



**All you always wanted to  
know about Solar Power...  
&  
First AGM of  
Salish Sea Renewable Energy  
Co-operative**

**March 31, 2018, 1:30-3:30 pm**



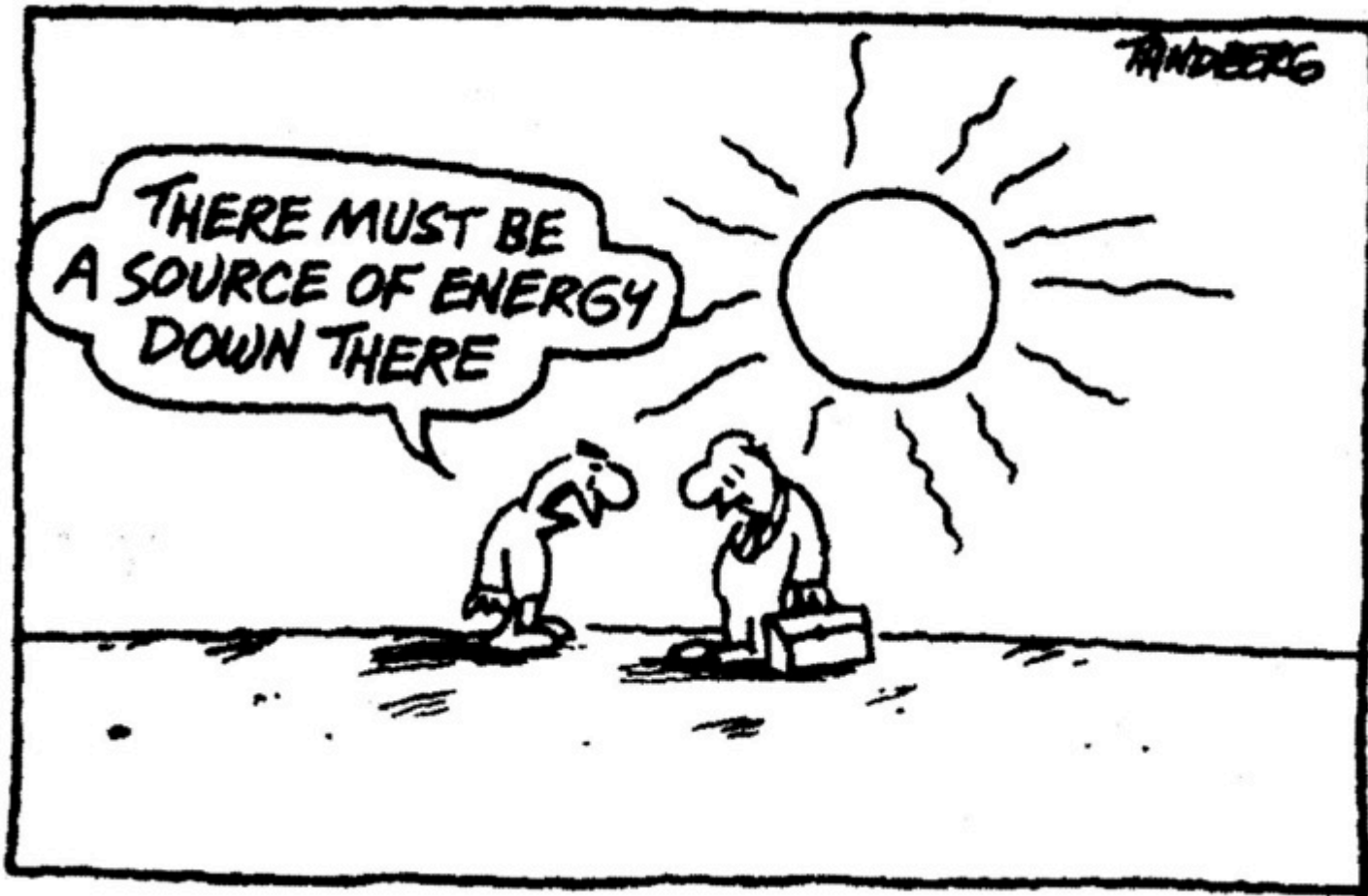
# **Salish Sea Renewable Energy Co-operative**

**[SSREInfo@gmail.com](mailto:SSREInfo@gmail.com)**

**SSREC.org**

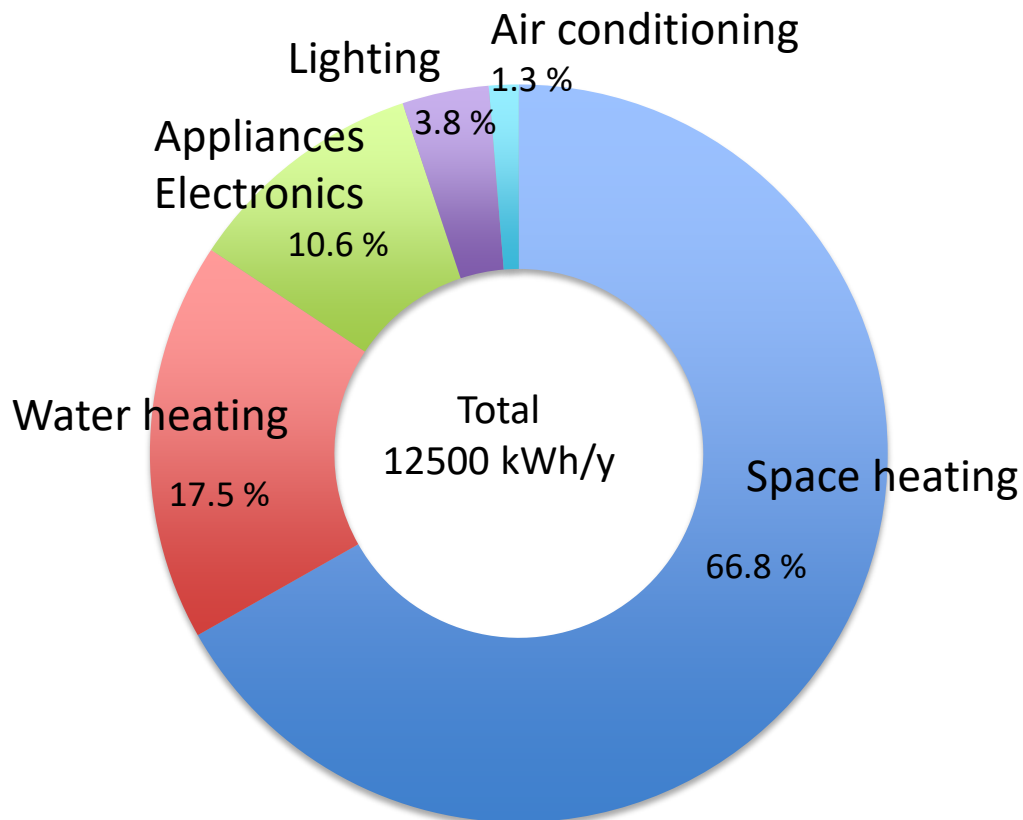
# Power hungry continent





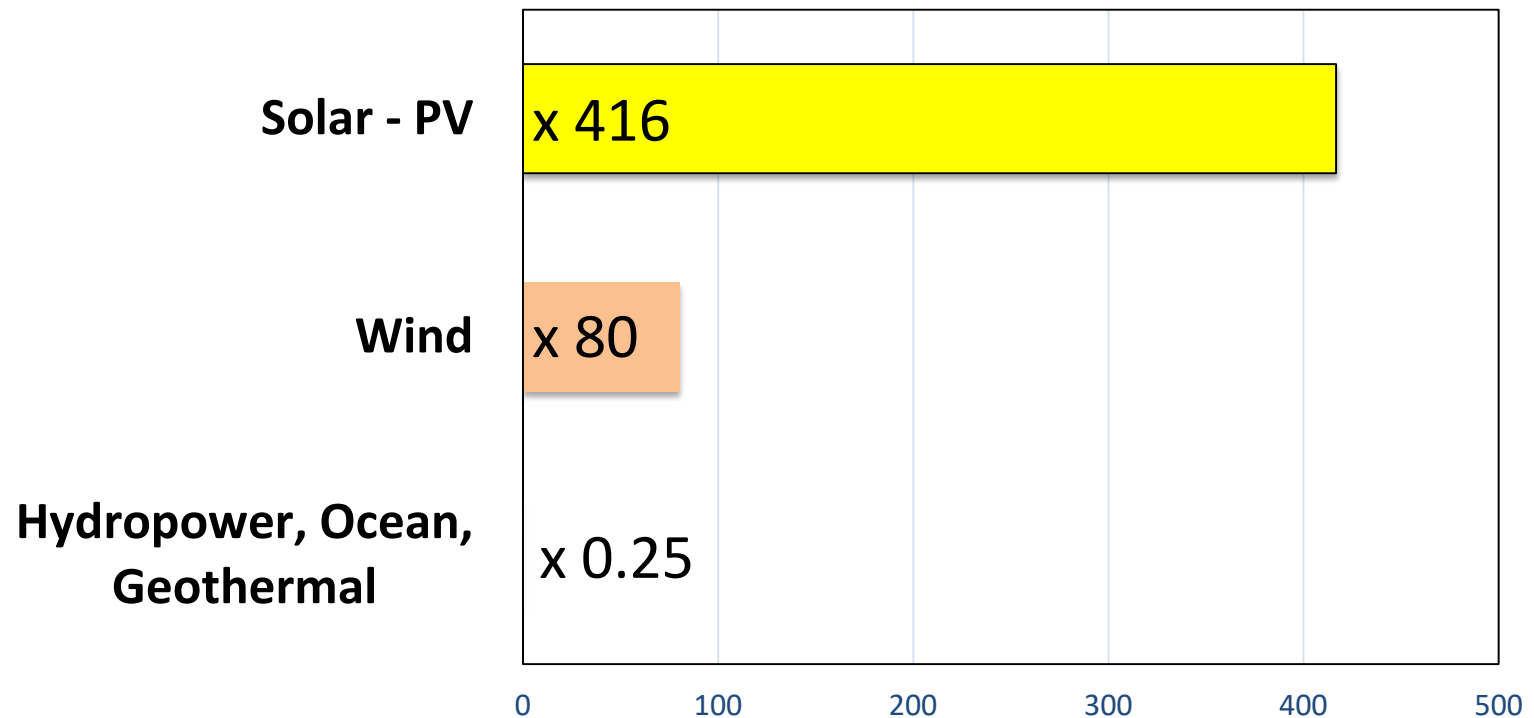
Ron Tandberg – The Age

# Residential energy use in an average Canadian home



Heating/Air conditioning = 85.6 % of total

# Meeting global energy demand (18 TW) with renewables



In less than two hours, the sun delivers all the energy needed on the globe in a year  
Data are for extractable potential of each energy.

# Why go solar?

- Truly clean energy
- Silent, reliable, very low maintenance
- Long-term (>35 years)
- Free power source & limitless (3 billion years or so)
- Free delivery
- Energy independence, energy security
- Distributed generation (no- to low-transmission losses)
- Easily scalable
- Minimizes tier-2 pricing
- Highly cost competitive
- Payback !

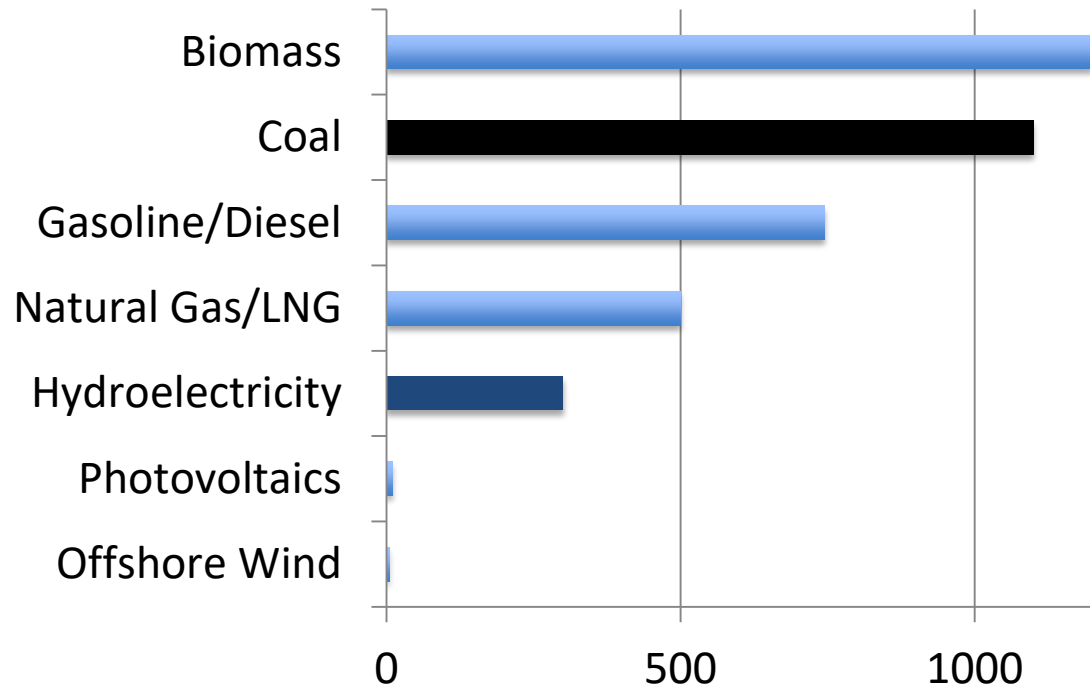
# Solar Myth:

**Electricity production in BC is 93% clean  
& only 7% dirty (diesel, natural gas, etc.)**

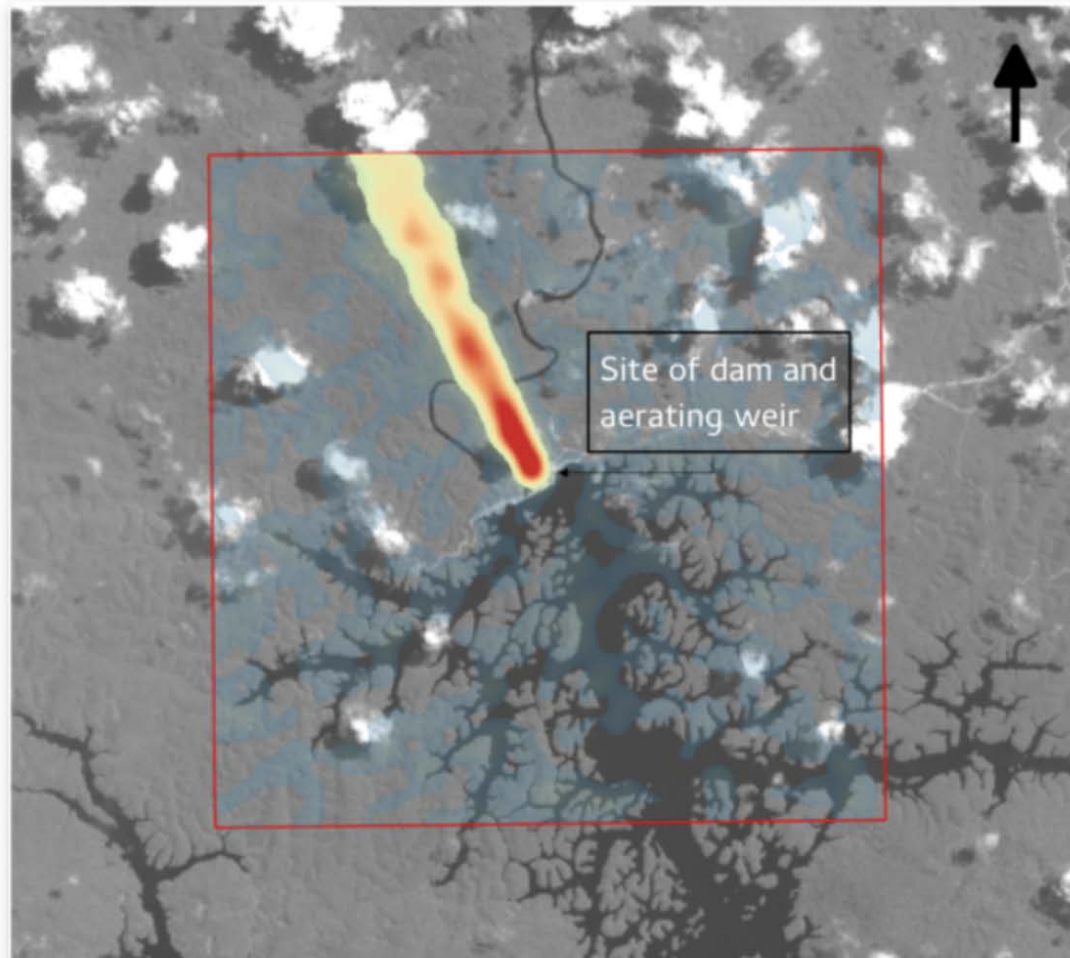
false

**X**

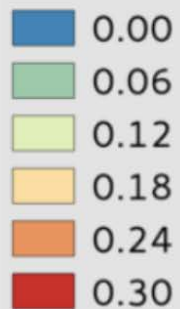
**Carbon dioxide(e) release (gram per kWh)**



# Satellite image of methane plume emanating from a hydroelectric dam



CH<sub>4</sub> (g/m<sup>2</sup>)



 GHGSat Field of View

Background Image is USGS Landsat 8,  
Band 6 Image taken on 2014-07-26

by satellite Claire 1 from GHGSat.com (Montreal, QC)

0 2 4 km



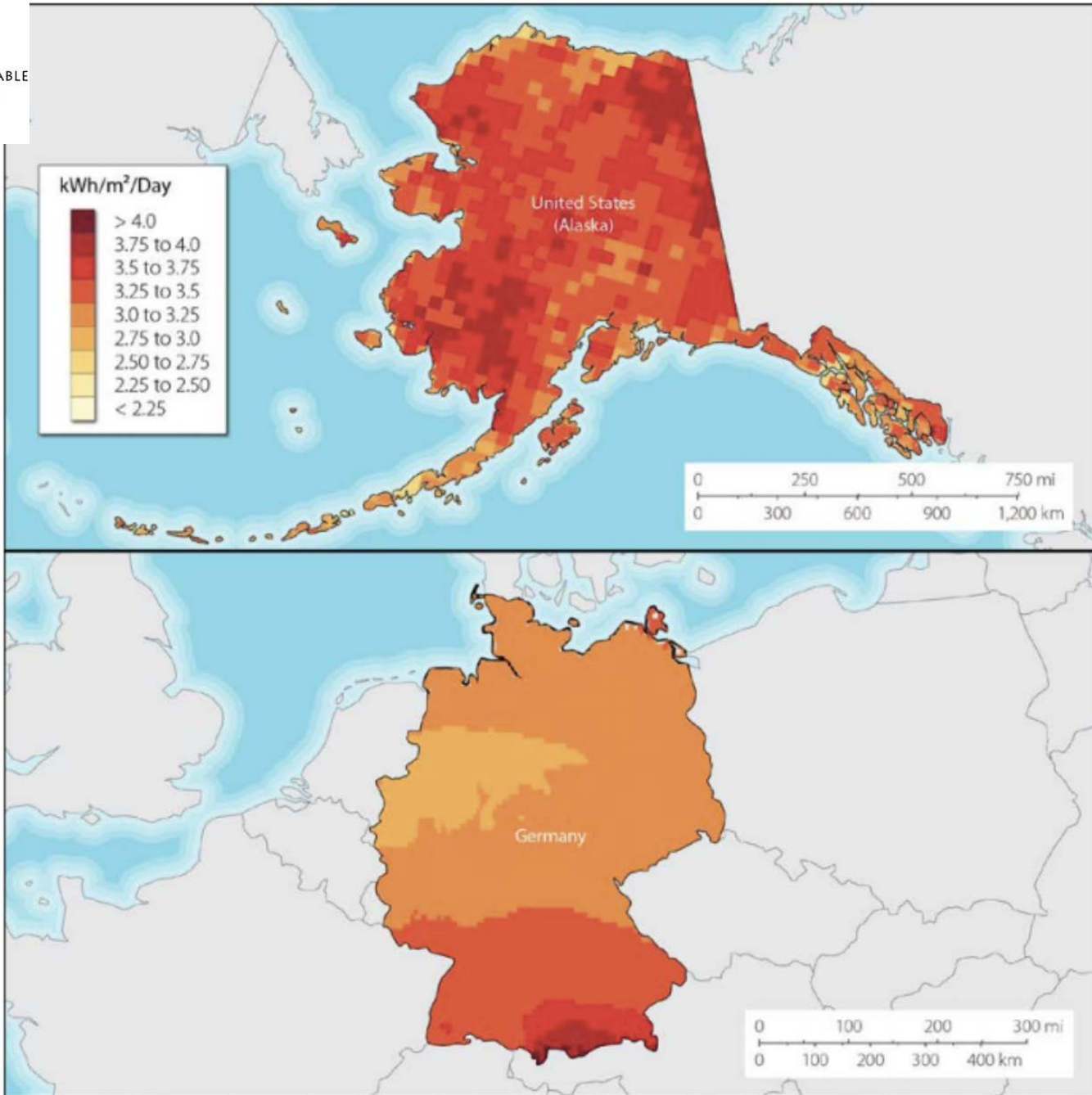
## Solar Myth:

**BC doesn't get enough sun.**

**We should leave solar energy to sunny places  
like California and Abu Dhabi**

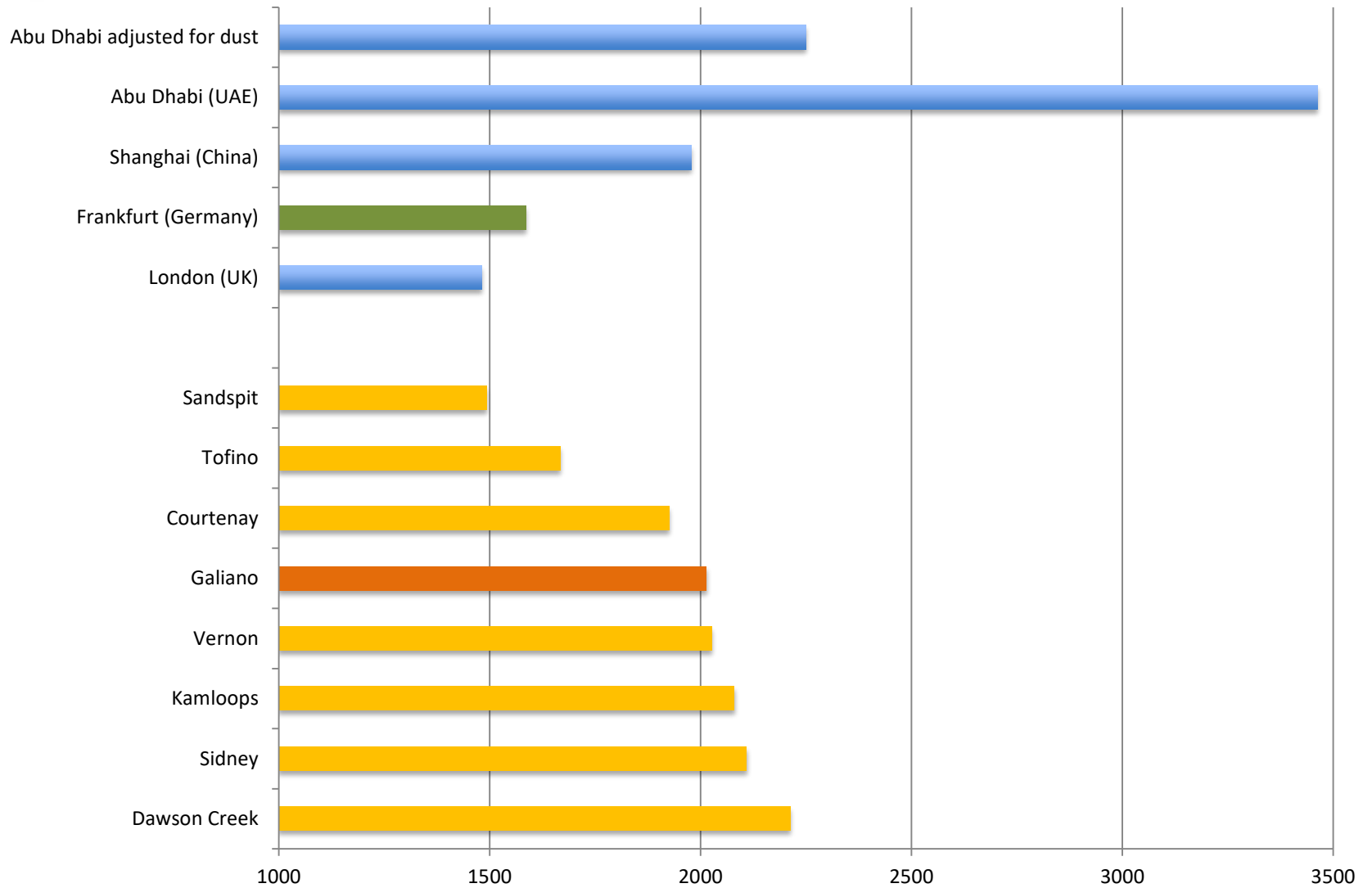
false





Alaska vs Germany solar insolation via US DOE

## Hours of Sunshine /Year



## Solar Myth:

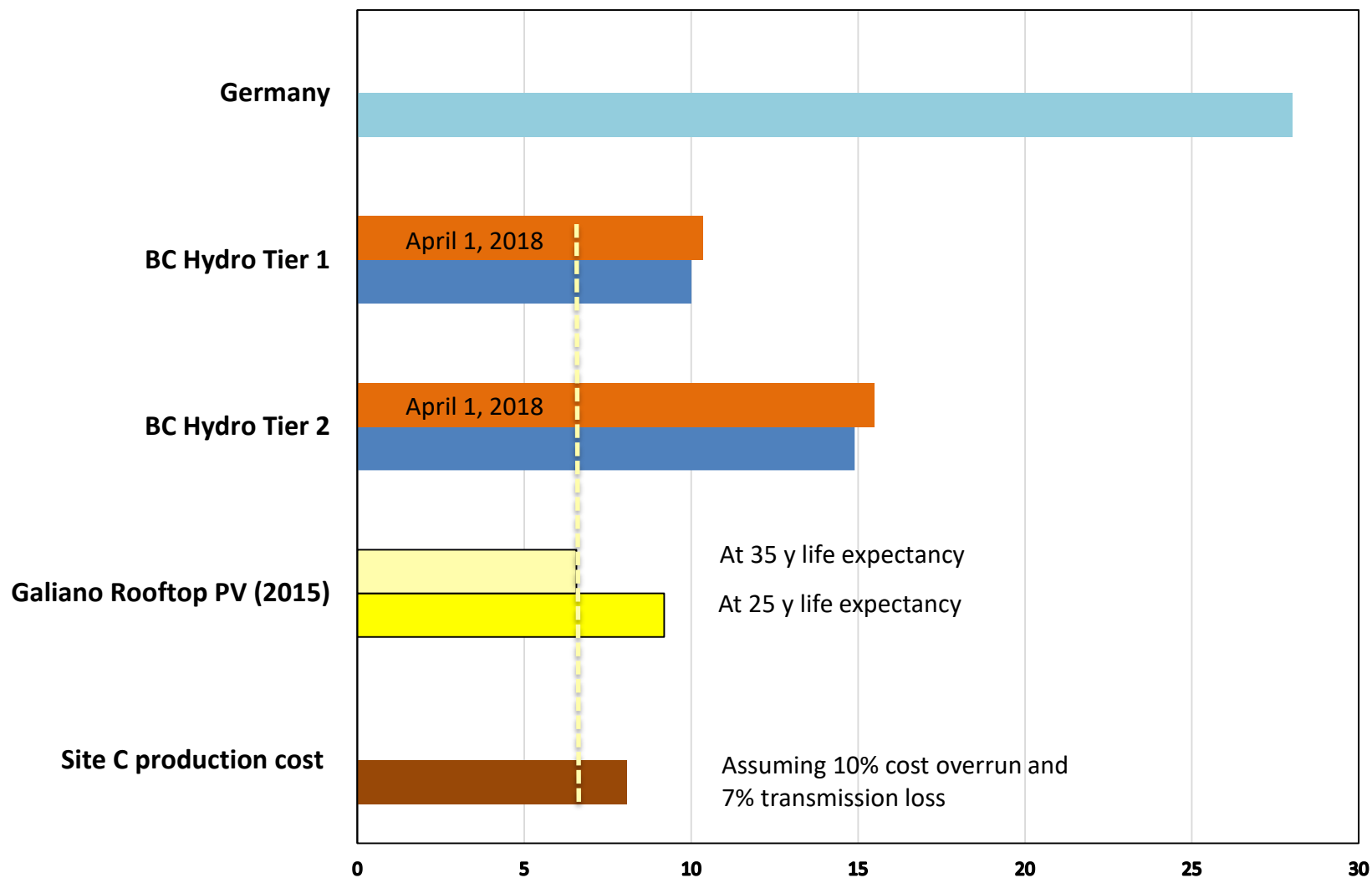
**PV is far too expensive – we cannot afford it!**

false

A large, bold red 'X' is centered within a white square box that has a thin blue border.

X

## Cost to consumer (cents/kWh)



And best of all for PC: **No 'rate rider', no taxes, fixed rate**

# Solar Myth :

**Solar uses too much valuable land area**

**X**

false

- 23 % of (facing south-ish) Vancouver roofs with PV would generate half of the electricity currently consumed by the city
- The BC Hydro right-of-way from Vancouver to Hope covered with PV would generate more electricity per year than the potential output of site C, cost \$6 billion (or less) and power would be available in a year or two. And sheep could still graze underneath
- Solar farms can be installed on brownsites, under power lines, along rail lines and highways
- 'Floatovoltaics on reservoirs', are becoming increasingly popular: positive side-effects: decrease in evaporative water losses, depression of algal growth, shelter for fish, decrease in water temperature, cooling of PV
- With proper design, no adverse effects on biodiversity or agriculture



# Before considering solar – part 1

## Assess usage and waste

- Identify power hogs (Kill-a-Watt; metering smart plugs)
- Study your hydro bill (how often are you in tier 2?)
- Look for heat leaks (infrared camera)
- Encourage the local public library to stock an electricity 'waste and usage kit'
- City of Nelson / Nelson Hydro teamed up to take IR photographs of houses to identify houses in dire need of better insulation

## Behavioural changes

- Turn lights off when you leave a room
- Do you really need that wine cooler?
- Use washer and dishwasher only when full
- Clothesline in summer
- Walk to the store

# Before considering solar – part 2

## The low hanging fruit – conservation

- Decrease temperature of hot water tank
- Decrease thermostat setting and in rooms you use less
- Put electronics (computer, router, modem, TV, printer, etc) on power bars or electronic timers (not top-set boxes)
- Don't purchase a plasma TV
- Switch to LED lights
- Unplug freezer when empty
- Run washer at 40 °C

## Before considering solar – part 3

### Not-so-low hanging fruit – long term investments

- Insulate your home (triple glazing, insulating basement and attic, etc).
- Consider purchasing a mini-split heat pump for heating and cooling
- Replace hot water tank with on-demand (electric) heater or with solar thermal
- Electric vehicle
- Consider a fridge without a freezer

**Congratulations, you just cut your electrical demand in half**

**Mind you, you are still consuming 30% more electricity than Central Europeans**



## How much solar is right for you ?

Average BC household consumption is 12,000 kWh per year (\$100/month in electricity cost; grid connection, 'rider' and taxes on top); with conservation efforts this decreases to 7500 kWh/y

On Galiano, 1 kW of PV produces about 1100 kWh per year

To break even over the year, your solar install should be around 7 kW, for 7700 kWh/y, *i.e.*

23 panels (305 W) or

21 panels (330 W). (We used 255 W panels in 2015).

If you own an electric vehicle add another 8 modules (2.5 kW) to drive 15,000 km/year.

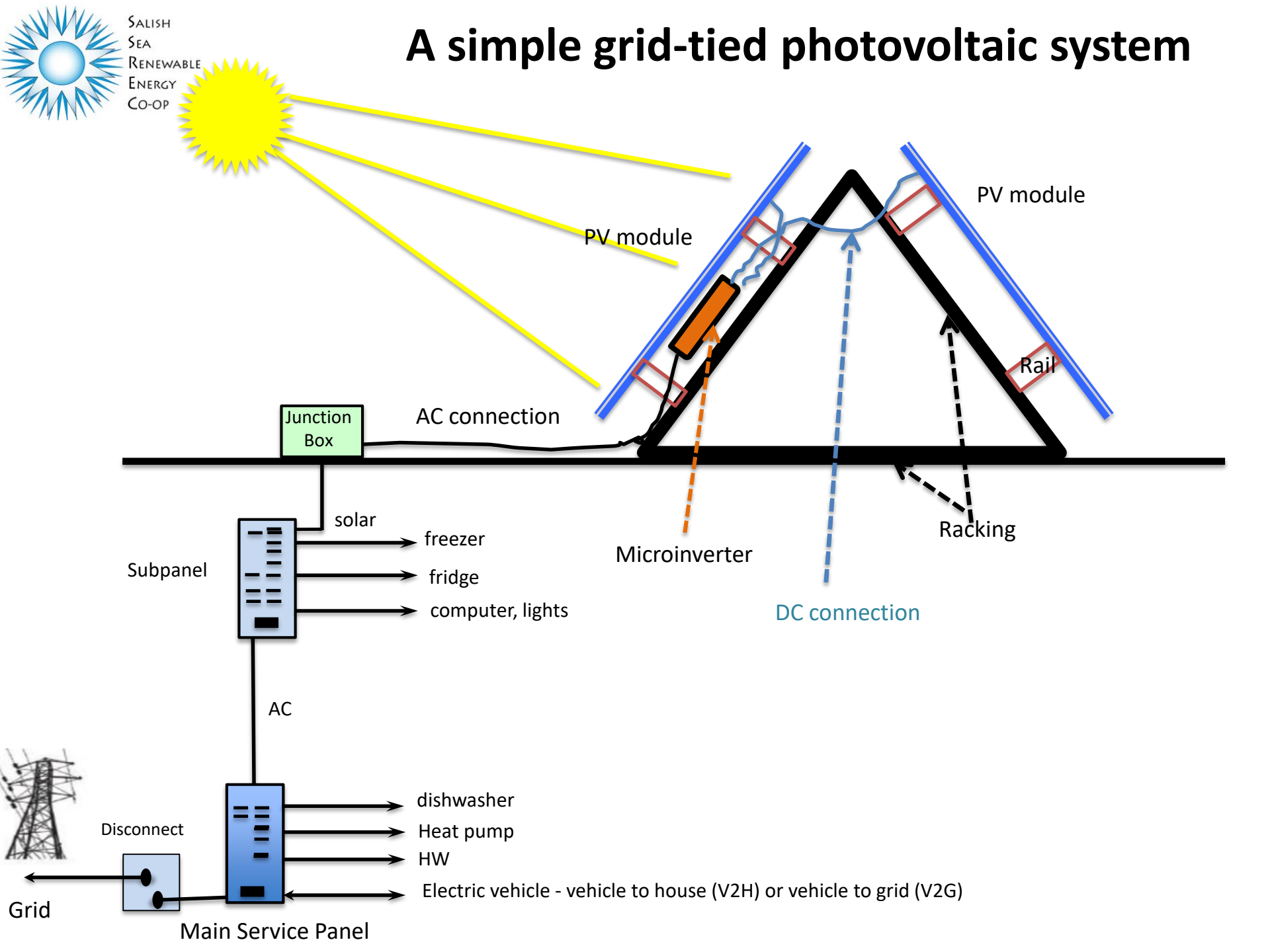
In 2015, our discount over the 'normal' costs for solar hardware was close to 30% and included 25 y warranties on all components.

# What about the ROI ?

- In 2015, we didn't think about return on the investment  
It simply was the right thing to do! And we just wanted to get started to decarbonize and live with solar
- Turns out, there was a financial ROI after all, in addition to the bragging rights  
**in 2015, the ROI was around 3% to 4%**
- In 2018 – it's a different story
  1. PV costs (hardware; installation) have dropped over 20%
  2. BC Hydro rates have increased; will continue to do so**in 2018, the ROI is in the 5% to 6% range**



What are we waiting for?



# Solar myth

**The sun does not always shine**

True

X

but so what?

- Drastic advances are being made in storage – both in cost and capacity
  - pumped hydro, compressed air, liquid air
  - heat storage, flywheels, superconductors
  - redox-flow batteries, lithium-ion batteries,
  - methane synthesis, hydrogen synthesis, transition phase
- BC has huge storage capacity through hydroelectric reservoirs. When the sun shines on PV, less water is required for the turbines, leading to water conservation for winter needs
- By 2020 it will be cheaper to buy storage for a solar plant than to operate fossil fuel based peaker plants
- In some areas, solar plus storage is already cheaper than coal, gas or nuclear
- Tesla has already provided huge commercial storage in California and enough storage to run an entire Pacific island (600 inhabitants) with off-grid solar PV

## Solar myth

**More energy is needed for production than will be repaid over the lifetime of PV panels**

false



- Energy used in production (including mining, purification, assembly, framing, wiring, transport, etc.) is paid back within the first 8 to 14 months
- Life expectancy of solar modules exceeds 35 years

# Solar myth

**Solar cells are inefficient**

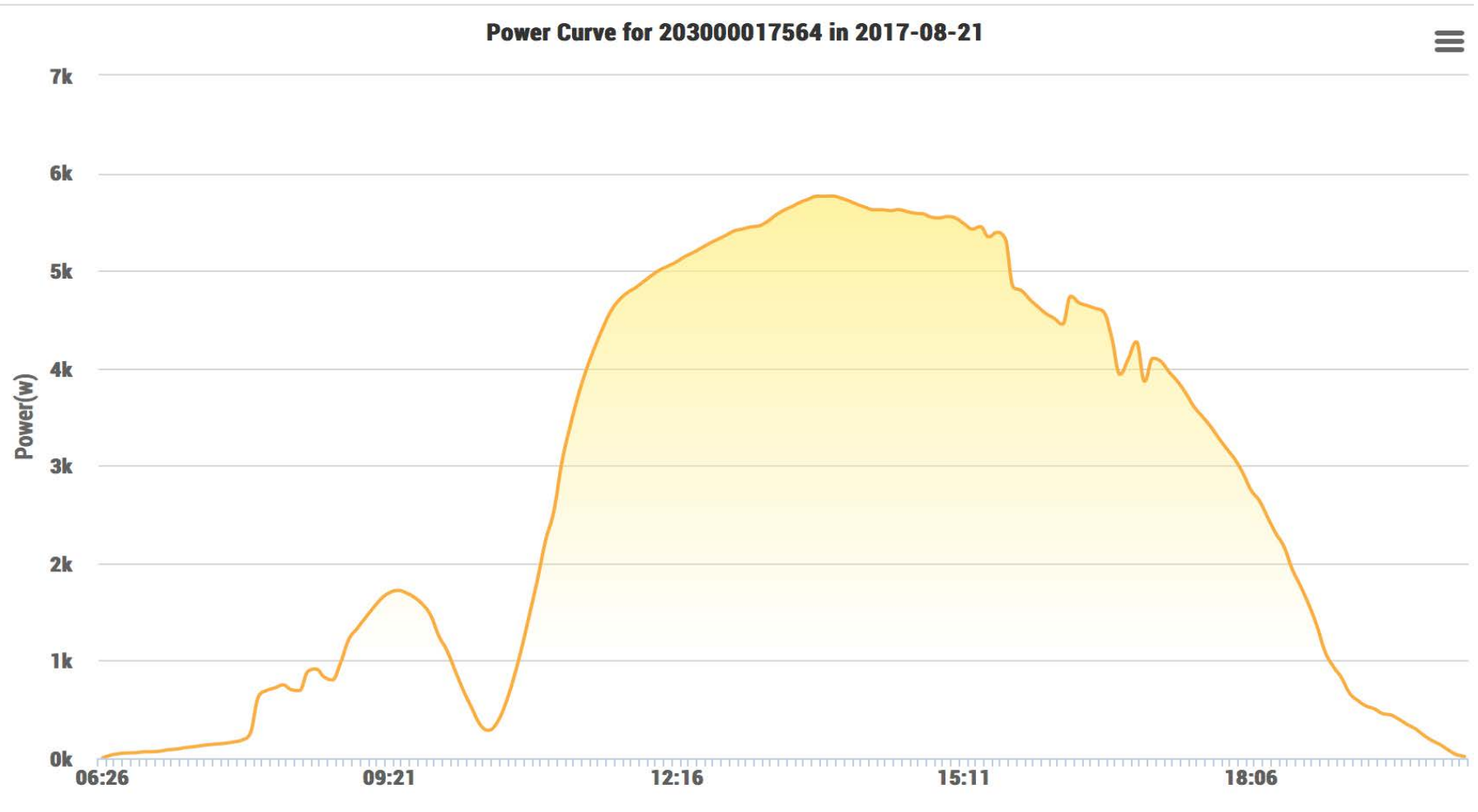
**We should wait until the industry is mature**

Irrelevant



- PV cells are not like computers and are not obsolete in a few years
- Increasing efficiency simply means that the PV area needed for a given kW decreases (about 25% since 2015)
- Current efficiencies are already four times better than photosynthesis

# Solar production on Aug 21, 2017 !



Power output of a Galiano solar array on 21 Aug, 2017; partial solar eclipse at 10:30 am



**Solar power is  
disruptive  
... in a good way**

# Solar myth

**Renewables destabilize the grid**  
**Grids can only handle 20% intermittent wind and solar.**

false

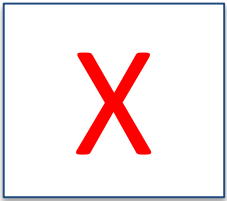


- Germany's grid has no problems incorporating 65% renewables
- California handles up to 70% renewables in their energy mix
- Total eclipses of the sun in 2015 (Europe) and 2017 (USA) did not cause a ripple in their respective grids
- The current discussion raging among scientists and covered exhaustively in the media is whether the grid will be able to handle 100% or 'only 80%' of renewables by 2040!

## Solar myth

**Photovoltaic cells are toxic and cannot be recycled**

false



- ✓ Photovoltaic cells in use today are non-toxic
- ✓ 100% recyclable
- ✓ Toxic solvent used during production is 100% recovered
- ✓ Toxic solvent is being phased out

# Solar myth

**Solar gets cheaper every year.**

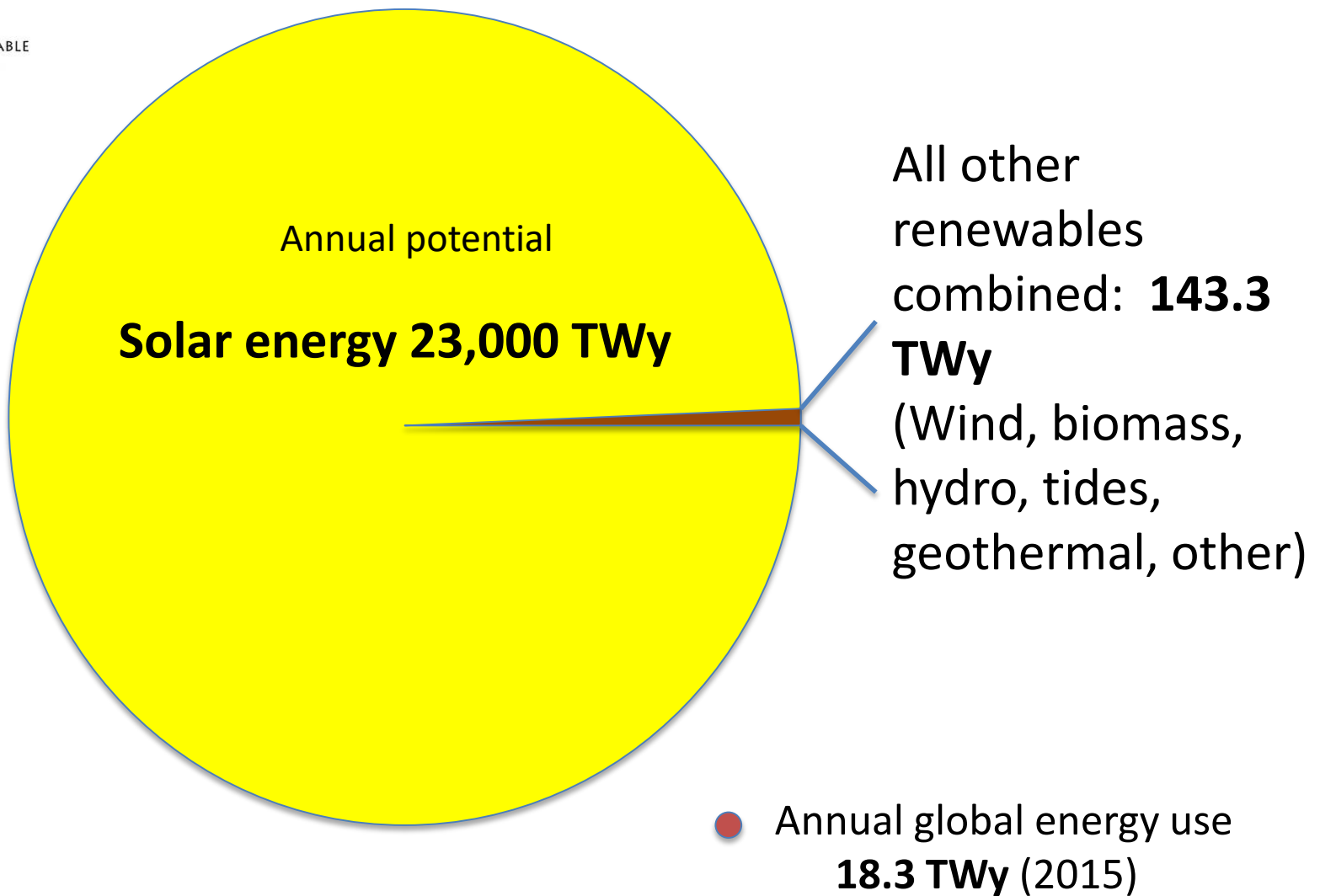
True



Solar energy has been getting less expensive by about 5% a year in 2016 and 2017

**Better to wait for newer technology and get a bargain**

- ✓ By waiting you lose out on solar energy production, supporting BC Hydro's expensive, inefficient megaprojects, subjecting yourself to ever increasing hydro rates, and contributing to global warming
- ✓ Besides, return on solar investment is already in the 4-5% range (without subsidies), and you get to pride yourself in taking an important step towards decarbonization and be a shining example to others!
- ✓ Research has clearly demonstrated that acceptance of new technology contains a large 'neighbour' component, with solar installations showing up in clear clusters.

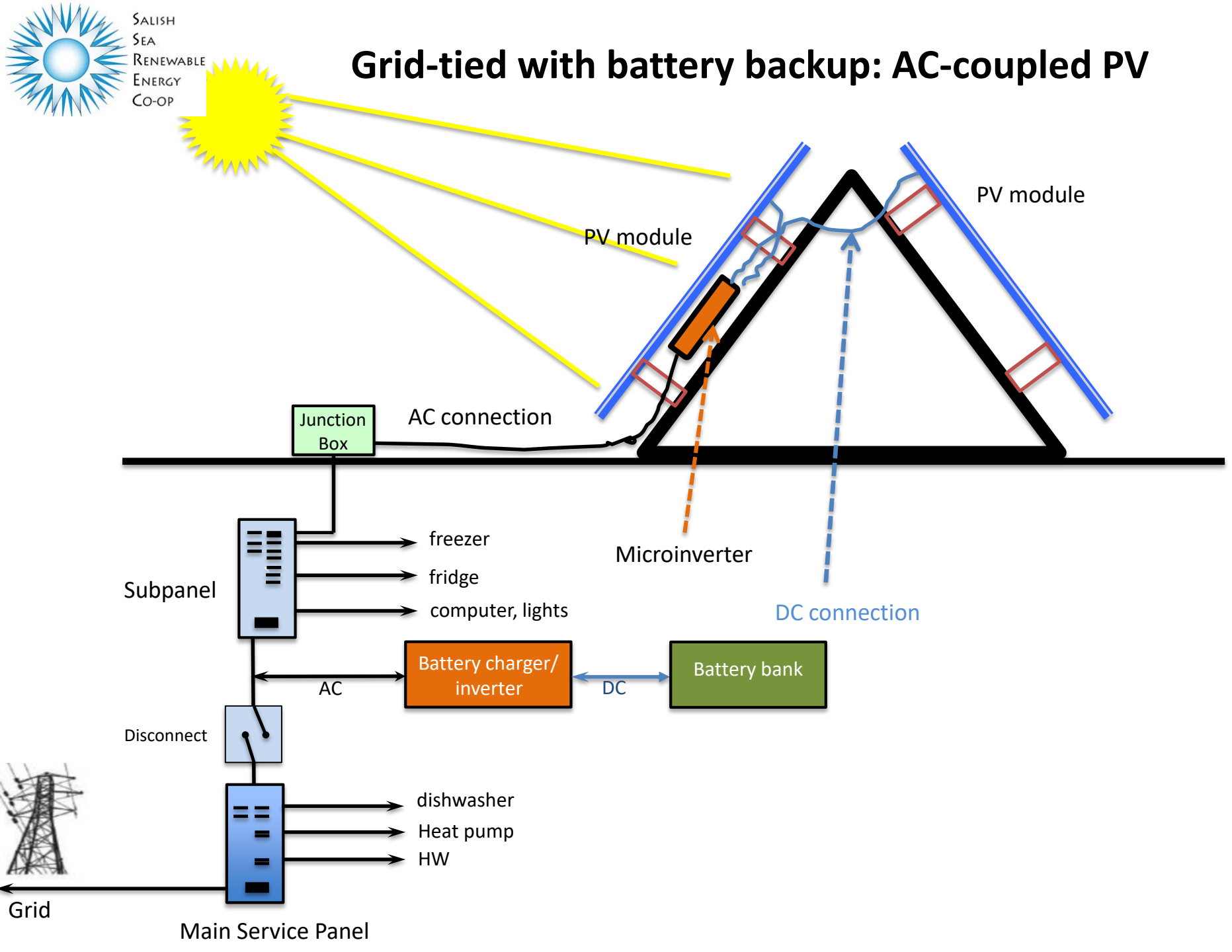


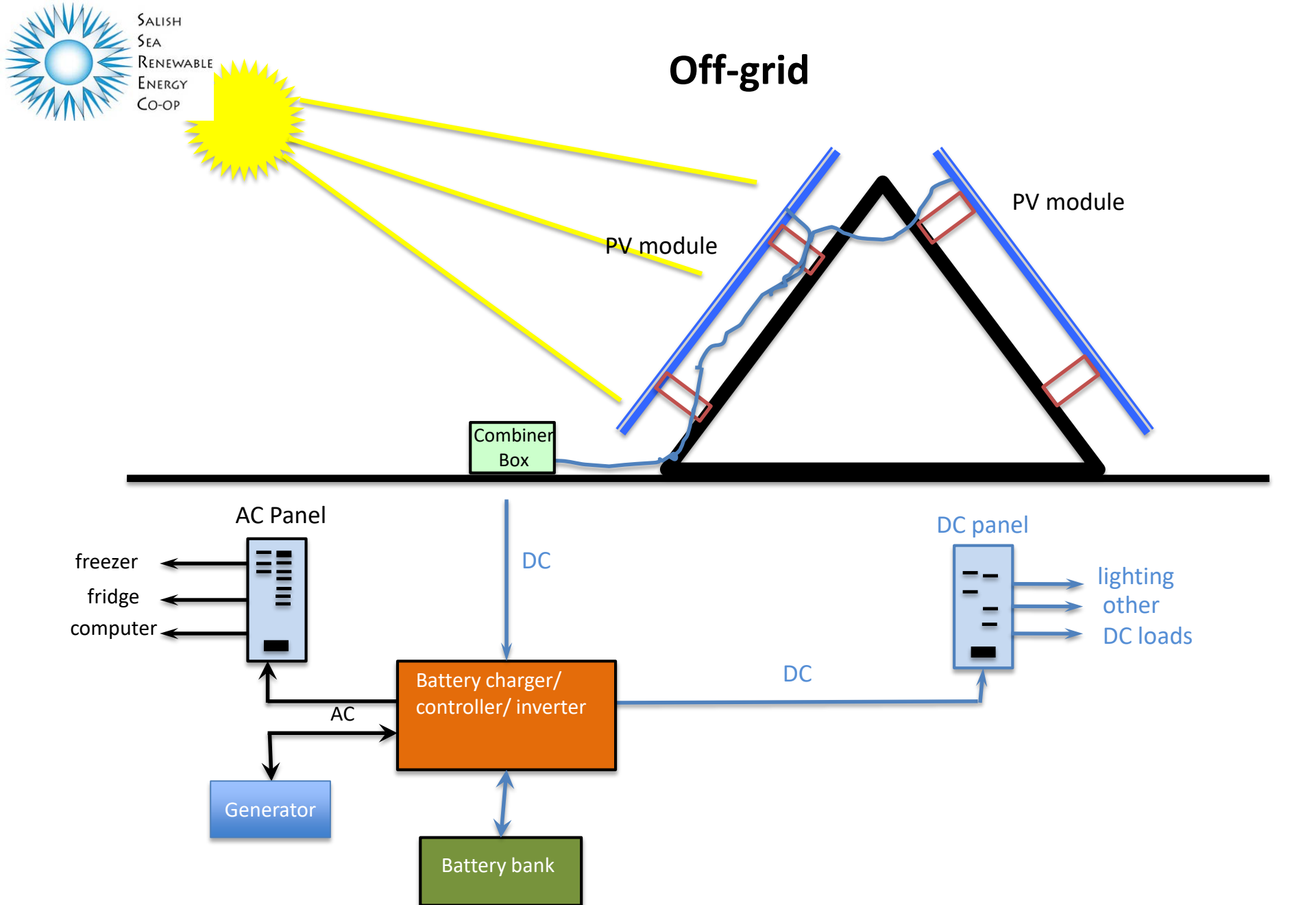
In less than two hours, the sun delivers all energy needed on the globe in a year



SALISH  
SEA  
RENEWABLE  
ENERGY  
CO-OP

# Grid-tied with battery backup: AC-coupled PV







SALISH  
SEA  
RENEWABLE  
ENERGY  
CO-OP

# Off-grid with battery storage & generator backup

