NREL
NATIONAL RENEWABLE ENERGY LABORATORY

PV Installation Labor Market Analysis and PV JEDI Tool Developments

Barry Friedman

NREL Strategic Energy Analysis Center

May 16, 2012

World Renewable Energy Forum

Denver, Colorado

NREL/PR-6A20-55130

Disclaimer

DISCLAIMER AGREEMENT

These information (“Data”) are provided by the National Renewable Energy Laboratory (“NREL”), which is operated by the Alliance for Sustainable Energy LLC (“Alliance”) for the U.S. Department of Energy (the “DOE”).

It is recognized that disclosure of these Data is provided under the following conditions and warnings: (1) these Data have been prepared for reference purposes only; (2) these Data consist of forecasts, estimates or assumptions made on a best-efforts basis, based upon present expectations; and (3) these Data were prepared with existing information and are subject to change without notice.

The names DOE/NREL/ALLIANCE shall not be used in any representation, advertising, publicity or other manner whatsoever to endorse or promote any entity that adopts or uses these Data. DOE/NREL/ALLIANCE shall not provide any support, consulting, training or assistance of any kind with regard to the use of these Data or any updates, revisions or new versions of these Data.

YOU AGREE TO INDEMNIFY DOE/NREL/ALLIANCE, AND ITS AFFILIATES, OFFICERS, AGENTS, AND EMPLOYEES AGAINST ANY CLAIM OR DEMAND, INCLUDING REASONABLE ATTORNEYS' FEES, RELATED TO YOUR USE, RELIANCE, OR ADOPTION OF THESE DATA FOR ANY PURPOSE WHATSOEVER. THESE DATA ARE PROVIDED BY DOE/NREL/ALLIANCE "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. IN NO EVENT SHALL DOE/NREL/ALLIANCE BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER, INCLUDING BUT NOT LIMITED TO CLAIMS ASSOCIATED WITH THE LOSS OF DATA OR PROFITS, WHICH MAY RESULT FROM AN ACTION IN CONTRACT, NEGLIGENCE OR OTHER TORTIOUS CLAIM THAT ARISES OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THESE DATA.

This work was supported by the U.S. Department of Energy under Contract No. DE-AC36-08-GO28308 with the Nation

Acknowledgement

This work was supported by the U.S. Department of Energy under Contract No. DE-AC36-08-GO28308 with the National Renewable Energy Laboratory.

Outline

NREL PV Installation Labor Market Analysis (LMA)*

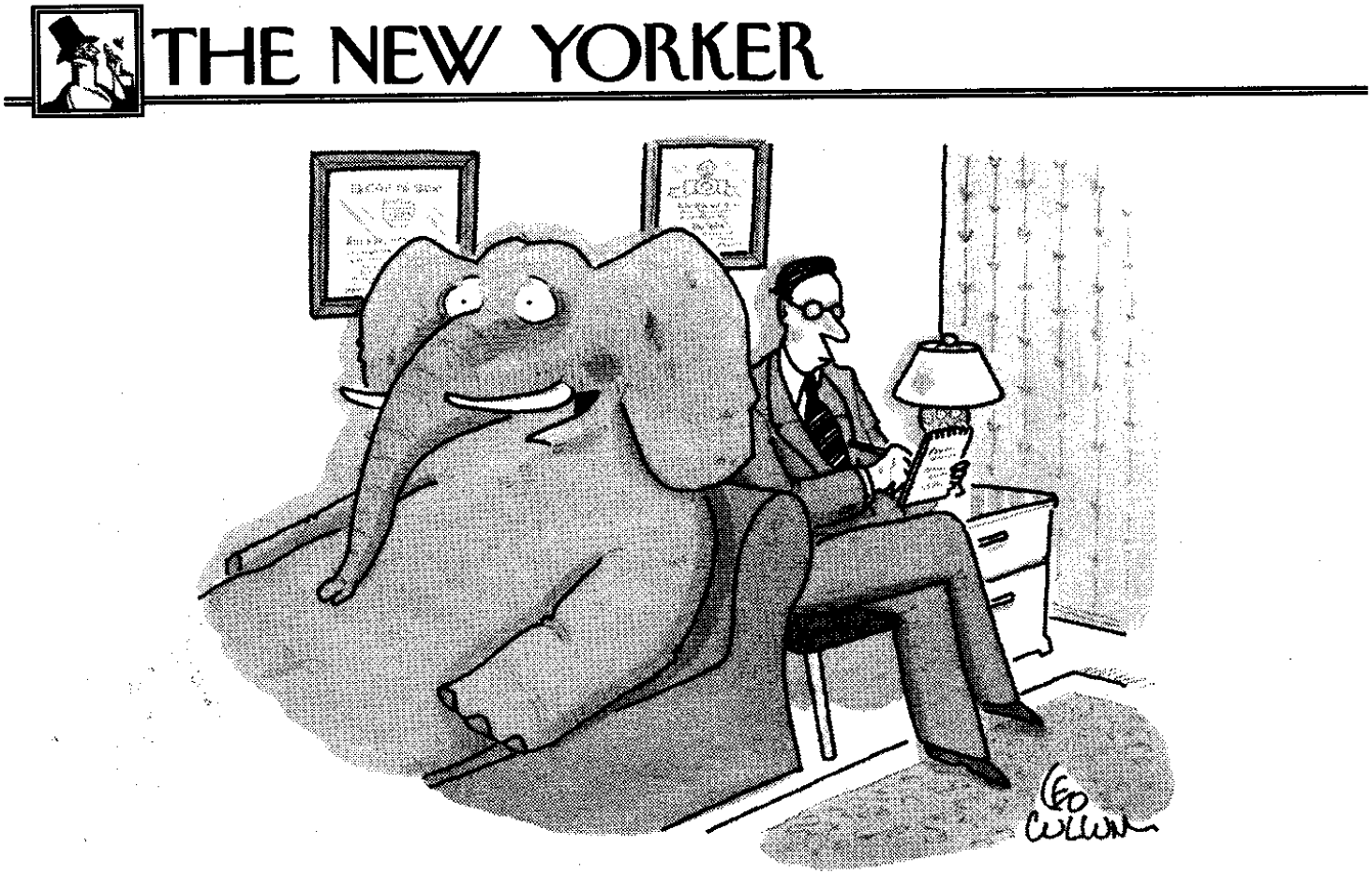
- Primary Audience: Solar Instructor Training Network
- Purpose of Report
- Report Highlights

PV JEDI

- What is PV JEDI ?
- Purpose, Audience, Use Overview
- Recent Developments
- Q&A

*Friedman, Jordan, Carrese. (December 2011), "Solar Installation Labor Market Analysis," TR NREL/TP-6A20-49339, http://www.nrel.gov/docs/fy12osti/49339.pdf.

Your Riddle for the Day:
What is a 4 Letter Word, Oft-Spoken, 3 Times Straight?



"I'm right there in the room, and no one even acknowledges me."

Published in The New Yorker 2/7/2011 by Eric Lewis

NREL's Capabilities in Economic Benefits Analysis

"Upstream"

"Manufacturing"

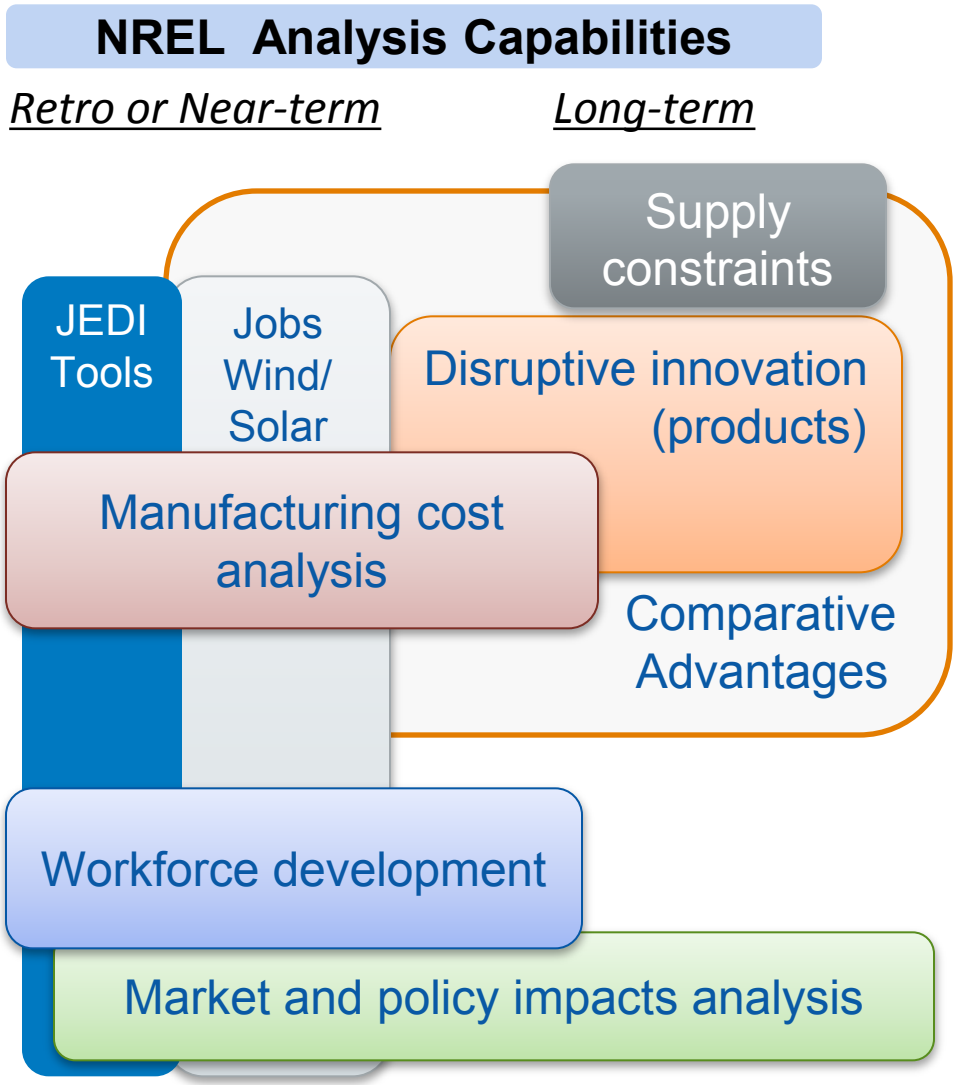
"Downstream"

Supply chain

Materials: cast iron, forgings, polysilicon.

Components, processes, and equipment: Towers, blades, gearboxes, wafers, cells, modules, BOS

Systems deployment and post-deployment: System design, financing, logistics, construction, O&M.



Downstream Solar Labor Market Analysis

Project Purpose:

To conduct a statistically valid regional and national solar photovoltaic (PV) Installation job count and assess the dynamics of labor supply and demand for key occupations in the U.S. solar installation industry.

Goal:

To complete interviews with statistically valid (n=1425 completed interviews) employer sample representing 8 U.S. regions and 6-8 key occupations and industry sectors for PV and solar thermal markets, to inform the Solar Instructor Training Network and other stakeholders.

For Eight U.S. Regions Designated by DOE's Solar Instructor Training Network:

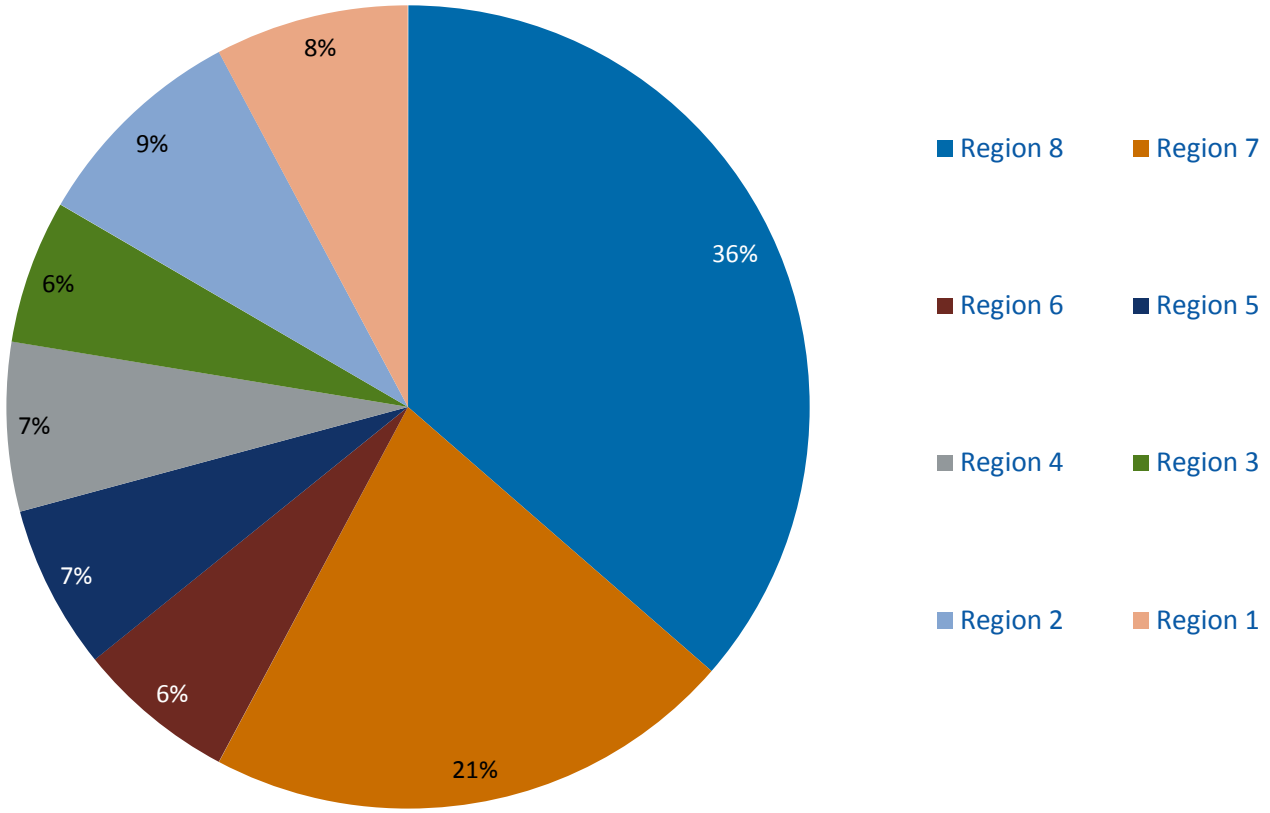
- Jobs by occupation type (installer, designer, site assessor, etc.)
- Solar incidence rate
- Relative difficulty finding employees (entry and non-entry)
- Workforce skill deficiencies
- Employers' preferred experience/ certifications
- On-the-job training (e.g. internships/ apprenticeships)
- First pass labor supply

Six Sectors Traditionally Engaged in Solar Installation, by NAICS Code

NAICS Code	Description
236118	Residential Remodelers
238160	Roofing Contractors
238210	Electrical Contractors and Other Wiring Installation Contractors
238220	Plumbing, Heating, and Air-Conditioning Contractors
238190	Other Foundation, Structure, and Building Exterior Contractors
238990	All Other Specialty Trade Contractors

LMA Completed Installer Interviews

Regional Distribution of Employers



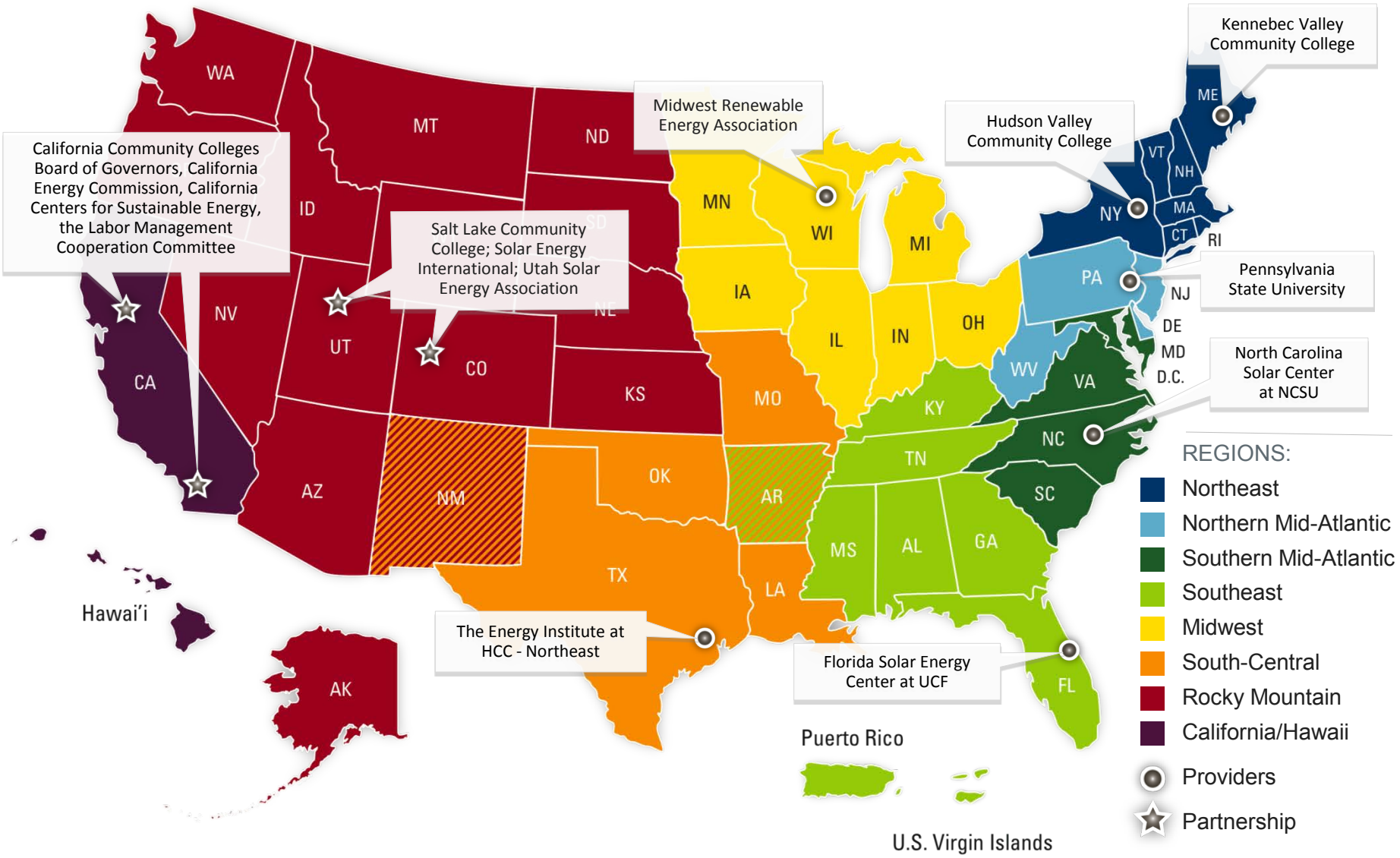
Region 8: CA/HI

Region 7: SW U.S.

DOE Solar Instructor Training Network

- Sponsors professional development of local instructors
- Enables capacity building of local educational institutions
- Develops materials, tools and resources

Solar Instructor Training Network

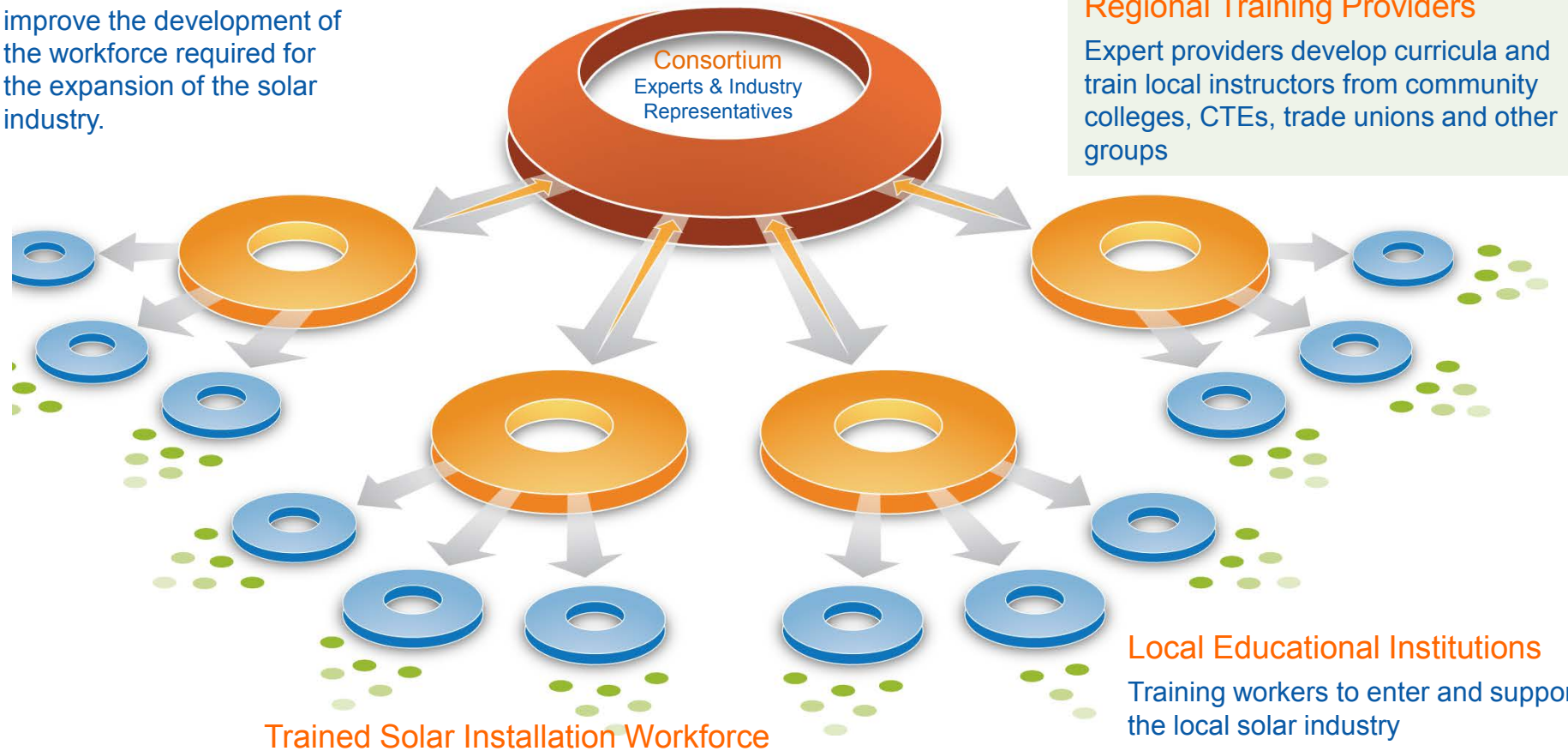


Solar Instructor Training Network

U.S. DEPARTMENT OF ENERGY

What is SITN?

DOE funds a system of centers to accelerate and improve the development of the workforce required for the expansion of the solar industry.



Regional Training Providers

Expert providers develop curricula and train local instructors from community colleges, CTEs, trade unions and other groups

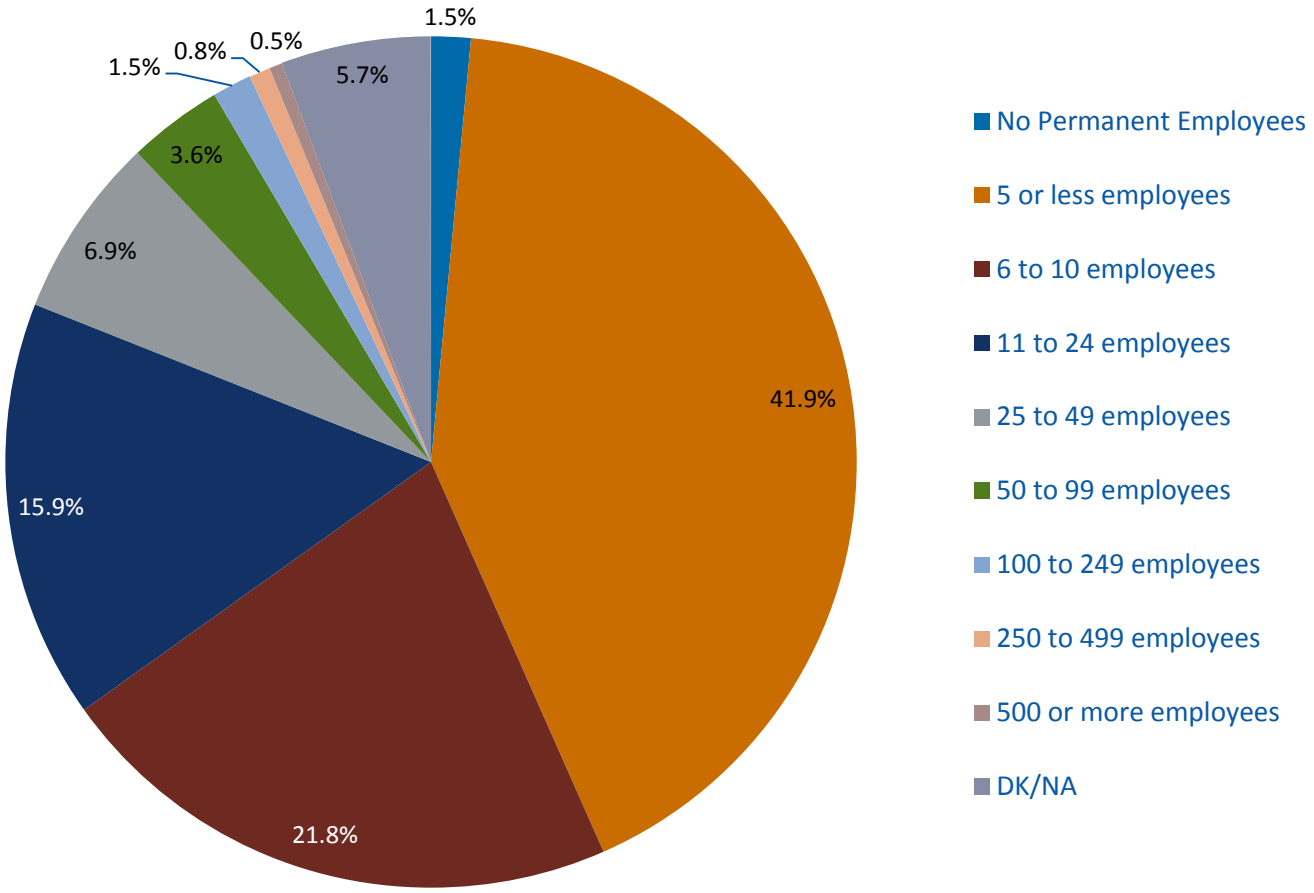
Local Educational Institutions

Training workers to enter and support the local solar industry

Trained Solar Installation Workforce

Includes installers, technicians, system designers, engineers, sales people and code officials

Solar Installer Respondents by Firm Size



Job Count Regional Breakout

	Total Employment by U.S. Companies Engaged in Solar Installation	Solar Employment (>50% Solar Focus)
Installer	147,501	43,934
Region 1: NY, VT, RI, CT, MA, NH, ME	4,932	2,282
Region 2: WV, PA, DE, NJ	10,356	4,888
Region 3: SC, NC, VA, DC, MD	8,664	3,995
Region 4: MS, AL, GA, TN, KY, FL	12,793	2,101
Region 5: MN, IA, WI, IL, IN, MI, OH	15,885	1,303
Region 6: NM, TX, OK, LA, AR, MO	9,769	4,309
Region 7: AK, AZ, NV, UT, CO, KS, NE , WY, SD, ND, MT, WA, OR, ID	22,858	7,521
Region 8: CA, HI	56,044	15,592
Other/ Data provided across regions (more than one location)	6,201	1,944
Total	**147,501**	**43,934**

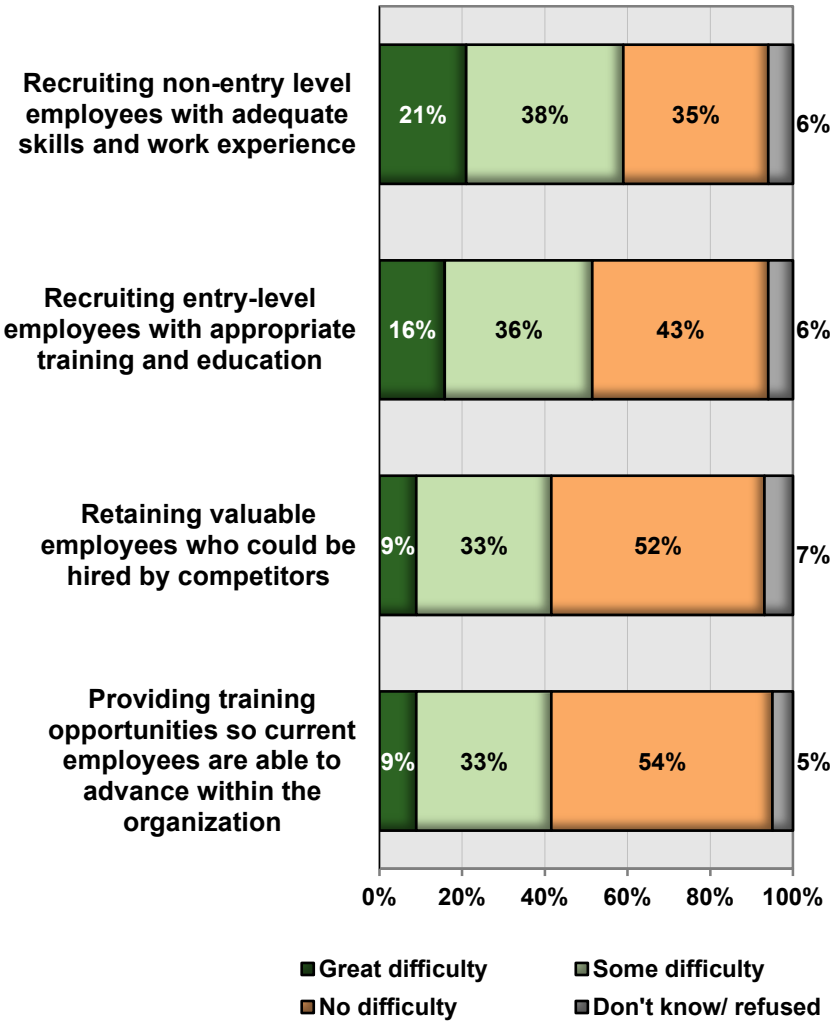
Growth Rate, Difficulty Hiring, and Wage Range by Occupation

Occupation	Difficulty Hiring	Firms that Employ	12-Month Growth %	Hourly Median Wage
Solar water- or pool-heating installers or technicians	65%	33%	29%	$15–$24
Solar photovoltaic installers or technicians	62%	72%	51%	$15–$25
Sales representatives or estimators	64%	70%	39%	$19–$32
Solar designers or engineers	67%	62%	33%	$19–$31
Solar installation managers or project foremen	65%	61%	32%	$20–$30
HVAC technicians with specific skills in solar installation	64%	11%	25%	$14–$25
Energy auditors	56%	20%	31%	$17–$25
Site assessors and remote evaluators	64%	37%	35%	$16–$25
Plumbers with specific skills in solar installation	59%	17%	25%	$18–$30
Electricians with specific skills in solar	62%	53%	42%	$20–$31
Roofers with specific skills in solar installation	47%	15%	36%	$15–$25

The range reflects the differences between entry-level and experienced workers.

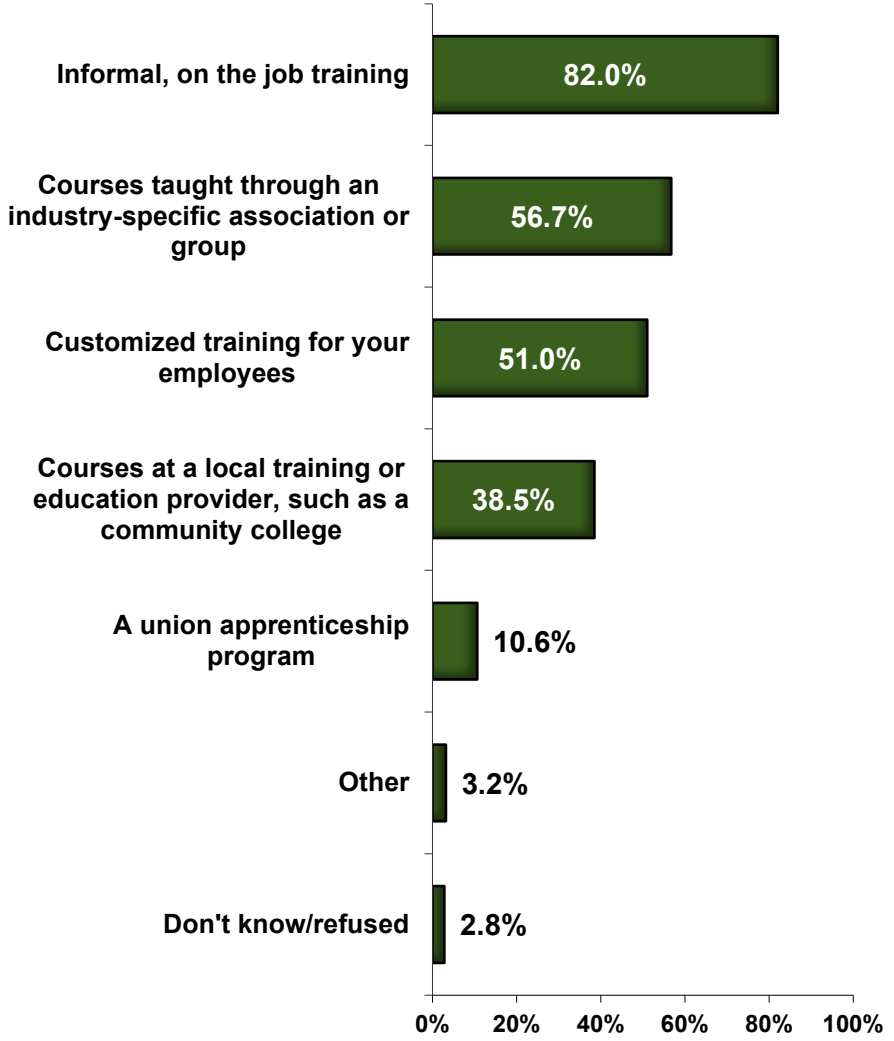
Employer Needs and Preferences

- 52% of firms reported difficulty in finding qualified entry-level candidates.
- 59% reported difficulty finding non-entry-level employees.
- Firms reported significant difficulty finding qualified applicants across all installation occupations.
- Companies are looking for experience with customer service, construction, and electrical projects.

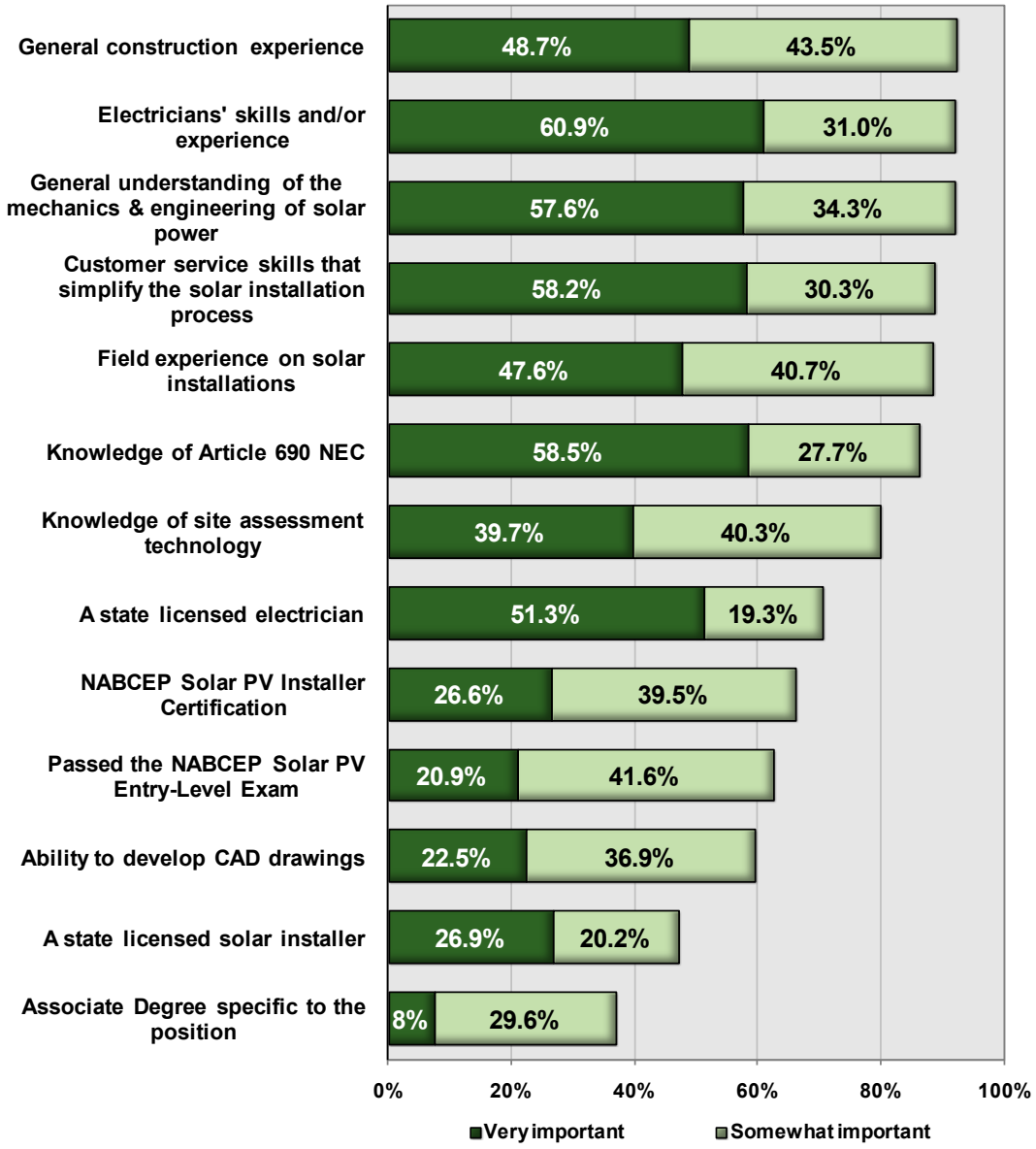


Employer Needs and Preferences

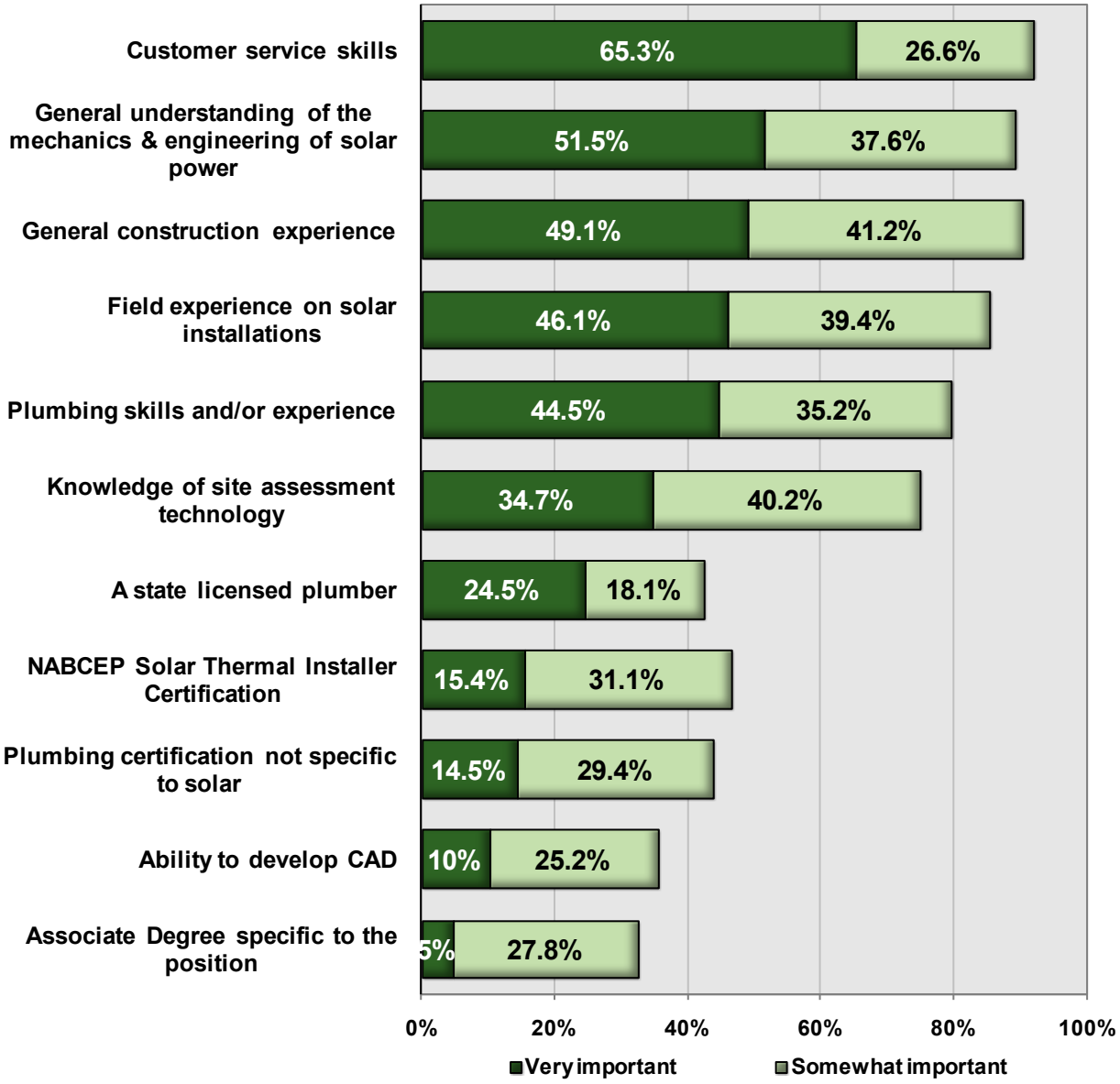
- Firms show preference for informal on-the-job training
- Over half use customized or existing training programs for their employees



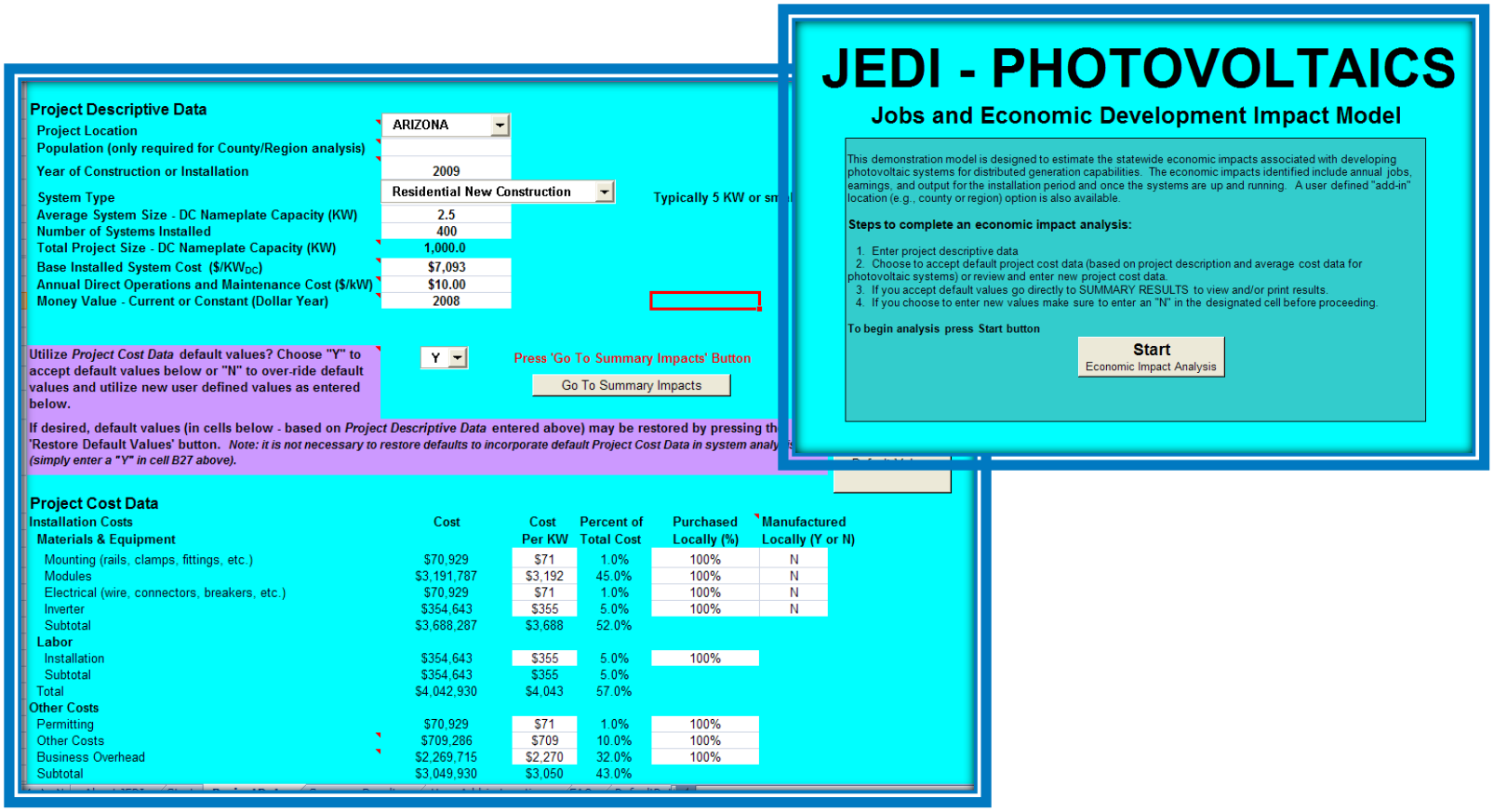
Skills, Areas of Knowledge, and Educational Certifications Needed for Employment at Solar Photovoltaic Installations



Skills, Areas of Knowledge, and Educational Certifications Needed for Employment at Solar Heating or Cooling Installations



What is the PV Jobs and Economic Development Impact Model (JEDI)?

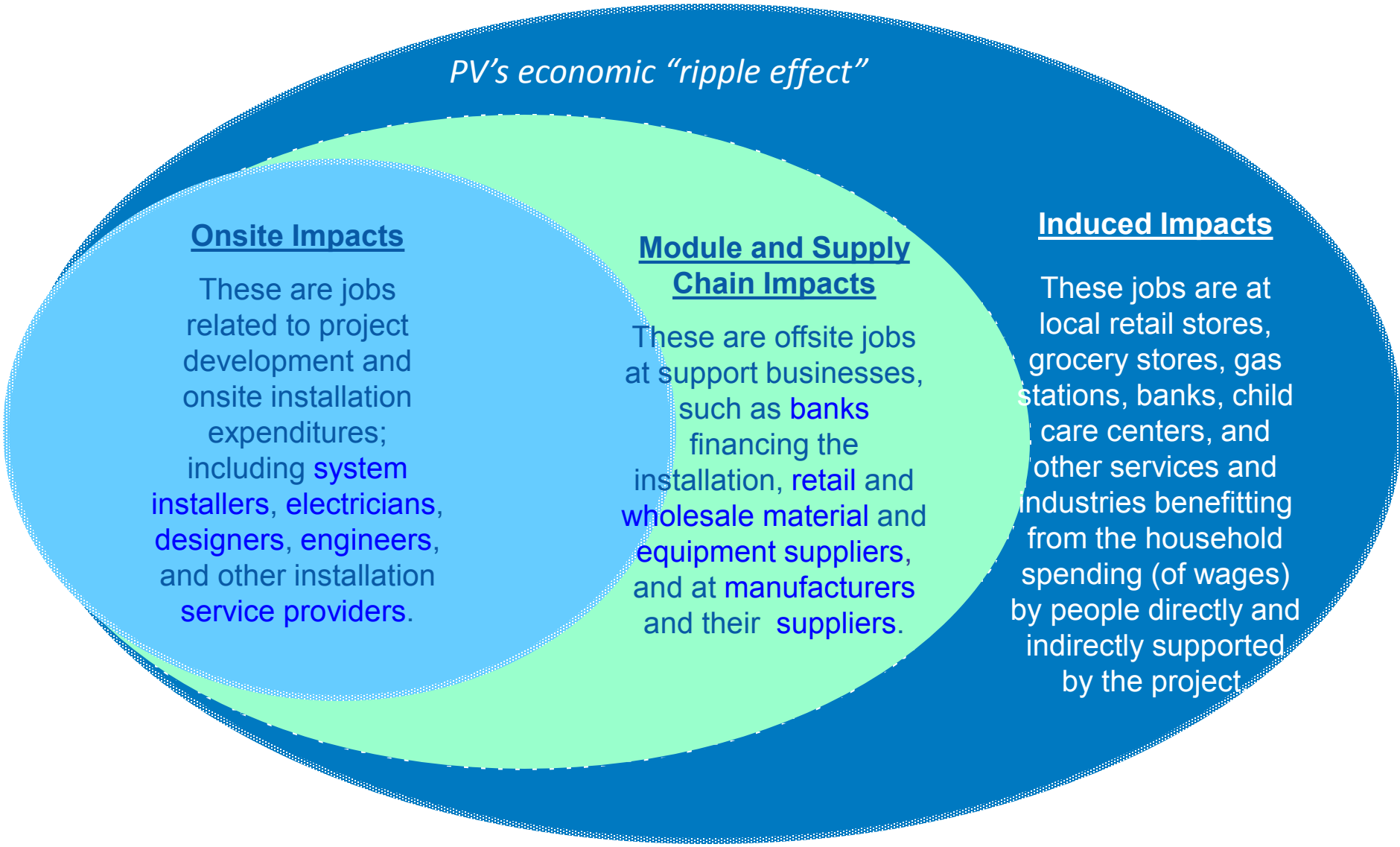


PV JEDI is a web and spreadsheet-based tool designed to calculate local economic impacts associated with the installation and annual operations of photovoltaic systems.

Who Uses PV JEDI?

- Project Developers
- Renewable Energy Advocates
- Resource Planners and Analysts
- Local Planning Depts.
- State and Local Economic Development Commissions
- Researchers (government, university, etc.)

JEDI Photovoltaic Economic Impacts



New Bifurcated Versions of PV JEDI

- PV Project JEDI – Used for assessing jobs and economic impacts at the project level. This year a web-version was created at https://jedi.nrel.gov/.

- PV Scenario JEDI – Will be released later this year. Models state or regional-level jobs and economic impacts over a multi-year target period for an entire policy or market size. Spreadsheet version only.

PV Project JEDI User Inputs

Minimum Information

Location (State or County*)

Year of construction

System Type

- Residential New
- Residential Retrofit
- Small Commercial
- Large Commercial
- Utility-Scale

Size of PV system (KW)

*County requires additional input-output data

or More Detailed Information

Installation

Materials and Equipment Costs (modules, mounting, electrical, etc.)

Labor Costs

Other Costs (permits, services, overhead, etc.)

Annual Operating & Maintenance

Labor Costs

Materials and Equipment Costs

Other Parameters (Financial, Tax, and Payroll)

PV Project JEDI Summary Results

Project Data

- Project Installation Costs (total and local share)
- Annual O&M Spending
- Debt Payments
- Property Taxes

Impacts

- Construction Period
  - Jobs
  - Earnings
  - Output
- Operating Years (annual)
  - Jobs
  - Earnings
  - Output

PV Scenario JEDI

- Unlike the project version, provides total jobs, earnings, and economic output for an entire market size over a multi-year period.
- There was a prevalent need for a PV model designed for policy planning. Some users were using the Project version for this purpose, though it was not designed for scenario modeling.
- Allows the user to input scenarios in virtually any format, for a proposed policy or projected market scale-up, with start date and target end date, via a drop-down list that includes:
  - capacity (MW),
  - energy (GWh),
  - investment ($m)
  - % retail consumption
  - # of systems

PV Scenario JEDI Decision-Support Resources

- Contains a wealth of new decision-support resources within the model. For example:
  - Solar PV companies by state
  - Tax information
  - Map of U.S. Manufacturing facilities
  - Expected RPS-related build-out by state

Thank You

Barry Friedman
Strategic Energy Analysis Center
National Renewable Energy Laboratory
http://www.nrel.gov/analysis/
Jedi.nrel.gov
Barry.friedman@nrel.gov