

Department of Energy Biomass 2013

Current trends in the Advanced Bioindustry

July 31st, 2013

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President



ALGENOL
BIOFUELS
Harnessing the sun to fuel the world

ENSYN

Who We Are

gevo™

CTC
CENTRO DE TECNOLOGIA CANAVIEIRA

AMYRIS

GranBio

AMERICAN
PROCESS

Syntroleum

DU PONT

REPREVE
RENEWABLES

solazyme

DDCE
DuPont Danisco Cellulosic Ethanol LLC

UOP
A Honeywell Company

EMERSON

SundropFuels

coskata

DynamicFuels™

SynGest

Sapphire
Energy™

EndicottBiofuels

BETASEED

CH2MHILL

Tyson

NESTE OIL

Canergy™

CIA
Green

SGC
GRUPO

MUSKET

VELOCYS

WASHAKIE
RENEWABLE ENERGY

Intertek

Elevance™
RENEWABLE SCIENCES

TRITON
ENERGY

CoolPlanet
ENERGY SYSTEMS

GENX
ENERGY GROUP

CHEMTEx

PRAXAIR

MUREX
N.A. LTD.

LanzaTech

VIESEL
MADE IN THE USA

VIRENT

KIOR

Butamax™
A joint venture between BP and DuPont

SWEETWATER

weaver

Demand will continue to grow: China's desire to reach 'energy parity' will alone have a massive effect, not including other developing nations



U.S.

Population: 308 MM
GDP per capita: \$47,100
Oil use: 19.2 MBD
Oil use (per 1,000): 62 bpd



Poland

Population: 38 MM
GDP per capita: \$18,800
Oil use: 0.55 MBD
Oil use (per 1,000): 15 bpd



China

Population: 1,330 MM
GDP per capita: \$7,500
Oil use: 8.3 MBD
Oil use (per 1,000): 6.2 bpd

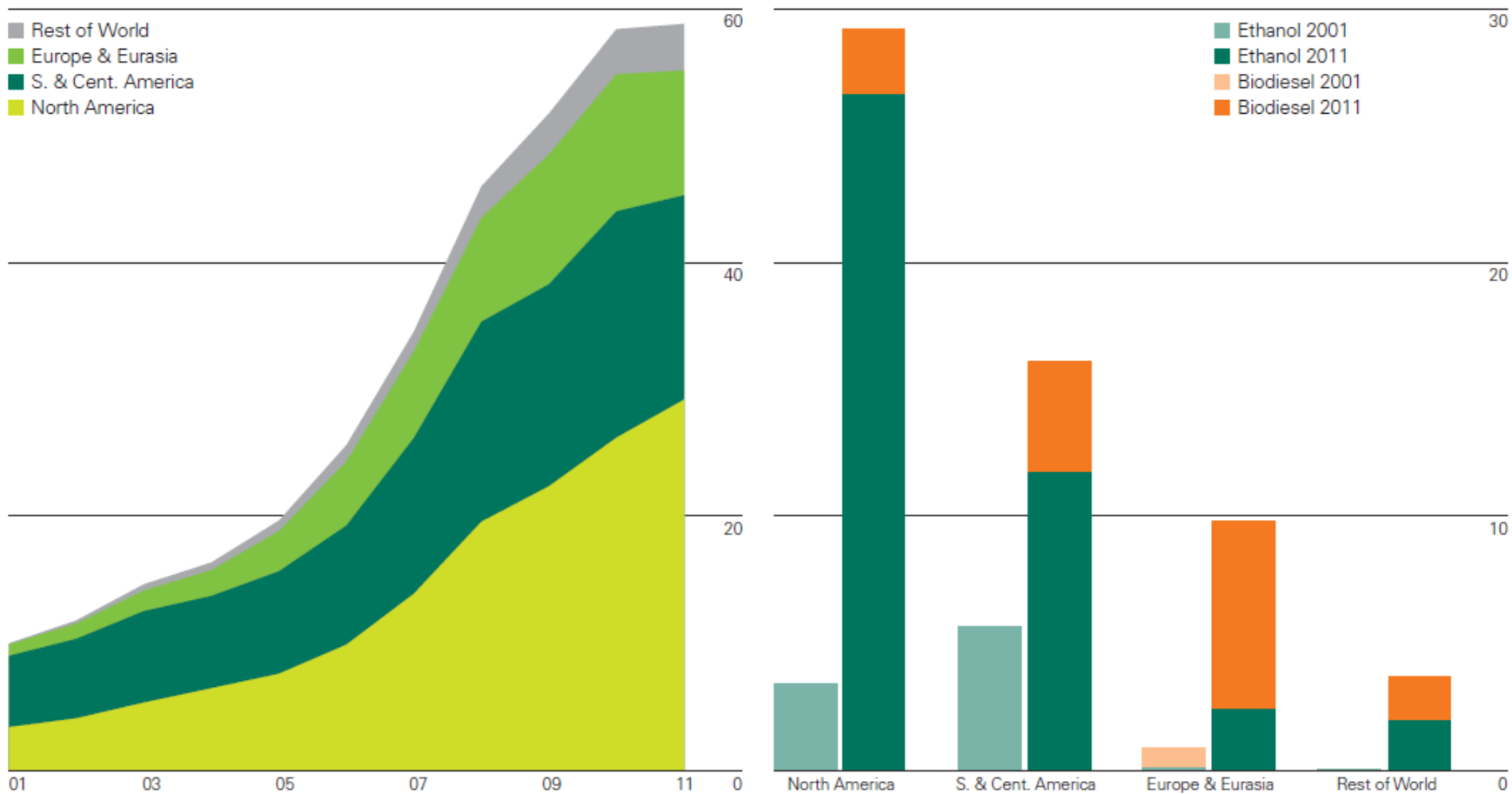
- If China aspires to be as "energy rich" as the U.S. by 2030, it will add **78.5 MBD**
- If China aspires to be half as "energy rich" as the U.S. by 2030, it will add **35.1 MBD**
- If China *only* aspires to be as "energy rich" as Poland* by 2030, it will still need to add **12.7 MBD** (and still be the largest consumer of oil in the world)
- *When you factor in the significant demand growth from India, Russia, Brazil, and the Middle East, the effect will be highly disruptive to the world oil markets*

* Poland has the lowest energy use per capita of any country with a GDP per capita greater than \$10,000

Note: Assumes population of China only grows to 1.4 billion by 2030

World biofuels production

Million tonnes oil equivalent



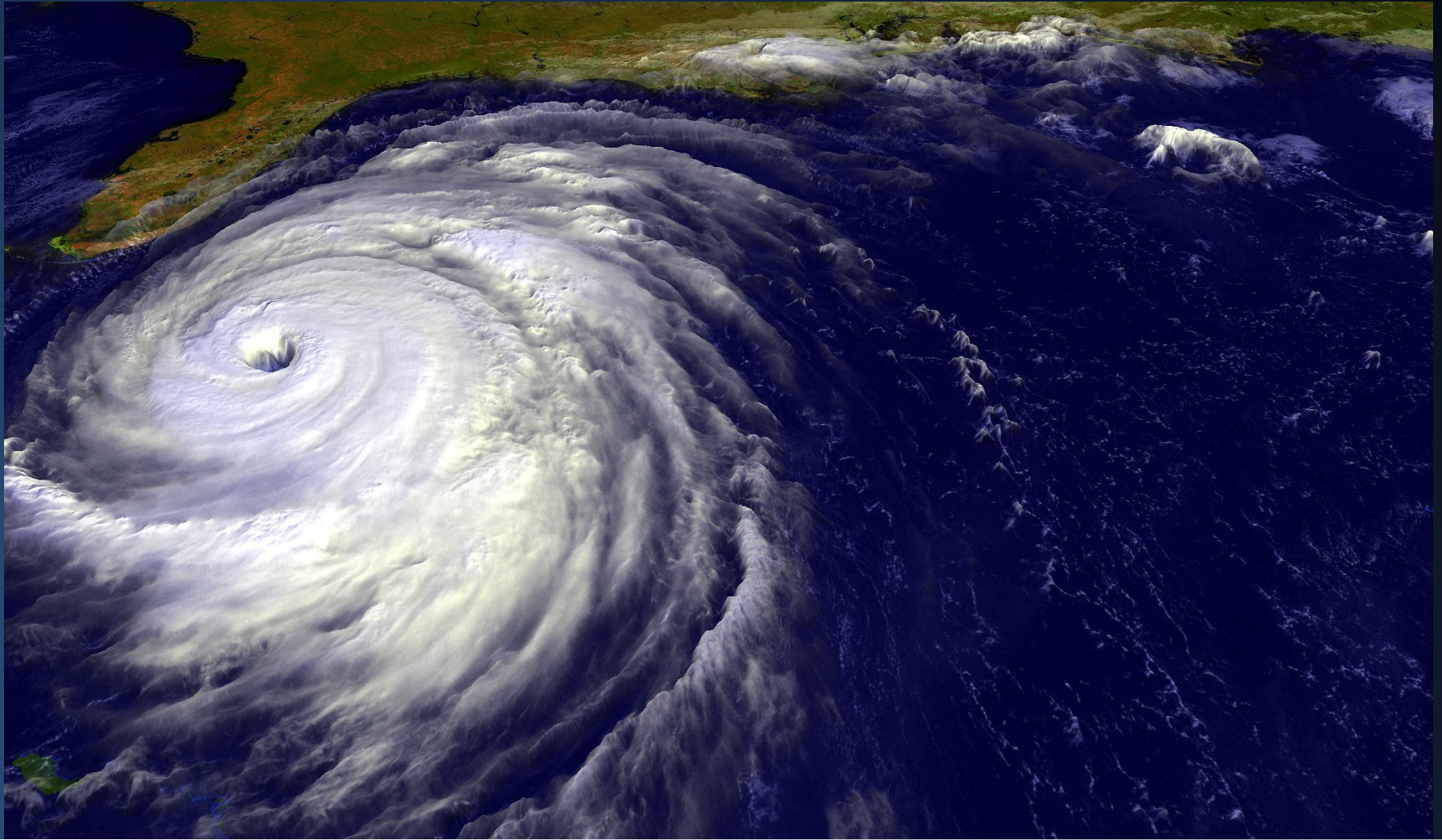
World biofuels production grew by 0.7% in 2011, the smallest increase since 2000. Increased output in North America was offset by declines in South & Central America and Europe. Biodiesel accounts for just 27.5% of global biofuels output, but accounted for all of the growth in global biofuels output. Global ethanol output declined by 1.4%.

Source: BP Statistical Review of World Energy, June 2012



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Climate Change



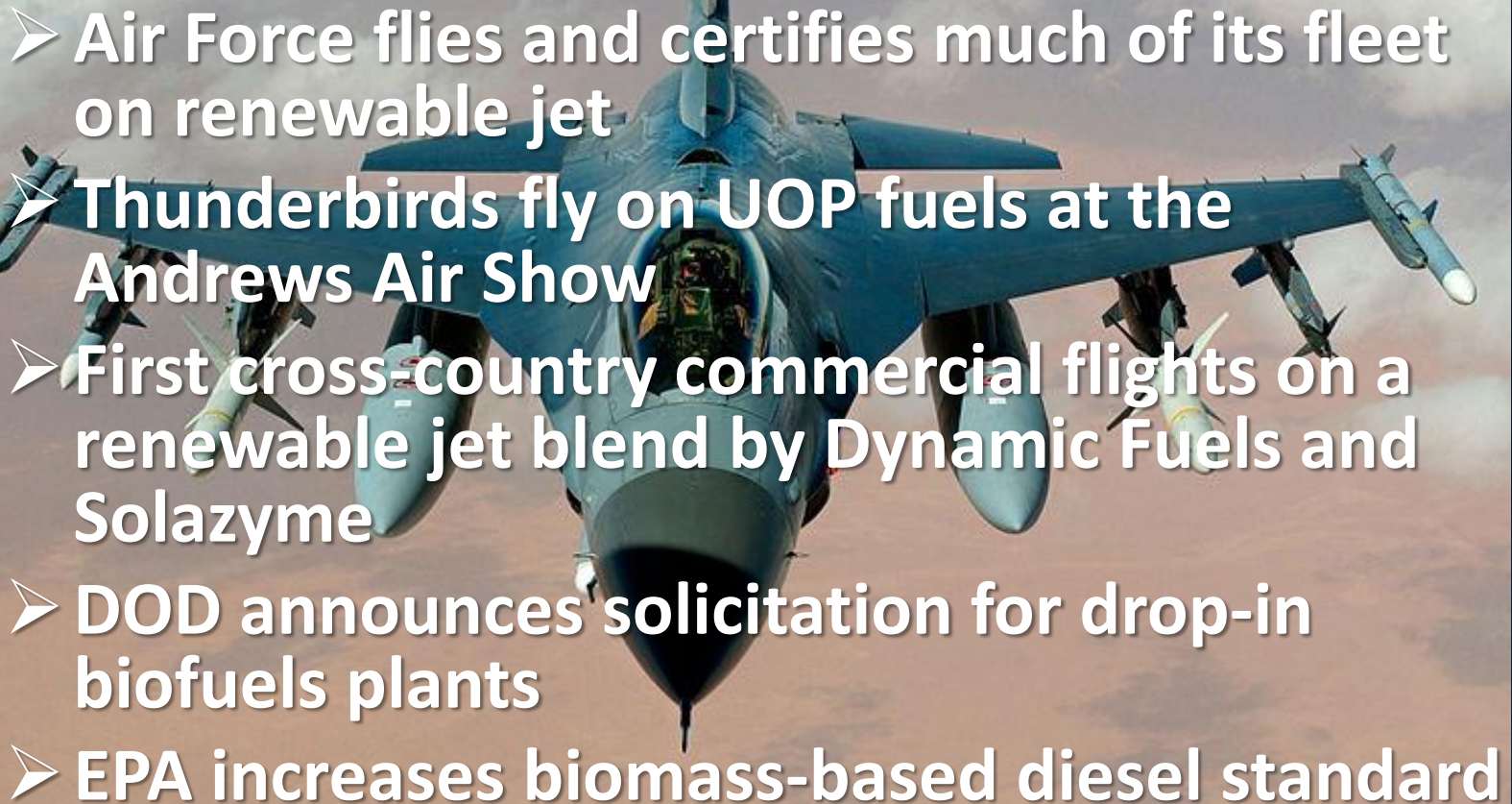
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Advanced Biofuels at work: Great Green Fleet



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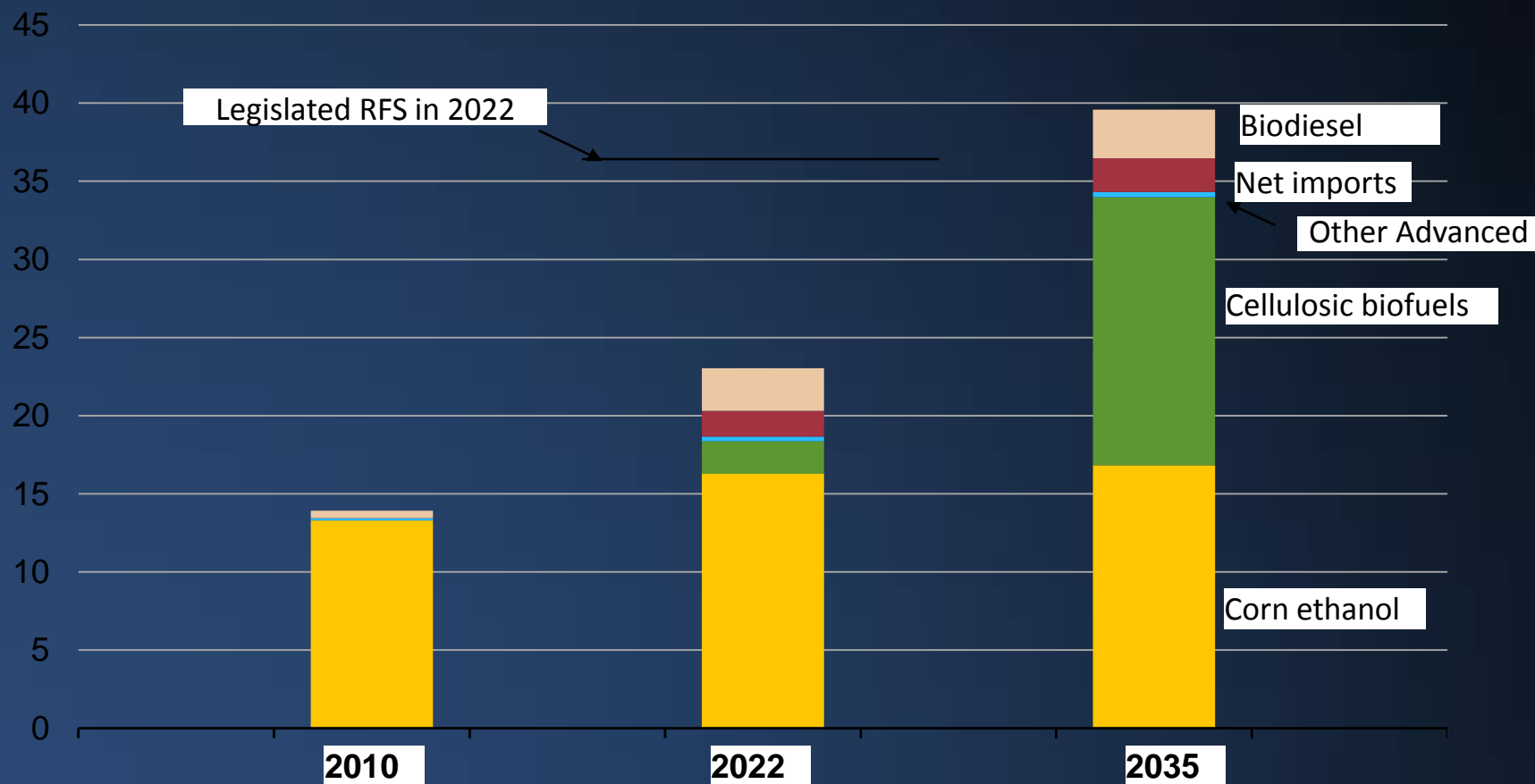
Major Events in Advanced Biofuels

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- Air Force flies and certifies much of its fleet on renewable jet
 - Thunderbirds fly on UOP fuels at the Andrews Air Show
 - First cross-country commercial flights on a renewable jet blend by Dynamic Fuels and Solazyme
 - DOD announces solicitation for drop-in biofuels plants
 - EPA increases biomass-based diesel standard



RFS encourages the production of cellulosic biofuels

billions ethanol-equivalent gallons



Source: EIA, Annual Energy Outlook 2012



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Chemtex



Gevo, MN



Kior, MS



LanzaTech, GA



Sapphire, NM



Dynamic Fuels, LA



Advanced Biofuels Market Vision

- Build a number of new plants to deliver a wide variety of advanced biofuels
- Quickly bring volume to the market
- Meet the targets set for the RFS2



Thank you Let's Work Together



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