

# Tennessee Energy Efficiency and Renewable Energy Resources

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Rural Energy for America Program  
Workshop

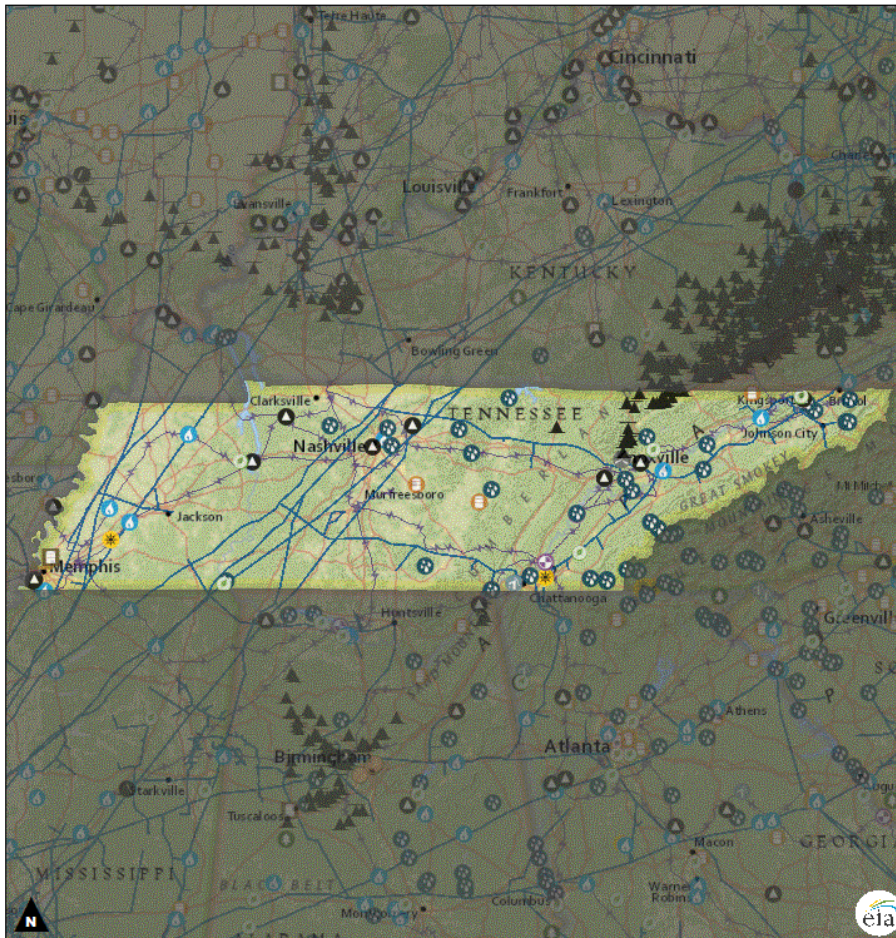
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# Outline

- Tennessee Energy
- Energy Consumption and Expenditures
- Energy Economy in Tennessee
- Tennessee Energy Rankings
- Wind and Solar Potential
- Energy Use in Agriculture
- Current and Alternative Energy Uses
- Tennessee Energy Funding Opportunities

# Tennessee Energy

- 28 Hydroelectric power plants
- 9 Natural-gas fired plants
- 6 Solar power plants
- 5 Coal-fired power plants
- 2 Nuclear power plants
- 1 Wind farm
- 1 Pumped-storage hydro-electric plant
- 1 Biomass plant



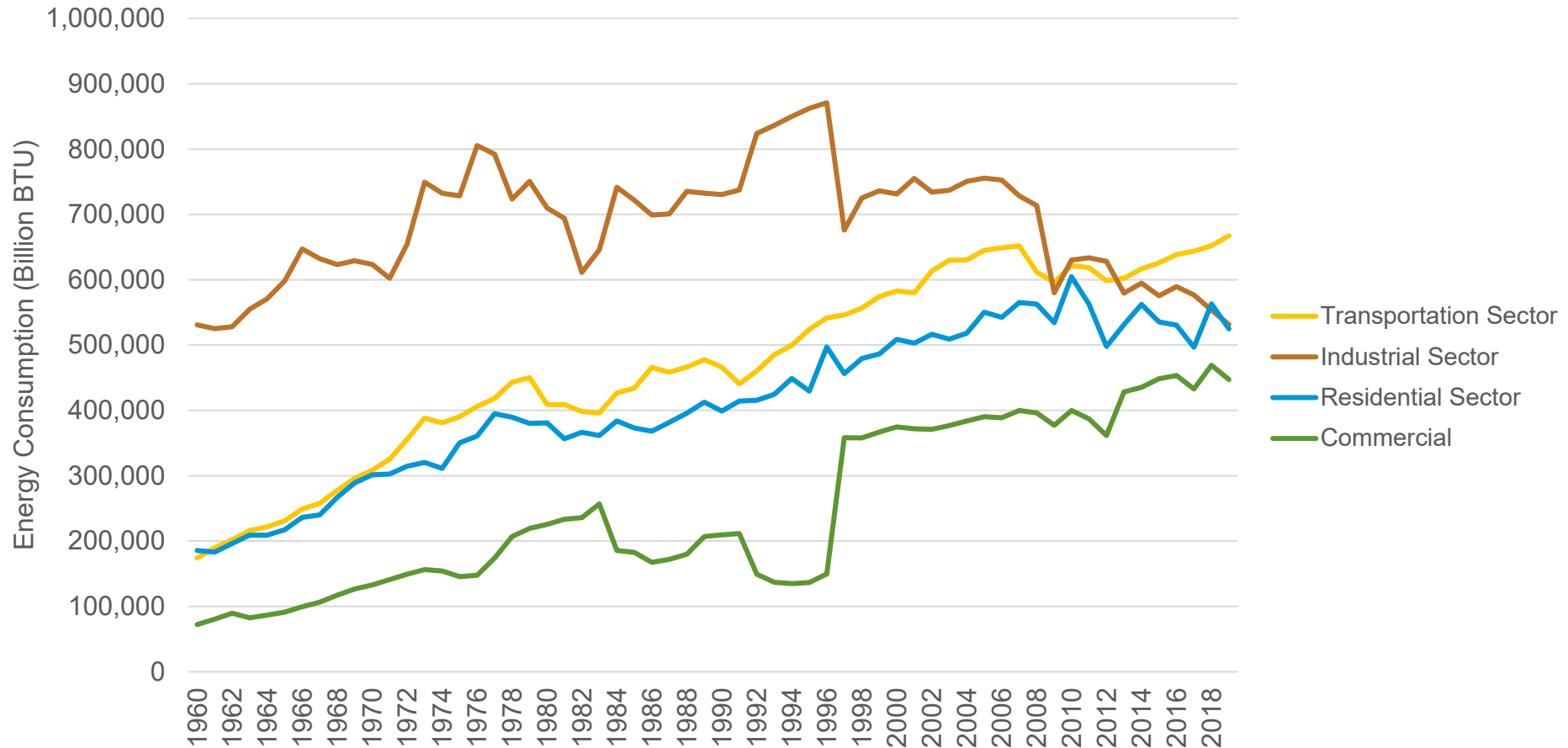
States:Electricity Transmission Lines - Ventyx, Velocity Suite;Grey Base:National

0 25 50 100 Miles

|                          |                                  |                               |
|--------------------------|----------------------------------|-------------------------------|
| ■ Mask                   | ● Hydroelectric Power Plant      | ● Pumped Storage Power Plant  |
| ▲ Surface Coal Mine      | ● Natural Gas Power Plant        | ★ Solar Power Plant           |
| ▲ Underground Coal Mine  | ● Nuclear Power Plant            | ● Wind Power Plant            |
| ● Biomass Power Plant    | ● Other Power Plant              | ● Wood Power Plant            |
| ● Coal Power Plant       | ● Other Fossil Gases Power Plant | ■ Petroleum Refinery          |
| ● Geothermal Power Plant | ● Petroleum Power Plant          | ◆ Strategic Petroleum Reserve |

<http://www.eia.gov/state/>

# Tennessee Energy Consumption, 1960-2019



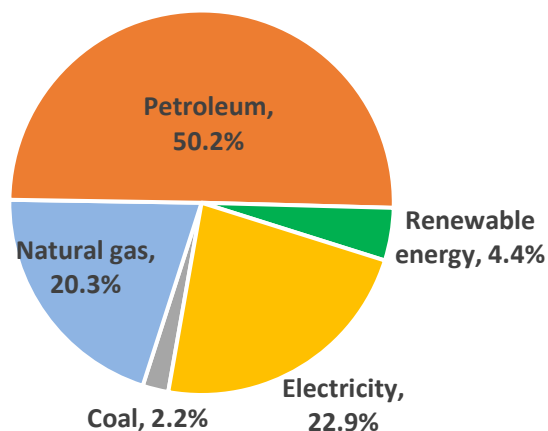
Source: State Energy Data System, U.S. Energy Information Administration

# Tennessee Energy Expenditures

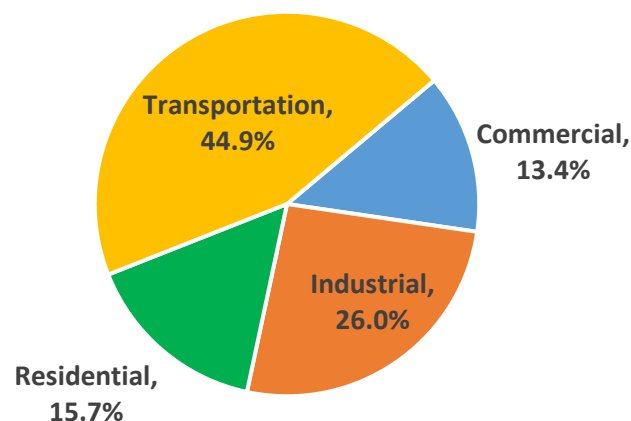
- Tennessee spends over \$26 billion annually on energy
- Tennessee Energy consumed per capita – 318 Million BTU
- Tennessee Energy expenditures per capita - \$3,807 annually
- Average electric rate – 11.5 cents/KWh; Tennessee is among the lowest in the country
- Tennessee is the largest ethanol producing state in the Southeast US

# Tennessee Energy Consumption

2019 Tennessee End-use Consumption by Source



2019 End-use Consumption by Sector



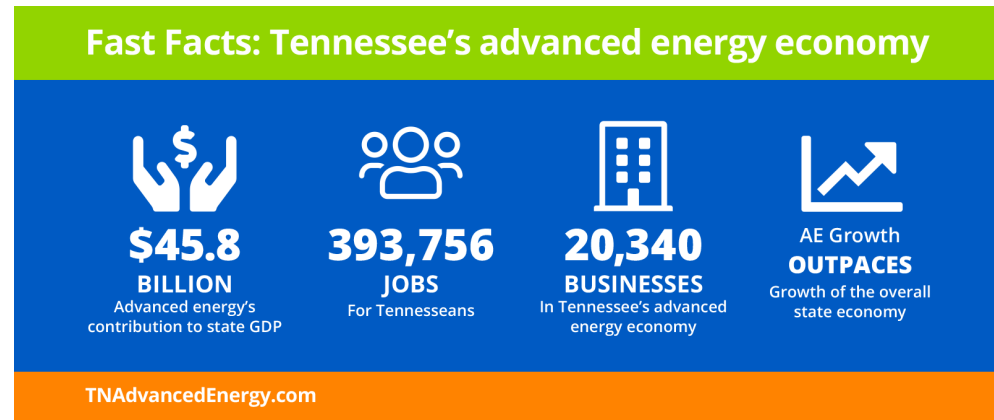
| Source           | BTUs (Trillion) | % of all sources |
|------------------|-----------------|------------------|
| Petroleum        | 745.6           | 50%              |
| Electricity      | 340.6           | 23%              |
| Natural gas      | 301.6           | 20%              |
| Renewable energy | 65.9            | 4%               |
| Coal             | 32.3            | 2%               |
| Total            | 1,486           | 100%             |

| Sector         | BTUs (Trillion) | % of all sources |
|----------------|-----------------|------------------|
| Transportation | 666.8           | 45%              |
| Industrial     | 386.8           | 26%              |
| Residential    | 232.9           | 16%              |
| Commercial     | 199.5           | 13%              |
| Total          | 1,486           | 100%             |

Source: Tennessee Department of Environment and Conservation

# Tennessee Energy Economy

- TN's advanced energy jobs – average wage is \$64,000.
- Opportunity to increase employment and capital investments in rural TN
- Advanced energy industry can be a targeted industry cluster

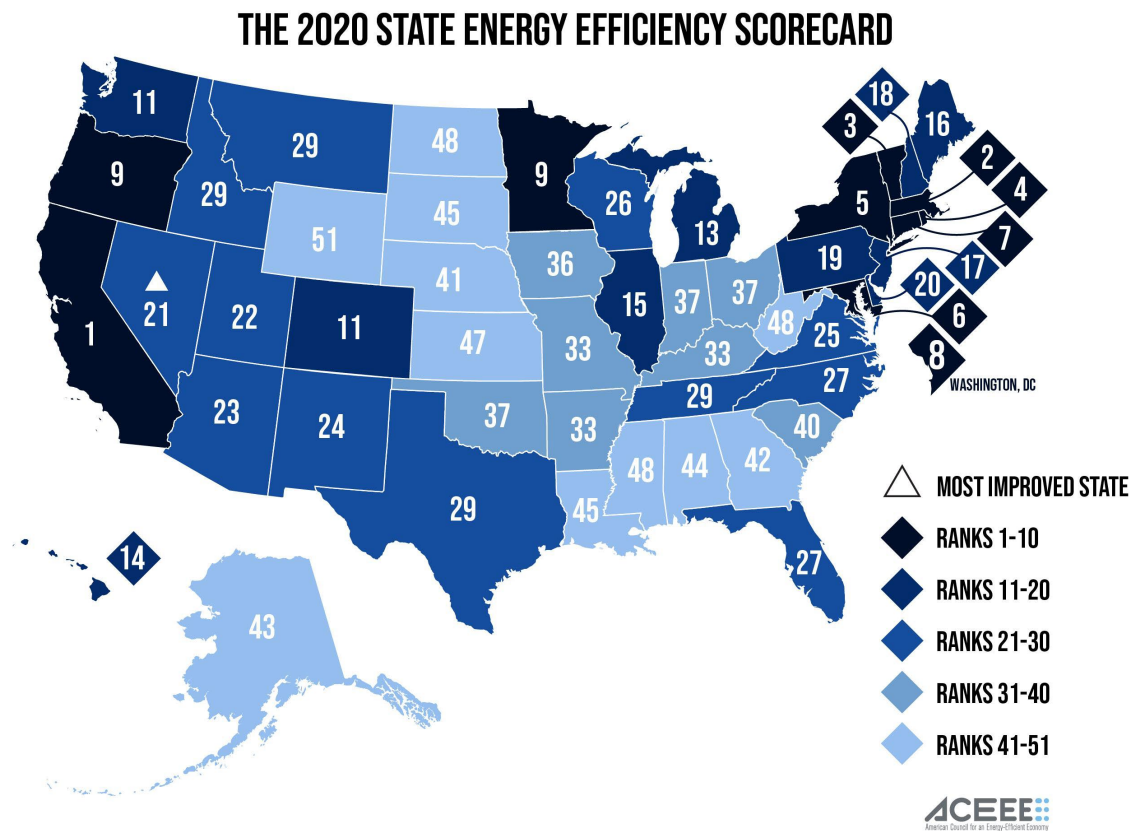


Source: 2021 Tennessee Advanced Energy Business Council's Economic Impact Report



# Tennessee Energy Efficiency Rankings

- Tennessee's Energy Efficiency program spending - \$19.2 million (US Average - \$64 million)
- 2021 State Energy Efficiency Scorecard – 29<sup>th</sup>

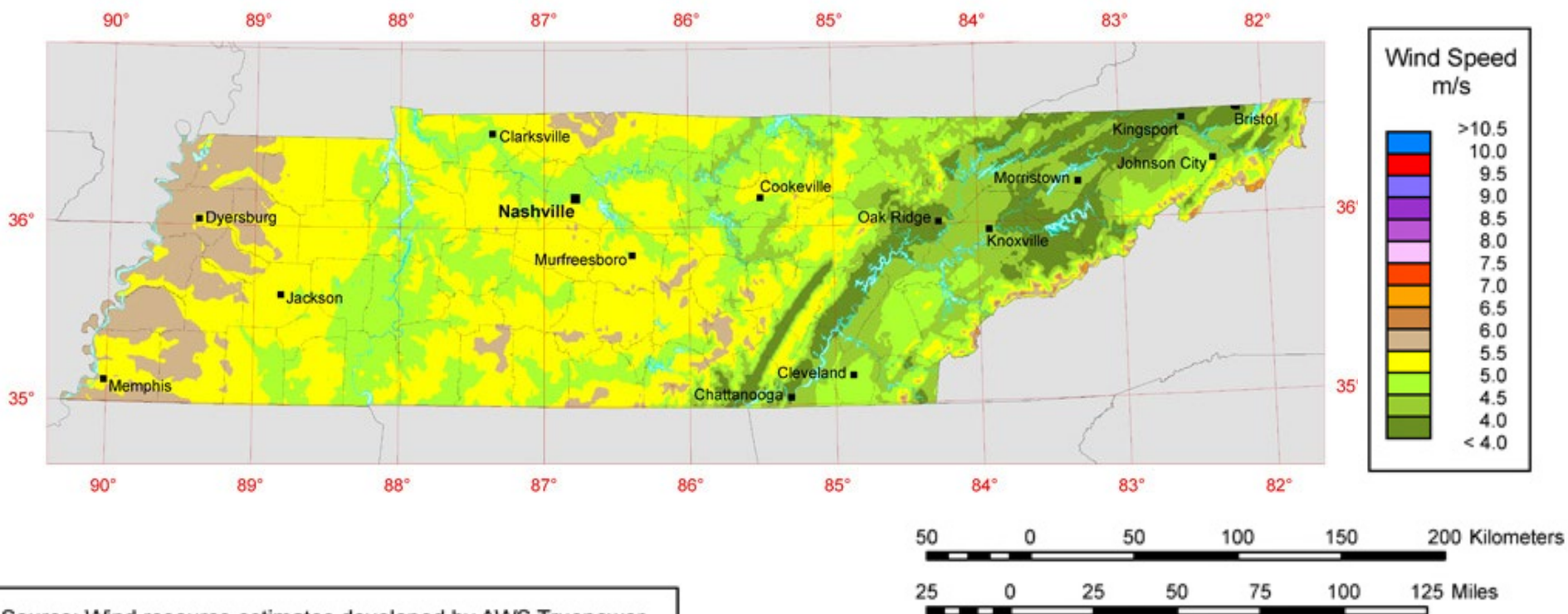


Source: American Council for Energy-Efficient Economy



# Tennessee Wind Energy Resource Potential

Tennessee - Annual Average Wind Speed at 80 m



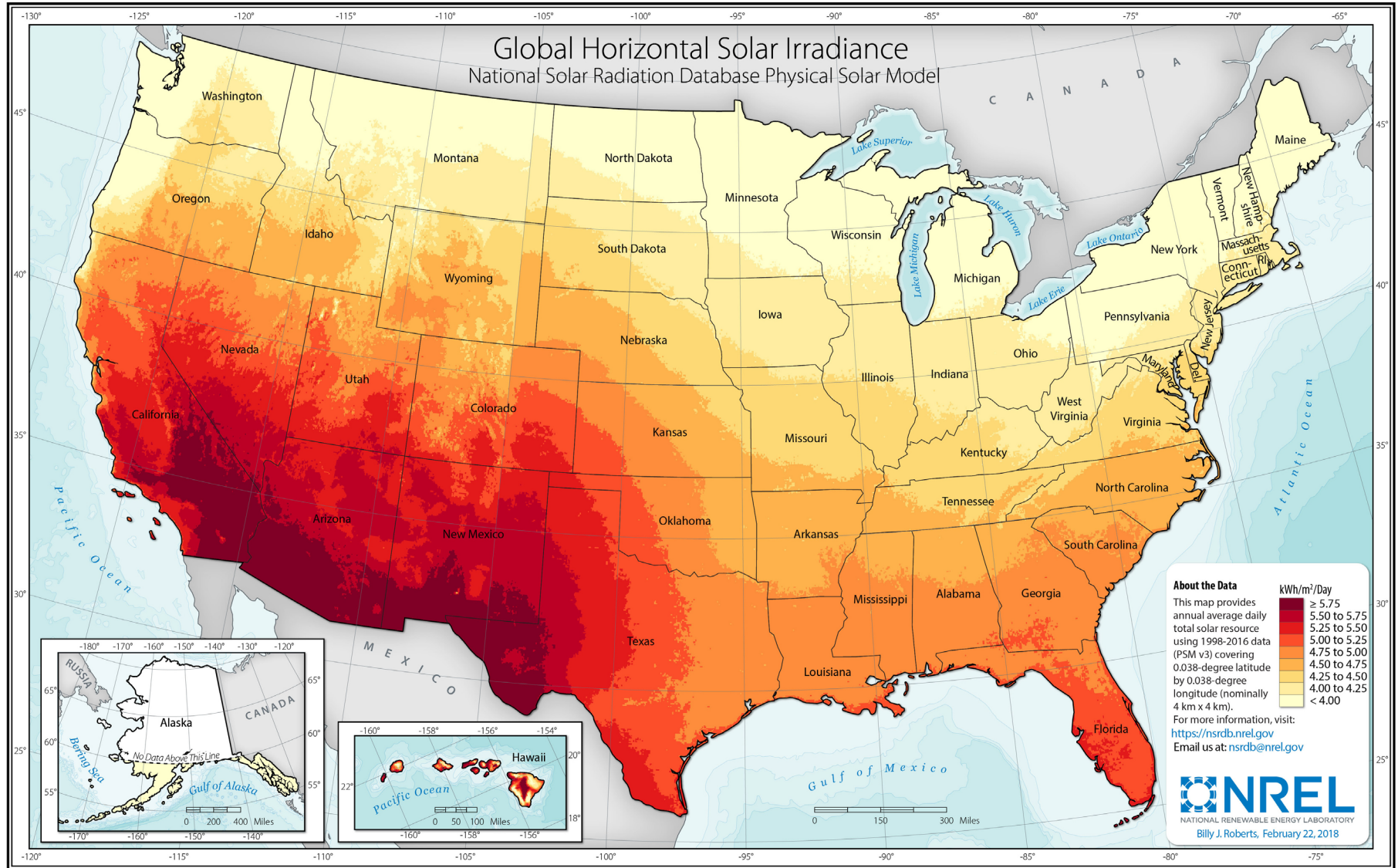
Source: Wind resource estimates developed by AWS Truepower, LLC for windNavigator®. Web: <http://www.windnavigator.com> | <http://www.awstruepower.com>. Spatial resolution of wind resource data: 2.5 km. Projection: UTM Zone 16 WGS84.



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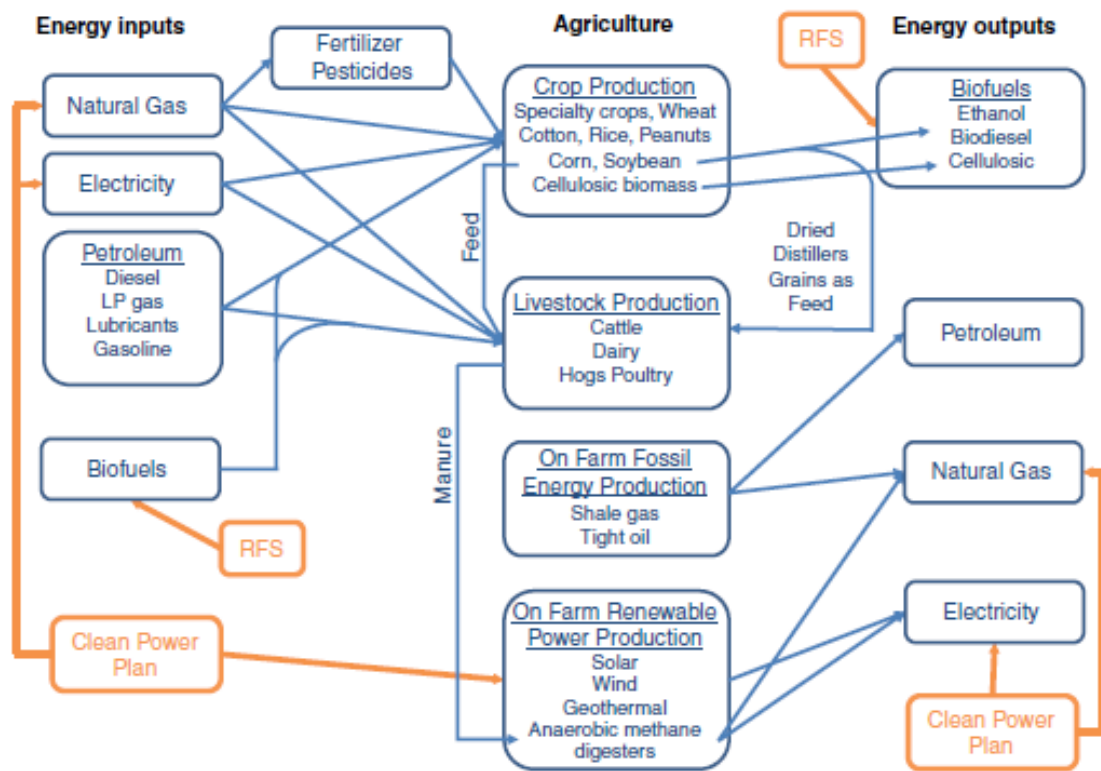


# Solar Energy Resource Potential



# Energy Use in Agriculture

- Key Energy consumption in Agriculture:
  - Tractor and field operations
  - Irrigation systems
  - Indoor and outdoor lighting
  - Farm shop energy use
  - Livestock building energy use
  - Grain drying
  - Livestock water systems



Source: Trends in US Agriculture's Consumption and Production of Energy, USDA-Economic Research Service

# Current and Alternative Energy Sources

| Current Energy Use                     | Alternative Energy Source  |
|--|--|
| Electricity                            | Wind Turbine<br>Photovoltaic panel<br>Micro-hydro system<br>Anaerobic Digester   |
| Hot Water (Electric/gas/propane)       | Solar Thermal System<br>Geothermal (desuperheater)   |
| Heater Air (Electric/gas/wood/propane) | Solar Air Collector<br>Transpired Solar Collector<br>Geothermal (Ground Source Heat Pump)<br>Biomass<br>Passive Solar Design |
| Transportation Fuel                    | Biofuel<br>Renewable Electricity (Electric/hybrid vehicles)  |

Source: Understanding Energy, University of Tennessee Extension Publication SP 757-G



# Tennessee Clean Diesel Fuels Fund

- Volkswagen Diesel Mitigation Trust
  - Prioritize school buses/New alternative fuel vehicles
  - Medium to large trucks (1992-2009 Model Range)
  - Shuttle and transit buses
- \$310,000 was available in FY 2021-2022
- Maximum vehicle funding requests are
  - 25% for vehicles that meet the current NOx standard
  - 35% for vehicles that meet the low-NOx standard
  - 45% for vehicles that have no tailpipe
- Funding is also available to:
  - repower an older diesel vehicle;
  - convert an older diesel vehicle to run on an alternative fuels
  - installing truck stop electrification equipment

# Building Resilient Infrastructure and Communities (BRIC) Fund

- Eligible activities:
  - Support communities through capacity-building
  - Mitigation projects to increase resilience and public safety, large infrastructure projects and support critical services and facilities
  - Management costs, administrative costs associated with specific mitigation project
- FY 2021 FEMA – BRIC funding - \$500 million
  - State/Territory allocation: \$57.4 million
  - Tennessee set-aside: \$600,000

# Energy Efficiency Grant and Loan - Schools

- Low-interest loan to fund energy-efficiency projects in Tennessee's public K-12 schools
- Eligibility:
  - Public K-12 schools and special school districts
  - Technical assistance to public K-12 schools, special school districts, achievement school districts and charter schools
- Eligible Projects:
  - Lighting upgrades
  - Pumps and motors
  - Building insulation
  - Energy management systems
  - Water and wastewater treatment
  - Heating, ventilation and airconditioning
  - Load shifting projects
- Interest rate fixed:
  - Loans up to \$3 million; 1.5% for term of loan
  - Loans greater than \$3 million; 1.5% for term of loan of \$3 million and 2% for remaining funds requested
- Loan must be repaid from energy cost savings within 16 years



# Other State Incentives for Renewables and Energy Efficiency

| Name  | State/<br>Territory | Category            | Policy/Incentive Type                 |
|---|---------------------|---------------------|---------------------------------------|
| <a href="#">Solar Easements</a>   | TN                  | Regulatory Policy   | Solar/Wind Access Policy              |
| <a href="#">Building Energy Code</a>                                      | TN                  | Regulatory Policy   | Building Energy Code                  |
| <a href="#">Energy Star Procurement Requirement for Agencies</a>          | TN                  | Regulatory Policy   | Energy Standards for Public Buildings |
| <a href="#">Energy Efficient Schools Initiative - Grants</a>              | TN                  | Financial Incentive | Grant Program                         |
| <a href="#">Energy Efficient Schools Initiative - Loans</a>               | TN                  | Financial Incentive | Loan Program                          |
| <a href="#">Pathway Energy Efficiency Loan Program</a>                    | TN                  | Financial Incentive | Loan Program                          |
| <a href="#">Green Energy Tax Credit</a>                                   | TN                  | Financial Incentive | Industry Recruitment/Support          |
| <a href="#">Sales Tax Credit for Clean Energy Technology</a>              | TN                  | Financial Incentive | Sales Tax Incentive                   |
| <a href="#">Green Energy Property Tax Assessment</a>                      | TN                  | Financial Incentive | Property Tax Incentive                |
| <a href="#">Green Energy Supply Chain Franchise and Excise Tax Credit</a> | TN                  | Financial Incentive | Corporate Tax Credit                  |

Source: Database of State Incentives for Renewables and Efficiency

<https://programs.dsireusa.org/system/program/tn>

# References

- American Council for Energy-Efficient Economy's 2020 State Energy Efficiency Scorecard - <https://www.aceee.org/state-policy/scorecard>
- Building Resilient Infrastructure and Communities - <https://www.tn.gov/tema/emergency-community/mitigation/mitigation-grant-programs/building-resiliency-in-communities--bric-.html>
- Database of State Incentives for Renewables and Efficiency – <https://programs.dsireusa.org/system/program/tn>
- Energy Efficient Loan Program - <https://www.tn.gov/eesi/apply-now.html>
- Energy Information Administration – Tennessee State Energy Profile – <https://www.eia.gov/state/print.php?sid=TN>
- National Renewable Energy Labs – Solar Radiation Database – <https://www.nrel.gov/gis/solar.html>
- Payless Power – 2020 Electricity Rates by State - <https://paylesspower.com/blog/electric-rates-by-state/>
- State Energy Data System, U.S. Energy Information Administration - <https://www.eia.gov/state/seds/seds-data-complete.php?sid=TN>
- Tennessee Advanced Energy Business Council's 2018 Economic Impact Report – <https://tnadvancedenergy.com/site/wp-content/uploads/2018/08/TAEBC-Economic-Impact-Report-2018.pdf>
- Tennessee Clean Fuels - <http://www.tncleanfuels.org/rde4ht/>
- Tennessee Department of Environment and Conservation - <https://www.tn.gov/environment/program-areas/energy.html>
- Tennessee and Volkswagen Diesel Settlement Environmental Mitigation Trust - <https://www.tn.gov/environment/program-areas/energy/state-energy-office--seo-/tennessee-and-the-volkswagen-diesel-settlement/project-solicitations.html>
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- Wind Energy in Tennessee - <https://windexchange.energy.gov/states/tn>

# Questions?

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# Pathway Lending – Energy Efficiency Loan Program

- Private non-profit lender supported by private and public funding
  - Loan Size: \$20,000 to \$5 million
  - 2% interest rate for 5 years; 5% interest rate for 10 years
  - Closing fees – 1% program fee, \$350 documentation fee and other fees
  - Eligibility:
    - Any industrial, commercial, private non-profit business, or local government facilities
    - Any project that reduces utility consumption across electric, gas, and/or water
  - Common projects:
    - HVAC replacements
    - Air compressors
    - Cool roofs
    - Lighting
    - Solar
- Agricultural Systems:
- Circulation fan systems
  - Totally enclosed houses
  - Insulated tunnel doors
  - Radiant heating systems
  - Attic inlet systems
  - Improved side wall air inlet systems
  - Dimmable LED lightings