



*Shaping the Future of Business On Long Island
Solar and Wind Energy
Wednesday, May 11, 2011
NYS Small Business Development Center*

Climate Crisis = Economic Opportunity

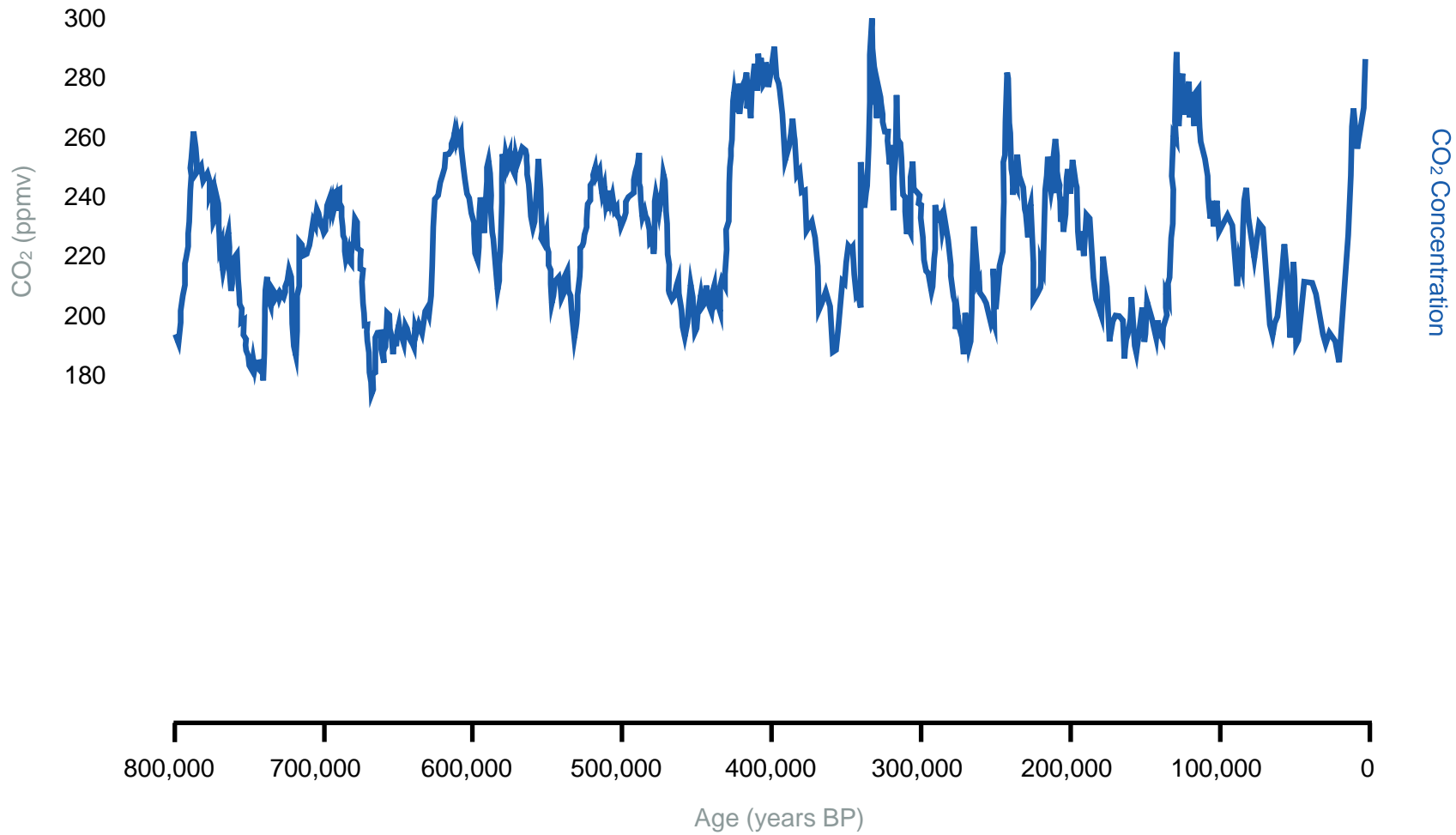
Gordian Raacke

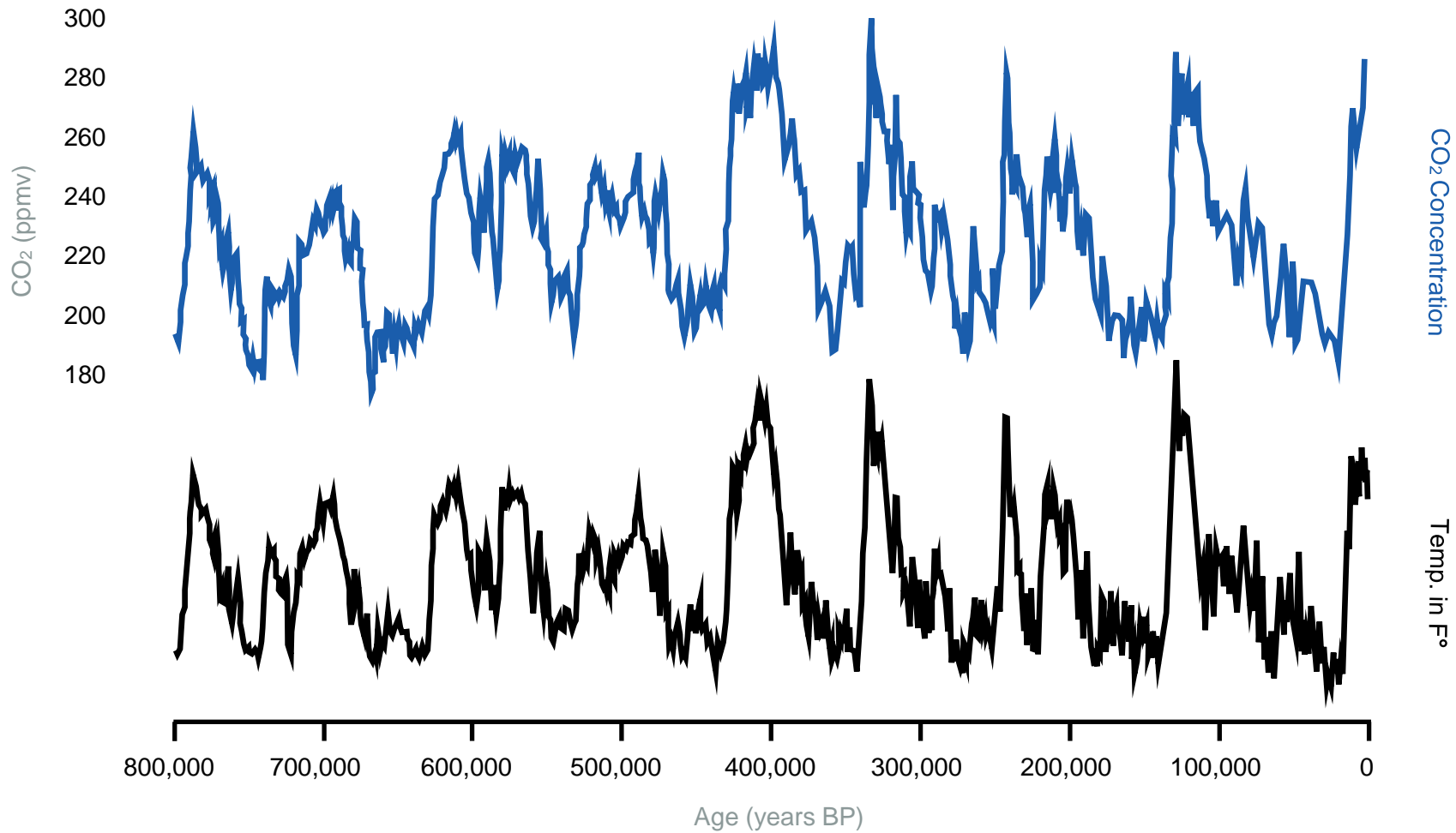
Executive Director

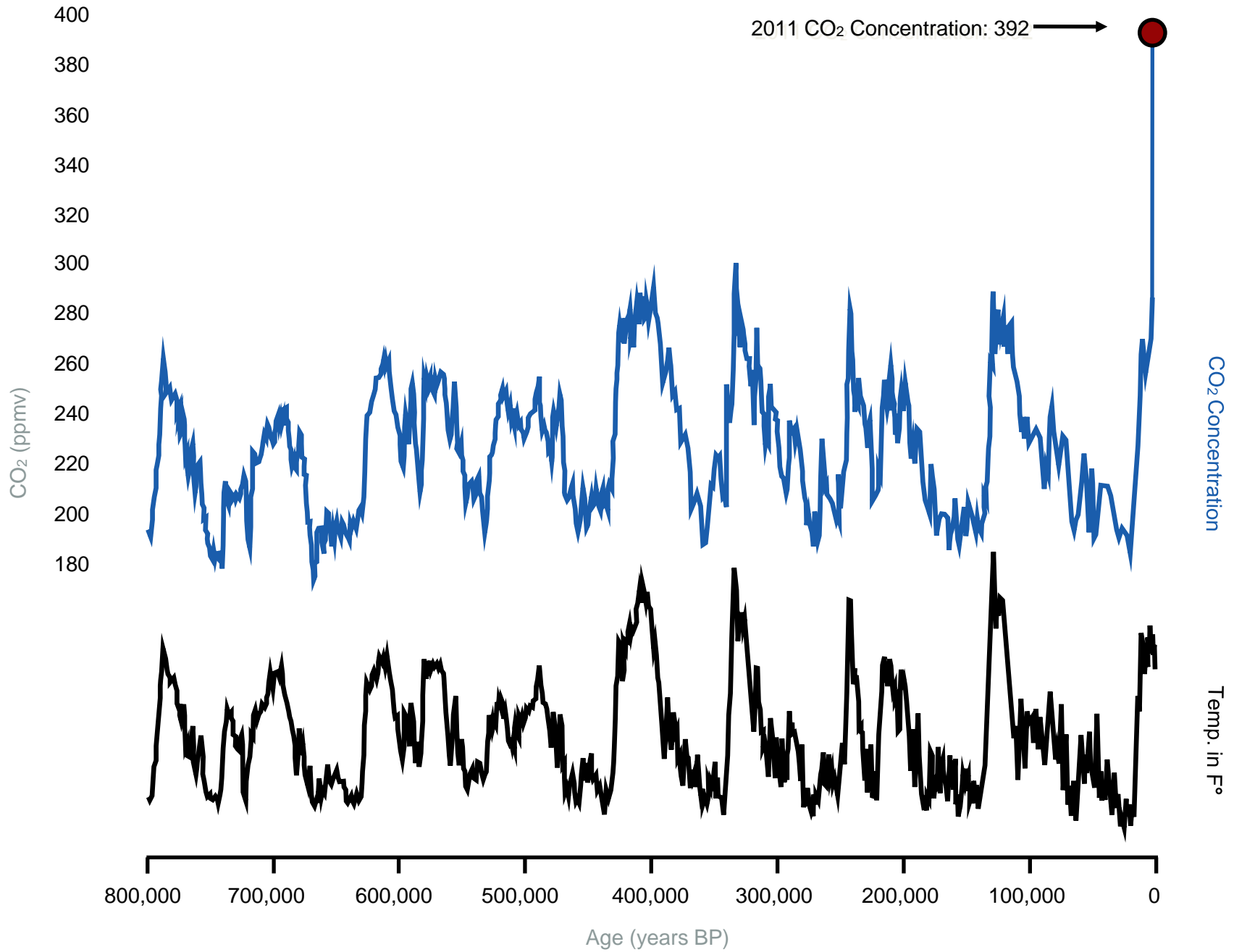
Renewable Energy Long Island (reLI)

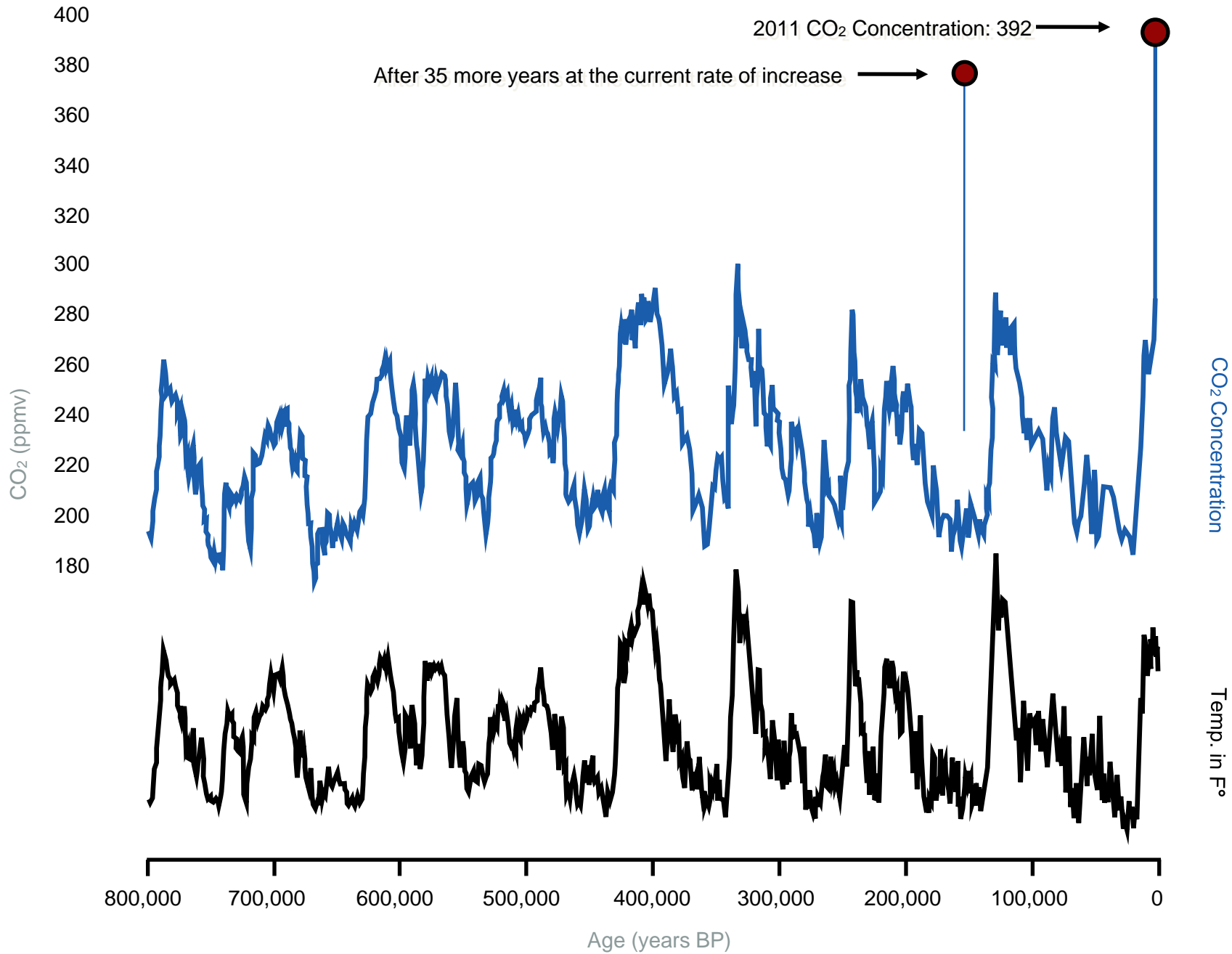
www.RenewableEnergyLongIsland.org





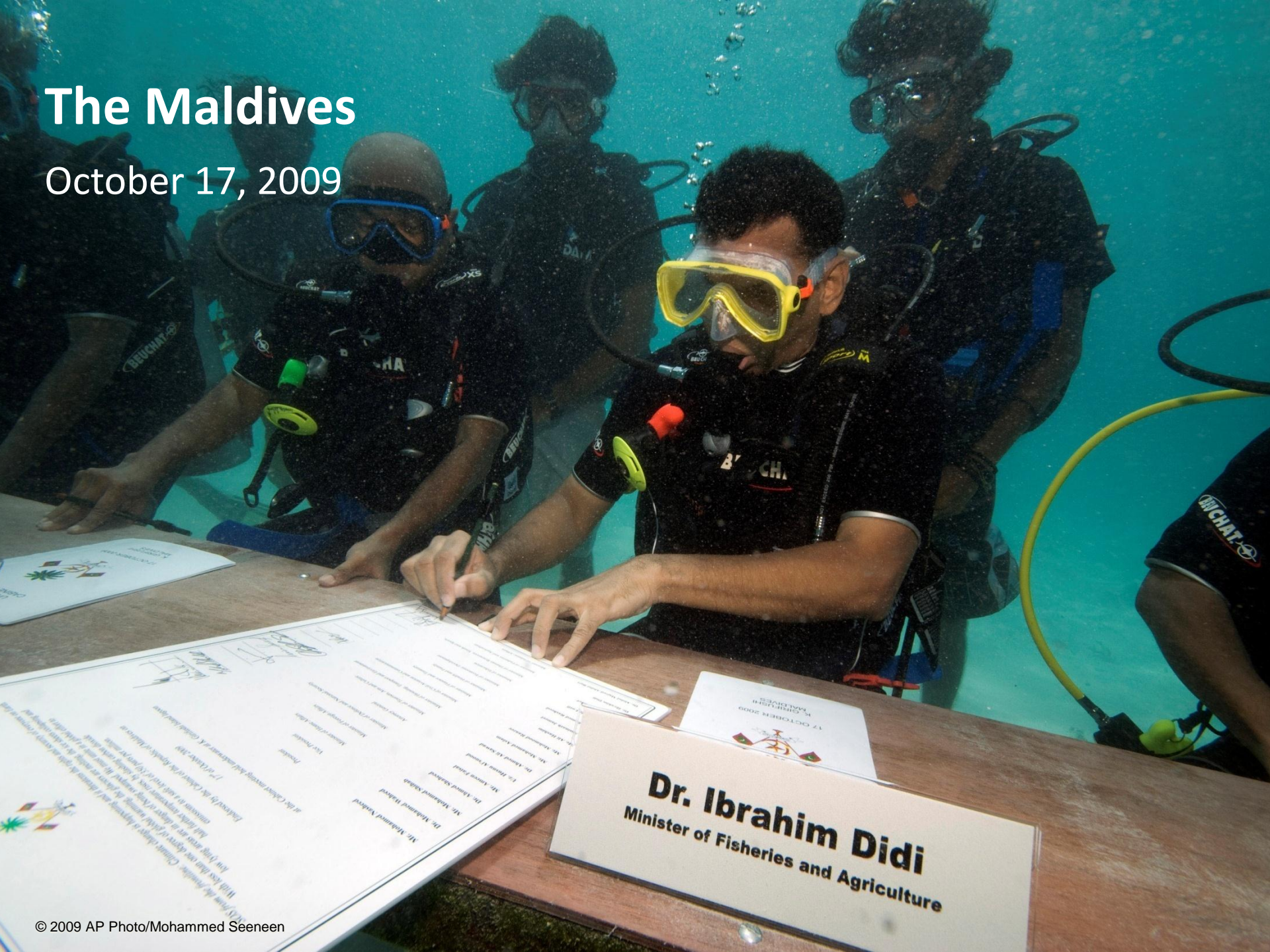






The Maldives

October 17, 2009



17 OCTOBER 2009
17 OCTOBER 2009
17 OCTOBER 2009

Dr. Ibrahim Didi
Minister of Fisheries and Agriculture



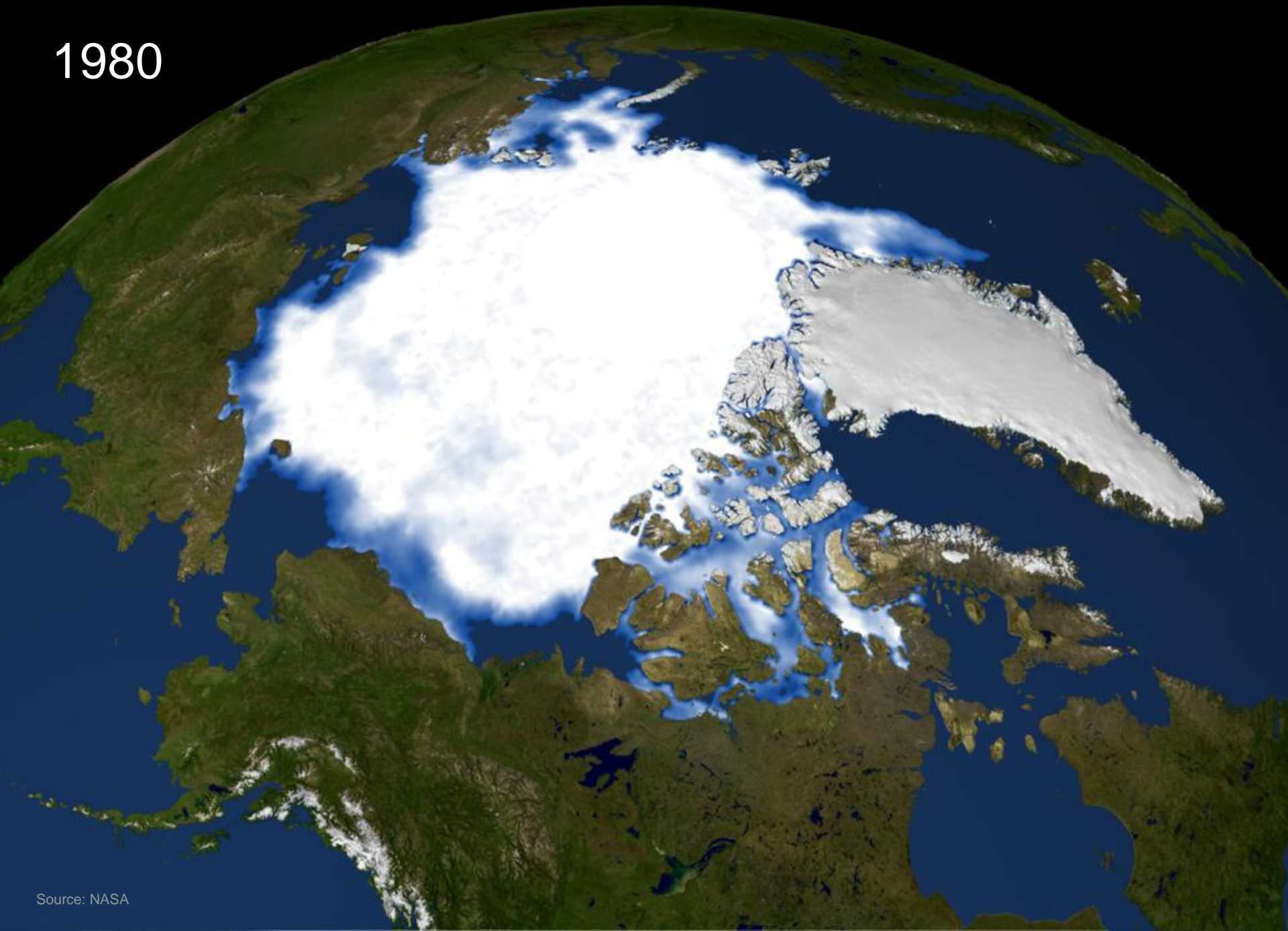
Avoiding Tipping Points

- Limit warming to 2° C (3.6° F)

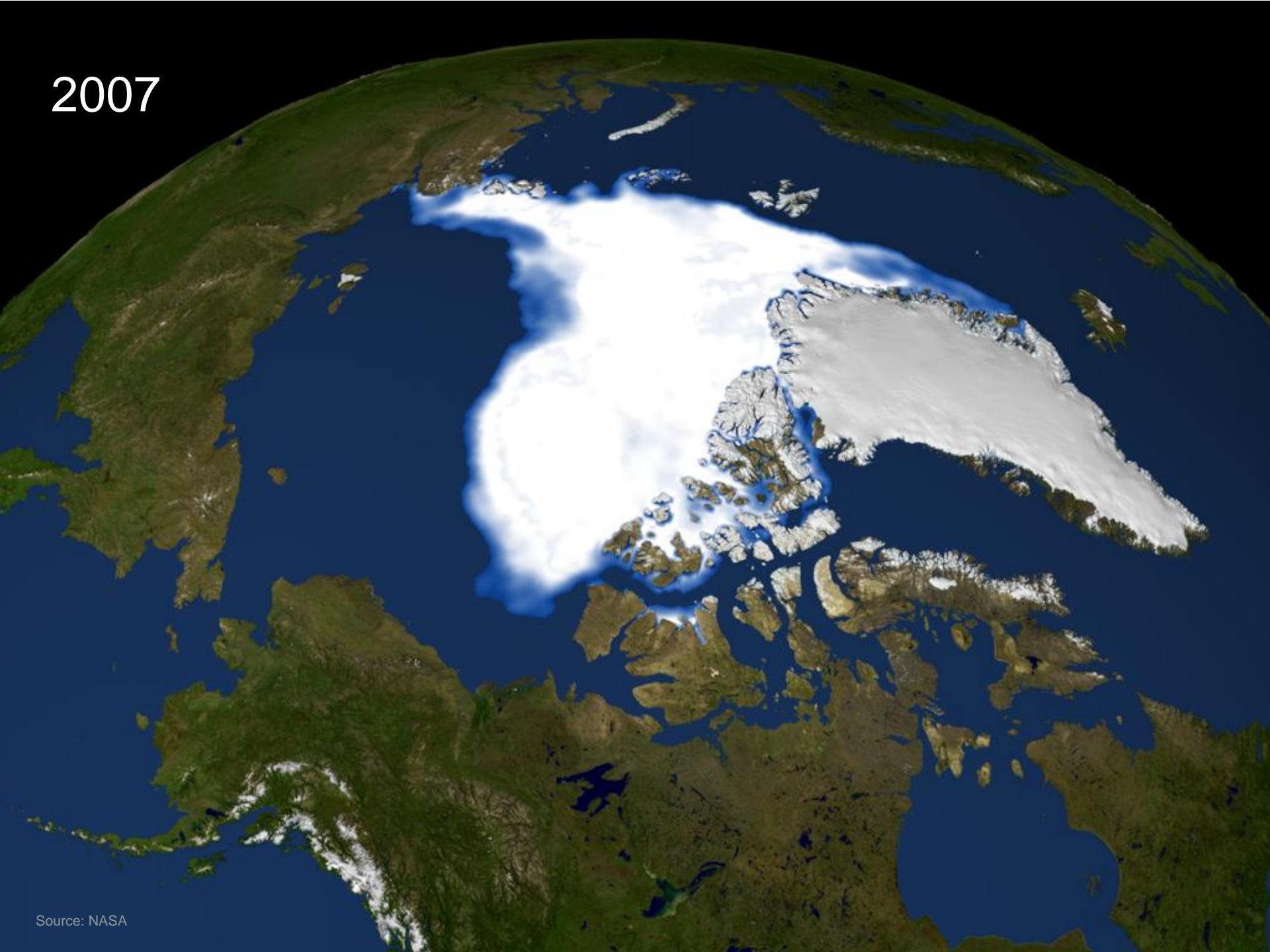




1980



2007



Greenland Seasonal Ice Melt



1979



1990



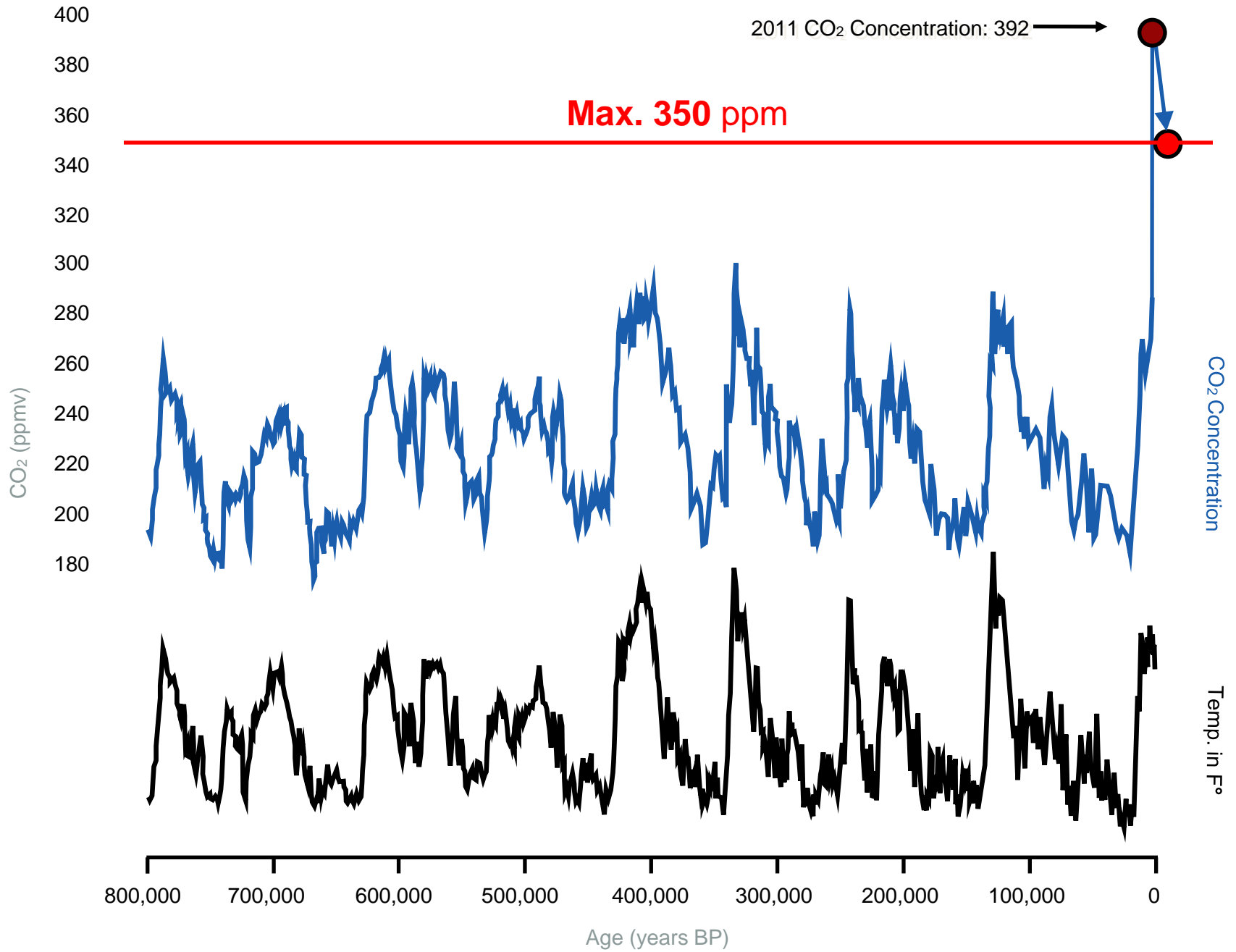
2007

Projected Sea Level Rise 2100

- IPCC 2007: ~~7 – 23 inches~~
- AMAP 2011: **35 – 63 inches**



* Arctic Monitoring and Assessment Programme





NYS Executive Order No. 24

80 x 50

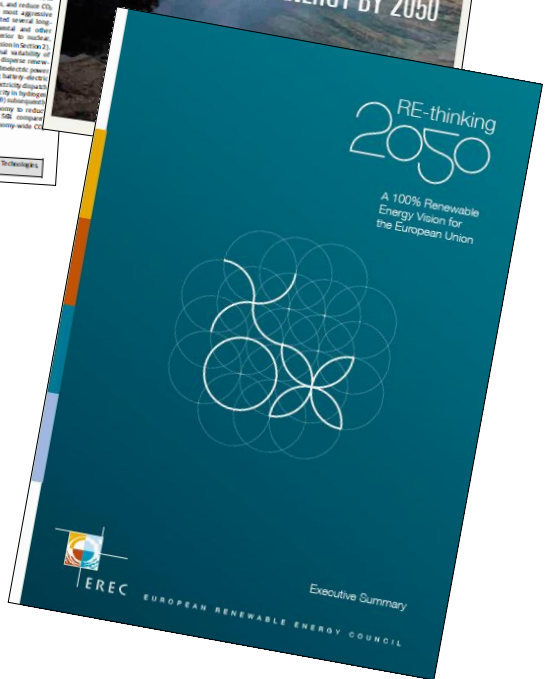
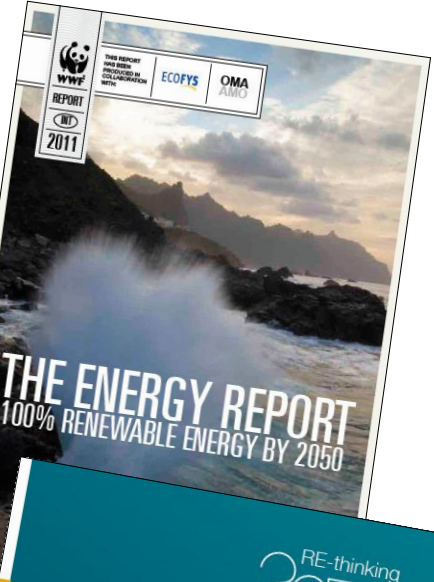
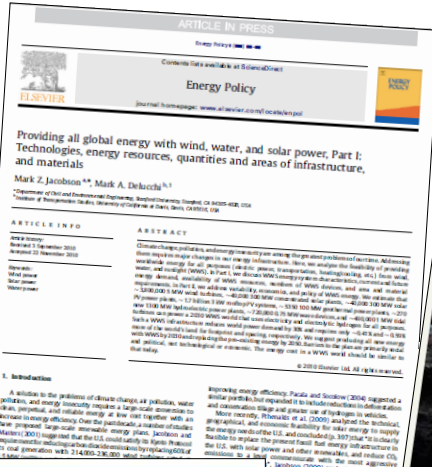
“It shall be a goal of the State of New York to reduce current greenhouse gas emissions from all sources within the State eighty percent (80%) below levels emitted in the year nineteen hundred ninety (1990) by the year two-thousand fifty (2050).”

The Great Transition





100% Renewable Energy





Existing Plans & Studies

Organization	%	Sector and Area	Target Date
Repower America	100 %	Electricity U.S.	2020
Beyond Zero Emissions	100 %	E/T/H/C* Australia	2020
Price Waterhouse Coopers	100 %	Electricity Euro/N. Africa	2050
SRU** Germany	100 %	Electricity Germany	2050
EREC/Greenpeace	100 %	E/T/H/C Europe	2050
WWF/Enerfys	100 %	E/T/H/C World	2050
Jacobson/Delucchi	100 %	E/T/H/C World	2030/50

*E/T/H/C = Electricity, Transport, Heat/Cool

**German Advisory Council on the Environment

100% Renewable Energy

SRU German Advisory Council on the Environment

Pathways towards a 100% renewable electricity system

Chapter 10: Executive summary and recommendations

Provisional Transition

RETHINKING "HOBBITS" What They Mean for Human Evolution

THE EVERYTHING Get Ready for the Wide-Spread

SCIENTIFIC AMERICAN

November 2009

The Long Sibling OUR

A Plan for a Sustainable Future

How to get all energy from wind, water and solar power by 2030

Chronic Pain What Goes Wrong

ARTICLE IN PRESS

Energy Policy () () ()

Contents lists available at ScienceDirect

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Energy Policy

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Providing all global energy with wind, water, and solar power, Part I: Technologies, energy resources, quantities and areas of infrastructure, and materials

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ABSTRACT

Climate change, pollution, and energy insecurity are among the greatest problems of our time. Addressing them requires major changes in our energy infrastructure. Here, we analyze the feasibility of providing worldwide energy for all purposes (electric power, transportation, heating/cooling, etc.) from wind, water, and sunlight (WWS). In Part I, we discuss WWS energy system characteristics, current and future energy demand, availability of WWS resources, numbers of WWS devices, and area and material requirements. In Part II, we address variability, economics, and policy of WWS energy. We estimate that ~3,000,000 5 MW wind turbines, ~40,000 100 MW concentrated solar plants, ~40,000 300 MW solar PV power plants, ~1.7 billion 3 kW rooftop PV systems, ~3350 100 MW geothermal power plants, ~270 new 1300 MW hydroelectric power plants, ~720,000 0.75 MW wave devices, and ~400,000 1 MW tidal turbines can power a 2030 WWS world that uses electricity and electrolytic hydrogen for all purposes. Such a WWS infrastructure reduces world power demand by 30% and requires only ~0.41% and ~0.50% more of the world's land for footprint and spacing, respectively. We suggest producing all new energy with WWS by 2030 and replacing the pre-existing energy by 2050. Barriers to the plan are primarily social and political, not technological or economic. The energy cost in a WWS world should be similar to that today.

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1. Introduction

A solution to the problems of climate change, air pollution, water pollution, and energy insecurity requires a large-scale conversion to clean, perpetual, and reliable energy at low cost together with an increase in energy efficiency. Over the past decade, a number of studies have proposed large-scale renewable energy plans. Jacobson and Masters (2001) suggested that the U.S. could satisfy its Kyoto Protocol requirement for reducing carbon dioxide emissions by replacing 60% of its coal generation with 214,000–236,000 wind turbines rated at 1.5 MW (million watts). Also in 2001, Orlich (2006) suggested that a totally renewable electricity supply system, with intercontinental backstop, could supply Europe, North Africa, and East Asia at total costs per kWh comparable with the costs of the current system. Hafner et al. (2002) suggested a portfolio of solutions for stabilizing atmospheric CO₂, including increasing the use of renewable energy and nuclear energy, decarbonizing fossil fuels and sequestering carbon, and

improving energy efficiency. Pacala and Socolow (2004) suggested a similar portfolio, but expanded it to include reductions in deforestation and conservation (e.g. and greater use of hydrogen in vehicles). More recently, Rhinakis et al. (2009) analyzed the technical, geographical, and economic feasibility for solar energy to supply the energy needs of the U.S. and concluded (p. 397) that "it is clearly feasible to replace the present fossil fuel energy infrastructure in the U.S. with solar power and other renewables, and reduce CO₂ emissions to a level commensurate with the most aggressive climate-change goals". Jacobson (2009) evaluated several long-term energy systems according to environmental and other criteria, and found WWS systems to be superior to nuclear, fossil-fuel, and biofuel systems (see further discussion in Section 2). He proposed to address the hourly and seasonal variability of WWS power by interconnecting geographically disperse renewable energy sources to smooth out loads, using hydroelectric power to fill in gaps in supply. He also proposed using battery-electric vehicles (BEVs) together with utility controls of electricity dispatch to them through smart meters, and storing electricity in hydrogen or solar-thermal storage media. Chenus et al. (2009) subsequently presented a "blueprint" for a clean-energy economy to reduce CO₂-equivalent GHG emissions in the U.S. by 56% compared with the 2005 levels. That study featured an economy-wide CO₂

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THE REPORT HAS BEEN DEVELOPED IN COLLABORATION WITH

ECOFYS OMA AMO

RE-thinking 2050

A 100% Renewable Energy Vision for the European Union

Executive Summary

EUROPEAN RENEWABLE ENERGY COUNCIL

- 100% renewable world energy feasible by 2030
- Variable resources can reliably match demand
- Adequate availability of raw materials
- Additional land footprint/spacing 0.41%/0.59%
- Cost similar to today's energy costs
- Barriers are social/political, *not* tech/economic



Jacobson/Delucchi U.S. #s

- 590,000 Wind Turbines (5 MW)
 - 110,000 Wave Devices (0.75 MW)
 - 830 Geothermal Plants (100 MW)
 - 140 Hydroelectric plants (1,300 MW)
 - 7,600 Tidal Turbines (1 MW)
 - 265 million Rooftop PV Systems (3 kW)
 - 6,200 Centralized PV Plants (300 MW)
 - 7,600 Concentrated Solar Plants (300 MW)
-
- 100% Renewable Energy for the U.S.



How many RE systems on LI?

- 150,000 Residential PV Arrays (6.7 kW)
 - 5,000 Commercial PV Arrays (100 kW)
 - 25 Centralized PV Farms (50 MW)
 - 75,000 Solar Hot Water Systems (64 sqft)
 - 500 Small Wind Turbines (50 kW)
 - 125 Wind Turbines (2 MW)
 - 200 Offshore Wind Turbines (5 MW)
 - 0.50 Off-Island Hydro Facilities (1,200 MW)
 - 278 Off-Island Wind Turbines (3.6 MW)
-
- 100% Renewable Electricity for Long Island

PhotoVoltaics

- 16.6 GW of PV added in 2010 (7.2 GW 2009)
- 40 GW total installed PV capacity YE 2010
- 130 – 200 GW by 2015

Wind

- 36 GW of Wind added in 2010 (22.5% growth)
- 200 GW total installed capacity YE 2010
- 450 GW by 2015
- 1,000 GW by 2020

Thank You

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