

An Immediate, Off-the-Shelf Solution to Energy and Climate

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The Answer

- Sunlight
 - 10^{18} kWh/yr
 - 250,000 times US electricity production
 - Equivalent of all world annual energy use in 40 minutes
- The Pieces
 - Photovoltaics
 - Solar Thermal Electric (or concentrating solar power)
 - Storage
 - Distribution
 - Electric/hybrid vehicles

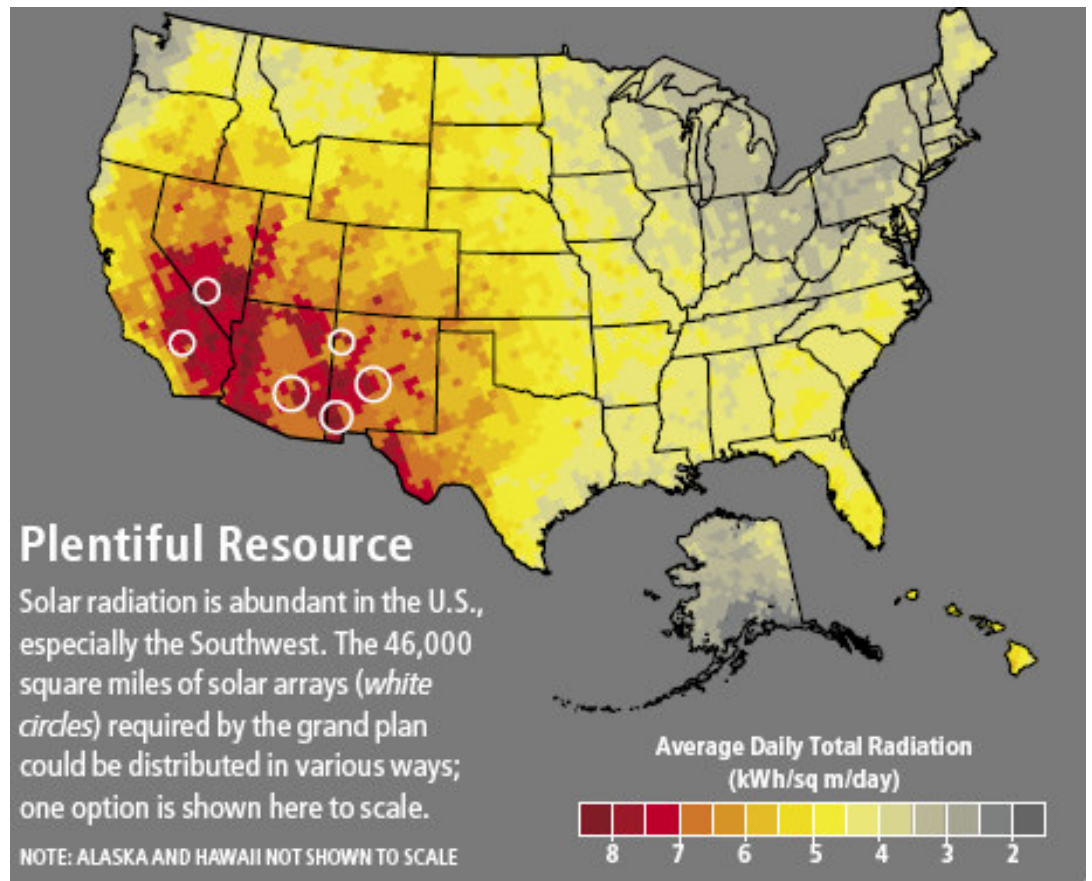
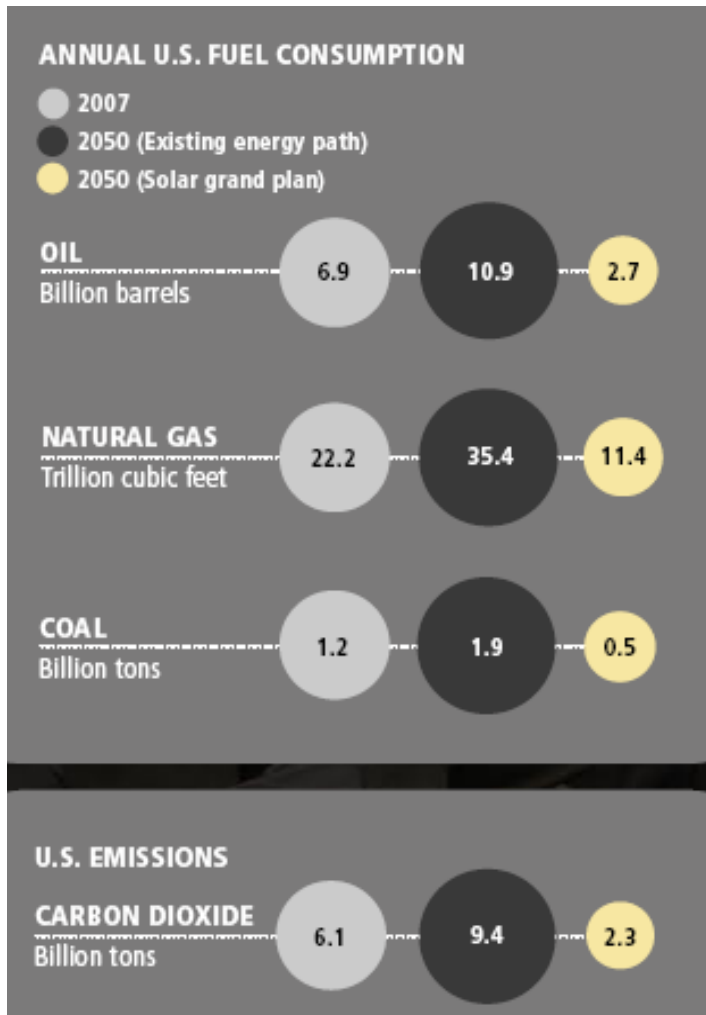
Actions

- Build solar photovoltaics and solar thermal electric (with thermal storage) in the world's best solar locations as fast as humanly possible
- Build high-voltage DC transmission lines from these locations to demand centers
- Build compressed air energy storage at the interstices of the DC-AC grids
- Incentivize electric transportation

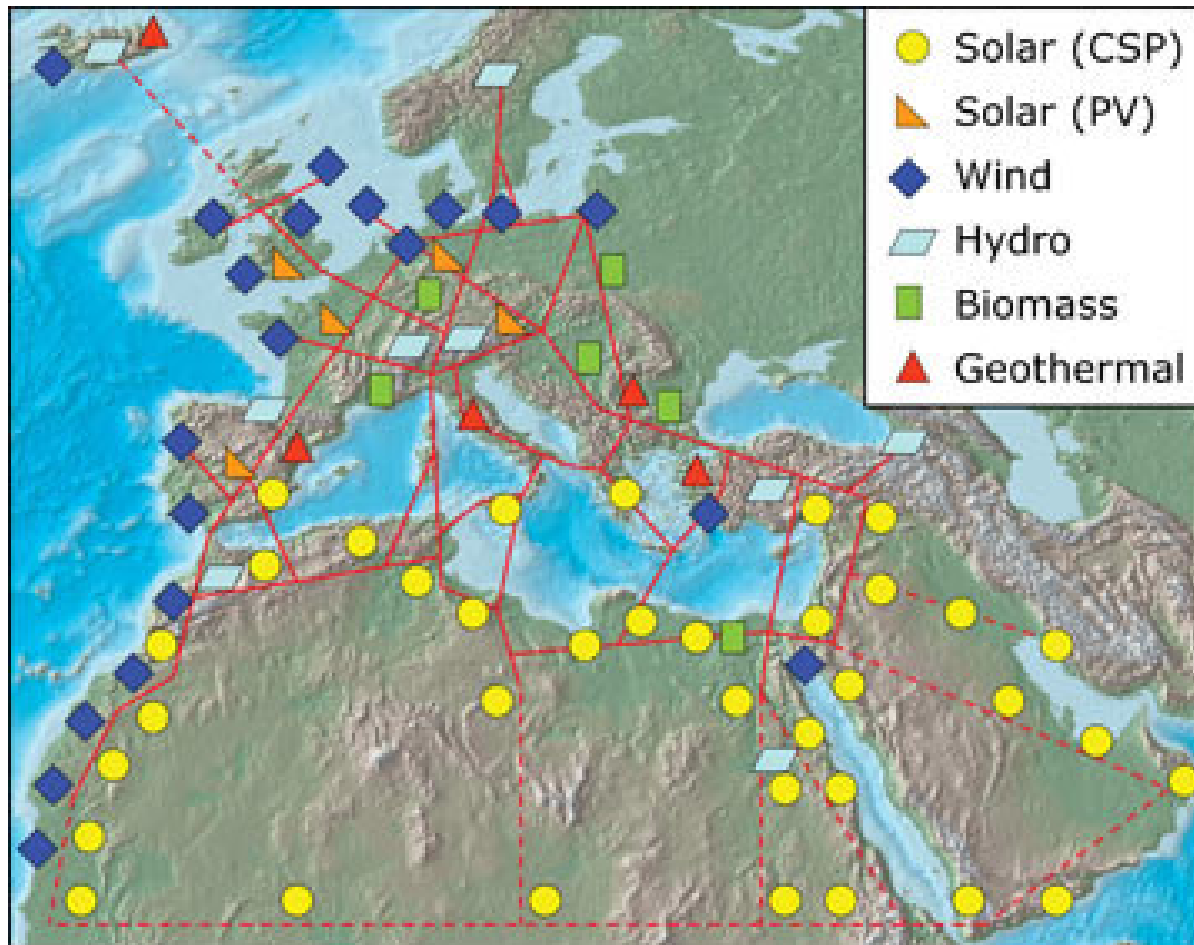
Actions

- Declare a worldwide income and property tax holiday on solar and its supply chain
- Provide low interest loans
- 30% Investment Tax Credit
- Mandate transmission access
- Upgrade the world's grids to best handle intermittency and new supplies
 - Add distributed storage
- Incorporate as much wind and distributed PV as possible

The US Solution



Europe Has One, Too



Trans-Mediterranean Renewable Energy Cooperation (TREC) vision of a sustainable energy future for Europe, the Middle East and North Africa: A super-grid of solar thermal power plants and other renewable energy sources such as wind, hydroelectric and geothermal fully powers the region.

California Energy Commission documents confirm that pricing is at or below the California market price referent (MPR).

March 28, 2008
SCE Launches 250-MW Solar Project

**PG&E Signs Contracts With BrightSource Energy for up to
900 Megawatts of Solar Thermal Power**
Tuesday April 1, 12:00 pm ET

First Solar 2-MW Array at Ft Carson, CO



Inside a Thin Film PV Factory



First Solar, Perrysburg, OH

Nevada Solar One 64-MW



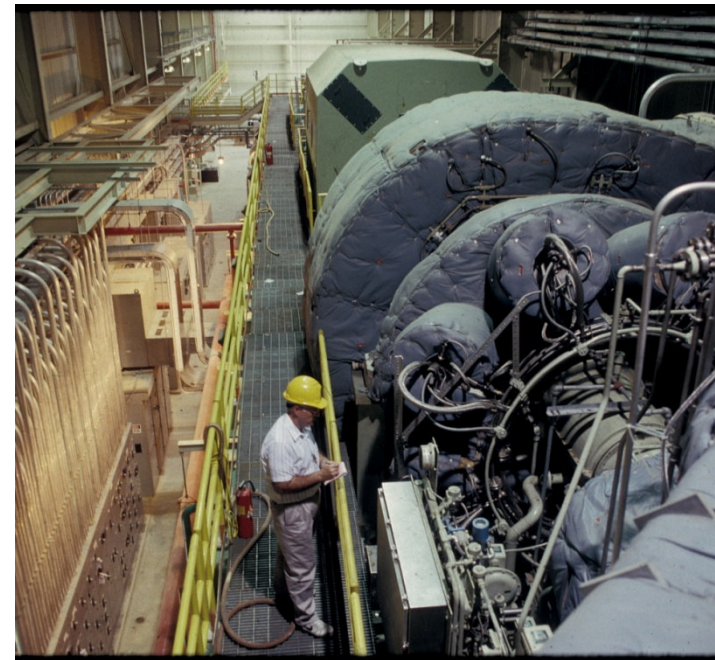
354 MW LUZ Solar Thermal Plants Built in CA in '80s and '90s



Transmission

- Location in US SW requires long distance transmission
- High voltage DC is proven and has significantly lower losses than AC transmission

McIntosh, Alabama 110-MW CAES power plant compressed air well-head for the turbo-train and the gas turbine power plant











Alabama Electric Cooperative, owners and operators of the McIntosh, Alabama CAES plant

Plug-in Hybrid Vehicles

- Path to converting to an electricity-based transportation system
- Need about 80% electricity, 20% fuel vehicle to offset CO₂ and fuel issues (Electricity for commuting, fuel for range extension)
 - *Need renewables as source of electricity or else you just transfer CO₂ back to electricity source*
- Opportunity for US car companies?

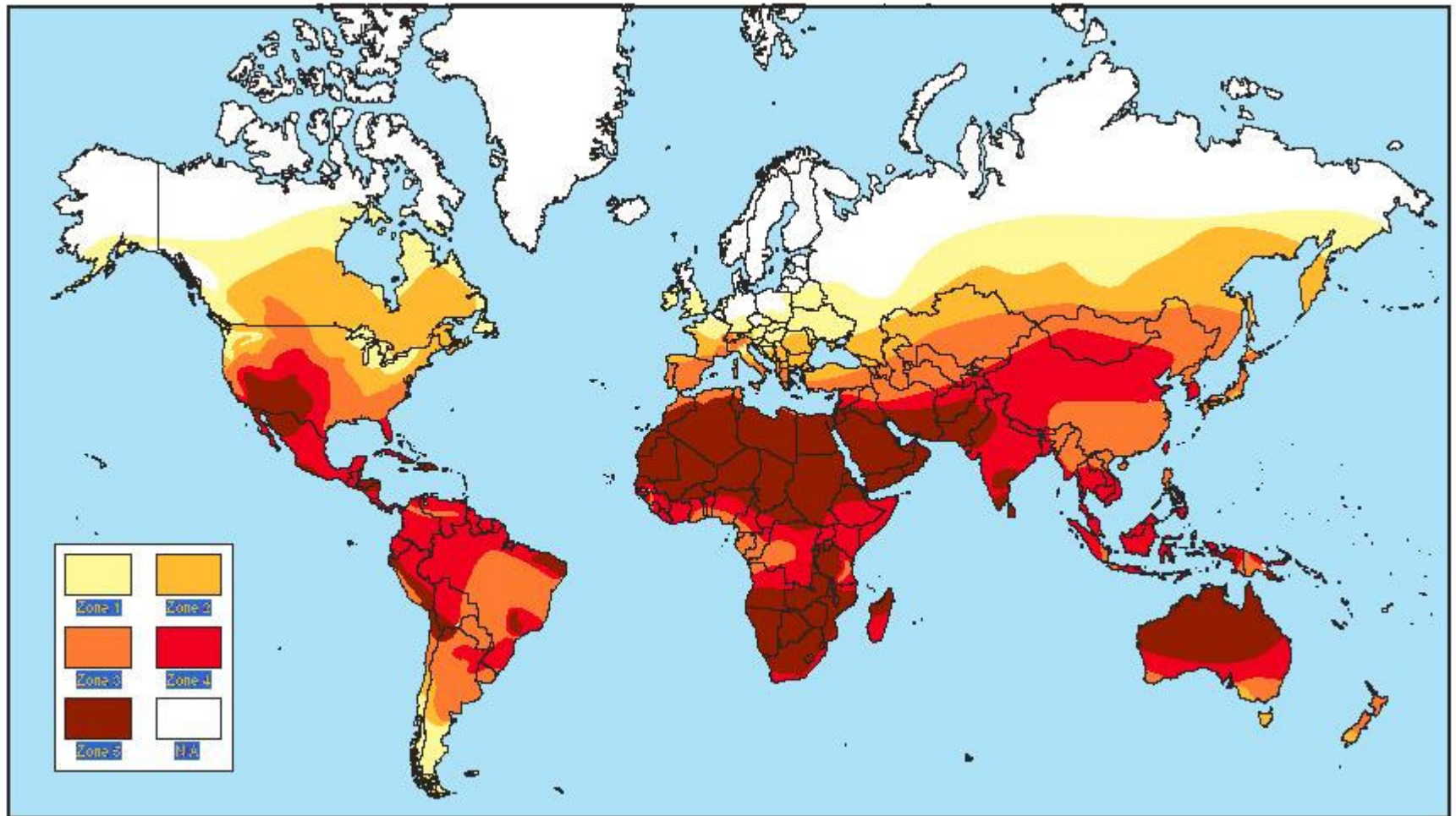
Formula for Success

Battery makers are racing to develop lithium-ion cells to power new generations of plug-in hybrids and electric cars. Their challenge: find the right chemistry for different types of cars that will maximize longevity, power, capacity and safety.

DEVELOPER	CHEMISTRY	EXPECTED VEHICLE	WHEN	
A123	Doped lithium nanophosphate	Chevy Volt electric Saturn Vue plug-in hybrid ▶ Think City electric	2010 2009 2009	
Compact Power (LG Chemical) NEC	Manganese spinel	Chevy Volt electric ▶ Nissan electric	2010 2010	
Panasonic EV Energy Johnson Controls/Saft	Lithium nickel cobalt aluminum oxide (NCA)	Toyota plug-in hybrid ¹ Mercedes S400 hybrid ▶ Saturn Vue plug-in hybrid	2010 2009 2009	
Hitachi	Lithium manganese oxide	future GM hybrids ▶	2010	
Commercially available lithium-ion cells	Lithium cobalt oxide and others	Tesla Roadster electric ▶	2008	
Altair Nanotechnologies	Lithium titanate spinel (anode)	Phoenix electric ▶	2008	
Lishen	Lithium iron phosphate	Miles XS500 electric ▶	2009	
EnerDel	Lithium manganese titanate	Think City electric ▶	2009	

¹According to industry sources.

Generalizing the Plan



Energy Prices

- We have waited too long to address energy prices
 - Are we going to see bad solutions implemented, because we didn't prepare?
- Our answer is a *real* solution (not a band-aid), but it takes commitment and vision
- **We must act politically to propose an immediate, practical path to the solar solution**

A(merican) S(olar) A(ction) P(lan)

- Scientific American, January 2008, Solar Grand Plan
 - Zweibel, Mason, Fthenakis
 - <http://www.sciam.com/article.cfm?id=a-solar-grand-plan>
- ASAP
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