PATRIOTS OF ARIZONA

Educate - Empower - Act

# Energy Symposium

## Moderator's Notes

**04/30/2022**


# Agenda

- Welcome
- Introduce the panel
- Setting the Stage
- Energy 101

15-minute break

- Carbon Neutral Agenda/Green New Deal
- The GRID and Energy Distribution

10-minute break

- Arizona’s Energy Profile
- Energy Innovations Past and Future

# The Panel:

## *Over 125 years Energy Industry Experience*

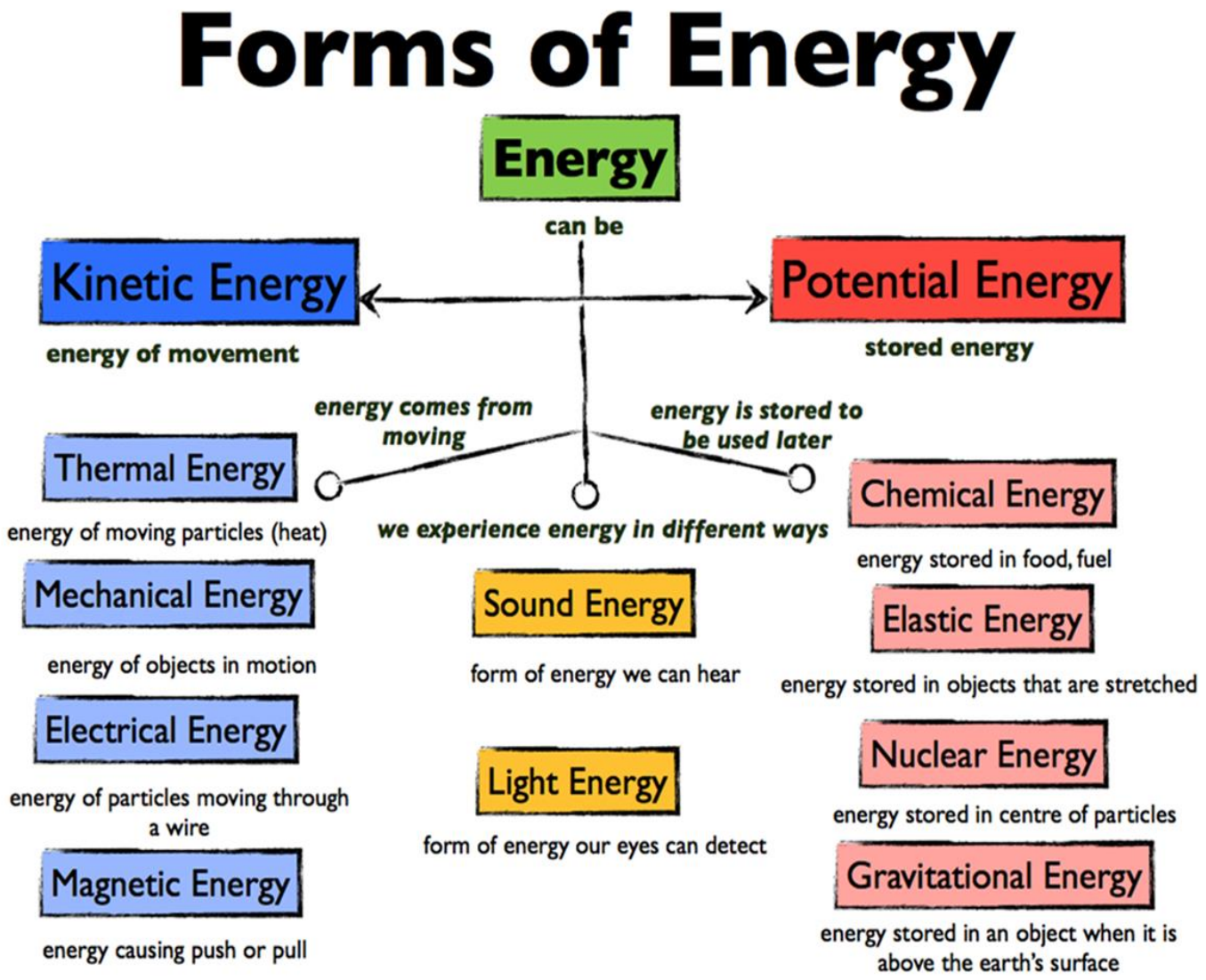
**Jim Lamon – Founder and former Chairman DEPCOM Power Inc.**
**U.S. Senate Candidate**

**Mark Lewis – Nuclear Advisor To Arizona Senate, drafted Arizona nuclear energy legislation, Appointed to National Coal Energy Commission**

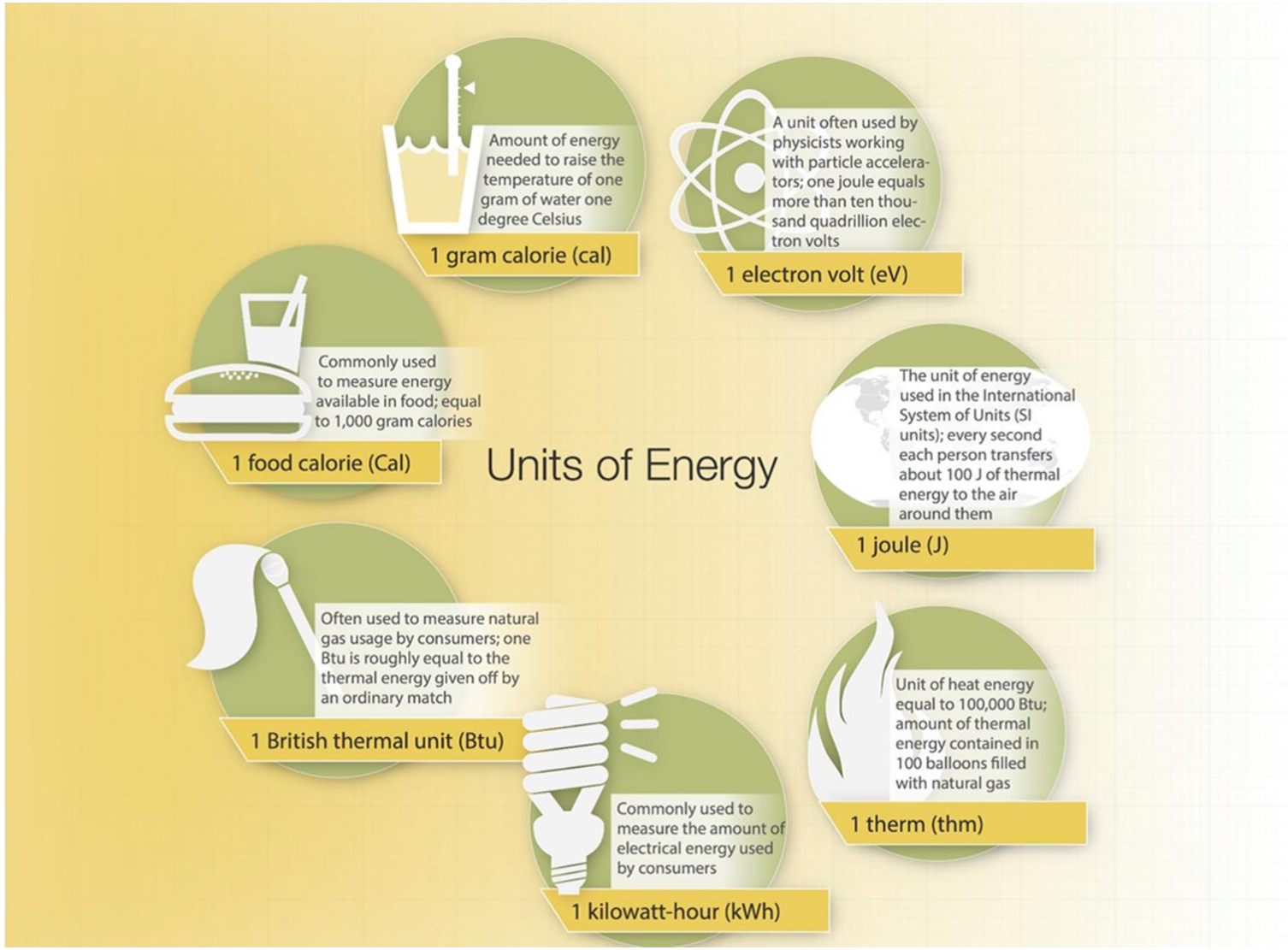
**Doug Little – Arizona Corporate Commission, Deputy Assistant Secretary for U.S. Department of Energy, Candidate Maricopa County Board of Supervisors**

**Court Rich – Co-founder of Rose Law Group and Director of firm's Regulatory and Renewable Energy Department**

***Energy is what enables us to do work!***



***We measure Energy in several ways.***



# *Energy Units of Measure*

**1 joule (J) = In physics, it's common to talk about joules of energy ; 1 joule = the energy to raise an apple one meter in the air (a Newton is about ½ lbs.)**

**1 Calorie = 1 Cal = 4.18 joules; *Women burn roughly 2,000 … Men roughly 2,500 calories per day* , children between 1,600 – 2,200 per day**

**1 kWh = 1 Kilowatt hour = 1.34 hp hr. ; *the Energy to blend 200 smoothies … ~900 kWh /month/Aver. U.S. home***

1 mWh =1,000 kWh = enough energy to power ~300 average homes

**1 Btu = 1 British thermal unit = heat to raise the temperature of one pound of water by 1 degree Fahrenheit at 1 atmosphere of pressure = *~252 calories***

**1 thm = 1 therm = 100,000 Btu's … 1 gallon of Gas = 1.25 thm**

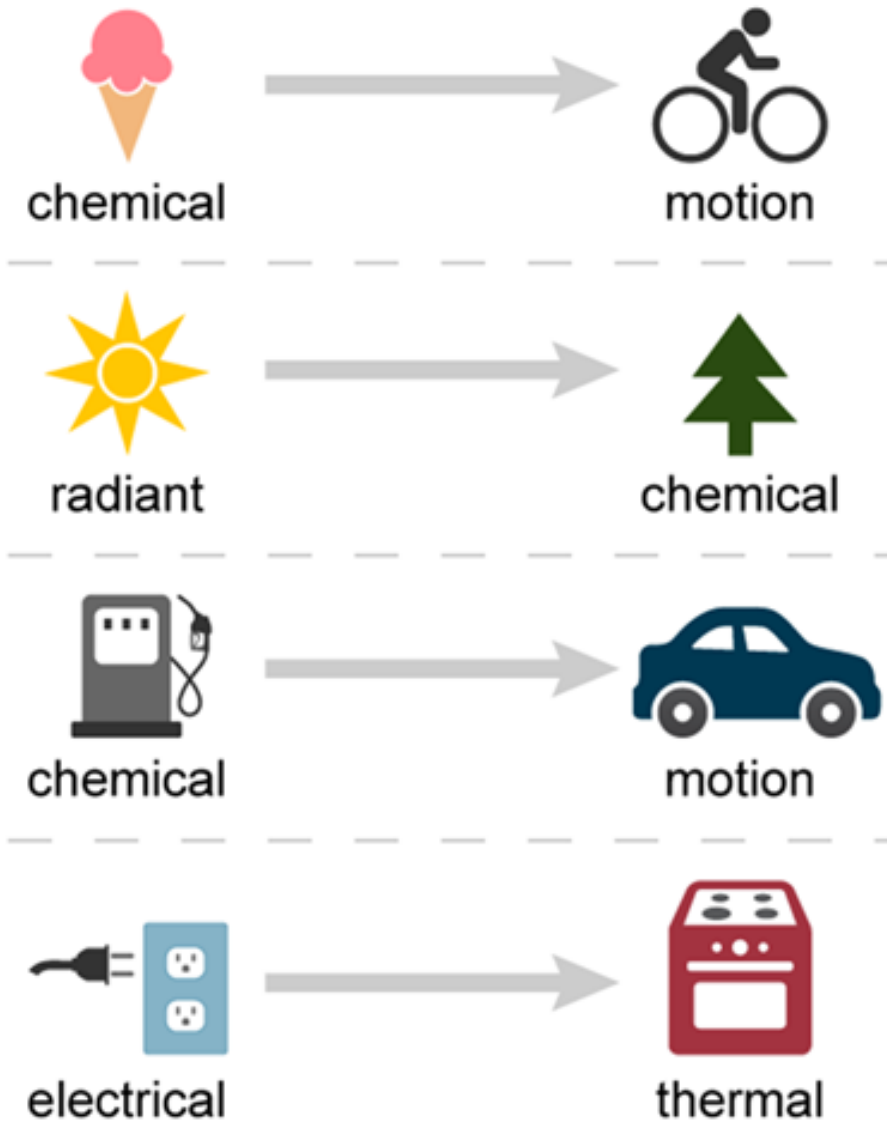
# *The law of conservation of energy*

***"Energy cannot be created nor destroyed"***

- **When people use energy, it doesn't disappear. It changes from one form into another form.**
- **A car engine burns gasoline, converting the chemical energy in gasoline into mechanical energy.**
- **Solar photovoltaic cells change radiant energy from the sun into electrical energy.**

***The total amount of energy in the universe stays the same and … Everything is Energy!***

# Energy transformations

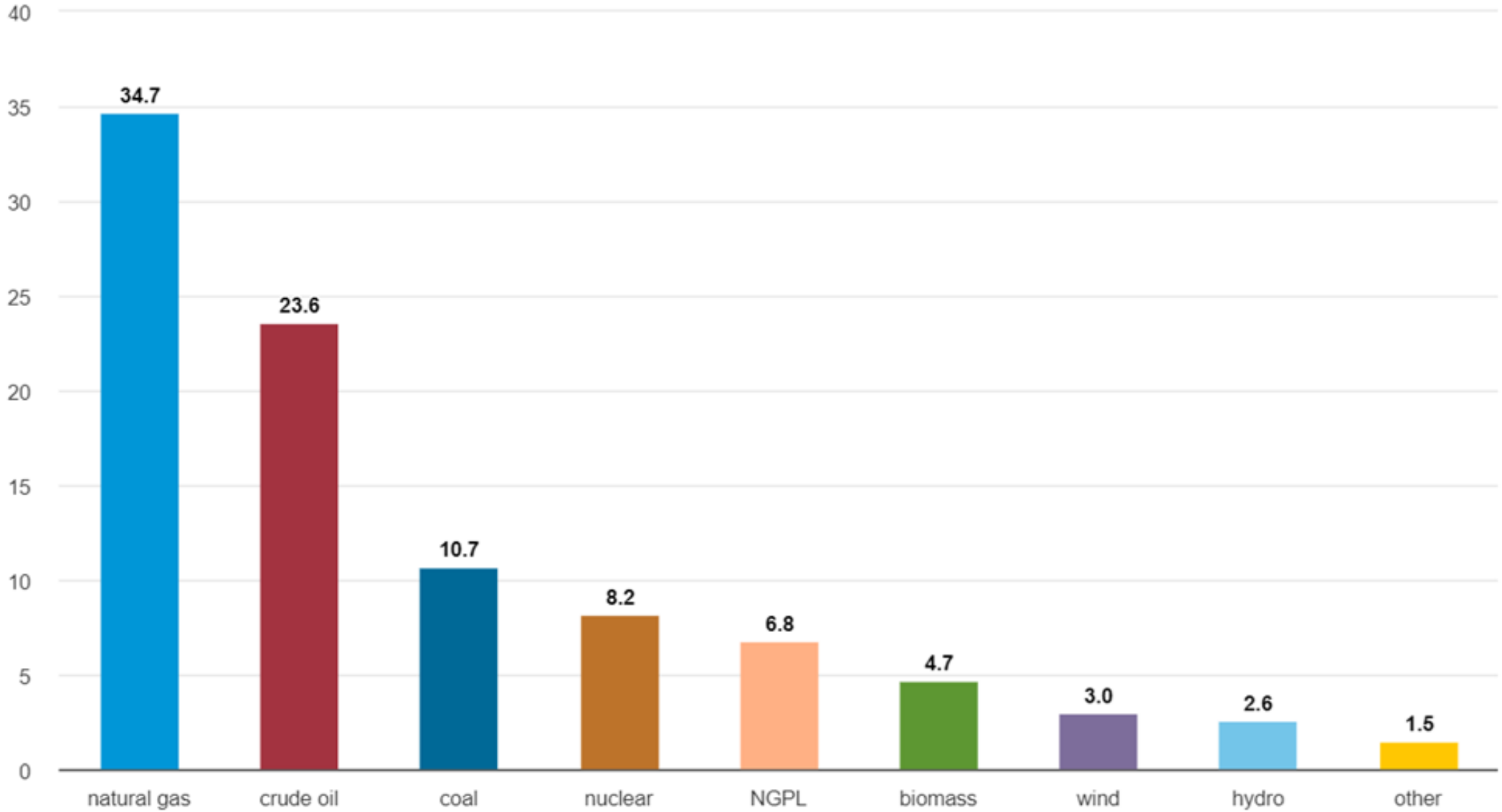


# *How has energy evolved over time?*

- ***Energy has not evolved … but our ability to understand it and harness it has:***
  - **Food to fuel man and beasts of burden**
  - **Water and wind to turn mills**
  - **Whale blubber to provide light**
  - **Coal to provide heat**
  - **Oil and natural gas to produce heat, steam, electricity**
  - **Nuclear power to complement fossil fuels with a “cleaner” energy**
  - **Emerging renewable energy technology to produce “Green” “Sustainable” energy**

## U.S. primary energy production by major sources, 2020

quadrillion British thermal units

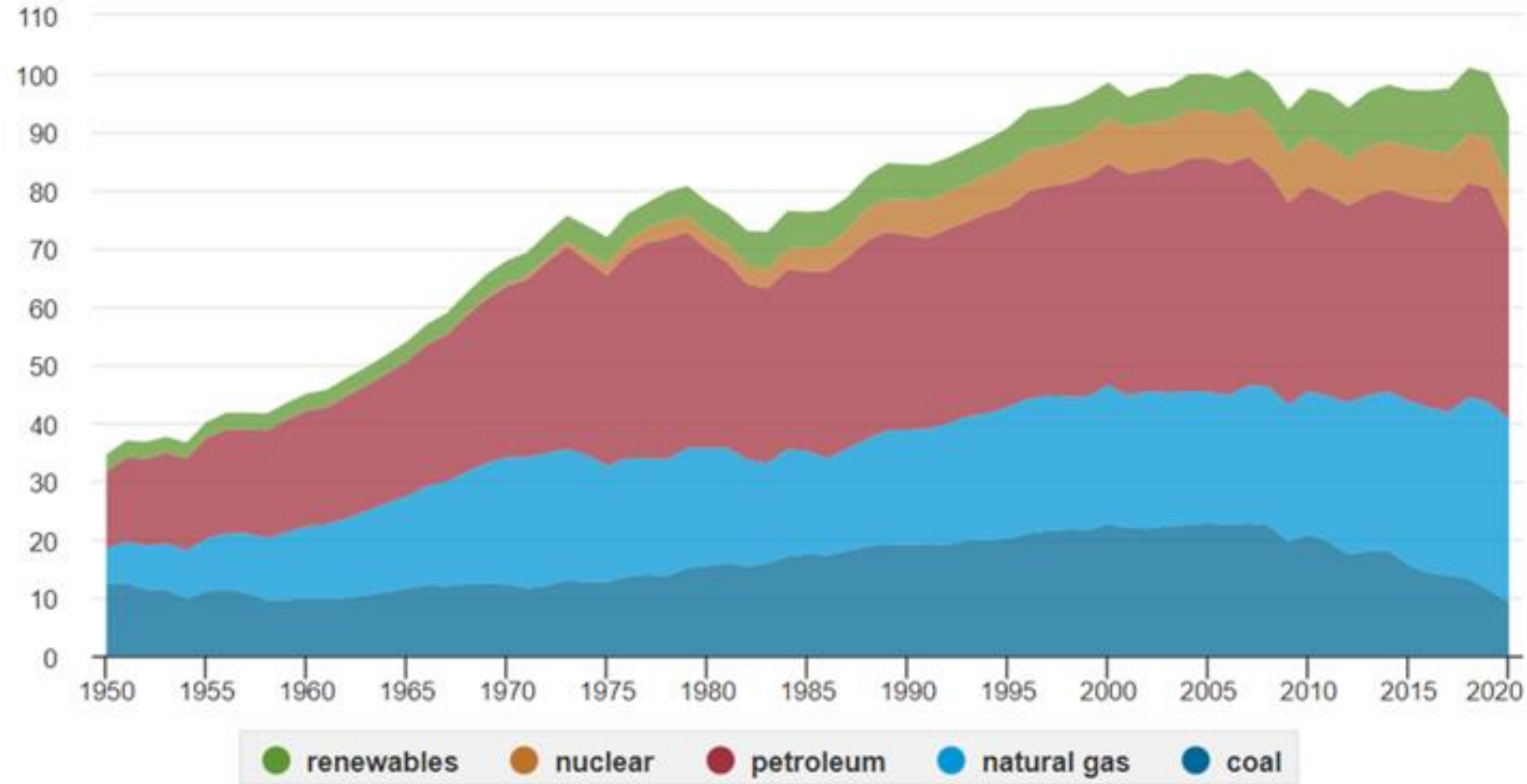



Source: U.S. Energy Information Administration, *Monthly Energy Review*, April 2021, preliminary data

# *U.S. primary energy production by major source*

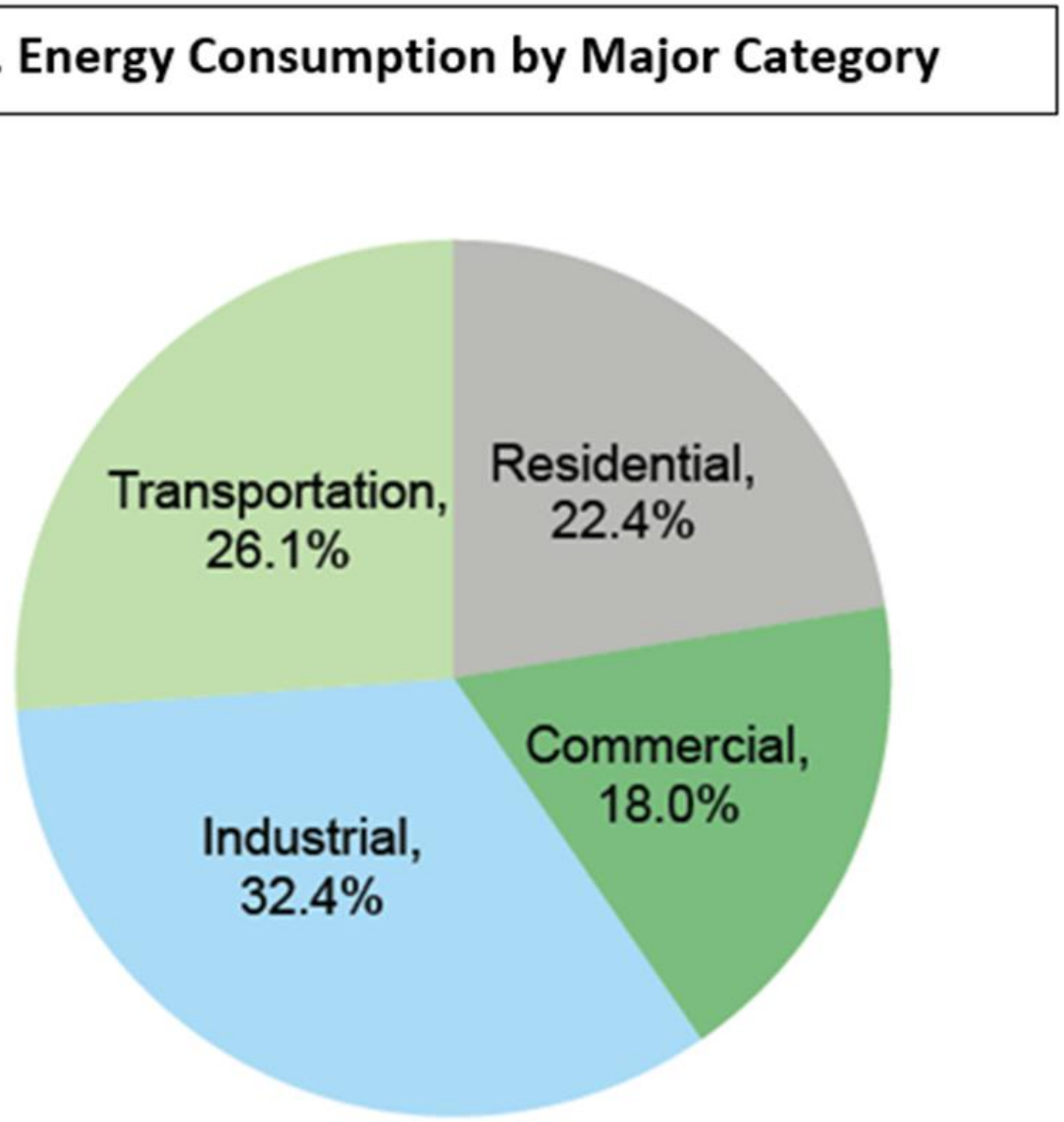
| Primary Source | Quadrillion British thermal units (BTU's) | Percent of Total |
|---|---|---|
| Natural Gas | 34.7 | 36.2% |
| Crude Oil | 23.6 | 24.6% |
| Coal | 10.7 | 11.2% |
| Nuclear | 8.2 | 8.6% |
| NGPL | 6.8 | 7.1% |
| Biomass | 4.7 | 4.9% |
| Wind | 3.0 | 3.1% |
| Hydro | 2.6 | 2.7% |
| Other | 1.5 | 1.6% |
| Total | 95.8 | 100.0% |

## U.S. primary energy consumption by major sources, 1950-2020




Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3, April 2021, preliminary data for 2020
Note: Petroleum is petroleum products excluding biofuels, which are included in renewables.

# *U.S. Energy Consumption by Major Category*



## Electric power sector consumption by source

1,063.8 trillion British thermal units
(percent of total for all sources)

**Coal**
251.2
(23.6%)

**Natural gas**
367.8
(34.6%)

**Petroleum**
0.7
(0.1%)

**Renewable energy**
110.9
(10.4%)

**Nuclear power**
333.3
(31.3%)

## Electricity flows

trillion British thermal units

**Net interstate outflows of electricity**
303.0

**Net international imports of electricity**
0.0

# That's it for Energy 101 – the Basics

- **Now we are going to dive into the meat of the agenda**
- ***The Carbon Neutral Agenda / Global Warming / The Green New Deal***
- **Next Four Slides are intended to hit hot buttons and stimulate questions.**

# *The Carbon Neutral Agenda*

- **Based on a belief that all fossil fuels are bad:**
  - ***Climate Change* ("Global Warming") *threatens the existence of the planet.***
  - ***Climate Change* is largely *man made***
  - ***Climate Change is caused by rising $CO^2$ levels* in the Earth's atmosphere.**

# *The Carbon Neutral Agenda*

## *What is the Goal of a Carbon Neutral economy?*

- **Environmental extremist would say its goal is to:**
  - ***Create a "Sustainable Economy"*** **that ultimately reduces the concentration of $CO^2$ and** ***saves mankind from extinction***
- **Those opposing the "Green New Deal" might say its goal is to:**
  - **Control the Energy sector, control the world economy,** ***create fear and drive a globalist/leftist agenda toward centralized control.*** **The Great Reset!**

**Regardless of where you are on this belief spectrum, the** ***Carbon Neutral Agenda*** **is having** ***profound impacts on our lives*****.**

# *The Carbon Neutral Agenda Affects Everything*

- ***National security*** **(dependence on others for critical resources)**
- ***Capital allocation*** **(thru Tax incentives/penalties or the adoption of Environmental, Social, and Governance (ESG) criteria to determine a company's value.**
- ***Economic impact*** **(higher energy costs mean higher prices for almost all goods and services)**
- ***Public policy*** **(Elimination of Coal Powered Plants, Banning of Fracking increases the price of Natural Gas … Trillions of dollars of deficit funding for the Green New Deal)**
- ***Education*** **– What do we teach our children?**
  - ***Man Made Global Warming will end the world in 10 years!***

    **OR**
  - ***We have a moral obligation to respect our God given natural resources! Waste is bad … and reduce, reuse, and recycle is good for everyone!***

# *Examples of "Carbon Neutral" Public Policy*

- ***The Climate Action Now Act***, **passed by the House in May 2019, would require an annual plan to ensure the United States meets its stated goals under the Paris Agreement of reducing greenhouse gas emissions by 26-28% by 2025.**
- ***CAFE regulations*** **- In 2012, new auto manufacturing standards for model years 2017-2025 were set, raising corporate average fuel economy to 54.5 miles per gallon for new light-duty vehicles in 2025.**
- ***Federal Production Tax Credit (PTC)*** ***2.5¢/*** **kWh to spur growth of biomass, geothermal, and wind.**
- ***Federal Tax Credit*** **of up to $7,500 is available for electric and plug-in hybrid electric vehicles purchased after January 1, 2010.**
- ***Tax Credits*** **for up to 26% of purchase and installation costs for renewable energy additions to new and existing houses until 2023.**

# The Carbon Neutral Agenda

Comments from the panel

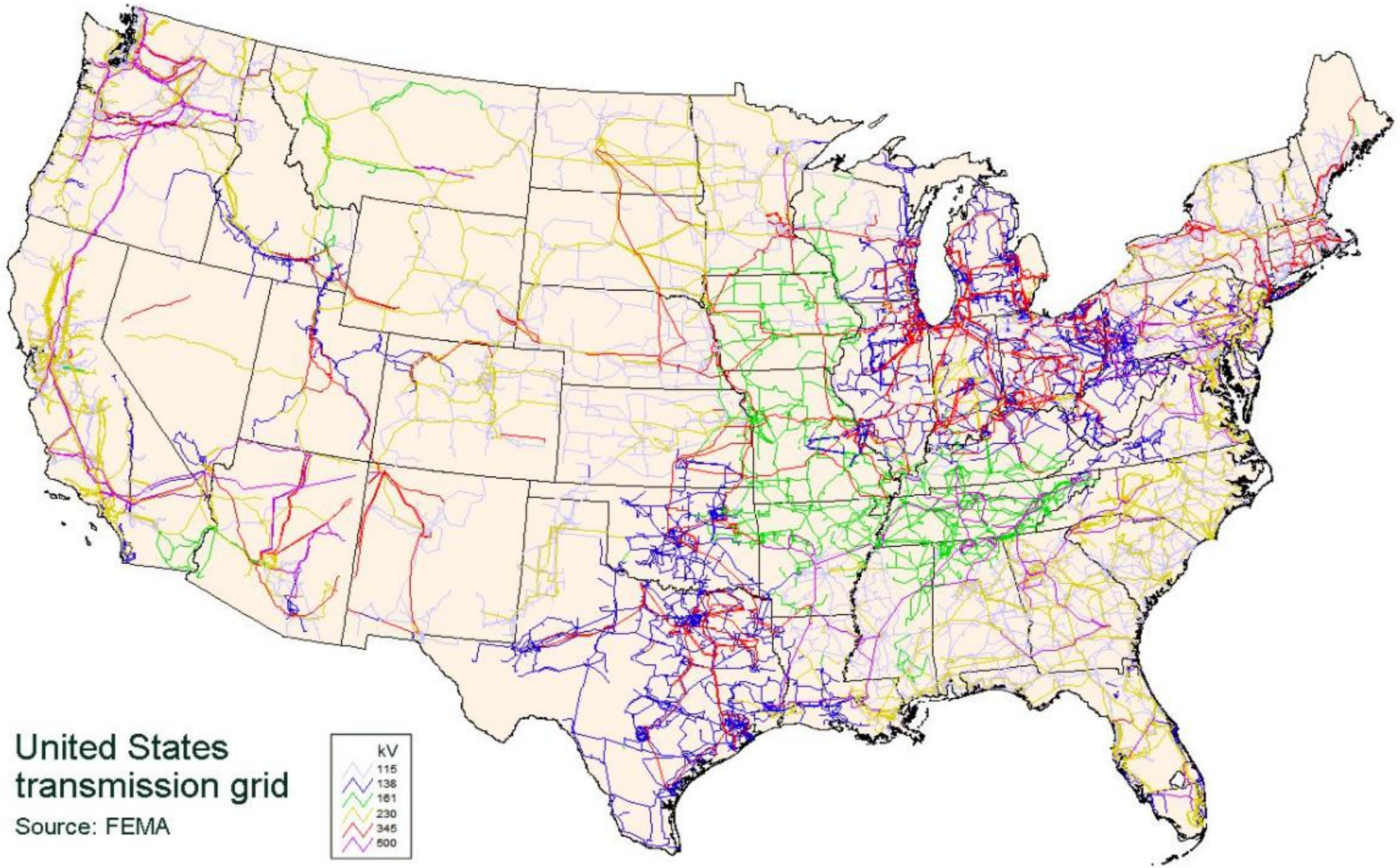
Questions for the panel

# *The GRID and energy distribution*

**What is *"The GRID"* ?**

- **The US grid is a complex network of:**
  - **More than *7,300 power plants and transformers***
  - **Connected by more than *160,000 miles of high-voltage transmission lines.***
- **It serves *145 million customers* … Transportation, Industrial, Commercial and Residential.**

# The U.S. Electricity Transmission GRID



# Who owns the electric system?

**The electric system, including generation, transmission, and distribution, is owned by.**

- **192 Investor-Owned Utilities (IOUs) account for 38% of net generation, 80% of transmission and 50% of distribution.**
- **~ 2,900 publicly owned utilities and cooperatives account for 15% of net generation, 12% of transmission, and nearly 50% of the nation's electric distribution lines.**
- **~ 2,800 independent power producers account for 40% of net generation.**
- **The Federal Government owns 9 power agencies (including 4 Power Marketing Administrations and TVA) with 7% of net generation and 8% of transmission.**
- **~211 Electric Power Marketers account for approximately 19% of sales to consumers.**

# Who runs the GRID?

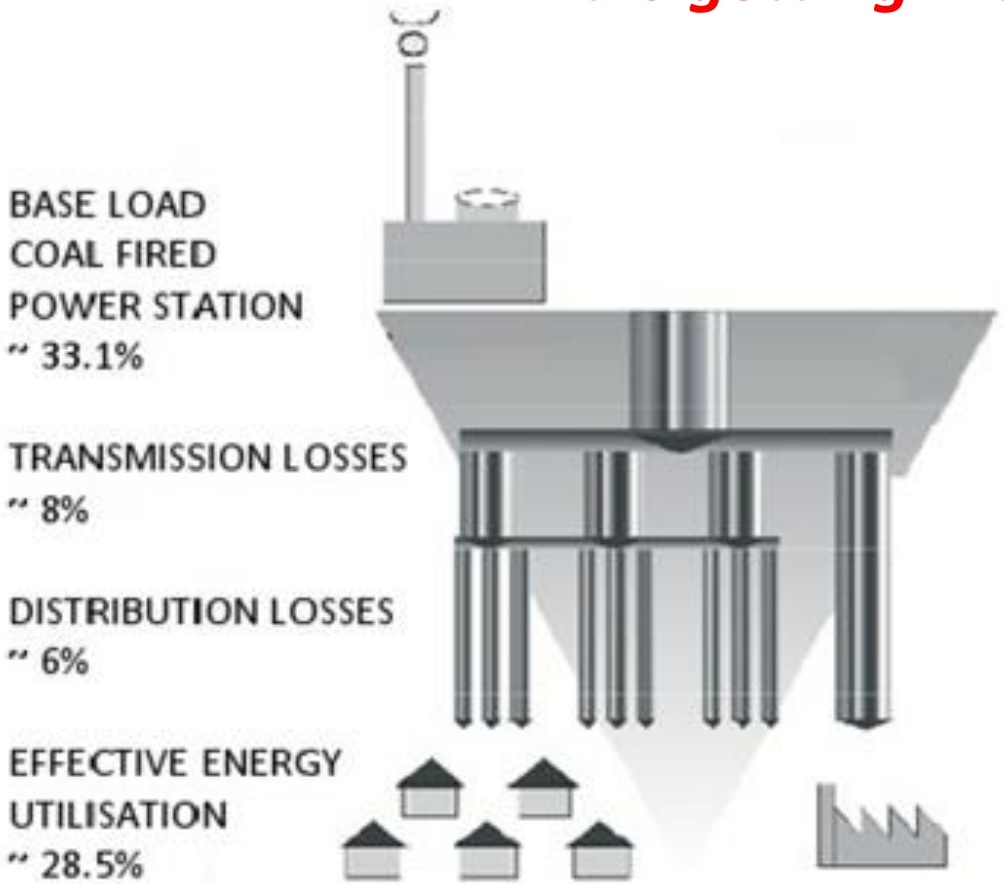
- There are generator operators and transmission owners.
- Independent System Operators and Regional Transmission Organizations (ISOs and RTOs)
  - They monitor system loads and voltage profiles;
  - Operate transmission facilities and direct generation;
  - Define operating limits and develop contingency plans;
  - Implement emergency procedures.
- NERC (North American Electric Reliability Corporation) develops and enforces reliability standards; monitors the bulk power system; assesses future adequacy; audits owners, operators, and users for preparedness; and educates and trains industry personnel.

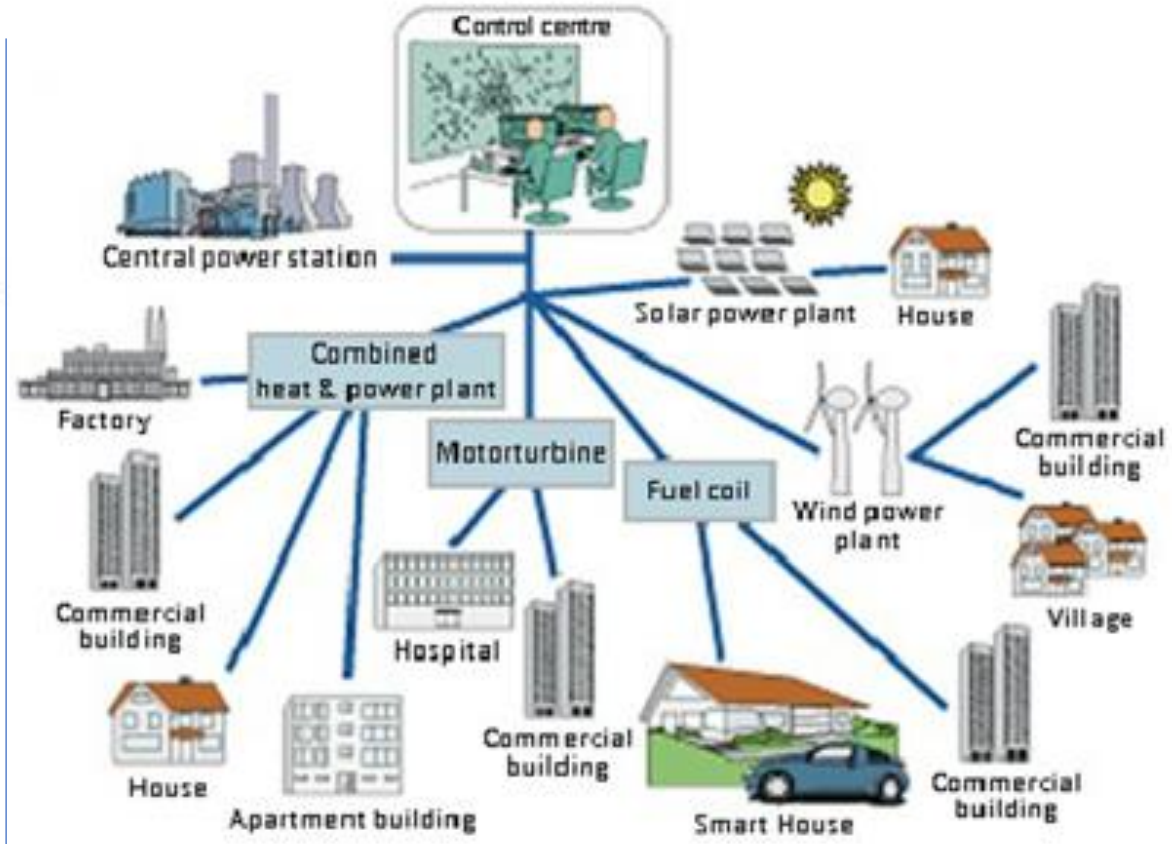
# The GRID and energy distribution

EXISTING CENTRALISED INDUSTRY

NEW DISTRIBUTED INDUSTRY

*It is getting more complicated!*



# The GRID

Comments from the panel

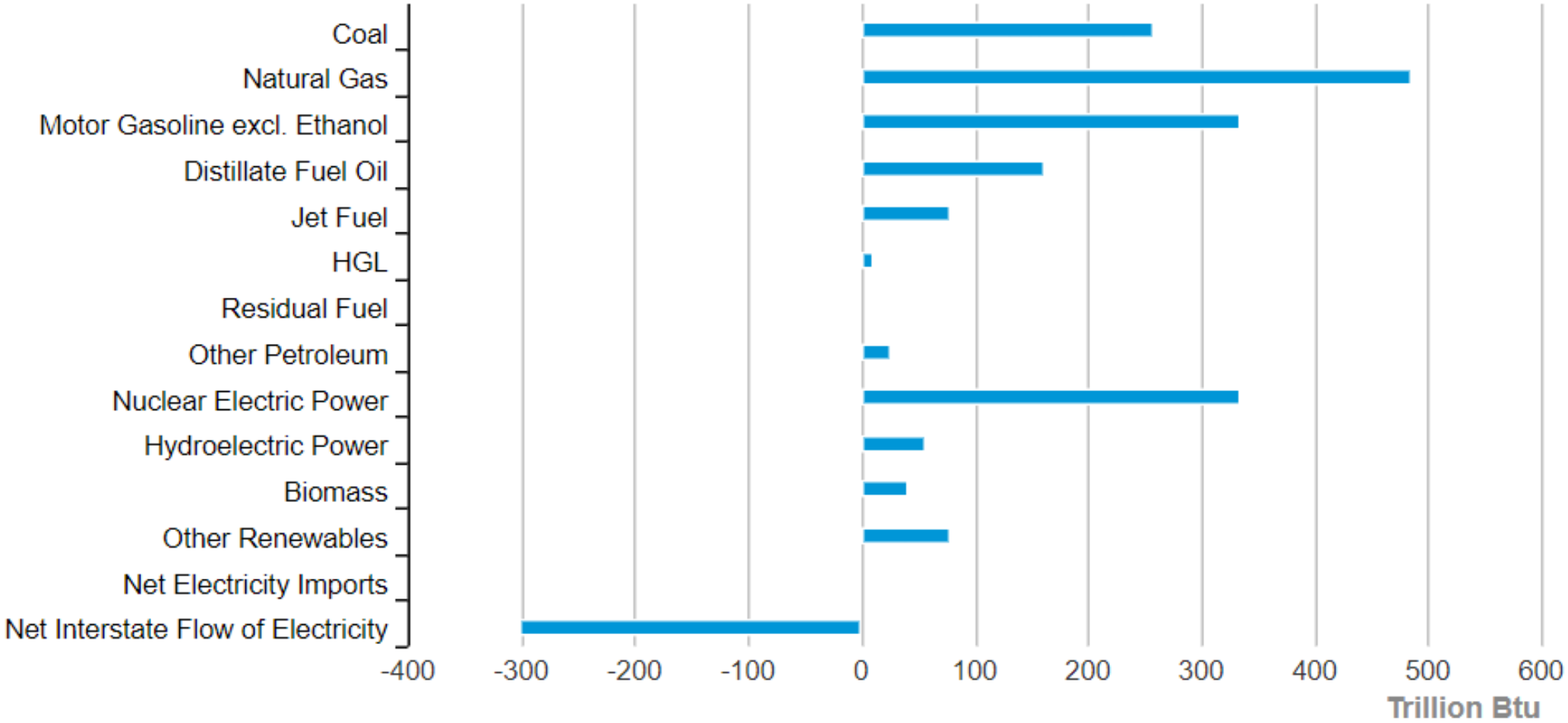
Questions for the panel

# Arizona's Energy Profile

EIA as of April 2022

- *Palo Verde is the largest U.S. nuclear power plant and #1 net generator of electricity!*
- *Arizona #5 in the nation in solar-powered electricity generation*.
  - **Solar provided more power than all other renewable energy sources combined.**
- *Arizona #5 with less energy per capita than all but five other states*.
- ***99% of Arizona's total electricity net generation was provided from 6 sources***:
  - **natural gas (43%);**
  - **nuclear power (28%);**
  - **coal (13%);**
  - **solar energy (9%);**
  - **hydroelectric power (5%):**
  - **wind (1%).**

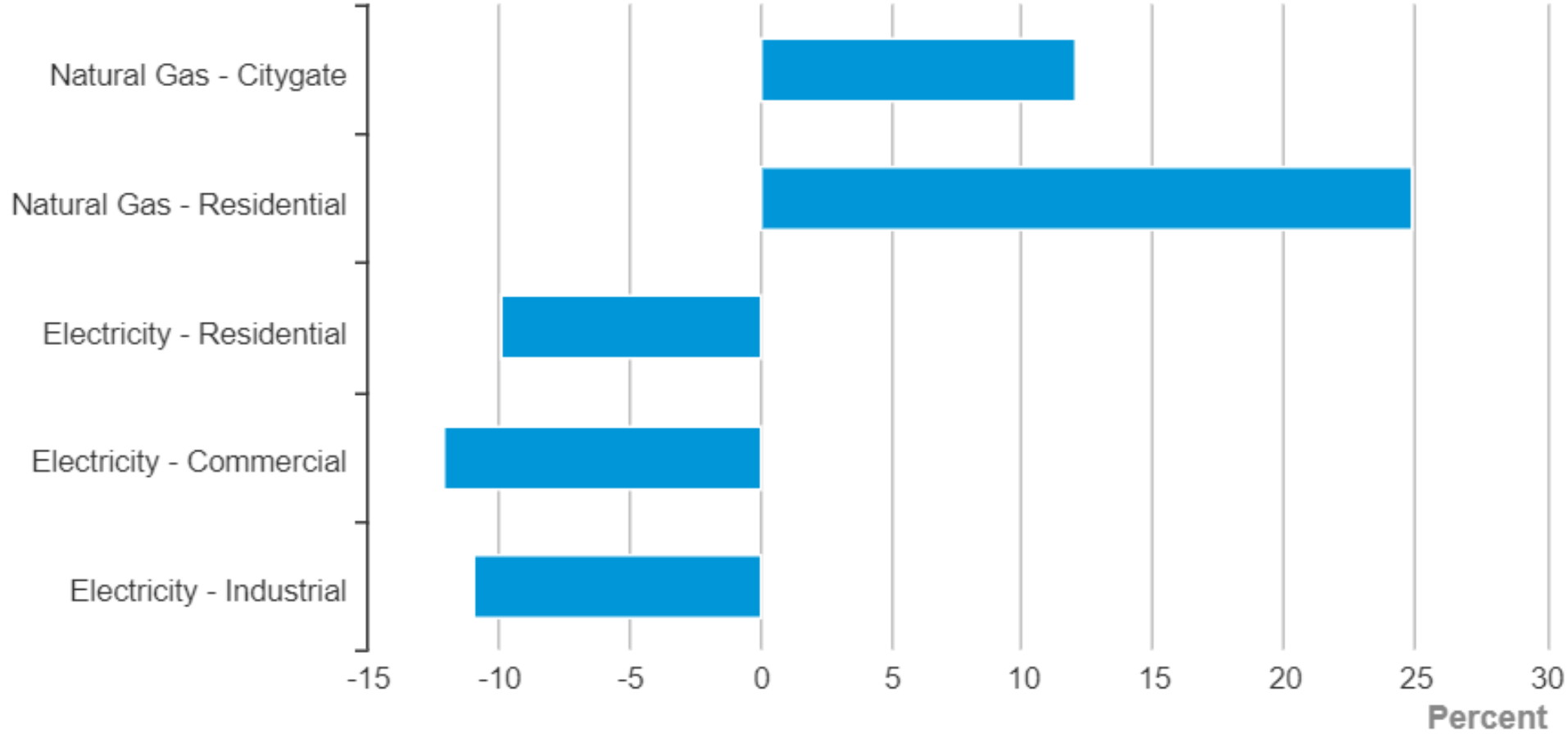
# Arizona Energy Consumption Estimates, 2019




Source: Energy Information Administration, State Energy Data System

## Arizona Price Differences from U.S. Average, Most Recent Monthly

DOWNLOAD




Source: Energy Information Administration, Petroleum Marketing Monthly; Natural Gas Monthly; Electric Power Monthly

# Arizona’s Energy Agenda

Comments from the panel

Questions for the panel

# Energy Innovations that Changed History

**Innovators never rest:**

- 1835 – Constant Electric Light
- 1878 – Hydropower
- 1882 - Power Stations
- 1913 - Solar Thermal Power Station
- 1949 - Hydraulic fracturing
- 1954 - Nuclear power and PV Solar
- 1980 - Wind farms
- 2012 – Widespread LED Lighting
- ???? - Fusion … **Other**

## ***Additional questions for the Panel:***

**Is there an innovative energy technology that has your attention?**

**Are you optimistic or pessimistic about our energy future … and why?**


**Thank you for your participation …**

**We hope to see you at POA's next program!**