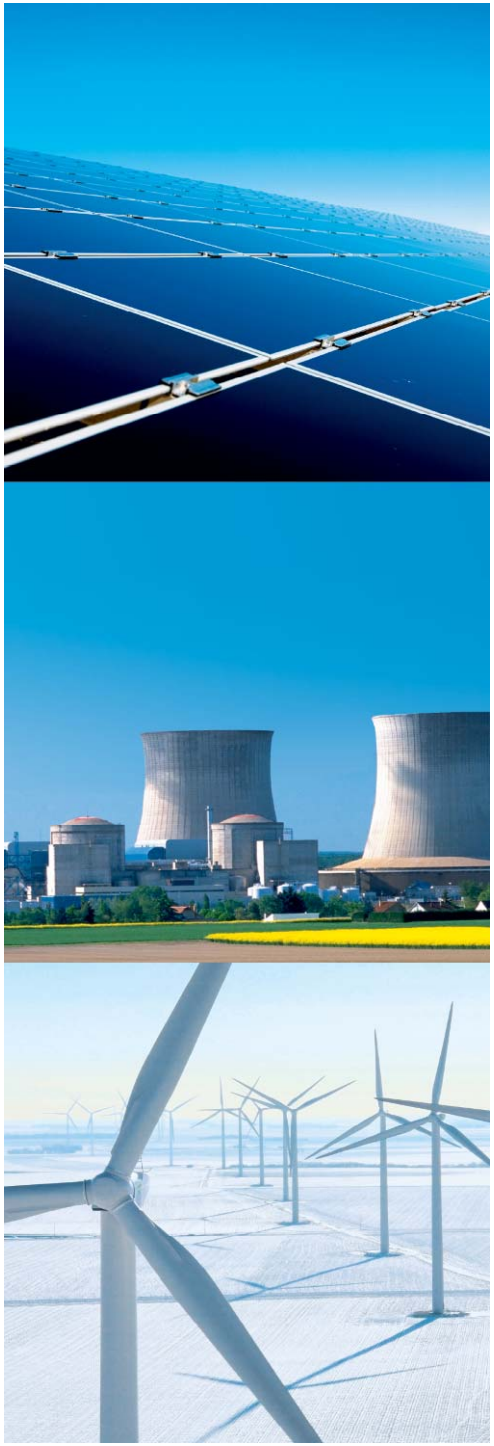
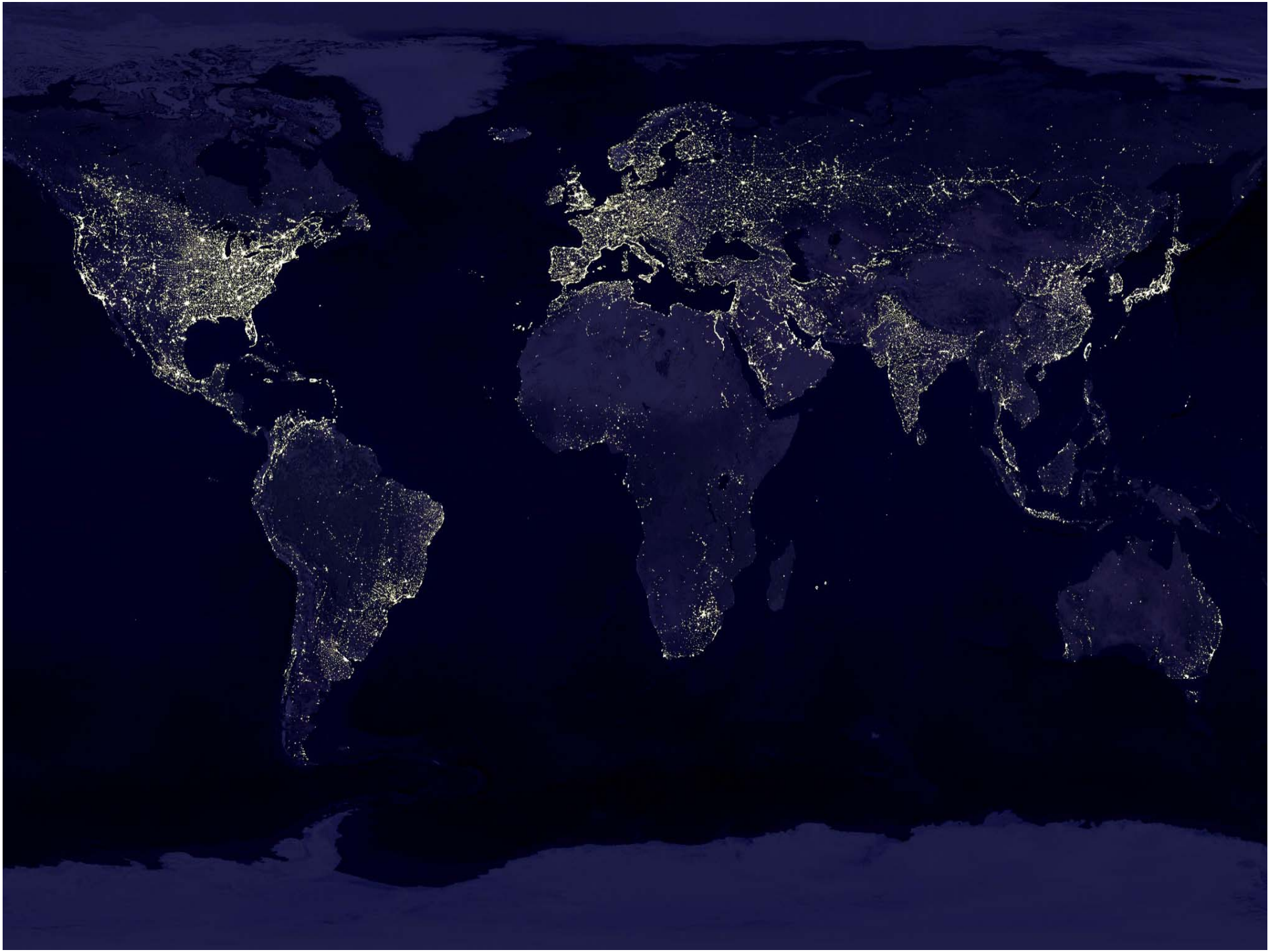
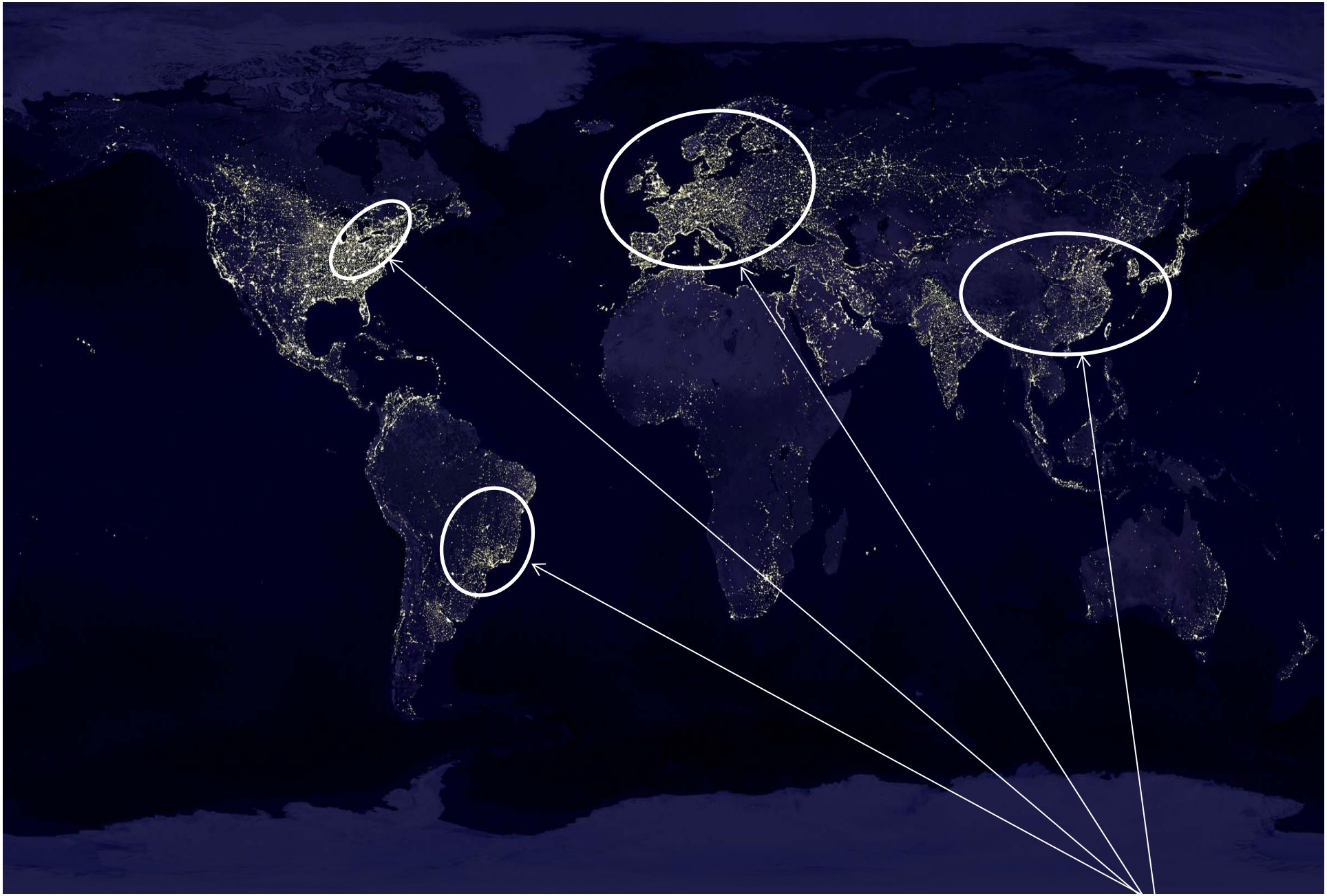


NORTH AMERICAN POWER MARKETS: CHALLENGES AND OPPORTUNITIES

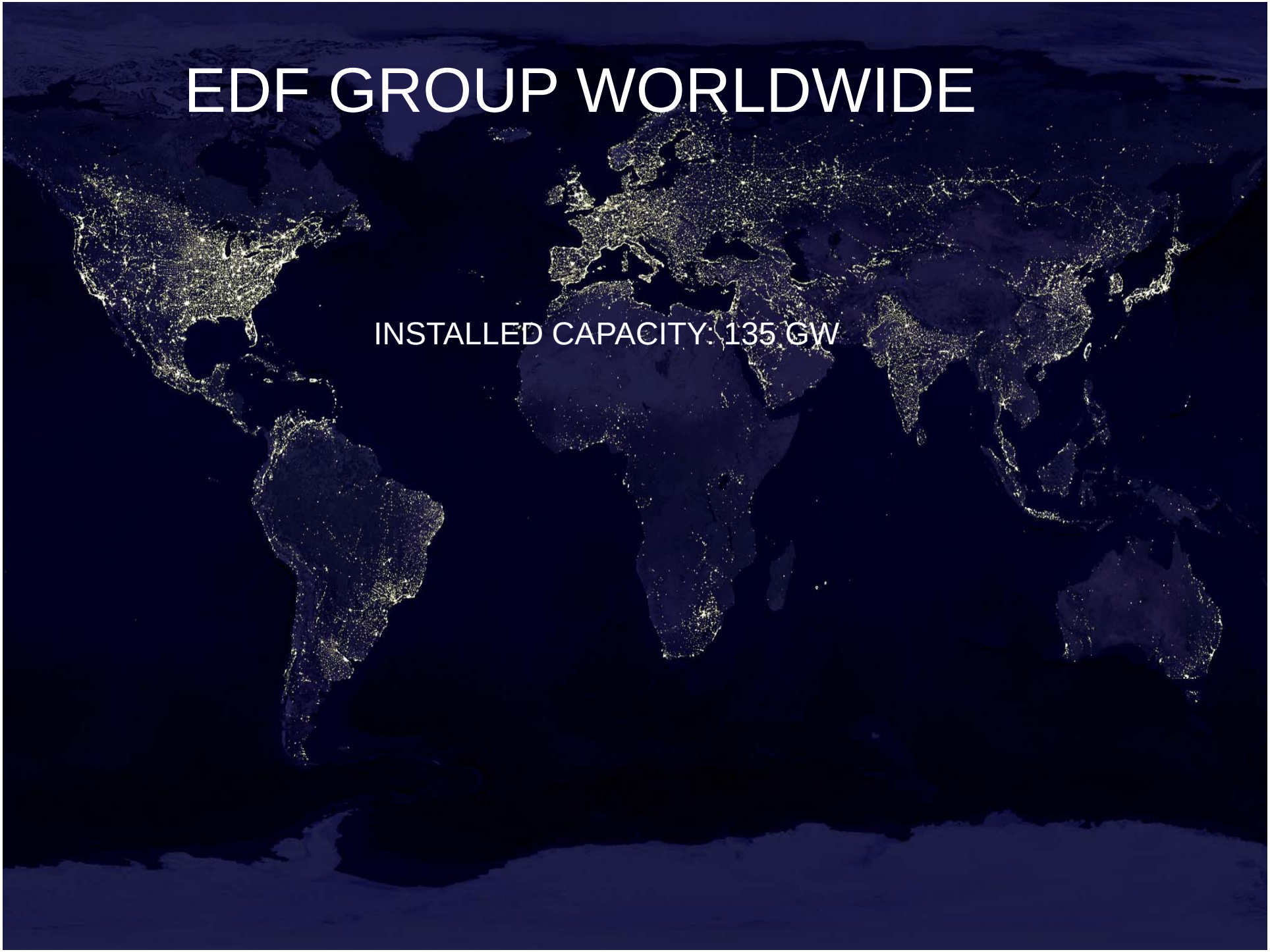
DANIEL LEROY
EVP Nuclear Operations and Canada
EDF Inc.

AAGEF Ontario, April 24, 2013





EDF GROUP WORLDWIDE



INSTALLED CAPACITY: 135 GW

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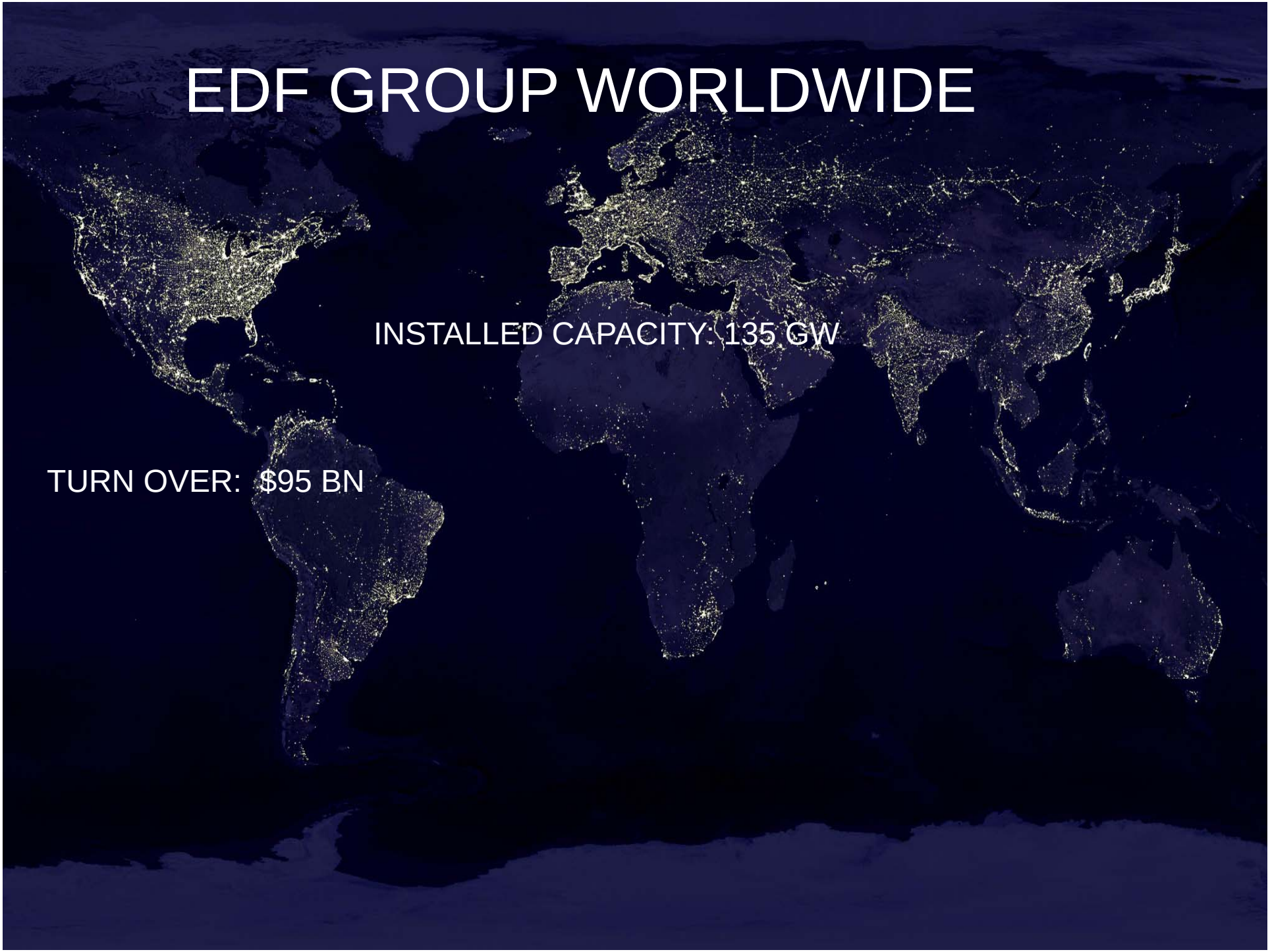

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TURN OVER: $95 BN

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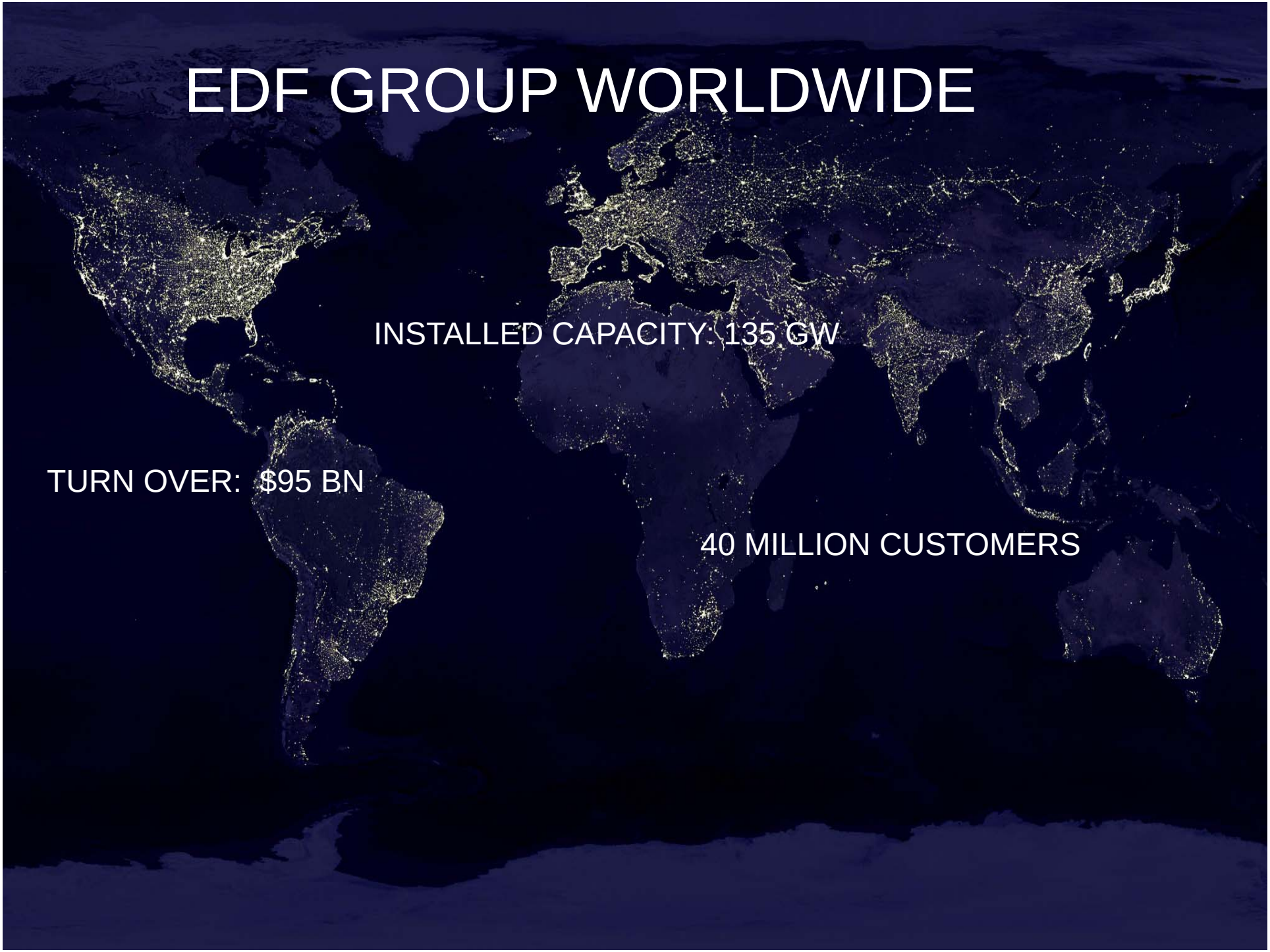

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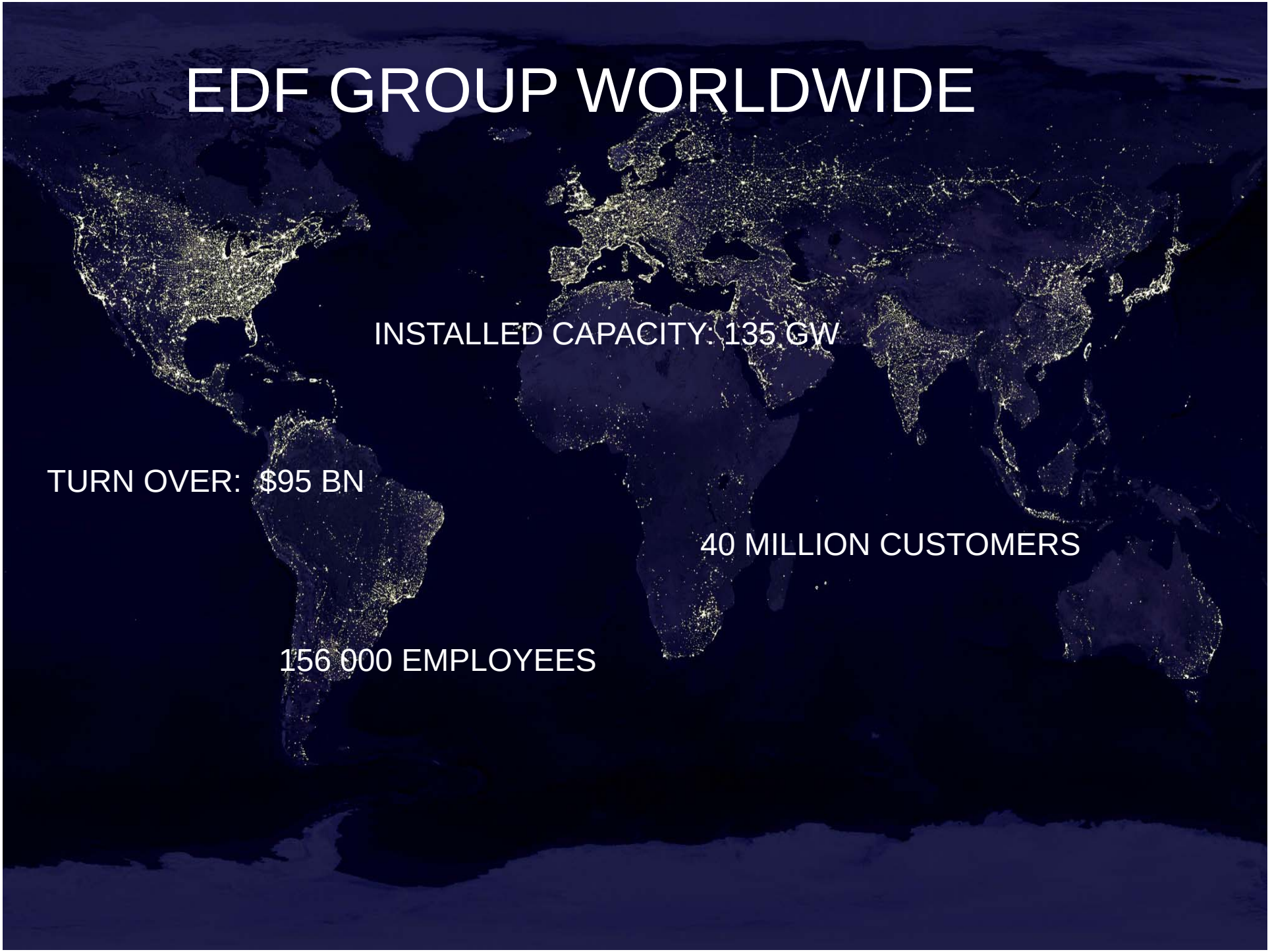
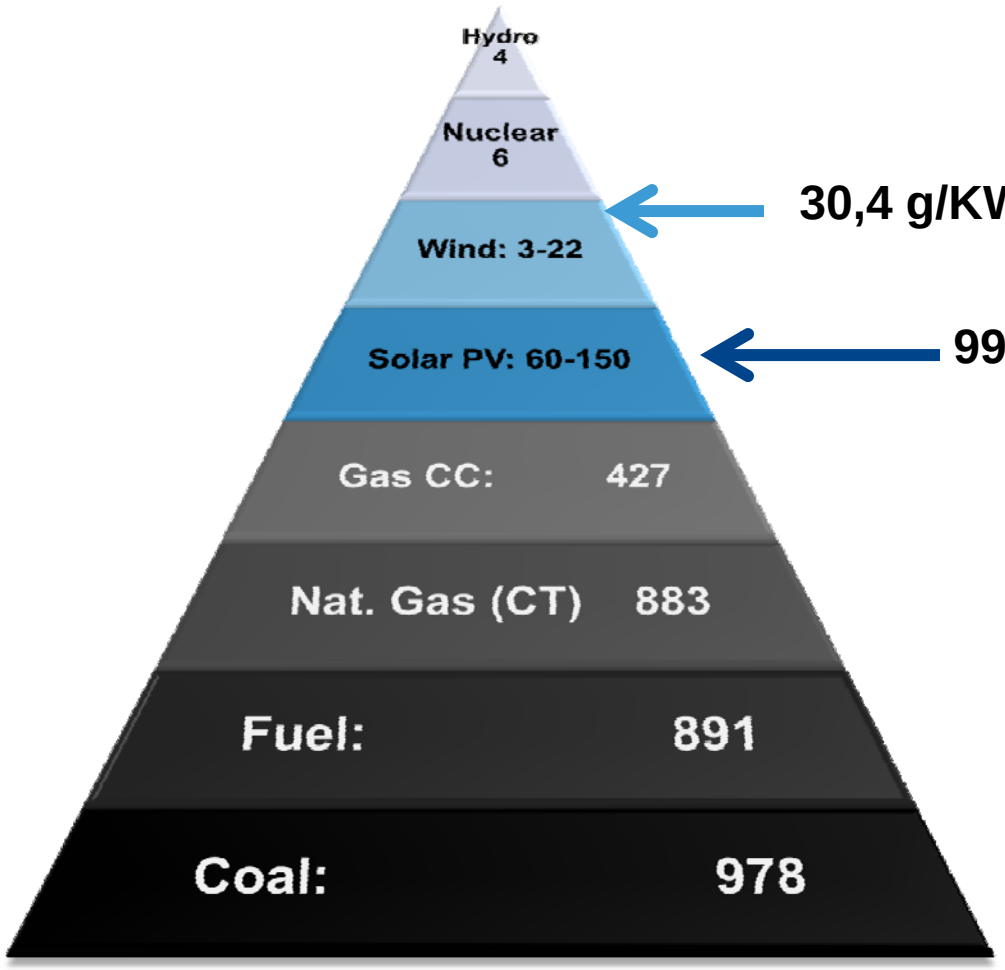


ONE OF THE CLEANEST GENERATION MIX IN THE WORLD



30,4 g/KWh in France

99.6 g/KWh globally

75% Nuclear
15% Fossil Fired
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CO2 emissions (g/KWh) – Life cycle assesment

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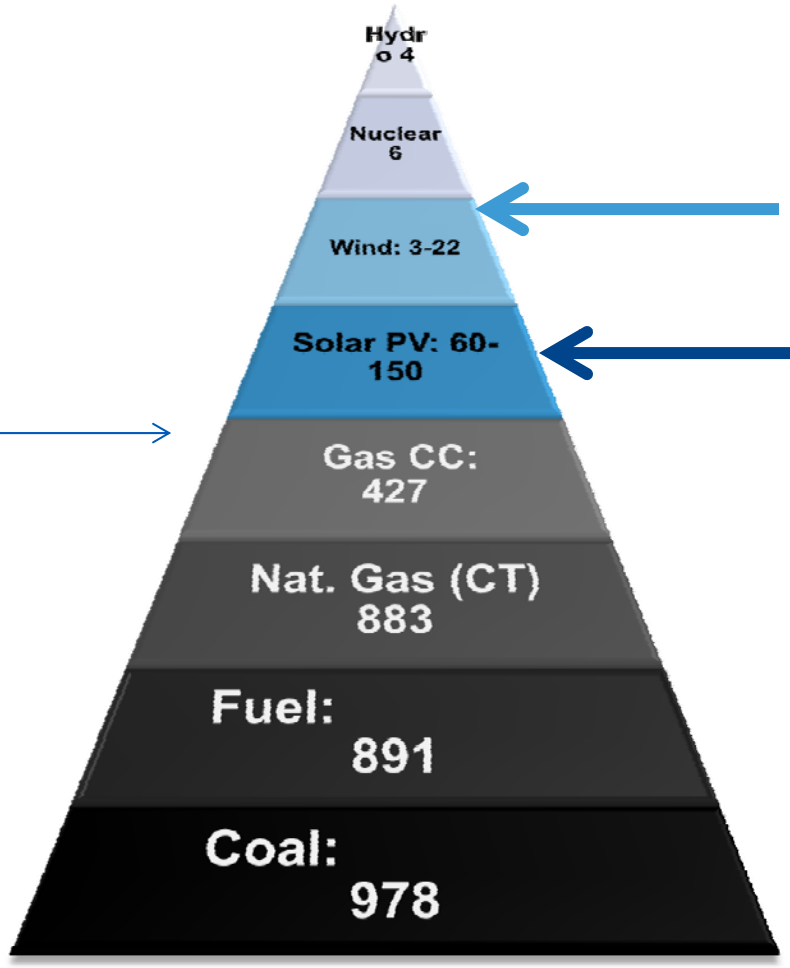

Canada: 180 g

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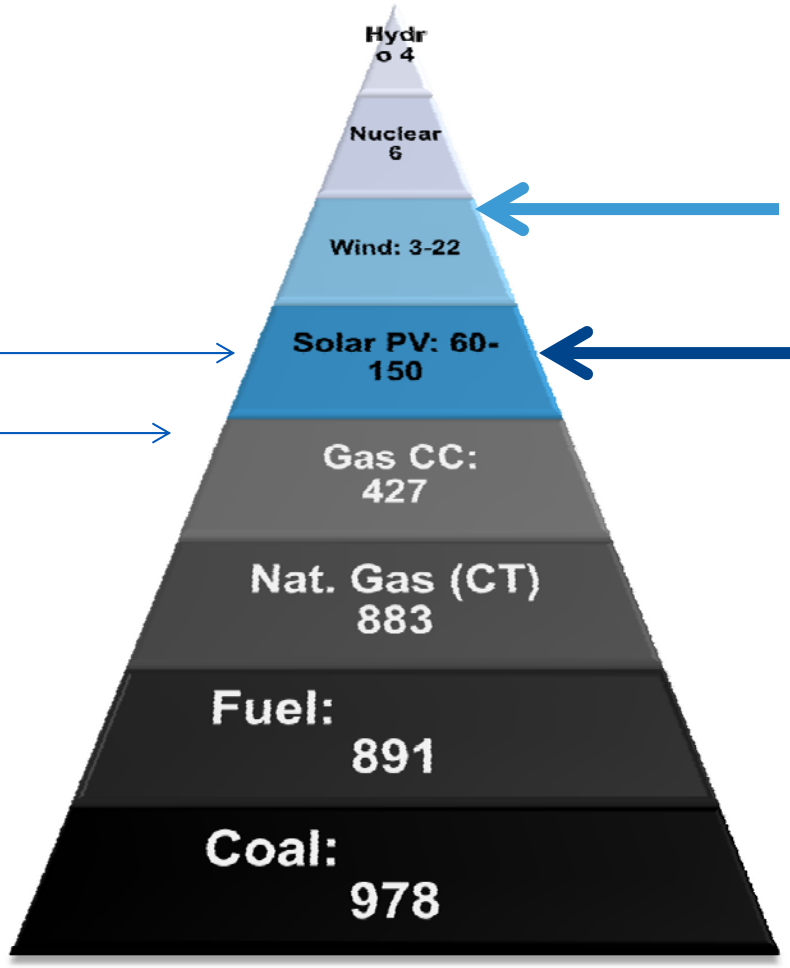

Ontario: 100 g

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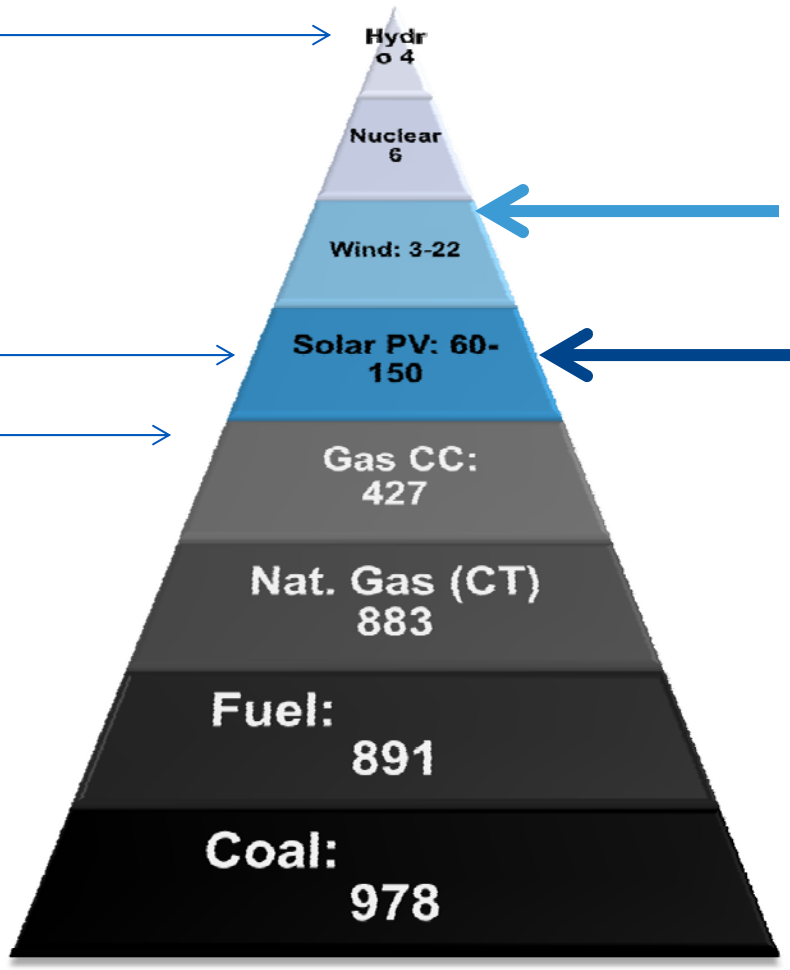

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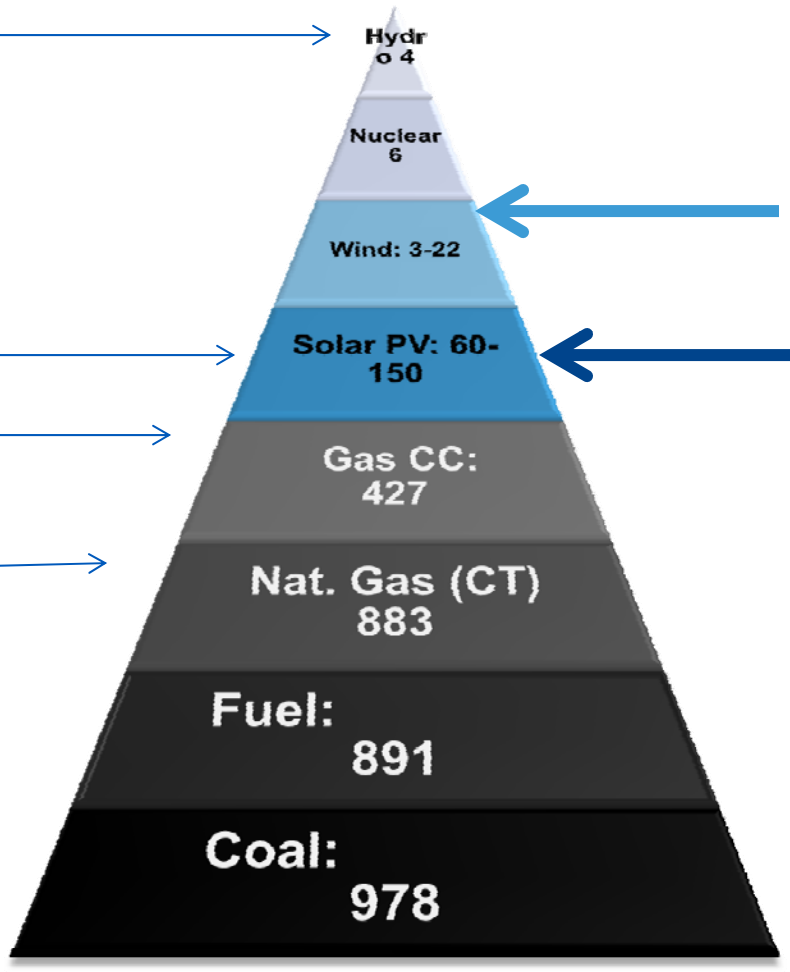

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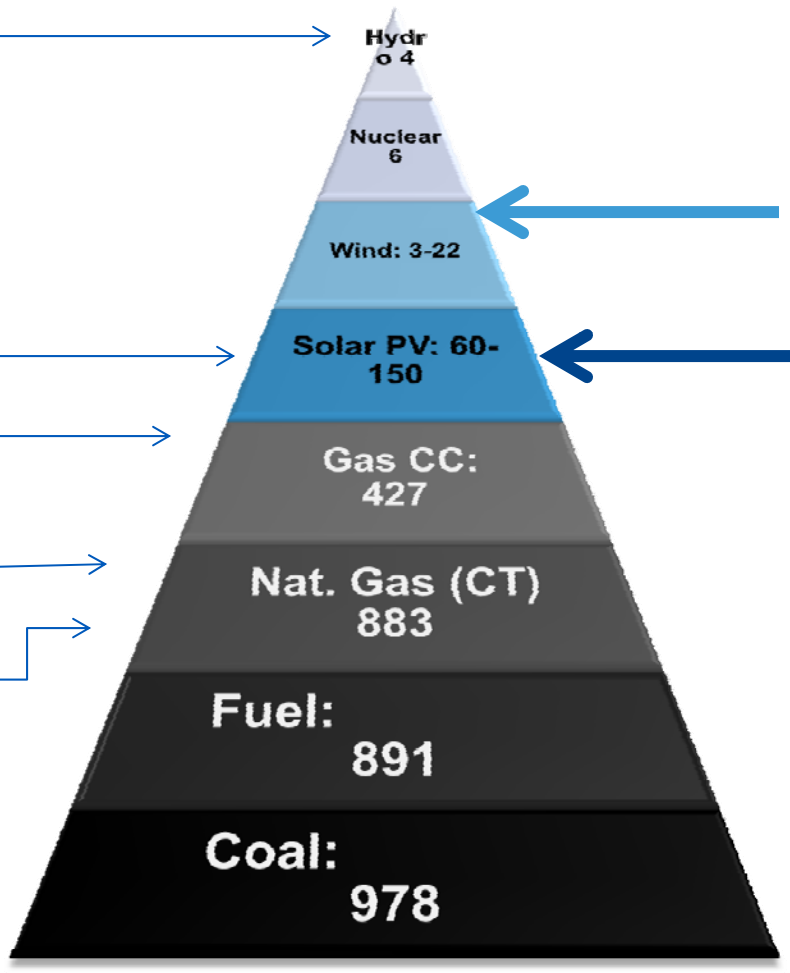

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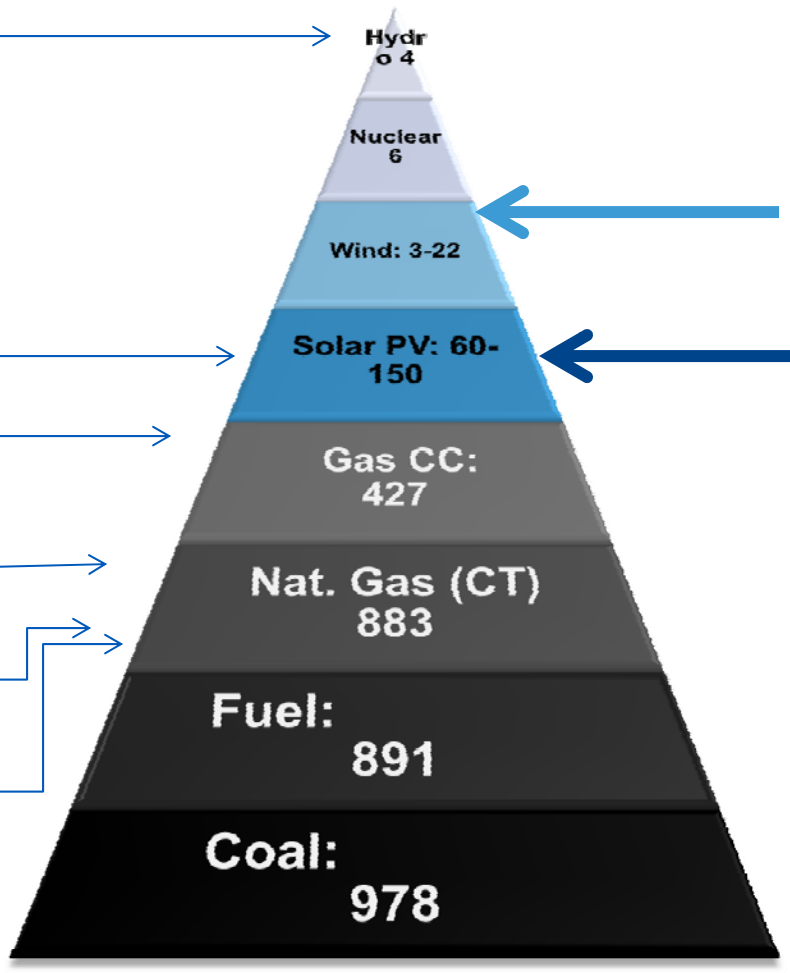

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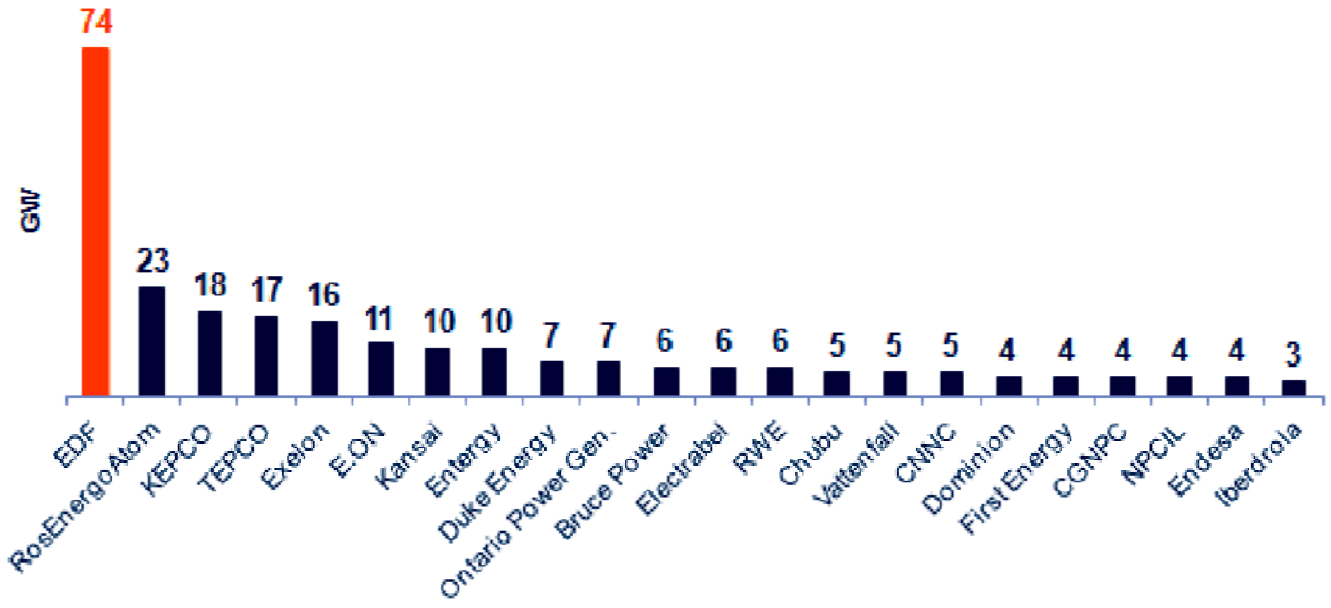
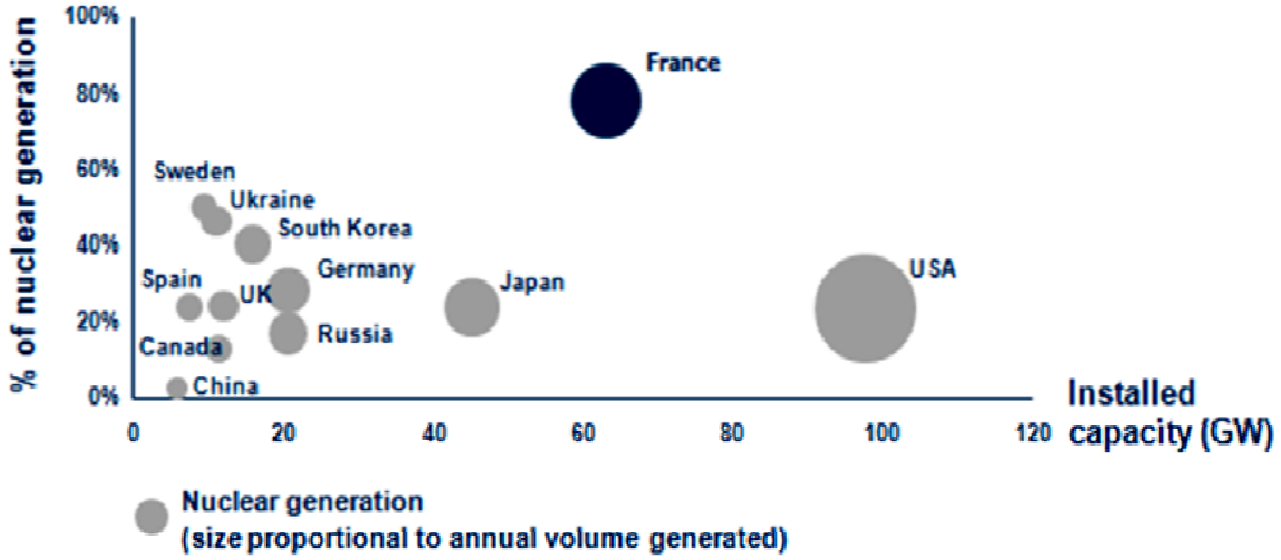
The largest nuclear operator in the world

EDF in comparison with other nuclear companies

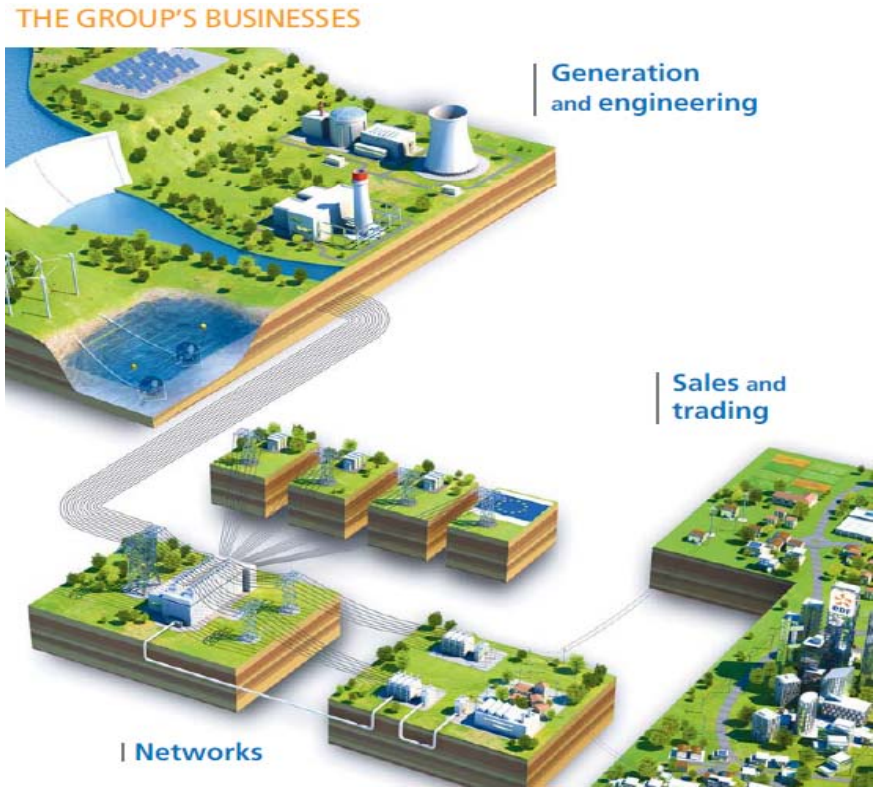




France in comparison with other nuclear countries

EDF GROUP WORLDWIDE

A fully integrated electric company



With a very long term vision

Generation

Networks

Customers

+

Research & Innovation

EDF Group in North America

RENEWABLES

Wind, solar & biogas: 1 500 MW owned, 6 000 MW under contract
EDF Renewable Services is the Leading provider of third-party operations and maintenance services in NA

Four Business lines, $8Bn of Assets, A low-carbon generation strategy

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EDF renewable energy

EDF Trading Holdings LLC

ENERGY MANAGEMENT

18 000 MW of generation under contract, 5 000 MW of peak retail load, 1.2bcm gas storage in 14 separate sites, trader of RECs, weather derivatives & emissions

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R&D, Innovation, Smart Cities

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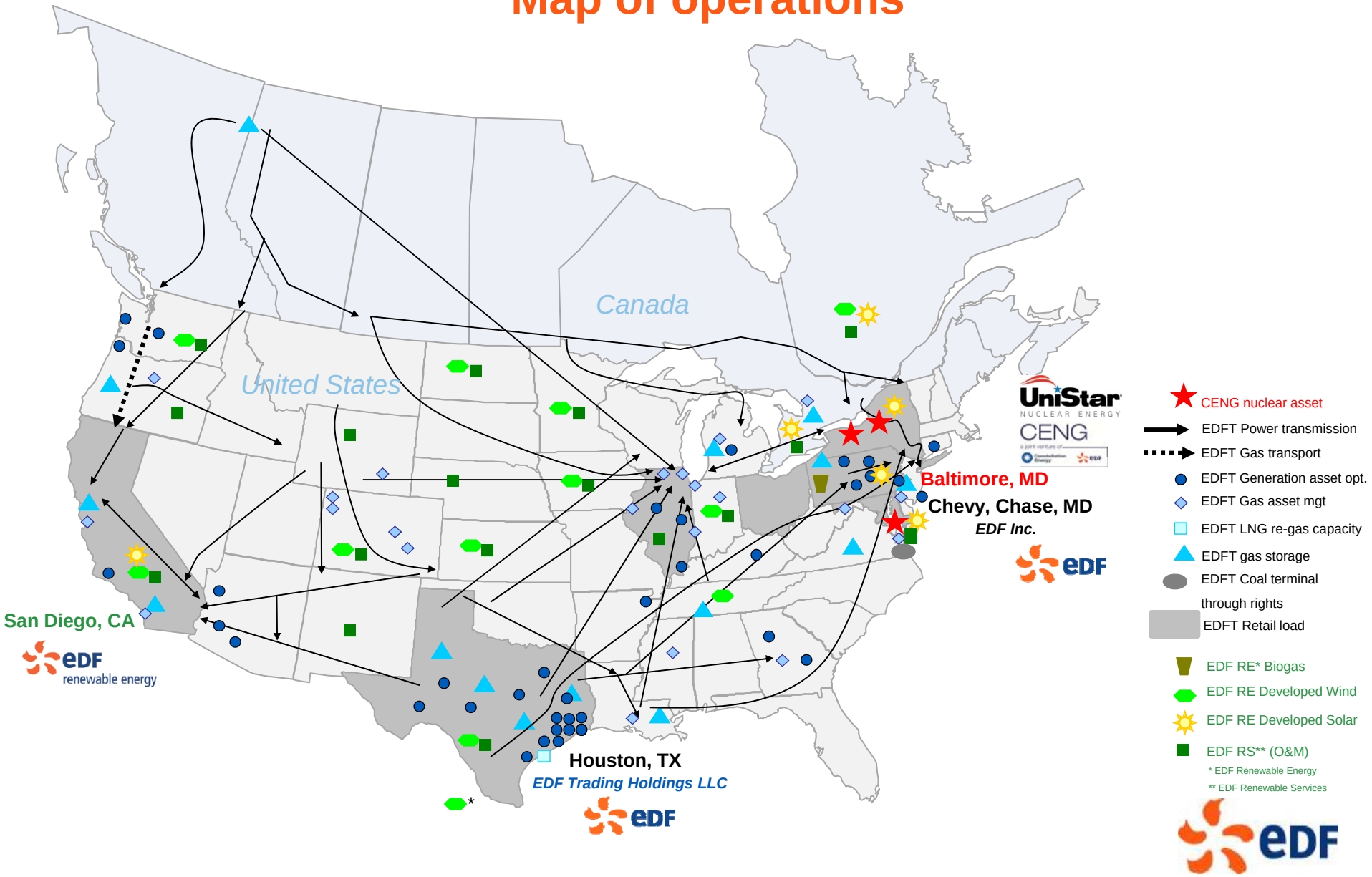
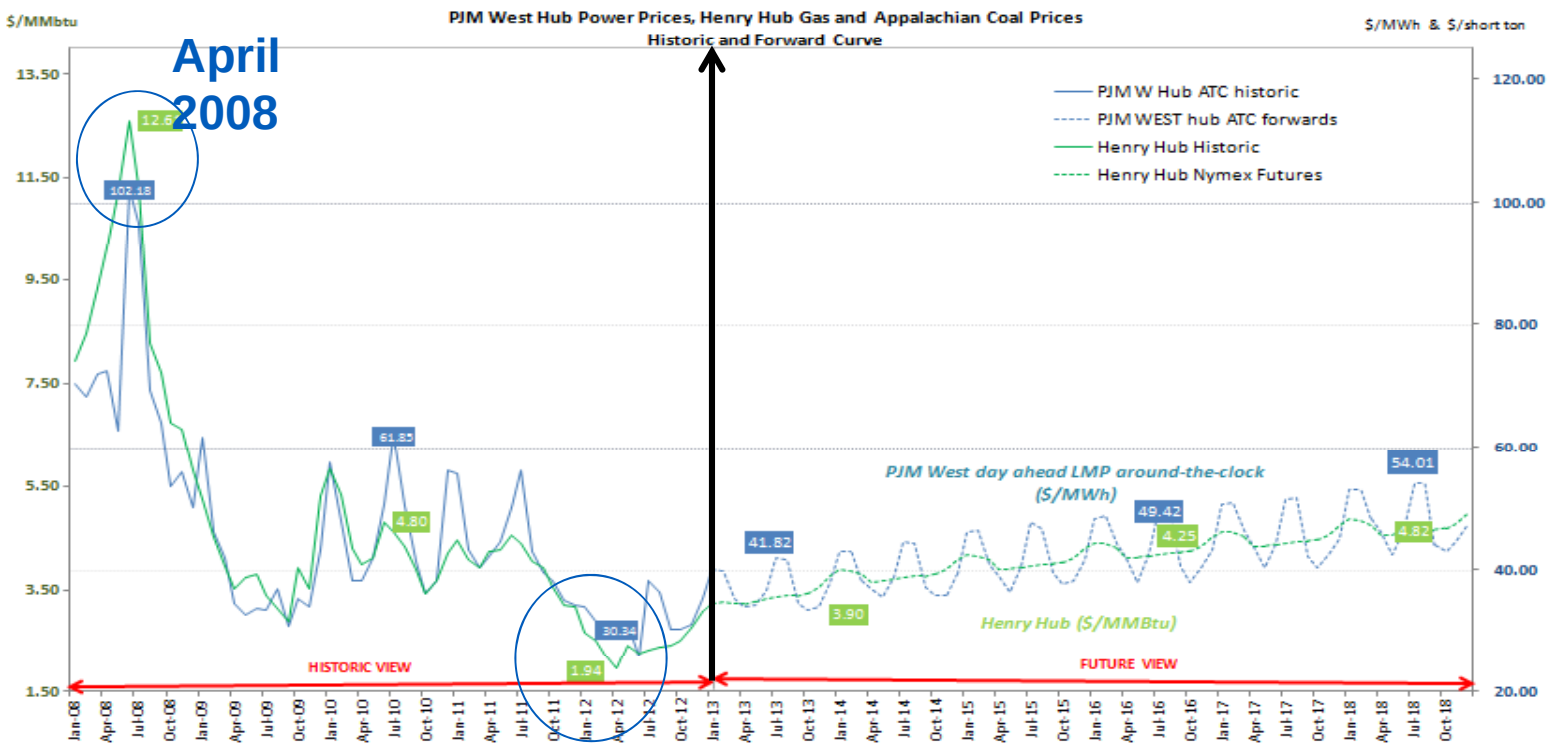
EDF Group in North America
Map of operations



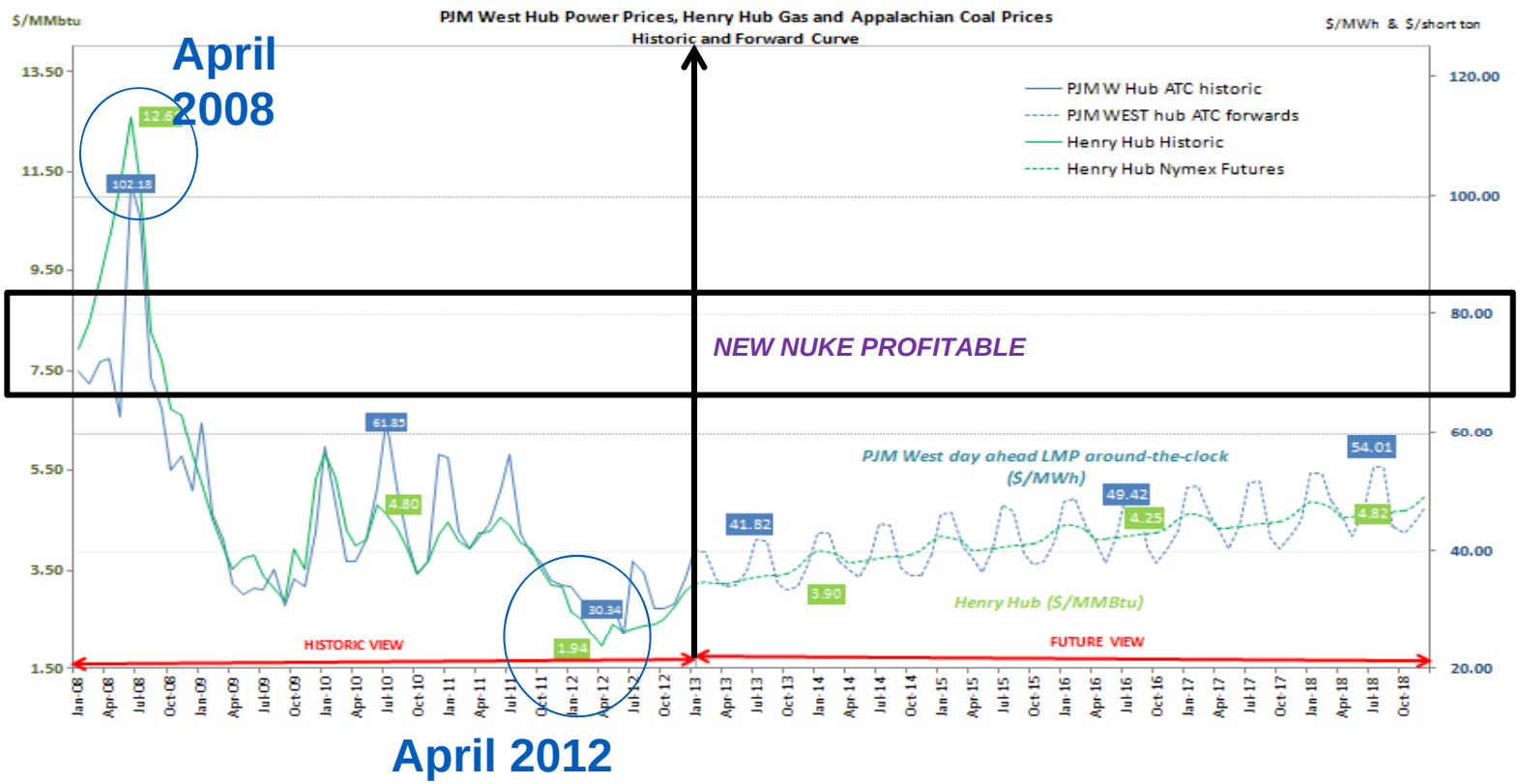
Power Prices on US Markets



April 2012

Reserve margins are high. Demand is expected to grow slowly. Gas now sets power prices.

Power Prices on US Markets



All types of investments are currently challenged (including gas-fired generators)

Shale gas (1)

Globally:

A true game changer, in the context of a third oil shock

Globally abundant (250 years of reserves), but not globally cheap ($3 Mbtu in the US, $10 in Europe, $ 15 in Asia)

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In North America:

Exceptionally favorable factors (geology, “humid gas” (liquids + gas), industry & transport density, property rights, public acceptance, tax incentives)

Shale gas production will continue to grow, have a huge macroeconomic & strategic impact, including a favorable environmental impact by displacing coal-fired electricity generation

Uncertainty regarding the environmental impact may emerge, but supply costs should remain low → forward prices will most likely be dynamic around $6 over long term (highs below $8, lows above $3)

Impact of shale gas (2)

In Europe:

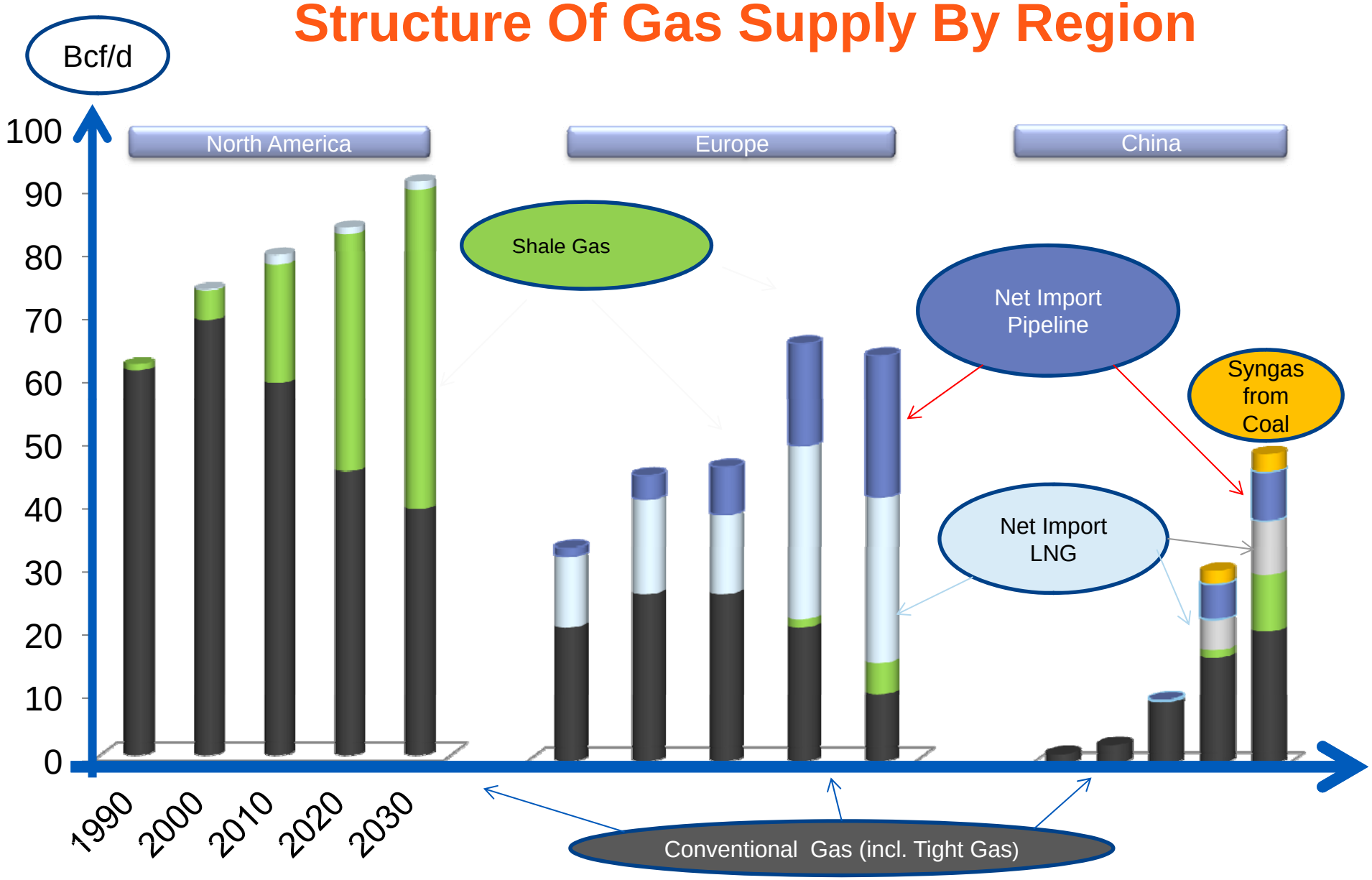
- **For now, it's the "dark ages" (dash for cheap American coal in Germany, 1/2 of gas supply through LT contracts linked to oil price, gas is too expensive → renegotiations)**
- **Current coal surge makes a nonsense of EU environmental policies (-80% of CO2 emissions by 2050, squeezing dirty coal out of electricity generation)**
- **Much lower potential and → unconventional gas won't match North Sea depletion (-100Gm³ by 2035)**
- **Fracking has met strong opposition (banned in France, Bulgaria, awaiting government approval in the UK).**
- **Bulk of gas demand will be covered by imports of LNG and Russian gas by pipe (x2 by 2035) → Risk of dependence will drastically slow demand**

Impact of shale gas (3)

In Asia:

- Contrary to the Europeans, Asian users are overcoming high gas prices and will expand use quickly
- Strong competition within Asia is pushing prices higher ($18/MBtu in July 2012): Japan (800 TWh of nuclear electricity to replace) and South Korea, who rely heavily on LNG, face increased competition from China
- LNG prices must fall if it is to be affordable for buyers in India, China
- China is home to the world's biggest unconventional gas resources (shale gas, Coal Bed methane)
- But high population density and lack of water (1/5 of the US amount) are big hurdles
- The trajectory of Asian prices will depend on China's ability to exploit its indigenous shale reserves. Today this remains a huge question mark.

Structure Of Gas Supply By Region



By 2030, unconventional gas will play a growing role across the world

What does EDF?

Of course, gas developments are on EDF's agenda

- With Edison in Italy (now 100% owned) EDF has acquired strong gas competences
- With 15% of South Stream, 65% of a new LNG terminal at Dunkirk, EDF just took robust up-stream positions to secure gas supplies in the future
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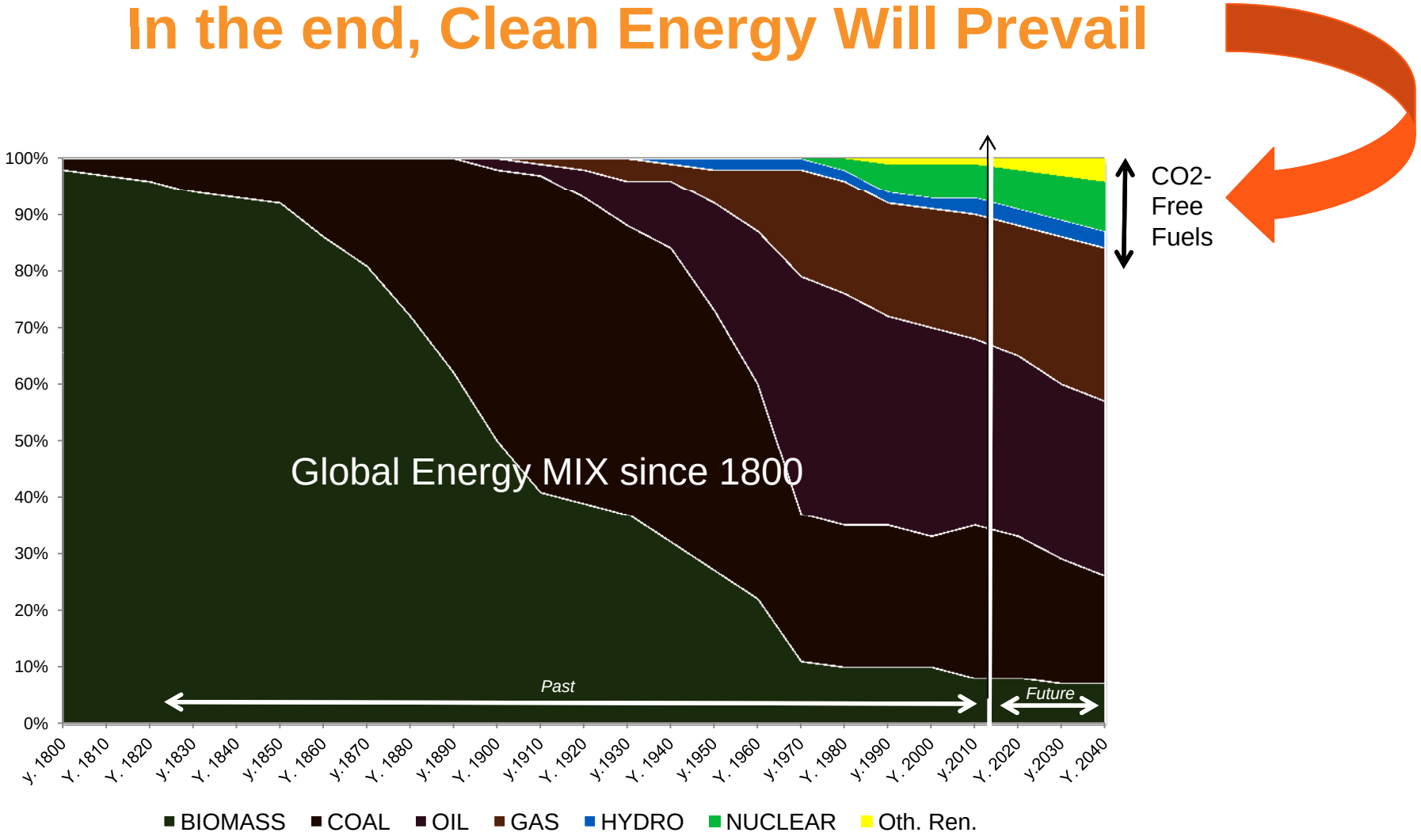
But Nuclear remains part of our DNA,

- 1st priority: life extension of existing nuclear fleets (F, UK), including post-Fukushima safety uprates
- New build:
  - EPR: start Flamanville-3, integrate lessons from Taishan and Olkiluoto, seize opportunities abroad (UK, Poland, Middle East, China)
  - New models: lead development of a French-Chinese mid-size PWR, keep an eye on SMRs

In the end, Clean Energy Will Prevail



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