, Ben Franklin conducted his experiment with a kite, a key, and a storm.

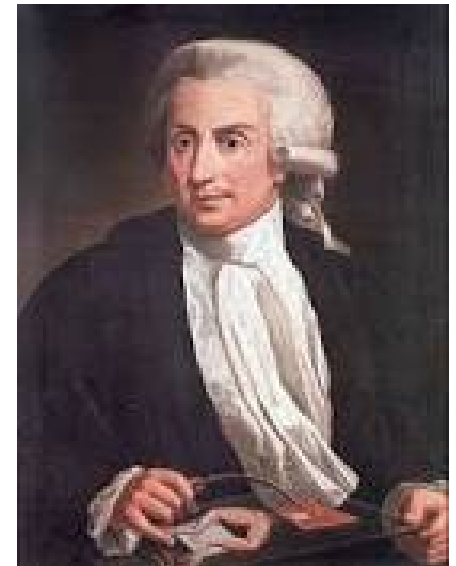
This simply proved that lightning and tiny electric sparks were the same thing.

<http://www.universetoday.com/82402/who-discovered-electricity/>
<http://instituteeforenergyresearch.org/history-electricity/>



□ Up until that time, scientists had mainly known about and experimented with **static electricity**. Benjamin Franklin took things a big step ahead. He came up with the idea that electricity had **positive** and **negative** elements and that electricity flowed between these elements

□ In 1791, **Luigi Galvani** published his discovery of bioelectromagnetics, demonstrating that electricity was the medium by which neurons passed signals to the muscles.



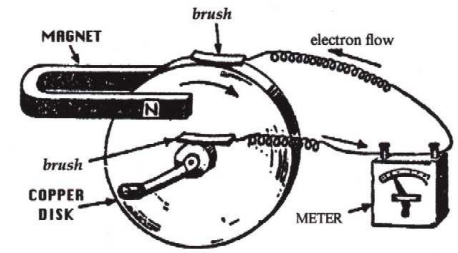
❑ **Alessandro Volta's** battery, or voltaic pile, of 1800, made from alternating layers of zinc and copper, provided scientists with a more reliable source of electrical energy than the electrostatic machines previously used.

❑ When a wire was connected to both ends of the pile, a steady current flowed

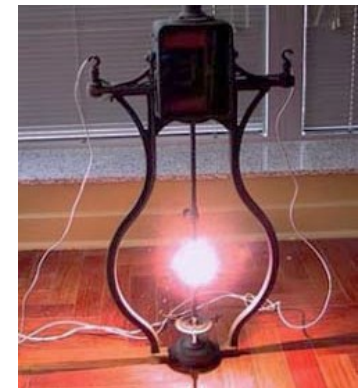
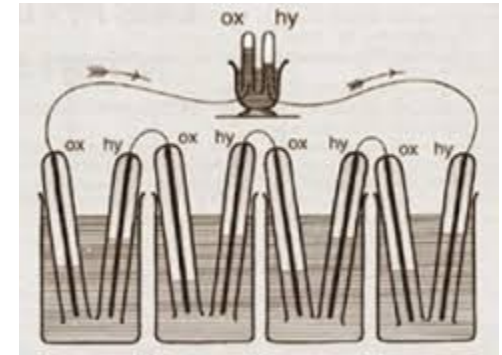


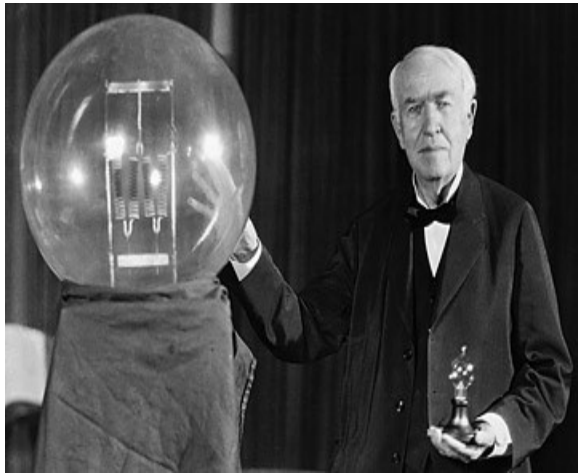
A Voltaic Pile

- 1821 --- First electric motor was invented by Michael Faraday
- 1832 --- Hippolyte Pixii - the first “dynamo,” an electric generator capable of delivering power for industry (Using Faraday’s principles)
- 1839-1842 --- Sir William Robert Grove developed the first fuel cell, a device that produces electrical energy by combining hydrogen and oxygen
- 1878 --- Joseph Swan, and Englishman, invented the first incandescent lightbulb/electric lamp. His lightbulb burned out quickly.
- Charles Brush developed an arc lamp that could be powered by a generator.
- Thomas Edison founded the Edison Electric Light Co. (US), in New York City. He bought a number of patents related to electric lighting.



Faraday's disk dynamo - for producing continuous (pure) dc voltage. This was the world's first electrical generator.





➤ 1879 --- Thomas Edison invented an incandescent light bulb that could be used for about 40 hours without burning out. By 1880 his bulbs could be used for 1200 hours.

➤ 1879 --- Electric lights were first used for public street lighting, in Cleveland, Ohio.

➤ California Electric Light Company, Inc. in San Francisco was the first electric company to sell electricity to customers. The company used two small Brush generators to power 21 Brush arc light lamps.

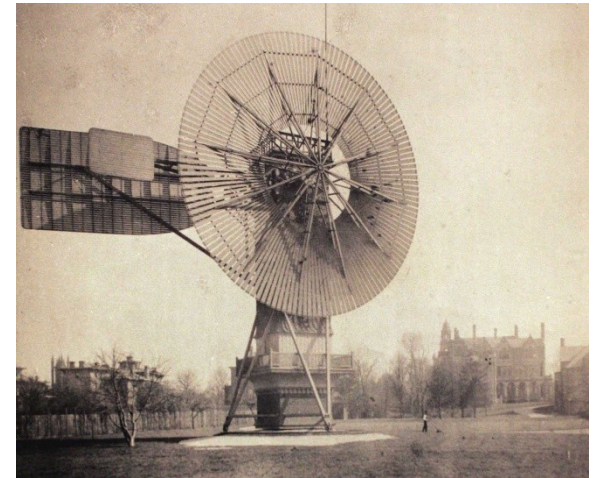
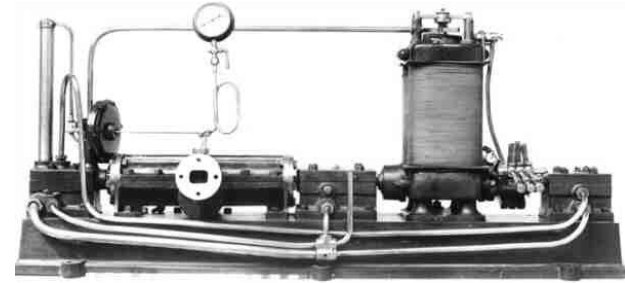
➤ 1881 --- The electric streetcar was invented by E.W. v. Siemens

➤ 1882 --- Thomas Edison opened the Pearl Street Power Station in New York City. The Pearl Street Station was one of the world's first central electric power plants and could power 5,000 lights. The Pearl Street Station was a direct current (DC) power system.

➤ The first hydroelectric station opened in Wisconsin.



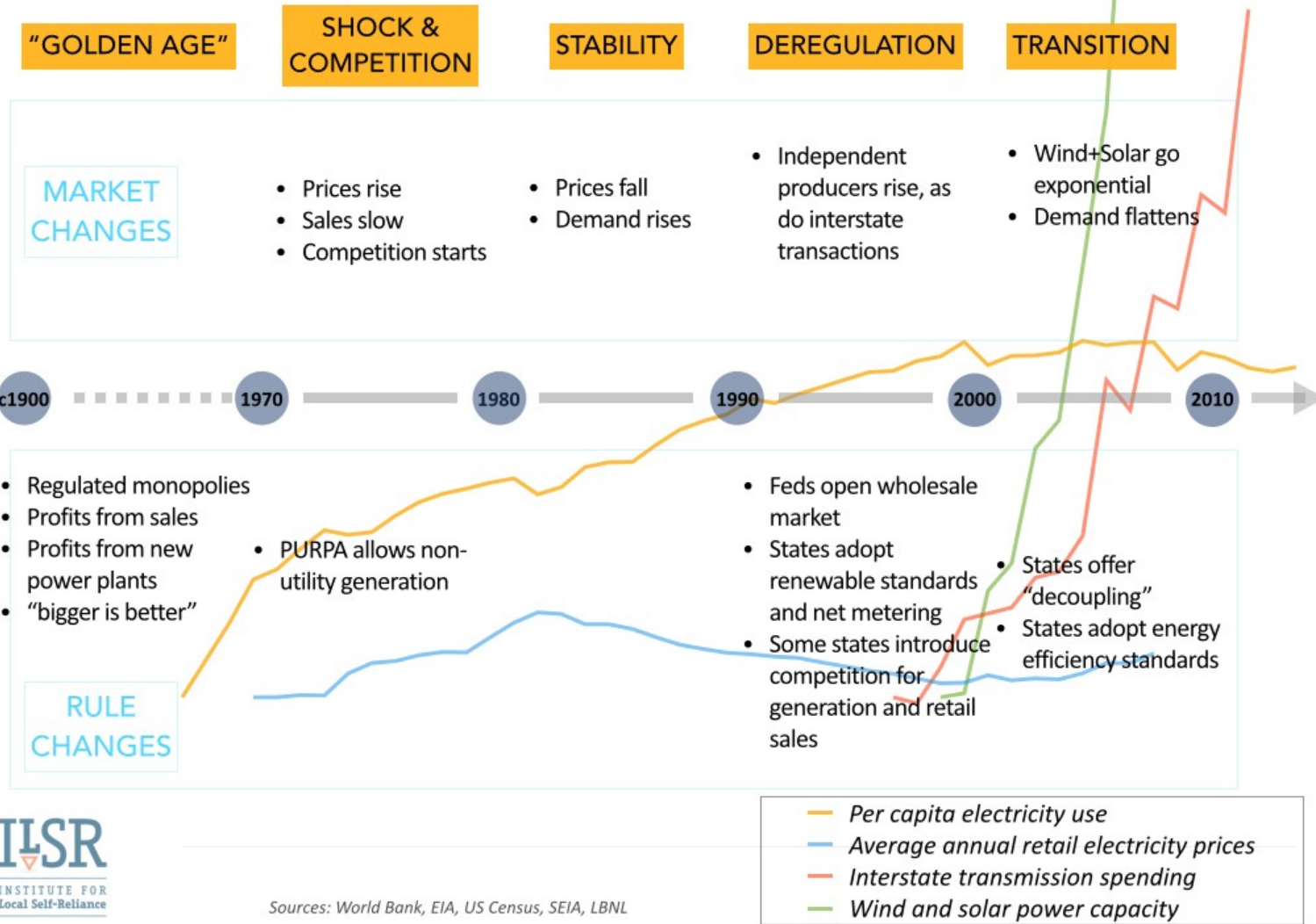
- 1883 --- Nikola Tesla invented the “Tesla coil”, a transformer that changes electricity from low voltage to high voltage making it easier to transport over long distances.
- Steam turbine generator, capable of generating huge amounts of electricity, was invented by Sir Charles Algernon Parsons.
- 1888 --- Charles Brush -- the first use of a large windmill to generate electricity. He used the windmill to charge batteries in the cellar of his home in Cleveland, Ohio.
- 1893 --- A 22 mile AC powerline was opened, sending electricity from Folsom Powerhouse in California to Sacramento.
- 1896 --- An AC powerline that transmits power 20 miles from Niagra Falls to Buffalo, New York was opened.
- 1901 --- First power line between USA and Canada at Niagra Falls.



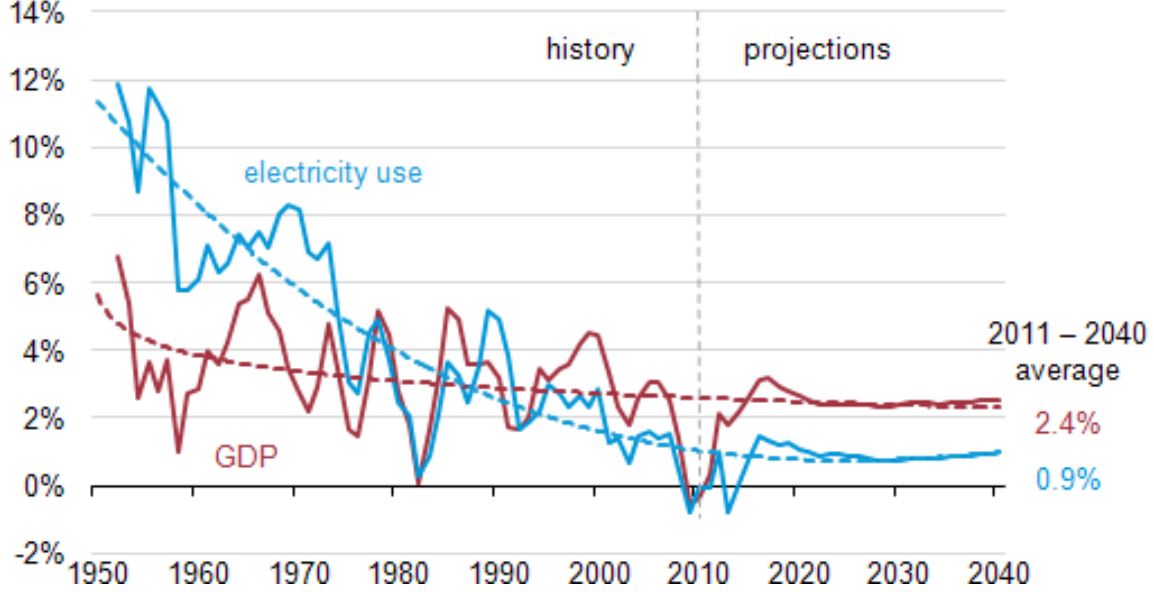
- 1902 --- 5-Megawatt turbine for Fisk St. Station (Chicago).
- 1903 --- First successful gas turbine (France) & World's first all turbine station (Chicago).
- 1920 --- Federal Power Commission (FPC) --- Federal Energy Regulatory Commission (FERC)
- 1921 --- Lakeside Power Plant in Wisconsin becomes the world's first power plant to burn only pulverized coal.
- 1923 --- Photoelectric cells were discovered.
- 1928 --- Construction of Boulder Dam begins.
- 1936 Boulder (Hoover) Dam was completed. A 287 Kilovolt power line stretched 266 miles to Boulder (Hoover) Dam. --- Rural Electrification Act.
- 1953 --- First nuclear power station ordered in England.
- 1954 --- World's first nuclear power plant (Russia) started generating electricity.
- Atomic Energy Act of 1954 allows private ownership of nuclear reactors.
- 1957 Shipping port Reactor in Pennsylvania was the first nuclear power plant to provide electricity to customers in the U.S.

- Two 1600 MW European Pressurized Reactors (EPRs) are being built in Europe, and two are being built in China. The reactors are a joint effort of French AREVA and German Siemens AG, and will be the largest reactors in the world.
- As of March 2007, there are seven nuclear power stations under construction in India, and five in China.
- In November 2011 Gulf Power stated that by the end of 2012 it hopes to finish buying off 4000 acres of land north of Pensacola, Florida in order to build a possible nuclear power station.
- In 2010 Russia launched a floating nuclear power station. The £100 million vessel, the Akademik Lomonosov, is the first of seven stations that will bring vital energy resources to remote Russian regions.
- By 2025, Southeast Asia nations would have a total of 29 nuclear power stations, Indonesia will have 4 nuclear power stations, Malaysia 4, Thailand 5 and Vietnam 16 from nothing at all in 2011.
- In 2013 China had 32 nuclear reactors under construction,

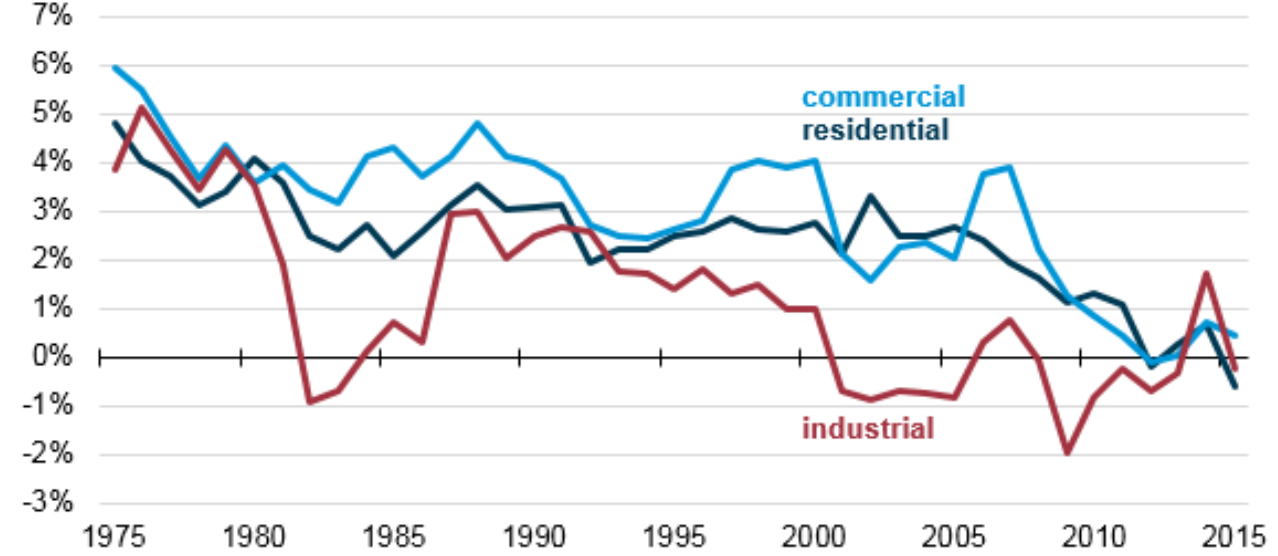
The U.S. Electricity Timeline



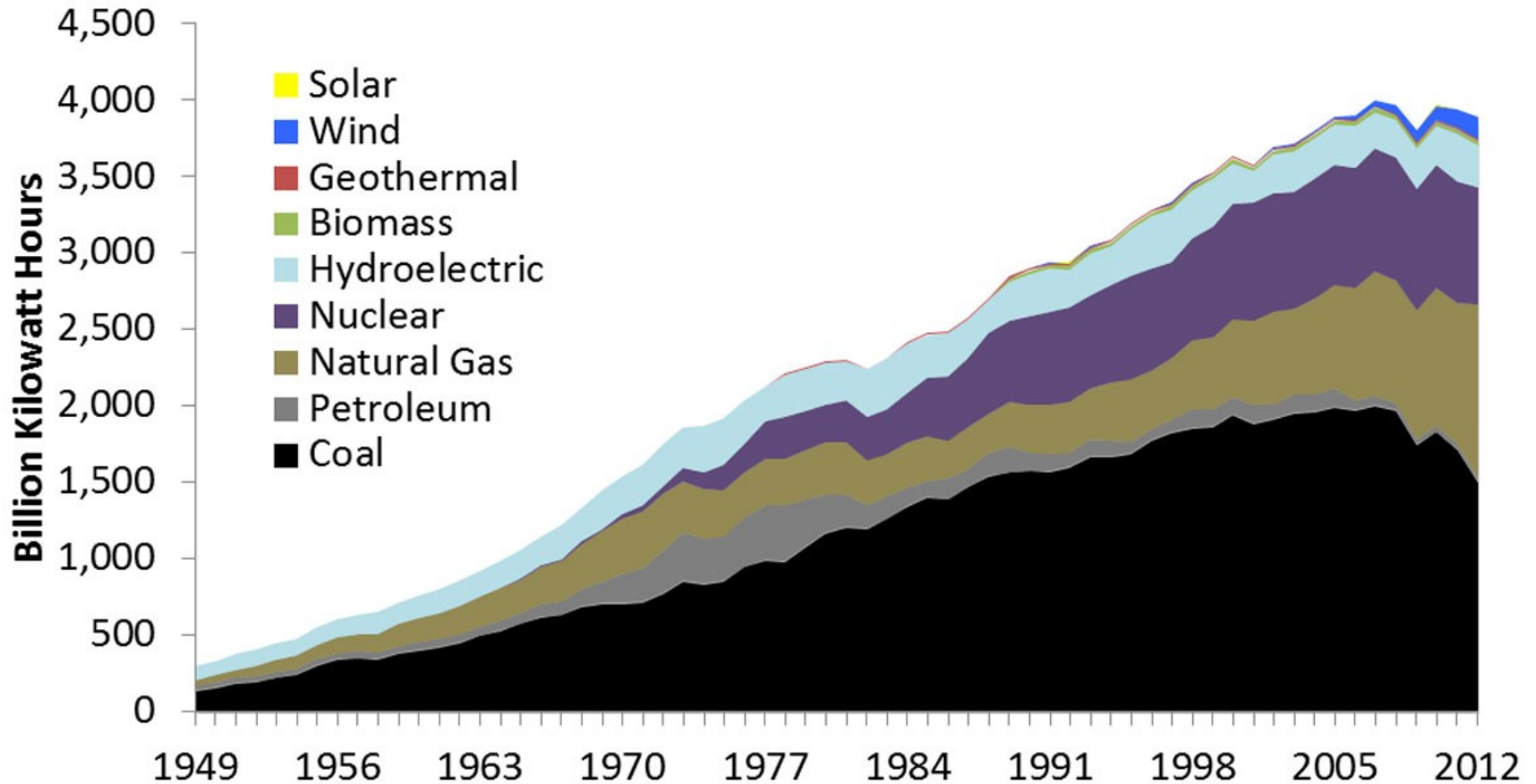
U.S. electricity use and economic growth, 1950 - 2040
 percent growth (3-year compound annual growth rate) and trend lines



Annual change in retail electricity sales by sector (1975-2015)
 percent change (five-year rolling average)

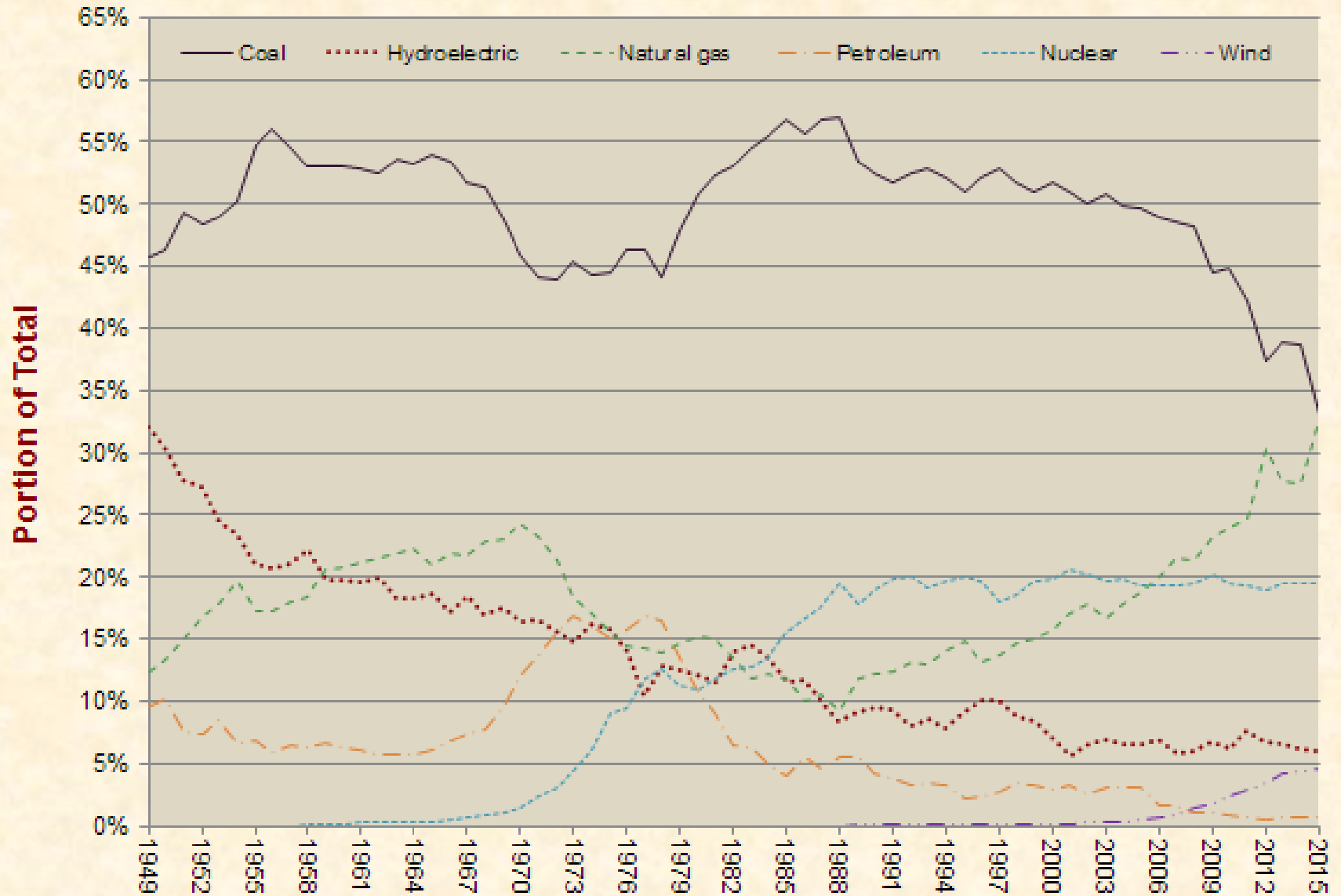


Historical Net Electricity Generation (Electric Power Sector Only) 1949-2012

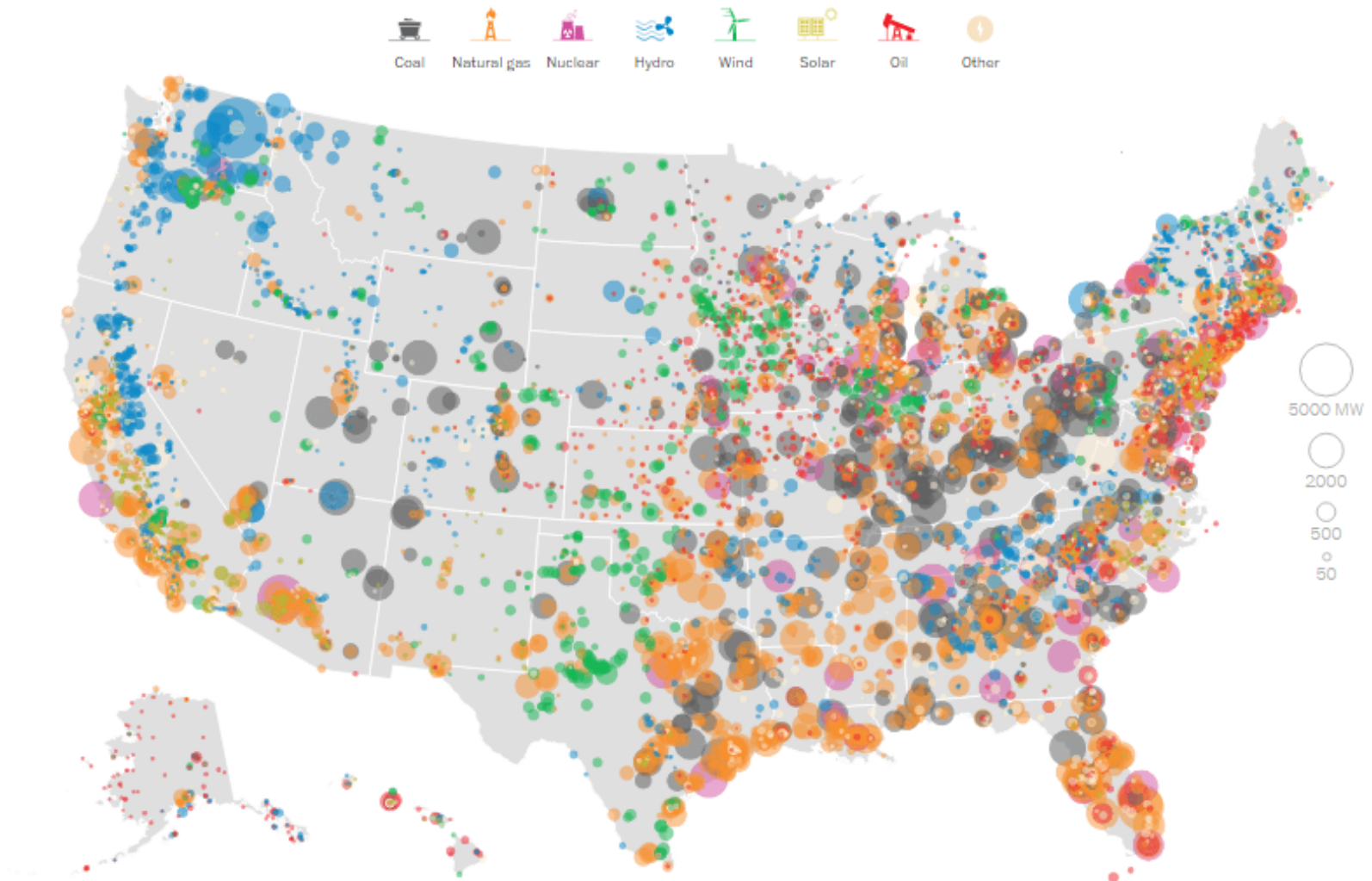


Source: Energy Information Administration; Online at: http://www.eia.gov/totalenergy/data/annual/pdf/sec8_9.pdf

Electricity Generation by Major Source



Plant capacity by power source in megawatts



Electricity generation by power source, January to May 2015

<https://www.washingtonpost.com/graphics/national/power-plants/>

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