

Game change technology comes to British Columbia

# Brilliant Future of Solar



District of Summerland - Community Conversation - Solar Energy

Presentation by Ron Percival, Bench Consulting Inc., February 16, 2017

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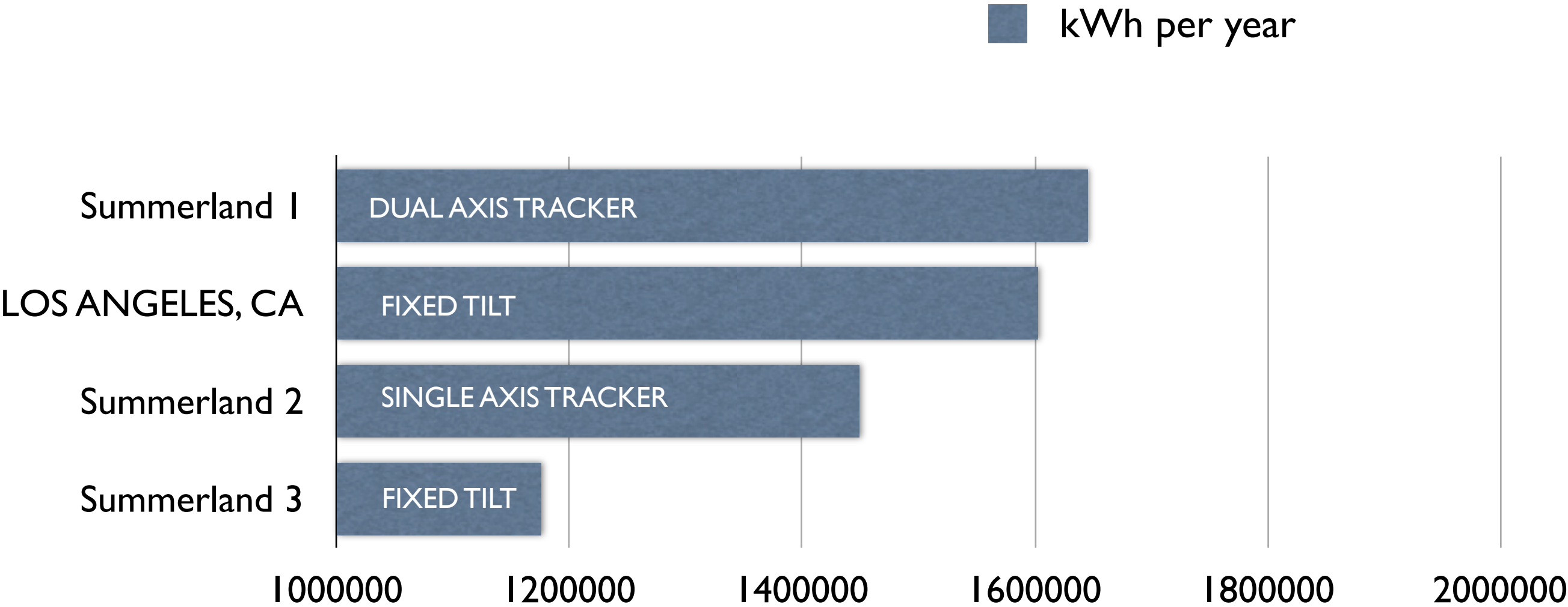
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# Summerland - the next Los Angeles?

Chart of annual **power production** from a **1 MW Solar PV Project** modelled in Summerland and Los Angeles, California using different solar panel mounting technologies.

Summerland beats LA when using NEW TECHNOLOGY but **identical number and quality of solar panels**.



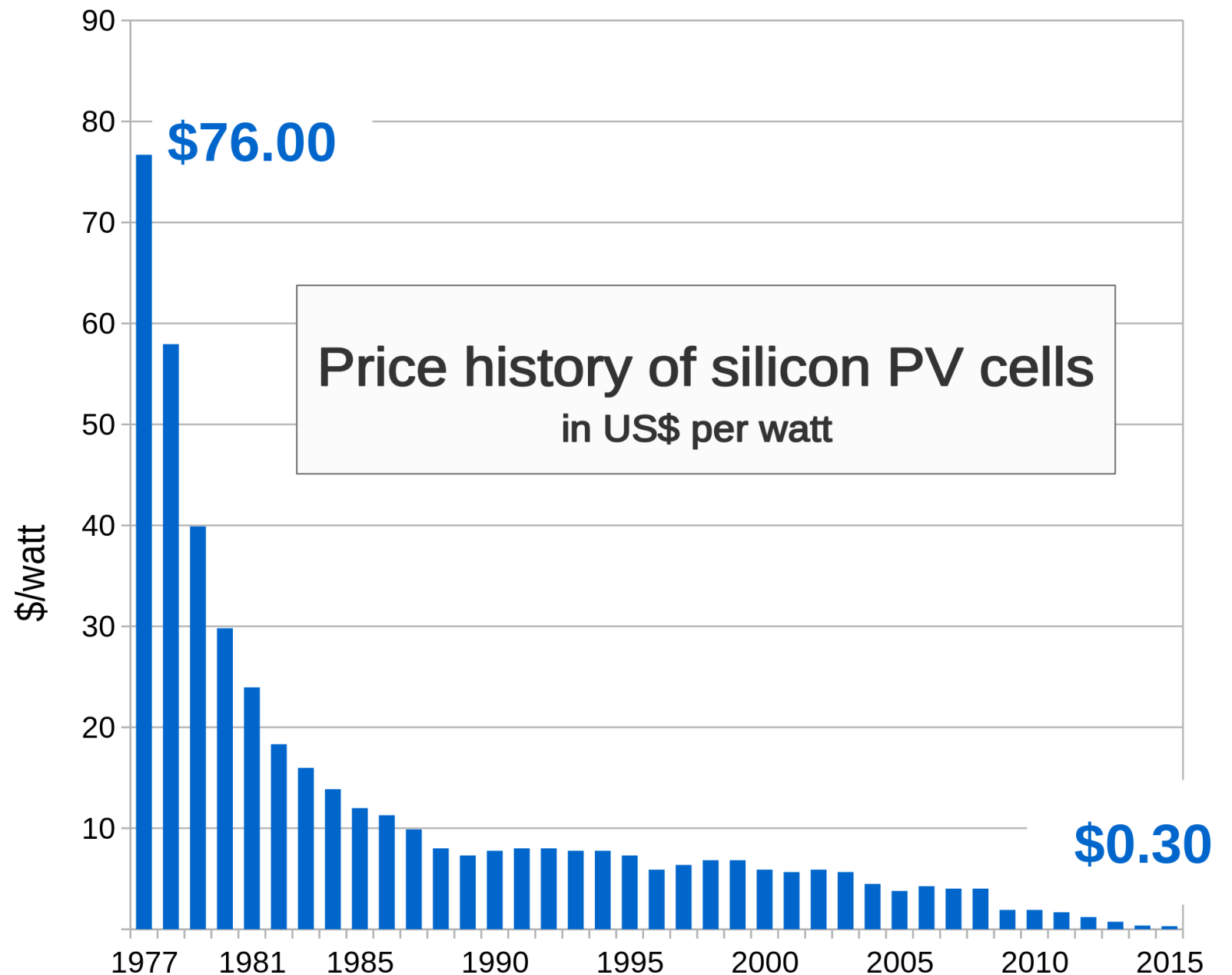
# Growth of Solar

Solar is fastest growing power sector in North America and globally, and is changing the way North American utilities and grid systems operate.

Cost of solar is falling - *dramatically*. Since the 1970's, the cost of solar has dropped by a factor of 250x.

There are more people working in US solar today than oil/gas or windpower.

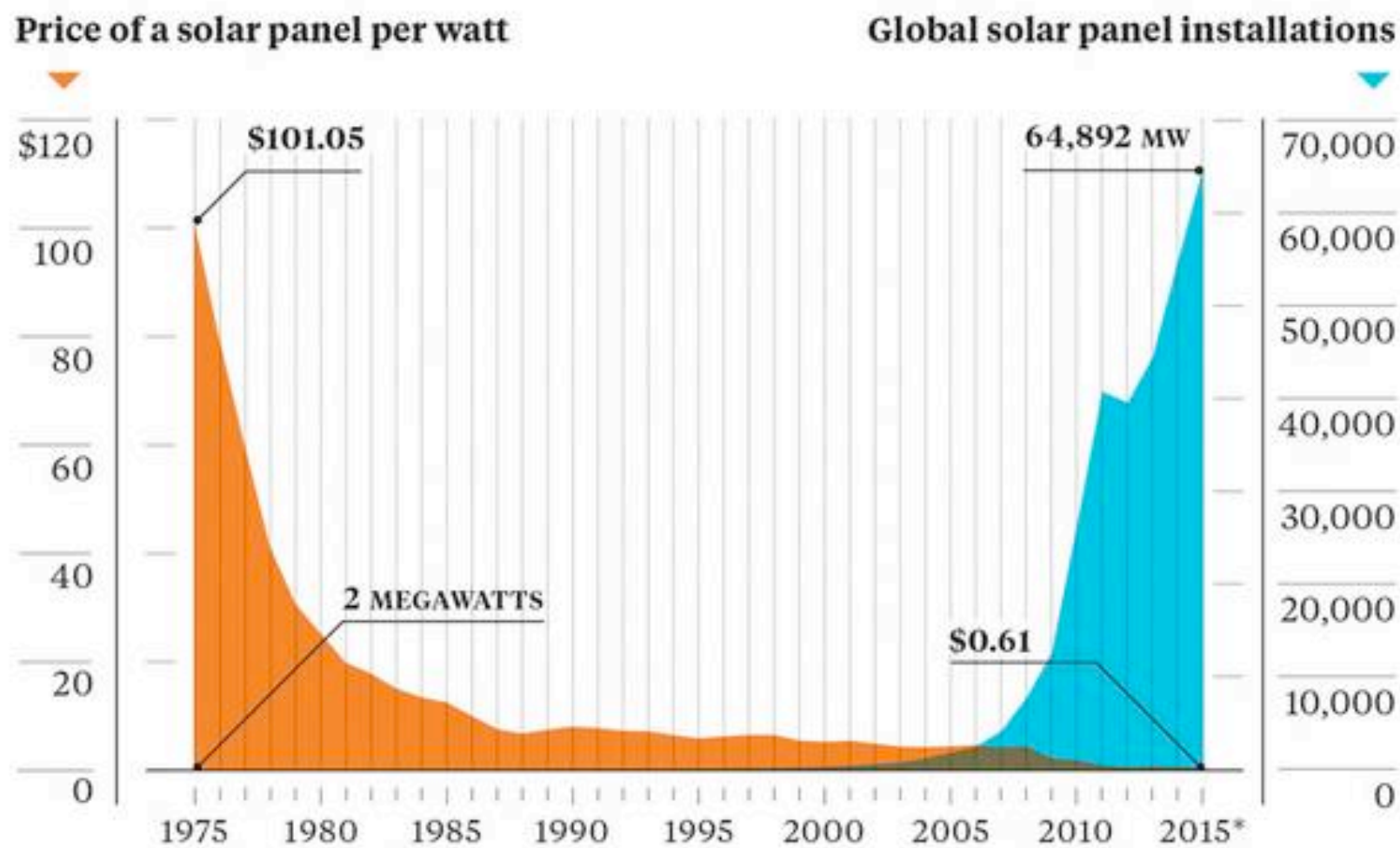
US development forecast is an additional \$78 Billion of new solar investment by 2020.



Source: Bloomberg New Energy Finance & [pv.energytrend.com](http://pv.energytrend.com)

# One chart says it all

From a global perspective, the chart below illustrates that until about 10 years ago the aggregate capacity of all solar PV installed on the planet was insignificant. The tide turned after 2005. The falling price of solar PV per watt (in orange) crossed the economic cost pivot point - and installations (in blue) exploded upwards.



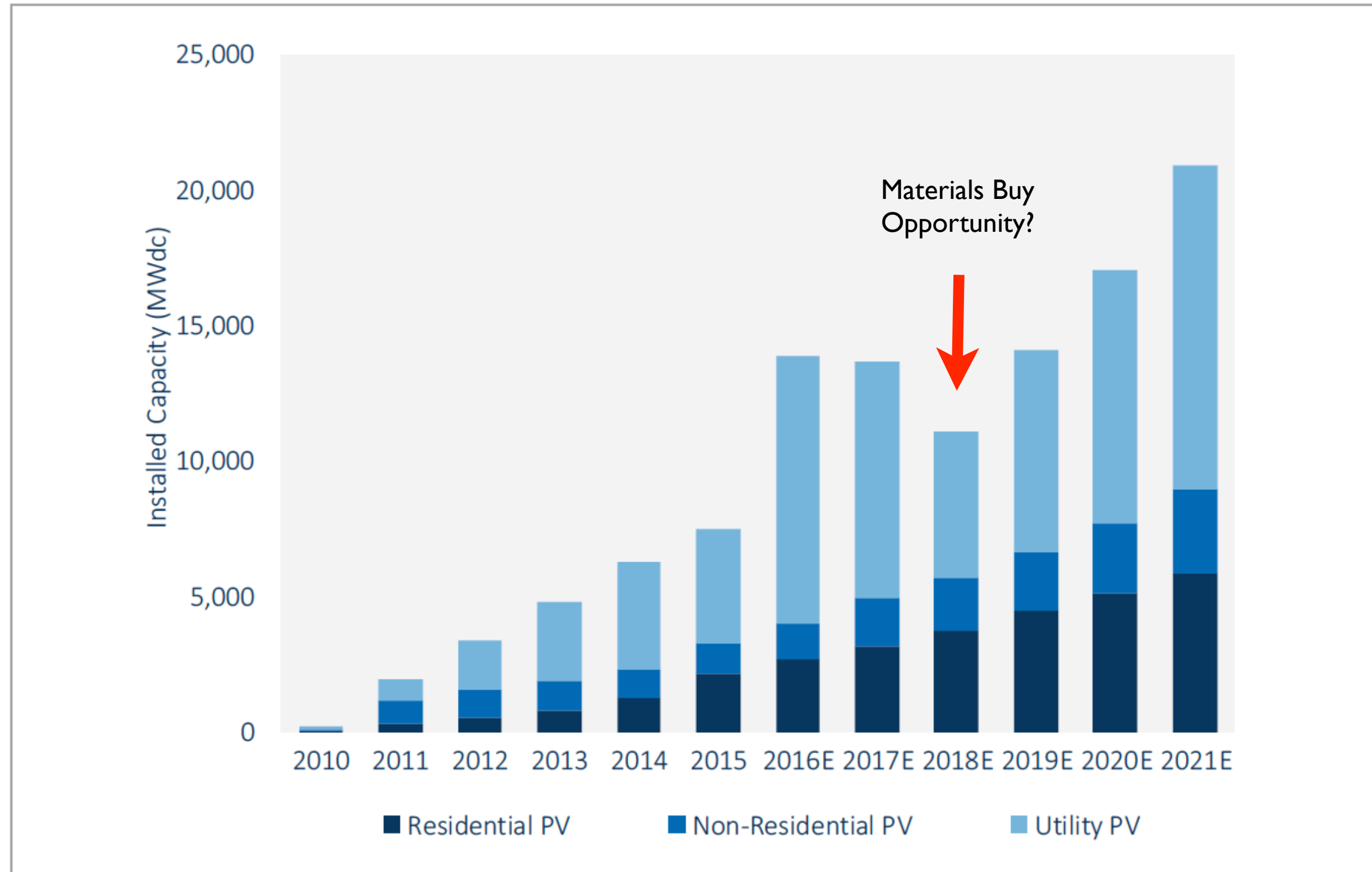


# US solar market grew 95% in 2016, Smashes records

- In its biggest year to date, the US solar market nearly doubled its annual record, topping out at 14,626 megawatts (MW) of solar PV installed in 2016. That's a game change 95 percent increase over the previous record of 7,493 megawatts installed in 2015.\*
- For the first time ever, U.S. solar ranked as the No. 1 source of new electric generating capacity additions on an annual basis. In total, solar accounted for 39 percent of new capacity additions across all fuel types in 2016.
- More than 260,000 Americans now employed in solar - more jobs than coal, oil and gas.
- U.S. is now home to more than 1.3 million solar PV installations, with a cumulative capacity of over 40 gigawatts. That's 40,000 MW - or almost 10,000 times BC's estimated installed solar capacity of about 4 MW's.
- Global installed capacity now 300 GW, or 300,000 MW, or about 60,000 times BCs installed solar capacity.
- Is BC missing the boat?

*\*Source: GMT Research and SEIA, Feb. 15, 2017*

# U.S. solar growth forecast is sunny



GMT Research sees another 5,000 MW installed in US by 2021

# Solar growth drivers

- **FALLING COST:** Cost of all solar components dropping dramatically year on year. According to Bloomberg, solar now cheaper than coal, gas and even wind power in emerging markets like China and India. In the U.S., utility scale solar cost already achieving \$1/watt installed in some US markets.
- **TECHNOLOGY IMPROVEMENTS:** Sun “tracking” solar mounting systems (racking) make solar in Northern Latitudes cost competitive with other renewables. Improvements in panel efficiencies and performance life. Investments in storage technologies. Tesla Giga-Factory in Nevada will be the largest factory in the world, employ 6,500 people and produce 5,000 MWh of batteries annually.
- **GLOBAL MANUFACTURING EXPLOSION:** Global solar panel manufacturing capacity expansions of 50,000 MW were announced in 2016. The new factory expansions are in China, India, South Korea, Malaysia and elsewhere. New and additional manufacturing capacity creates competition. Competition creates greater efficiencies and even lower costs.

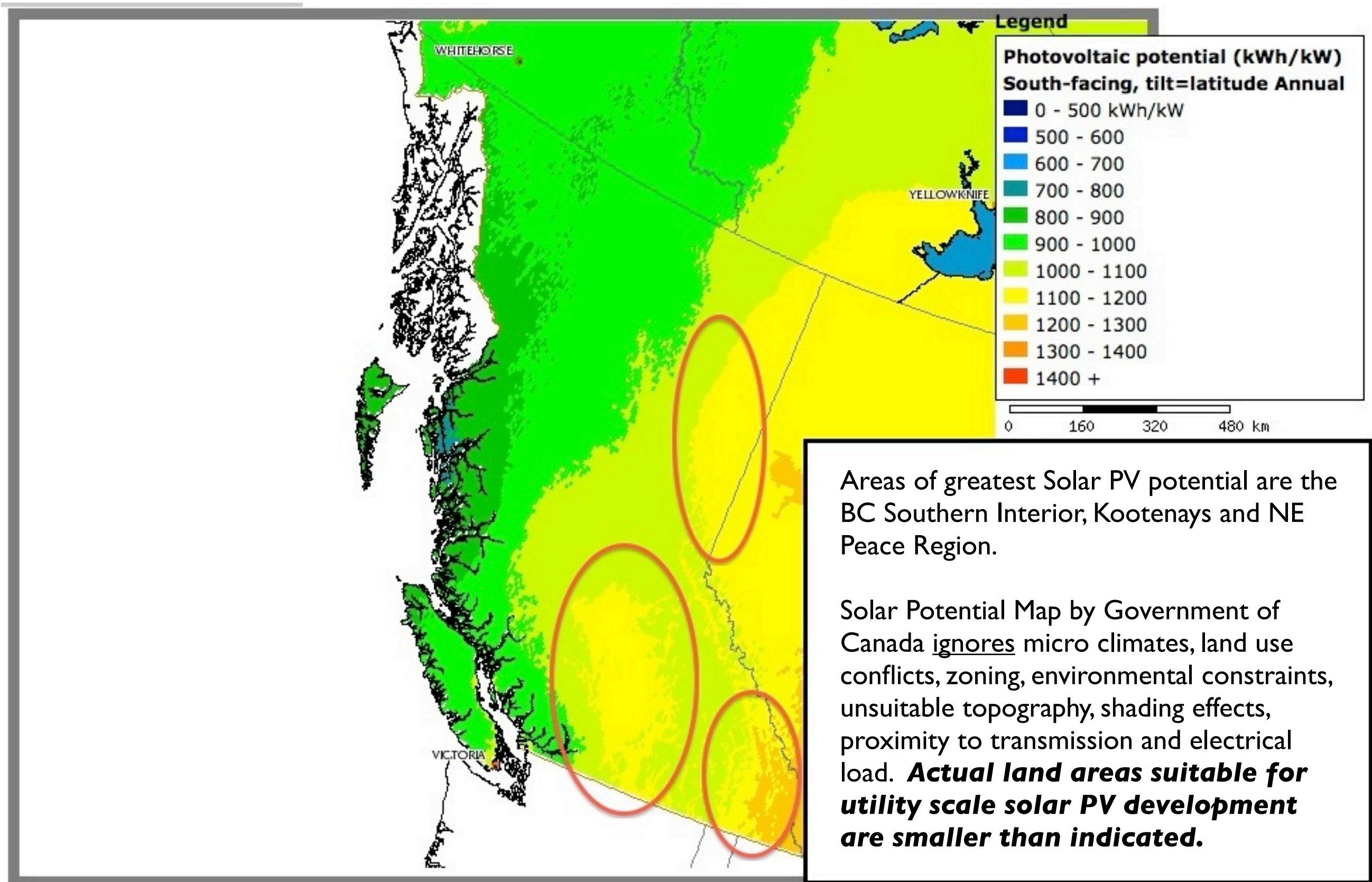
During the years the BC Hydro Site C Dam is under construction, the **total surface area** of solar panels manufactured annually is expected to grow globally - **by 600%**. Surface area of manufactured panels are forecast to expand from about 140 million sq/m annually in 2015 - to become 856 million sq/m annually by 2024. (1)

**That's 856 square kilometers of solar glass panels manufactured, shipped, sold and installed annually by 2024.**

(1) Solar PV Glass Market Size to Reach \$3.38 Billion by 2024, Report by GrandView Research Inc., May 31, 2016



# BC solar potential map - “high level” view



# Benefits of solar development



- The new model for North American power is locally generated and distributed generation from small projects that serve local communities - instead of large projects and costly transmission infrastructure.
- Solar can serve spring, summer and early fall season peak electrical loads. Time of day service can be extended when combined with battery storage.
- Benefits of local solar include:  
No GHG emissions, no sound, low visual profile and positive public acceptance.
- Solar fits perfectly into the niche of small and mico projects.
- As solar is modular, expansion may be achieved by simply adding more panels.



# Requirements for utility scale ground-mount Solar projects

- On flat graded terrain, direct area land use requirements for solar projects are largely determined by choice of panel mounting system (following slides to discuss).
- On complex terrain, topography can increase land area requirements and pre-determine choice of mounting system.
- Each ground-mount solar project will have unique constraints related to site topography, shading/shadows, transmission interconnection, environmental issues and permitting expectations. These constraints can eliminate all or portions of potential projects.
- Solar ground observations, satellite data modelling, project layout modelling, third-party energy calculations, geotech and other engineering, technical and economic studies are required to achieve the optimum output.



# #1 - Solar Project with Fixed Tilt Mounts

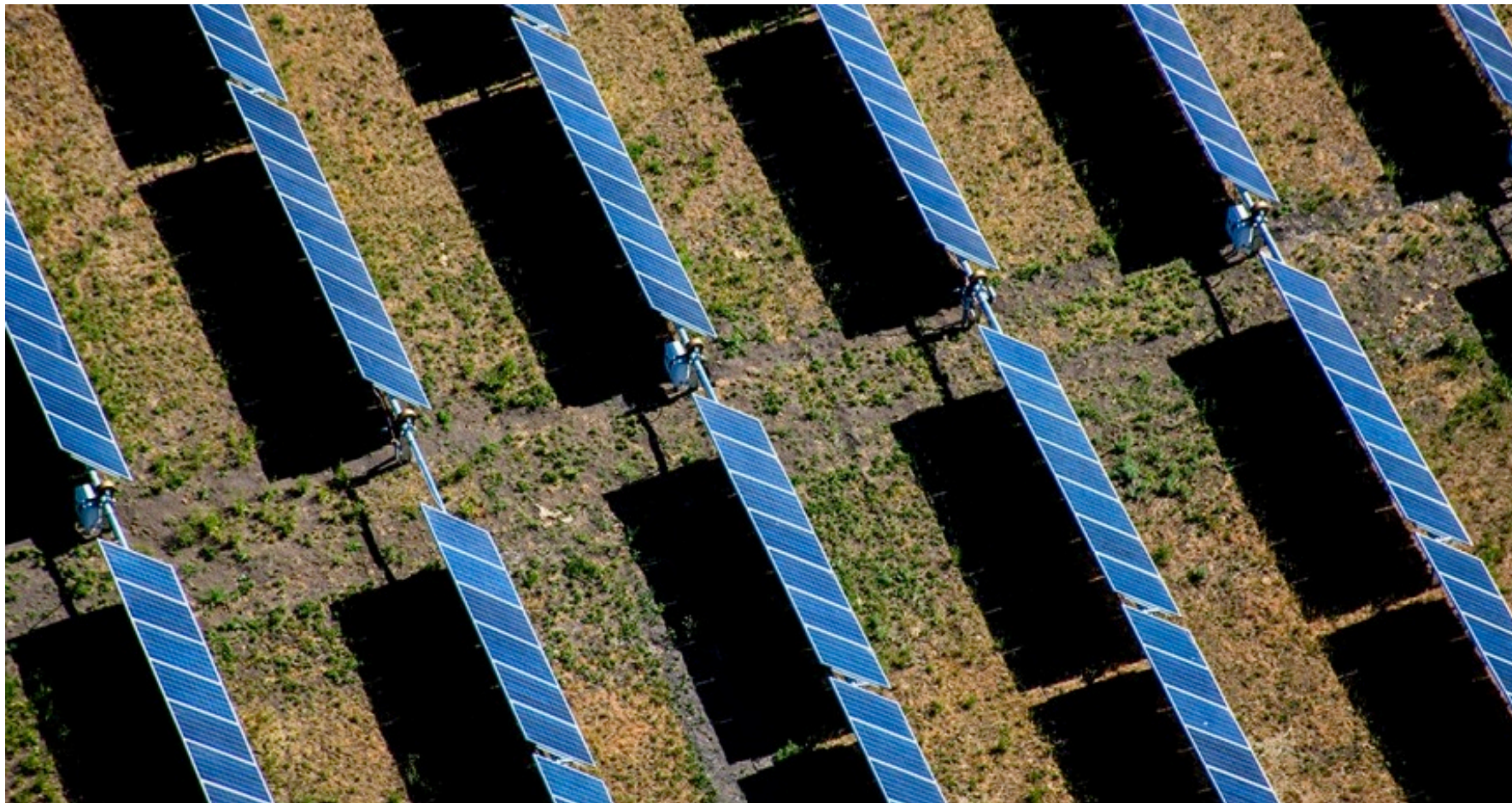
- Most existing solar projects use Fixed Tilt Mounts (Panel Racks). Angle of tilt varies with latitude.
- Fixed Tilt Mount is lowest cost option - and least land use. Typically occupies about 2.25 ha per MW of generation.





## #2 - Solar with Single-Axis Tracking

- Single axis trackers (east-west) mechanically follow the sun east-to-west, but require more land for row separation to avoid shading.
- Racking cost is higher - but may provide up to 25% improvement in project yields vs. fixed mount depending on site. Typically occupies about 2.75 Ha per MW.





## #3 - Solar with Dual-Axis Tracking

- Dual axis trackers (east-west & north-south) use pivoting “solar panel tables” mounted on steel posts. Panel tables track in two directions to capture maximum solar energy.  
Example: Sunmine Solar Project in Kimberly.
- Two axis is most costly racking option and requires slightly more land, but may provide up to about 40% improvement to project yields vs. fixed tilt mount project on some sites.  
Typically occupies about 3 ha per MW.





# Conclusion:

Aside from the significant environmental benefits - falling costs and technology improvements are making rooftop, commercial and utility Solar the world's fastest growing energy option.

***Solar has passed the tipping point. Solar is unstoppable - and represents the future of power generation in BC and globally.***

With support from local, regional and provincial governments, more small solar PV projects will soon develop. Solar will help power BC's bright future for the benefit of all.





# Thank You

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