

Energy Economics: Facts, Fiction & Trends

MEA Environmental Learning Summit
September 16, 2015

Derek D. Ingram, P.E., P.G.

XDD, LLC

St. Louis, MO



Do it right. Do it once.

Purpose

Purpose: To provide a general overview of some key misconceptions by the energy end-users and to present some interesting facts and trends of the U.S. and the world on energy generation and consumption.

An update on 2012 MEA presentation.

As employees, contractors, and vendors in the utility industry, it is our responsibility to help educate the energy consumer.

Overview

General Energy Economics Quiz

Clarify Definitions

Common Misconceptions

Facts

Historical and Present Trends

General Energy Economics Quiz

Question 1:

How much of the world's energy does the United States use?

- a. 12%
- b. 18%
- c. 28%
- d. 34%

ANSWER:

b. 18%.....by approximately 4.5% of the world's population

China is first at 20%....with approximately 18.5% of the world's population

Source: U.S. Energy Information Administration, 2014

General Energy Economics Quiz (cont.)

Question 2:

What percentage of 2014 U.S. electricity generation was from fossil fuel (coal, natural gas, petroleum)?

- a. 30%
- b. 46%
- c. 57%
- d. 67%

ANSWER:

d. 67%.....70% in 2012; 40% coal; renewable 4.8% (wind 3%)

Coal 39%; Natural Gas 27%; Nuclear 19%; Hydropower 6.3%; Other Renewable 6.9% (Wind 4.4%, Biomass 1.6%, Geothermal 0.4%, Solar 0.5%); Petroleum <1 %; Others <1%

Source: U.S. Energy Information Administration, 2014

General Energy Economics Quiz (cont.)

Question 3:

Name three of the six primary renewable energies?

ANSWER:

Hydropower

Biomass (wood, garbage, waste, algae)

Biofuels (alcohol fuels, landfill gases)

Wind

Geothermal

Solar

Non-primary renewable energies are oceanic: tidal, wave, current

Current percentage of world energy consumption from renewable energy is 10%.....2035 forecast is 14%; however, electricity demand is projected to increase by 28%

Source: U.S. Energy Information Administration, 2012, 2014

General Energy Economics Quiz (cont.)

Question 4:

How much tax (cents per gallon) do we pay on gasoline?

- a. 9.9
- b. 19.72
- c. 28.48
- d. 42.52

LC7

ANSWER:

d. 42.62 NOTE: Fixed tax, not percentage based; 41.08/47.58.

	<u>Gasoline</u>	<u>Diesel</u>
Federal	18.40	24.40
Avg. State	<u>24.12</u>	<u>24.90</u>
	42.52	49.30

Source: U.S. Energy Information Administration, July 1, 2014

General Energy Economics Quiz (cont.)

Question 5:

How much average energy (Btu) does a U.S. person use in a year?

- a. 81 million
- b. 194 million
- c. 317 million
- d. 492 million

ANSWER: LC4

c. 317 million Btu.....world average is 81 million Btu

Source: U.S. Energy Information Administration, 2012

General Energy Economics Quiz (cont.)

Question 6:

What is the primary reason that diesel is more expensive than gasoline?

- a. Supply & Demand**
- b. Cost increase for low sulfur refining**
- c. Higher profit for oil companies**
- d. Higher tax**

ANSWER:

a. Supply & Demand.....especially in Europe, China, India, and U.S caused by a tight global refining capacity

Minor reasons:

- The transition to less polluting, lower sulfur diesel has affected production and distribution costs.**
- Tax is 6 cents per gallon higher. LC8**

Source: U.S. Energy Information Administration, 2015

General Energy Economics Quiz

Question 7:

When was the last major refinery (production >200,000 barrels per day) built in the U.S.?

- a. 1967**
- b. 1977**
- c. 1987**
- d. 1997**

ANSWER:

b. 1977 Garyville, LA LC5
LC6

Twelve simple refineries have been built since, but all have low capacity (generally 15,000 barrels per day or less)

Source: U.S. Energy Information Administration, 2015

General Energy Economics Quiz (cont.)

Question 8:

What percentage of gasoline cost is crude oil (based on \$2.80/gallon cost)?

- a. 40%
- b. 51%
- c. 62%
- d. 73%

ANSWER:

b. 51 %.....2012: 67% @ \$3.85/gallon in 2012

Crude Oil	51%/67
Refinery Cost & Profit	21%/16
Distribution, Marketing, Retail Cost & Profit	11%/6
Taxes (federal and state)	16%/11

Source: U.S. Energy Information Administration, June 2015

General Energy Economics Quiz (cont.)

Question 9:

How many gallons of gasoline are produced from one barrel (42 gallons) of crude oil? LC11

- a. 19
- b. 27
- c. 38
- d. 52

ANSWER:

a. 19.....remainder yields diesel (11 gallons), distillates and fuel oils, jet oil (kerosene), and other products

NOTE: In 2012 @ \$100/barrel, gas sold at \$3.58/gallon (19 gallons equate to \$68.02). In 2015 @ \$45/barrel, gas sells at \$2.37/gallon (\$45.03).

Source: U.S. Energy Information Administration, 2013

General Energy Economics Quiz (cont.)

Question 10:

What is the current outlook for gasoline prices for remainder of 2015 and 2016?

- a. Remain Relatively Flat**
- b. Go Down Significantly**
- c. Go Up Significantly**
- d. Fluctuate by +/- \$0.50**

ANSWER:

a. Remain Flat...but history shows it is anybody's guess....current avg. is \$2.37 (9/14/15)

**Remaining 2015 projection is \$2.44/gal.
Projection for 2016 is \$2.55/gal.**

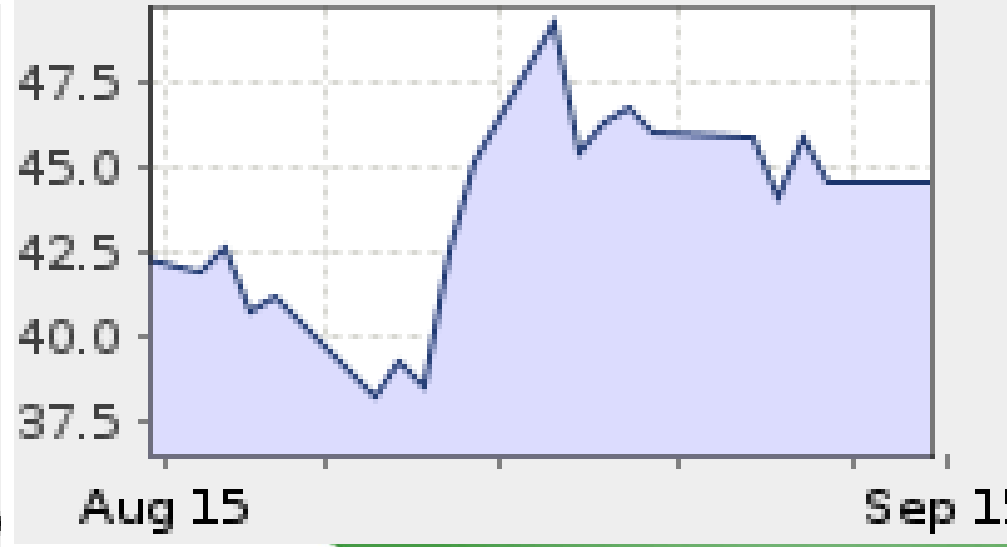
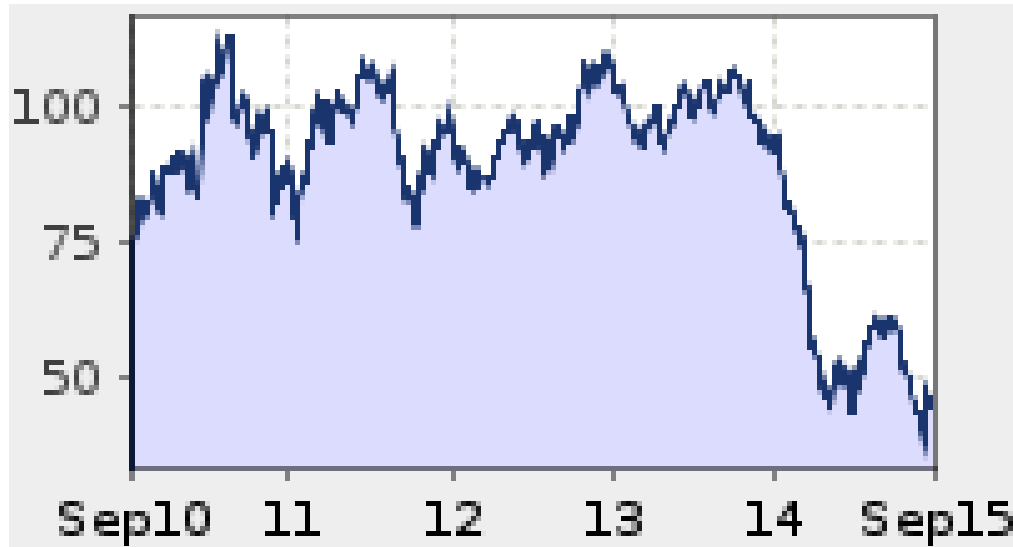
Source: U.S. Energy Information Administration, 2015

Why is gas below \$2.00/gal?

Supply and Demand.....the world is extracting more crude than is needed.....2.2M barrels/day

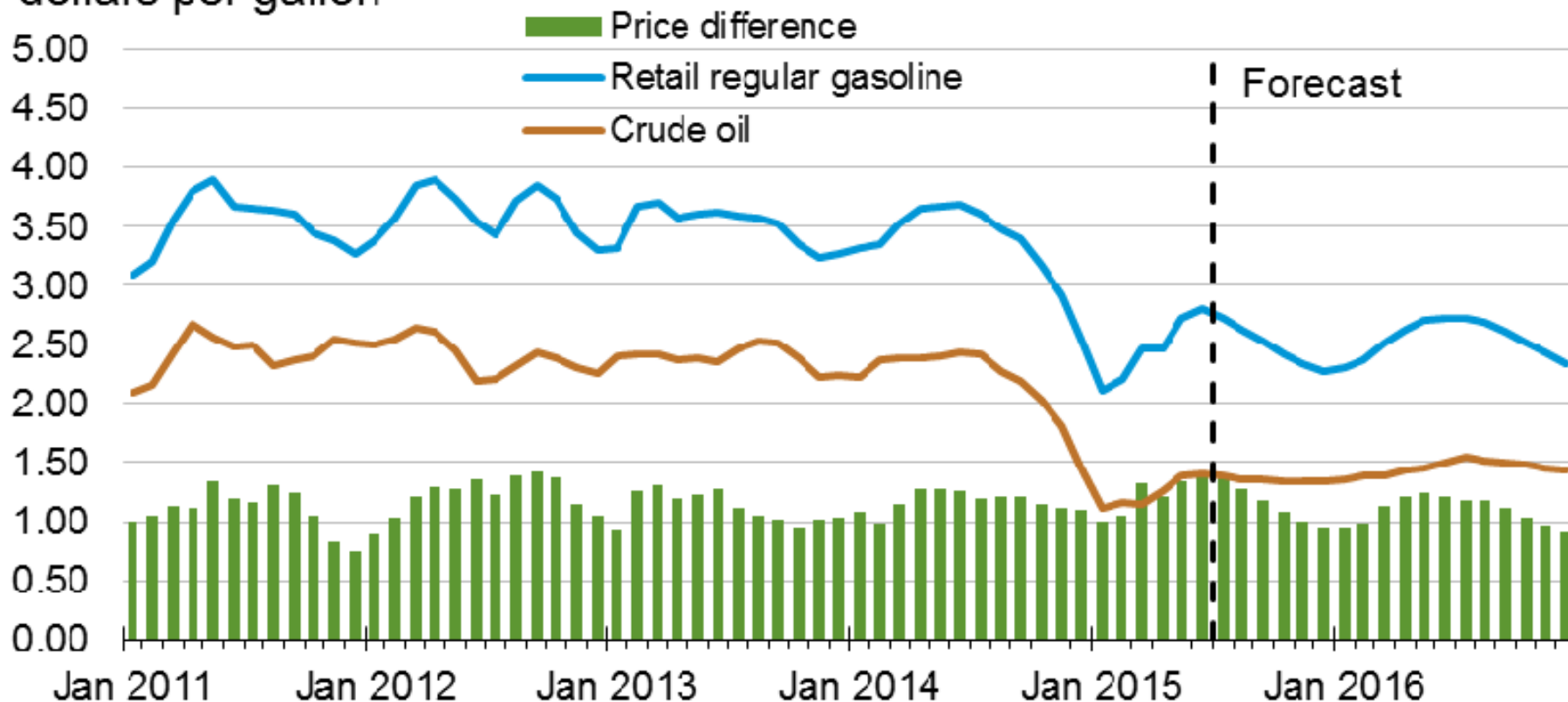
Mid-East is purposely trying to collapse the Russian and South American markets....cripple the US market

Russian and South American markets depend on oil to sustain their economies....so they increase output as well.



U.S. Gasoline and Crude Oil Prices

dollars per gallon



Crude oil price is composite refiner acquisition cost. Retail prices include state and federal

Source: Short-Term Energy Outlook, July 2015.

Why do fuel prices end in 9/10^{ths}?

- Sales tactic to nth degree. \$0.99 is cheaper than \$1.00.
- Goes back to 1930's when incremental taxes started....but stuck.
- That "penny" per gallon is \$1.7B annually....500 gallons per US consumer (\$4.50)
- Too costly to change.....



Definitions are Broad-Based

Renewable Energy – is energy derived from natural resources such as sunlight, wind, rain, tides, and geothermal heat, which are naturally replenished.

Sustainable Energy – Renewable energy combined with technology to encompass energy efficiency. Meets the present without comprising the future.

Green Energy – THERE IS NO UNIVERSALLY ACCEPTED DEFINITION; however, it is implied as any source of energy that is sustainable and not “excessively” harmful to human health or the environment. A strict definition would include only water, wind and solar power. A more expansive definition would include nuclear power*, biofuel and biogas.

Alternative Energy – an “umbrella term” referring to any source of usable energy intended to replace fuel sources without the undesired consequences of the replaced fuel....often used out of context in place of renewable, sustainable and/or green energy.

Clean Energy – a broadly term used to reference energy sources that reduce the environmental footprint while balancing the increased global demand and promoting energy independence.

*no greenhouse gases are produced

8 Common Energy Misconceptions

- Renewable energies are a recent phenomenon.
- All green energies are cheap...“free energy”.
- Use of alternative fuels (ethanol) results in less greenhouse gases.
- Leaving a light on uses less energy than turning it off and on.

8 Common Energy Misconceptions

(continued)

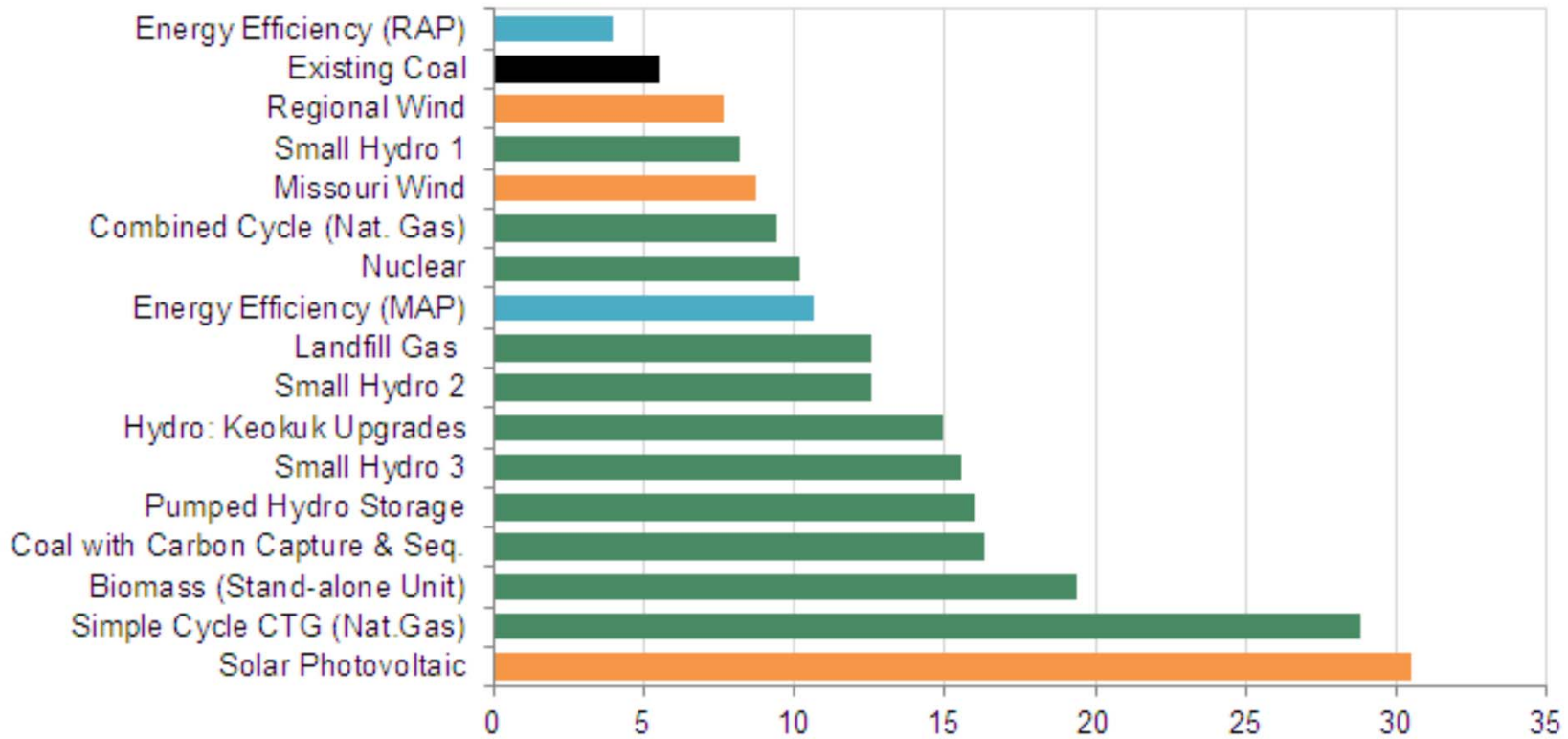
- Keeping your thermostat constant uses less energy than turning it down at night ; however, continuous circulation has shown to be a benefit.
- Most of the oil consumed in the U.S. comes from the Middle East.
- U.S. uses the most energy and thereby emits a disproportionate amount of greenhouse gases.
- Appliances use no energy when turned off.

Energy Waste - Non-Utilized Servers

- In 2010, data centers utilized about 2% of all electricity used in the U.S.....2015????
- Stanford University conducted a 4,000 server study and discovered 30% of them hadn't been used during the previous six months. They calculated than 3.6 million comatose servers in the U.S.
- Keeping them powered up requires the services of an estimated 1.44 gigawatts of generating capacity—equivalent to three big power plants.

Energy End-Cost

Levelized Cost of Energy (cents/kWh)

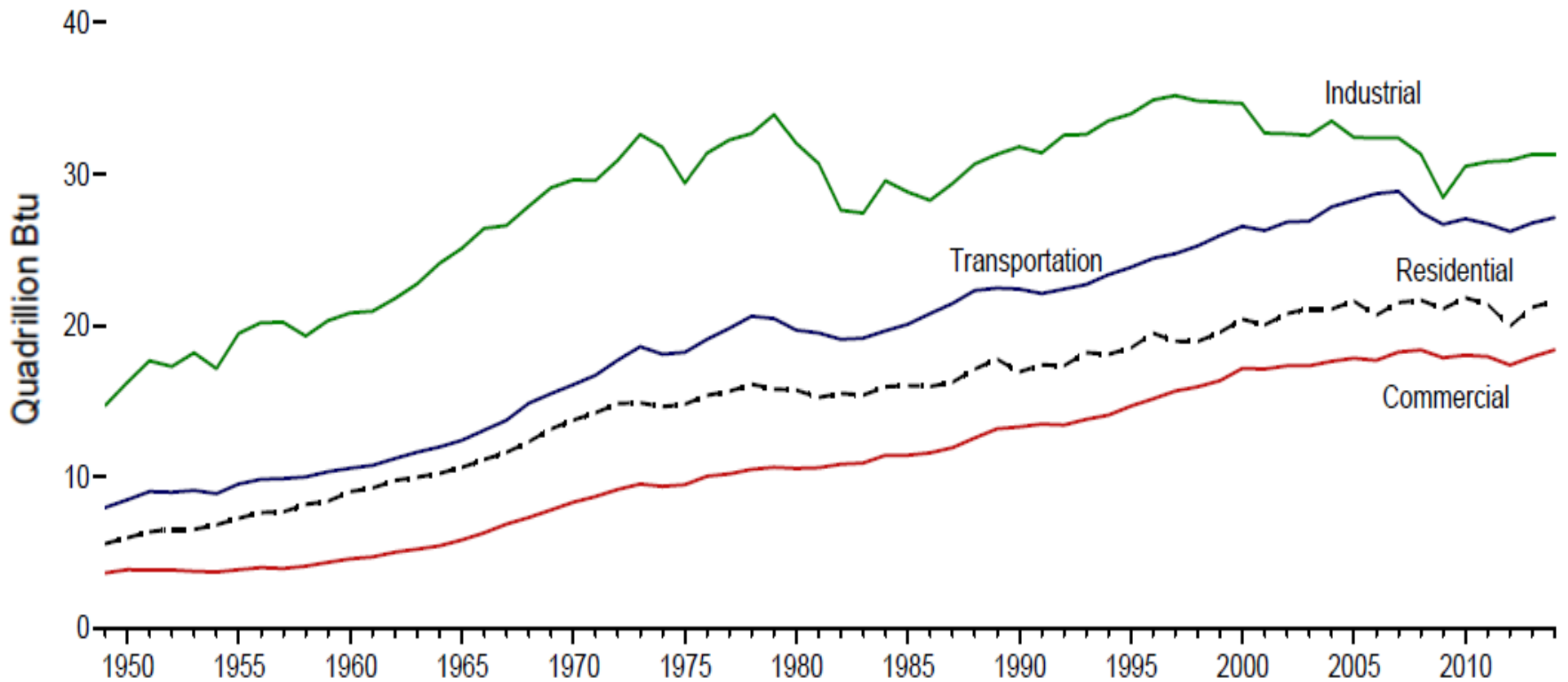


Note: Does not reflect inclusion of tax incentives. Blue denotes energy efficiency. Black denotes existing coal. Orange denotes intermittent resources. MAP energy efficiency reflects costs and energy savings incremental to RAP.

Source: Ameren Integrated Resource Plan, 2014

U.S. End-Use Trend

Total Consumption by End-Use Sector, 1949–2014

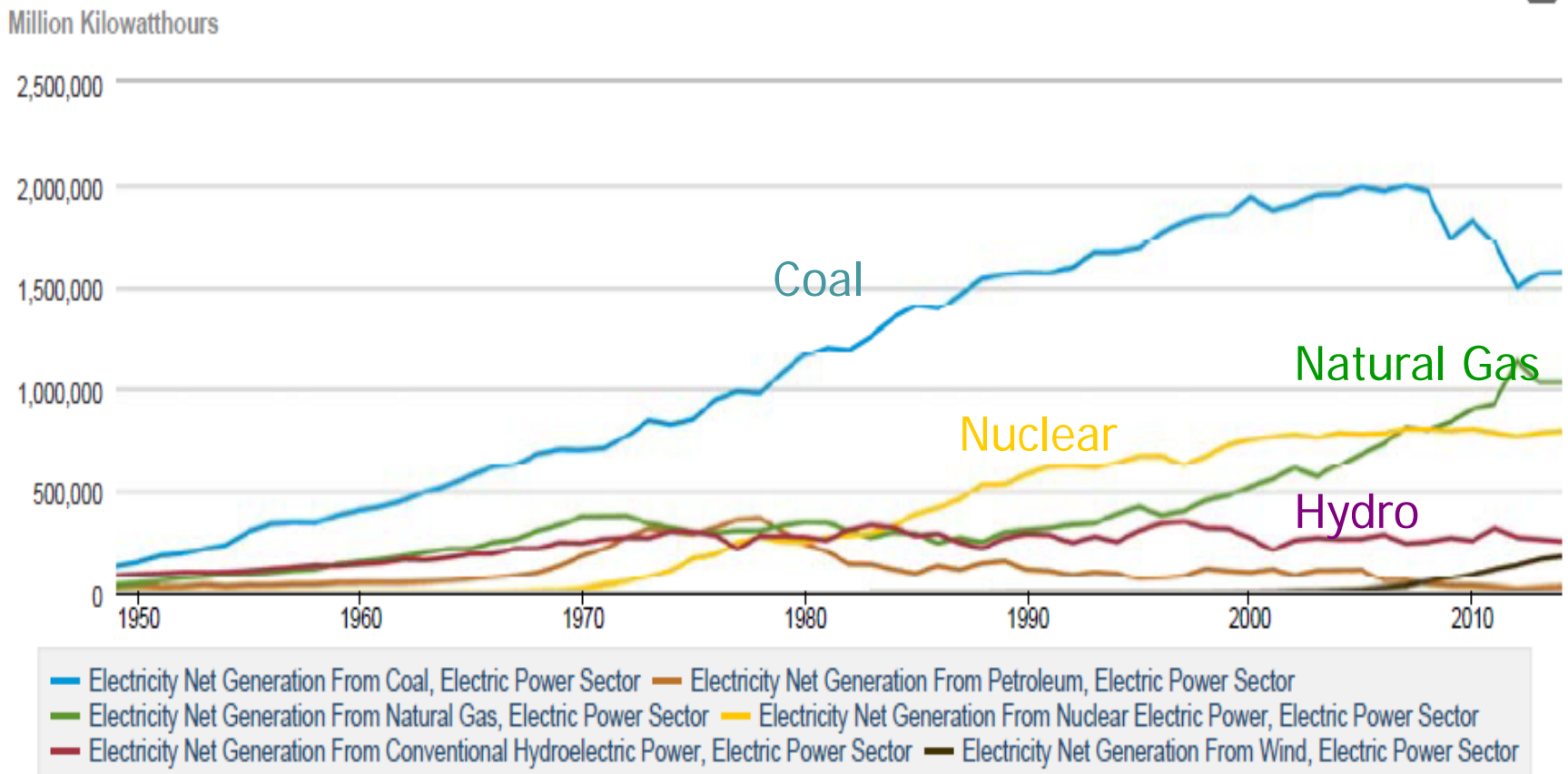


Source: U.S. Energy Information Administration, 2014

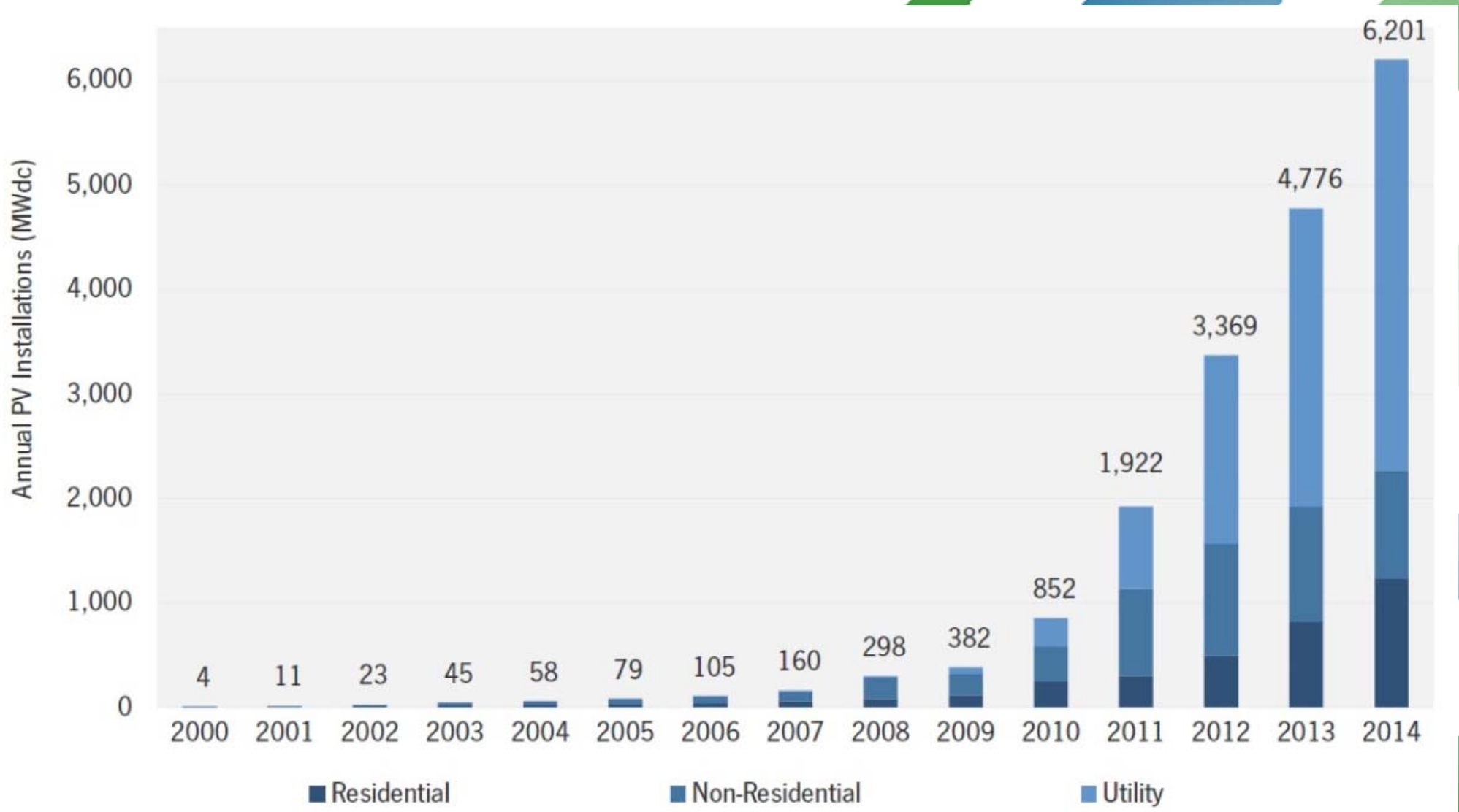
Electrical Generation

Electric Power Sector, 1949-2011

Table 7.2b Electricity Net Generation: Electric Power Sector

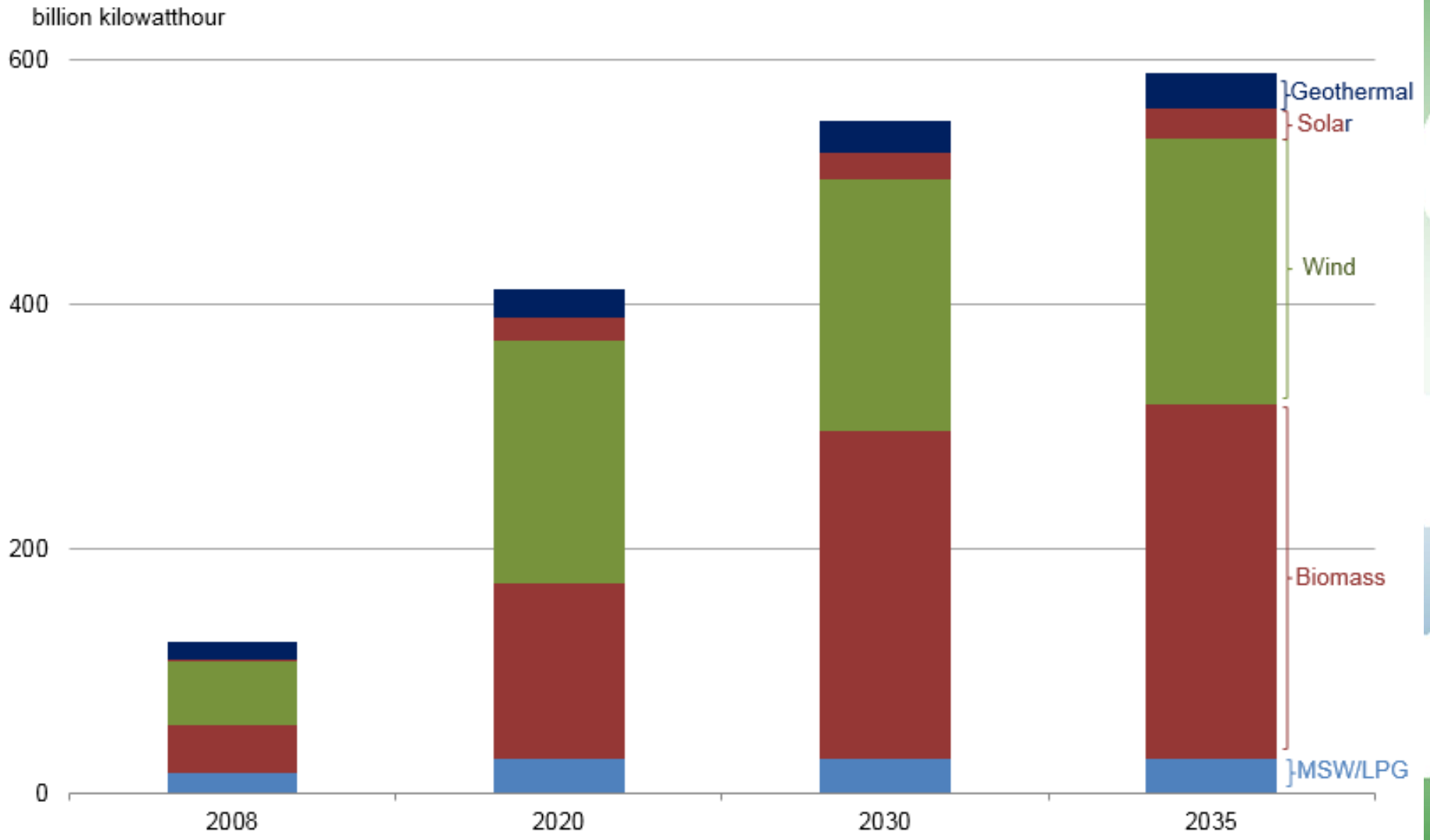


Renewable Generation Trend - Solar



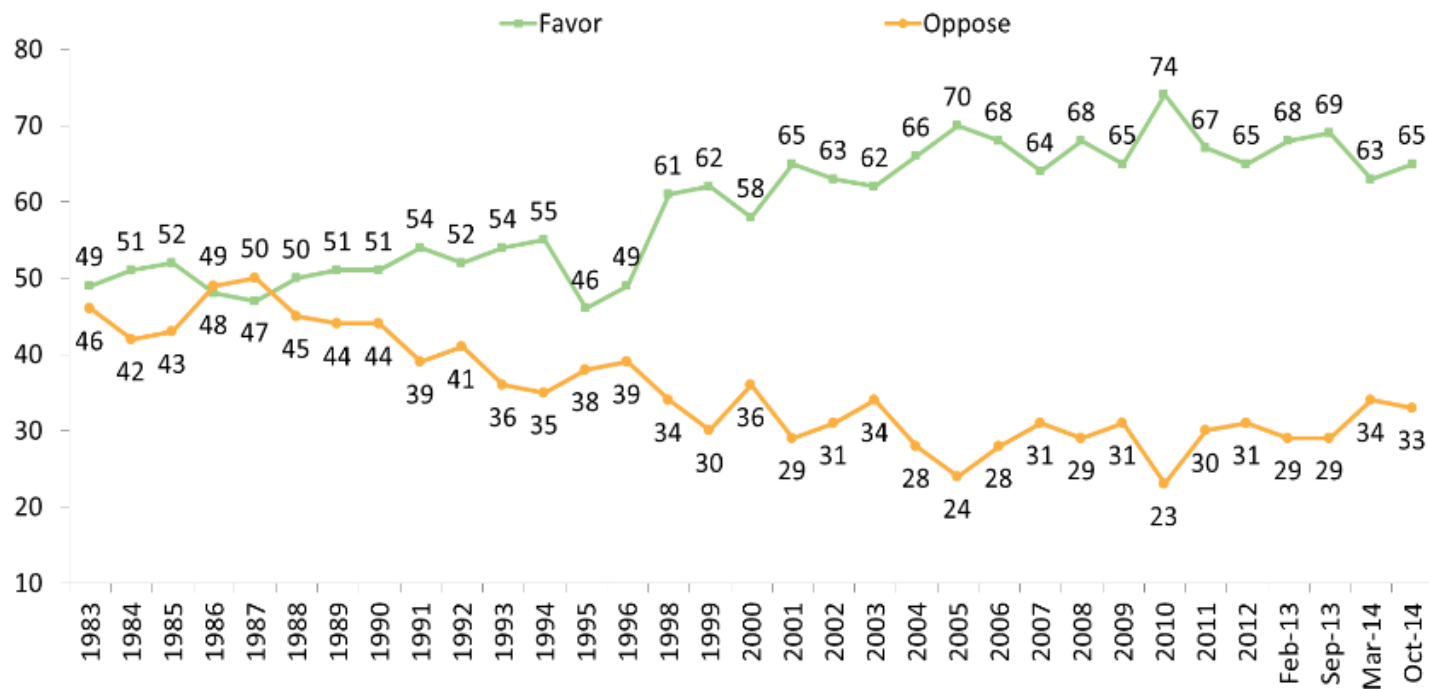
Renewable Generation Trend

Figure 65. Nonhydroelectric renewable electricity generation by energy source, 2008-2035



U.S. Nuclear Support

Percent Who Favor and Oppose Nuclear Energy: Annual Averages 1983 to 2014



Source: Bisconti Research Inc.

Key Incidents

1979 - Three Mile Island

1986 - Chernobyl

1996 - Costa Rica Radiotherapy

2000 - Russian nuclear submarine sank during training mission

2011 - Japan tsunami

Questions to Ponder with Others

- Is your higher electric bill reflective of rising electric costs or your overall electric usage?
- How do transportation energy prices affect the cost of EVERYTHING purchased?
- Have you and your family really made any changes that affect your overall energy usage?

Summary

Energy terms can refer to the same source, but these terms ARE NOT interchangeable.

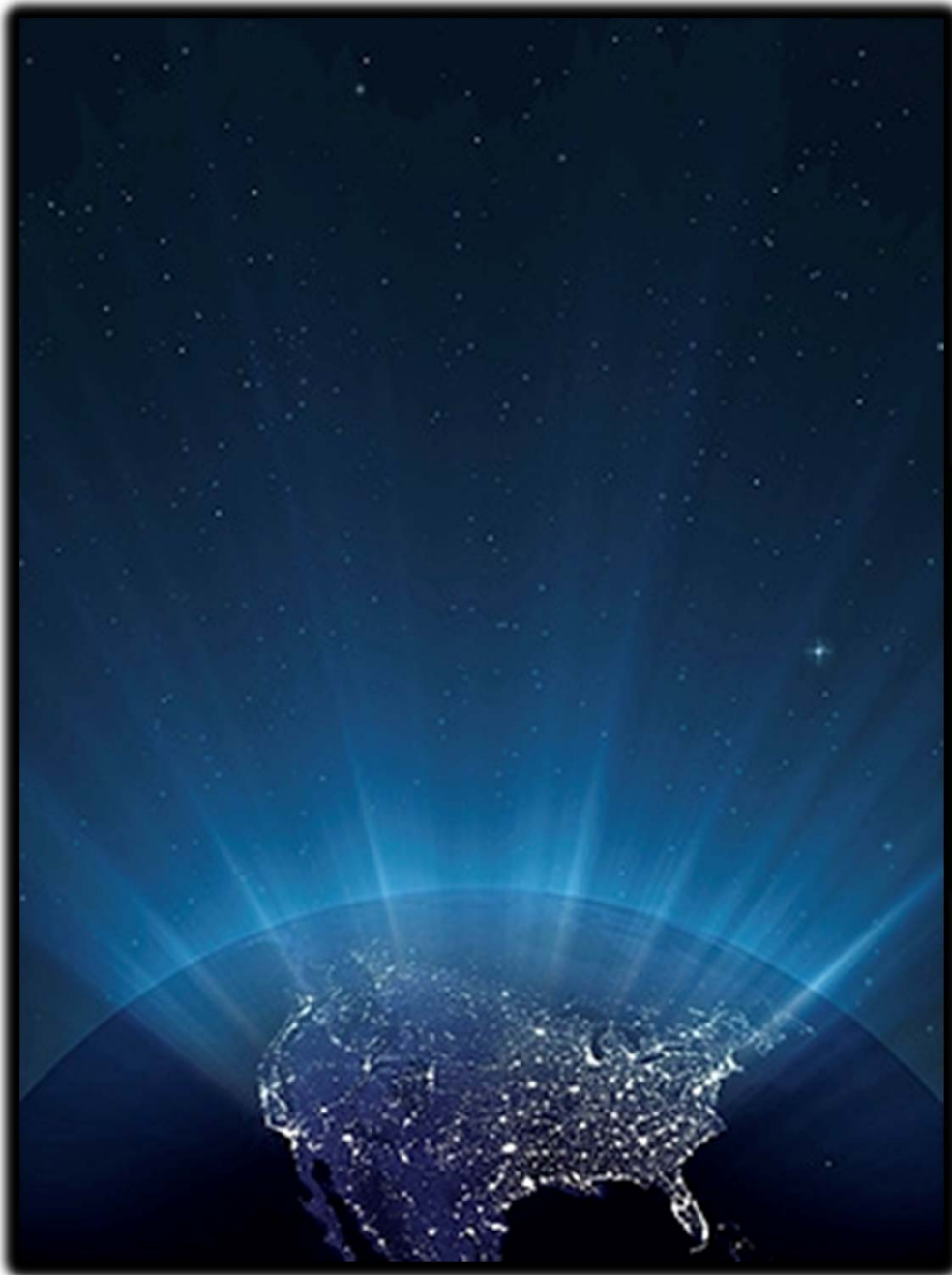
- Renewable is natural and replenishing
- Sustainable is renewable and efficient
- Green is sustainable and “not excessively” harmful
- Alternative replaces a consequence
- Clean reduces footprint and promotes independence

Fossil fuel energies are required to produce our energy demand.

Research & Development in alternatives must be continued, but are no where near providing for our needs in regards to supply or cost.

Renewable energy generation provides only 10% of the world consumption and is trending relatively flat, while energy demand is increasing.

To achieve true gain.....we need a 60's NASA-like drive



Thank You!

Derek D. Ingram, P.E., P.G.
Midwest Operations Manager
XDD Environmental
ingram@xdd-llc.com
(800) 486-3575