Brazil

Presentation 4

Presented by
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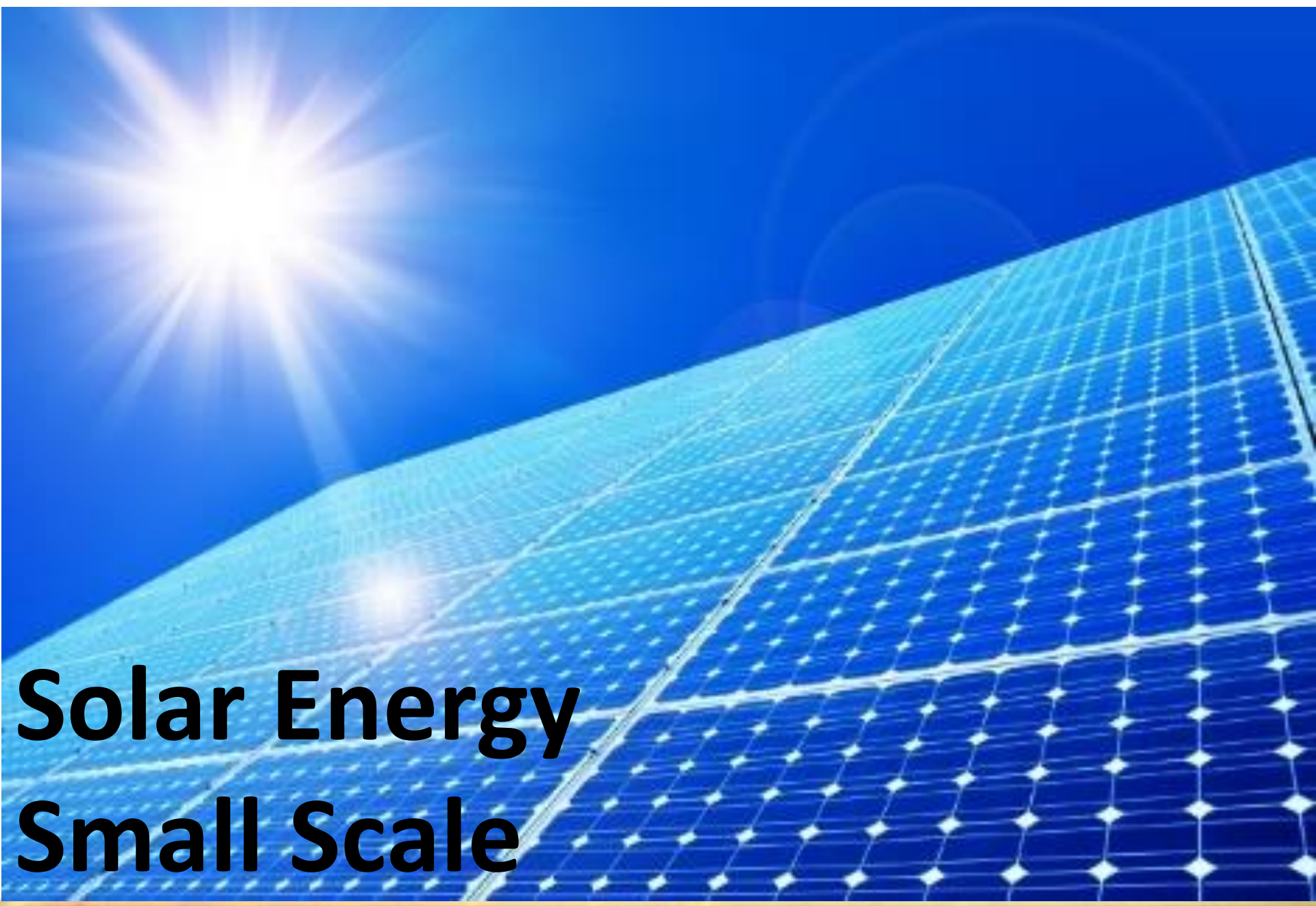
Best Practices

Top Countries with Installed Renewable Electricity by Technology (2012)

Hydropower	Solar PV (Grid-Tied)	CSP	Geothermal	Wind	Biomass
1 China	1 Germany	1 Spain	1 United States	1 China	1 United States
2 Brazil	2 Italy	2 United States	2 Philippines	2 United States	2 Brazil
3 United States	3 United States	3 Algeria	3 Indonesia	3 Germany	3 China
4 Canada	4 China	4 Egypt/Morocco	4 Mexico	4 Spain	4 Germany
5 Russia	5 Japan	5 Australia	5 Italy	5 India	5 Sweden

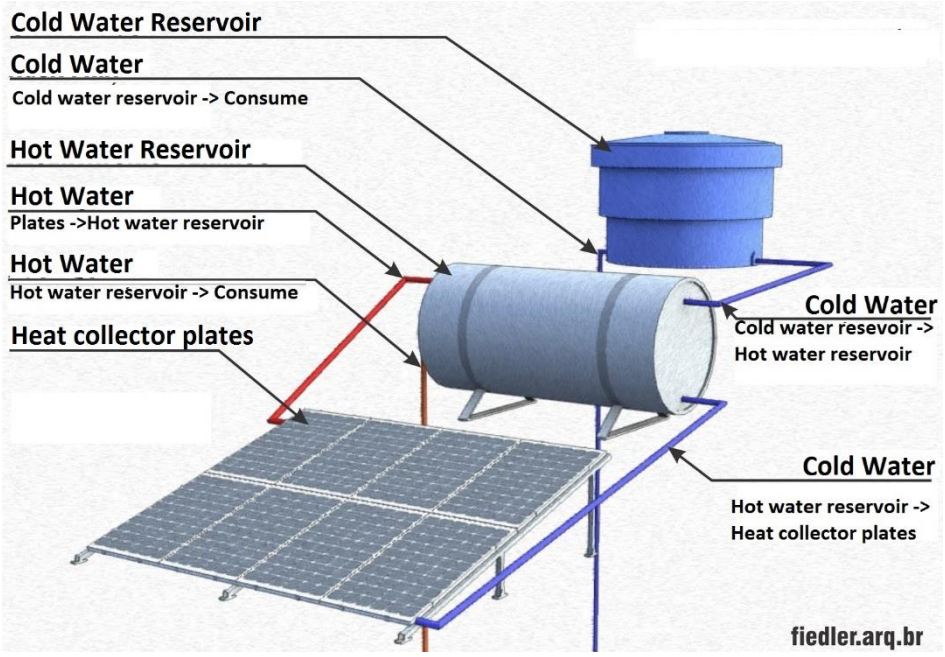
Sources: EIA, REN21

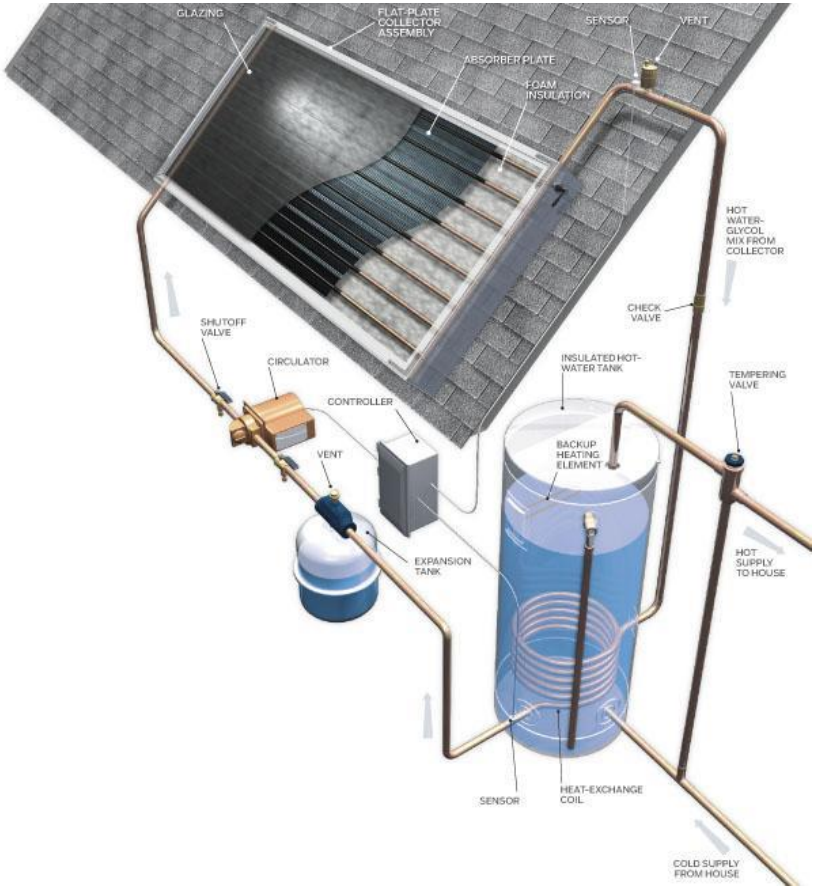


Solar Energy Small Scale

Residential Thermal solar Production

Technology





Price vary between R$ 800,00 to R$ 1.500,00
($260.00 to $500.00)

Source: energiatecsolar.com & pacificenergysales.com

Incentives

- **The first step is educate people!**
- Show
  1. Cost to install the system
  2. How much could be save on water heating costs
  3. Pay back period = cost / annual savings
  4. Life cycle of the system

Save Money

Save up to 75% percent on your home's water heating costs.

Conserve Energy

Sunlight is abundant, free, forever renewable and inflation-proof.

Reduce Greenhouse Gases

Reduce your carbon footprint and be part of the solution!

Source: energycenter.org

Incentives

The California Solar Initiative

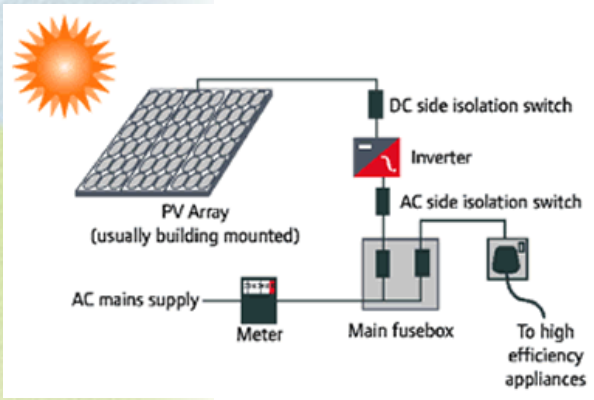
Sample Residential System Cost

Average Cost of a Residential Solar Water Heating System	$7,300
Less Average CSI-Thermal Natural Gas Rebate	-3,300
SUBTOTAL	$4,000
30% Federal Tax Credit ($4,000 x 30%)	-1,200
NET SYSTEM COST TO CUSTOMER	**$2,800**

Source: energycenter.org

Residential Solar (PV)

Technology



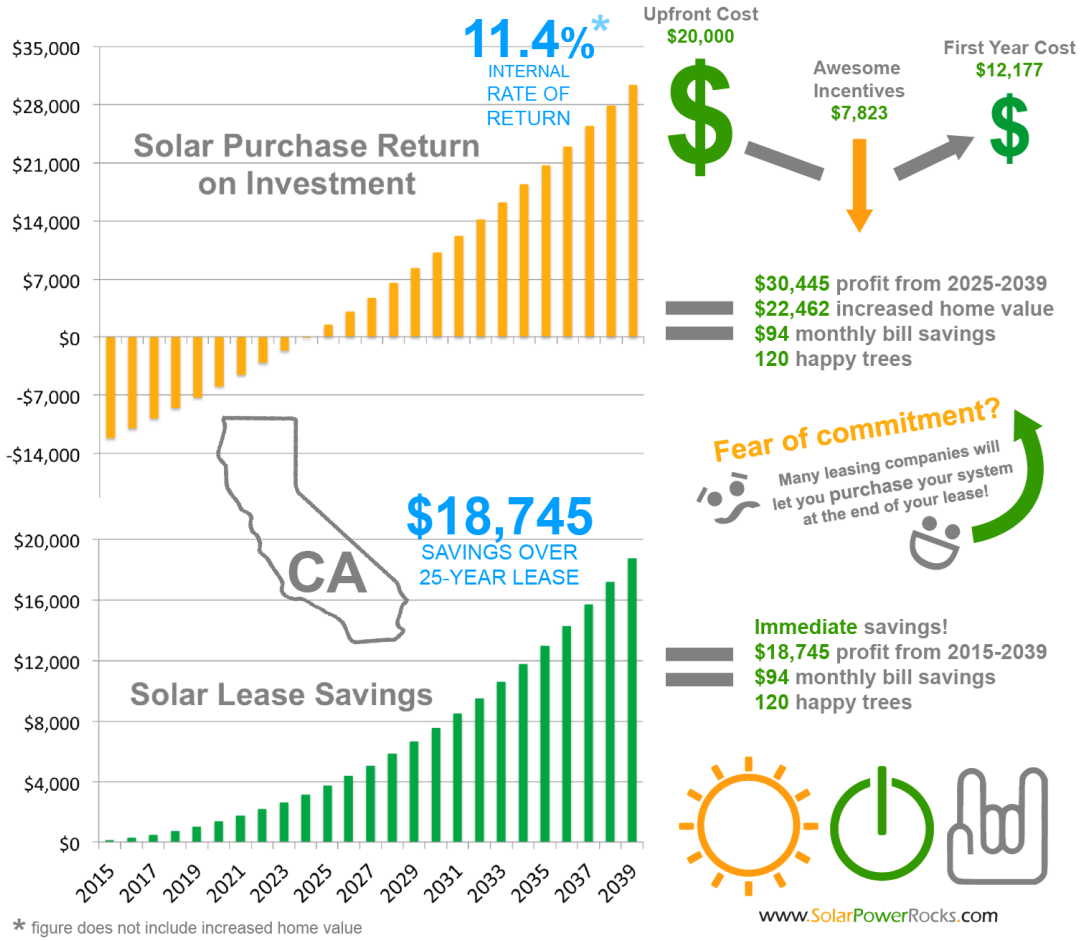
Source: energycenter.org

Incentives

The California Solar Initiative (CSI)

Advantages

- Energy Independence
- Home value increases
- Leasing
- 30% on Solar Investment Tax Credit



Technology

PV Solar Parking

Photovoltaic wall near Barcelona

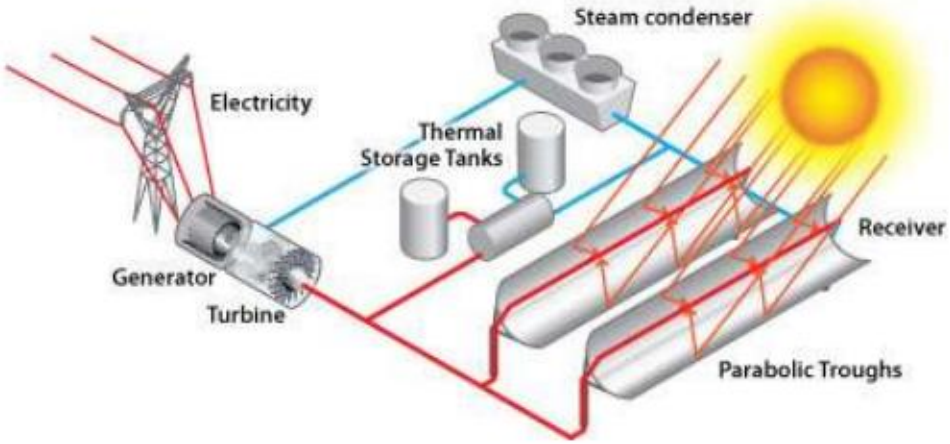
Sources: sunvie.eu & newindianexpress.com


Solar Energy
Large Scale

Concentrated Solar Power (CSP)

- Use the sun light to generate electricity or heat
- Generate temperature between 400 and 1000ºC
- Curved mirrors that reflect the sunlight onto a receiver tube

Parabolic Trough System

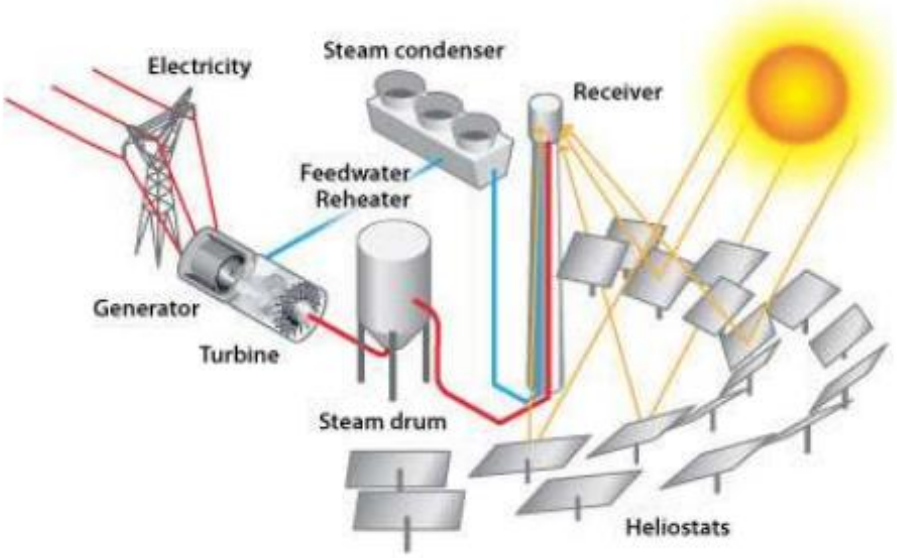


- **Solar Energy Generating System (SEGS**)
- Mojave Desert, California
- Potential of **354 MW**

Sources: wpi.edu & seia.org

Concentrated Solar Power (CSP)

CSP Tower System

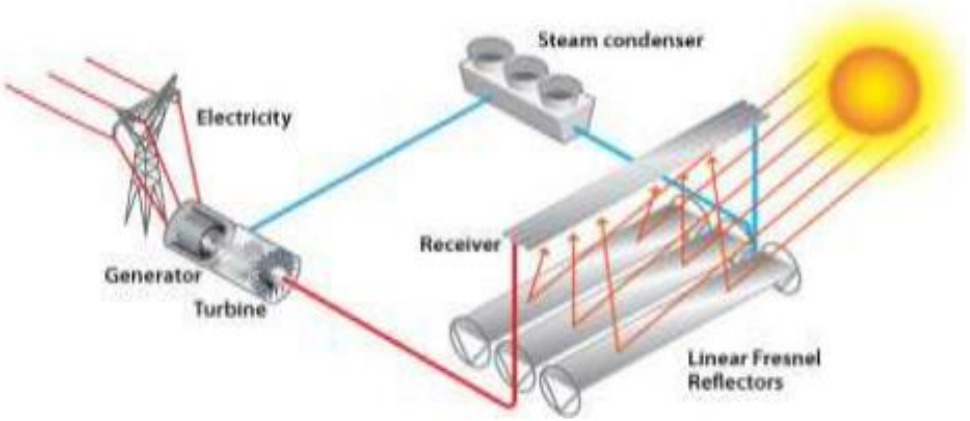


- **Ivanpah Solar Power Facility**
- San Bernardino County, California
- Potential of **392 MW**

Sources: wpi.edu & seia.org

Concentrated Solar Power (CSP)

Linear Fresnel Reflector System



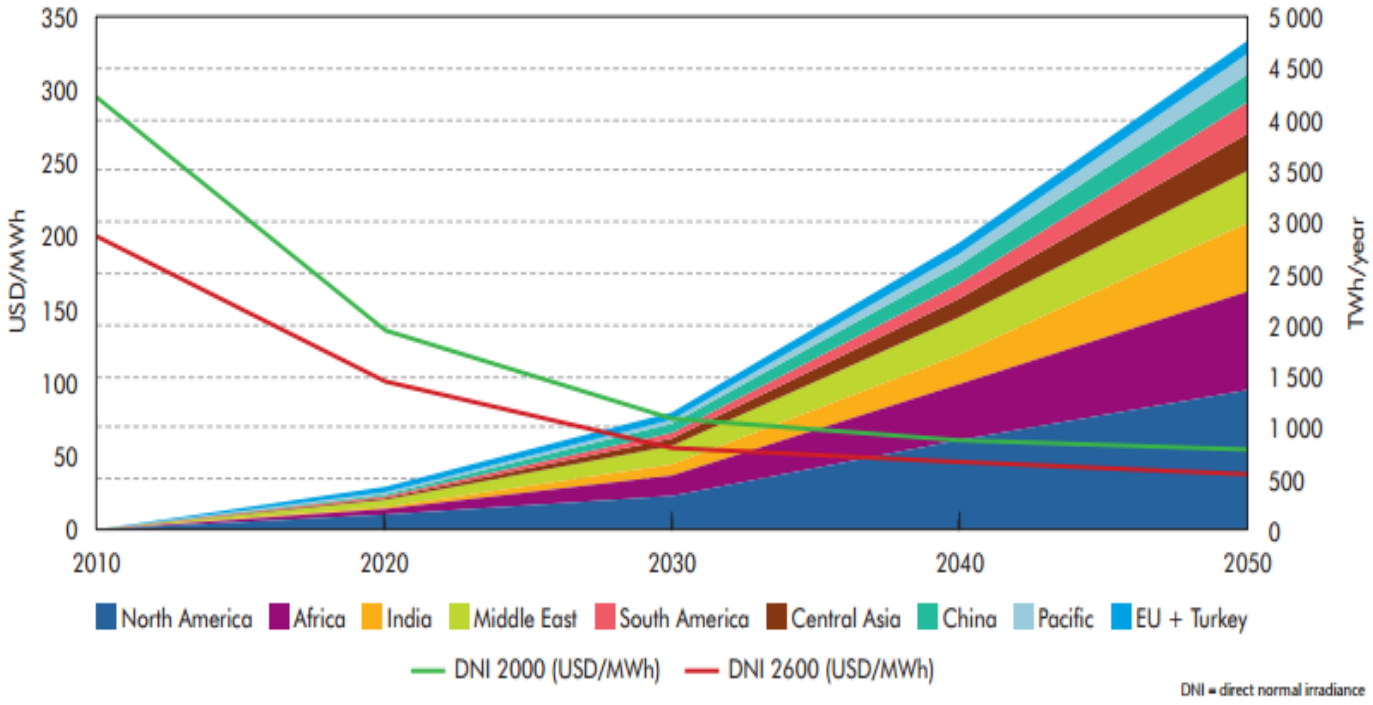
- **Puerto Errado**
- Spain
- Potential of **31.4 MW**

Sources: wpi.edu & seia.org

CONCENTRATING SOLAR POWER ROADMAP

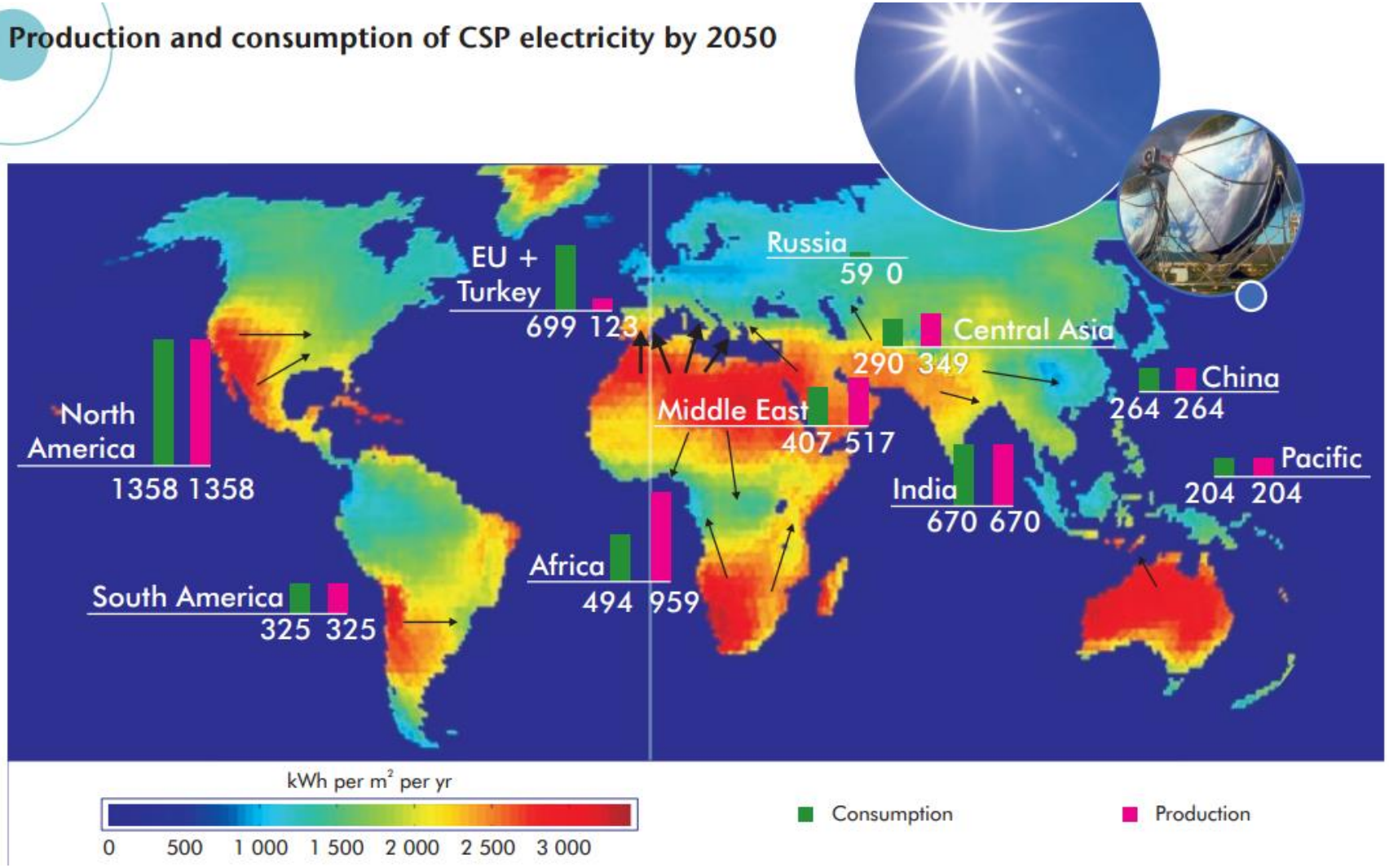
International Energy Agency

Decreasing cost and increasing production



(DNI) is the amount of solar radiation received per unit area by a surface
USD/MWh Cost of electricity per MWh (dolars)

Production and consumption of CSP electricity by 2050

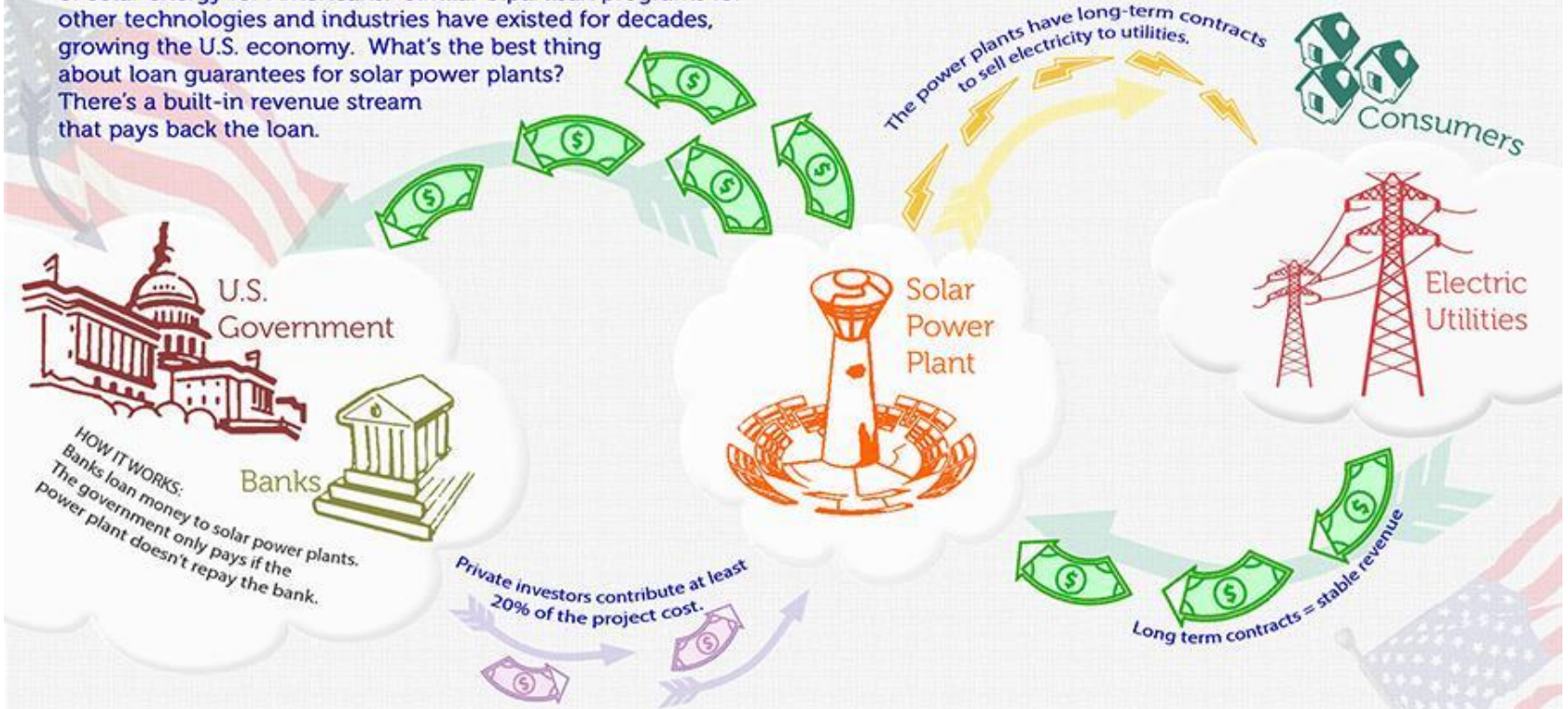


https://www.iea.org/media/freepublications/technologyroadmaps/foldout/csp_roadmap_foldout12010.pdf

CALL IT A SAFE BET

Why the DOE Loan Guarantee Program is a Good Deal for America

The DOE Loan Guarantee Program creates jobs and reduces the cost of solar energy for Americans. Similar bipartisan programs for other technologies and industries have existed for decades, growing the U.S. economy. What's the best thing about loan guarantees for solar power plants? There's a built-in revenue stream that pays back the loan.

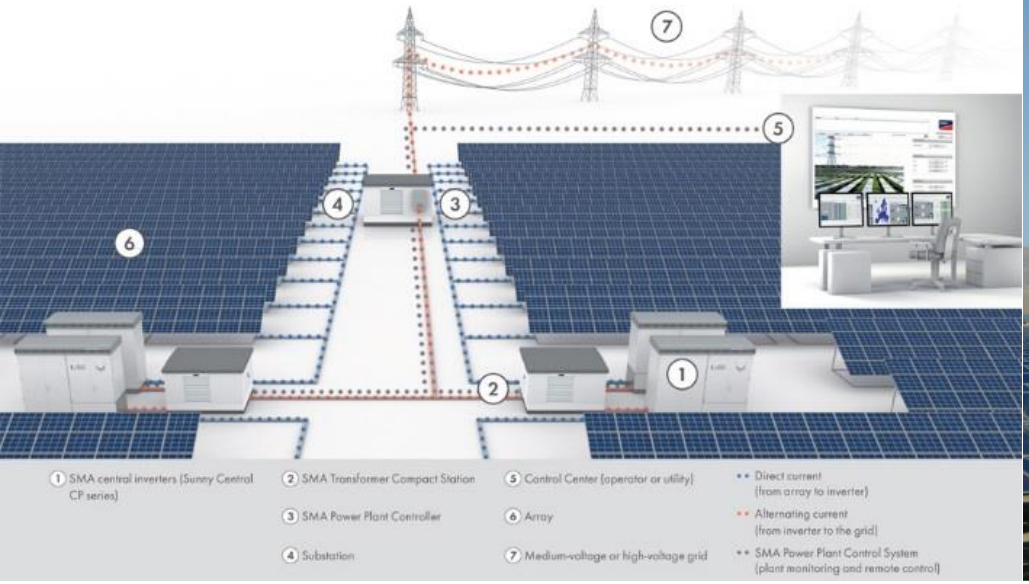


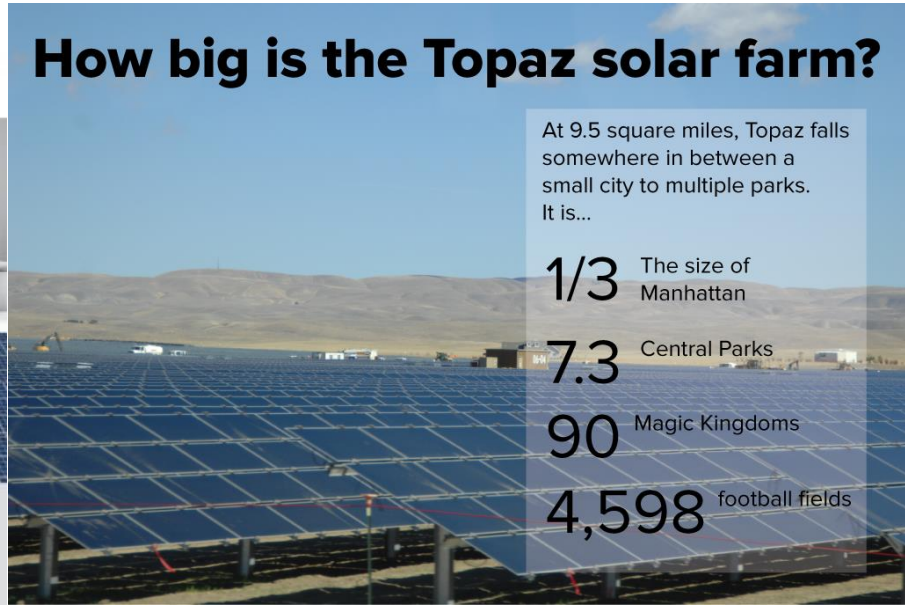
LOAN GUARANTEE = JOBS

Every solar power plant with a loan guarantee creates desperately-needed American jobs

Photovoltaic Solar Plant (PV)

- Three largest PV power plants are located in US

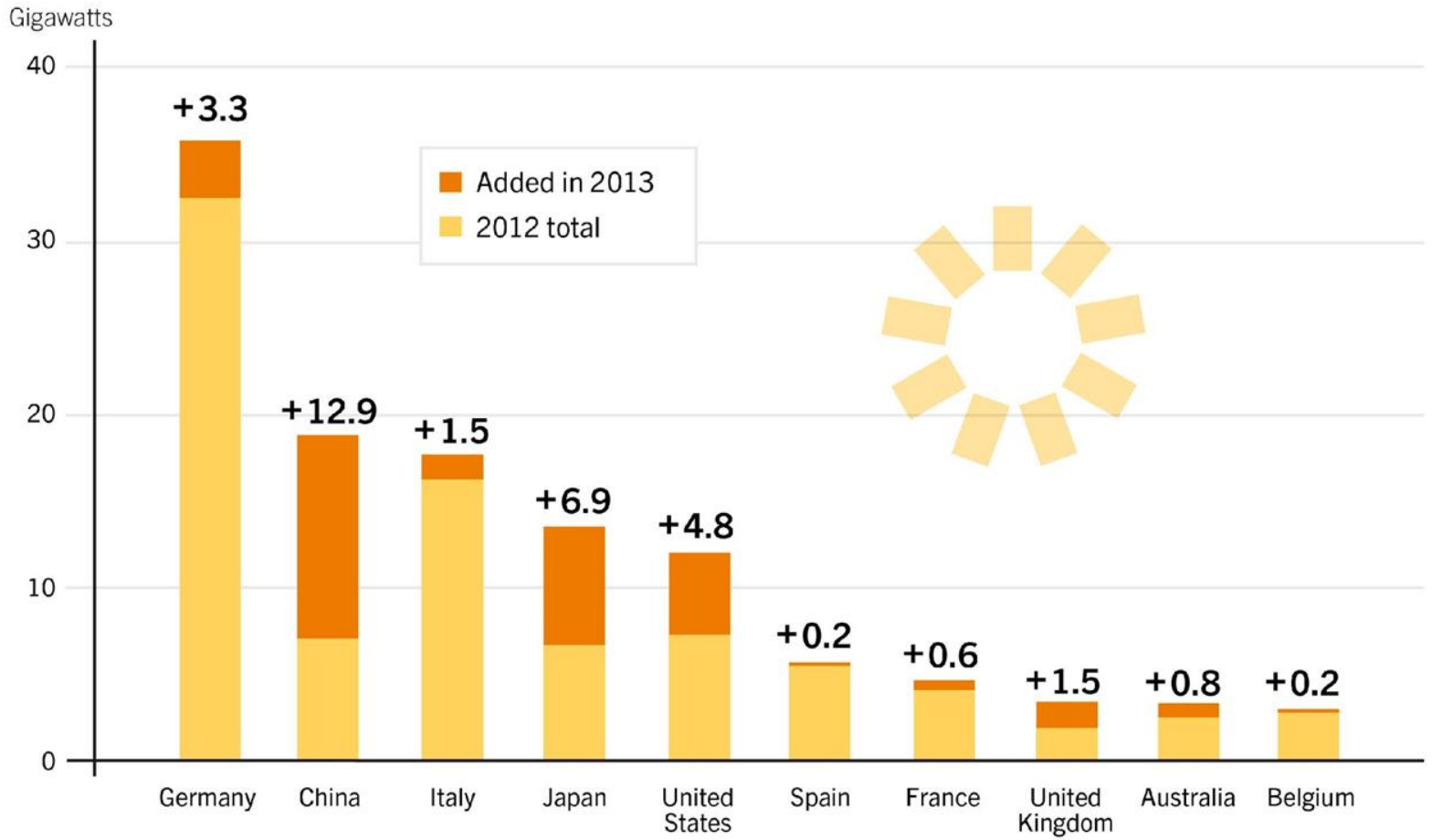




- Solar Star (579 MW) – Rosamond, CA
- Topaz Solar Farm (550 MW) – San Luis Obispo County, CA
- Desert Sunlight Solar Farm (550 MW) – Riverside County, CA

Source: gigaom.com

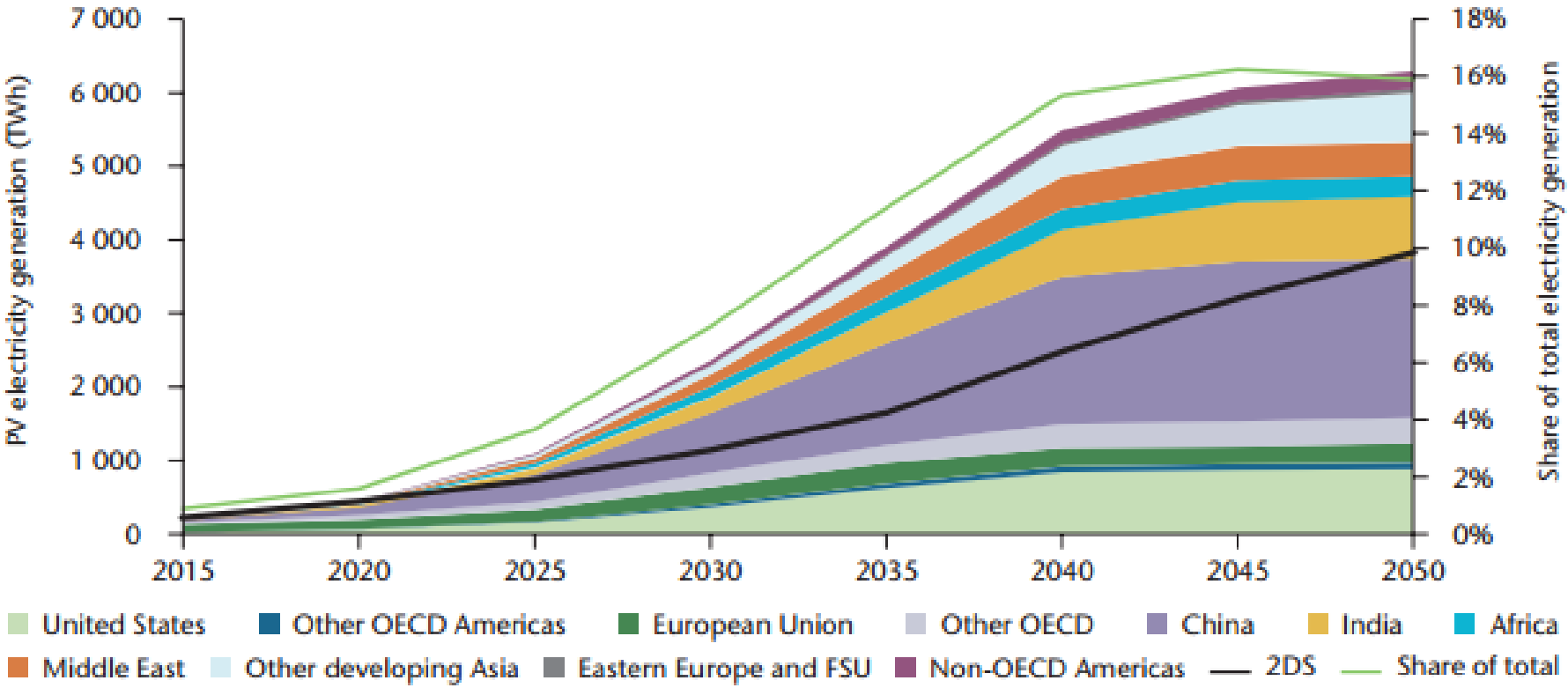
Solar PV Capacity and Additions, Top 10 Countries, 2013



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

REN21 Renewable Energy Policy Network for the 21st Century

Photovoltaic Solar Plant (PV)

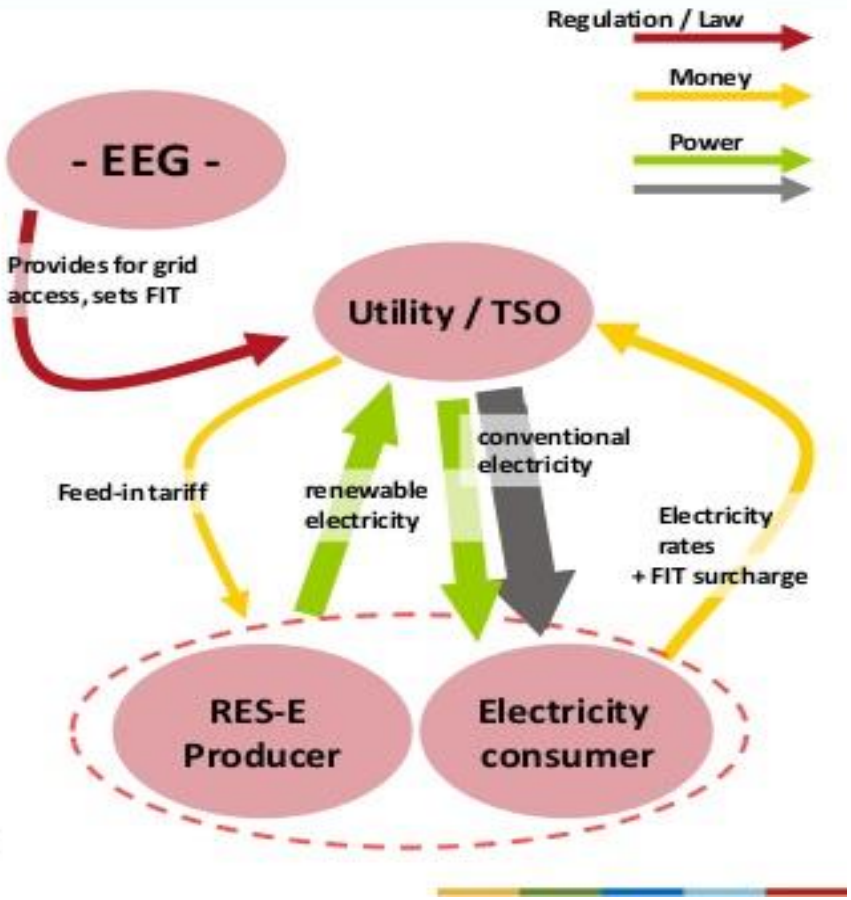


Source: eia.gov

The Renewable Energy Act – EEG –

BEE Bundesverband Erneuerbare Energie e.V.

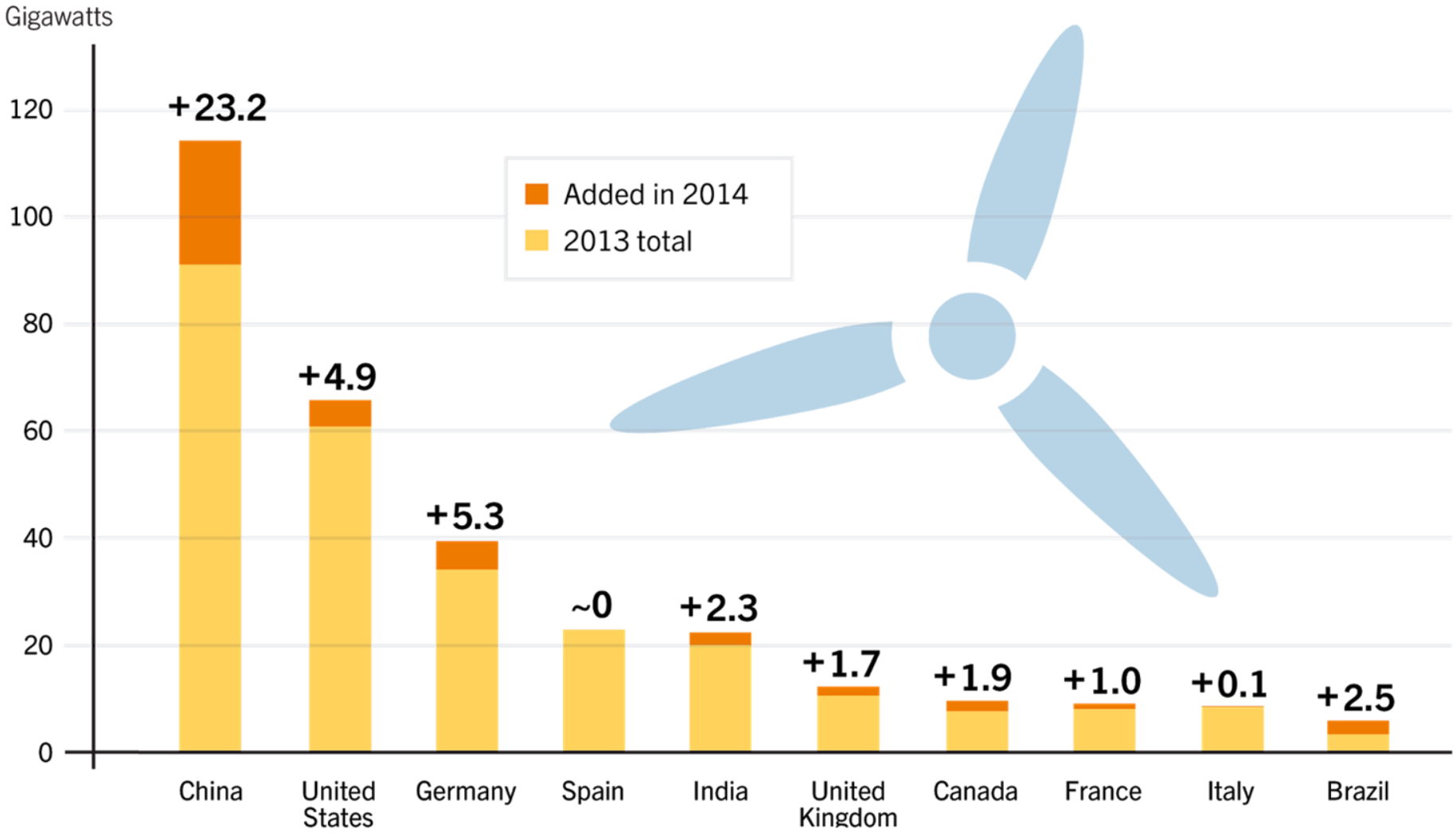
- Priority grid access for Renewables installations
- Each kWh must be purchased and remunerated by the utility / grid operator (with defined exceptions)
- Fixed feed-in tariff paid for 20 years
- Annual (monthly for PV) degression for new installations (a fixed percentage or a defined mechanism)
- Differentiated support according to technology, size and site quality
- Costs are passed on to all electricity consumers (specific exceptions for energy intensive industry)
- Regular evaluation and amendments



http://www.slideshare.net/Kestavatalous/ekskursio-german-renewable-energy-federation-bee

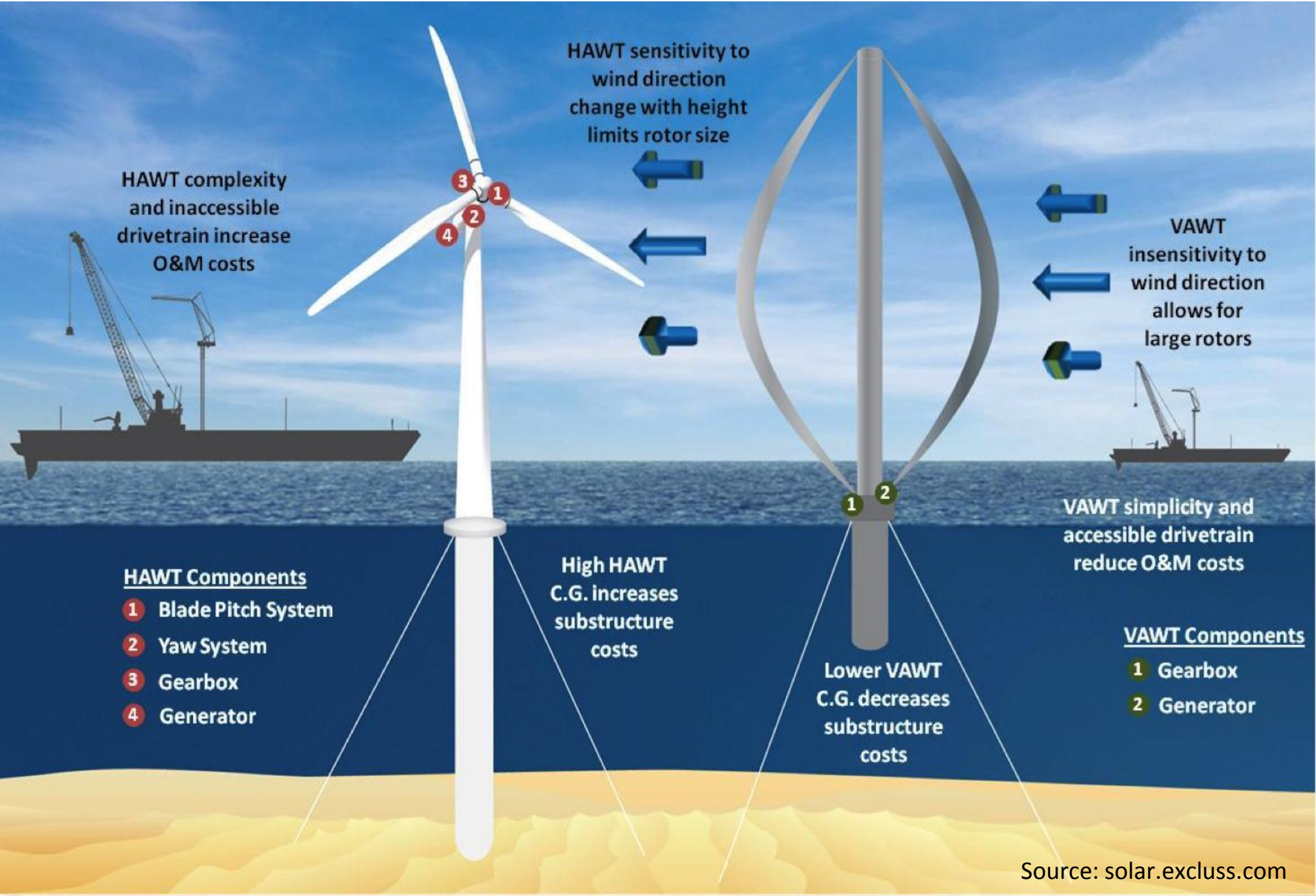
Wind Energy
Large scale

Wind Power Capacity and Additions, Top 10 Countries, 2014



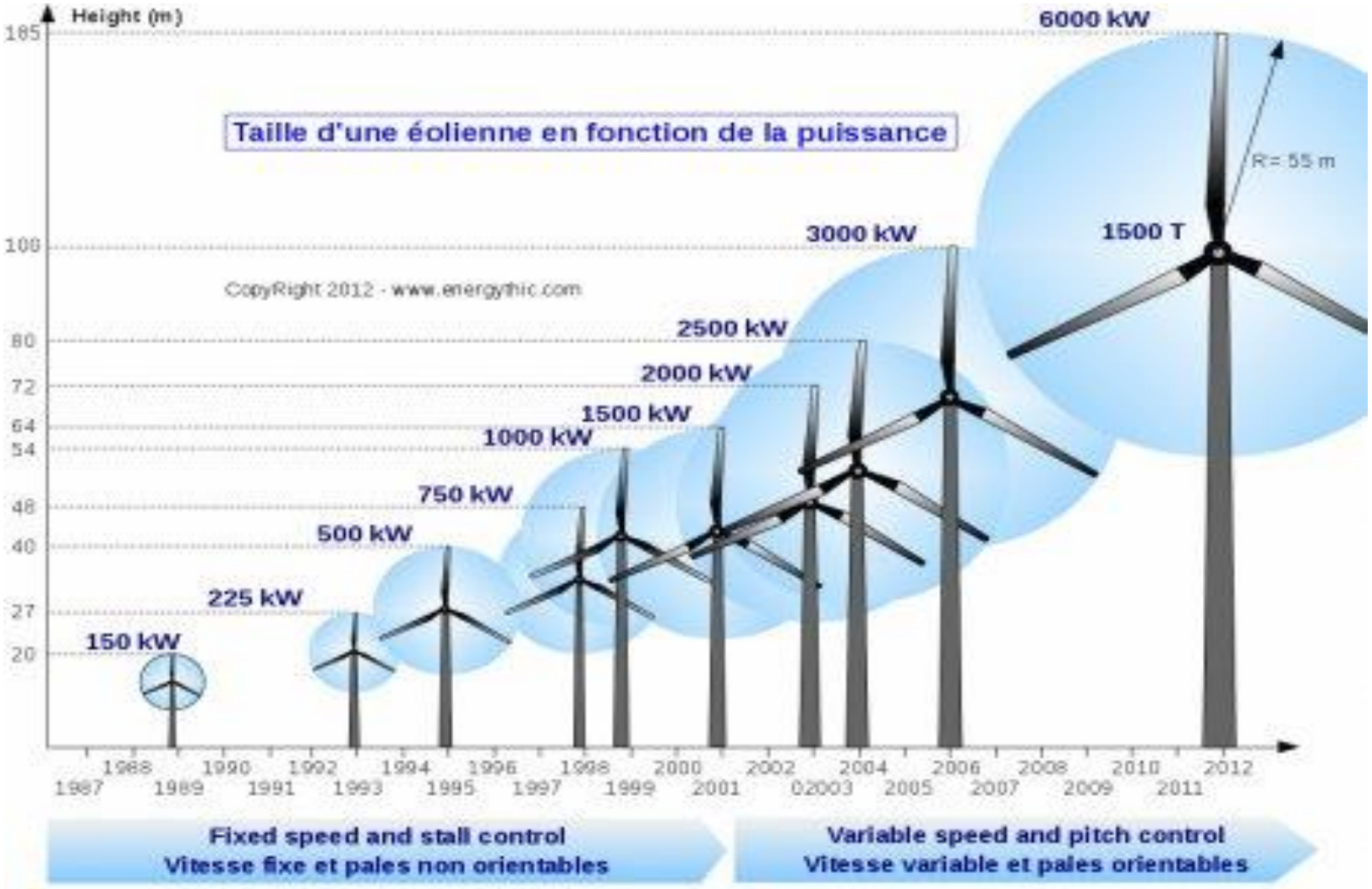
Additions are net of repowering.

REN21 *Renewables 2015 Global Status Report*



Source: solar.excluss.com

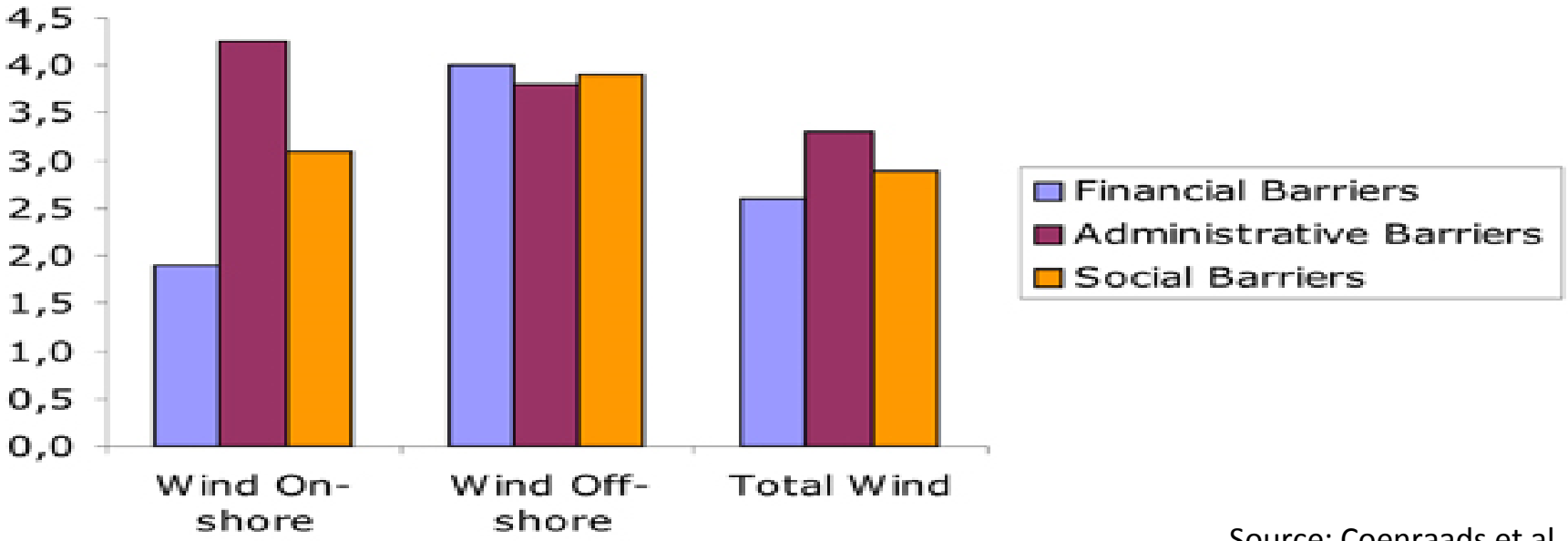
Technology Evolution



Source: energythic.com

On-shore

Off-shore



Source: Coenraads et al. (2006)

Off-Shore

London Array Farm

- England, UK
- More than 70 km (12 miles)
- 175 turbines
- Potential of **630MW**

On-Shore

Gansu Wind Farm

- China
- Potential of 7,965 MW (20,000 MW)

Alta Wind Energy Center

- Kern County, California
- Potential of 1,320 MW

Global Investments in Renewable Energy 2014

U.S.News

Alan Neuhauser for USN&WR; Source: UNEP

Sustainability practices in action

LED vs Icandescent

60 watt Incandescent

- Yearly Operating Cost - **$12.92**
- Energy Usage - **60w**
- Brightness(Lumens) - **800**
- Bulb Lifetime- **750 Hours**

14 watt CFL

$58 Lifetime Savings over an incandescent with the **same brightness**

- Yearly Operating Cost - **$3.01**
- Energy Usage - **14w**
- Brightness(Lumens) - **800**
- Bulb Lifetime - **10,000 Hours**

12 watt LED

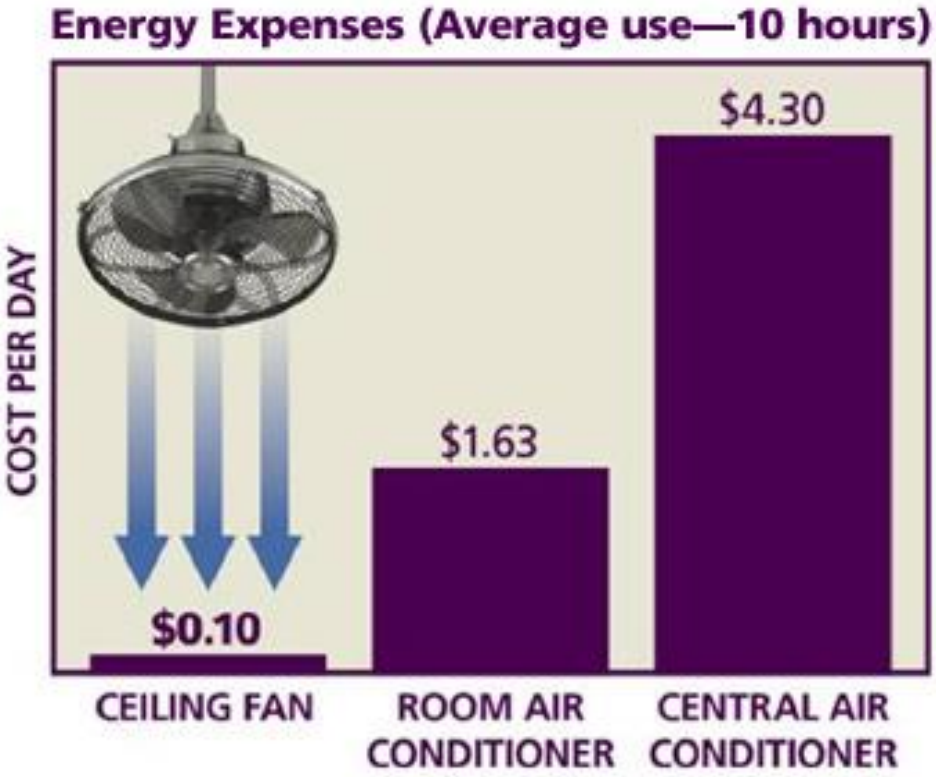
$200 Lifetime Savings over an incandescent with the **same brightness**

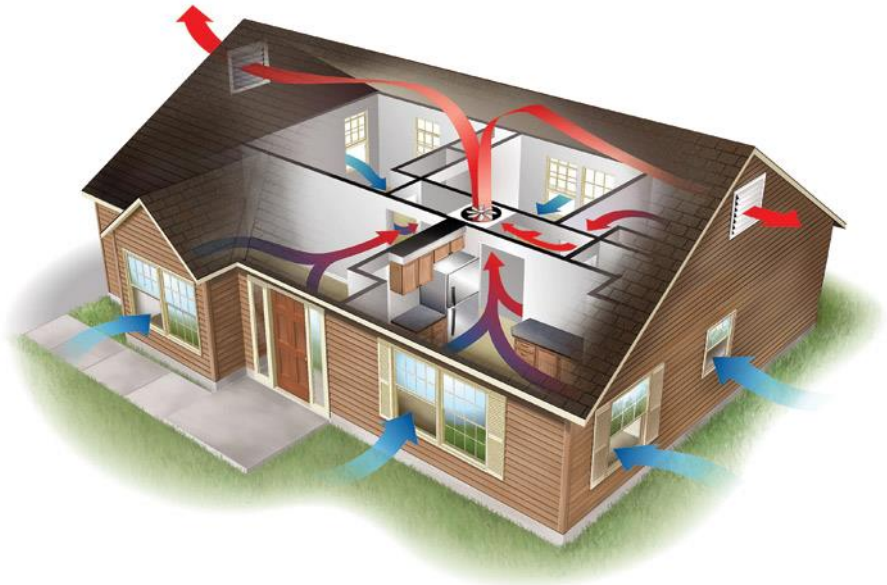
- Yearly Operating Cost - **$2.58**
- Energy Usage - **12w**
- Brightness(Lumens) - **800**
- Bulb Lifetime- **50,000 Hours+**

4everled

Source: Forbes.com

Fan vs Air Conditioner





Font: directelectricco.com

Fonte: bellacor.com & directelectricco.com

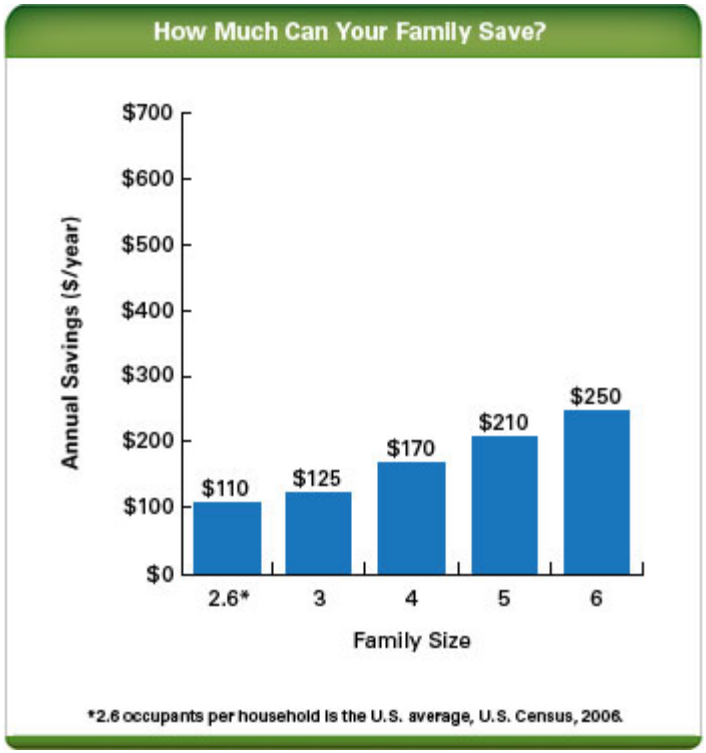
Solar Powered Exhaust Fan

$ 349.00

- Uses mechanical devices (fan) to distribute stored thermal energy
- Stored water or air on the roof, heats it, and then pumps it through the building
- Use the electricity from sun to move

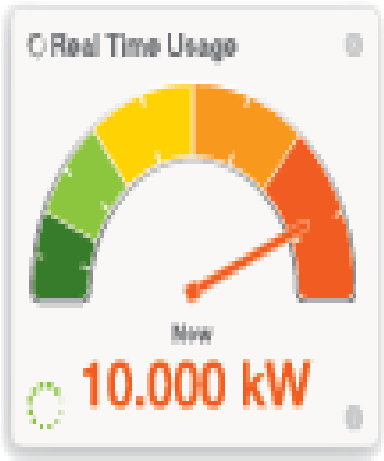
Source: farmwholesale.com

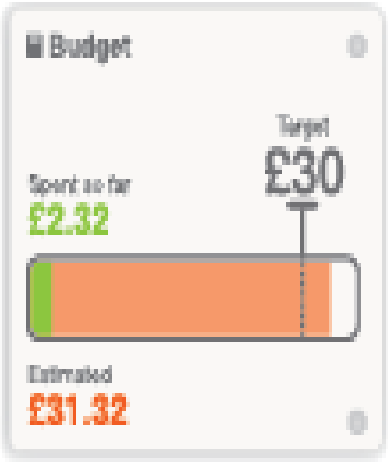
Energy Star

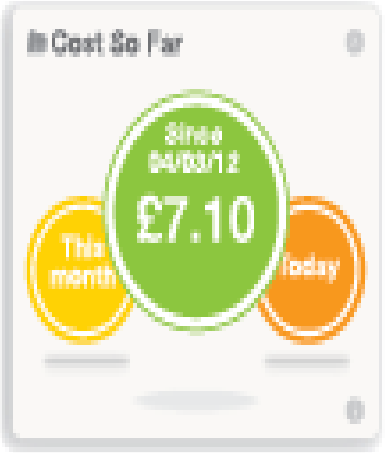


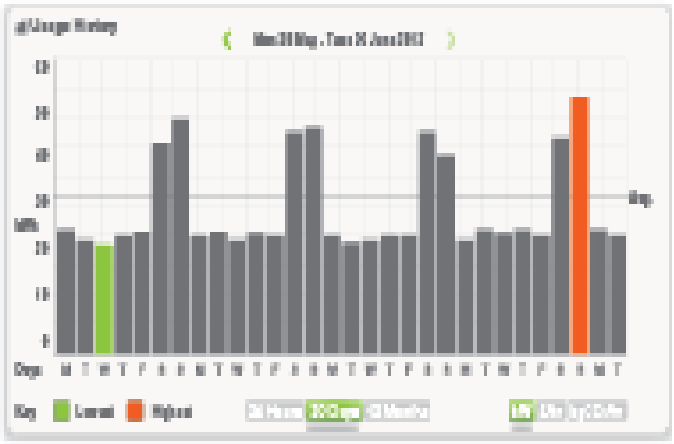
Font: energy star.gov

Energy Monitoring System









REAL-TIME USAGE

See your current power usage instantly in real-time

BUDGET

Set a target and accurately track your performance

COST SO FAR

Discover how much you have spent in real-time

USAGE HISTORY

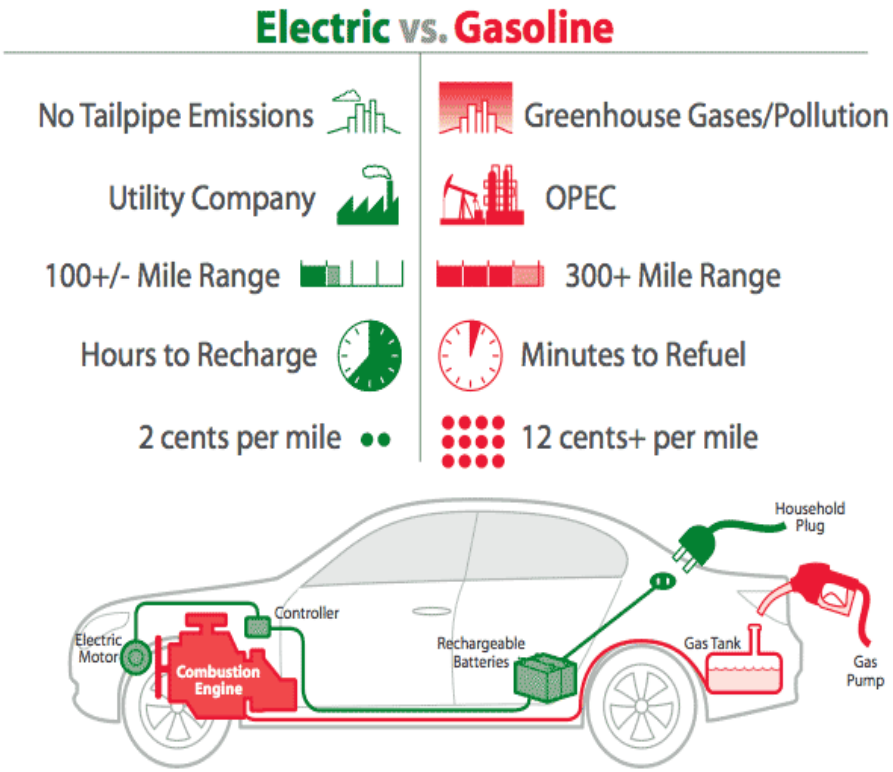
See the amount of energy consumed per day and month as well as the cost of that energy

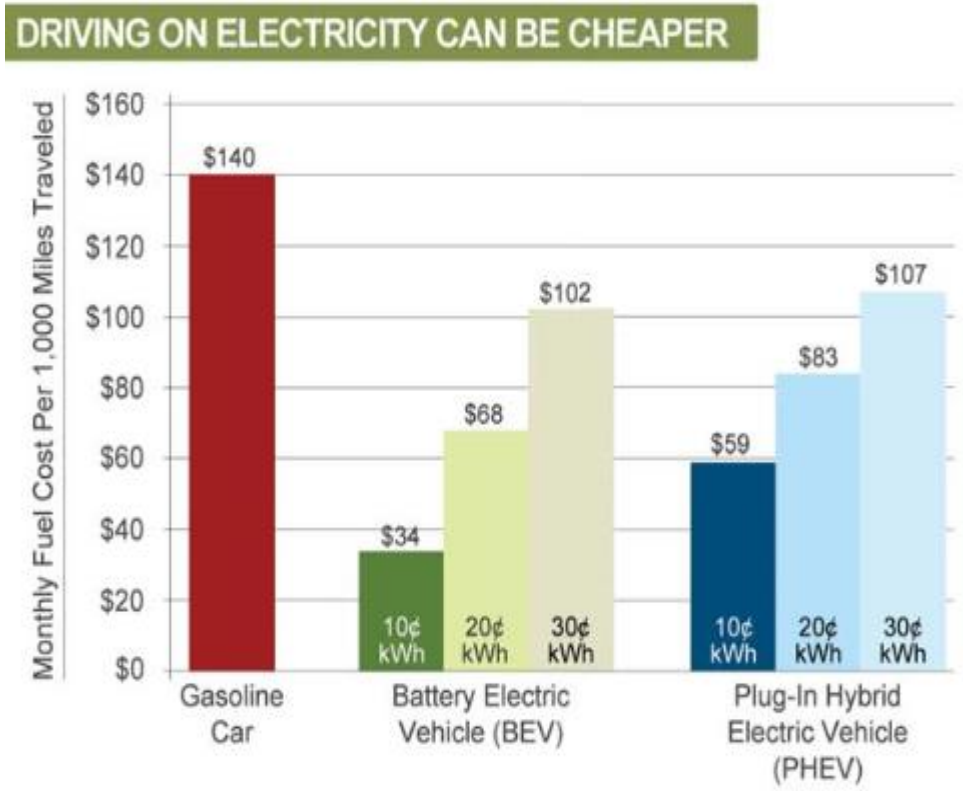
Source: efergy.com

The Change Worth

Source: directelectricco.com

Electric Car





Source: California PEV Collaborative (CG4-1)