

Aii Overview Course





Learn a little about a **Lot!**

This virtual course series will give you an introduction into the world of law and policy, innovation and technology, and critical challenges and solutions across topics like high speed and cargo rail, natural gas and oil pipelines, drones, climate change, and more!

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In this presentation, Aii will give you background information, fun facts, and raise critical questions you should be asking. There will only be three slides on each topic to do it. Get ready!

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Aii Resources

To learn more, visit our [Issues tab](#) and click on one of these areas:



[Climate and Conservation](#)



[Damage Prevention](#)



[Energy Infrastructure](#)



[Innovation and Technology](#)



[Transportation Infrastructure](#)

Damage Prevention

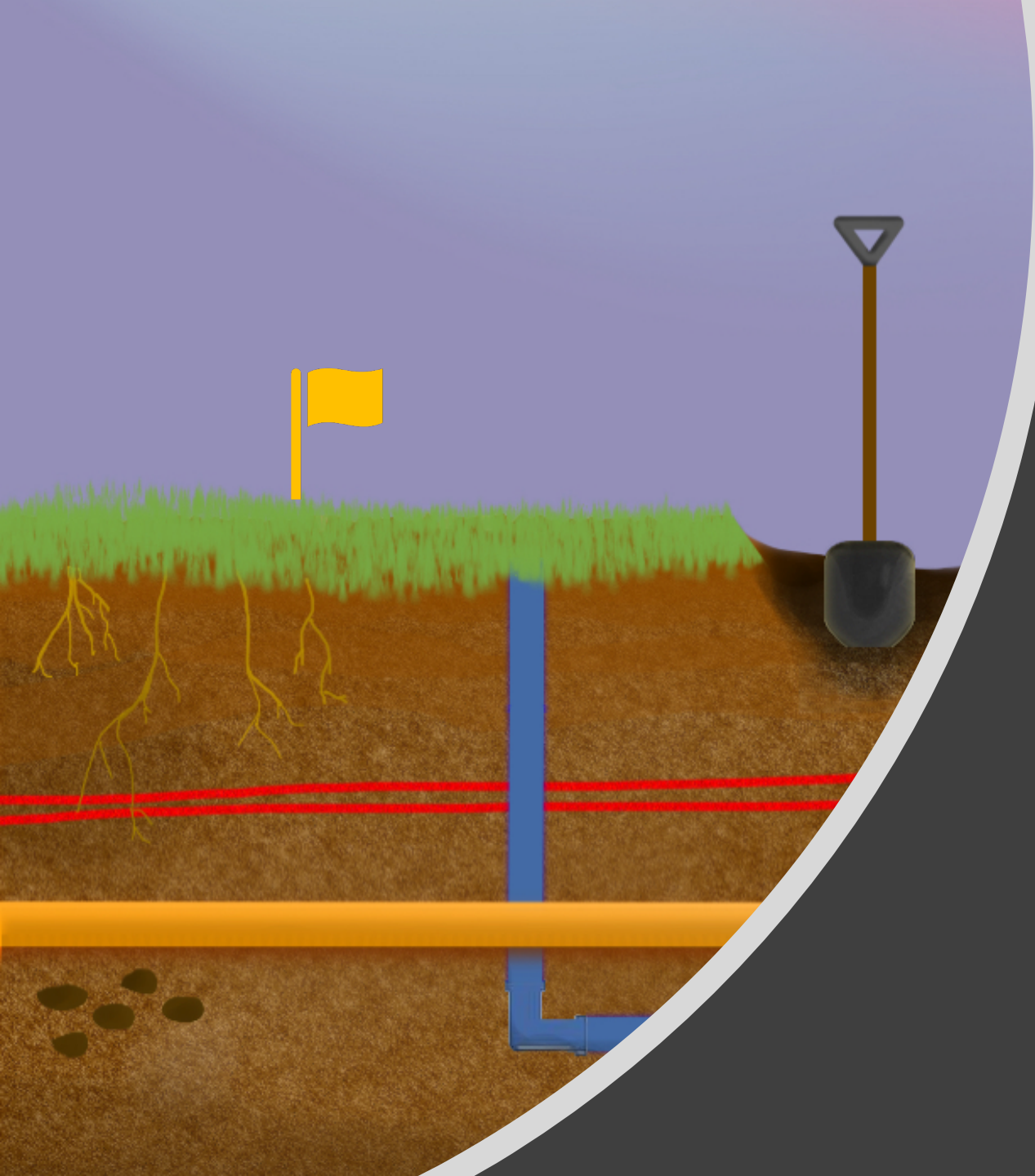
also known as **Facility Safety**

is the practice of avoiding damage to underground pipelines, cables, wires, and other “utilities” or “facilities.”

Across America, there are over 20 million miles of these facilities under your feet! They are under places like front and back yards, sidewalks, parking lots, roads, parks, buildings, fields, and more. This makes it critically important not to start digging – or “excavating” – before knowing what is below.

To know that, **call 811.**





Call 811 Three Days Before Digging

This begins a chain of events to facilitate the “damage prevention” goals.

First, an excavator designates a spot he wants to dig. Then he calls 811. This rings to a one-call center dedicated to facility safety. That one-call center notifies the companies and utility operators with facilities underground in the area of the dig.

During the three-day window, the utility operators then send “locators” to the site, armed with colored spray paint, colored flags, and virtual maps of the facility locations.

They mark the ground and plant the flags to guide excavators, specifically showing where to avoid when they dig. The colors denote the type of facility underground.

After Marking, Best Practices Ensure Facility Safety

Now the excavator doing the digging must be careful and follow the best practices – or proven techniques – to ensure no facilities are damaged.

This might mean making test holes to check for hidden facilities, staying at least 18 inches away from the spray paint and flag markings, and not digging too deep too fast with power tools.

There are many best practices, and numerous rules and regulations in law across states and localities. They are incredibly important, because striking facilities can lead to power loss, contamination, flooding, and even explosions that are deadly. Damage prevention is a collaborative effort. Even children and parents do their part by calling 811 before digging and respecting the colored flags.



Red = Electric

Blue = Potable Water

Yellow = Natural Gas, Oil, Petroleum

Orange = Telecom, Phone, Internet

Green = Sewer, Drainage

Purple = Reclaimed Water

White = Proposed Excavation

Pink = Survey Marks

Energy in America

allows the production of food and consumer goods, transportation of people and goods, heating and cooling of homes, cooking, and more.

America produced 4.12 trillion kWh of utility scale energy in 2019. The U.S. is second only to China in both energy production and consumption. Meanwhile, U.S. CO₂ emissions are half that of China.

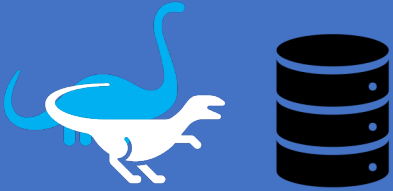
All that power comes from a variety of sources broken down into three main groups: fossil fuels, renewables, and nuclear.

Approximately 6.5 million Americans work in the energy sector.



The annual energy produced in the U.S. could power a single average American home for 377 million years.

Powering America

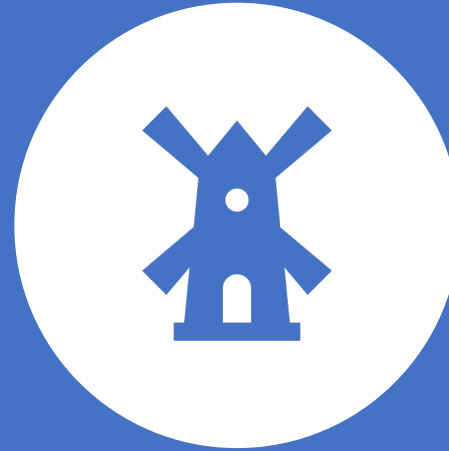


Fossil Fuels

Fossil fuels come from organic material – plants and animals – which were buried and compressed over geologic time into dense energy-rich resources:

- Coal 23.5%
- Petroleum 00.5%
- Natural Gas 38.4%

Total power 62.7%

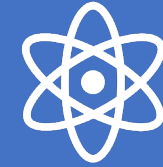


Renewables

Renewables are resources that replenish naturally or can be developed on human time-scales:

- Hydropower 6.6%
- Wind 7.3%
- Biomass 1.4%
- Solar 1.8%
- Geothermal 0.4%

Total power 17.5%



Nuclear

Nuclear power primarily comes from the fission – or splitting up – of uranium or plutonium atoms into two or more elements releasing energy:

- Nuclear 19.7%

Total power 19.7%

Challenges and Solutions

The American economy requires low-cost, abundant, and efficient energy. Fossil fuels are incredibly vast and energy dense, making them ideal for powering an industrial world. But they produce CO₂ and other emissions with adverse health and environmental impacts.

Renewables like solar and wind are obvious candidates for the future of American energy development, because they do not produce any emissions – but then neither does nuclear. It does take a lot of energy to mine, manufacture, and deploy solar and wind infrastructure, so even if they do not come with smokestacks or tail pipes, they are not net-zero emitters. The biggest challenges for wind and solar are **intermittency** and **diluteness**.

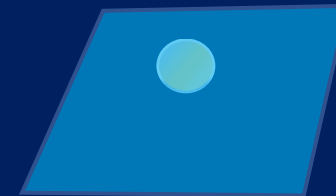
Intermittency refers to the fact that the sun is not always shining, and the wind is not always blowing – unlike carbon-based or nuclear generation, which can continuously supply power day and night. **Diluteness** refers to the energy density or strength of power coming from the sources of sun and wind. Wind farms and photovoltaic solar panels currently cannot capture the full potential of energy from the natural sources. Both challenges are solved with storage, like industrial batteries, which would allow peak sun and wind generation to be stored for later use when the sun sets and wind stops. Further development into more efficient or sensitive technology would also go a long way. Until then, nuclear and natural gas are reliable, low-cost, low-impact, and efficient.



Natural Gas emits 50% less CO₂ than Coal, making it an ideal bridge fuel to a cleaner future.



Solar panels are currently about 20% efficient. Meaning approximately 80% of the sun's energy remains uncaptured.



Wind Turbines achieve around 45% efficiency.

The cost of solar panels has fallen by over 20% in the last 5 years and as much as 60% since 2008.



The Interstate Highway System



The 46,876-mile Interstate took approximately 35 years and \$130 billion to complete



Nearly 280 million vehicles are in operation in the United States as of 2019



By 2019, there were over 200,000 electric vehicles on the road, not including hybrids

was a collaborative effort by the states and federal government initiated in 1956. It was funded through a federal fuel tax, designated for the Highway Trust Fund.

The Interstate is owned by each of the respective states. That means each state has jurisdiction over its own section of Interstate Highway to set the rules of the road and each is responsible for undertaking any needed maintenance and repairs.

The federal government is responsible for 90% of maintenance and construction costs. So while states do the roadwork and bear the costs up front, they are reimbursed for most of that cost. The federal government pays for this primarily through the fuel tax, which is **18.4 cents** on every gallon of gasoline and **24.4 cents** on every gallon of diesel fuel. State add their own taxes to the price you see at the pump. Usually about 30 or more cents on every gallon is taxation alone.

What is the Problem?

The federal government still exerts control over the Interstate system, even though the states own and operate them. This takes different forms, like the general prohibition on converting existing Interstate sections into tollways. Others are less direct, like offering or withholding transportation grants to states based on their drinking age, speed limits, or seatbelt rules.

States experiencing mounting maintenance issues, with a high price tag may be limited in their ability to raise revenue because of the ways the federal government acts. And while states receive reimbursement up to 90% from the federal government, they may be increasingly hesitant to conduct high-cost maintenance while the Highway Trust Fund's financial security is in question.

Despite the **rise of inflation**, **fuel efficiency gains**, no-gas **electric vehicles**, and **heavier vehicles** adding strain to the roadways, the federal gas tax has remained unadjusted at 18.4 cents per gallon **since 1993**. Revenue is simply not keeping pace.



Unfortunately, the Highway Trust Fund is speeding toward **insolvency**. That means its expenses will overtake its revenue **by 2021**.



Heavy trucks and trailers commit a disproportionate amount of wear and tear.



Split Solutions

Raise the Gas Tax

Many believe the gas tax is equipped to handle this issue and simply believe it should be raised:

- General increase to account for shortfall
- Index the tax to inflation
- Price in fuel efficiency
- Increase diesel and trucking fees
- Add a charge tax for electric vehicles

Eliminate the Gas Tax

Many believe the gas tax is not equipped to handle this issue, because per-gallon revenue will be undercut by innovation, efficiency, and vehicle weight:

- Eliminate the federal gas tax altogether
- Eliminate state gas taxes
- Switch to a Vehicle Miles Traveled (VMT) or Road Usage Charge (RUC), which assesses a fee based on road use directly rather than using fuel as a proxy
- Collect tax through smartphone apps, GPS tracking, or odometer readings.

More options: tolls, registration fees, license and permit charges, ratio changes so the federal government does not pay 90% for every state, loosening of federal rules and transportation grants, eliminating the Mass Transit Account from the Highway Trust Fund or designating an independent revenue stream, and more. There is no easy solution, but everyone must agree that roads and bridges need maintenance. Whatever change occurs, it is important that it be innovation-proof and road-use-proportionate for all vehicles – large and small.

Sources and Additional Resources

Damage Prevention

- [Common Ground Alliance \(CGA\)](#)
- [Pipeline and Hazardous Material Safety Administration \(PHMSA\)](#)

Energy in America

- [Energy Information Administration \(EIA\)](#)
- [Environmental Protection Agency \(EPA\)](#)
- [U.S. Department of Energy](#)

Interstate Highway System

- [Federal Highway Administration \(FHWA\)](#)
- [U.S. Department of Transportation \(DOT\)](#)

