

OPERATION SOLAR CENTURY

Stony Brook SBDC
NYSERDA Solar & Wind Workshop

May 11, 2011

EmPowerSolar 

Presentation Overview

- **EmPower Overview**
- Energy Challenge
- About Solar
- Solar Financials
- Hiring A Contractor
- Call to Action

US Department of Energy: Solar Decathlon



100,000 enthusiastic visitors

Success





America's First
Solar Hydrogen Home

USMMA NYIT LIPA

EmPower's Focus

- Solar Energy Engineering & Installation
 - Residential
 - Business
 - Municipal
 - Non-Profit

- Electric Vehicle Charging Infrastructure

EmPower Overview

- ❑ Founded In 2003
- ❑ Over 300 Installations in the Region
- ❑ 30 Employees
 - Engineers
 - Architects
 - Technicians Sales
 - Installers



EmPower Credentials

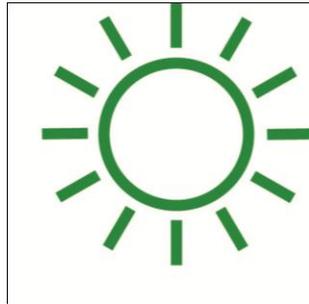
- ❑ **Five** North American Board of Certified Energy Practitioners Solar Installers



- ❑ PE Leading Engineering Department
- ❑ Robust Training Programs Throughout

EmPower Vision

Renewable energy will lead to a more
prosperous, healthy, and civil world.



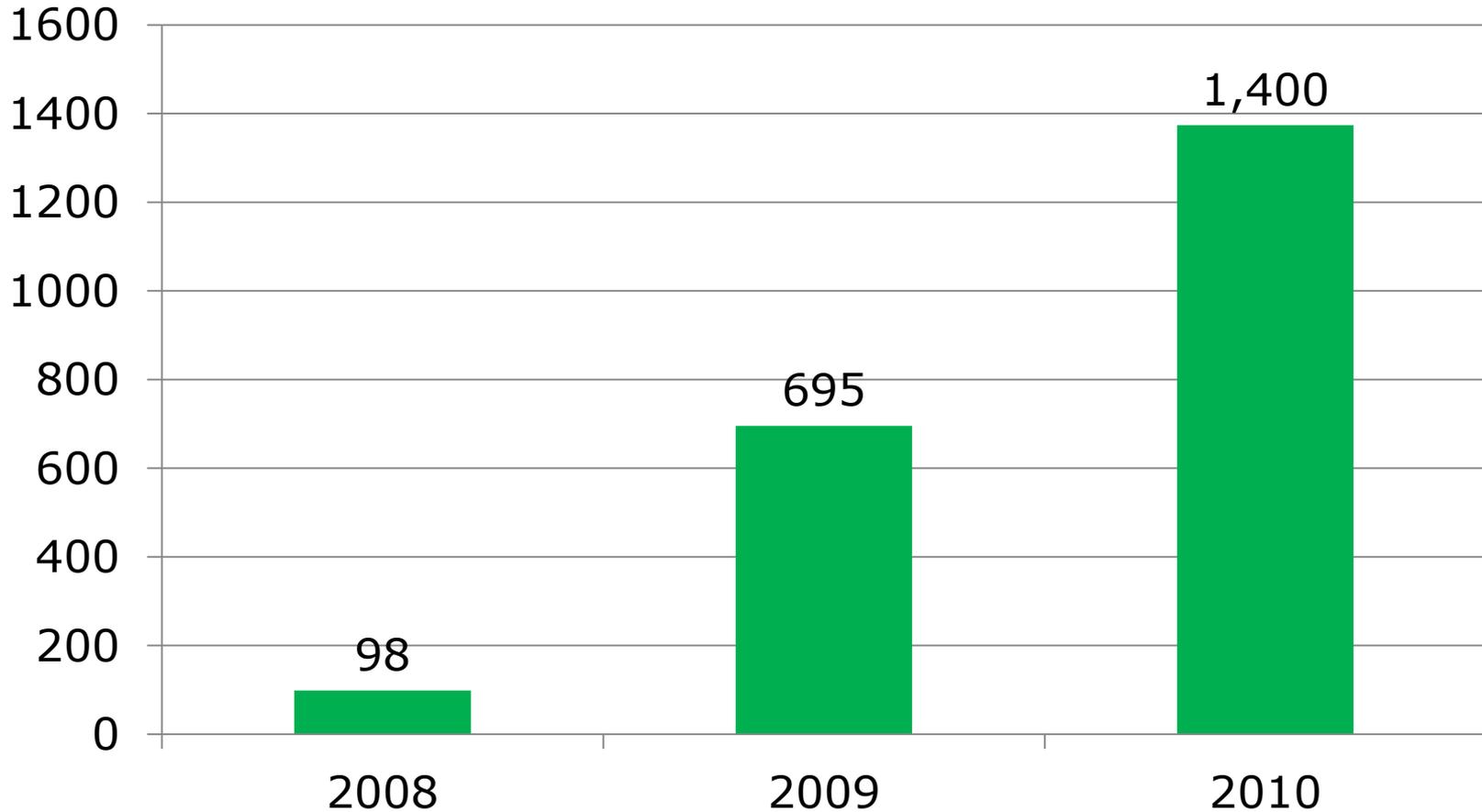
EmPower Mission(s)

- Mission 1
 - **EmPower** clients to control energy bills, be energy independent and help the environment

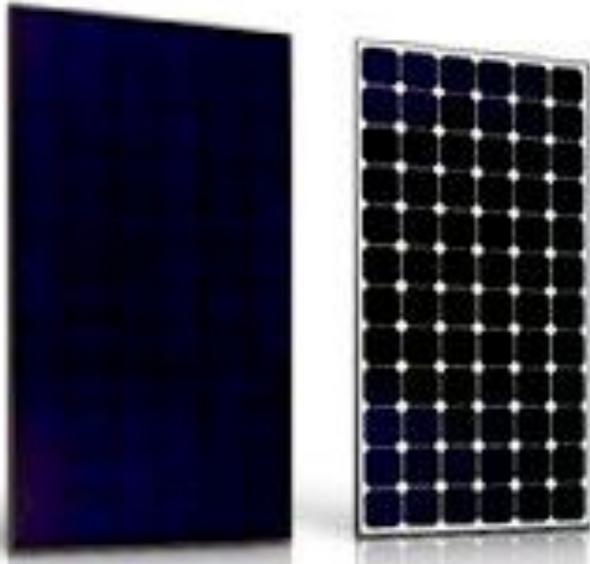
- Mission 2
 - **EmPower** employees to achieve their potential

EmPower Installation Growth

kW Installed



SUNPOWER®



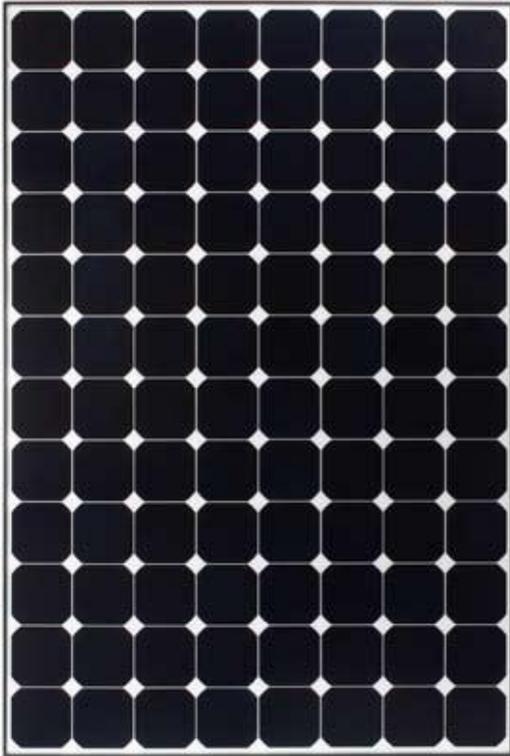
Solar Modules

- ❑ Direct Dealer Network
- ❑ Industry Leading Warranty
- ❑ Highest Module Efficiency
- ❑ Extensive Training Programs & Requirements
- ❑ Quality Assurance Program



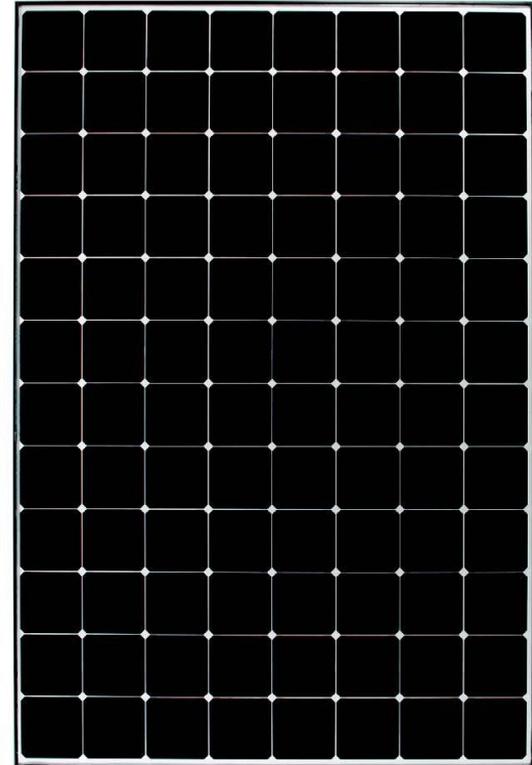
SunPower Modules

SunPower 308W



- Industry Leading Efficiency: 18.9%
- 17.5 Watts/Sq. Ft.
- Price Point

SunPower 320W



- Industry Leading Efficiency: 19.6%
- 18.2 Watts/Sq. Ft.
- Fewer Panels Per Install

NPOWER



Organizations

- Long Island Solar Energy Industry Association (LISEIA)
- Greater Long Island Clean Cities Coalition (GLICCC)



NYIT
NEW YORK INSTITUTE
OF TECHNOLOGY

the pod

- about
- overview
- solar roof
- body module
- the deck

This modular, contemporary design solution uses lightweight, highly efficient, and sustainable materials. A building-block assembly system enables each pod to be transported to a building's roof via staircase, freight elevator or crane hoisting.

Photovoltaic technology will be used to generate power for lighting the Solar Roof Pod, while solar thermal collectors will power air conditioning systems and supply hot water.



Residential 10 kW Long Beach









Piece Management 117 kW



Piece Management 117 kW

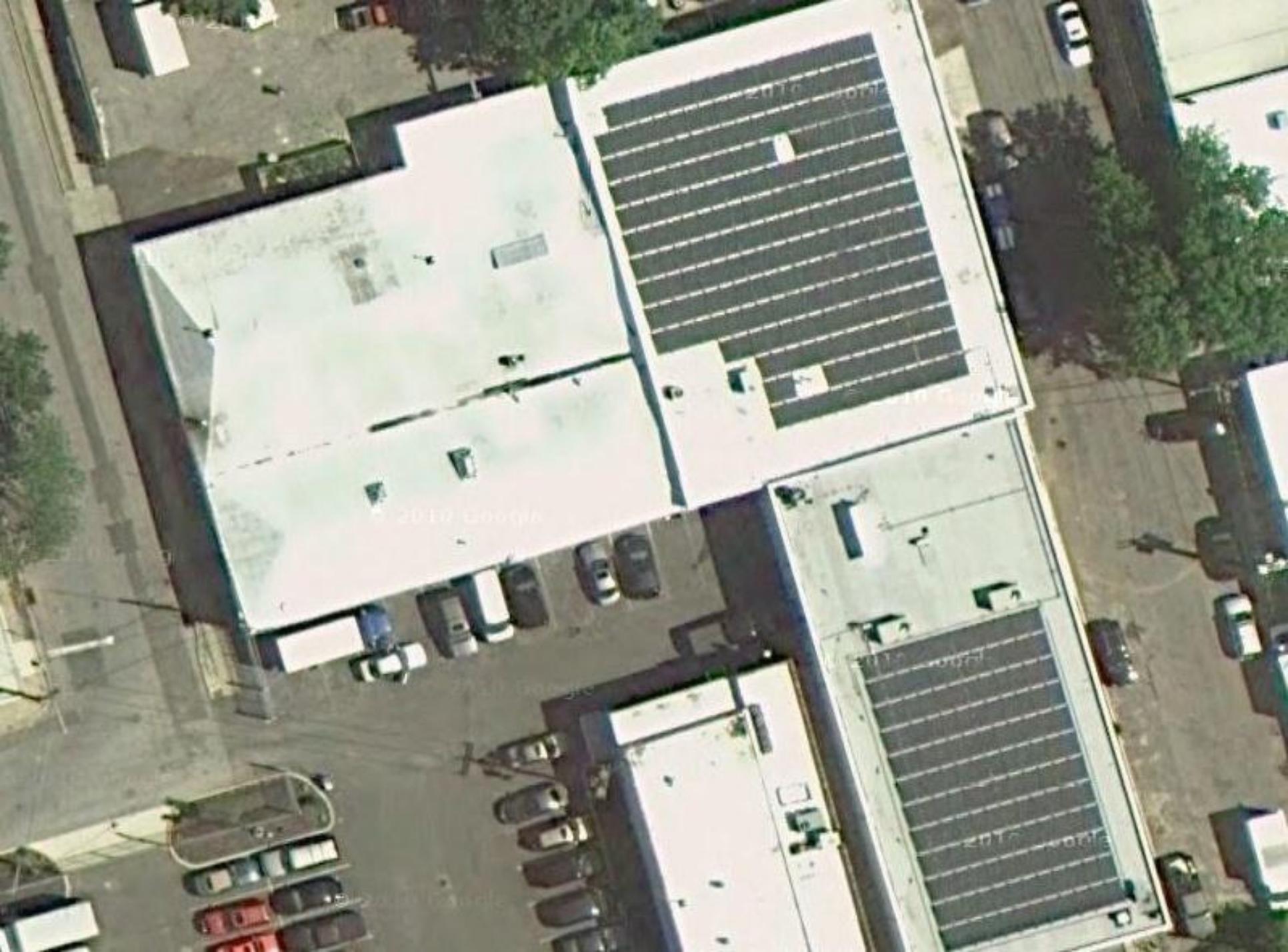


Piece Management Inverters



Piece Management Inverter





Unitarian Universalist Congregation at Shelter Rock 100 kW



Unitarian Universalist Congregation at Shelter Rock 100 kW



Unitarian Universalist Congregation at Shelter Rock 100 kW



Unitarian Universalist Congregation at Shelter Rock 100 kW





75 kW Proton Energy



30 kW Smithtown Municipal Facility



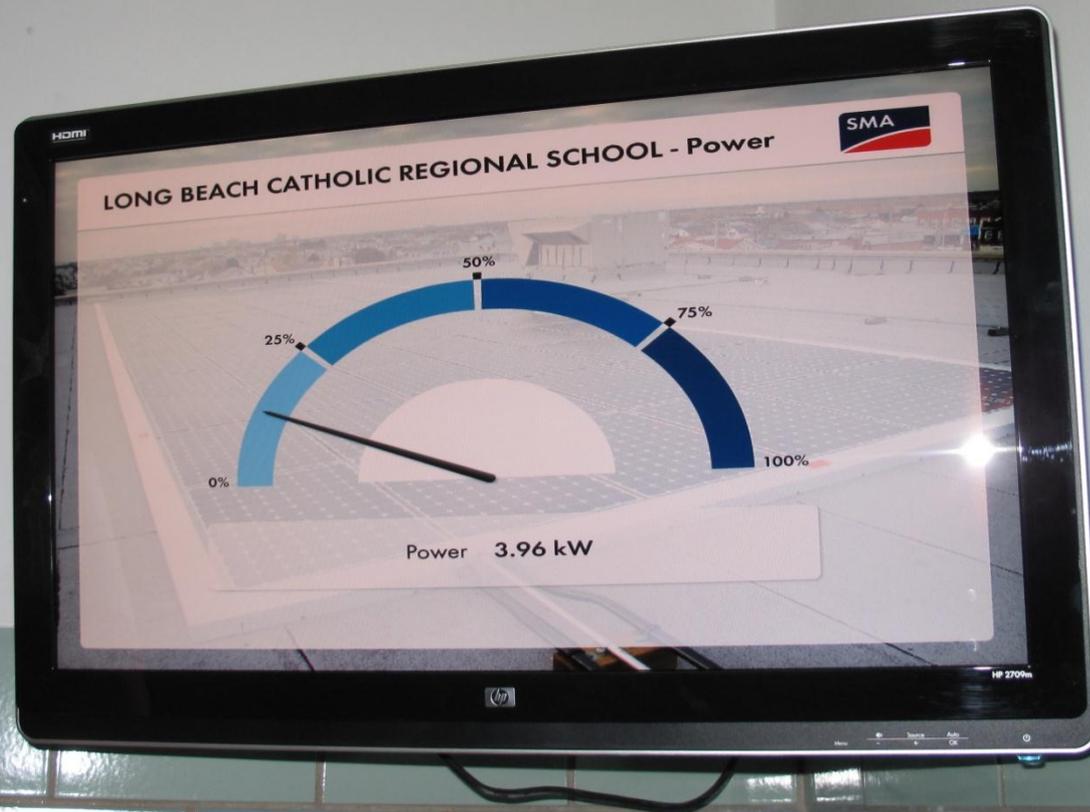
20 kW TMBA



30 kW Long Beach Catholic



30 kW Long Beach Catholic



30 kW Long Beach Catholic



NYIT (OW) Solar Carport



NYIT (OW) Solar Carport



NYIT Ribbon Cutting w/ Cong. Israel



FREE: 800 kW, 45 Sites

800 kW Across 45 Sites.
Family Residences Has Been EmPowered.

[Learn More](#) 



FREE: SEIA & SEPA AWARD



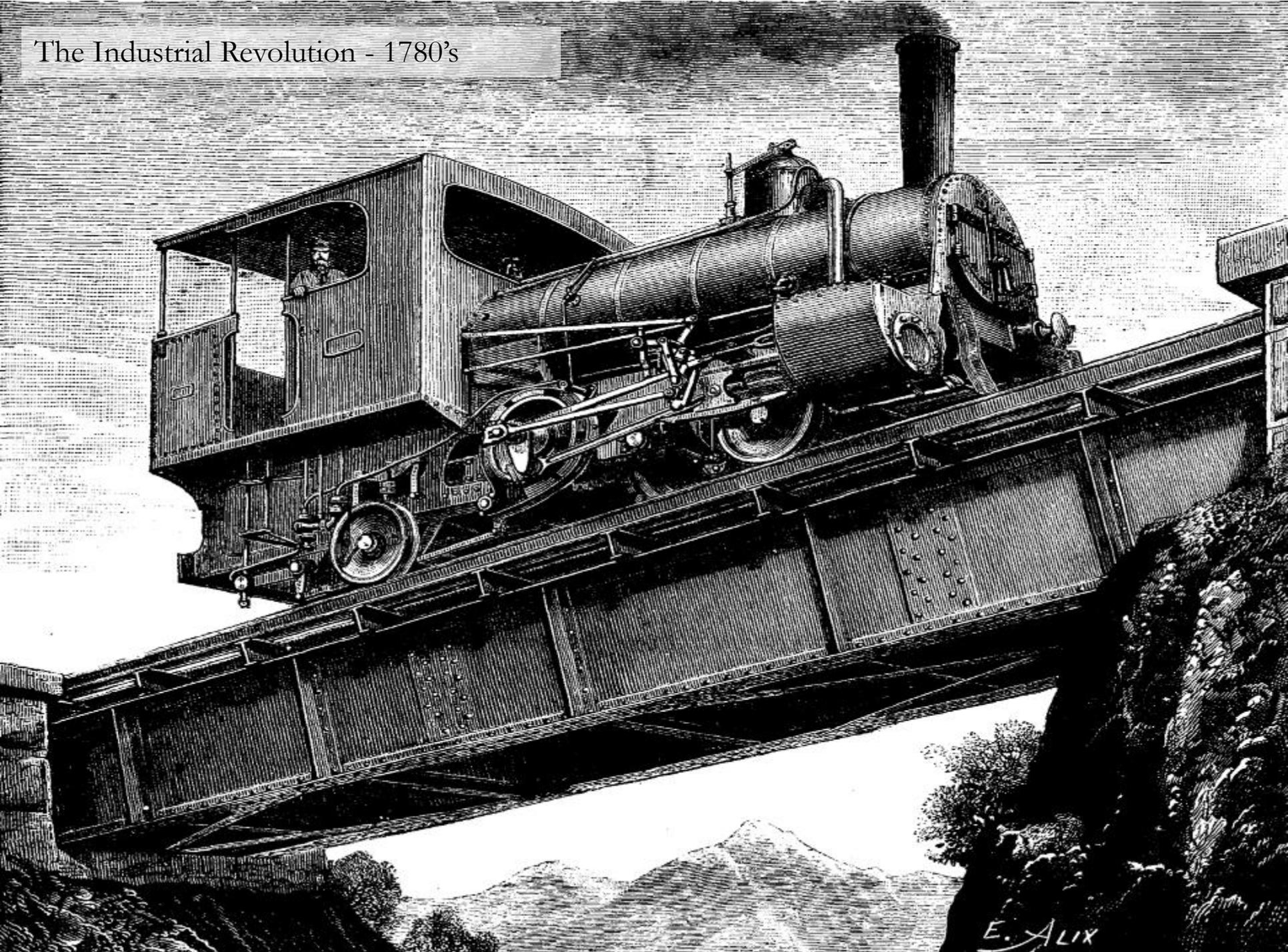
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An *amazing* time in which we live..



The Industrial Revolution - 1780's









Environmental Issues

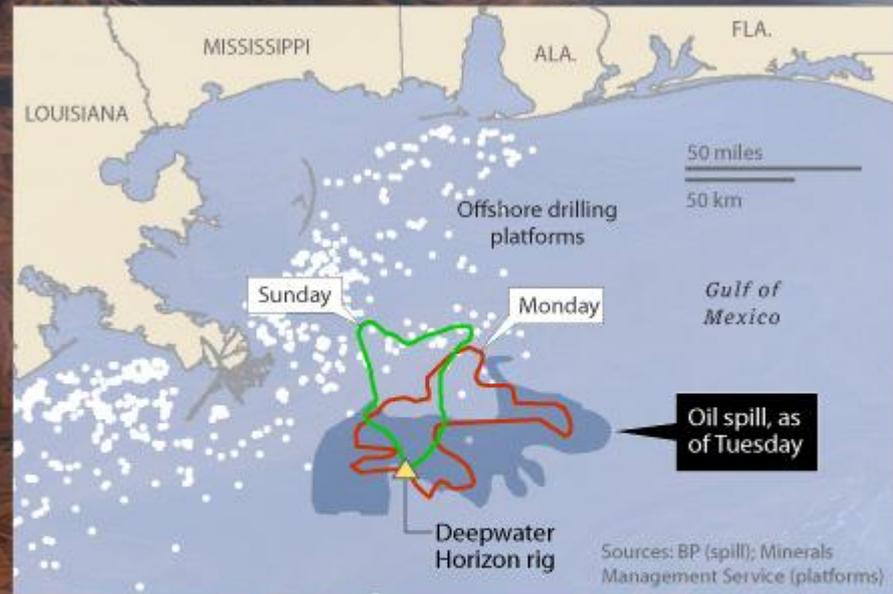
- ❑ Combusting Fossil Fuels
- ❑ Emissions
 - Carbon Dioxide
 - Nitrogen Oxides
 - Sulfur Dioxide
 - Mercury
 - Particulates



Gulf Spill

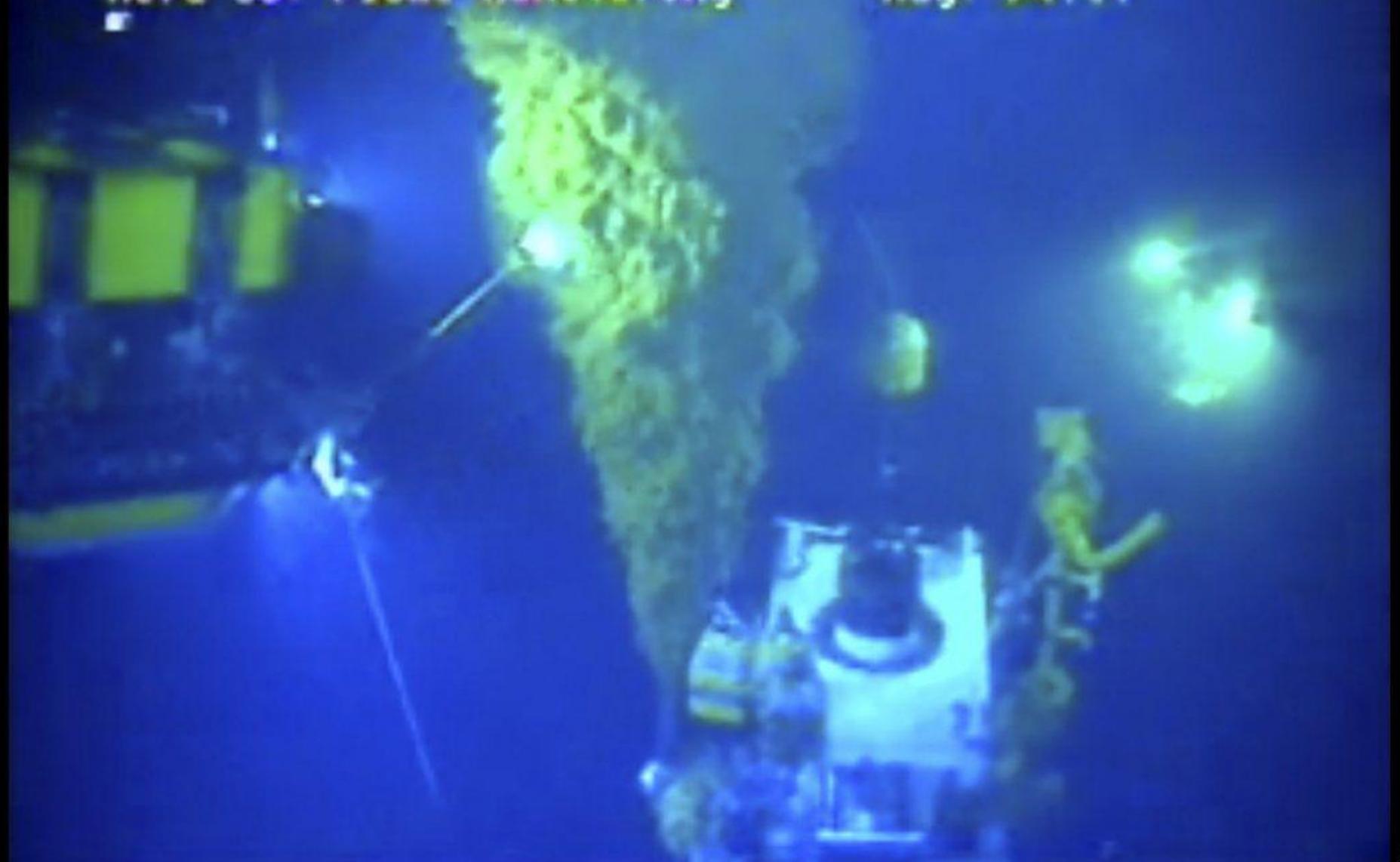
Rig Disaster

Weathered oil floated on the Gulf of Mexico near the coast of Louisiana April 27. (Patrick Semansky/Associated Press)



MSV SKANDI NEPTUNE
E: 1202756.27 N: 10431639.69
D: 4882.7 Alt: 10E.7
Herc 06: Plume Monitoring

Subsea 7
14/07/10
22:25:17
Hdg: 74.44



Fukushima Daiichi Nuclear Plant



Fukushima Daiichi Nuclear Plant



Japanese Oil Refinery

東北地方太平洋沖地震
各地に大津波警報

揺れの大きい地点は次のとおりです

千葉 市原
中継



Direct Health Costs Pollution

\$120 Billion
...Annually

National Academies of Sciences
Hidden Costs of Energy, 2009

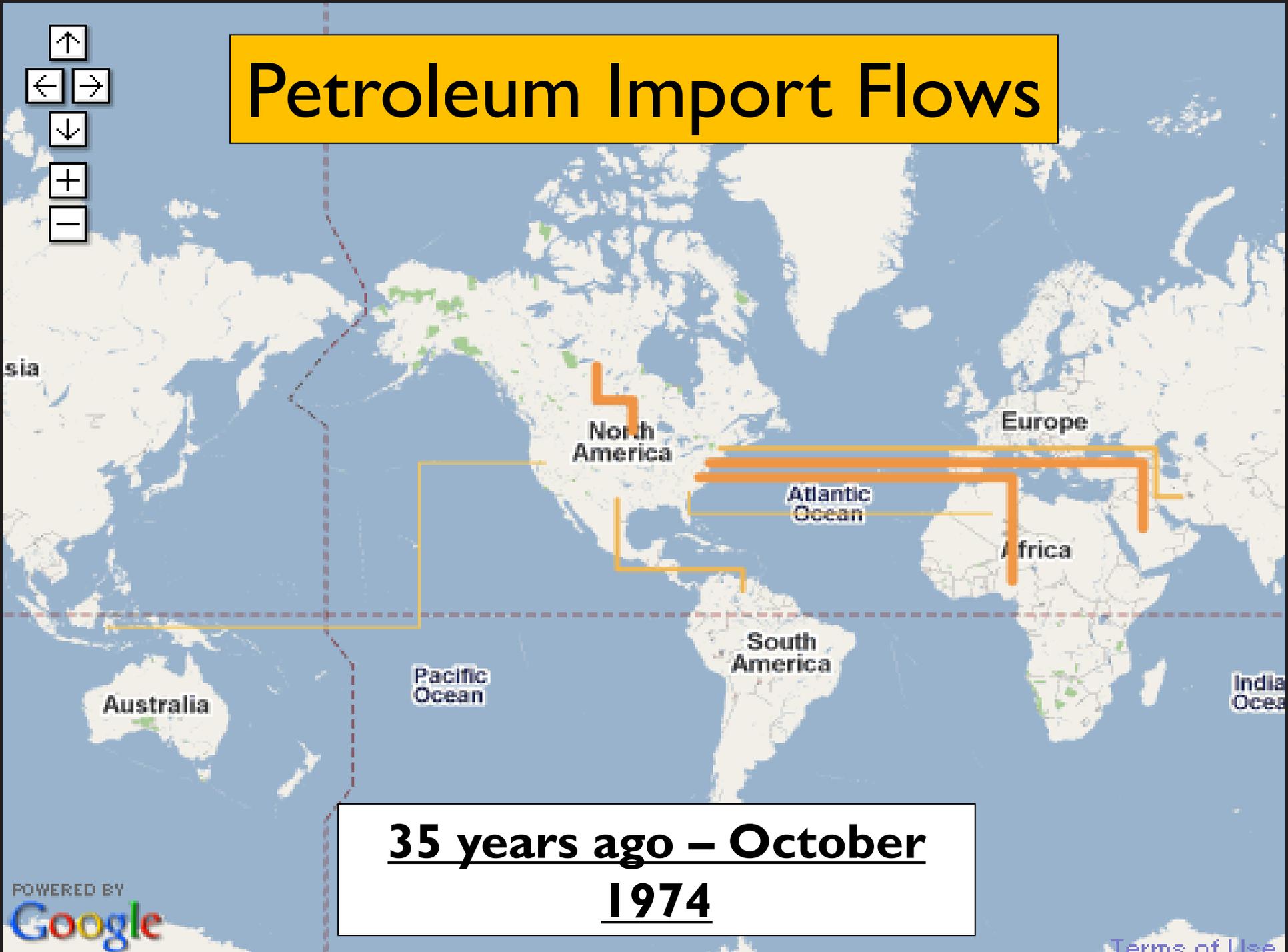
“Humankind has inherited a 4-billion-year store of natural capital. At present rates of use and degradation, there will be little left by the end of [this] century. This is not only a matter of aesthetics and morality, it is of the utmost practical concern to society and all people.”

Paul Hawken, Amory Lovins, L. Hunter Lovins, *Natural Capitalism*

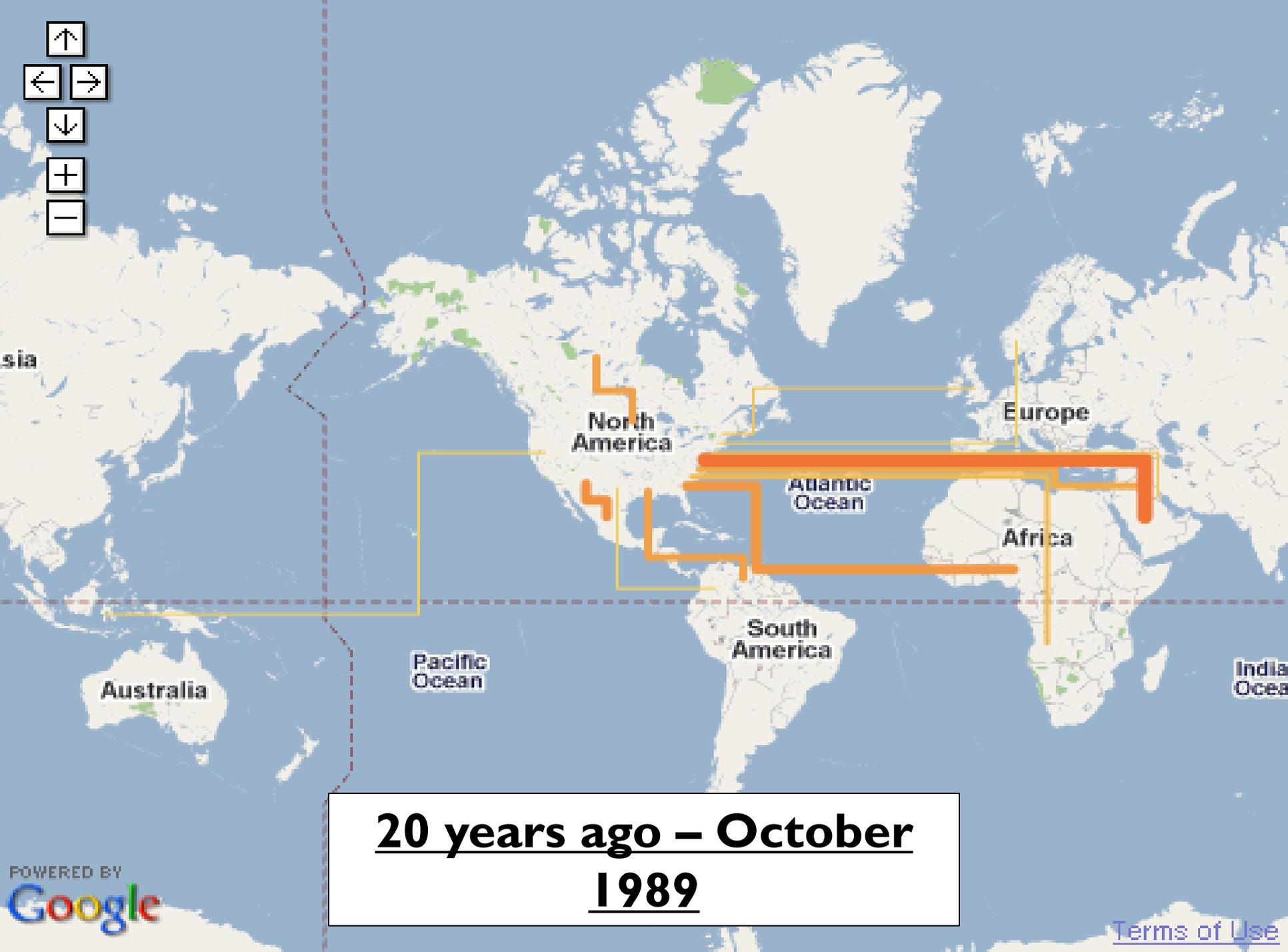
“I once met an economist who believed that everything was fungible for money, so I suggested he enclose himself in a large bell-jar with as much money as he wanted and see how long he lasted.”

- Amory Lovins

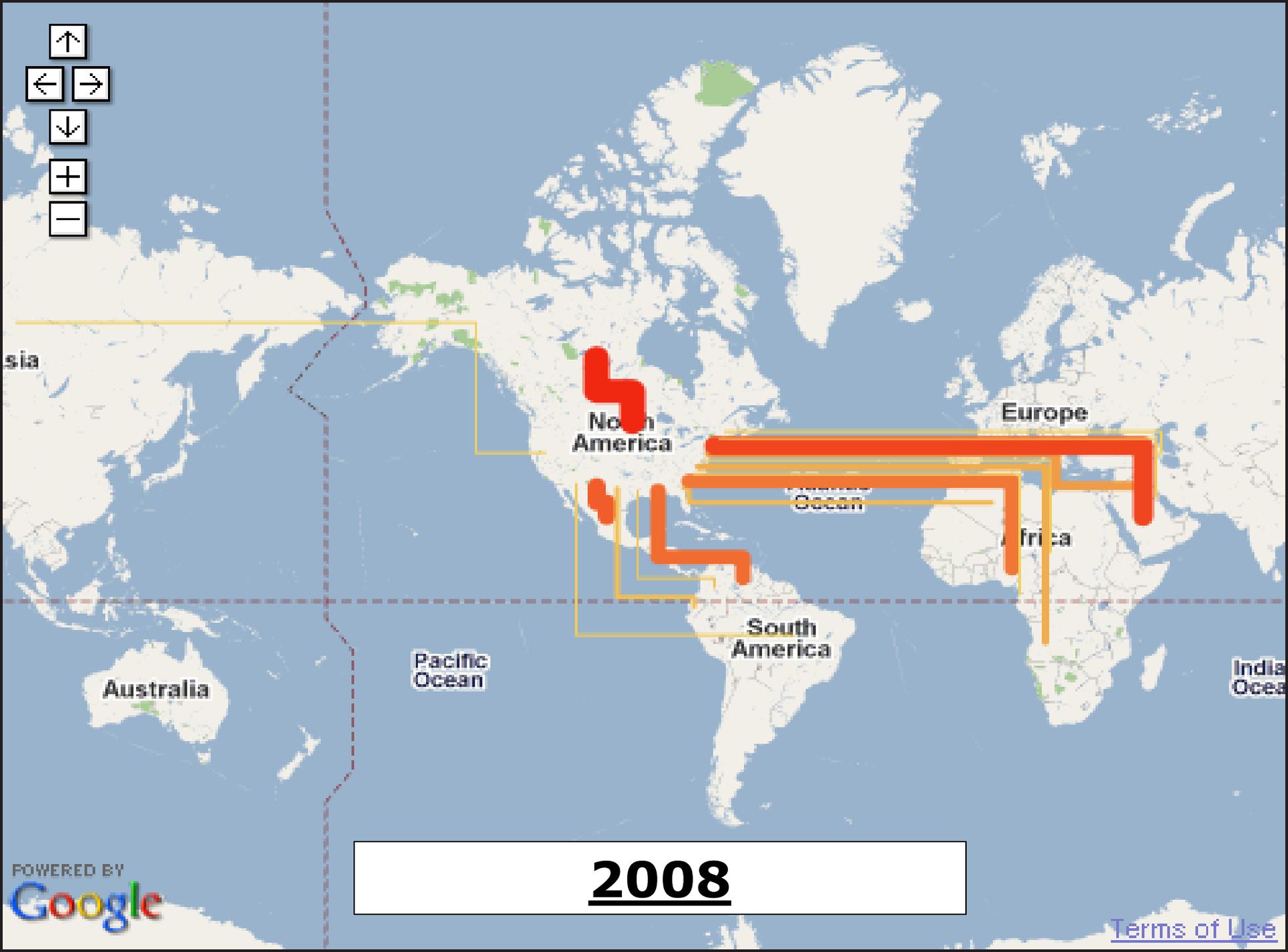
Petroleum Import Flows



35 years ago - October
1974



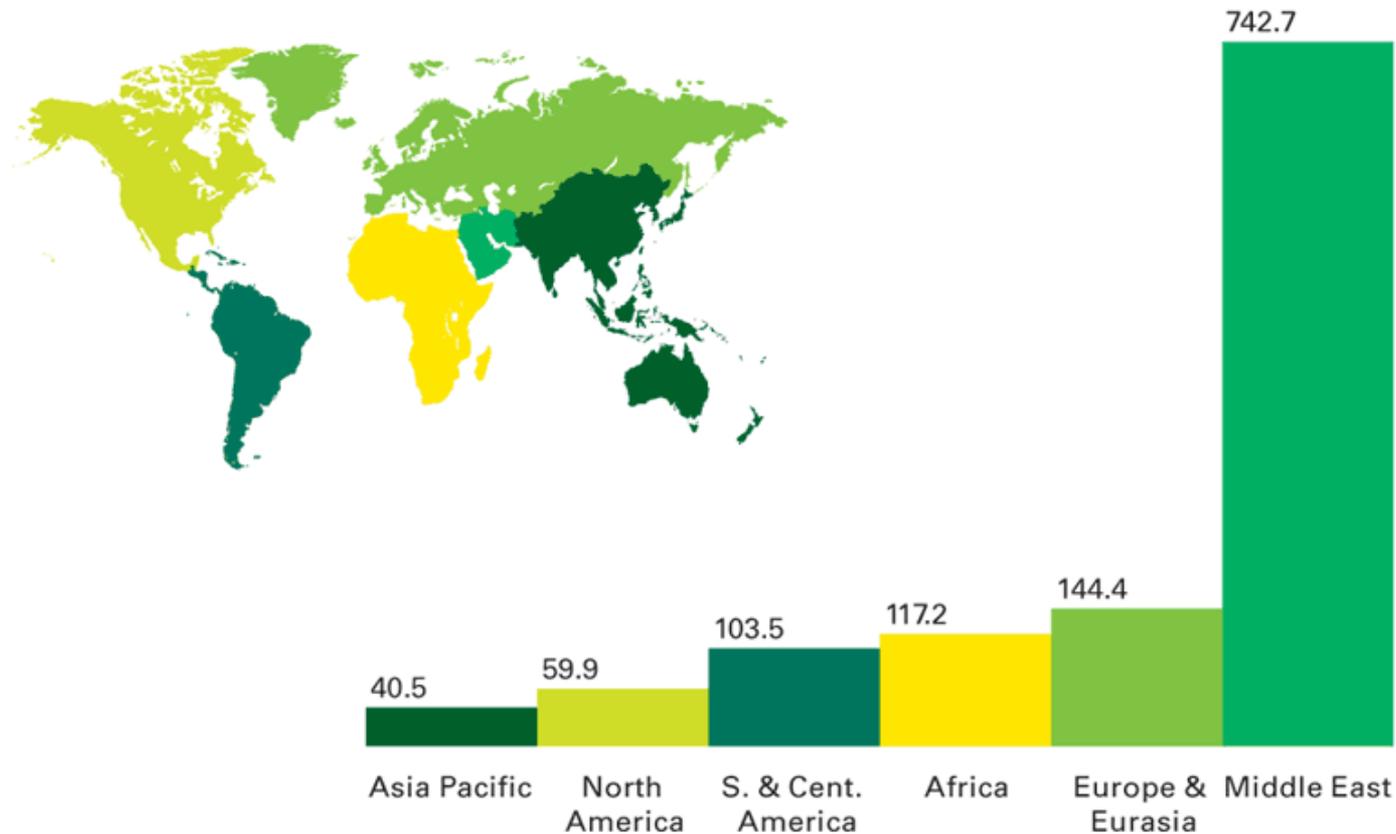
20 years ago – October
1989



2008

World's proven oil reserves are 1,200 billion barrels

Proved reserves at end 2006
Thousand million barrels



Oil Imports

**\$300+ Billion
...Annually**

>\$3 Trillion Over a Decade

KEY ECONOMIC INPUTS

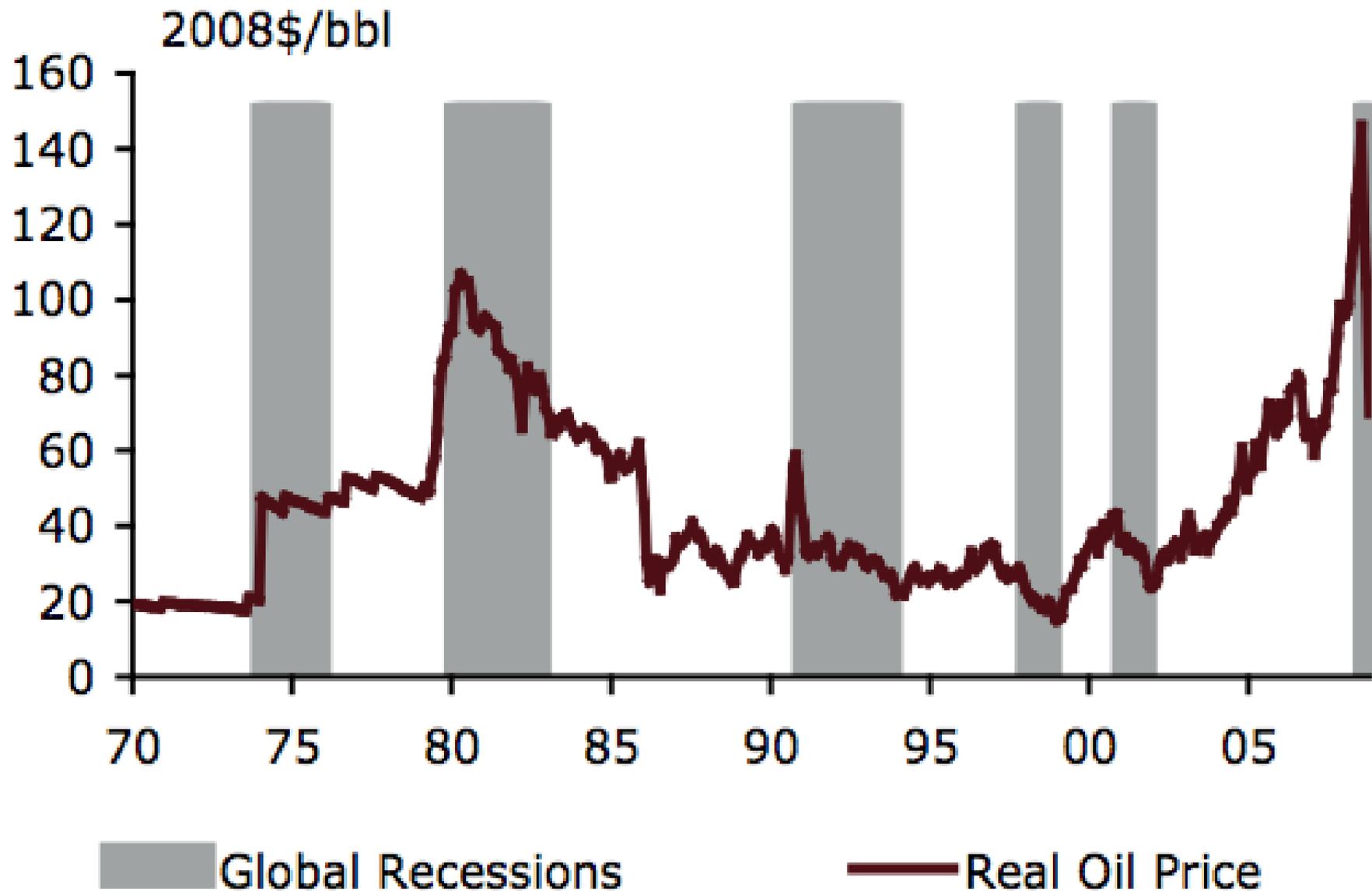
- Interest Rates
 - FEDERAL RESERVE
 - Appointed By President, Senate Confirms

- Fiscal Policy
 - Elected Representatives
 - Voters

- Energy Prices
 - OPEC for Oil



Oil Spikes and Recessions



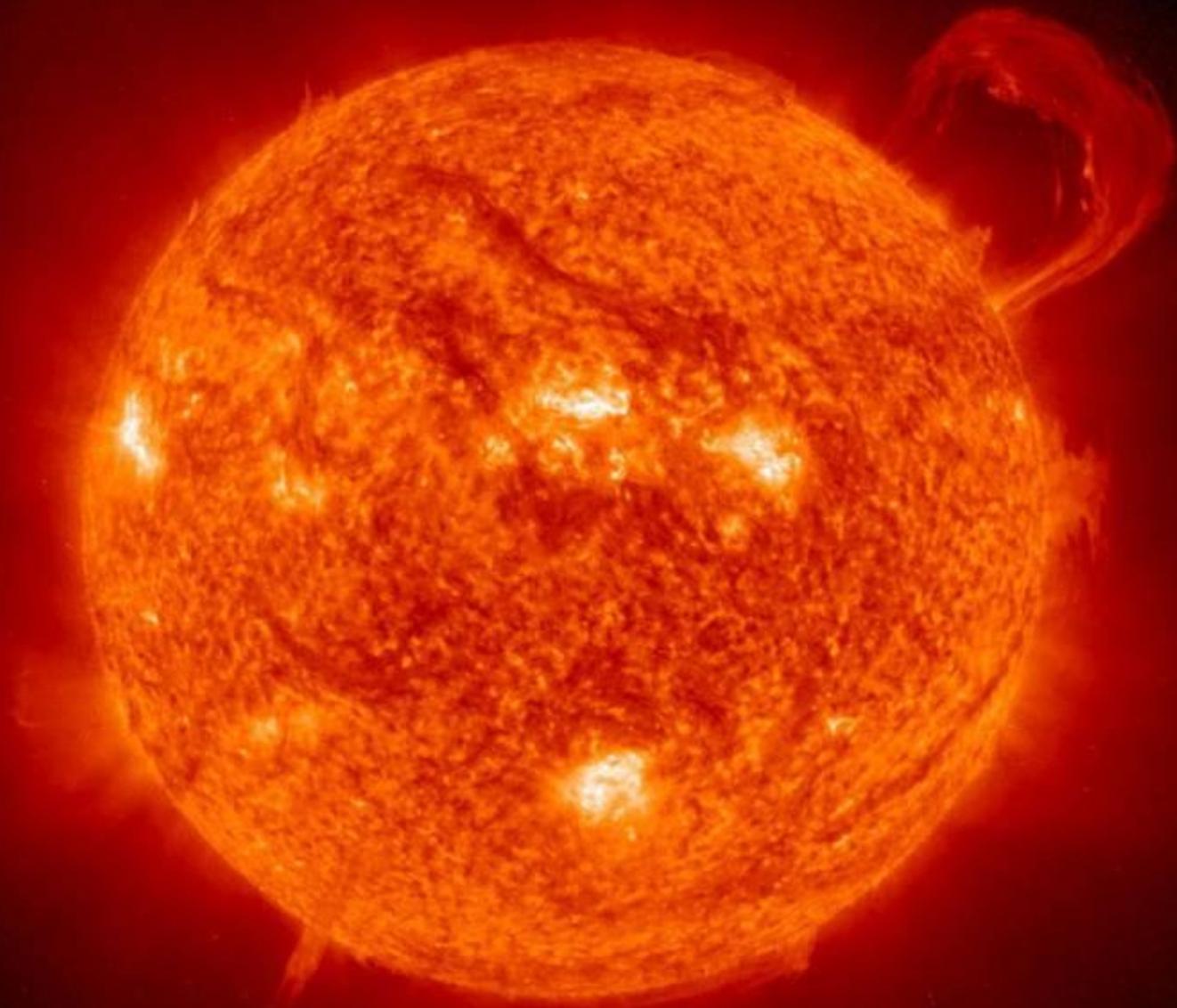
Fossil Fuels...Thank You

- Have Been Essential to Growth
- We Appreciate You, Yes



Energy Challenge Summary

- ❑ Fossil Fuel Combustion Dirty = Unhealthy
- ❑ Fossil Fuel Extraction Dirty + Dangerous
- ❑ Dependency Bad, Hurts Economy
 - We send \$\$\$ abroad
 - Volatility leads to Uncertainty
- ❑ Nuclear Expensive, Can Be Very Dangerous





Enough Sunlight Falls

On Earth In One Hour

To

Power

The WORLD

For One Year

OSC

PROSPERITY

- ❑ Renewables Will Lead to Significant Economic Growth
- ❑ Increase the Standard of Living
- ❑ Lead to a More Prosperous, Healthy and Civil World

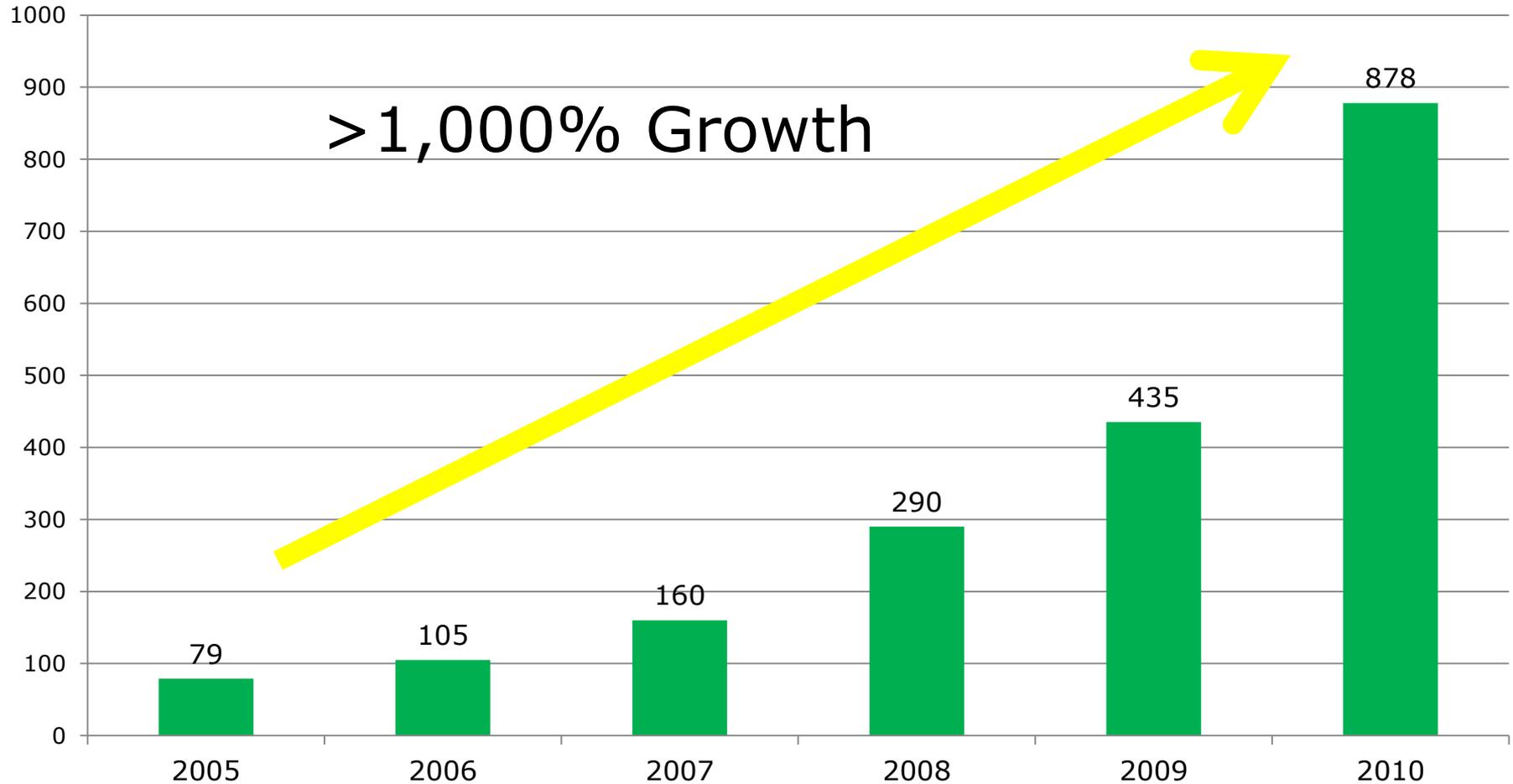
Key Reason

- ❑ Renewable Energy Prices Will Go Down or Stay Constant In Real Terms Over Time
- ❑ Imagine: Dramatically Reduced Volatility
- ❑ Imagine: Eliminate Uncertainty WRT Energy Prices

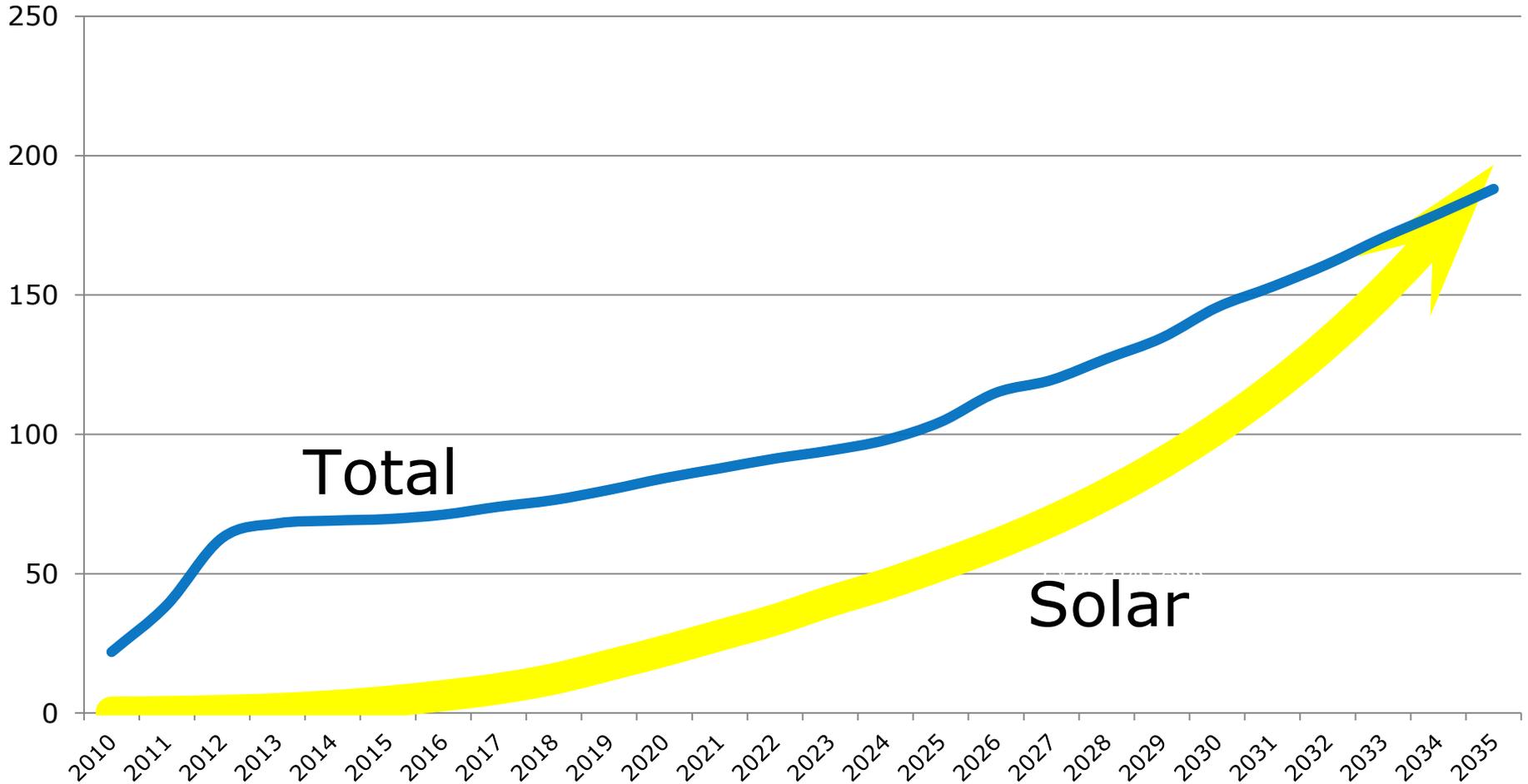
Solar...Pie in The Sky?

- ❑ Must Work Financially
- ❑ Today: Incentives = Great Investment
- ❑ Tomorrow: Grid Parity

US Installations Megawatts DC



US Power Generation Additions



Solar PV to Power the US

- 4119 Billion kWh Electricity 2008 (EIA)
- 1681 kWh (AC) per 1 kW (DC) in NM
@ 180, 35 tilt, fixed array
- 2451 GW Array Necessary
- 16 w/sqft (high efficiency panels)
- 5494 sqmi
- 74.1 mi x 74.1 mi

Solar PV to Power the LI

- ❑ 20 Million kWh Electricity 2008 (LIPA)
- ❑ 1225 kWh (AC) per 1 kW (DC) in NYC @ 180, 33 tilt, fixed array
- ❑ 16 GW Array Necessary
- ❑ 16 w/sqft (high efficiency panels)
- ❑ 37 sqmi
- ❑ 6.0 mi x 6.0 mi

36 square miles



China & India

- China: Target 50 GW Installed By 2020
 - India: 67 GW By 2022
- Dominating this sector key to economic success in 21st century

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Harnessing Energy from the Sun

SOLAR ENERGY SYSTEM TYPES

TYPES, Photo-Voltaic

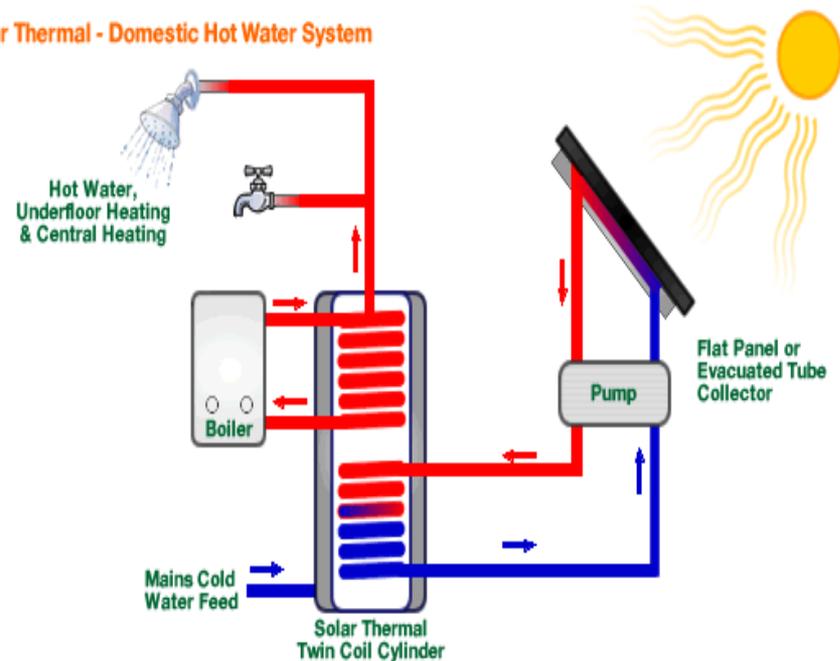
1. Conversion:
Solar Radiation ->
Moving Electrons
(Electricity)
2. Solar PV is the
Focus of this
Presentation



TYPES, Thermal

- ❑ Solar Hot Water
- ❑ Conversion:
Solar Radiation ->
Thermal Energy
- ❑ Typical Collectors
 - Evacuated Tubes
 - Flat Plate Collectors

Solar Thermal - Domestic Hot Water System



TYPES, Concentrated Solar

- ❑ Thermal or PV
- ❑ Collector Types
 - Parabolic Trough
 - Heliostats



PV System Components

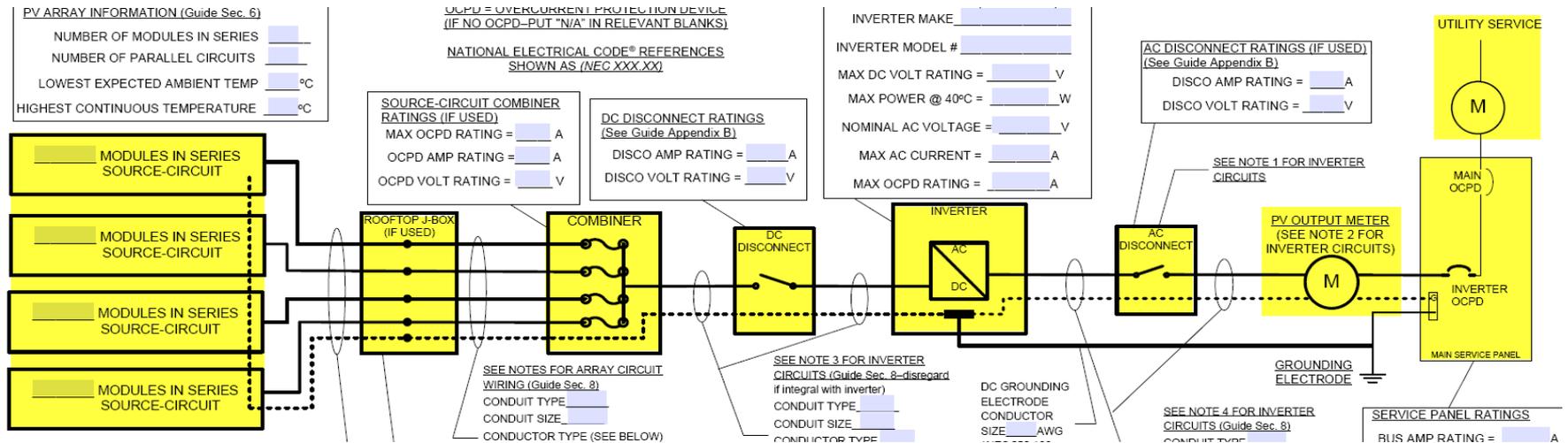
1. Solar Modules
2. Mounting System
3. Inverter
4. Balance Of Plant
5. Data Monitoring



969



Engineering



System Components:

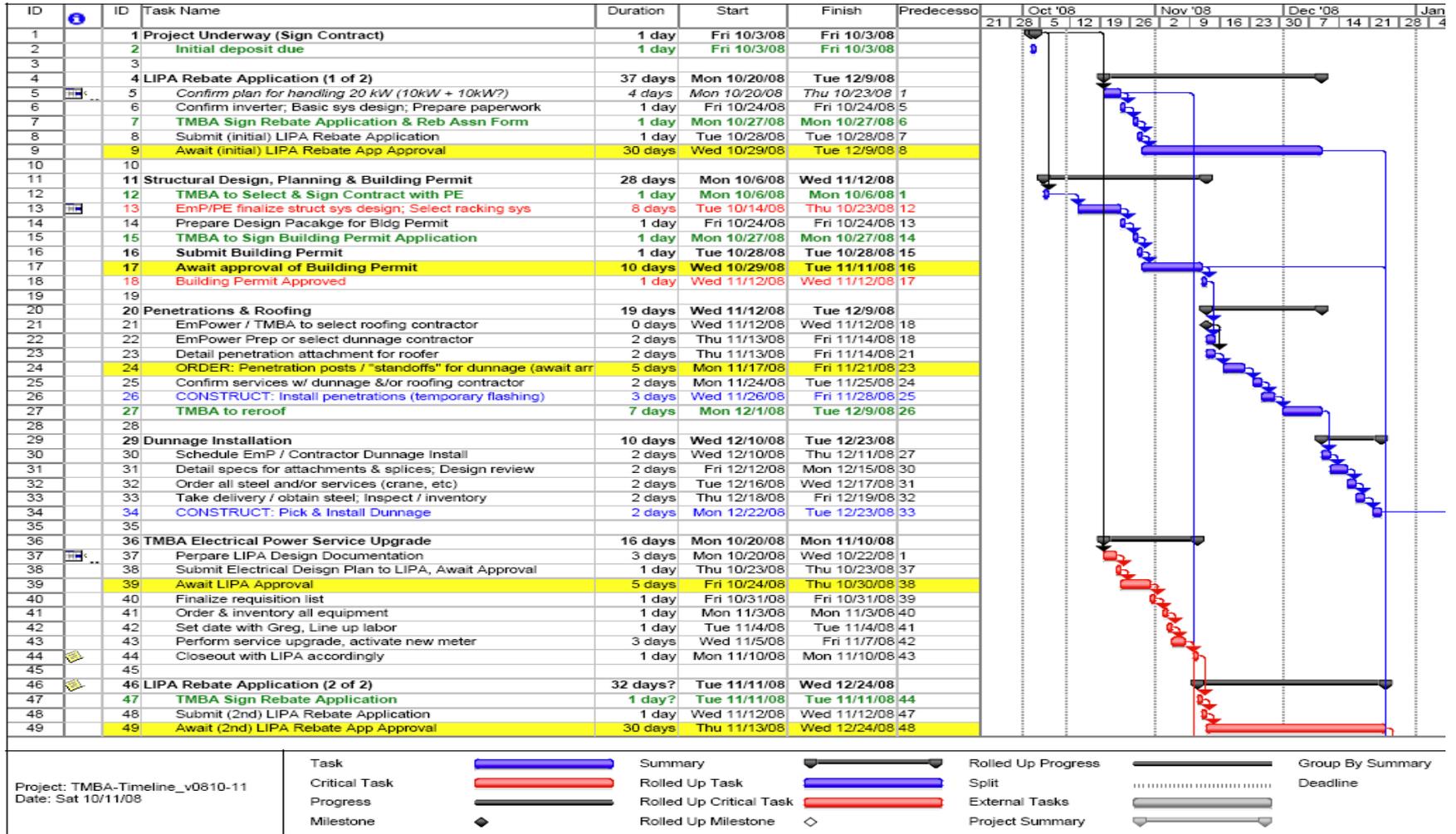
1. PV Strings (DC)
2. Rooftop Junction Box
3. "Combiner Box"
4. "DC Disconnect"
5. Inverter
6. "AC Disconnect"
7. PV Production Meter
8. Grid Interconnection

Installation

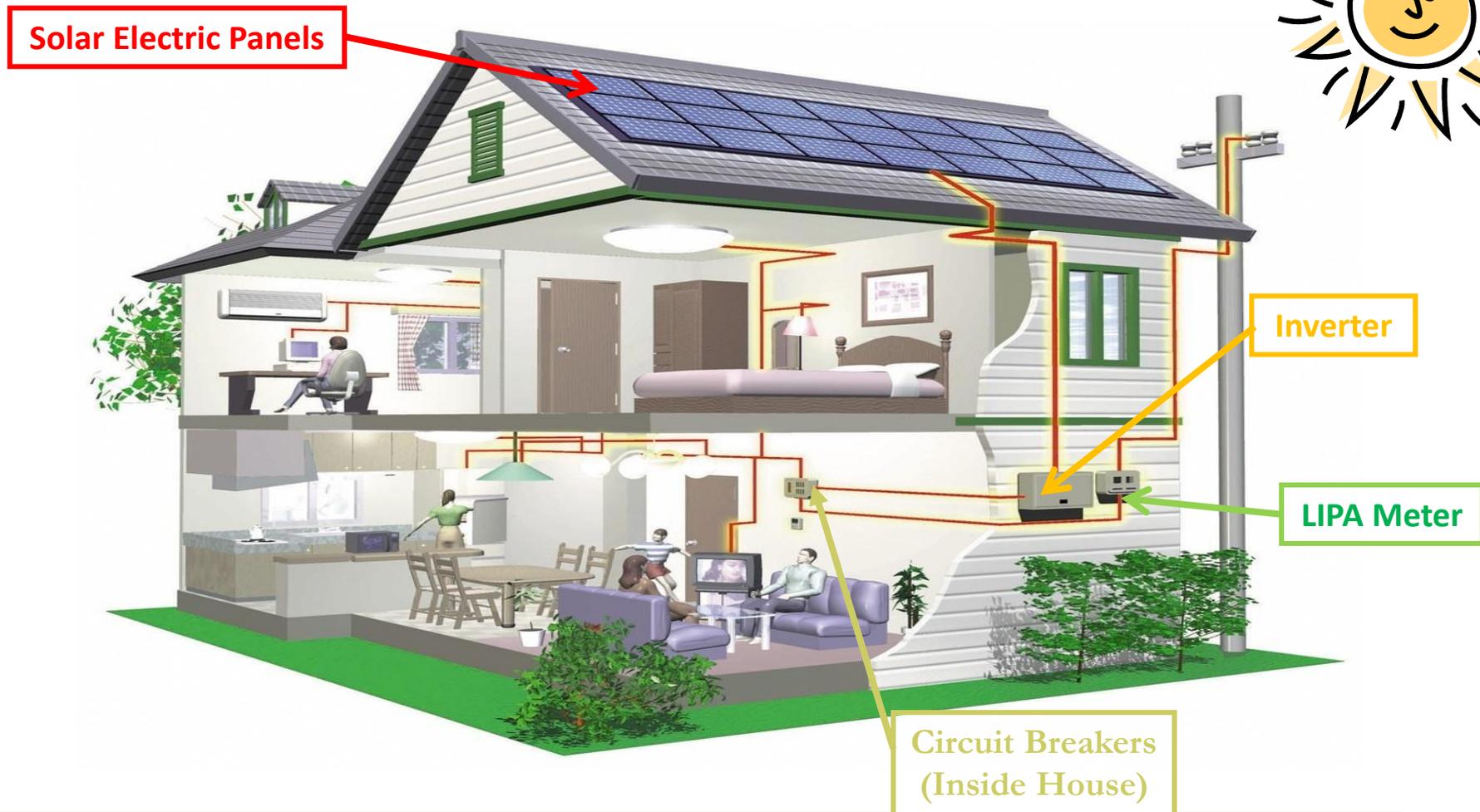
- Training
- Workmanship
- Technique
- Management

➤ All Essential

Project Management



Energy Flow



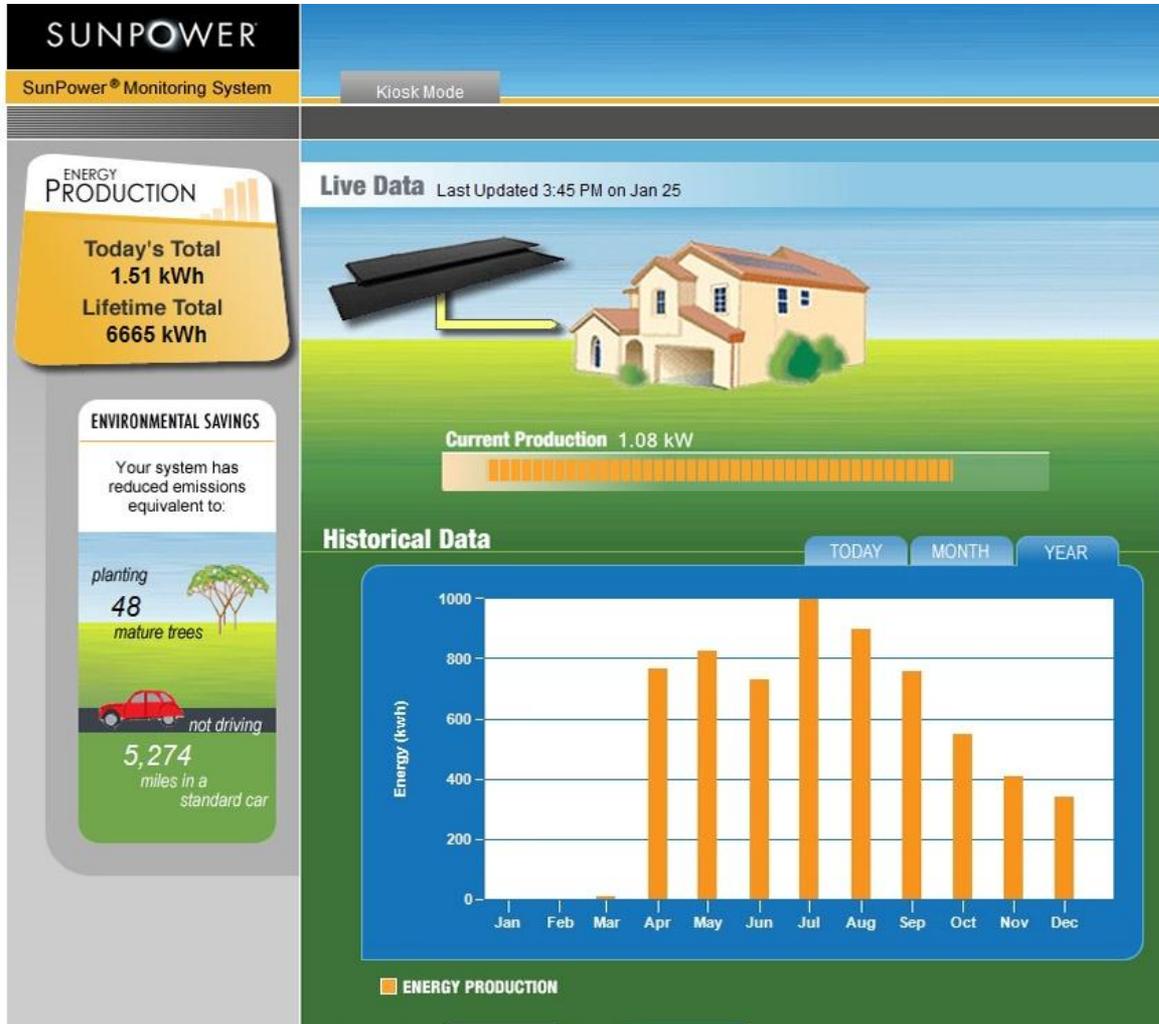
Net Metering



- ❑ LIPA Installs Net Meter
- ❑ Measures electricity flow both ways
- ❑ Pay only for monthly net-usage
- ❑ Credit issued for extra electricity produced

ELECTRIC USAGE	Meter # 21197108
12/09/2009 ACTUAL reading	01982
11/11/2009 ACTUAL reading	-01383
KWH Used in 28 day(s)	599
Applied from Energy Credit Bank	-599
Billed KWH	0
ENERGY CREDIT BANK	
Opening Balance	988
Applied to Current Bill	-599
Energy Credit Balance	389

Data Monitoring



System Sizing

- Question 1: How Much Do I Need
- Question 2: How Much Can We Fit
- Question 3: What Will Solar Produce

Q1: How Much Do I Need

- 12,000 kilowatt hours Annual Average
- \$2,500 annual bills typical
- \$0.21 / kWh current rates

Electricity 101

- ❑ Ten 100 watt bulbs = 1,000 watts = **1 kW**
- ❑ Ten 100 watt bulbs left on for one hour equals 1,000 watt hours = **1 kilowatt hour (kWh)** of energy
- ❑ LIPA bills by measuring month kWh usage



OLD



NEW!

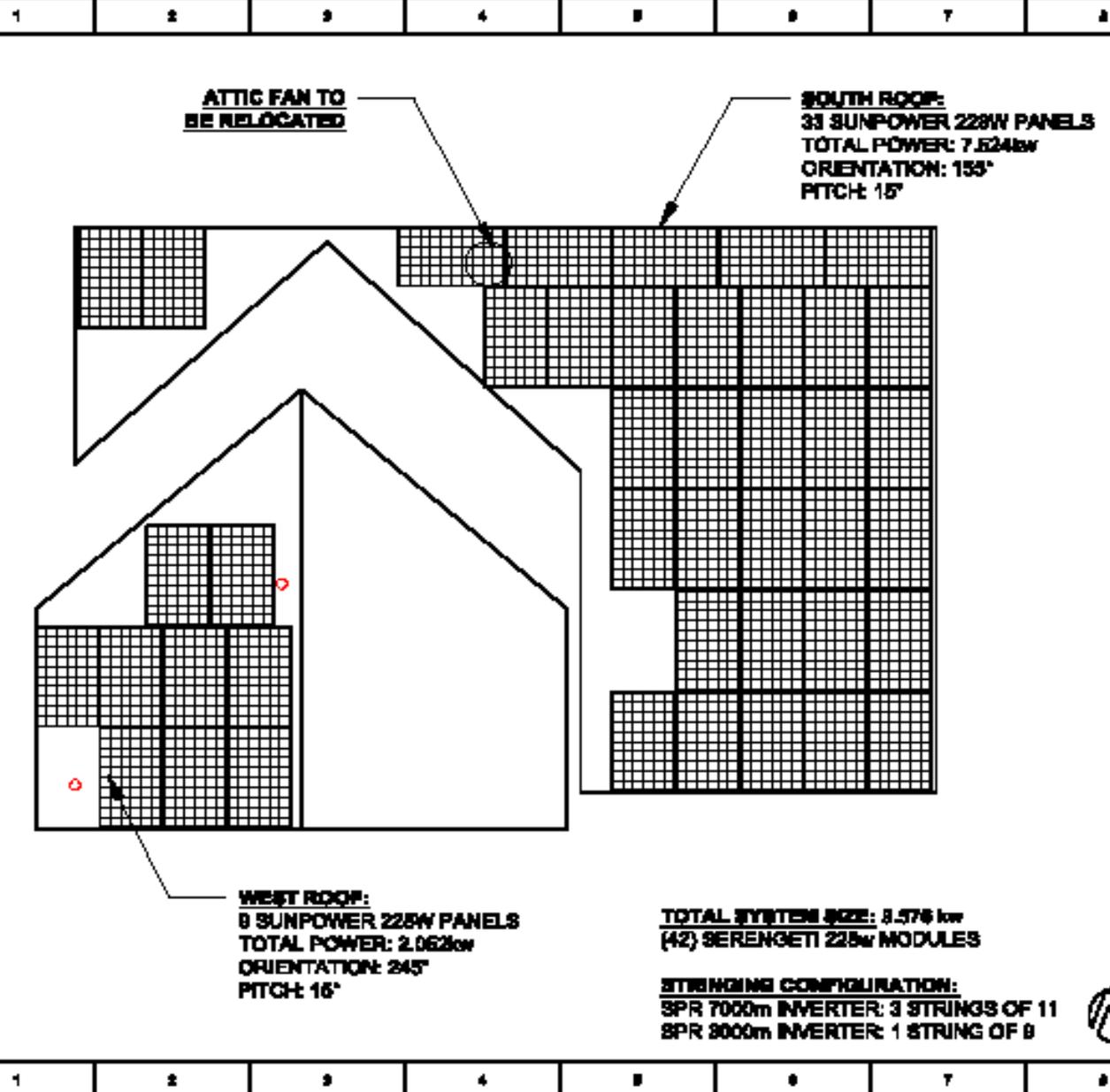


Q2: How Much Can We Fit

- Thorough Site Assessment
 - Roof Measurements
 - Shading Analysis
 - Electrical System
 - Etc.



System Design



EmPower Solar
 821 LONG BEACH ROAD
 BELLEVILLE PARK, NY 11860
 TEL: 516-837-3458
 FAX: 516-708-1788
 www.EmPowerSolar.com

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REV.	DESCRIPTION	DATE

PROJECT NAME:
 DEFRANCESCO RESIDENCE

PROJECT LOCATION:
 181 JEFFERREY LN
 OGBURN, NY

PROJECT:
 PHASE: PROPOSAL
 DATE: OCT 27, 2016
 DESIGNED BY: JK
 CHECKED BY: JC
 SCALE: 1/8" = 1'-0"

TITLE:
 PV LAYOUT

SHEET:
 DWG 1

TOTAL SYSTEM SIZE: 9.576 kw
(42) SERENGETI 228w MODULES

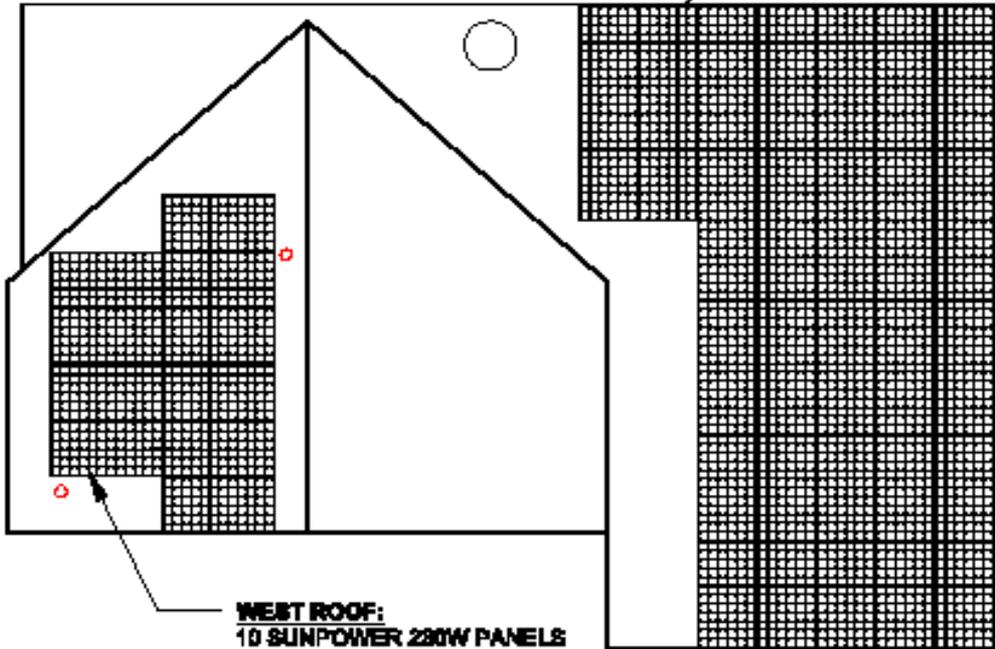
STRINGING CONFIGURATION:
 SPR 7000m INVERTER: 3 STRINGS OF 11
 SPR 8000m INVERTER: 1 STRING OF 8





1 2 3 4 5 6 7 8

G
F
E
D
C
B
A



SOUTH ROOF:
34 SUNPOWER 230W PANELS
TOTAL POWER: 7.82kw
ORIENTATION: 155°
PITCH: 15°

WEST ROOF:
10 SUNPOWER 230W PANELS
TOTAL POWER: 5.83kw
ORIENTATION: 245°
PITCH: 15°

TOTAL SYSTEM SIZE: 10.12 kw
(44) SUNPOWER 230w MODULES

STRINGING CONFIGURATION:
SPR 6000m INVERTER: 2 STRINGS OF 10
SPR 6000m INVERTER: 3 STRING OF 6



1 2 3 4 5 6 7 8

EmPowerSolar
221 LONG BEACH ROAD
ISLAND PARK, NY 11854
TEL: 516-837-3458
FAX: 516-708-1788
www.EmPowerSolar.com

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REV: DESCRIPTION: DATE:

PROJECT NAME:
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PROJECT LOCATION:
181 JEFFERREY LN
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DATE: OCT 27, 2010
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CHECKED BY: JC
SCALE: 1/8" = 1'-0"

TITLE:
PV LAYOUT
SHEET:

DWG 1

Site Conditions

- ❑ South 180 degrees ideal
 - ❑ 30 degrees pitch ideal
 - ❑ East & West Work
 - ❑ North Generally Bad (can pitch south)
 - ❑ Shading bad
-
- ❑ Site Conditions Have Big Impact

Q3: What Does Solar Produce?

- ❑ 1 kW generates 1,200 kWh annually
- ❑ 1 kW requires 60 – 80 sq feet
- ❑ 10 kW covers 12,000 kWh, the average load
- ❑ 10 kW ~700 square feet

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Residential System Incentives

- ❑ LIPA Rebate \$1.75 / Watt Up To 10 kW
- ❑ 25% NY State Tax Credit (\$5,000 Cap)
- ❑ 30% Federal Tax Credit
- ❑ Incentives Cover >60% of System Cost
- ❑ No Sales Tax
- ❑ Property Tax Abatement



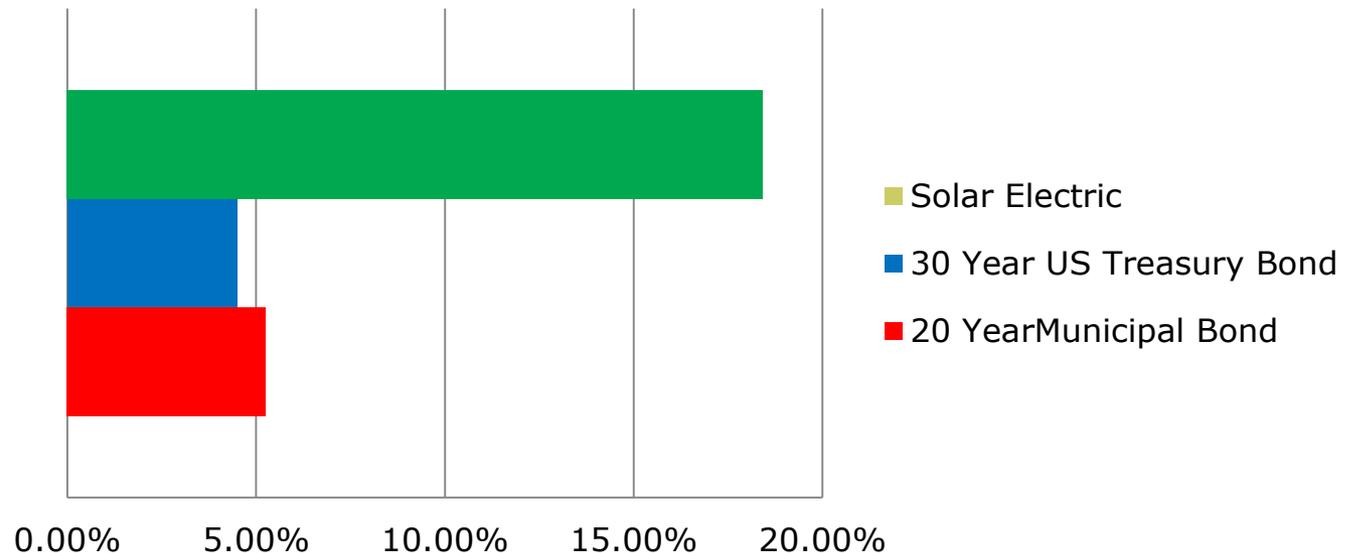
10.03 kW PV System on LI

Installed Cost (\$5.10/watt)	\$51,205
LIPA Rebate (at \$1.75 x 10,000)	<u>(17,500)</u>
Cost after Rebate	\$33,705
30% Federal Tax Credit	(10,111)
NYS Tax Credit (lower of 25% or \$5,000)	(5,000)
Total Combined Tax Credits	<u>15,111</u>
Final Customer Investment	\$18,593
<u>Annual Estimated Savings</u>	\$2,580

Profitable Investment

- Annual Return on Investment 16.85%
- Simple Payback 6.7 Years

Comparative Annual Returns



Financing Programs

- ❑ Home Equity Loans/Credit Lines
- ❑ Unsecured Loans Tied to Credit Score

- ❑ Great Way To Go Solar
- ❑ No Upfront Costs
- ❑ Low Monthly Payments

- ❑ Many Financing Programs Available

No Money Down 15 Year Loan

- Low monthly payments with 15 year term and amortization schedule
- Use tax credits received after year one to prepay, lower payments further
- Fast, easy application process
- Interest rate based on Credit Score, FICO 670 and up eligible
- Cash flow positive starting year 2!

<i>Example Cash Flows</i>	<i>10.03 kW System</i>	<i>Payments</i>	<i>Savings</i>	<i>Net</i>
Sign Contract		0		
Year 1 System Installed, Monthly Payments Begin		(289)	210	(79)
Year 2 Tax Credit, Use to Pay Down Loan			14,515	
Years 2 - 15 Monthly Pymt + <u>AVG</u> Month Savings		(152)	309	157

Benefits

Own solar power system with zero down, low monthly payments!

No home equity impact!

Benefit from solar energy before having to pay down loan!

Example: E. Pine St. LB

9.9 kW SunPower 225s



W Bay Dr



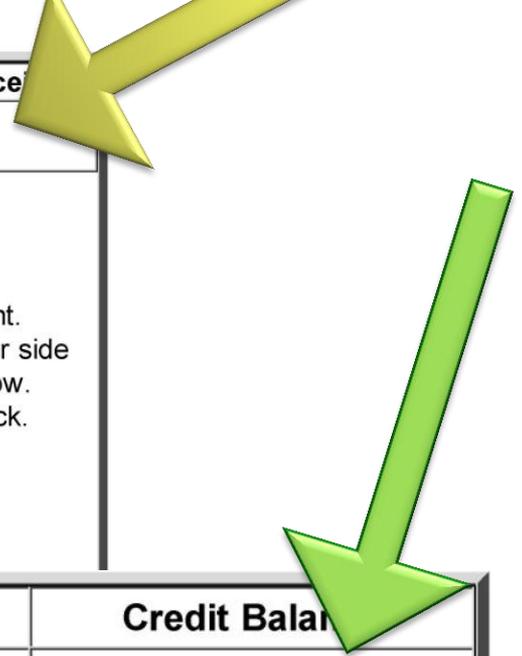


Customer ID	Please Pay Upon Rece
0626-0001-79 4	\$ 431.81

June 2008

Please make checks payable to LIPA

- Mail this part of bill with your payment.
- Be sure that the address on the other side appears in the return envelope window.
- Write your Customer ID on your check.



Customer ID	Credit Balan
0626-0001-79 4	\$ -125.29

- NO Payment Due.

June 2009

Long Bch NY 11561



PETER
 PENN ST
 LONG BEACH NY 11561-4122

008629

07/24/2009

Account No. 1910541101
 For Service at: E PENN ST

Long Island Power Authority
 Residential Generation Program
 Annual Statement of Energy Buy-Back

Your Annual Reconciliation Payment from LIPA is: \$177.35



Date	Net Energy Generated kwh	Buy-Back Rate kw\$/h	Total Earned	Base Rate \$/kwh	FPPCA Rate \$/kwh
07/29/08	0	\$0.1195	\$0.00	\$0.0553	\$0.0642200
07/30/08	0	\$0.1195	\$0.00	\$0.0553	\$0.0642200
08/20/08	117	\$0.1195	\$13.98	\$0.0553	\$0.0642200
09/17/08	154	\$0.1195	\$18.41	\$0.0553	\$0.0642200
10/23/08	370	\$0.1081	\$40.01	\$0.0439	\$0.0642200
11/18/08	10	\$0.1017	\$1.02	\$0.0375	\$0.0642200
12/17/08	-98	\$0.1017	-\$9.97	\$0.0375	\$0.0642200
01/20/09	-193	\$0.1055	-\$20.36	\$0.0375	\$0.0679994
02/19/09	128	\$0.1081	\$13.84	\$0.0375	\$0.0706450
03/20/09	9	\$0.1081	\$0.97	\$0.0375	\$0.0706450
04/20/09	-66	\$0.1081	-\$7.14	\$0.0375	\$0.0706450
05/18/09	269	\$0.1039	\$27.95	\$0.0375	\$0.0664047
06/18/09		\$0.1119	\$43.86	\$0.0478	\$0.0640490
07/23/09	459	\$0.1193	\$54.78	\$0.0553	\$0.0640490

Totals 1,551
 This is not an Invoice.
 Your reconciliation check will be mailed shortly.

Amount of check sent to reimburse customer

Total excess kilowatt hours generated for the 12 month period

Commercial System Incentives

- ❑ LIPA & NYSERDA Rebates \$1.75/Watt – up to 50 kW (\$87,500)
- ❑ 30% Federal Tax Credit
- ❑ Property Tax Abatement
- ❑ Accelerated Depreciation Schedule (5 Years)



Commercial Systems

- +15% Internal Rate of Return
- Financing Options
 - Loans
 - Leases
 - Power Purchase Agreements



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Four Pillars of Great Installation

- Thorough Site Visit
 - Great Engineering
 - Great Products
 - Great Installation
-
- **Foundation:** Great Company

Hiring Contractors

- ❑ How Many Years In Business
- ❑ Referrals, also warranty referral
- ❑ Department of Consumer Affairs
- ❑ Better Business Bureau
- ❑ Careful Contract Review
- ❑ Multiple Quotes

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LEGISLATION

- ❑ Solar Industry Development and Jobs Act
- ❑ Establishes SREC Program
- ❑ Minimum % of Solar Required

EmPower Solar

Operation Solar Century

May 11, 2011