

Tennessee Energy Efficiency and Renewable Energy Resources

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Rural Energy for America Program
Workshop

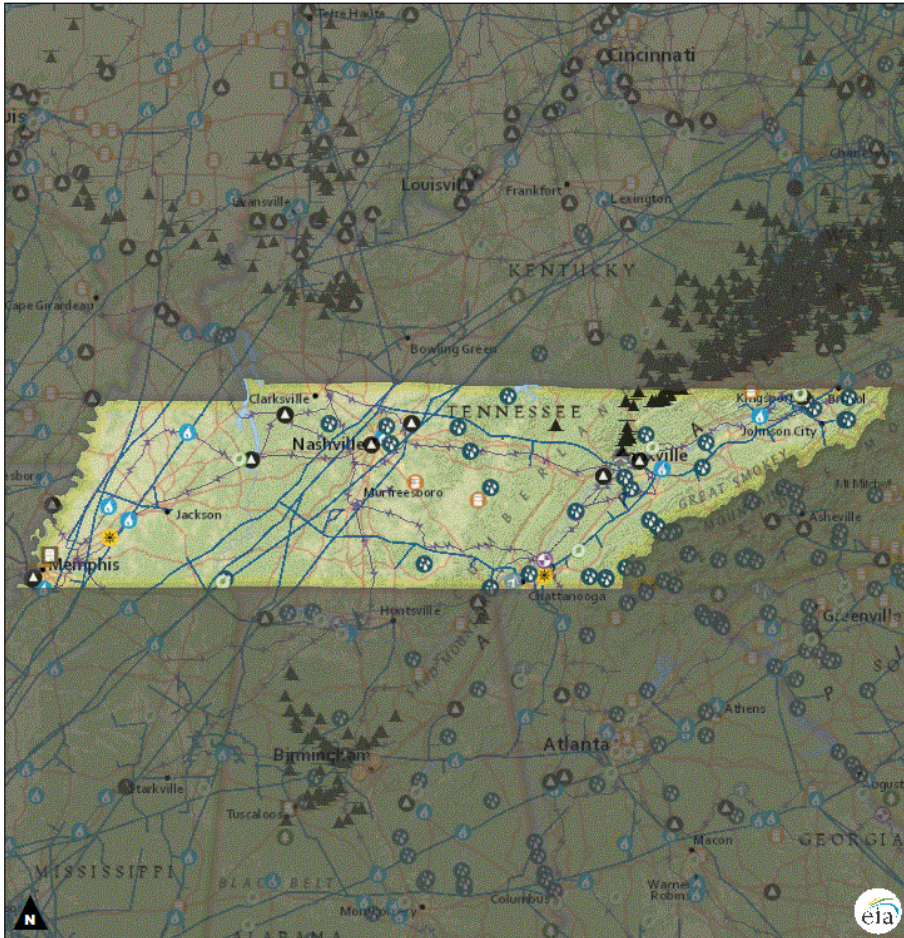
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Outline

- 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 hydroelectric plant
- 1 Biomass plant



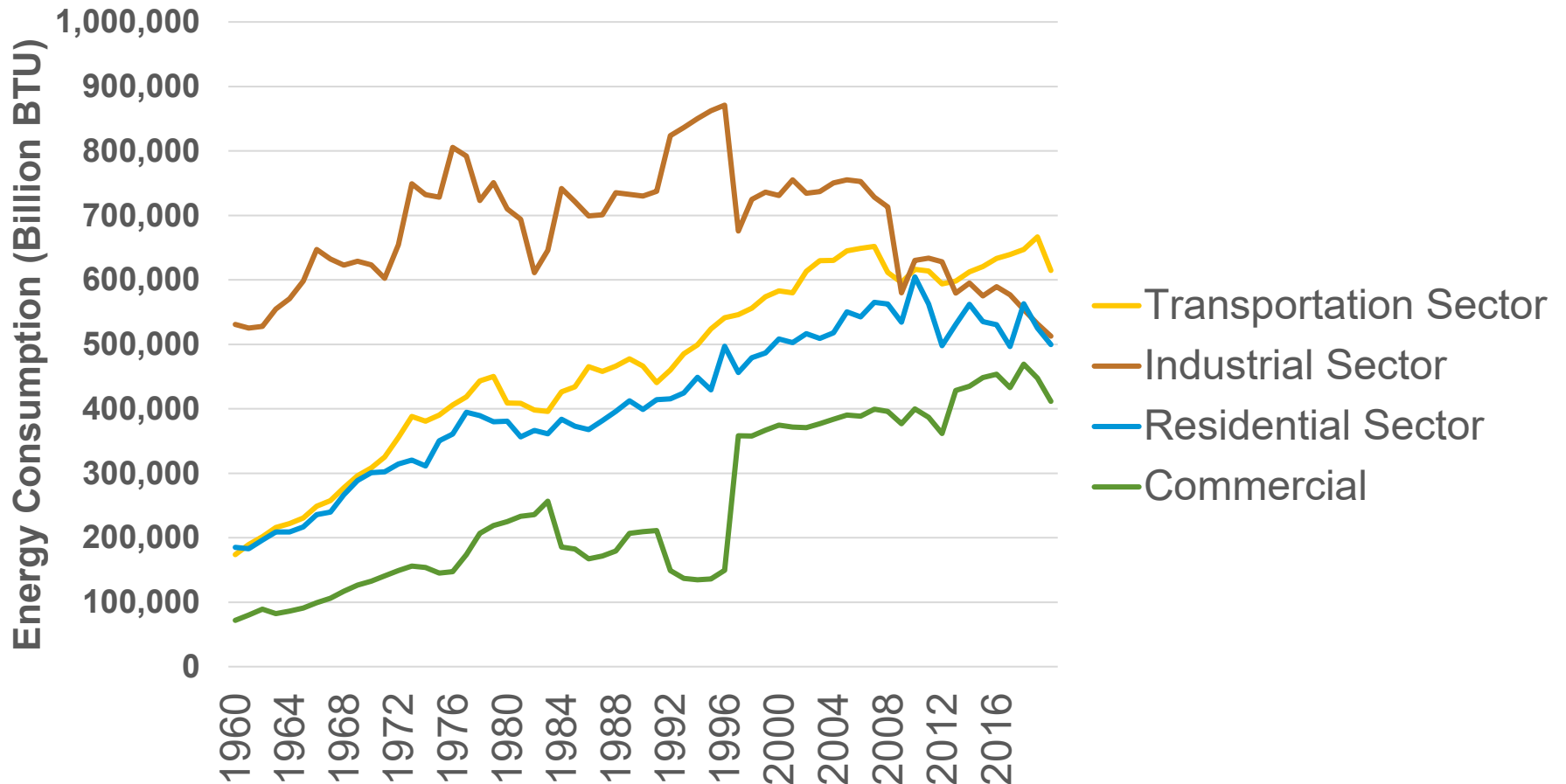
States:Electricity Transmission Lines - Ventyx, Velocity Suite;Grey Base:National

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, 1960-2020



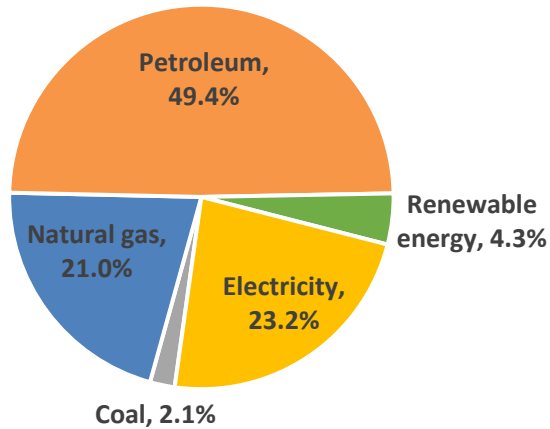
Source: State Energy Data System, U.S. Energy Information Administration

Tennessee Energy Expenditures

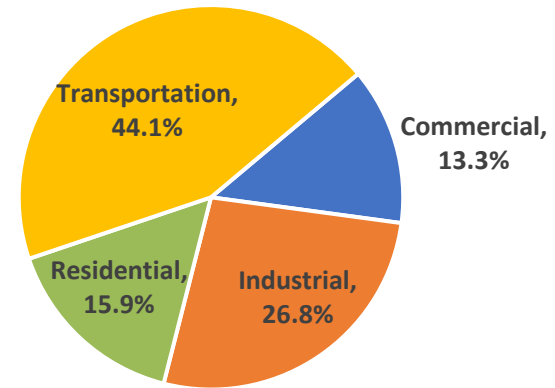
- Tennessee spends over \$26 billion annually on energy
- Tennessee Energy consumed per capita – 318 Million BTU
- Tennessee Energy expenditures per capita - \$3,807 annually
- Average electric rate – 11.5 cents/KWh; Tennessee is among the lowest in the country
- Tennessee is the largest ethanol producing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

Tennessee Energy Consumption

2020 Tennessee End-use Consumption by Source



2020 End-Use Consumption by Sector



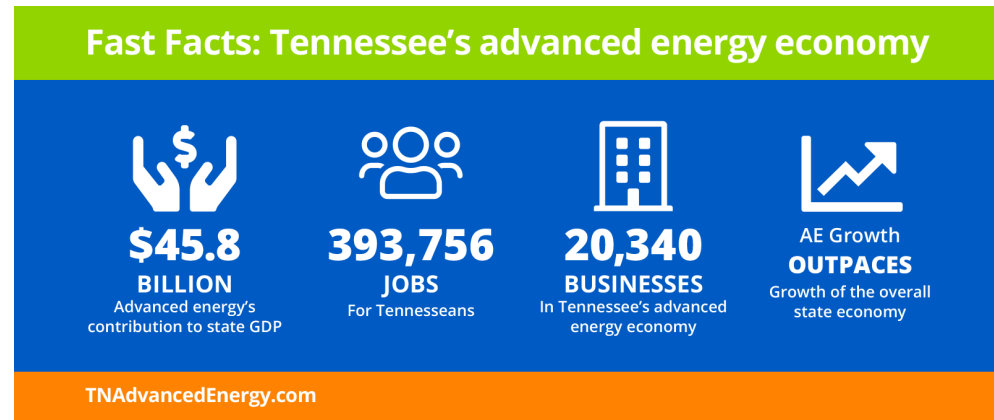
Source	BTUs (Trillion)	% of all sources
Petroleum	688.5	49.4%
Electricity	324.2	23.2%
Natural gas	293.6	21%
Renewable energy	59.7	4.3%
Coal	29.1	2.1%
Total	1,395	100%

Sector	BTUs (Trillion)	% of all sources
Transportation	614.8	44.1%
Industrial	374.2	26.8%
Residential	221.2	15.9%
Commercial	184.9	13.3%
Total	1,395	100%

Source: Tennessee Department of Environment and Conservation

Tennessee Energy Economy

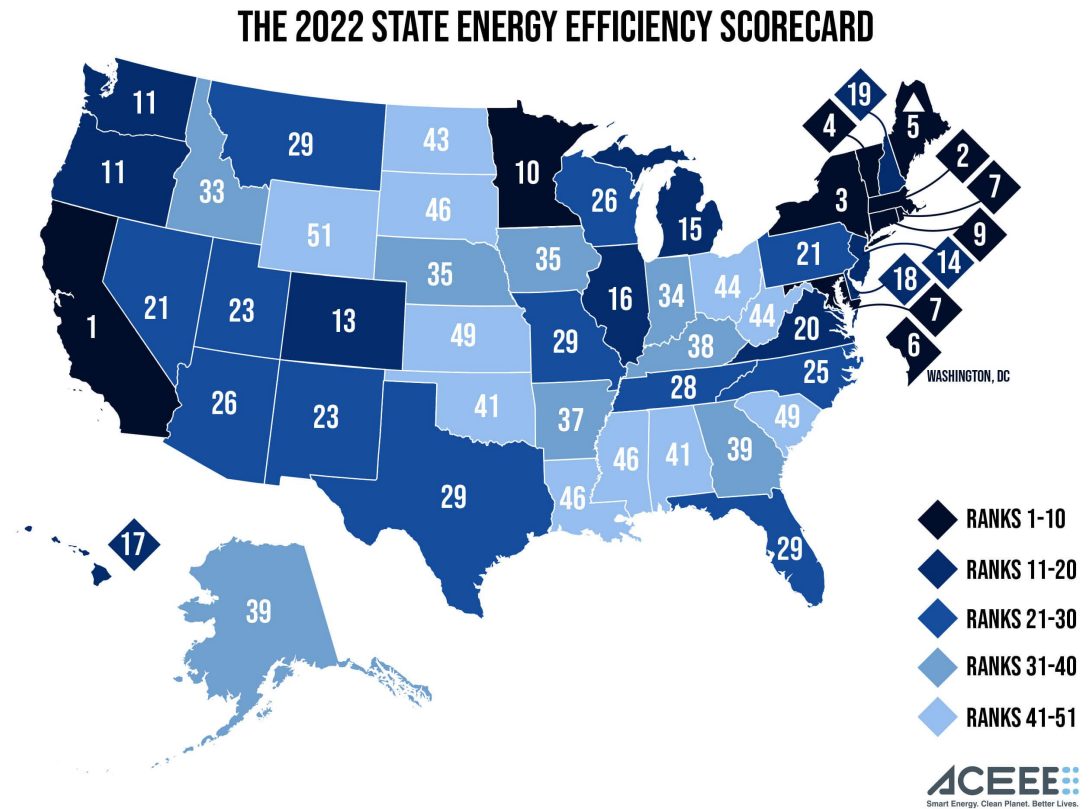
- TN's advanced energy jobs – average wage is \$64,000.
- Opportunity to increase employment and capital investments in rural TN
- Advanced energy industry can be a targeted industry cluster



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

Tennessee Energy Efficiency Rankings

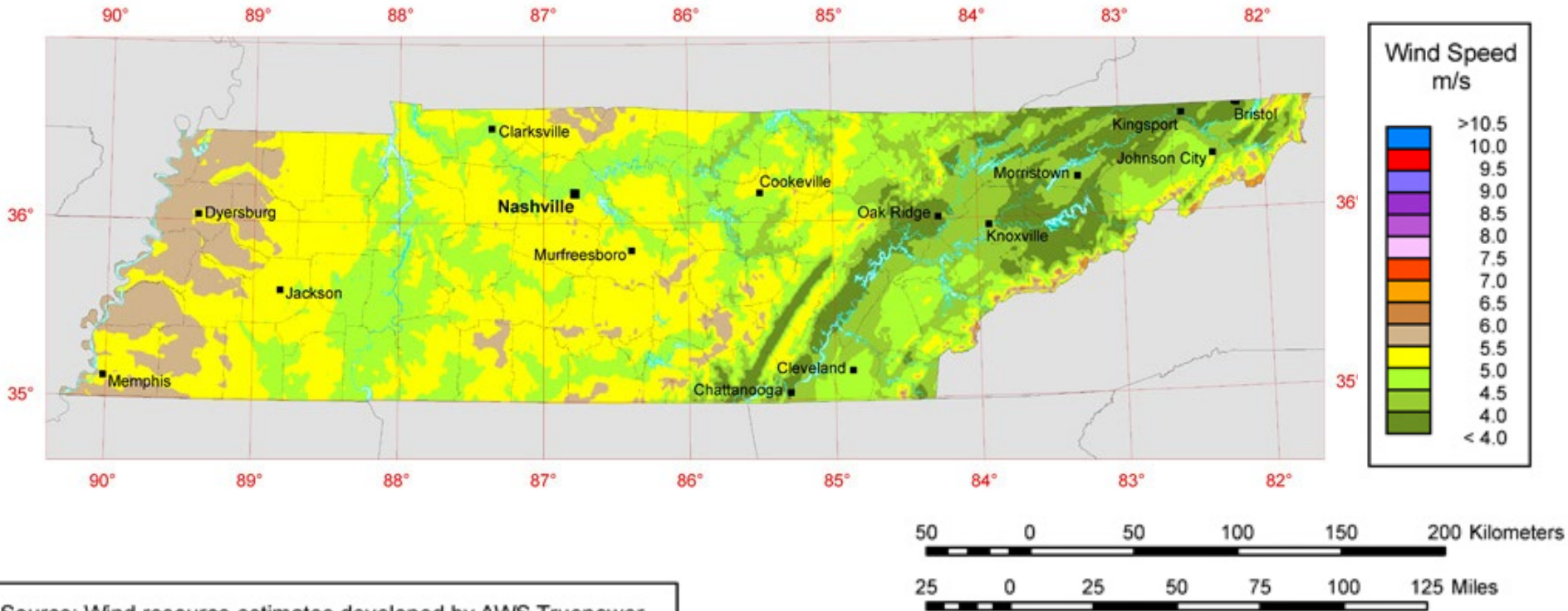
- Tennessee's Energy Efficiency program spending - \$21.9 million (US Average - \$64.2 million)
- 2022 State Energy Efficiency Scorecard – 28th



Source: American Council for Energy-Efficient Economy

Tennessee Wind Energy Resource Potential

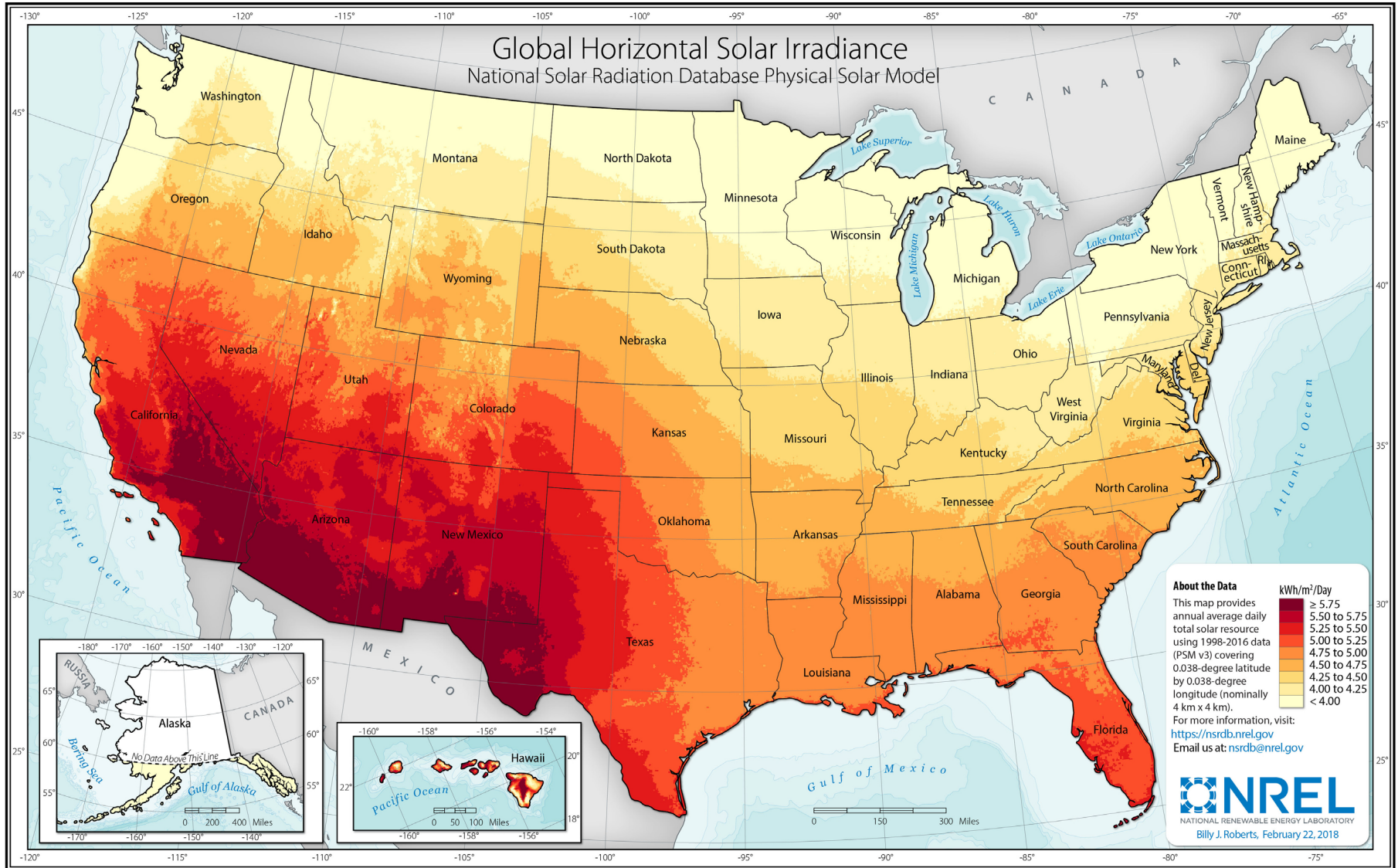
Tennessee - Annual Average Wind Speed at 80 m



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.

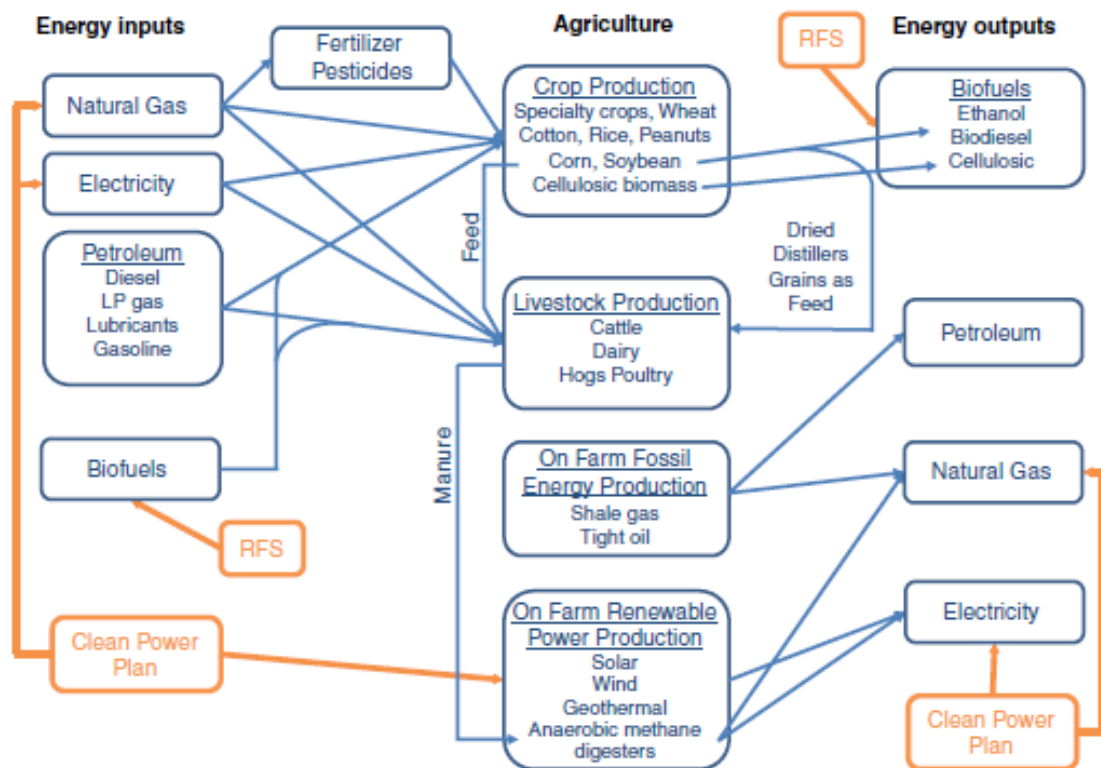


Solar Energy Resource Potential



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	<ul style="list-style-type: none"> Wind Turbine Photovoltaic panel Micro-hydro system Anaerobic Digester
Hot Water (Electric/gas/propane)	<ul style="list-style-type: none"> Solar Thermal System Geothermal (desuperheater)
Heater Air (Electric/gas/wood/propane)	<ul style="list-style-type: none"> Solar Air Collector Transpired Solar Collector Geothermal (Ground Source Heat Pump) Biomass Passive Solar Design
Transportation Fuel	<ul style="list-style-type: none"> Biofuel Renewable Electricity (Electric/hybrid vehicles)

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

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 \$5 million; 0.5% for term of loan
- Loan must be repaid from energy cost savings within 16 years

Other State Incentives for Renewables and Energy Efficiency

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

Source: Database of State Incentives for Renewables and Efficiency

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

References

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- Database of State Incentives for Renewables and Efficiency – <https://programs.dsireusa.org/system/program/tn>
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- National Renewable Energy Labs – Solar Radiation Database – <https://www.nrel.gov/gis/solar.html>
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- Tennessee Clean Fuels - <http://www.tncleanfuels.org/rde4ht/>
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- 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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- University of Tennessee Extension Publication SP 757-G: Understanding Energy – <https://extension.tennessee.edu/publications/Documents/SP757-G.pdf>
- 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

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

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