

# Tennessee Energy Efficiency and Renewable Energy Resources

Sreedhar Upendram, Ph.D.

Rural Energy for America Program  
Workshop

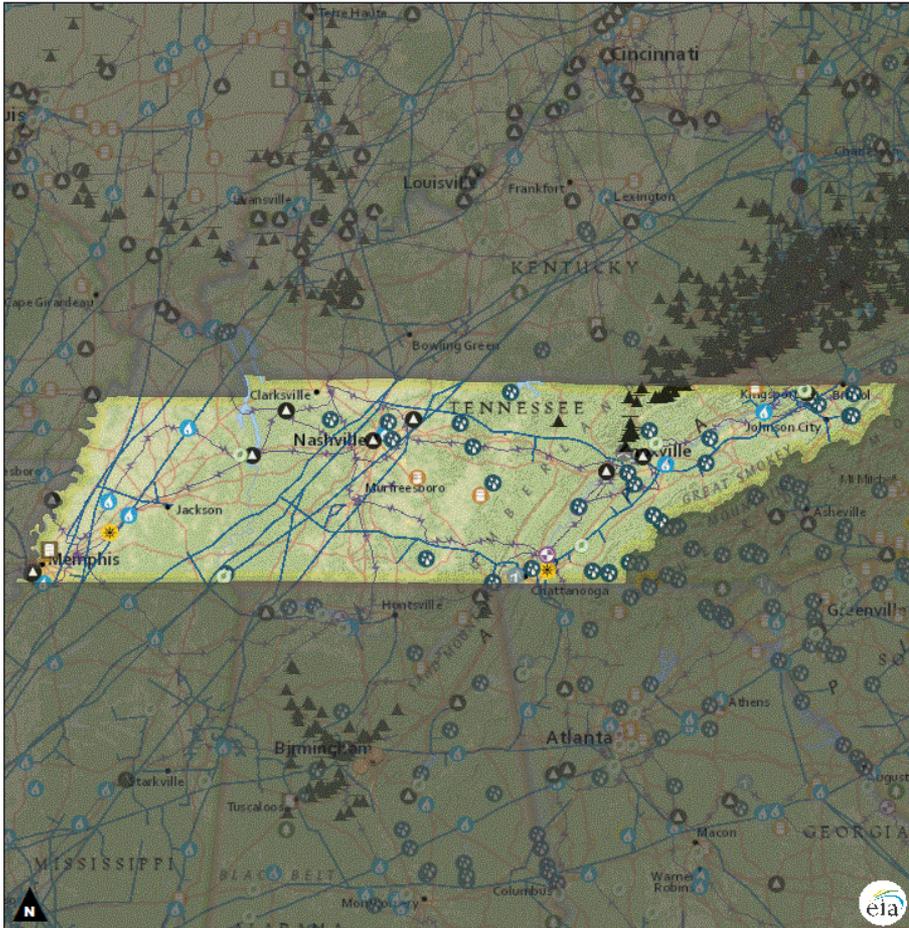
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# Outline

- 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



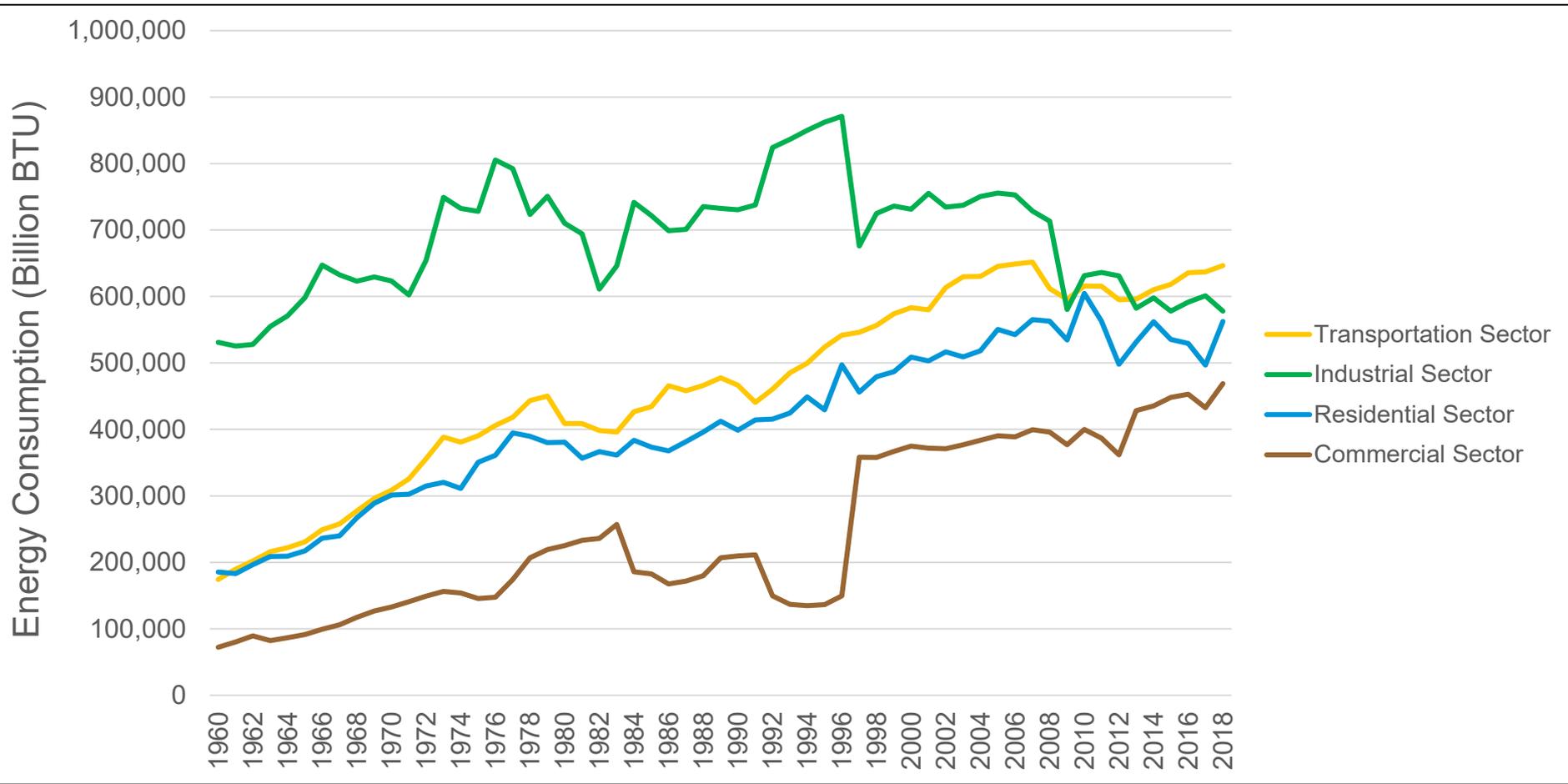
States:Electricity Transmission Lines - Ventyx, Velocity Suite;Grey Base:National

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, 1960-2018



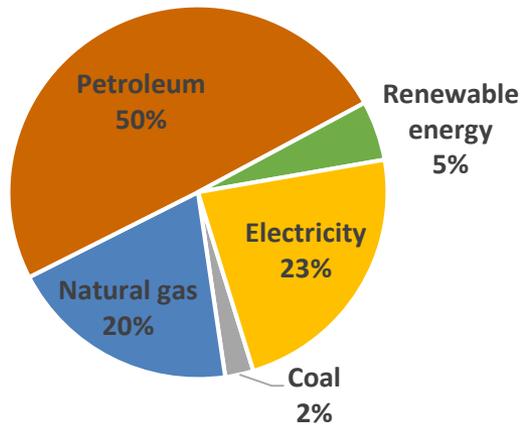
Source: State Energy Data System, U.S. Energy Information Administration

# Energy Expenditures

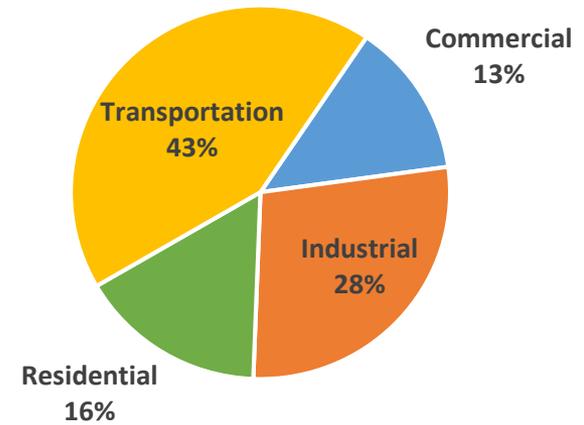
- Tennessee spends over \$15 billion annually on energy
- Tennessee Energy consumed per capita – 333 Million BTU
- Tennessee Energy expenditures per capita - \$4,001 annually
- Average electric rate – 11 cents/KWh – Tennessee is among the lowest in the country
- Tennessee is the largest ethanol producing state in the Southeast US

# Tennessee Energy Consumption

Tennessee End-use Consumption by Source, 2018



Tennessee End-use Consumption by Sector, 2018



Source	BTUs (Trillion)	% of all sources
Petroleum	754.8	50%
Electricity	351.1	23%
Natural gas	301.2	20%
Renewable energy	78.4	5%
Coal	36.8	2%
<b>Total</b>	<b>1,522.4</b>	<b>100%</b>

Sector	BTUs (Trillion)	% of all sources
Transportation	651.9	43%
Industrial	422.9	28%
Residential	243.9	16%
Commercial	203.7	13%
<b>Total</b>	<b>1,522.4</b>	<b>100%</b>

Source: Tennessee Department of Environment and Conservation

# Tennessee Energy Economy

- TN's advanced energy jobs – average wage is \$59,665.
- Opportunity to increase employment and capital investments in rural TN
- Advanced energy industry can be a targeted industry cluster

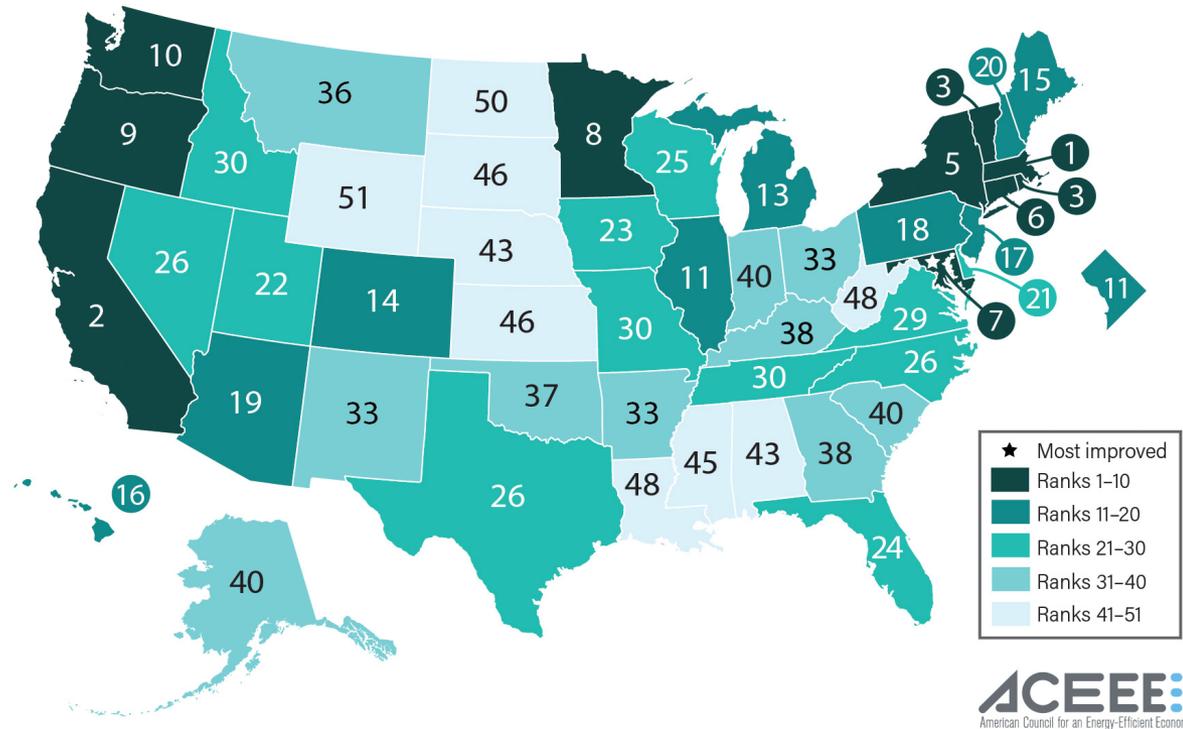


#AEinTN

Source: 2018 Tennessee Advanced Energy Business Council's Economic Impact Report

# Tennessee Energy Rankings

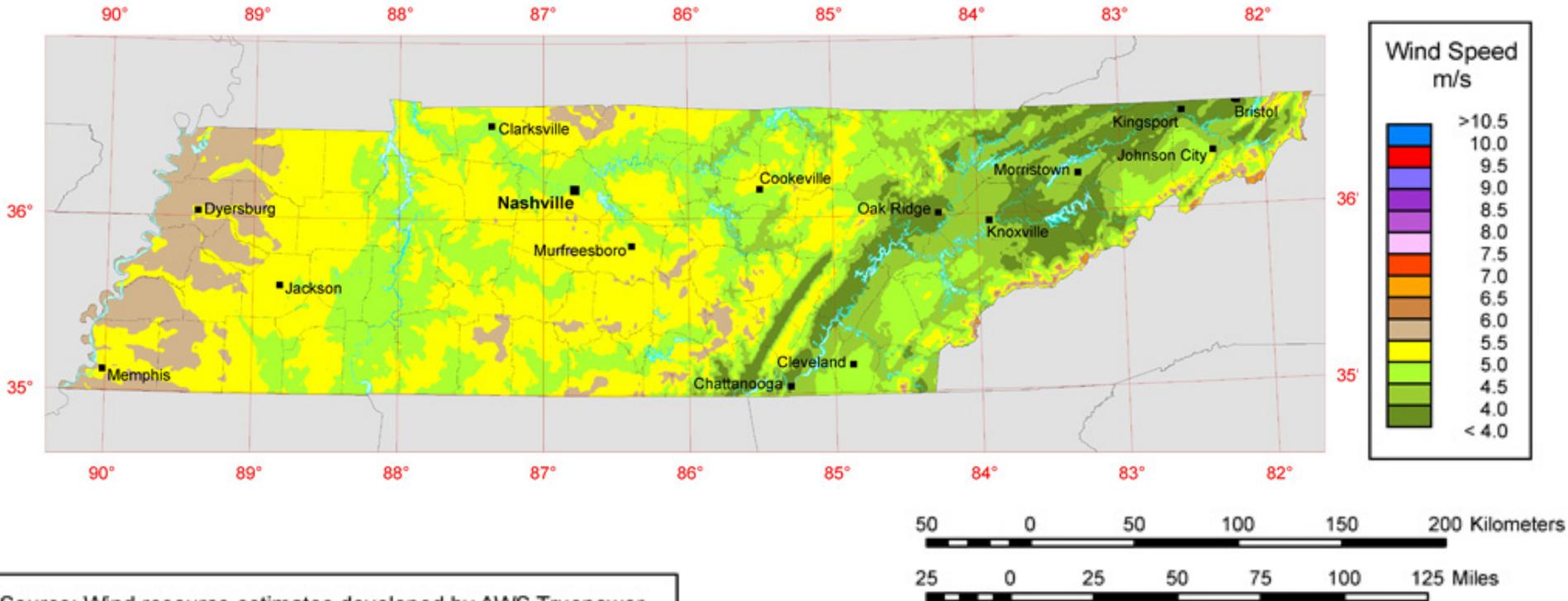
- 2018 Total Energy Consumed per capita – 20<sup>th</sup>
- 2018 Total Energy Expenditures per capita – 23<sup>rd</sup>
- 2019 State Energy Efficiency Scorecard – 30<sup>th</sup>



Source: American Council for Energy-Efficient Economy

# Tennessee Wind Energy Resource Potential

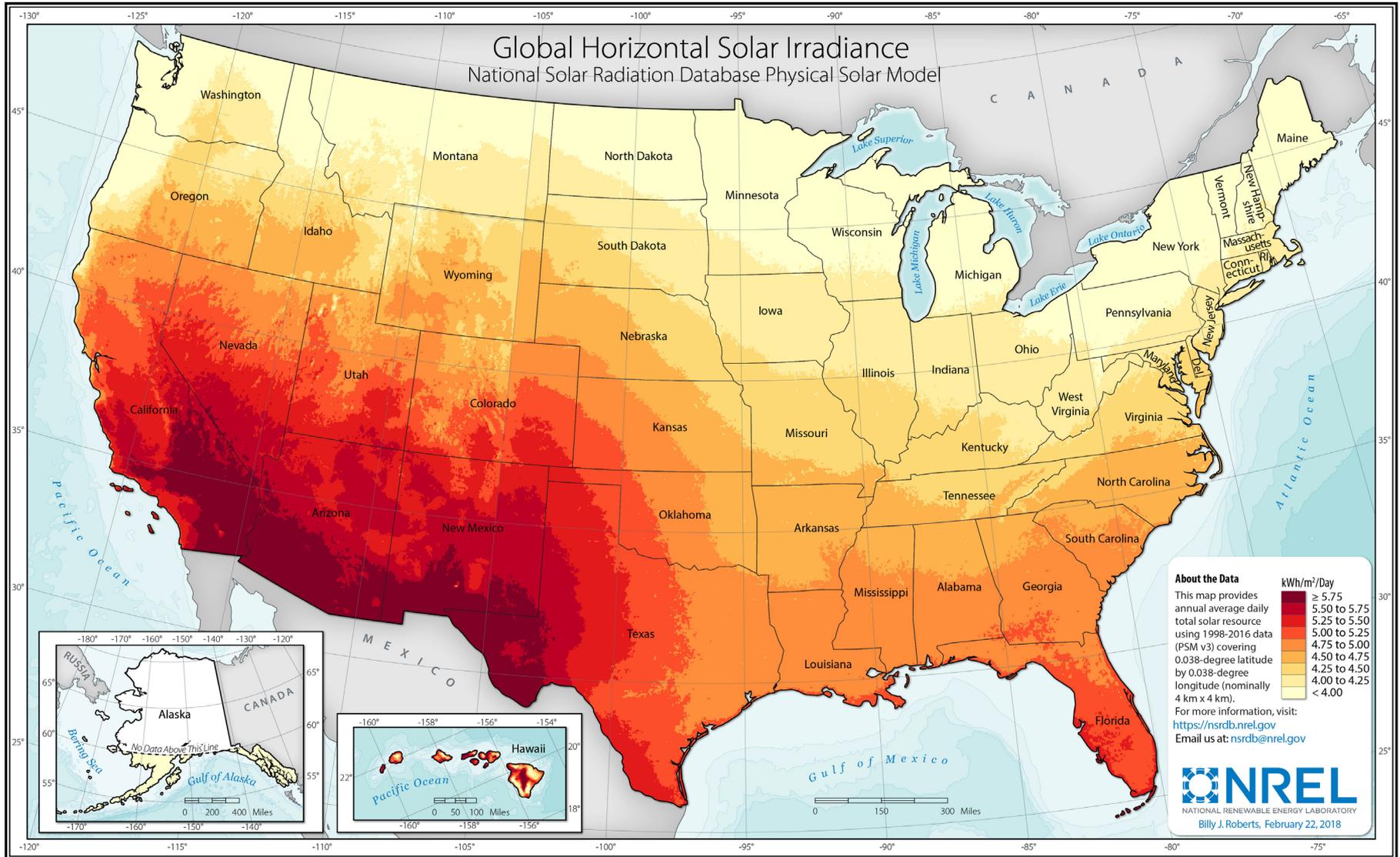
Tennessee - Annual Average Wind Speed at 80 m



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.

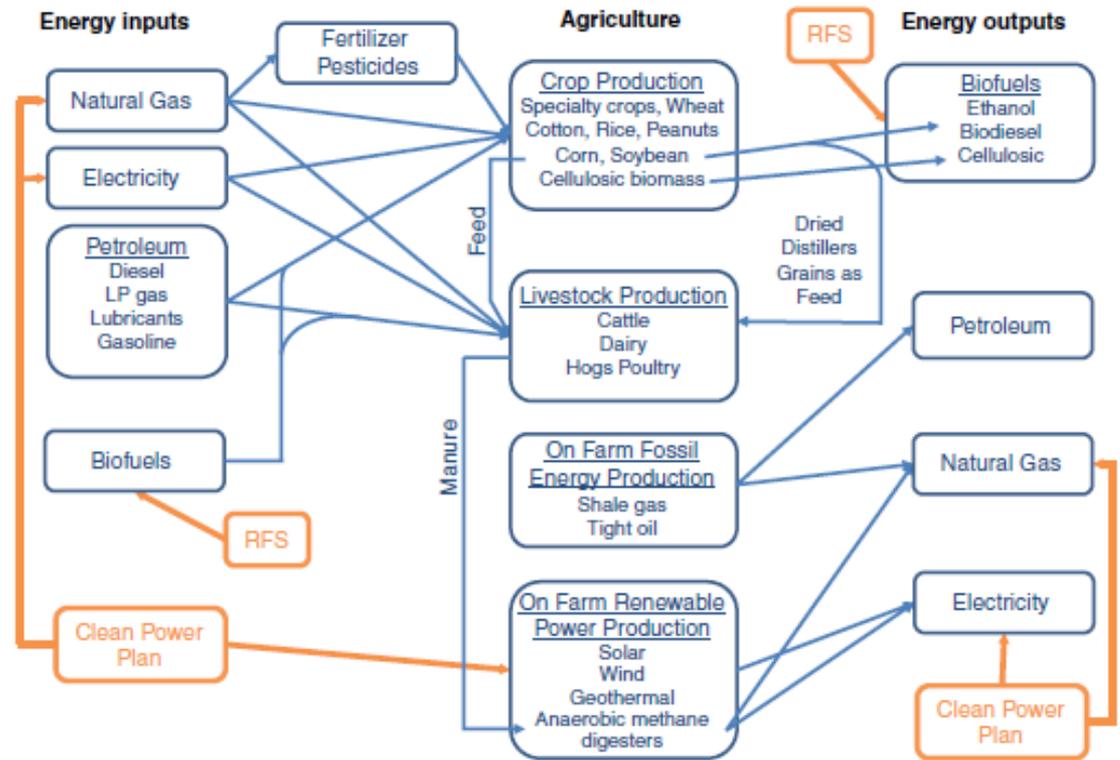


# Solar Energy Resource Potential



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

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
- \$305,000 was available in 2020
- 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 a) repower an older diesel vehicle or b) convert an older diesel vehicle to run on an alternative fuels

# 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 2020 FEMA – BRIC funding - \$500 million
  - State/Territory allocation: \$33.6 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 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/ 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 2019 State Energy Efficiency Scorecard - <https://www.aceee.org/research-report/u1908>
- 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>
- Pathway Lending – [www.pathwaylending.org](http://www.pathwaylending.org)
- 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>
- USDA – Economic Research Service – Trends in Agriculture's Consumption and Production of Energy: Renewable Power, Shale Energy and Cellulosic Biomass - [https://www.ers.usda.gov/webdocs/publications/74658/60128\\_eib159.pdf?v=0](https://www.ers.usda.gov/webdocs/publications/74658/60128_eib159.pdf?v=0)
- 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?

Sreedhar Upendram, Ph.D.

Assistant Professor

Department of Agricultural and Resource Economics

227C Morgan Hall, 2621 Morgan Circle

Knoxville, TN 37996-4518

865-974-7410 Office/865-367-3400 Mobile

[supendra@utk.edu](mailto:supendra@utk.edu) | [ag.tennessee.edu](http://ag.tennessee.edu)

