



UNCONVENTIONAL ENERGY SOURCES – NEW SOLUTIONS AND PERSPECTIVES



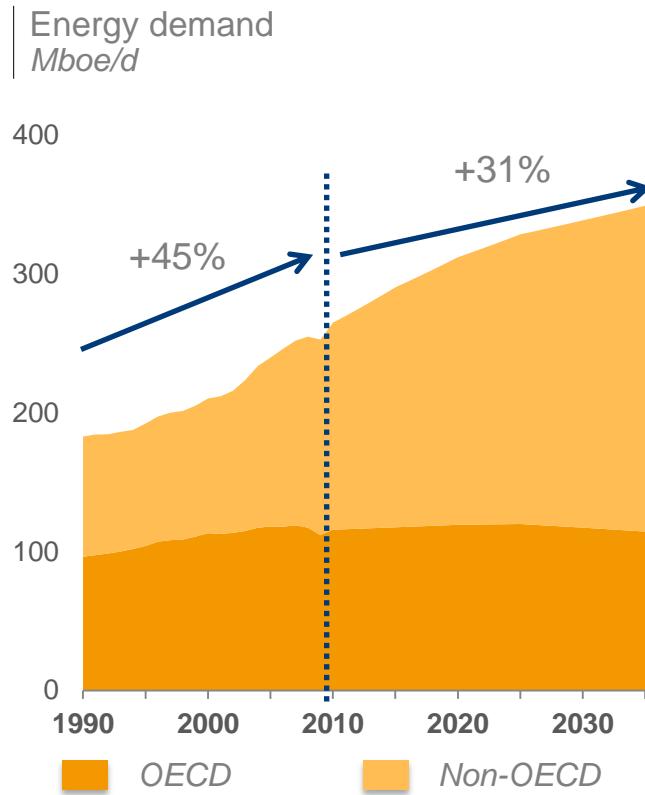
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TOTAL E&P Continental Europe and Central Asia Senior Vice President

VIII KAZENERGY EURASIAN FORUM, Astana, October 8th, 2013



Our vision of the energy mix

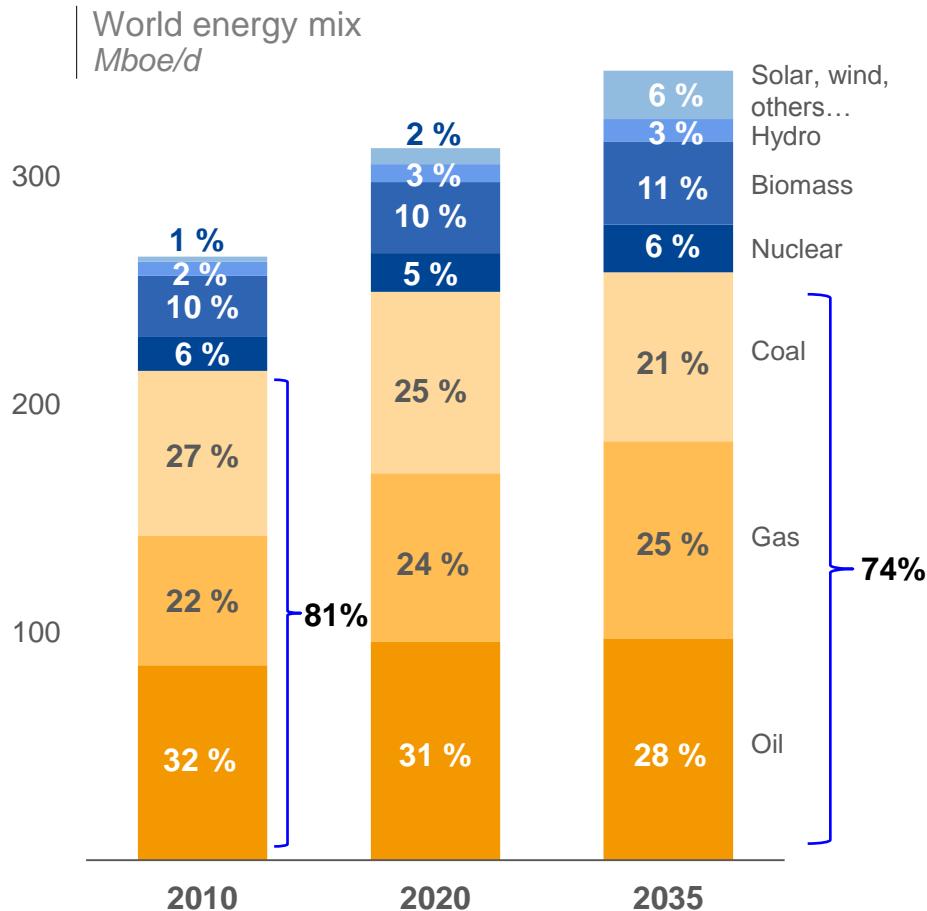
CHALLENGES TO CHANGING THE ENERGY MODEL



- Under Total's vision, energy demand will increase by **31%** between 2010 and 2035 driven by non-OECD countries' needs
- To secure enough **energy supply** to meet the needs of 8.6 billion people (vs. 7 bn. in 2012), the energy industry will need to focus on:
 - **Diversifying** the energy supply
 - **Dedicating** each energy to uses where it is most efficient
 - oil in transport and petrochemicals;
 - gas in power generation and heating
 - **Progressively reducing the carbon content** of the energy mix
 - Contributing to **improve energy efficiency**

Reaching a **new energy model** will be a long process that will require technology, innovation and massive investment

PROGRESSIVE CHANGE OF THE WORLD ENERGY MIX



- By 2035 and beyond, **all kinds of energies** will be needed to meet the demand
- **Fossil energies** to represent 74% of energy supply in 2035
- **Gas** to become the second largest energy source before 2030
- Share of **nuclear** to remain steady
- Strong growth of **new energies**, in particular solar energy and biomass (non-traditional)

Renewable energies are a promise for **a bright future** but substitution of fossil fuels will be slow



SOLAR ENERGY

A new energy future

MORE THAN AN OIL COMPANY...

To **MEET** growing demand

for energy and address climate change



TOTAL INVESTS

in renewable energies to diversify our solutions

TOTAL holds a 66% stake in SUNPOWER

More than
5,000
employees

Revenue in 2012
\$2.42
billion

World-record panel
efficiency
21.5%

1,000
Megawatts/year
production capacity

SUNPOWER

MORE ENERGY. FOR LIFE.™

World's
#2
in solar



* by 2012 revenue

SUNPOWER

A global international footprint



SUNPOWER®

MORE ENERGY. FOR LIFE.™



SUNPOWER

A solar market leader

An **innovative technology**: Maxeon® cells, used by NASA and Solar Impulse, convert more solar energy to electricity per square foot than conventional cells.

SunPower panels are the world's most efficient : **21.5%** efficiency, **highly resistant** to wear, corrosion and temperature fluctuations.



SUNPOWER

MORE ENERGY. FOR LIFE.™

21.5%

World's most efficient
solar panels *



* SunPower 345W solar panel vs. conventional panel (240W, 15% efficient, approx. 1.6 m²)

World's largest photovoltaic solar power plants

CALIFORNIA VALLEY SOLAR RANCH

San Luis Obispo, California, USA

250 MW AC (315 MW DC)

800,000 SunPower panels

100,000 homes powered

Construction started: 2011

Completion: 2013



ANTELOPE VALLEY SOLAR PROJECTS

Rosamond, California, USA

579 MW AC (709 MW DC)

1,717,920 SunPower panels

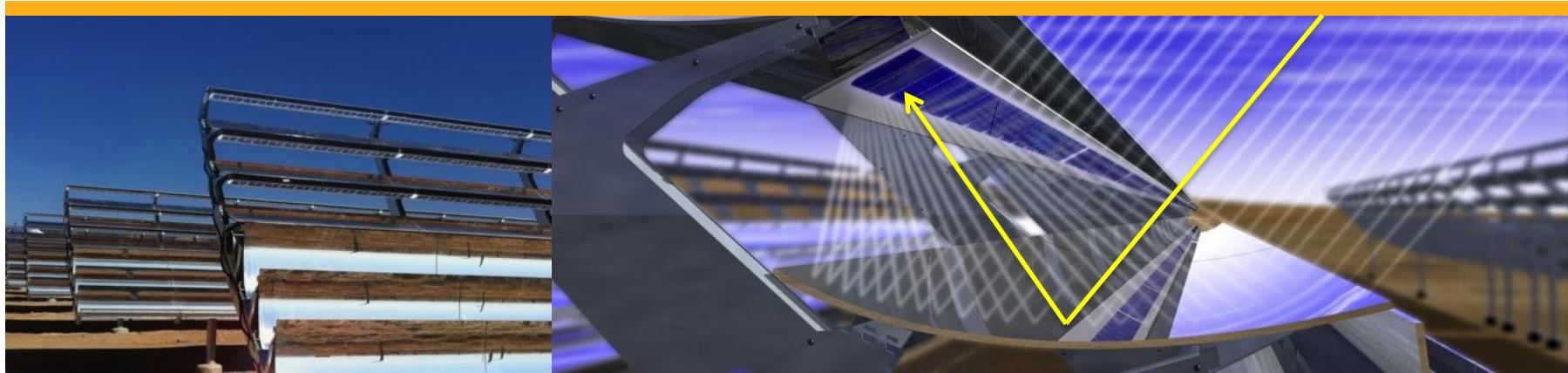
400,000 homes powered

Construction started: 2013

Expected completion: 2016

C7 PRODUCT

Solar concentrator



The future of low cost solar energy

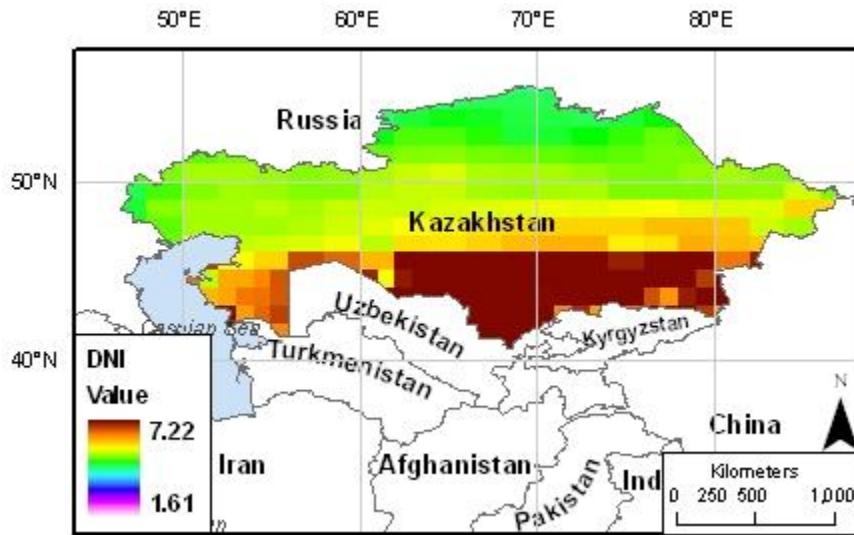
- The power of 7 suns focused on each high efficiency solar cell
- Only possible with SunPower Maxeon cell technology
- Certified by TUV (European standards IEC62108 for product quality and IEC62688 for safety), & UL (8703 certificate) for installation in the U.S.

Kazakhstan's Solar Power Generation Potential

Support the Nazarbayev University's Research Center's solar activities (PhD students - Icube),

Install and operate a pilot to test the system under different sunlight and weather conditions.

Kazakhstan Solar Direct Normal Insolation (Source: NASA)

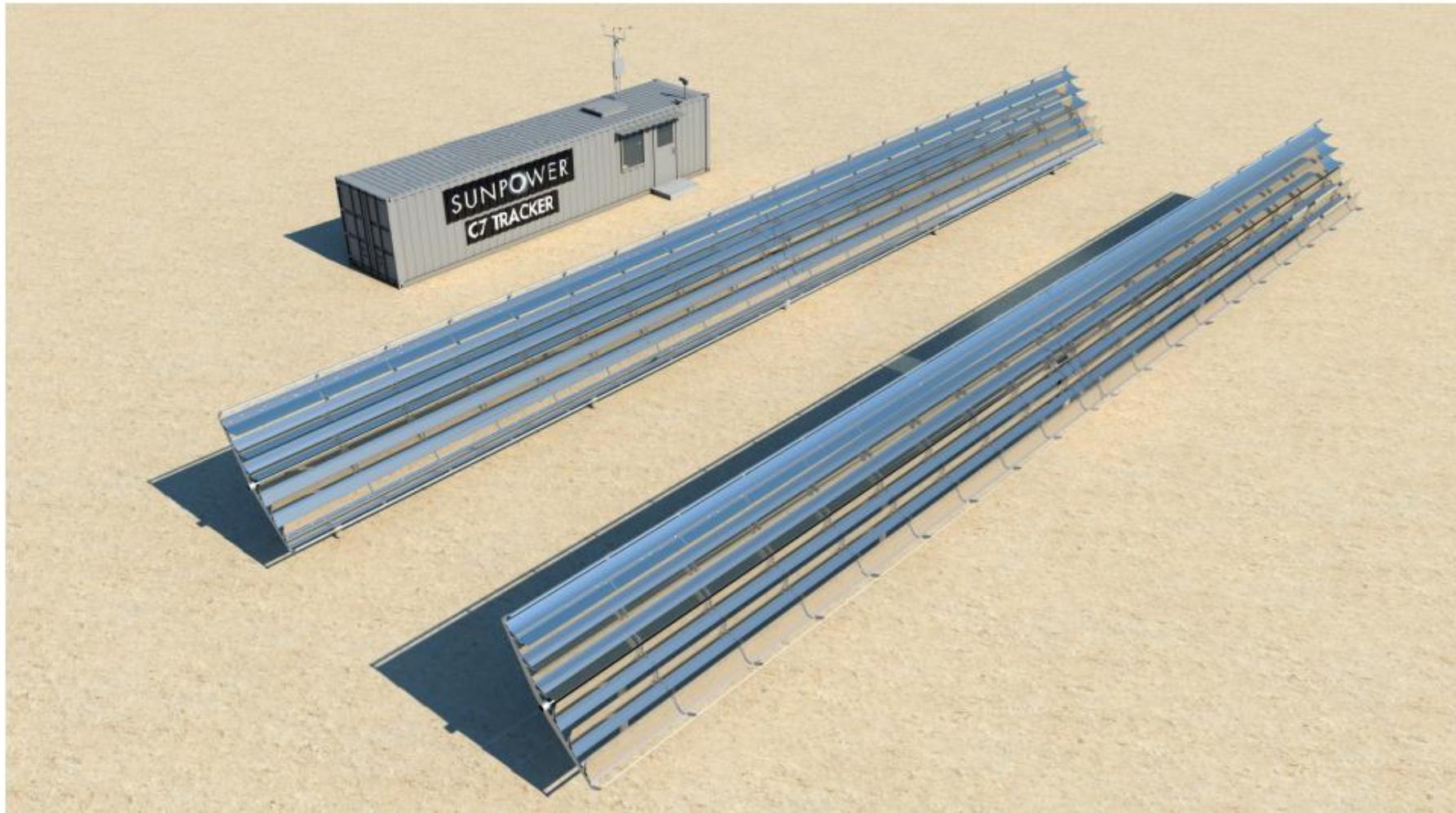


SunPower

SunPower™ OASIS™ C7 Proposal

C7 Demo

Kazakhstan



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