

# **‘Energy Transition in the Deserts’**

*What used to be a wild vision has become reality*

Paul van Son

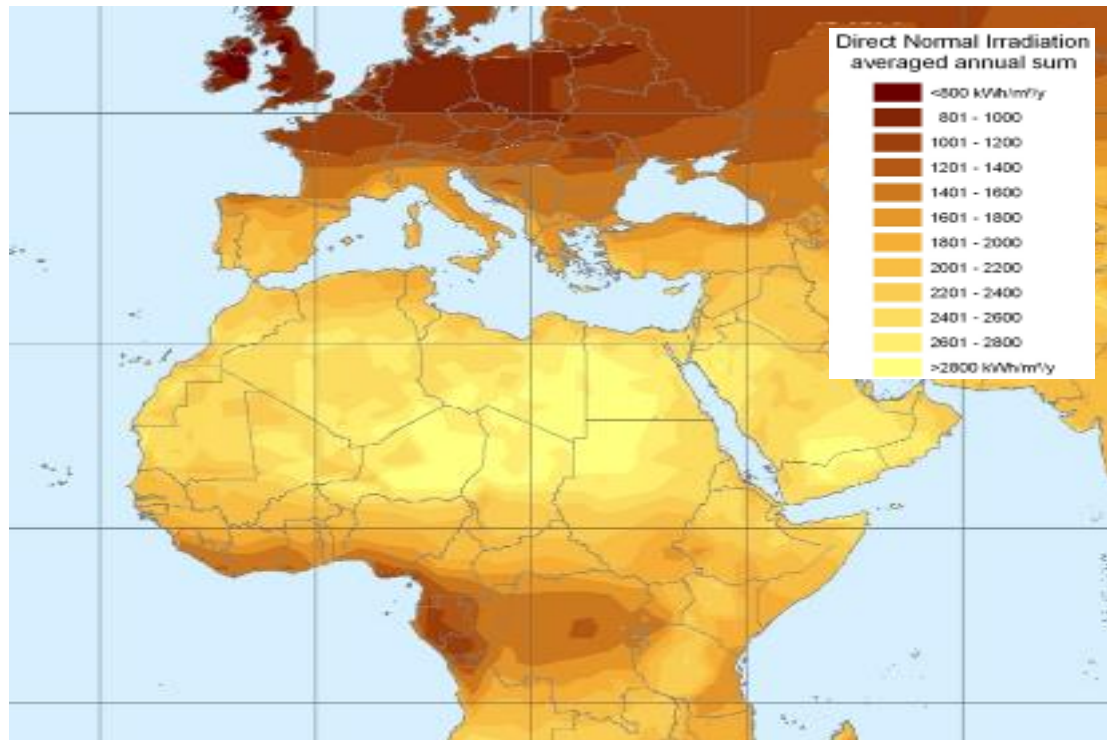
Innogy & Dii Desert Energy

[www.dii-desertenergy.org](http://www.dii-desertenergy.org)

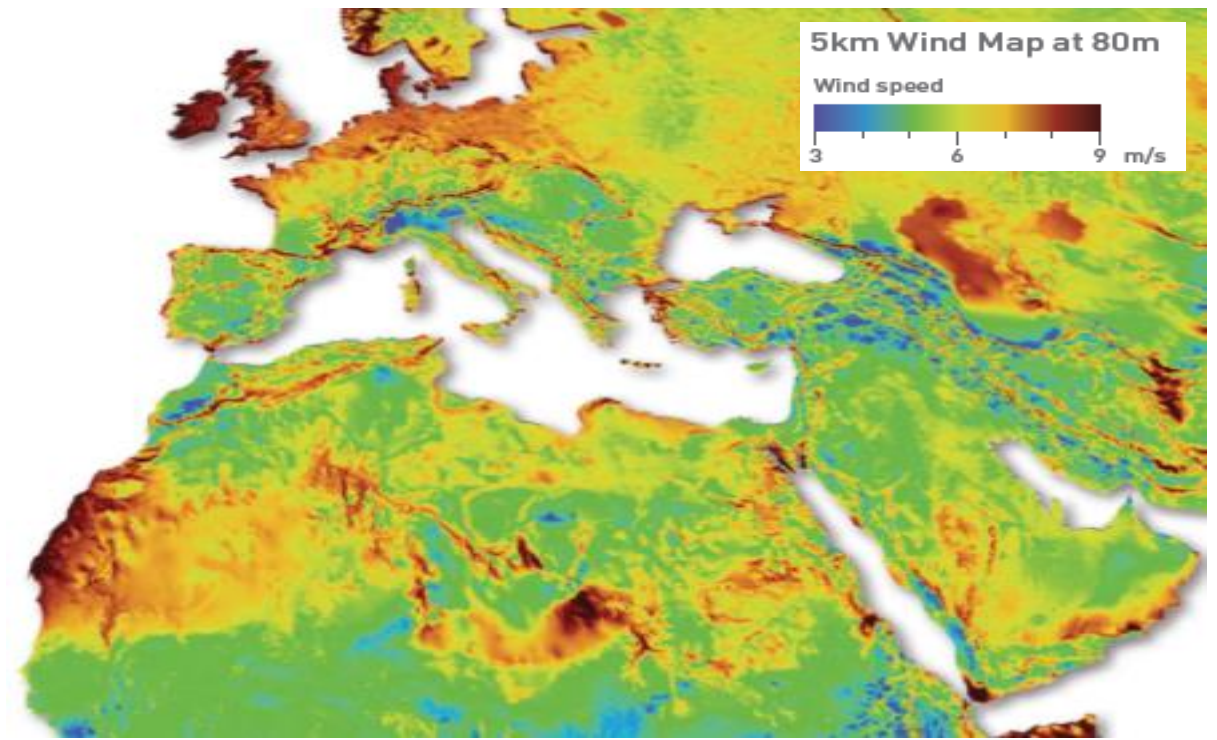
Saturday March 9<sup>th</sup>, 2019 in Gouda, NL

# A quasi unlimited potential of Emission Free Energy in the Deserts of North Africa and West Asia (MENA)

## Solar potential

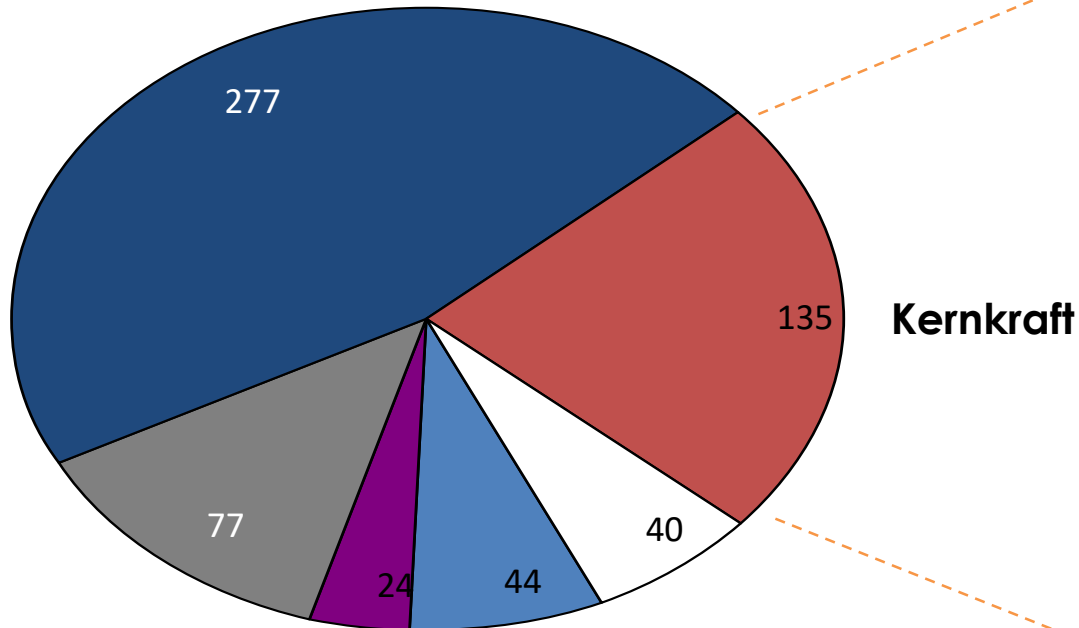


## Wind potential



# Main Trigger for ‚Desertec‘ in 2009 was the Potential Gap in Power Supply due to Face-Out of Nuclear

Energymix End 2009 (TWh)



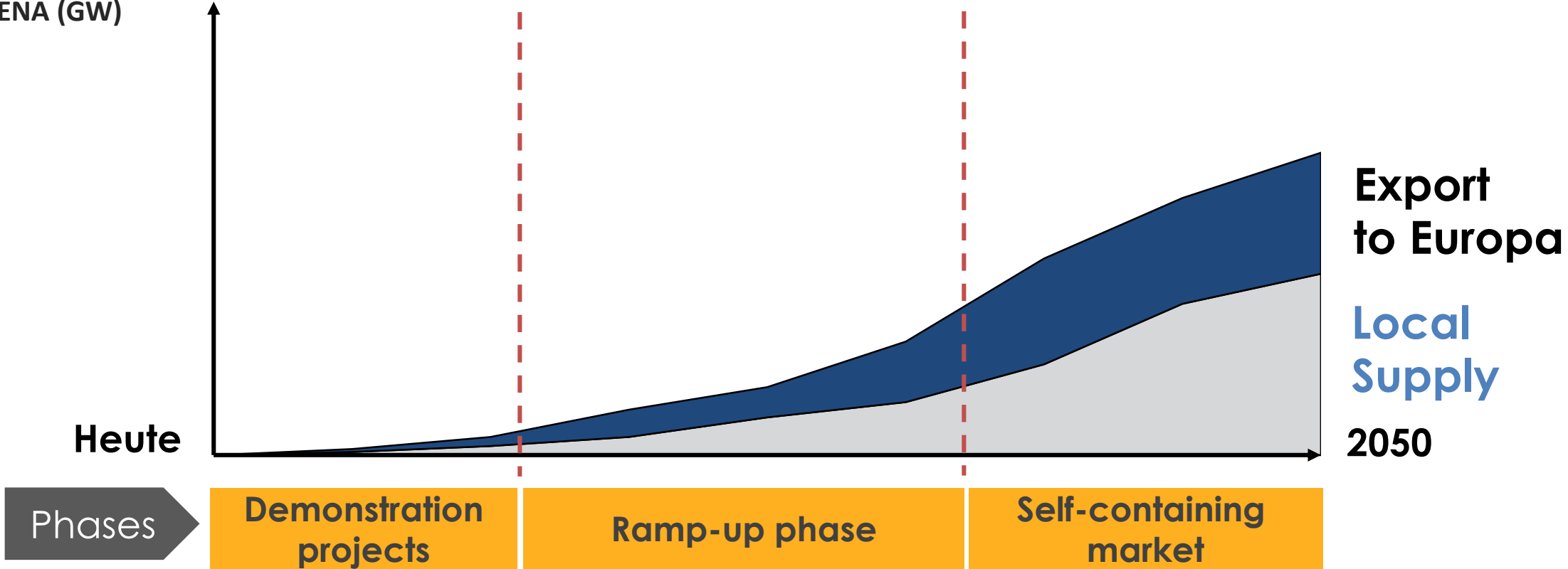
Alternatives for Nuclear in Germany

	Mit geringem CO <sub>2</sub> -Ausstoß	Regelbare Kraftwerke
<b>Inlanderzeugung</b>		
Wind	✓	⚡
Biomasse /-gas	✓	✓
PV	✓	⚡
Gas/ Kohle	⚡	✓
<b>Import</b>		
FR/ CZ usw.	?	✓
„Wüsten-strom“	✓	✓

■ Other RE   
 ■ Hydro   
 ■ Gas   
 ■ Coal   
 ■ Nuclear   
  Other Fossil

# The core of the Desertec Idea was to build mainly solar thermal power plants in the deserts for export to Europe...

RE Capacity in MENA (GW)



Quelle: Dii

# Mission of Dii (Desertec Industry Initiative) given by the German Industry and Desertec Foundation in 2009

**Dii Mission**

**Cover by 2050 up to 15%  
of the European power demand with energy from  
the deserts of MENA**

Studies until  
End of 2012

**Legal Conditions**

**Demonstration  
Projects**

**Roll-Out Plan for  
investments until  
2050**

# Modified Mission of Dii Desert Energy 2013 till to date, after much debat

**Dii Mission**

**Pave the way for emission free energy in desert countries of MENA and eventual export of clean energy into the global market / Europe**

Practical  
Guidance

**Remove Hurdles for  
RE Projects**

**Promotion and  
Interaction Public –  
Private Sector**

**Selected Actions  
along the Emission  
Free Energy Chain**

# From 'Desertec Idea' to Desert Energy



Development phases



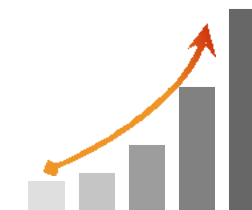
- Studies on the **Desertec** vision by **DLR** (Deutsche Luft- und Raumfahrtzentrum) and **TREC** (Trans-Mediterranean renewable energy Cooperation Studies)
- Creation of **awareness and motivation**



- **Foundation of Dii GmbH** (Munich) in 2009
- **System, country and technology studies (Desert Power 2050, Desert Power: Getting Started)** by Dii supported by Dii's industrial, research and political network (e.g. Fraunhofer, CESI, Sonelgaz)
- Local adoption of idea
- **Preparation of services** for implementation phase



- **Being active locally** Dii in Dubai
- **Identifying and solving practical hurdles** of wind/solar/grid projects in the field
- Extension of international industry network '**Dii Desert Energy**'
- **Renewables competitive!**



- **Market acceleration** towards full renewable energy supply, storage and flexible demand in MENA
- **Full Market integration** throughout MENA and connected markets. Increase of Desert Power share in energy mix. Retreat of fossils
- **Green Molecules** (Hydrogen etc.) for storage, transport and other purposes

# Main Challenges on the Way to emission free power supply

## 1. Markets

Fair open market conditions. No subsidies for Fossils, Nuclear and Renewables. Trade of flexibility, emission and renewables certificates etc.

## 2. Transport of Energy

Integration of local and international grids and transport means for 'green electrons' and 'green molecules'

## 3. Regulatory Frameworks

Effective regulatory frameworks and conditions for energy conversion, storage and exchange (electrons, molecules, heat, cooling etc.)

## 4. International Cooperation

Effective cooperation among the private and public sector across countries and continents

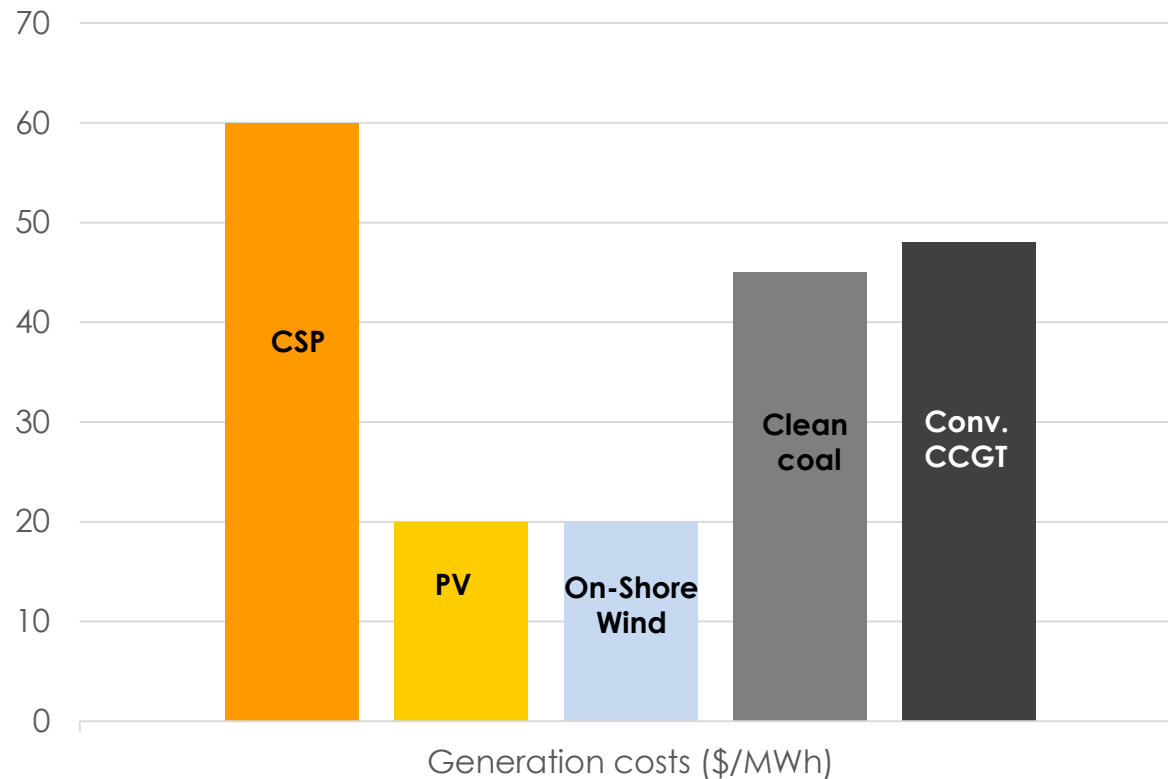
## 5. Competitive Technologies

Encouragement of truly competing technologies and assets along the energy value chains



# Cost comparison of RE and Fossil (2019)

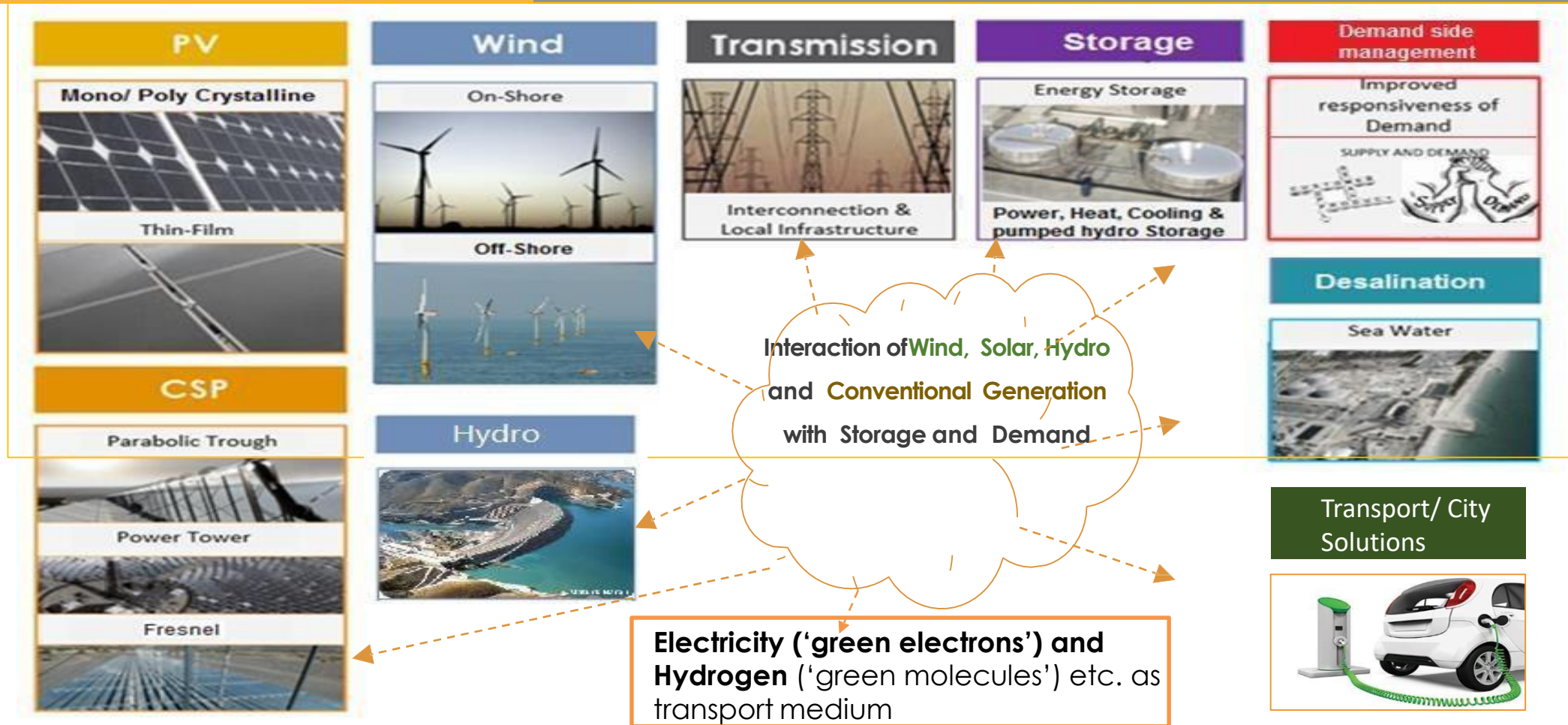
Global cost comparison of power generation technologies



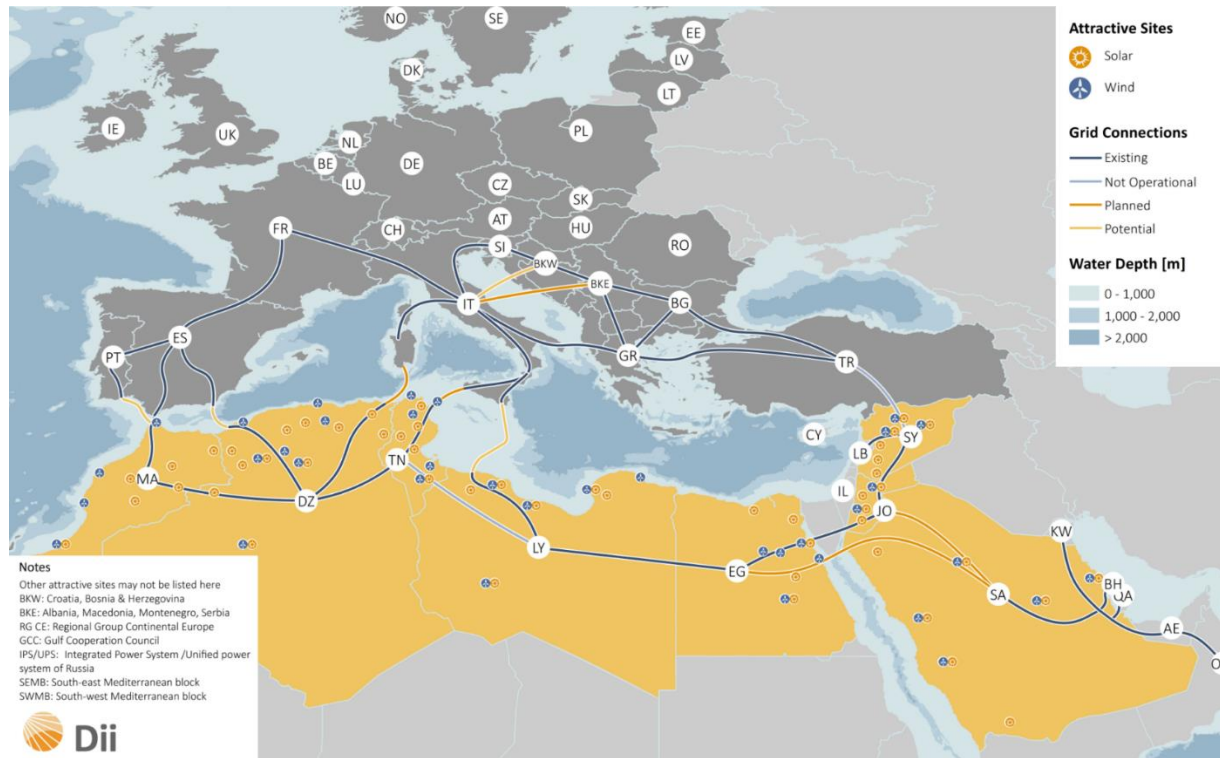
## PV / Wind have become extremely competitive/CSP is approaching:

- ✓ Aggressive price drops PV and Wind (e.g. PV from 28 ct/KWH in 2009, to 5.85\$ct/KWh in 2015 to below 2\$ct/KWh in 2018!). Wind from 10ct to 2 ct/KWh!
- ✓ Gradual **reduction of fossil subsidies**
- ✓ Emerging **need for flexibility**
- ✓ Ambitious Renewable Energy Targets in most countries in MENAT
- ✓ Chinese manufacturers diving into the RE industry have further lead to lower costs
- ✓ Competitive bidding procedures

# Integration of Renewables ('Green Electrons' and 'Green Molecules') in the Energy Systems



# Anticipated project locations in studies Vs actual operational projects



The anticipation by Dii in the past becoming reality now!



Operational:  
On-Shore  
wind



Operational:  
Solar PV



Operational:  
Solar Thermal



# Partners of Dii in 2012

## 21 Shareholders



## 35 Associated Partners



Note: **State Grid Cooperation of China** joined as a shareholder in 2013  
**Shareholders in 2019: ACWA Power, State Grid of China, innogy** plus 20 Associate Partners

# The Energy Transition

## Where do we stand today?

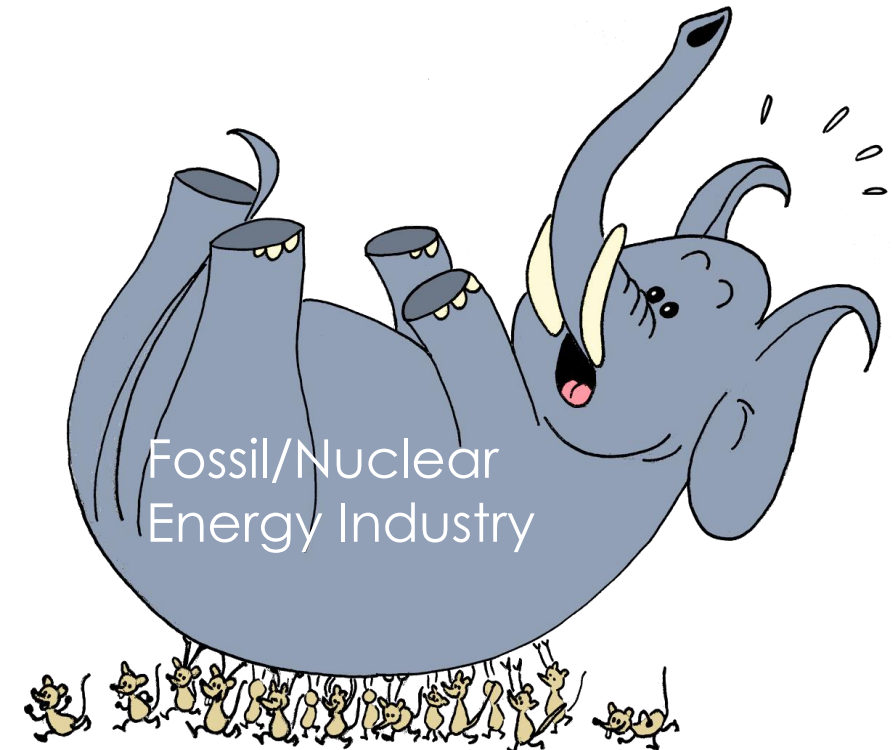


### Europe:

- Fast growth of competitive small/medium/large size PV and Wind **without or with reduced subsidy** (e.g. auctioning)
- **Coal/lignite is out!** New Nuclear too expensive. Traditional energy companies are restructuring
- **Flexibility is king.** Flexible demand, storage, international power exchange (medium/long term with MENA)

### MENA:

- Still **mainly fossil** based. High growth of demand
- **Wind and Solar costs down to about 2ct/KWh!**
- Climate not really felt as a concern (!). However **ambitious RE programs** in most countries
- Weak power grid connections. No open markets
- **Local developers and governments** take the lead (ACWA Power, Access Power, MASEN, Jordan, Egypt etc.)
- **Hydrogen** is the talk of town. CSP still modestly present



**Renewables, flexible demand, storage, smart grids, hydrogen etc.**