Encore Learning Presents

Save Money While Combating Climate Change: Sustainable Energy Solutions for Every Household

Presentation 3 of 3

Presenter: Scott Sklar

June 1, 2020

The Stella Group, Ltd.

The Stella Group, Ltd.. is a strategic technology optimization and policy firm for clean distributed energy users and companies which include advanced batteries and controls, energy efficiency, fuel cells, geoexchange, heat engines, microhydropower (including tidal and wave), modular biomass, photovoltaics, small wind, and solar thermal (including CSP, daylighting, water heating, industrial preheat, building air-conditioning, and electric power generation). Scott Sklar serves as Steering Committee Chair of the Sustainable Energy Coalition, composed of the renewable and energy efficiency associations, national environmental groups, and analytical groups, and sits on the national Boards of Directors of the non-profit Business Council for Sustainable Energy and The Solar Foundation, teaches two unique interdisciplinary sustainable energy course at The George Washington University, Scott Sklar was awarded the prestigious The Charles Greely Abbot Award by the American Solar Energy Society (ASES) and on April 26, 2014 was awarded the Green Patriot Award by George Mason University in Virginia, and serves on the US Department of Commerce Renewable Energy & Energy Efficiency Advisory Committee, term ending June 2020

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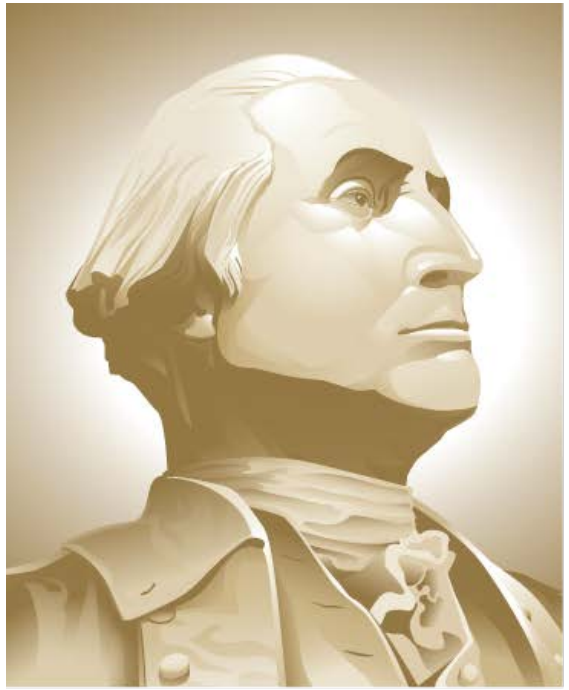

THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

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- **The amount of solar energy that hits the Earth in a single day could power the world for 27 years.**

- The LCOE ("levelized cost of electricity") for solar comes in at $70/MWh, which is about 18 percent less than the LCOE-solar from the first half of 2017. **But this global average price obscures lower costs for solar in certain parts of the world.** For instance, while the global average for solar is $70/MWh, solar in India costs $41/MWh. (For comparison, the price of coal-generated power in India is $68/MWh and $93/MWh for natural gas.)

- In 2017, **solar power attracted more investment money world-wide than any other energy technology**, reaching almost $161 billion, an 18 percent increase compared to 2016.

- **In 2017, solar power generated a third of all newly generated electricity worldwide, and with wind and other renewables provided more than 50%\ of all new electricity generation**

- **California's fleet of large-scale solar power plants has reached a new record peak** on the California ISO grid, hitting 10,411 MW at 10:18 AM on March 5. Solar photovoltaic facilities accounted for the lion's share, peaking at 9,874 MW in mid-morning, while solar thermal hit 557 MW in mid-afternoon.

Renewables Are Now Neck-and-Neck with Gas for New Generating Capacity in 2019:
Federal Energy Regulatory Commission, December 18, 2019

https://www.ferc.gov/legal/staff-reports/2019/oct-energy-infrastructure.pdf

According to the latest issue of FERC's "Energy Infrastructure Update" (with data through October 31, 2019), renewable sources (i.e., biomass, geothermal, hydropower, solar, wind) are rapidly closing the gap with natural gas for new electrical generating capacity added in 2019. For the first ten months of this year, new natural gas capacity added 7,808 MW (with just one MW of new capacity added in October) while the mix of renewables now totals 7,617 MW of new capacity. Renewable sources now account for 21.95% of total available installed generating capacity -- nearly a full percentage point ahead of coal (20.96%) and well ahead of both nuclear power and oil (8.89% and 3.33% respectively). Natural gas, however, dominates with 44.70% of total available capacity. FERC forecasts new wind capacity over the next three years (29,407 MW) to exceed that of natural gas (21,486 MW). New utility-scale solar capacity is projected to total 19,463 MW ... and that does not included distributed (e.g., rooftop) solar systems.

Certain investments in renewable energy property qualify for an ITC. The amount of the credit is determined as a percentage of the taxpayer's basis in eligible property (generally, the cost of acquiring or constructing eligible property). The tax credit rate and other credit parameters depend on the type of property or technology for which the credit is being claimed. Current law for the energy credit is summarized in Table 1.

Table 1. Energy Credit: Summary of Current Law

Eligible Technology	Credit Rate	Expiration Date (End of Year)
Solar, Fiber Optic Solar, Fuel	30%	2019
Cells, Small Wind	26%	2020
	22%	2021
Microturbines, Combined Heat and Power, Geothermal Heat Pump	10%	2021
Solar, Geothermal Energy	10%	Permanent

The solar investment tax credit ("ITC") phase-down:

2019: 30%
2020: 26%
2021: 22%
2022: 10% (*ongoing*)

TSG VA Office

Standardized Interconnections

- 29 States allow DG under IEEE consensus standards which has allowed smart battery banks like GridPoint to enter the market - but we need a national interconnection standard NOW!

EAST SIDE

The Stella Group, Ltd. zero energy office (Arlington, VA)
UniSolar PV, SW Windpower Turbine, ReliOn Fuel Cell, Gridpoint Battery Bank

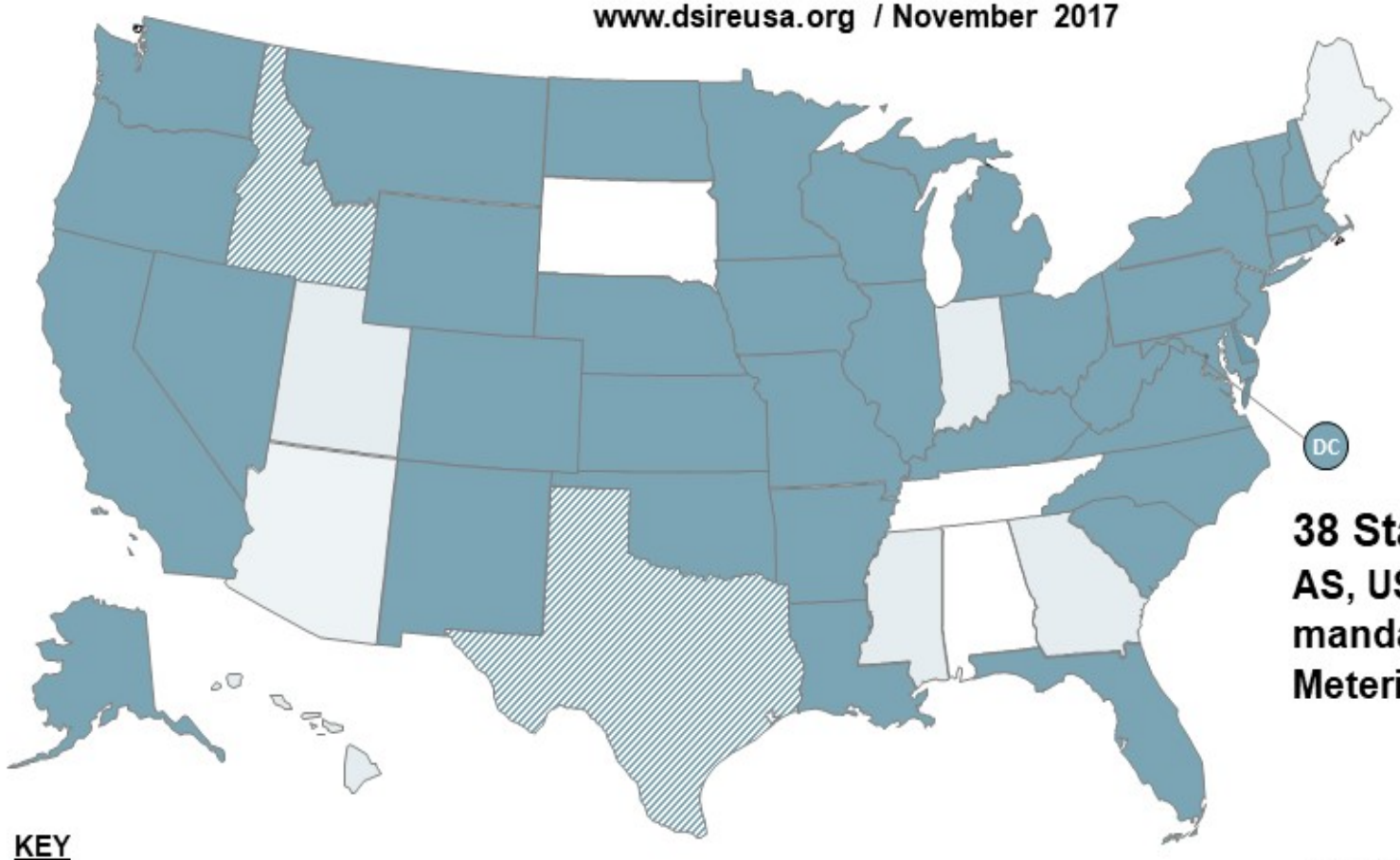
SKLAR (ARLINGTON) 1921 SEARS KIT HOME: solar water heating, geothermal heating & cooling, PV with battery bank, electrochromic glass, LEDs, etc.

PV and SWH (Sklar Home)

SKLAR HOUSE – SOUTH FACE (WEST SIDE OF ROOF)

Net Metering

www.dsireusa.org / November 2017



38 States + DC, AS, USVI, & PR have mandatory Net Metering rules

KEY

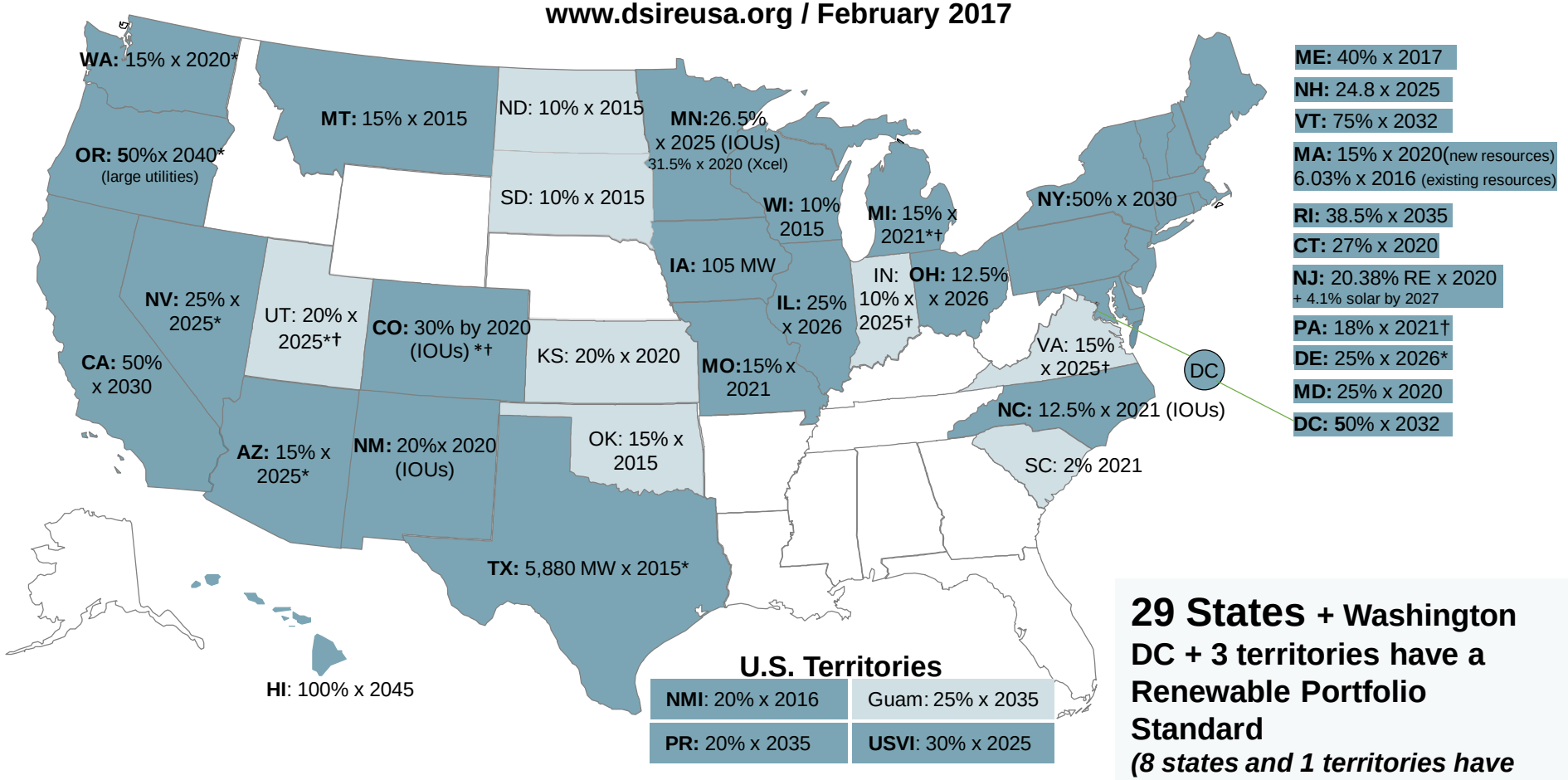
- State-developed mandatory rules for certain utilities (38 states + DC+ 3 territories)
- No statewide mandatory rules, but some utilities allow net metering (2 states)
- Statewide distributed generation compensation rules other than net metering (7 states + 1 territory)

U.S. Territories:

AS PR
VI GU

Renewable Portfolio Standard Policies

www.dsireusa.org / February 2017



ME: 40% x 2017
NH: 24.8 x 2025
VT: 75% x 2032
MA: 15% x 2020(new resources)
6.03% x 2016 (existing resources)
RI: 38.5% x 2035
CT: 27% x 2020
NJ: 20.38% RE x 2020
+ 4.1% solar by 2027
PA: 18% x 2021†
DE: 25% x 2026*
MD: 25% x 2020
DC: 50% x 2032

U.S. Territories

NMI: 20% x 2016	Guam: 25% x 2035
PR: 20% x 2035	**USVI**: 30% x 2025

29 States + Washington DC + 3 territories have a Renewable Portfolio Standard
(8 states and 1 territories have renewable portfolio goals)

Renewable portfolio standard
Renewable portfolio goal

* Extra credit for solar or customer-sited renewables
† Includes non-renewable alternative resources

MONEY MAKES THE WORLD GO ROUND .....

ENERGY SYSTEMS NEED TO BE FINANCED – MOST DO NOT JUST GET PURCHASED, EXCEPT IN SOME RESIDENTIAL and COMMERCIAL PROJECTS – USUALLY BY WEALTHIER CUSTOMERS

SO WHAT ARE THE WAYS ???

1. POWER PURCHASE AGREEMENTS – MEANING THE CUSTOMER SIGNS A LONG TERM CONTRACT FOR THE ELECTRICITY OR HEAT AND THE SELLER BORROWS MONEY OR ACCEPTS INVESTMENT TO BUILD, INSTALL & SERVICE THE PROJECT

2. LEASING – BUYER LEASES AN ENERGY SYSTEM FROM 5 – 10 YEARS AND OWNER THEN TAKES THE SYSTEM, OR LESSOR CAN PURCHASE IT FOR IT'S "RESIDUAL VALUE"

3. SHARED SAVINGS – WHERE SELLERS INSTALLS ENERGY EFFICIENCY OR RENEWABLE ENERGY AT THEIR COST, AND CHARGES THE CUSTOMER FOR HALF THE ENERGY SAVINGS, AND THEY USE THE OTHER HALF PAYMENT TO PAY LOAN AND OBTAIN THEIR PROFIT

- continued –

4. COMMERCIAL PROPERTY-ASSESSED CLEAN ENERGY (**CPACE**) is a financing structure in which building owners borrow money for energy efficiency, renewable energy, C-PACE offers 100% financing of hard and soft costs of eligible energy efficiency, renewable energy, and water conservation measures. That includes associated construction (e.g., roof upgrades associated with solar PV installation). with payment on the property tax bill ...

5. Universities, Schools and Hospitals (**MUSH**) **market** has consisted of some ... industrial (C&I), are attractive to **investors** because of their appealing credit. ... them to hedge against the often volatile wholesale **energy market**. The Municipalities, Universities, Schools and Hospitals (MUSH) market has consisted of some of the most attractive solar project opportunities, and Community Solar.

6. OPPORTUNITY ZONES - **Permanent exclusion of taxable income on new gains.** For investments held for at least 10 years, investors pay no taxes on capital gains produced through their investment in Opportunity Funds (the investment vehicle that makes investments in Opportunity Zones). For capital gains placed in Opportunity Funds for at least five years, investors' basis on the original investment is increased 10 percent. If invested for at least seven years, investors' basis on the original investment is increased 15 percent.

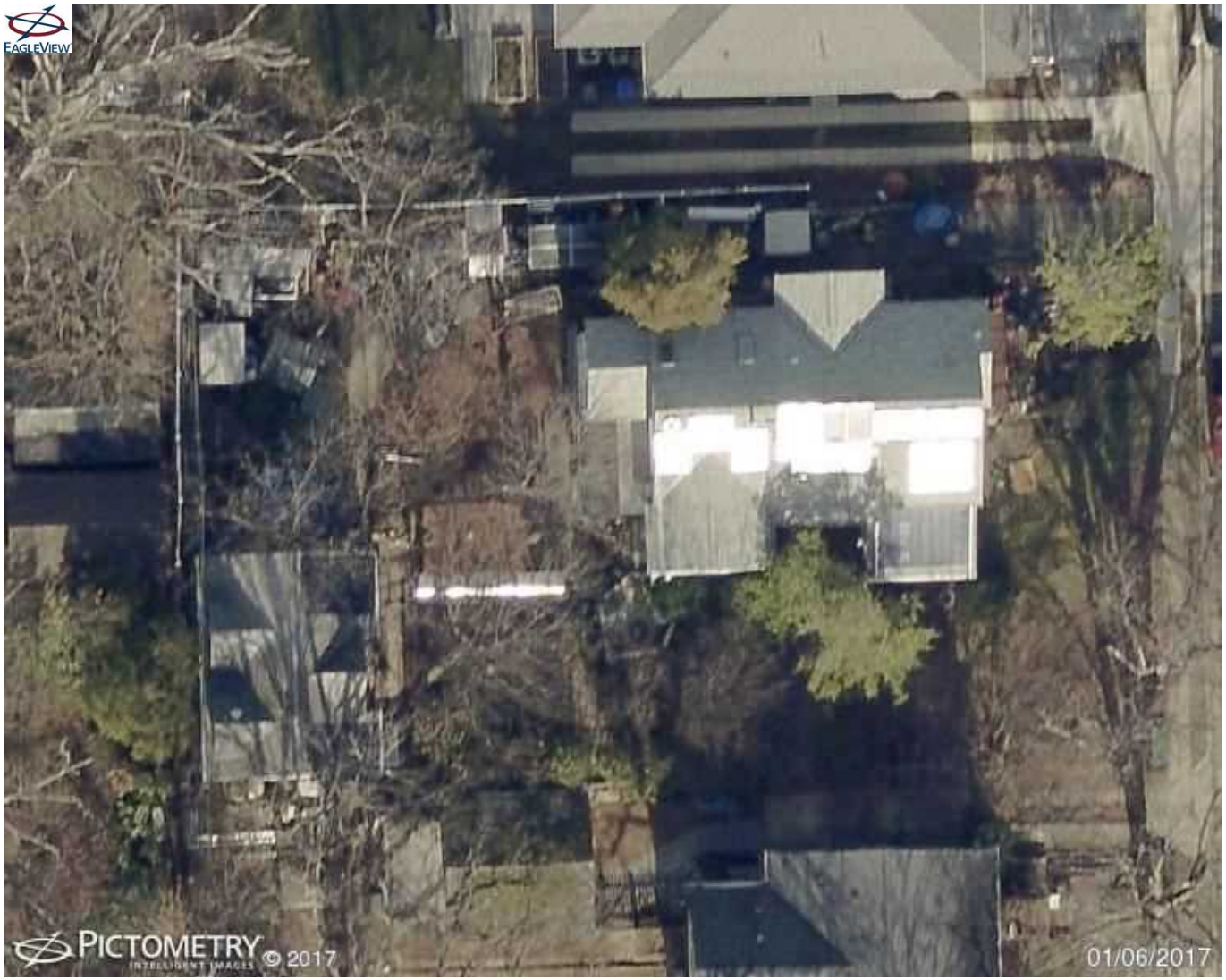
Temporary deferral of capital gains. Investors can place existing assets with accumulated capital gains into Opportunity Funds. Those capital gains are not taxed until the end of 2026 or when the asset is disposed of.

https://www.taxpolicycenter.org/taxvox/little-publicized-incentive-new-tax-law-could-become-americas-largest-economic-development

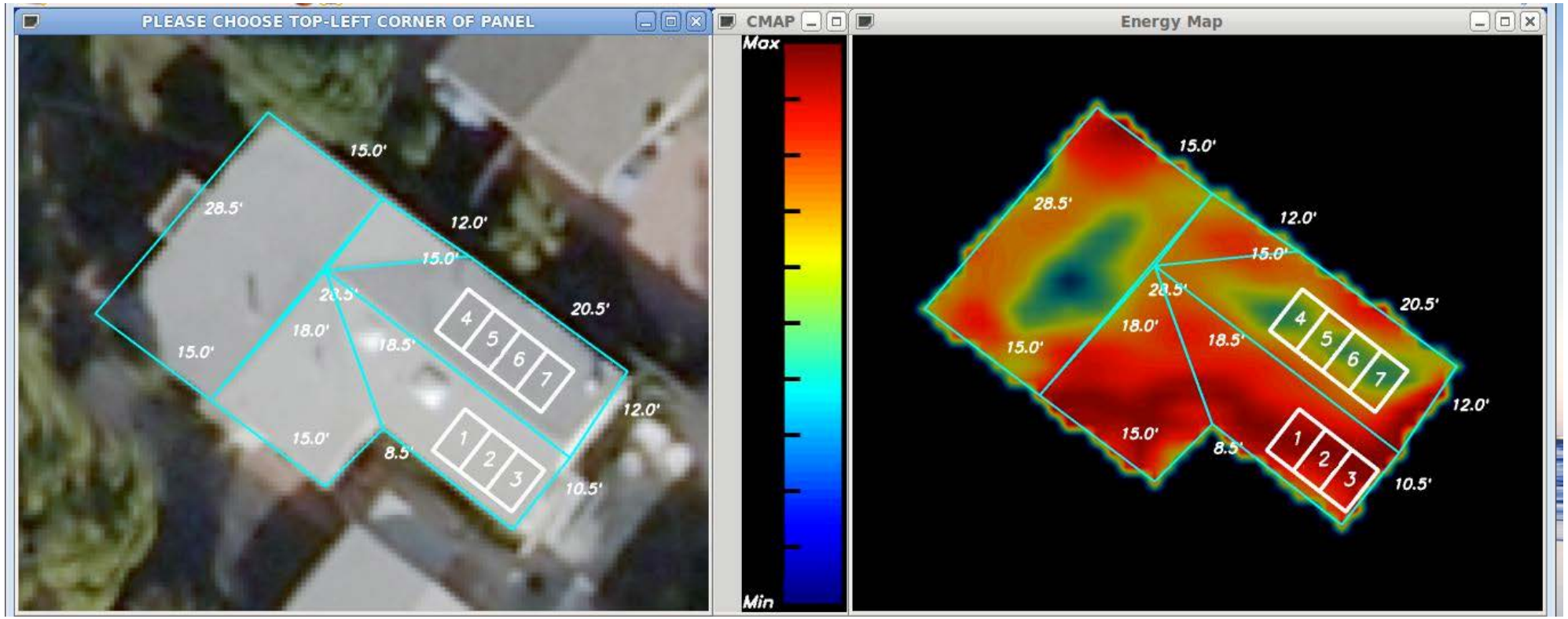
Report Says Global Solar Installations to Spike 14% and Add 142 GW in 2020:
Environmental Leader, by Emily Holbrook, January 7, 2020

https://www.environmentalleader.com/2020/01/report-solar-installations-to-spike-14-in-2020
and
https://www.pv-magazine.com/2020/01/07/the-world-will-add-142-gw-of-new-solar-this-year
and
https://www.pv-tech.org/news/ihs-markit-remains-bullish-on-global-solar-demand-hitting-142gw-in-2020

Global solar installations will continue double-digit growth rates into the new decade, according to the new "2020 Global Photovoltaic Demand Forecast" by IHS Markit. New annual installations in 2020 will reach 142 gigawatts, a 14% rise over the previous year. The expected 142 gigawatts are seven times that of the entire capacity that had been installed by the start of the prior decade (20 GW in 2010). There were just seven countries with more than 1 GW of installed capacity in 2010, most of them confined to Europe. IHS Markit expects more than 43 countries to meet that threshold by the end of 2020.



EAGLEVIEW SATELLITE PIC – REAL TIME



Solar Energy Siting Software

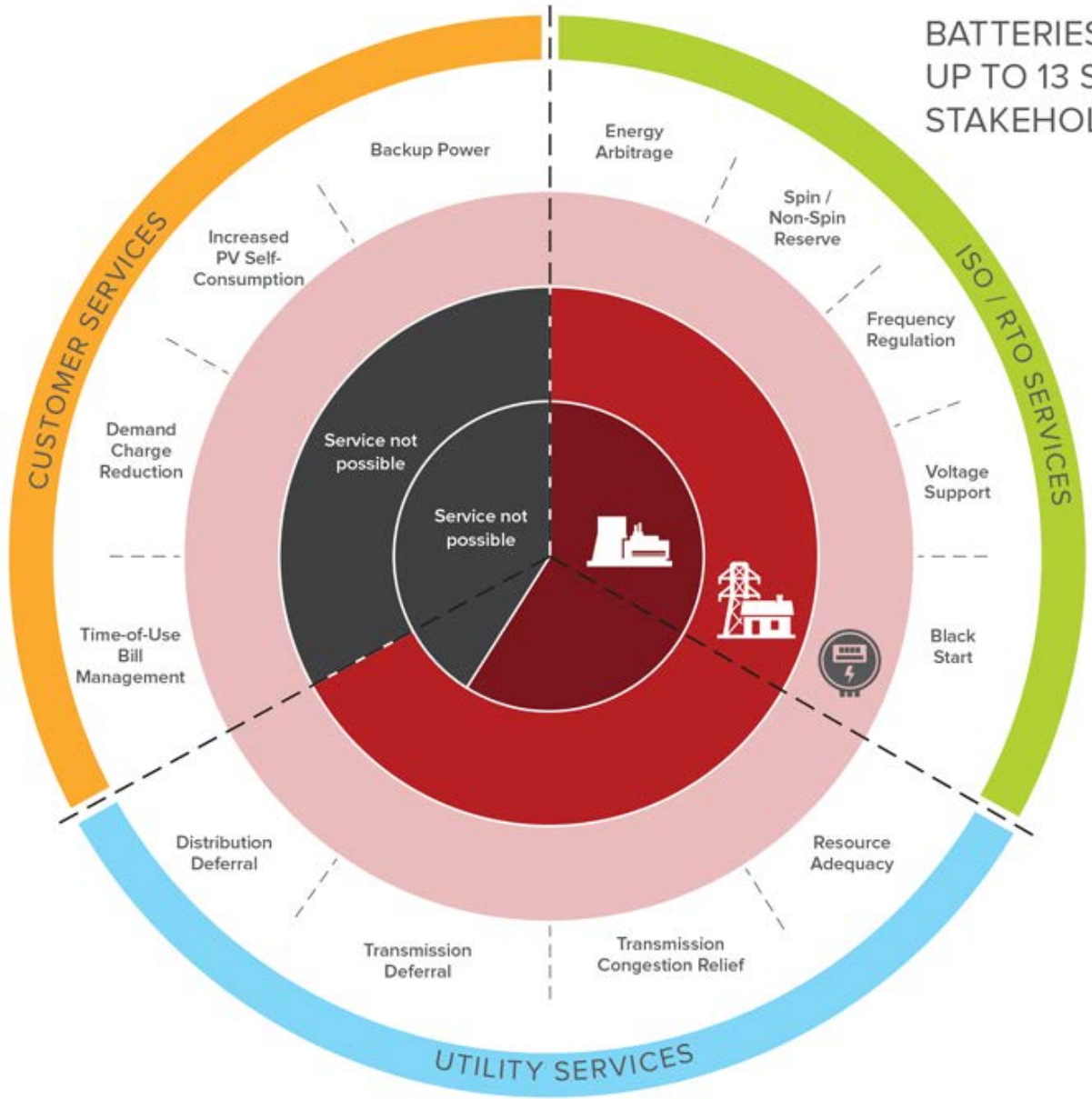
www.solar-red.net

SKLAR HOUSE: OUTBACK CHARGE CONTROLLERS: HIGH & LOW VOLTAGE MODULES

16 Concorde (CA) Absorbed Glass Matrix (AGM) Battery Bank (Sklar Home)
Model: PVX-2580L Deep Cycle AGM Battery 12 volt, 258 AH 159 lbs

100% charge -94 degrees F at 50% charge – 13 degrees F Max 125 degrees F

BATTERIES CAN PROVIDE UP TO 13 SERVICES TO THREE STAKEHOLDER GROUPS



CENTRALIZED

TRANSMISSION

DISTRIBUTION

BEHIND THE METER

DISTRIBUTED

Early adopters of fuel cells are driven by the need for uninterrupted, high quality power.

Power Disruption Events per Month

Event	Median	Average	Worst
Interruptions	1.0	1.3	10.0
Sags / undervoltages	4.1	27.9	1,660
Swells / overvoltages	3.4	13.9	1,450
Transients	15.7	63.5	1,166

Source: Duke Power, Sandia National Laboratories

- Power disruptions may cause sensitive equipment to fail.
- As a result, organizations face potential for significant losses – lost data, lost materials, lost productivity, and lost income – as well as risks to public safety.
- A study by Sandia National Laboratories estimates losses from power disruptions at more than $150 billion per year in the U.S.
- In response, more and more organizations are turning to on-site generation to boost power availability.

Hanus Associates, Inc.

Powerwall comes in 10 kWh weekly cycle and 7 kWh daily cycle models. Both are guaranteed for ten years and are sufficient to power most homes during peak evening hours. Multiple batteries may be installed together for homes with greater energy need, up to 90 kWh total for the 10 kWh battery and 63 kWh total for the 7 kWh battery. (Tesla)

40.7 MW of energy storage was deployed in Q2 2015, a nine-fold increase from Q2 2014, and six-fold increase from Q1 2015. Behind-the-meter market continued its strong showing of previous quarters, and grew over eleven times from same period last year.

http://files.ctctcdn.com/1fb72c5e001/5e784b5b-74ee-4031-88b0-c2ea937bf943.pdf

sonnen

Sonnen's mission is to provide clean and affordable energy for all. As the first mainstream grid tied residential energy storage company in the world and with 24,000 sonnenBatterie systems installed worldwide, sonnen is a proven global leader in intelligent energy management solutions. The all-in-one sonnenBatterie smart energy storage solution easily integrates with new and existing solar installations to help homes manage their energy throughout the day-saving money, providing backup power, and maximizing the effective use of solar power day and night. Sonnen has won several awards for its energy innovations, including the 2017 Zayed Future Energy Prize, MIT's Technology Review's 50 Smartest Companies in 2016, Global Cleantech 100 for 2015-2017

LG rolled out new battery products at the 2018 Solar Power International Conference this week in California: a 5 kW AC-coupled system for homes where solar panels are already installed and a 7.6 kW DC-coupled system for new installations. (9/26/2018)

https://www.utilitydive.com/news/as-residential-energy-storage-booms-lg-enters-market-with-expandable-batte/533123/

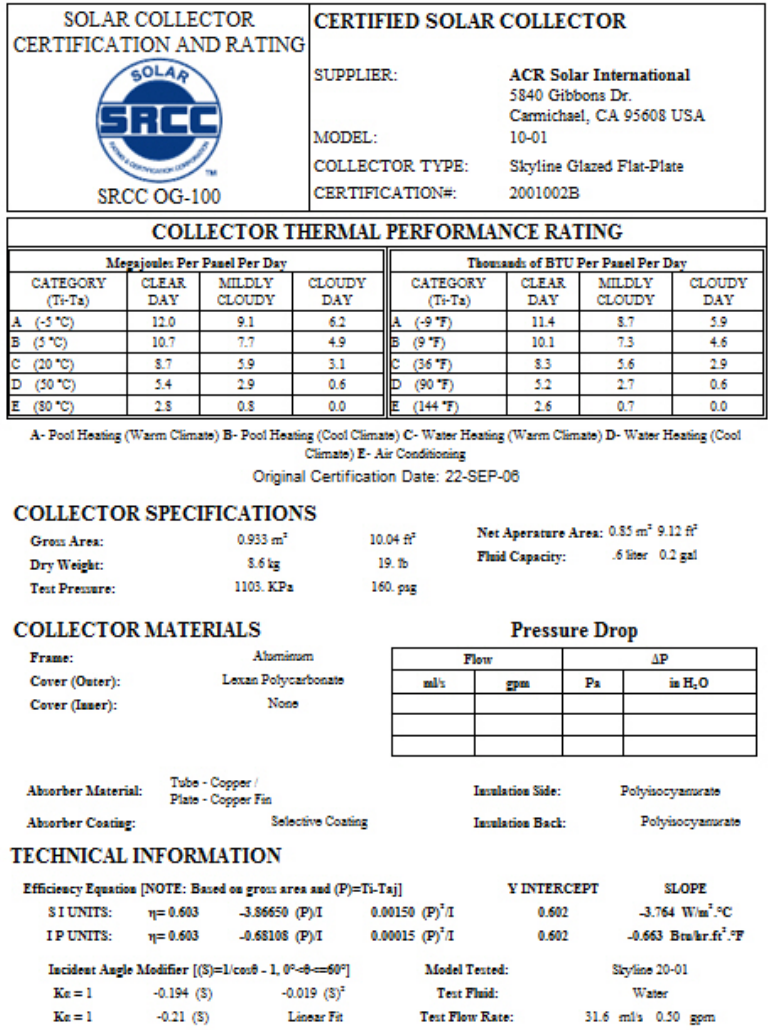
2018-03-21 - With its modular design, ABB’s new solar inverter with energy storage capability, REACT 2, provides a capacity of up to 12 kWh, increasing electric self-sufficiency of homes.

http://www.abb.com/cawp/seitp202/B2A53C2AB2AFE7F6C125825700315D59.aspx

TESLA ROOFING TILES
RELEASED 2017

http://news.energysage.com/tesla-solar-panel-roof-the-next-solar-shingles/

Each listed collector has a data page…



SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **ACR Solar International**
5840 Gibbons Dr.
Carmichael, CA 95608 USA

MODEL: 10-01

COLLECTOR TYPE: Skyline Glazed Flat-Plate

CERTIFICATION#: 2001002B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of BTU Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY	CATEGORY (Ti-Ta)	CLEAR DAY	MILDLY CLOUDY	CLOUDY DAY
A (-5 °C)	12.0	9.1	6.2	A (-9 °F)	11.4	8.7	5.9
B (5 °C)	10.7	7.7	4.9	B (9 °F)	10.1	7.3	4.6
C (20 °C)	8.7	5.9	3.1	C (36 °F)	8.3	5.6	2.9
D (50 °C)	5.4	2.9	0.6	D (90 °F)	5.2	2.7	0.6
E (80 °C)	2.8	0.8	0.0	E (144 °F)	2.6	0.7	0.0

A- Pool Heating (Warm Climate) **B**- Pool Heating (Cool Climate) **C**- Water Heating (Warm Climate) **D**- Water Heating (Cool Climate) **E**- Air Conditioning

Original Certification Date: 22-SEP-06

COLLECTOR SPECIFICATIONS

Gross Area:	0.933 m^2	10.04 ft^2
Dry Weight:	8.6 kg	19. lb
Test Pressure:	1103. KPa	160. psig

Net Aperature Area: 0.85 m^2 9.12 ft^2

Fluid Capacity: .6 liter 0.2 gal

COLLECTOR MATERIALS

Frame:	Aluminum
Cover (Outer):	Lexan Polycarbonate
Cover (Inner):	None

Pressure Drop

Flow		ΔP	
ml/s	gpm	Pa	in H_2O

Absorber Material: Tube - Copper / Plate - Copper Fin

Absorber Coating: Selective Coating

Insulation Side: Polyisocyanurate

Insulation Back: Polyisocyanurate

TECHNICAL INFORMATION

Efficiency Equation [NOTE: Based on gross area and (P)=Ti-Ta]				Y INTERCEPT	SLOPE
S I UNITS:	η= 0.603	-3.86650 (P)/I	0.00150 $(P)^2/I$	0.602	-3.764 $W/m^2 \cdot °C$
I P UNITS:	η= 0.603	-0.68108 (P)/I	0.00015 $(P)^2/I$	0.602	-0.663 $Btu/hr.ft^2 \cdot °F$

Incident Angle Modifier [(S)=1/cosθ - 1, 0°<θ<=60°]

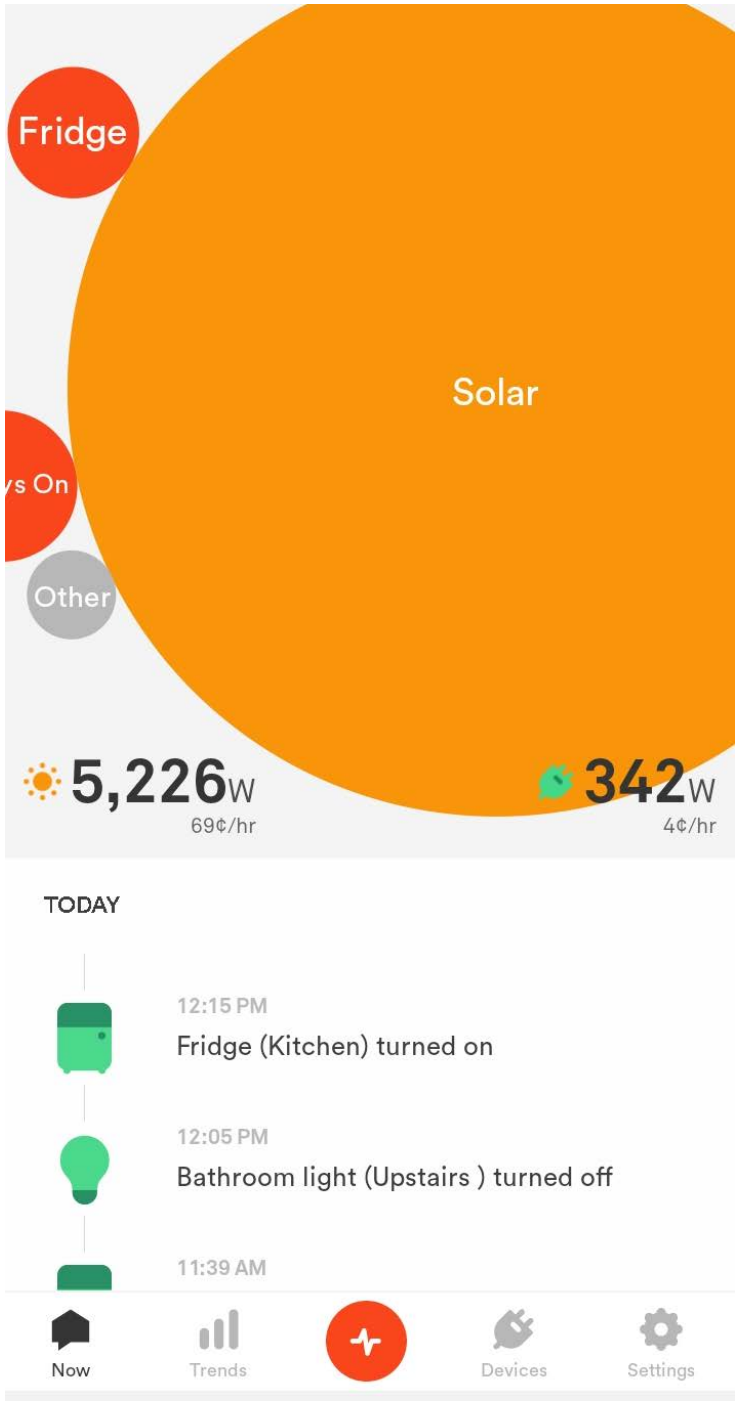
Kα = 1	-0.194 (S)	-0.019 $(S)^2$	
Kα = 1	-0.21 (S)	Linear Fit	

Model Tested: Skyline 20-01

Test Fluid: Water

Test Flow Rate: 31.6 ml/s 0.50 gpm

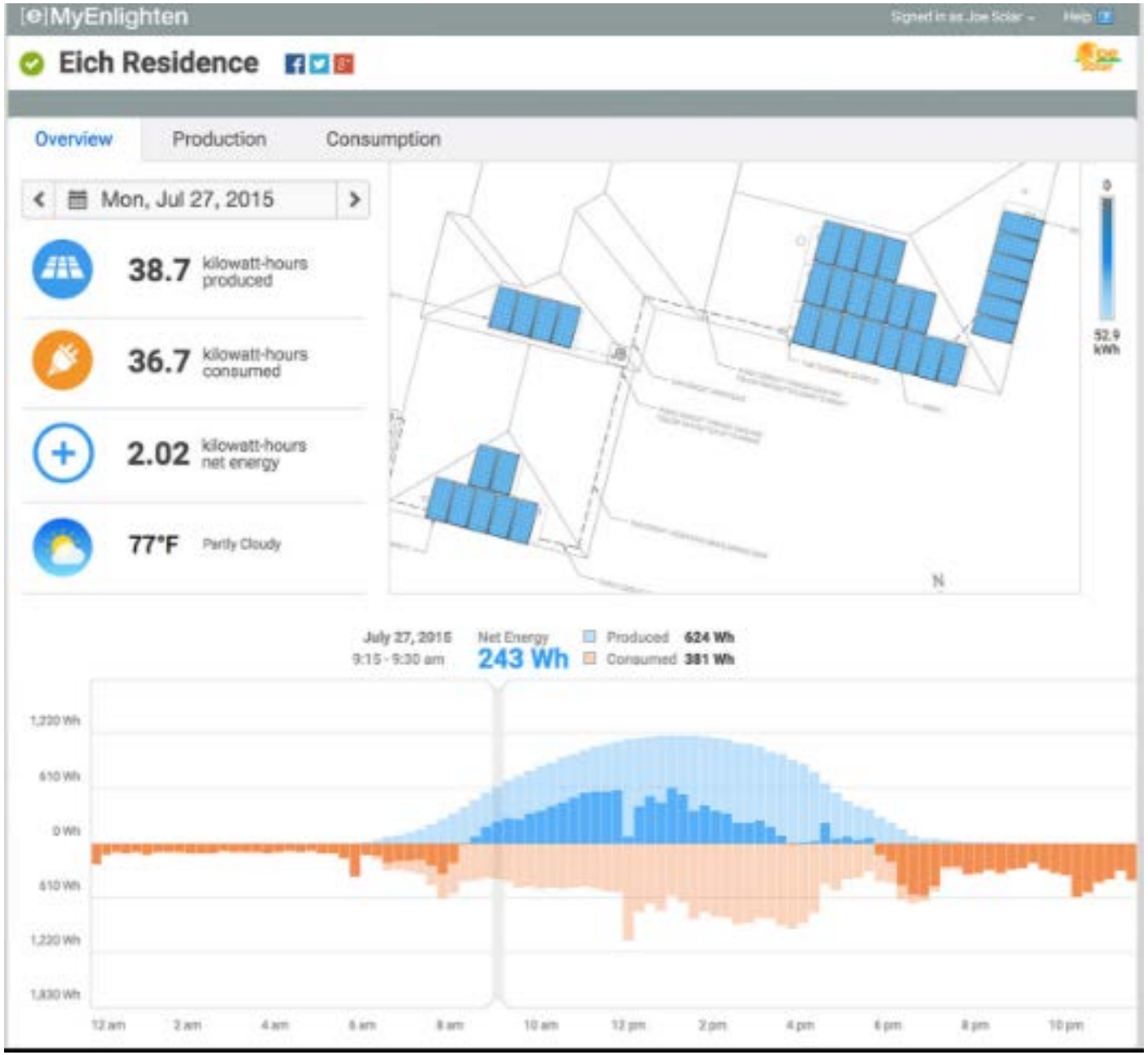
http://securedb.fsec.ucf.edu/srcc/coll_detail?srcc_id=2001002B


Fridge
Solar
Other
5,226W
69¢/hr
342W
4¢/hr
TODAY
12:15 PM
Fridge (Kitchen) turned on
12:05 PM
Bathroom light (Upstairs) turned off
11:39 AM
Now
Trends
Devices
Settings

SOLAR SENSE

INSTALLER ACCREDITATION: COMPANIES & INDIVIDUALS
PHOTOVOTAICS, SOLAR THERMAL, SMALL WIND

http://www.nabcep.org/company-accreditation


MyEnlighten
Signed in as Joe Solar
Help
Eich Residence
Overview
Production
Consumption
Mon, Jul 27, 2015
38.7 kilowatt-hours produced
36.7 kilowatt-hours consumed
2.02 kilowatt-hours net energy
77°F Partly Cloudy
0
52.9 kWh
N
July 27, 2015
9:15 - 9:30 am
Net Energy
243 Wh
Produced 624 Wh
Consumed 381 Wh
1,220 Wh
610 Wh
0 Wh
610 Wh
1,220 Wh
1,830 Wh
12 am
2 am
4 am
6 am
8 am
10 am
12 pm
2 pm
4 pm
6 pm
8 pm
10 pm

The roof tiles are actually made of textured glass. From most viewing angles, they look just like ordinary shingles, but they allow light to pass through from above onto a standard flat solar cell. The plan is for Panasonic to produce the solar cells and for Tesla to put together the glass tiles and everything that goes along with them. That's all predicated on shareholders approving the $2.2 billion acquisition of SolarCity, the biggest U.S. rooftop installer, on Nov. 17. Tesla says the tempered glass is "tough as steel," and can weather a lifetime of abuse from the elements. It can also be fitted with heating elements to melt snow in colder climates. "It's never going to wear out," Musk said, "It's made of quartz. It has a quasi-infinite lifetime."

THERE ARE NO “DUMB” QUESTIONS !!

Any questions ???

Need reports, contacts ???

Contact:

Scott Sklar
solarsklar@aol.com

Thank you!

www.EncoreLearning.net