Key Findings

1. Vermont continued to lead the nation in clean energy jobs

2. Jobs grew in most segments of the value chain, other than manufacturing and utilities in 2023

3. Renewable energy employment declined slightly in 2023, while clean transportation and energy efficiency employment grew modestly

4. Future growth in clean energy jobs is expected to be supported by the recent doubling of Vermont's in-state renewable generation requirements, while moderated by:

- Substantial gains already achieved within the sector

- Broader macroeconomic trends

- Sustained hiring difficulties for clean energy workers

- Changes to the net metering program
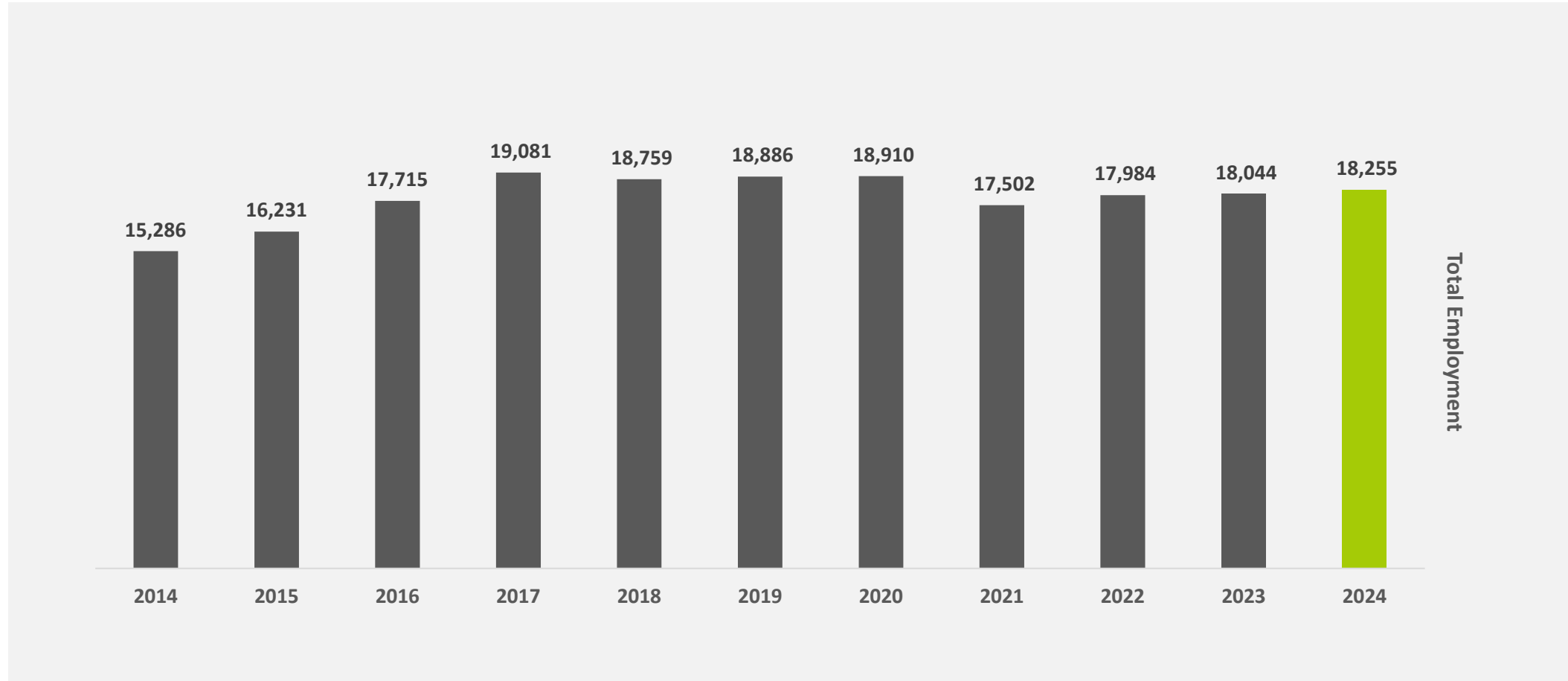
Clean Energy Employment

18,255
Total of Clean Energy Jobs across Vermont
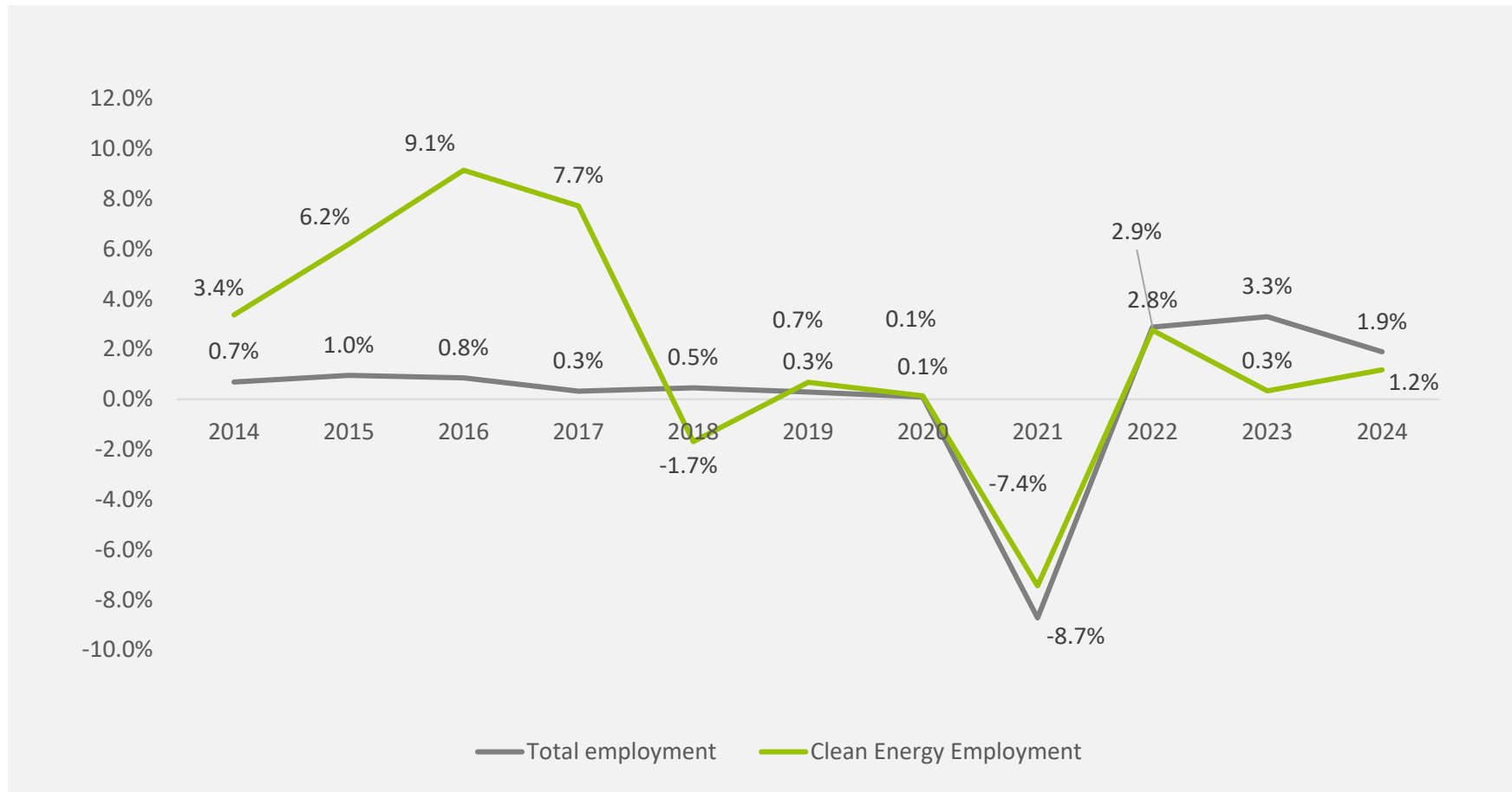(representing 6% of all jobs in the state)

1%
Percent Clean Energy Jobs grew over the last 12 months

The state's clean energy employment reached the highest level recorded since the COVID-19 pandemic.

2014-2024 Clean Energy Employment

Total Employment

| Year	Value
2014	15,286
2015	16,231
2016	17,715
2017	19,081
2018	18,759
2019	18,886
2020	18,910
2021	17,502
2022	17,984
2023	18,044
2024	18,255

# Annual Percent Change, Total Jobs and Clean Energy Jobs, 2014-2024

Clean energy jobs grew faster over the last 12 months than the prior year, but Vermont's economy-wide job growth outpaced clean energy job growth.

Overall Energy Hiring Difficulty by State, 2024
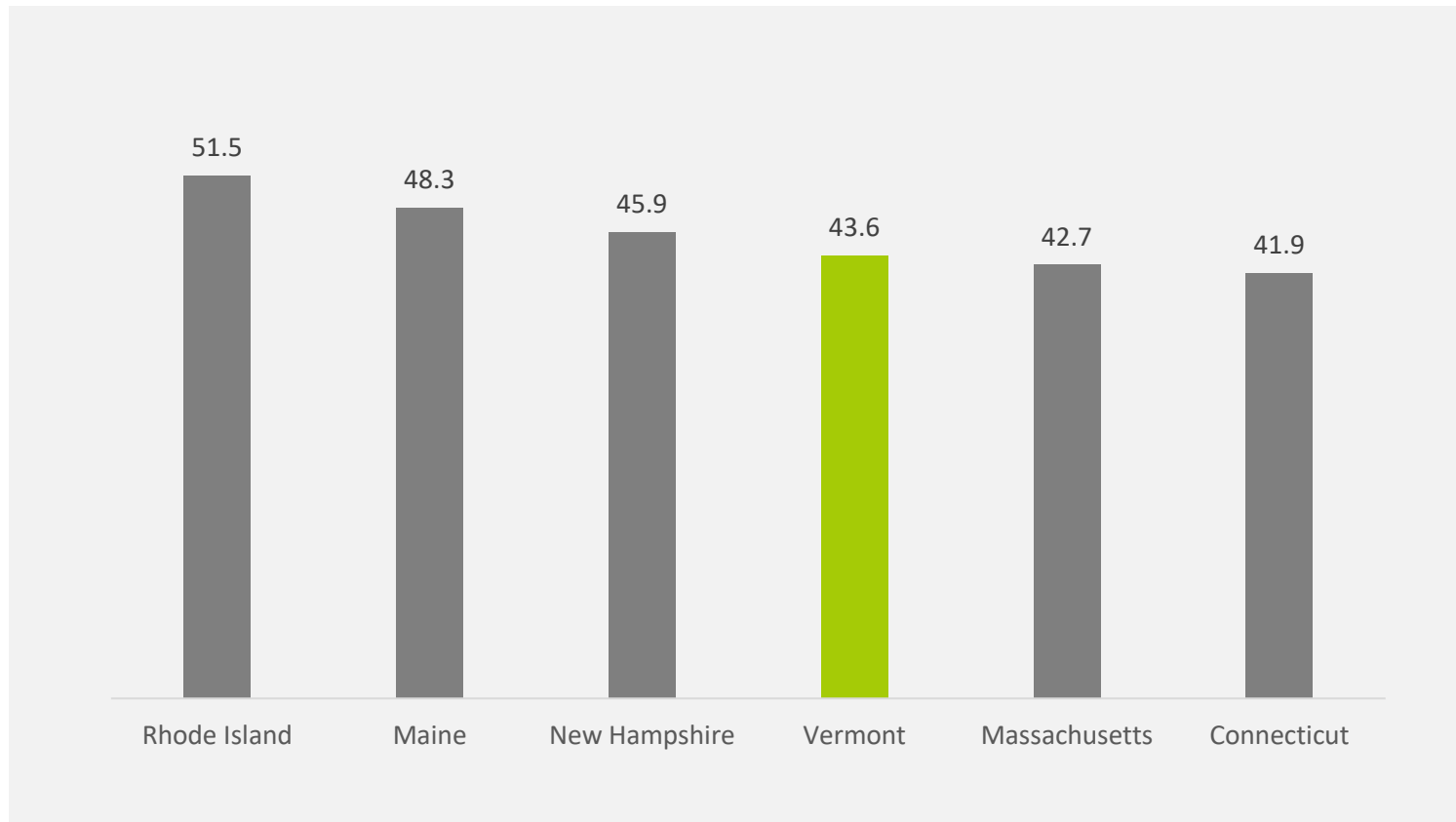
Vermont exhibits moderate levels of hiring difficulties relative to other New England states, with lower hiring difficulty than Rhode Island, Maine, and New Hampshire, but slightly higher hiring difficulty than Massachusetts and Connecticut.

Clean Energy Employment by Technology Sector
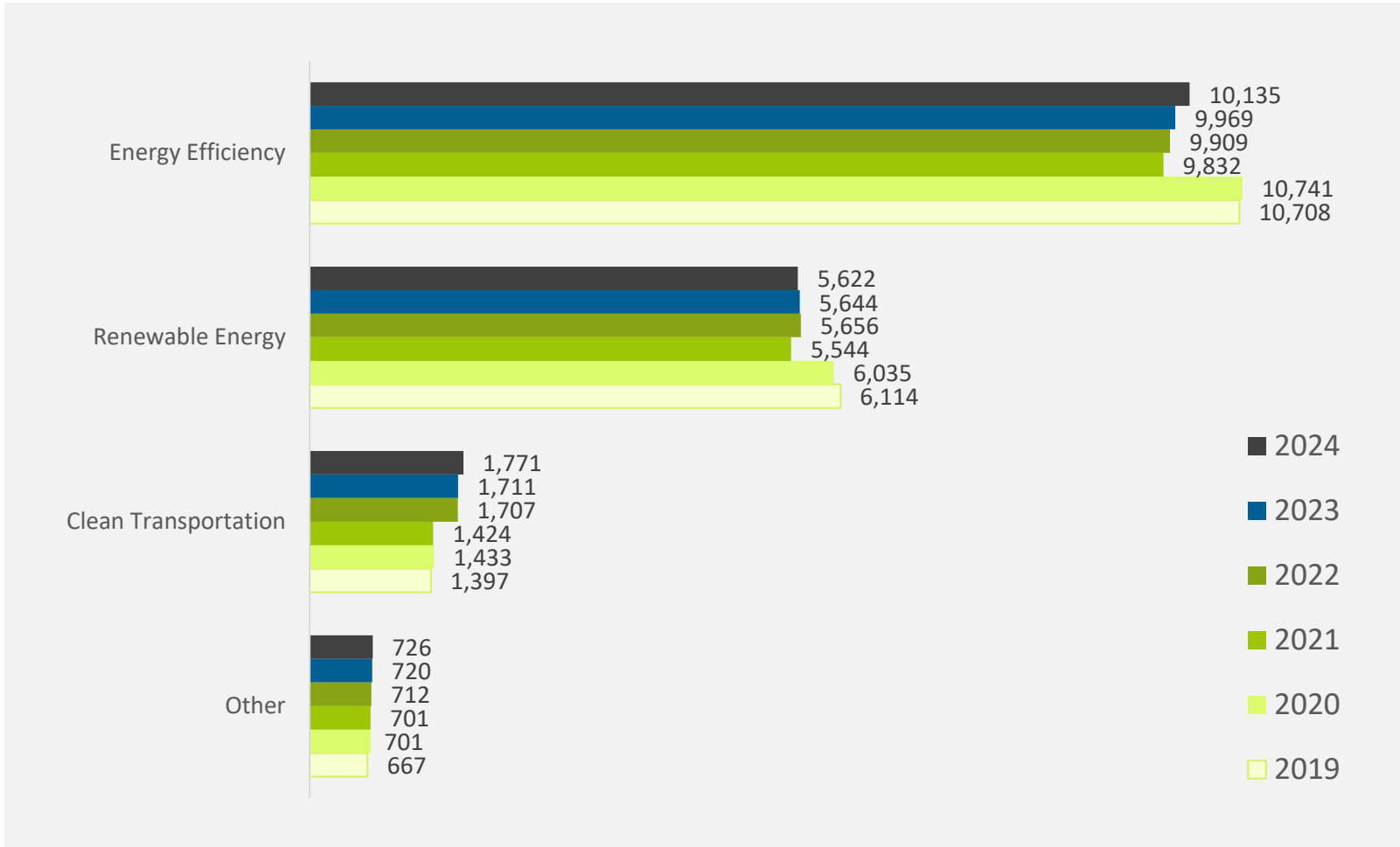
10,135
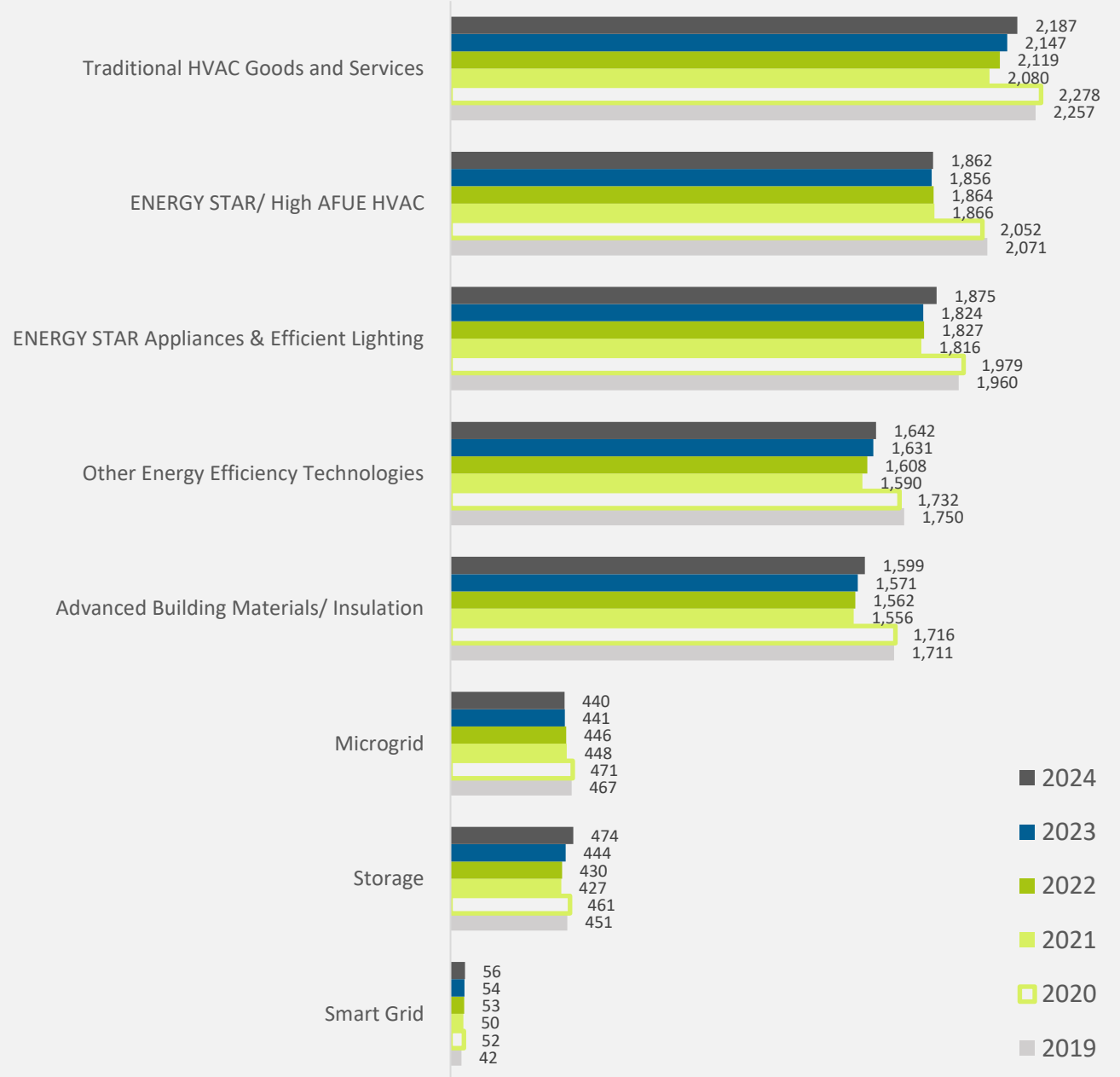2024 Energy Efficiency

5,622
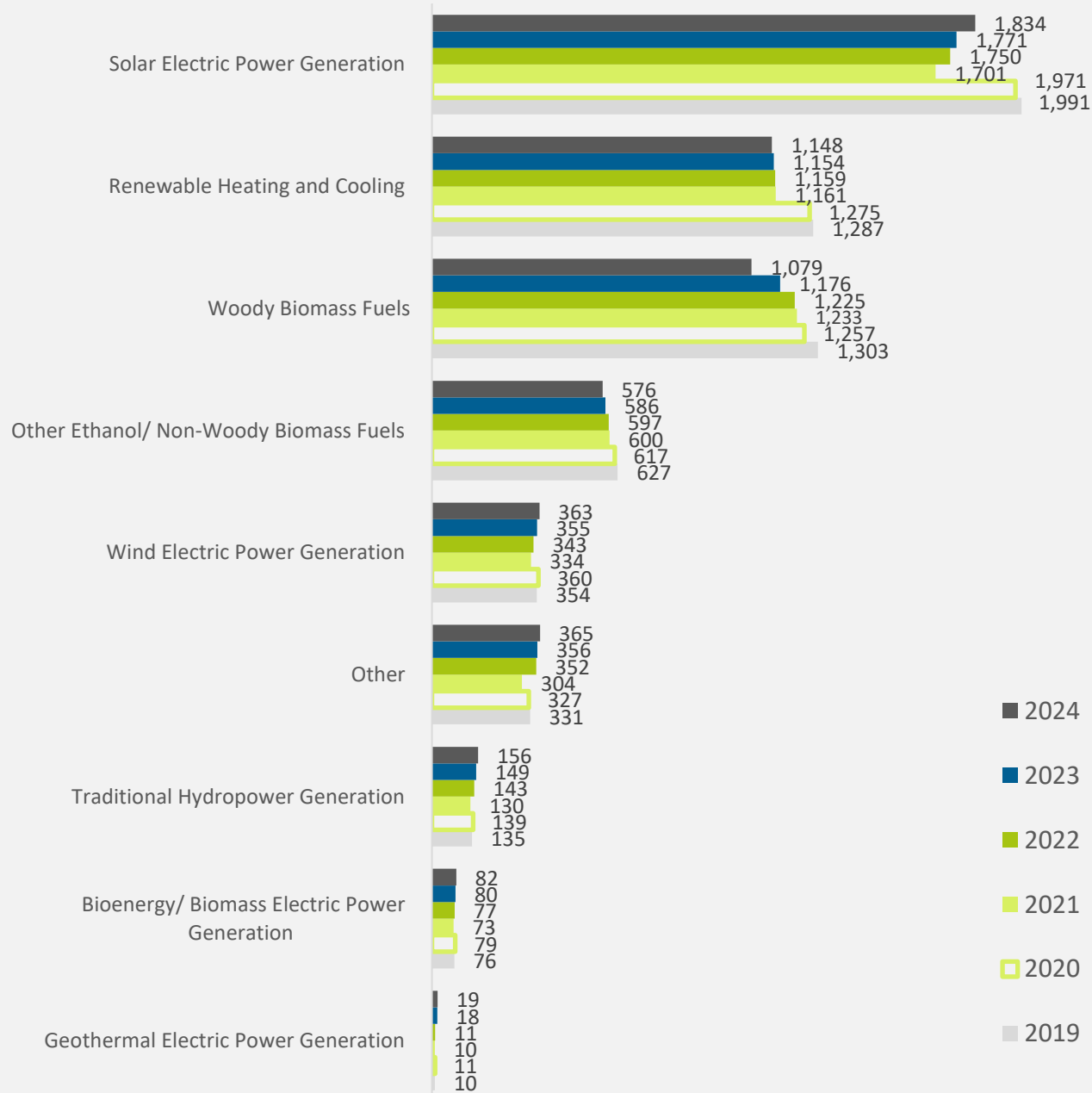2024 Renewable Energy

1,771
2024 Clean Transportation

Three of the four sectors in Vermont's clean energy economy added jobs over the last 12 months, with the clean transportation sector growing the most rapidly (+3.5 percent) of all sectors, and the renewable energy sector shedding a modest 22 jobs.

Energy Efficiency Employment by Sub-Technology

Nearly all sub-technologies within the energy efficiency sector continued to add jobs over the last year, other than microgrid, where employment remained essentially unchanged, shedding one job.
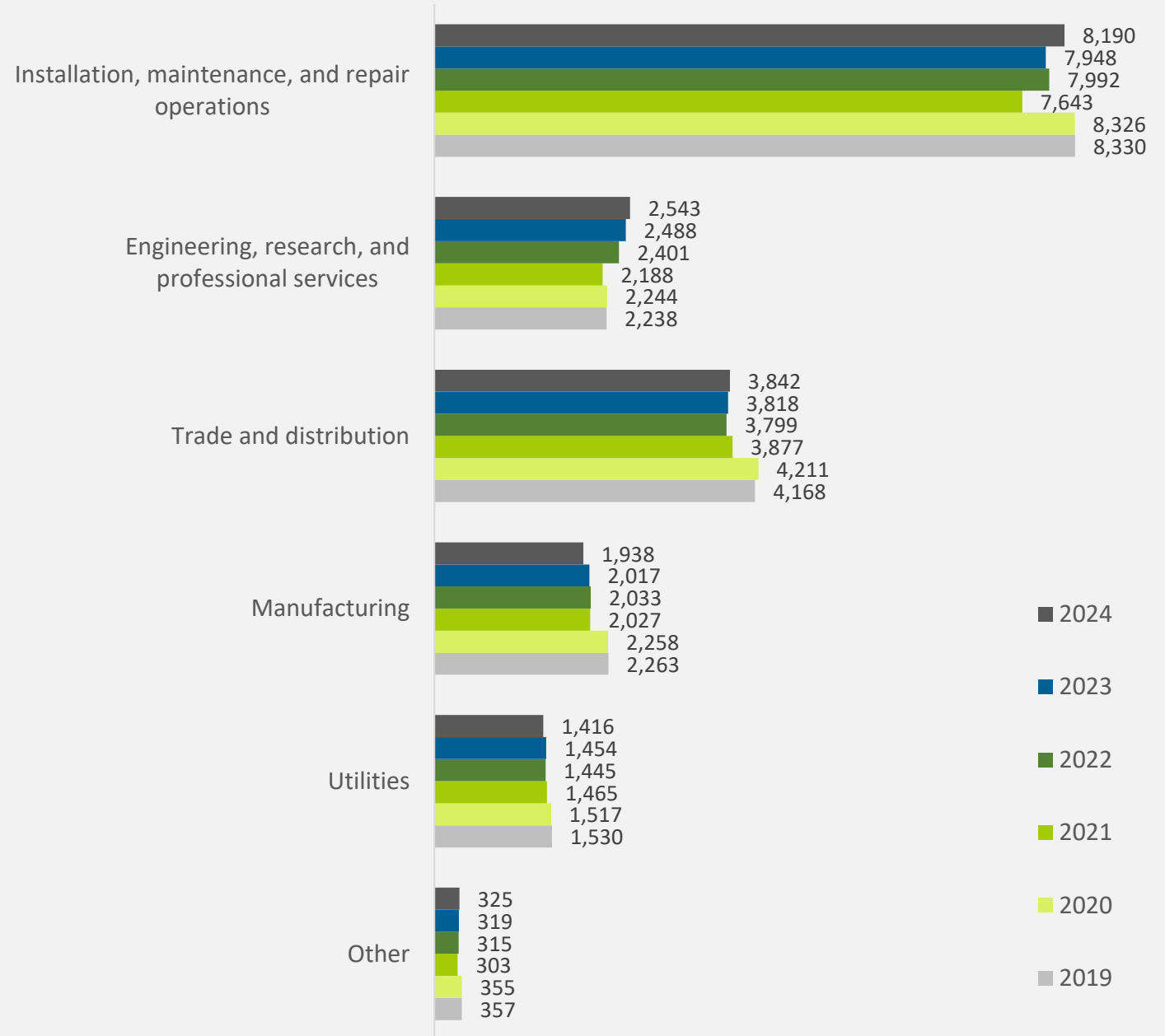

Traditional HVAC Goods and Services
- 2024: 2,187
- 2023: 2,147
- 2022: 2,119
- 2021: 2,080
- 2020: 2,278
- 2019: 2,257

ENERGY STAR/ High AFUE HVAC
- 2024: 1,862
- 2023: 1,856
- 2022: 1,864
- 2021: 1,866
- 2020: 2,052
- 2019: 2,071

ENERGY STAR Appliances & Efficient Lighting
- 2024: 1,875
- 2023: 1,824
- 2022: 1,827
- 2021: 1,816
- 2020: 1,979
- 2019: 1,960

Other Energy Efficiency Technologies
- 2024: 1,642
- 2023: 1,631
- 2022: 1,608
- 2021: 1,590
- 2020: 1,732
- 2019: 1,750

Advanced Building Materials/ Insulation
- 2024: 1,599
- 2023: 1,571
- 2022: 1,562
- 2021: 1,556
- 2020: 1,716
- 2019: 1,711

Microgrid
- 2024: 440
- 2023: 441
- 2022: 446
- 2021: 448
- 2020: 471
- 2019: 467

Storage
- 2024: 474
- 2023: 444
- 2022: 430
- 2021: 427
- 2020: 461
- 2019: 451

Smart Grid
- 2024: 56
- 2023: 54
- 2022: 53
- 2021: 50
- 2020: 52
- 2019: 42

Legend:
- 2024
- 2023
- 2022
- 2021
- 2020
- 2019

Renewable Energy Employment by Sub-Technology

Woody Biomass Fuels shed jobs at a rate of -4.0 percent over the last year.

Clean Energy Employment by Value Chain Segment

Installation, maintenance, and repair operations accounted for the largest share of clean energy jobs and grew the most rapidly over the last 12 months, adding 242 jobs (+3.0 percent).

| Segment	2024	2023	2022	2021	2020	2019
Installation, maintenance, and repair operations	8,190	7,948	7,992	7,643	8,326	8,330
Engineering, research, and professional services	2,543	2,488	2,401	2,188	2,244	2,238
Trade and distribution	3,842	3,818	3,799	3,877	4,211	4,168
Manufacturing	1,938	2,017	2,033	2,027	2,258	2,263
Utilities	1,416	1,454	1,445	1,465	1,517	1,530
Other	325	319	315	303	355	357

Selected Demographics of Clean Energy Workers in Vermont

Vermont's clean energy workforce is significantly younger than the state's overall workforce, with only 15% of workers ages 55 and over, as compared to 27% statewide.

Demographic	VT Clean Energy Workers	VT Overall Workforce
Male	72%	50%
Female	28%	50%
Hispanic or Latino	6%	3%
Not Hispanic or Latino	94%	97%
American Indian or Alaska Native	1%	0%
Asian	4%	2%
Black or African American	4%	2%
Native Hawaiian or Other Pacific Islander	0%	0%
White	88%	93%
Two or more races	4%	2%
Veterans	7%	n/a
55 and over	15%	27%

Clean Energy Jobs by County

Chittenden County accounts for the largest share of the state's clean energy employment, with 6,742 clean energy jobs.
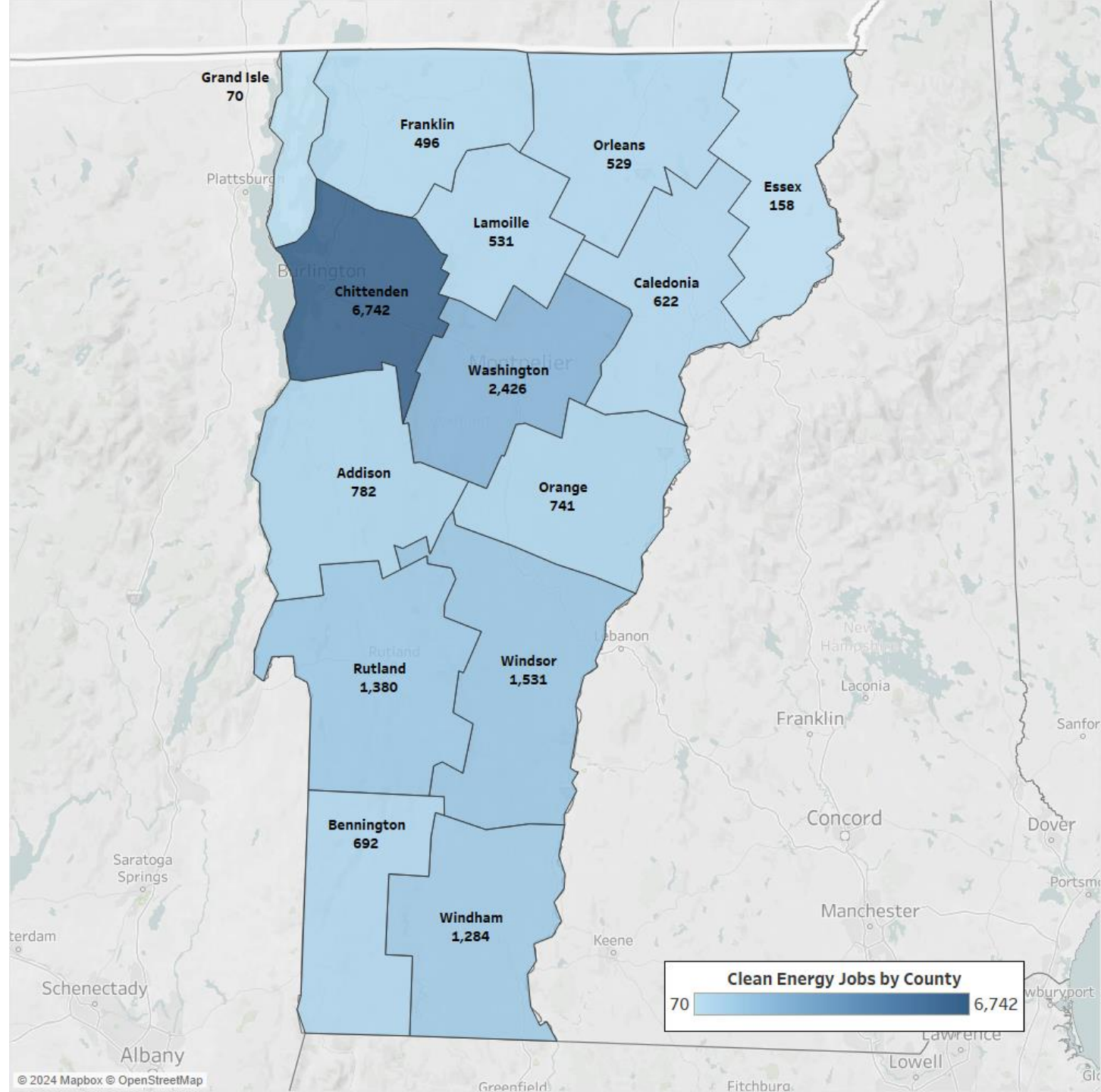
Clean Energy Jobs by Technology Sector and by County

Energy efficiency accounts for the largest share of jobs in 12 of 14 counties in Vermont.

County Name	Renewable Energy	Energy Efficiency	Clean Transportation	Other	Total Clean Energy Jobs	Percent of Total Jobs
Essex County	104	38	12	5	158	15%
Orange County	228	416	69	28	741	9%
Washington County	1,209	943	194	80	2,426	7%
Windsor County	525	805	143	59	1,531	7%
Chittenden County	1,635	4,192	649	266	6,742	7%
Windham County	435	651	140	57	1,284	6%
Caledonia County	238	300	59	24	622	6%
Rutland County	328	834	155	63	1,380	6%
Addison County	238	440	73	30	782	5%
Grand Isle County	17	43	7	3	70	5%
Orleans County	156	298	53	22	529	5%
Lamoille County	112	338	58	24	531	4%
Bennington County	153	422	83	34	692	4%
Franklin County	159	265	52	21	496	3%
N/A	86	151	25	10	272	-

Clean Energy Jobs by Substate Area

The Burlington NECTA accounts for 41% of clean energy employment. The South Balance accounts for 34%, and the North Balance accounts for 24%.
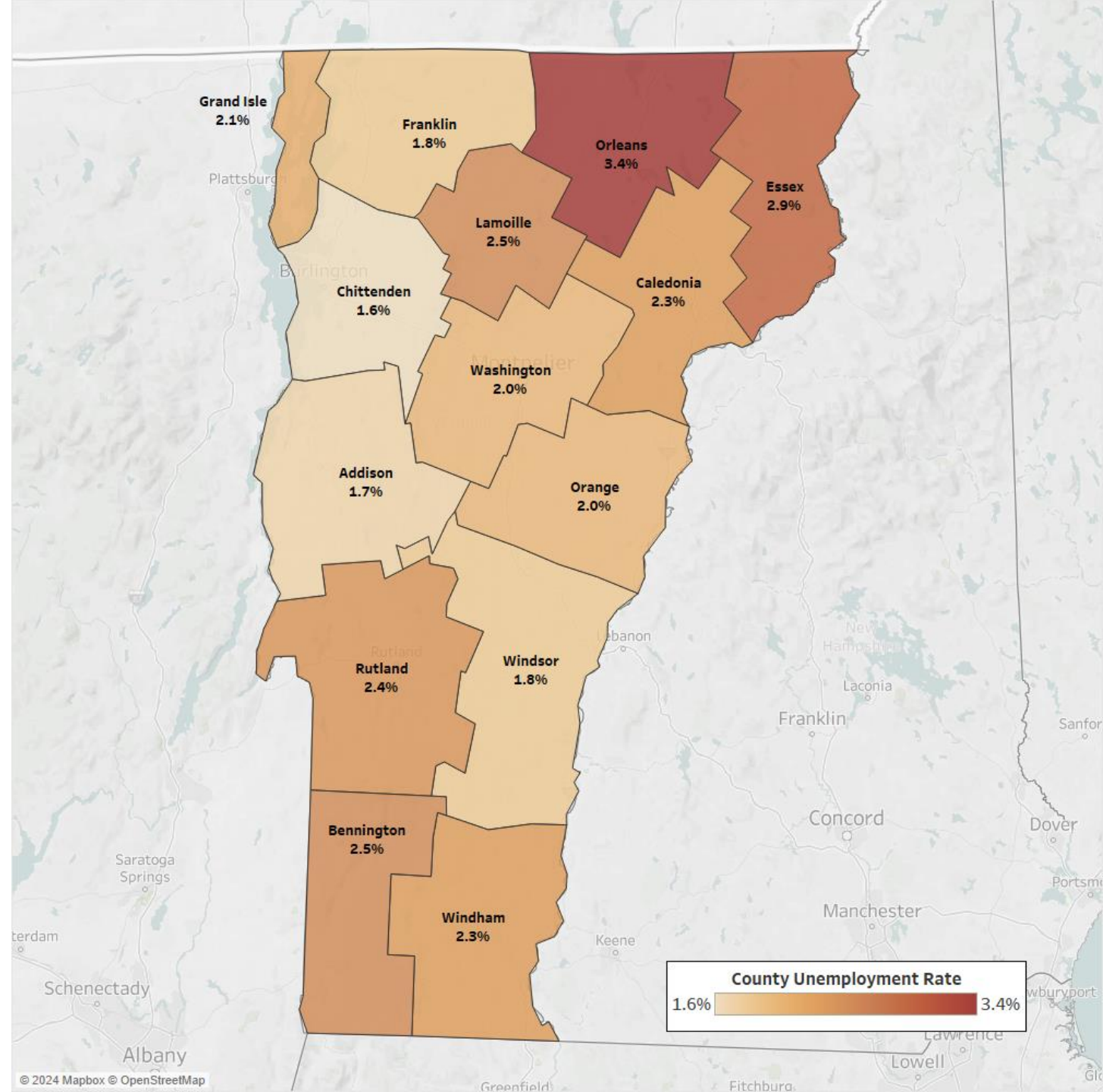
Note: 1.5% of jobs could not be allocated to a substate area.
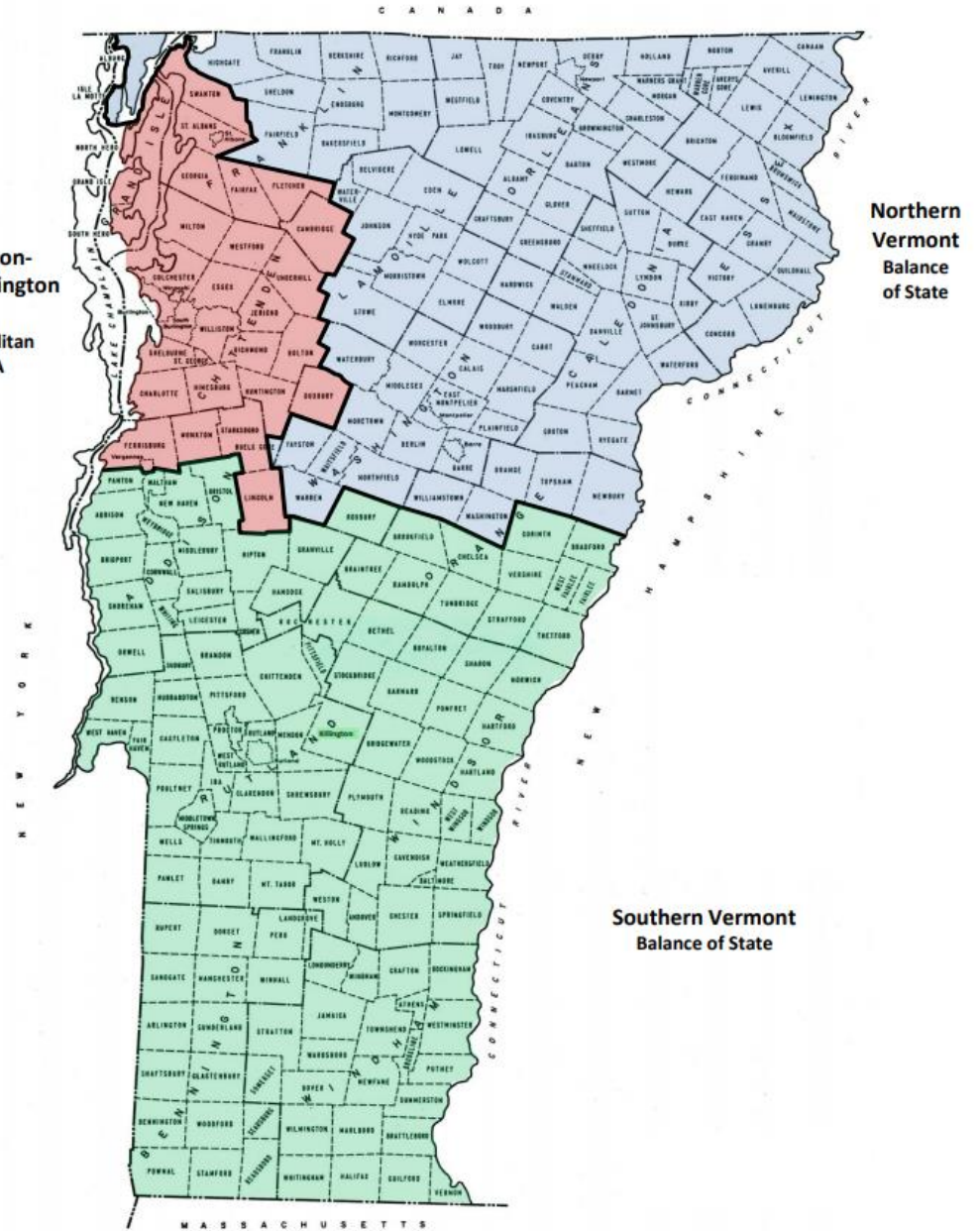
Unemployment Rates by County

Essex County has the highest share of clean energy workers as a percentage of the overall workforce but has no training centers or programs in clean energy. In addition, Essex County has one of the highest unemployment rates in the state.

Unemployment Rates by Educational Attainment & Age

Younger jobseekers with lower levels of educational attainment experience higher levels of unemployment than the rest of the state's workforce and represent a significant share of the potential workforce for the growing clean energy sector.
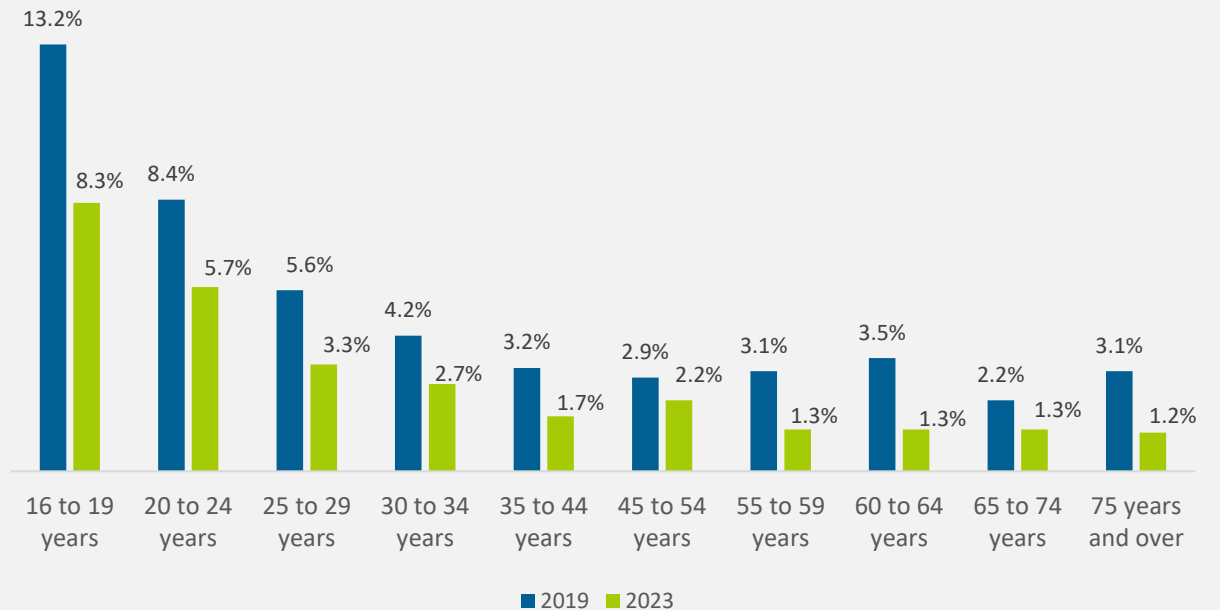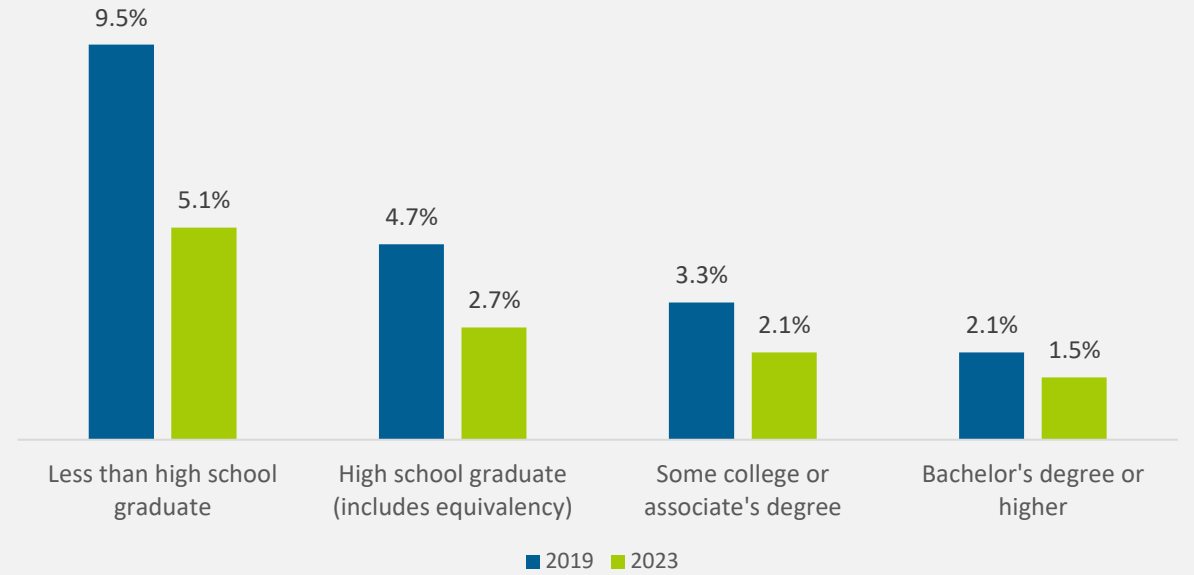
Clean Energy Employment by Opportunity Zone

11% of Vermont's clean energy workers reside in Opportunity Zones.

The Burlington/S. Burlington/Winooski Opportunity Zone has the largest number of clean energy workers (750), which account for 36 percent of clean energy workers living in Opportunity Zones.

Aggregated Opportunity Zone	Clean Energy Employment Estimates	Share of Opportunity Zone Clean Energy Employment
Barre	50	3%
Bennington	40	2%
Brattleboro	100	5%
Burlington/S. Burlington/Winooski	750	36%
Johnson	60	3%
Newport	80	4%
Randolph/S. Royalton	220	11%
Rutland	190	9%
Springfield/Bellows Falls	290	14%
St. Albans	30	1%
St. Johnsbury/Lyndonville	170	8%
Vergennes	60	3%

Note: Clean energy employment estimates by opportunity zone for 2024 are not comparable to prior-year estimates due to a change in reporting methodology and data limitations.

Methodology

The 2024 VCEIR uses publicly available data from the 2024 U.S. Energy and Employment Report (USEER) on Vermont energy employment produced by BW Research Partnership on behalf of the Department of Energy (DOE). These public data are refined and customized for Vermont based on additional analyses conducted on behalf of the Vermont Clean Energy Development Fund (CEDF) at the Vermont Department of Public Service by BW Research Partnership.

The 2024 USEER utilizes data from the Bureau of Labor Statistics Quarterly Census of Employment and Wages (BLS QCEW 2023 Q3) and Current Employment Statistics (CES Table B-1), as well as survey data. All data in the USEER rely on the BLS QCEW data for the end of the third quarter of 2023, and the BLS Unemployment Situation Table B-1 monthly reports through December 2023, except for motor vehicle employment. Due to anomalies in BLS QCEW 2023 Q4 motor vehicle and motor vehicle component parts manufacturing employment caused by the September 2023 United Auto Workers (UAW) strike, revised 2023 Q3 data is used. The survey was designed and implemented by BW Research Partnership. For the past decade, national, state, and local energy-related data collection and analysis efforts have used this survey methodology.

Glossary

RENEWABLE ENERGY GENERATION

Renewable energy generation jobs cover all utility and non-utility employment for renewable electricity-generating technologies. Included in these employment estimates are any firms engaged in renewable energy facility construction, generation equipment manufacturing, wholesale parts distribution, and professional and business services such as consulting, finance, administrative, and legal support for the following renewable energy generation sub-technologies:

- Solar Photovoltaic Electric Generation
- Concentrated Solar Electric Generation
- Wind Generation
- Geothermal Generation
- Bioenergy/Biomass Generation
- Low-Impact Hydroelectric Generation, including wave/kinetic generation
- Traditional Hydroelectric Generation
- Combined Heat and Power
- Other Renewable Electric Power Generation
- Renewable Heating and Cooling
    - Solar Thermal Water Heating and Cooling
    - Other Renewable Heating and Cooling (geothermal, biomass, heat pumps, etc.)

RENEWABLE FUELS

These jobs encompass all work related to the production of clean fuels. Fuels employment spans industries such as agriculture and forestry, manufacturing, professional and business services, wholesale trade, transportation, and construction.

It is important to note the difference between bioenergy electricity generation jobs and woody biomass fuels jobs. The former includes workers that are involved in the utility generation of electricity from materials derived from biological sources or any organic material, while the latter encompasses those workers who are engaged in fuel development from these materials such as manure, vegetable oil, trees and woody plants, and other living matter. Bioenergy generation workers are expressly involved in the electricity-producing component (including the construction of facilities and manufacture and wholesale trade of generators or turbines) while woody biomass workers are involved in the production, refinement, and distribution of those fuels used to produce the electricity. Vermont includes the following renewable fuel sub-technologies under the overall renewable energy generation sector:

- Woody Biomass, including cellulosic biofuel
- Non-Woody Biomass, including biodiesel

Glossary (cont'd)

ENERGY EFFICIENCY

o   Traditional HVAC goods, control systems, and services
o   ENERGY STAR Certified Heating Ventilation and Air Conditioning (HVAC), including boilers and furnaces with an AFUE rating of 90 or greater and air and central air conditioning units of 15 SEER or greater
o   ENERGY STAR® Appliances & Efficient Lighting
   ▪   ENERGY STAR Certified Appliances, excluding HVAC
   ▪   ENERGY STAR Certified Electronics (TVs, Telephones, Audio/Video, etc.)
   ▪   ENERGY STAR Certified Windows and Doors
   ▪   ENERGY STAR Certified Roofing
   ▪   ENERGY STAR Certified Seal and Insulation
   ▪   ENERGY STAR Certified Commercial Food Service Equipment
   ▪   ENERGY STAR Certified Data Center Equipment
   ▪   ENERGY STAR Certified LED Lighting
   ▪   Other LED, CFL, and Efficient Lighting
o   Advanced Building Materials/Insulation
o   Other Energy Efficiency
   ▪   Reduced Water Consumption Products and Appliances
   ▪   Recycled Building Materials

CLEAN GRID & STORAGE

Electric Power Transmission and Distribution
o   Smart Grid
o   Microgrids
o   Other Grid Modernization

Storage
o   Pumped Hydropower Storage
o   Battery Storage, including battery storage for solar generation
   ▪   Lithium Batteries
   ▪   Lead-Based Batteries
   ▪   Other Solid-Electrode Batteries
   ▪   Vanadium Redox Flow Batteries
   ▪   Other Flow Batteries
o   Mechanical Storage, including flywheels, compressed air energy storage, etc.
o   Thermal Storage
o   Biofuel, including ethanol and biodiesel storage

CLEAN TRANSPORTATION

o   Hybrid Electric Vehicles
o   Plug-In Hybrid Vehicles
o   Electric Vehicles

Credits

This Clean Energy Industry Report is the eleventh in a series of reports conducted and written by BW Research Partnership, Inc. under commission by the Clean Energy Development Fund (CEDF) of the Vermont Department of Public Service (PSD).

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CLEAN ENERGY DEVELOPMENT BOARD MEMBERS, APPOINTING AUTHORITY, YEAR TERM ENDS

- o   Cara Robechek, Chair, PSD Commissioner, 2025
- o   Sam Swanson, PSD Commissioner, 2027
- o   David Farnsworth, PSD Commissioner, 2025
- o   Ken Jones, Senate Energy Committee Chair, 2025
- o   Paul Zabriskie, Senate Energy Committee Chair, 2027
- o   Johanna Miller, House Energy Committee Chair, 2025
- o   Vacant Position, House Energy Committee Chair, 2027