



Solar Power & Utilities: Today and Tomorrow

Presentation at the Nova Scotia Power Customer Symposium 2015



Outline

- Solar Power in the News: the World of Solar Today
- Global Solar Mega-Trends: Policies, Prices, Capacities
- Solar Power in Canada: Evolution in Leadership
- Solar Power: what is in it for Nova Scotia?
- Distributed Solar and Utilities: Today and Tomorrow

In the News: the World of Solar Today

Solar at grid parity in 80% of world by 2017:

- The analysis, completed by the University of Cambridge and PwC, finds solar photovoltaic power is expected to reach grid parity in 80% of countries in the next two years.
- A new report produced for NBAD, a leading Middle Eastern bank, finds "solar PV systems are now at or approaching retail electricity prices in many markets, across both residential and commercial user segments."

*The National Bank of Abu Dhabi (NBAD): Financing the Future of Energy Report
March 2, 2015*

In the News: the World of Solar Today

"The next shale": How solar is poised to transform America's energy markets

- A new study says the solar boom is coming faster than many think
- Plummeting module prices and rising module efficiencies are driving a solar boom so big it may face only one obstacle: Its own success.



Wood Mackenzie, Edinburgh/Singapore/Houston, February 2, 2015

In the News: the World of Solar Today

Utility-scale Solar Has All-time Best Year with over 3.7 GW Installed in 2014

- According to SNL Energy's latest report, with more than 3.7 GW installed, 2014 was the best year yet for utility-scale solar installations, besting the nearly 3.4 GW installed in 2013 by 10% and bringing the U.S. to a total of 10.6 GW of operating utility-scale solar capacity.

SNL Energy, February 25, 2015

<https://www.snl.com/InteractiveX/Article.aspx?cdid=A-31247037-12340>

In the News: the World of Solar Today

Google commits \$300M to SolarCity residential funding program

Apple commits \$848M to California solar

Duke Energy is buying one of the largest U.S. commercial solar developers:

- Duke's \$225 million fund will ready commercial solar for a post-ITC market

REC Solar's Boulder Cowdery Meadows array
Credit: REC Solar (used with permission)

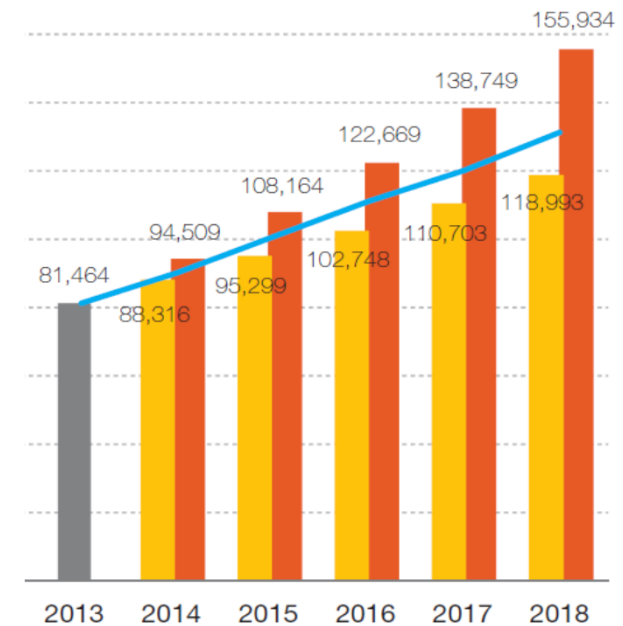


Pacific Gas and Electric (PG&E) has announced a new solar program: customers can pay an estimated \$0.02 to \$0.03 per kwh extra to guarantee their electricity is sourced from solar energy

In the News: the World of Solar Today

The photovoltaics market is expected to grow from **\$89.52** billion in 2013 to **\$345.59** billion by 2020, at a CAGR of 18.30% between 2014 and 2020.

- In terms of geography, APAC held the major market share at 53.25% in 2013, followed by Europe at 23.52%.

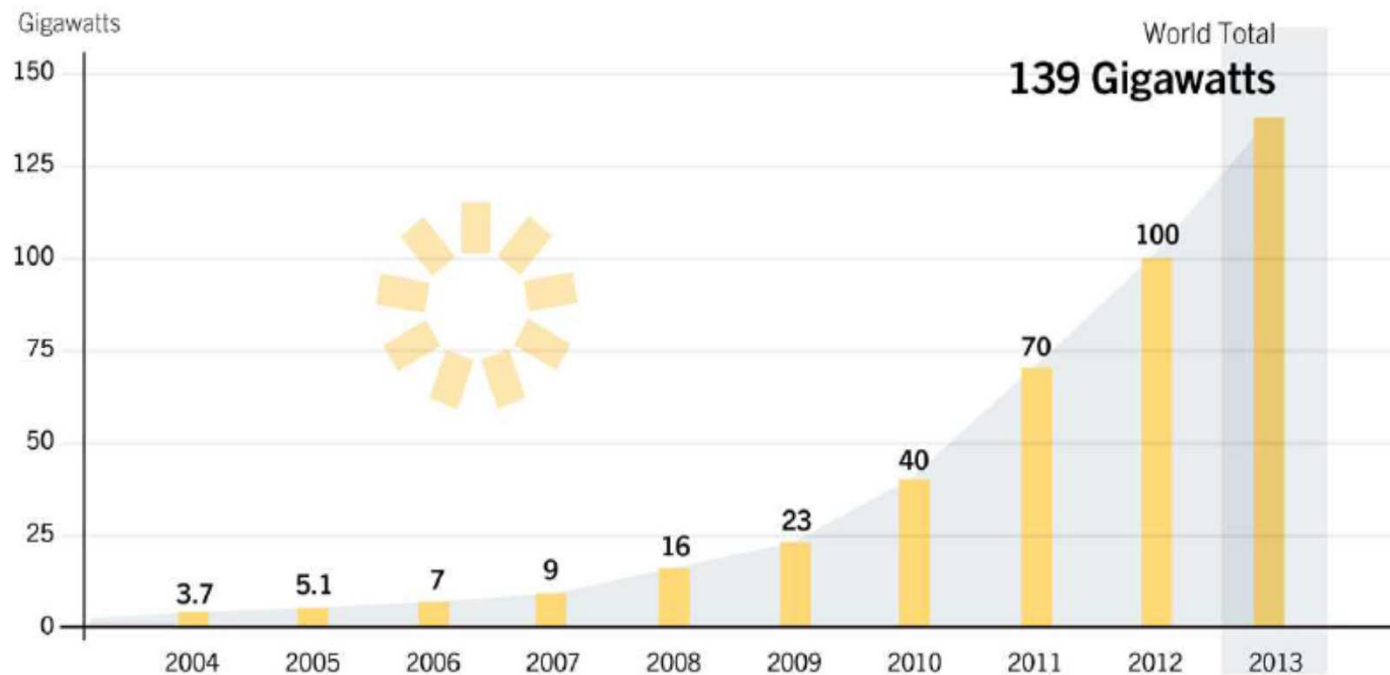


EPIA 2014: European cumulative PV market scenarios

*marketsandmarkets.com PV report
Publishing Date: February 12, 2015*

Global Solar Mega-Trends: Total Global Capacity

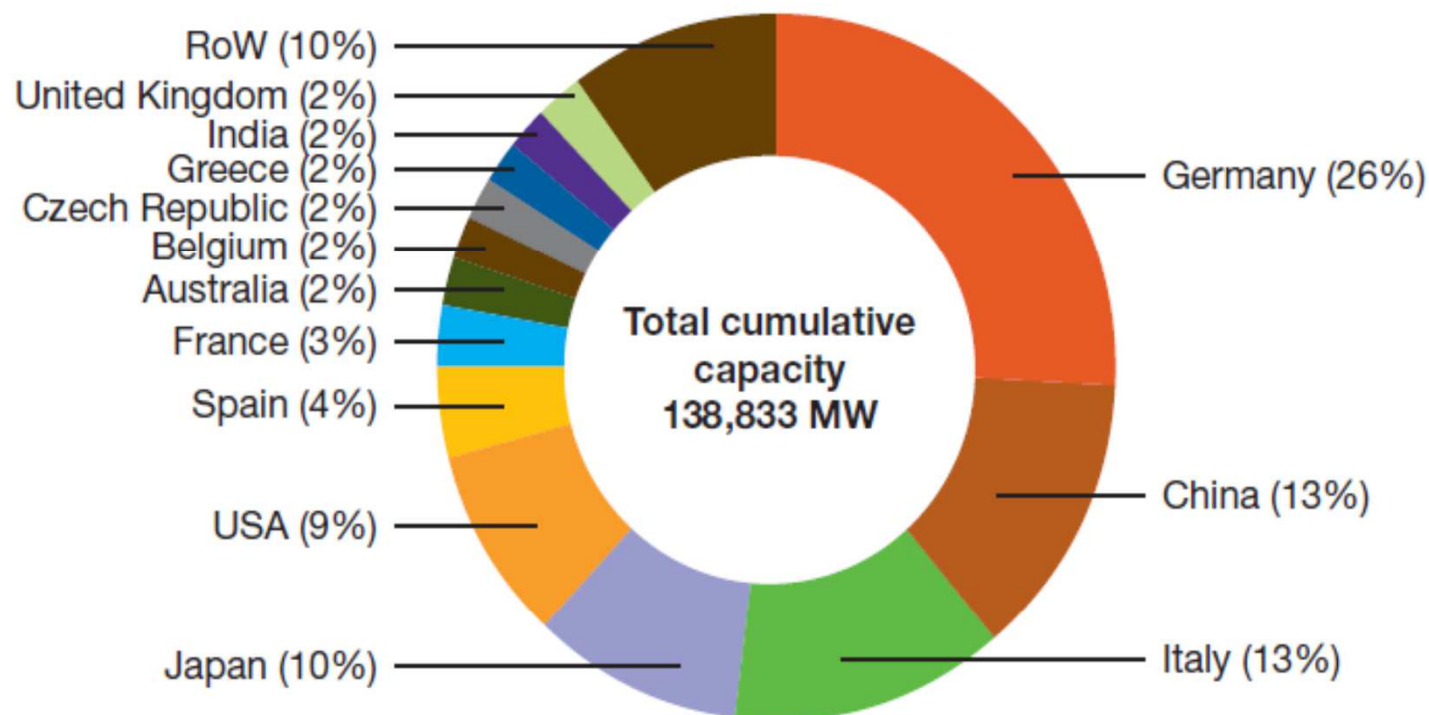
Solar PV Total Global Capacity, 2004–2013



REN21. 2014. *Renewables 2014 Global Status Report* (Paris: REN21 Secretariat).



Global Solar Mega-Trends: Global Capacity by Share



Methodology used for RoW data collection has changed in 2012.

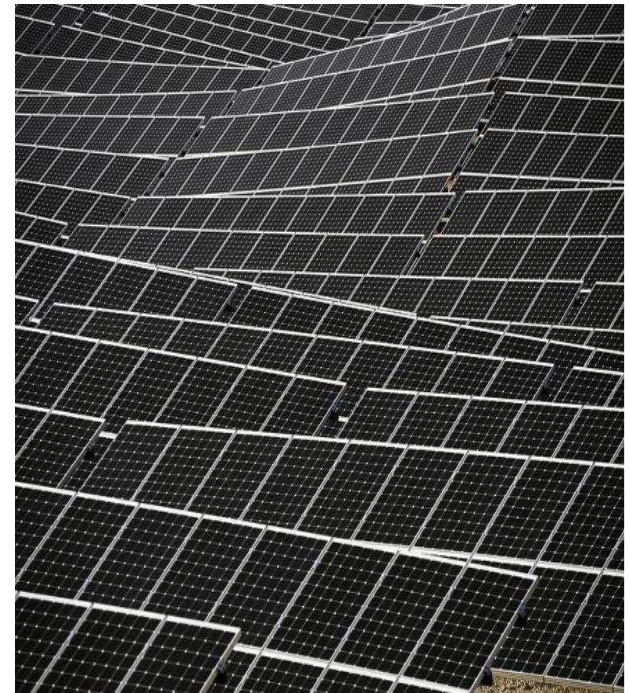
EPIA Global Market Outlook for Photovoltaics 2014-2018

Global Solar Mega-Trends: Growing Capacity in China

China to install 15 GW of photovoltaic (PV) capacity in 2015

- According to the National Energy Administration, China will aim to install 15 GW of photovoltaic (PV) capacity this year, which seven GW will be allocated to distributed generation (DG) solar arrays, at least 3.15 GW of which will be installed on building rooftops.

Jan 28, 2015 (SeeNews) citing the National Energy Administration (NEA).



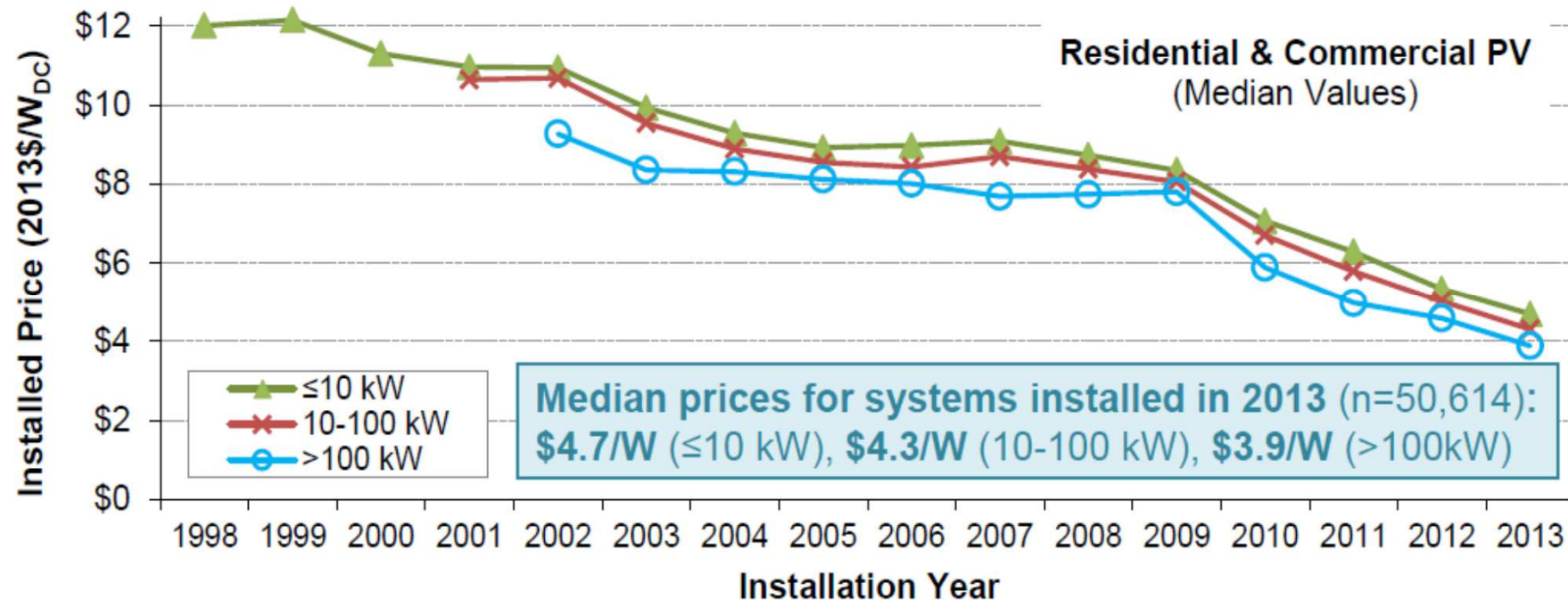
Solar PV plant. Featured Image: Gilles Paire/Shutterstock.com

Global Solar Mega-Trends: Solar Modules Pricing

History and Forecast exemplify continuing trends but different drivers



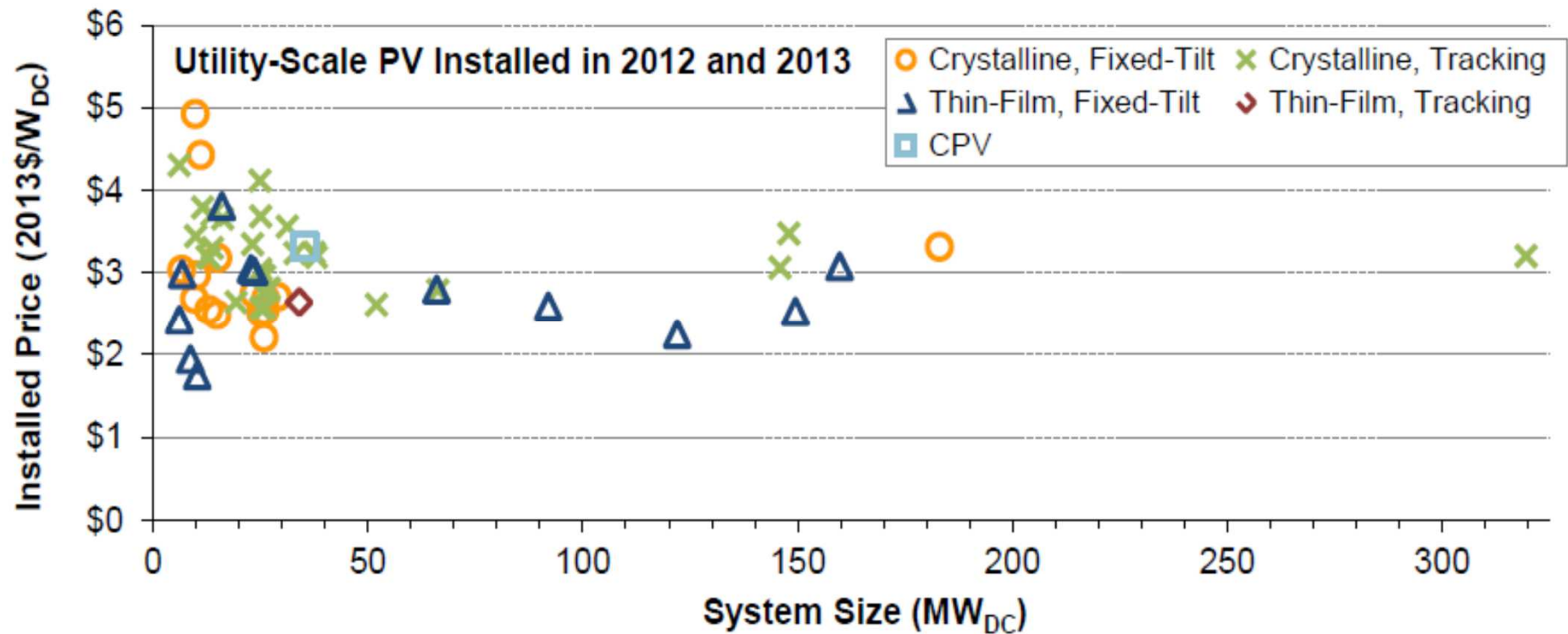
Global Solar Mega-Trends: Installed Prices Continued Their Precipitous Decline



Source: Lawrence Berkley National Laboratory 2014

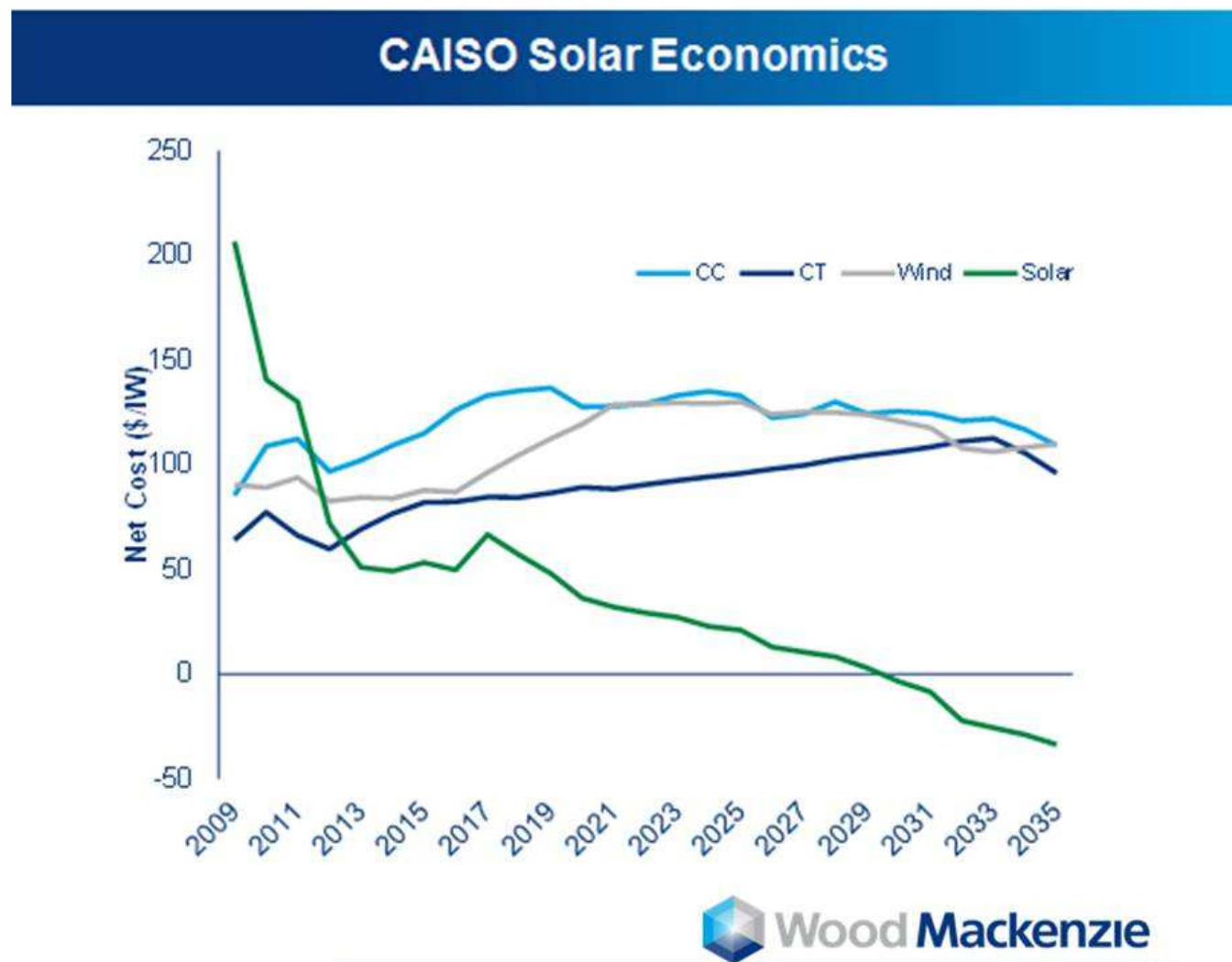
Global Solar Mega-Trends: Utility-Scale Projects

Installed Price



Source: Lawrence Berkley National Laboratory 2014

Global Solar Mega-Trends: Solar Power Costs



Global Solar Mega-Trends:

Third-Party Ownership (TPO) for Solar

SolarCity Introduces MyPower, a First-of-its-Kind Solar Loan Paid Back by the Sun

“Solar installation at no additional cost and immediate utility savings just like a standard Power Purchase Agreement, but now you own it”



Global Solar Mega-Trends: Community Shared Solar

U.S. Dept of Energy is going big on community shared solar

- “Utility participation is going to be transformational. The perceived resistance to solar from utilities is really not there when you talk about aggregating consumers on larger projects to get economies of scale and siting near substations or distribution feeders to reduce interconnection issues.” *Minh Le, SunShot Director*

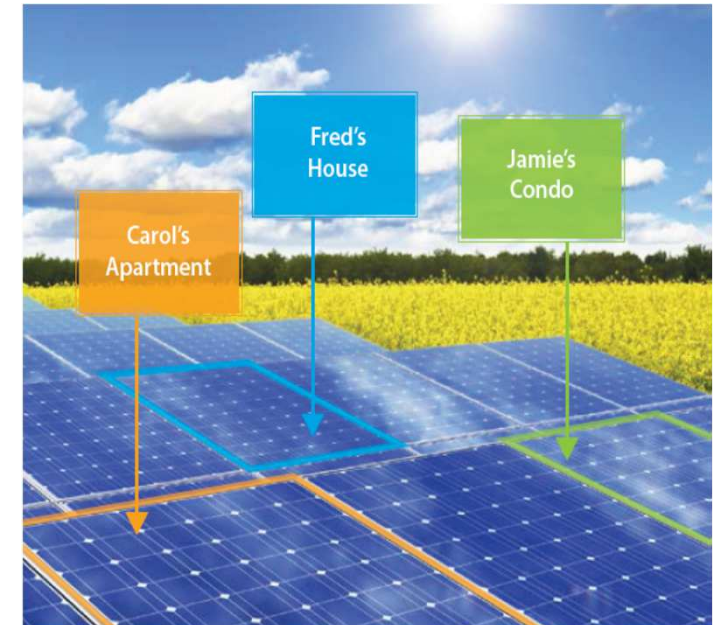


Photo by iStock, 2809987

Global Solar Mega-Trends: Utility-led Community Solar

Expanding Solar Access Through Utility-led Community Solar

- Utilities across the United States are taking a leading role in the spread of community solar projects aimed at expanding access to clean power for customers who, for a variety of reasons, may not want or be able to install solar panels on their roofs. Community solar programs initiated by utilities constitute 87 percent of the projects now online.



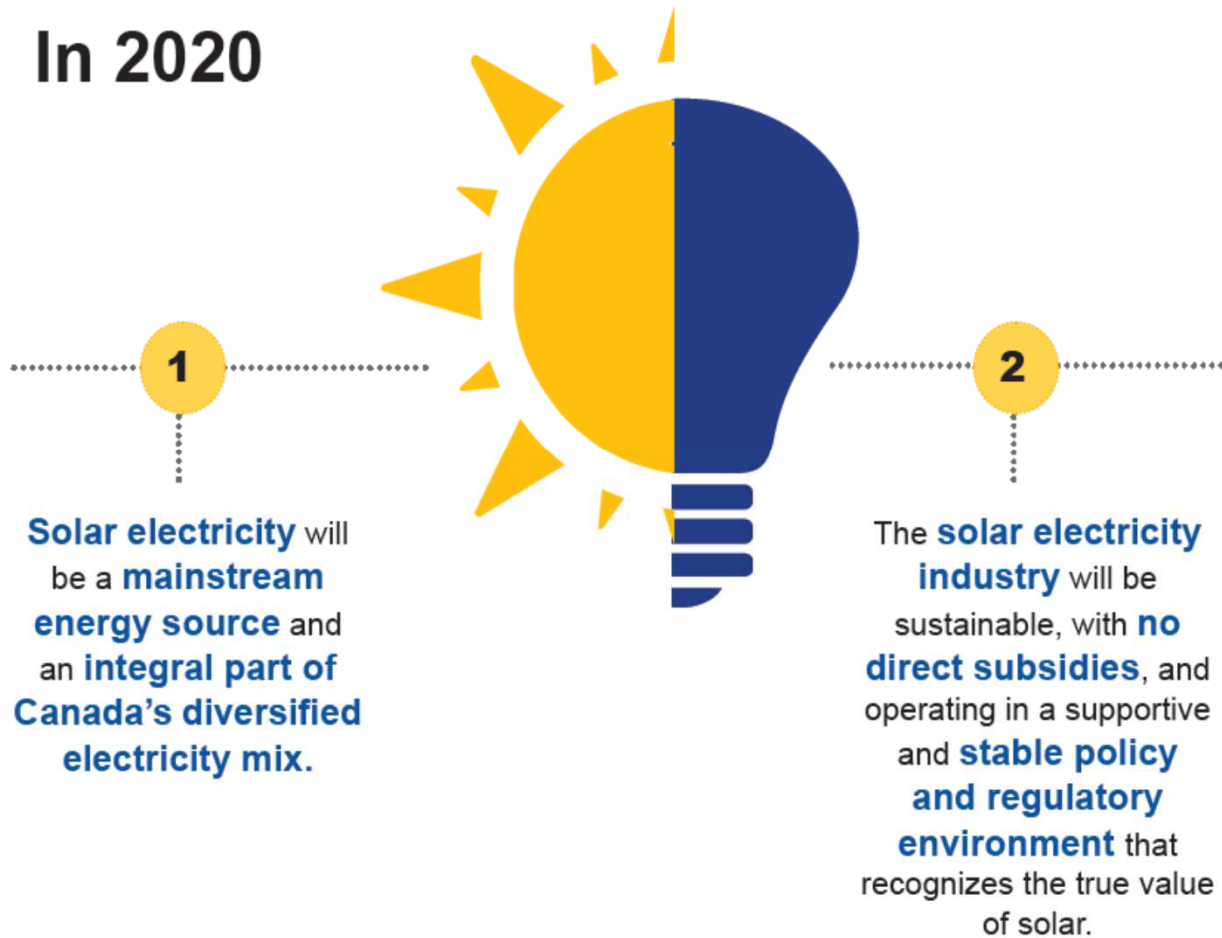
14 • EPIA • GLOBAL MARKET OUTLOOK
FOR PHOTOVOLTAICS 2014-2018

Global Solar Mega-Trends: Yieldcos

- A growing trend in the renewable-energy industry to pool projects into publicly traded entities that offer shareholders payouts
- Companies that build power plants, sell completed projects to their yieldco affiliates and use that capital to fund new power plants.
- (Bloomberg) -- First Solar Inc. and SunPower Corp., the two largest U.S. solar-panel manufacturers, are planning a joint venture that will own and operate some of their projects.
- (SunEdison) The SunEdison/TerraForm purchase of First Wind demonstrated the power of the YieldCo financial product.

Solar Power in Canada: CanSIA ROADMAP 2020

In 2020



CanSIA ROADMAP 2020:

Powering Canada's Future with Solar Electricity

By 2020 solar electricity will:



Produce approximately **1%** of electricity generation in Canada, with almost **6,300 megawatts (MW)** of installed capacity.

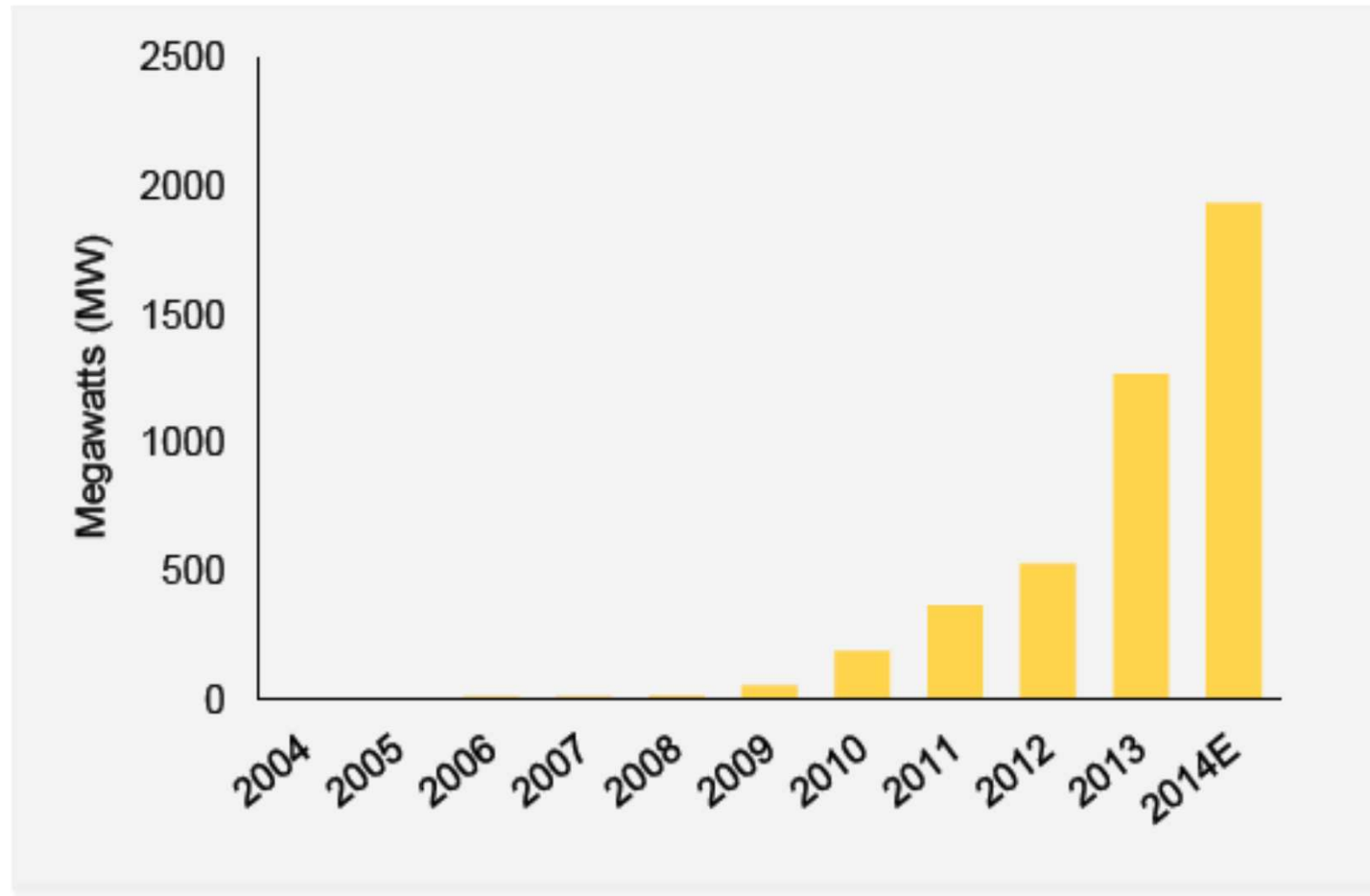


Create approximately **65,000 job-years**, employing a labour force of approximately **10,000 people per year**, with the majority in construction and manufacturing, followed by operations and maintenance jobs.



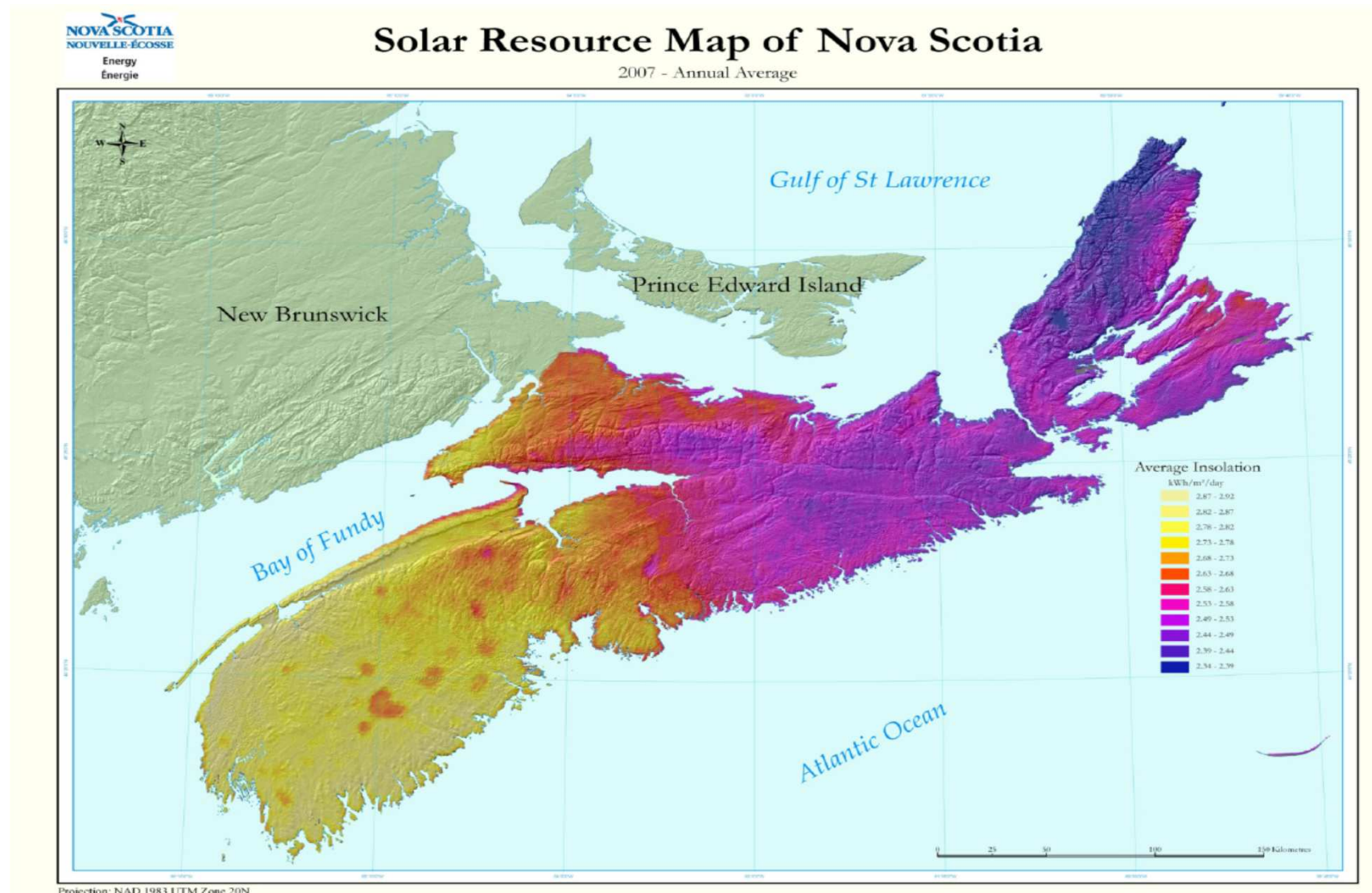
Displace approximately **1.5 million tonnes** of greenhouse gas (GHG) emissions per year, the equivalent of removing **250,000 cars and trucks off the road each year**.

Solar Electricity Capacity in Canada



Source: International Energy Agency, CanmetENERGY & CanSIA

Solar Resource in Nova Scotia



Source: Green Power Labs 2007

Distributed Solar and Utilities: Business Models in Works

.....Utilities invest in residential solar outside of their regulated territory. Much like a utility invests in centralized power plants or wind farms, it can invest in many rooftop solar installations. The advantage is that the utility now has a relationship with a new customer to whom it can sell additional services.

.....A utility owns distributed solar assets in its own territory and earns a return as it would on other investments.

The utility could purchase solar from an independent power producer and resell it to the consumer at a profit in some cases. The utility has a low cost of capital and is a trusted and known brand compared to solar installers or financiers

.....Utility offers solar as part of a “value-added service model”

Solar is a “gateway” to upsell other technologies, such as EV charging stations or smart thermostats.

.....

Source: greentechsolar

Distributed Solar and Utilities: Today and Tomorrow

	Stage 1: Cross-Functional Teams	Stage 2: Dedicated Renewables Energy Group(s)	Stage 3: Full Integration of Renewables
	Collateral accountabilities for staff	Core accountabilities for staff	Renewables are treated as a normal part of business operations
Market Profile	- Limited number of distributed interconnections - Utility-scale renewables used to meet RPS policies	- Critical mass and strong growth in distributed generation - Utility-scale renewables used to meet RPS policies	- Significant penetration of distributed generation - Utility-scale renewables competitive with other sources of new generation
Typical Drivers	- Minimal distributed generation interconnection requests - Limited utility-scale PPAs or capacity connected to the grid	- Growing or strong potential for distributed generation - Existence of a variety of utility-scale renewable energy PPAs and/or interconnections	- A critical mass of distributed generation or utility-scale renewables are connected to the grid - Renewables growth may begin to slow, allowing focus on operations
Utility Experience	- Secures and manages PPA contracts for utility-scale renewables - Outsources O&M responsibilities	- Leverages lessons from operational experience; include in strategic planning - Owns and operates renewable assets	Explores opportunities to improve operations (e.g., O&M) of utility-owned assets
Renewables Organization	Utility incorporates renewable functions into work flow of existing functional teams to solve tactical needs in reactive approach	Utility establishes core teams dedicated to distributed and/or utility-scale renewables	Utility manages renewable capacity similar to other generation assets

Source: Solar Electric Power Association, September 2014



Thank You

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