

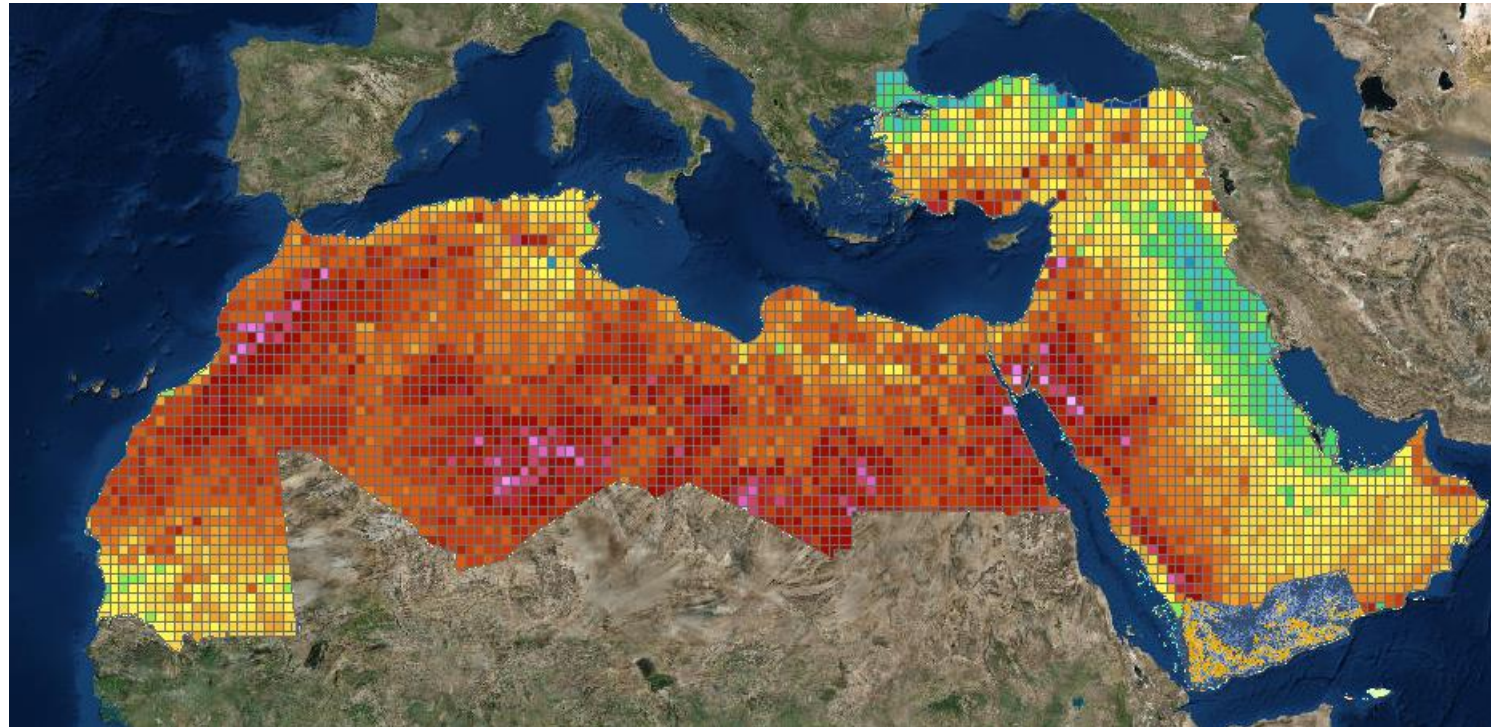


# From 'Desertec' to 'Desert Energy' in North Africa, West Asia and Southern Europe

Eurofes, Malta May 19<sup>th</sup>, 2017



# 'Desertec' pointed in 2008 at the enormous solar and wind potential in North Africa and West Asia



Solar potential (Direct Normal Irradiation)

Source: Dii GIS Tool

## Middle East

GHI : 1800 – 2300 kWh/m<sup>2</sup>a

DNI : 2000 – 2600 kWh/m<sup>2</sup>a

Wind Speed : 4.7 – 5.8 m/s

## North Africa

GHI : 1750 – 2300 kWh/m<sup>2</sup>a

DNI : 2100 – 2500 kWh/m<sup>2</sup>a

Wind Speed : 4.6 – 6.5 m/s

## Turkey

GHI : 1800 – 2300 kWh/m<sup>2</sup>a

DNI : 2000 – 2600 kWh/m<sup>2</sup>a

Wind Speed : 4.7 – 5.8 m/s

# From 'Desertec 2008' to 'Desert Energy 2017'



- 'Desertec', was originally a 'grande vision' of mainly **solar (thermal) power from the MENA deserts for export to Europe, replacing fossils and nuclear**
- The German industry took the lead in **2009** with **Dii**
- Dii studied the subject from its base in Germany until 2014:
  - System studies Europe – North Africa – West Asia showed enormous **synergy potential**
  - Established an **international network of partner companies**
  - Published **conditions for accelerating renewable energy projects and power grid developments**
- **Dii (Dubai) changed scope to 'regional RE and grid developments first'**. Export will come later once the region will reach oversupply level at attractive market conditions

# Integrating and Interconnecting Renewables North Africa- West Asia - Southern Europe



- **Connecting renewables** to the power grids/markets
  - Interaction renewables with flexible demand
  - HVAC and HVDC connections
  - Harmonizing price zones
- **Connecting countries** and continents; Connecting people
- **Connecting the Public and Private Actors**



# Where do we stand today?

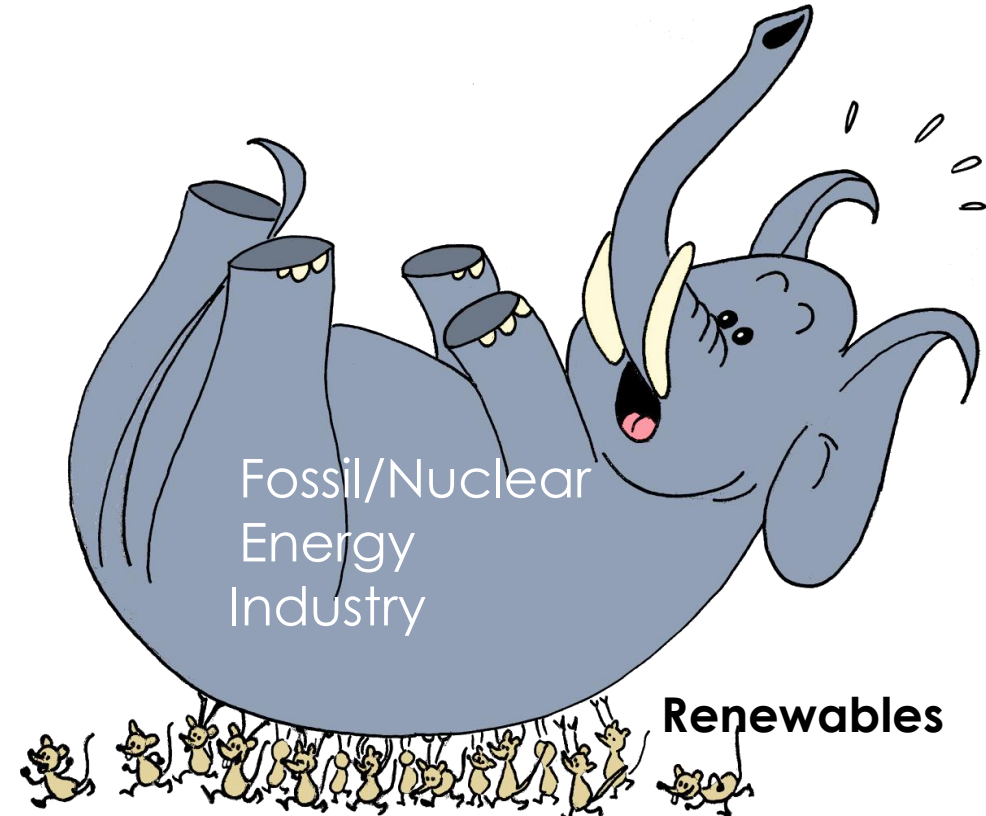
## Historic Worldwide Paradigm Shift 2010 → today

### Europe:

- Fast growth of competitive small/medium/large size renewables without subsidy
- European power market prices collapsed (low power prices lead to **export to North Africa**)
- Traditional 'fossil' power players restructuring
- Many small/medium size actors in the field

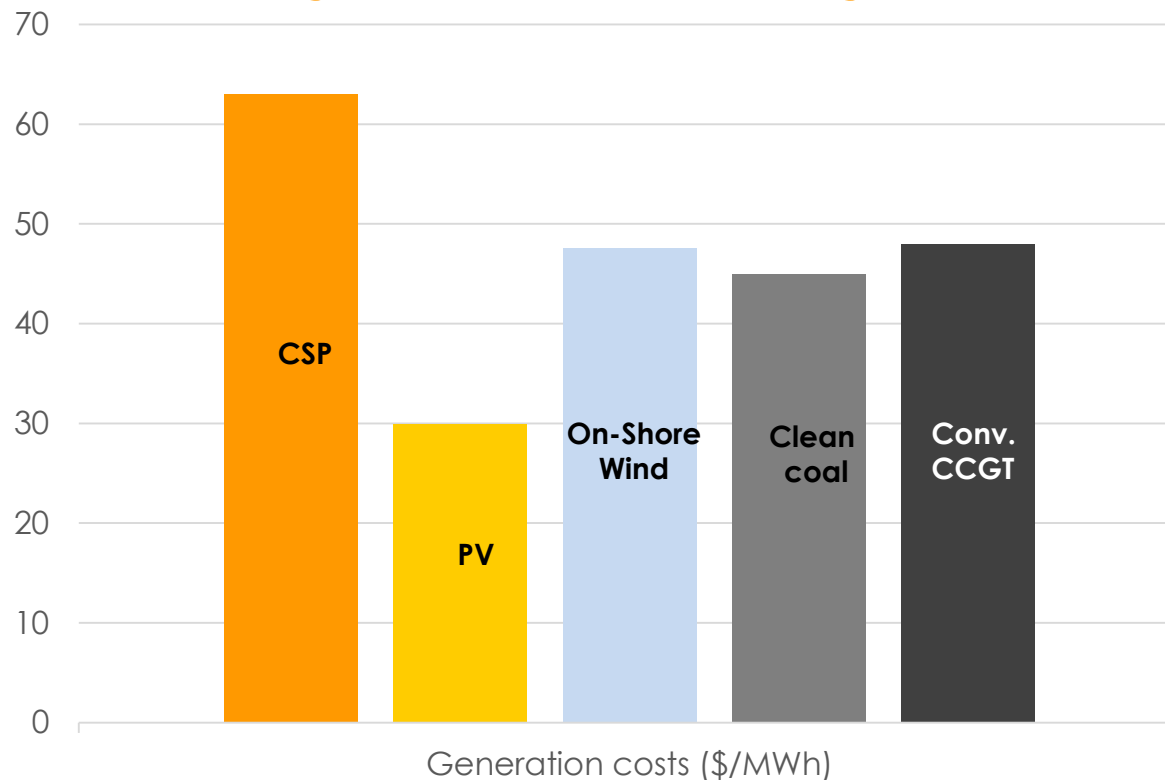
### MENA:

- Discovers the virtues of Renewables
- Ambitious RE targets in most countries
- Renewables at ultra low costs (e.g. Solar 2.4 \$ct, Wind 3.9 \$ct)
- Weak grid connections. No open markets



# Cost comparison of RE and Fossil

Global cost comparison of power generation technologies



## PV / Wind have become competitive:

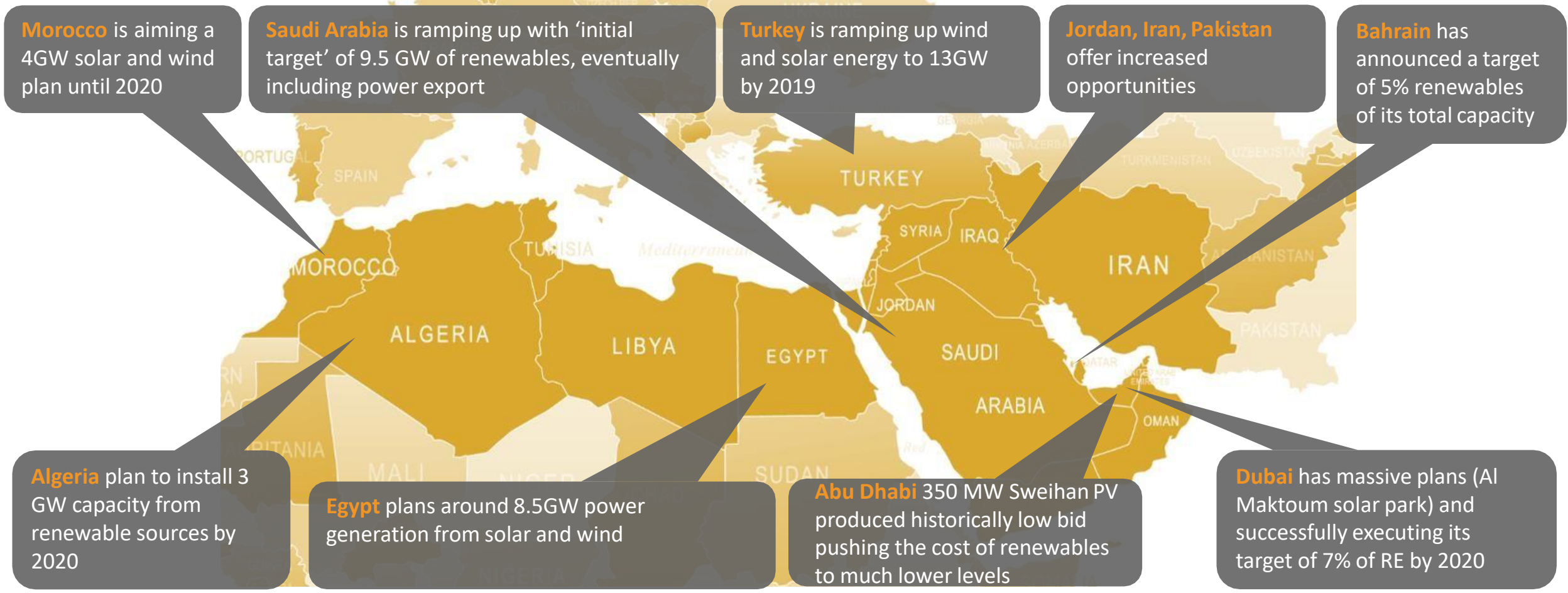
- ✓ Aggressive price drops PV and Wind (e.g. PV from 5.85\$/KWh in 2015 to 2.4\$/KWh in 2016!)
- ✓ Gradual reduction of fossil subsidies
- ✓ Battery mass production
- ✓ Ambitious Renewable Energy Targets in most countries in MENAT
- ✓ Chinese manufacturers diving into the RE industry have further led to lower costs
- ✓ Competitive bidding procedures

# Today most countries heading for renewables

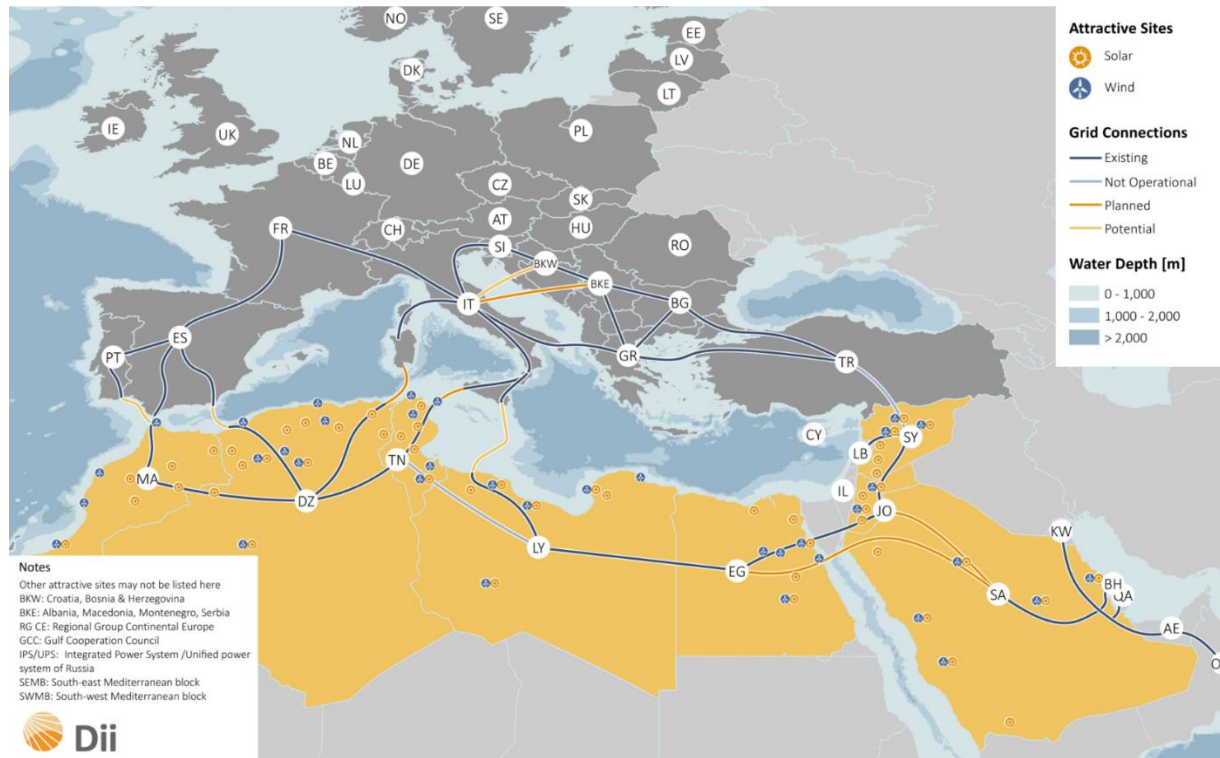
## Today we observe 9.2GW RE in operation (MENAT)



Dii



# 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





# Learnings and key Recommendations

- ‘Crazy initiatives’ like Dii/Desertec raised attention. Market actors discovered **durable benefits** in the energy transition
- The energy transition will not happen ‘top – down’ via master plans, but step-by-step by local government priority treatment of solar rooftop, larger RE plants and grid connections
  - Eventually **MENA will become 100% renewable**, with high degree of solar PV
  - Eventually **MENA will exchange substantial power / net export**
  - Eventually **MENA will attract energy intensive industries and RE related services**
- Still many obstacles: **e.g. (perceived) risk/return, integration into the grids, lack of knowledge and awareness**
- **Transparent Market Prices are key to show competitiveness of renewables.**
  - Avoid subsidies (fossil / nuclear / Renewables). Encourage flexible demands

# Learnings and Key Recommendation

- Smart interaction between public and private actors is key
  - Public: ensure a stable and transparent market environment, without unnecessary distortions or subsidies
  - Private: push for renewables, flexible demand and grid extensions based on fair business cases
- International Cooperation at all levels is key
  - But avoid 'selling' European approaches
  - Keep things simple and hands-on 'business oriented'
- Joint projects not through subsidies, but through simplifying project conditions and honest learning from pro's and con's



Dii

**Thank You For  
Your Attention!**



# Evolution of Desert Energy in the Mediterranean

Development phases



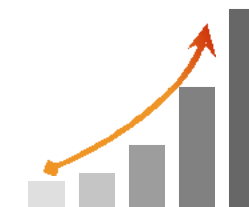
- Studies on the **Desertec** vision by **DLR** (Deutsche Luft- und Raumfahrtzentrum) and **TREC** (Trans-Mediterranean renewable energy Cooperation Studies)
- Creation of **awareness and motivation**



- **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

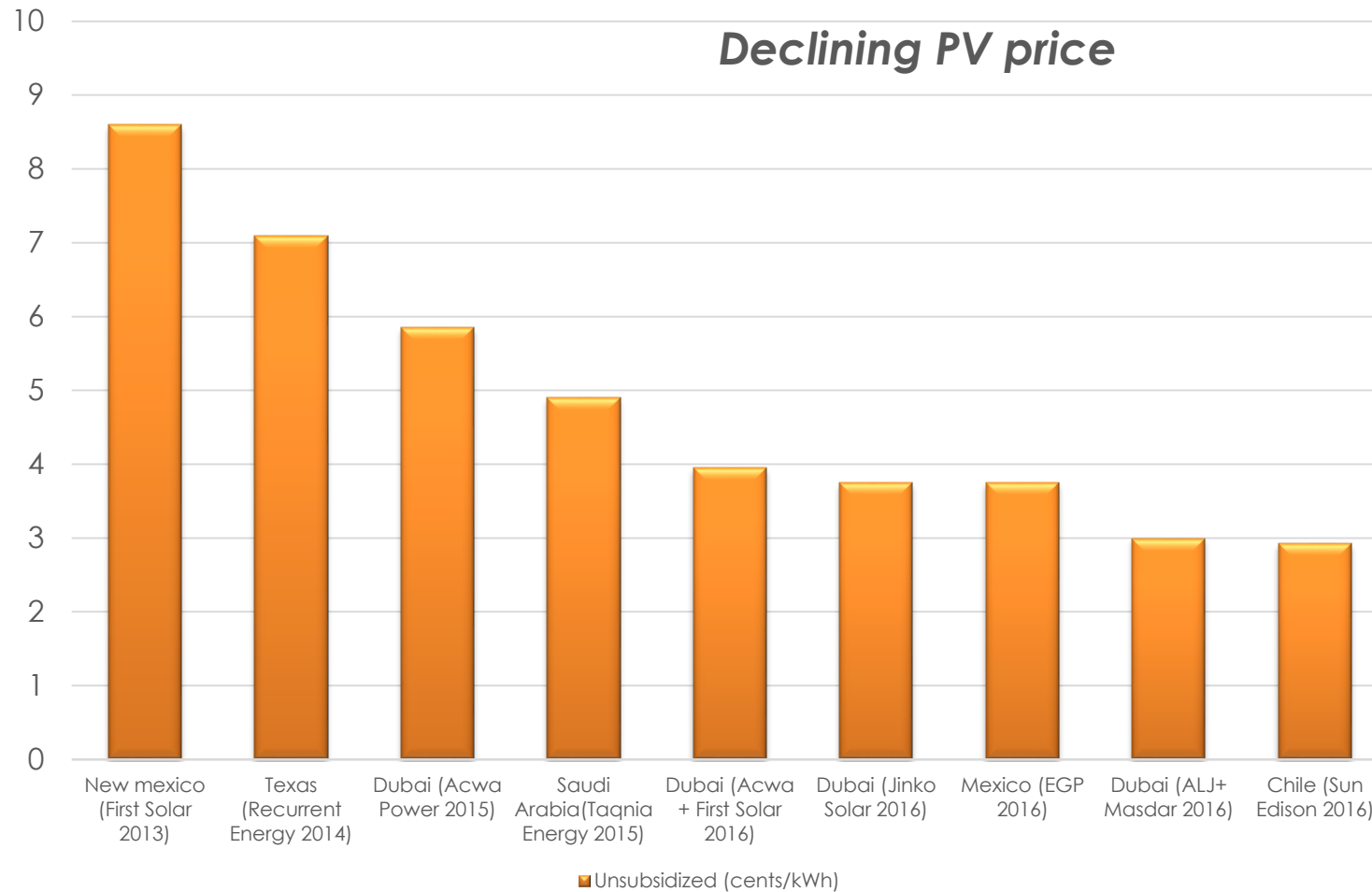


- **Being active locally**  
Foundation of Dii Ltd in Dubai
- **Identifying and solving practical hurdles** of wind/solar/grid projects in the field
- Creation of international industry network **'Supporters of Desert Energy'** and partnerships



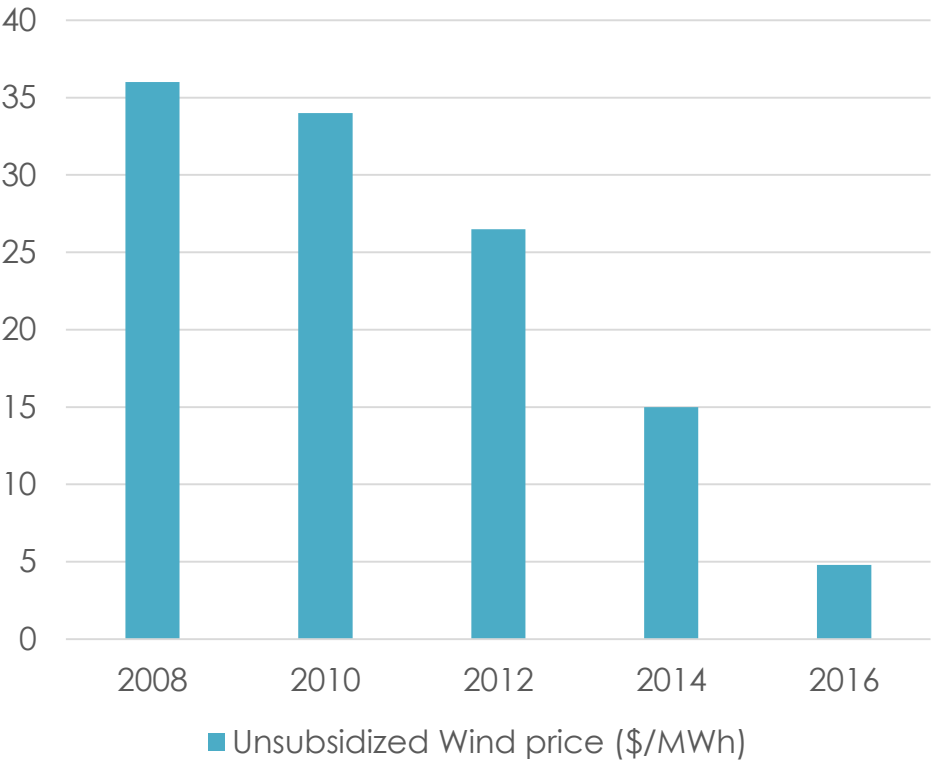
- **Market acceleration** towards full renewable energy supply in MENA
- **Full Market integration** throughout MENA and connected markets. Increase of Desert Power share in energy mix

# Fast declining costs of Solar PV

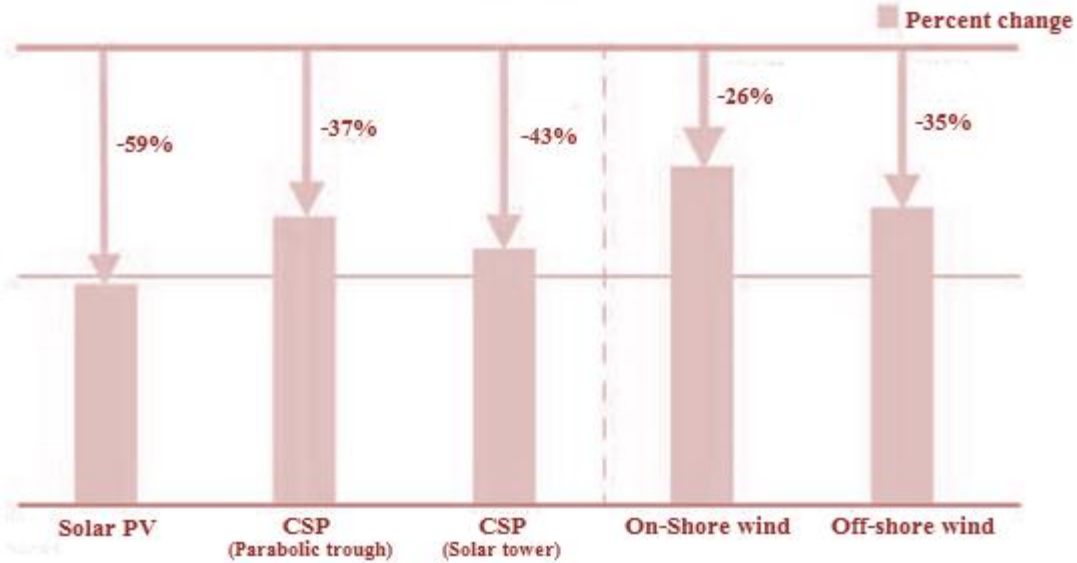


# Fast declining costs of On-Shore Wind

Decreasing On-Shore wind price

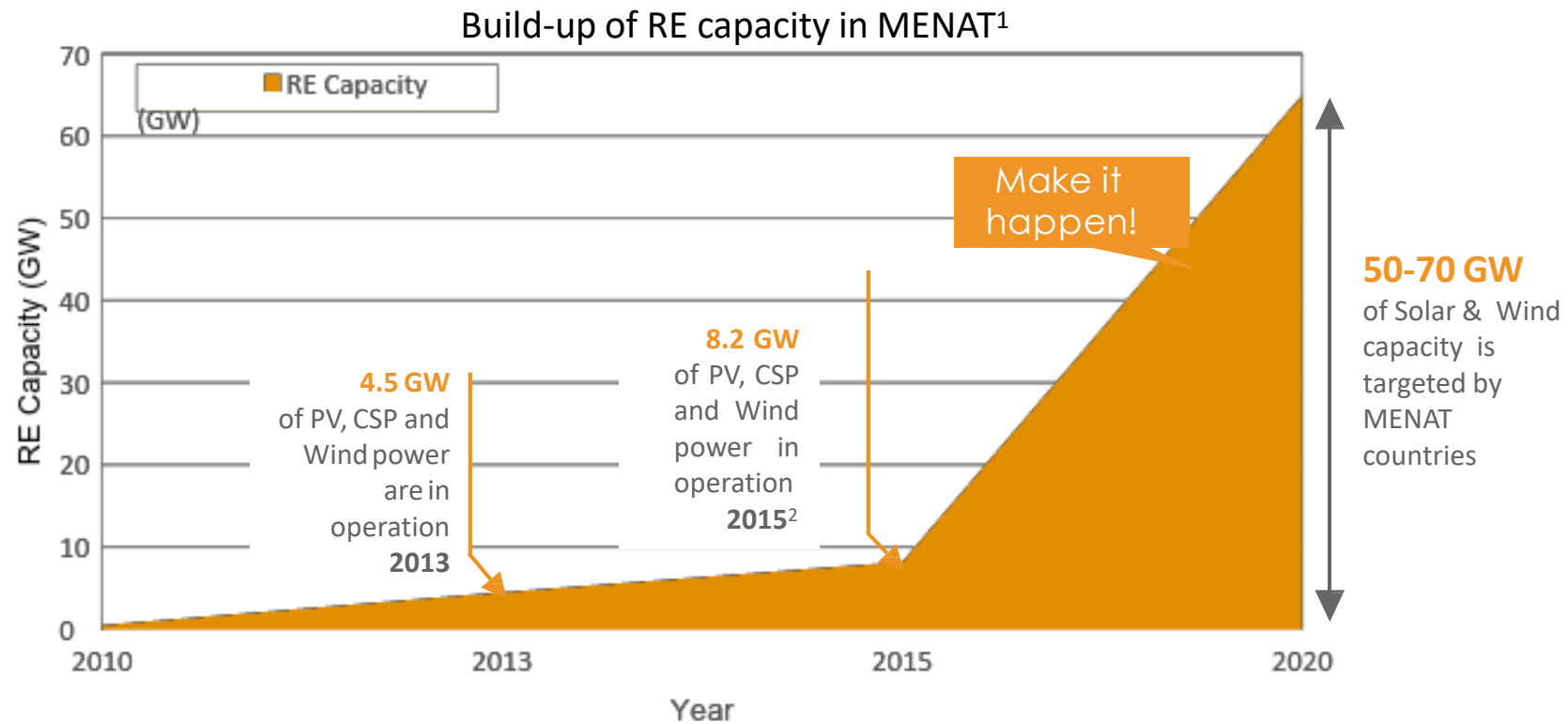


Expected global reductions in Solar and Wind LCOE (2015-2025)



# Speeding up RE after a period of relative 'lethargy'

Removal of barriers => Acceleration of renewable energy capacity build-up

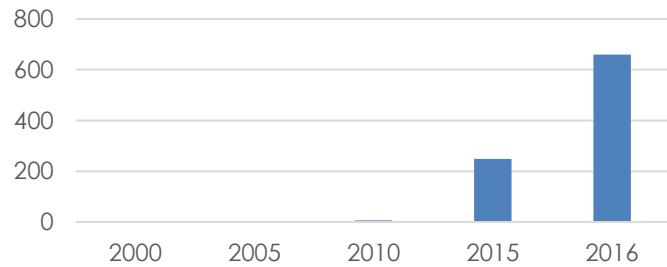


Note: 1) Dii Database holds data on grid-connected RE projects with a capacity above 1MW; MENAT hereby includes Mauritania, Morocco, Algeria, Tunisia, Libya, Egypt, Jordan, Palestine, Israel, Syria, Iraq, Kuwait, Bahrain, Qatar, Saudi Arabia, United Arab Emirates, Oman, Yemen, and Turkey; 2) Not included are projects that have only been announced and projects with unfinished tenders; Status 2015, Source:Dii

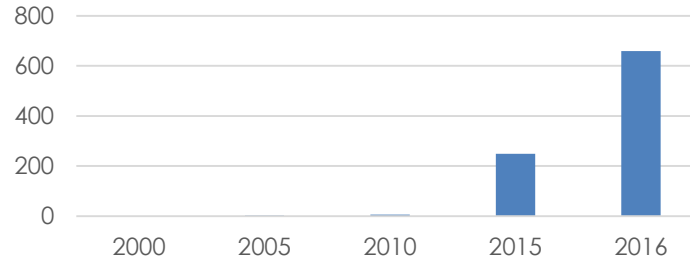
# RE Projects implementation growth by year



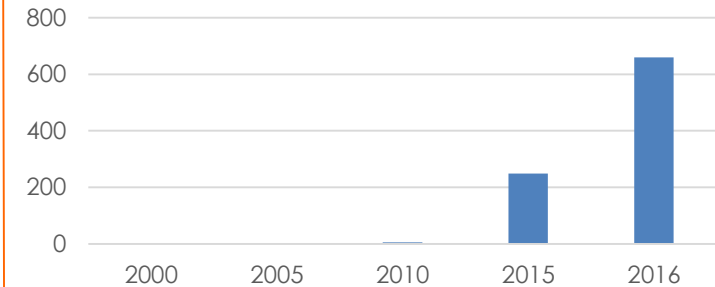
**North Africa:** On-shore wind generation by year (MW)



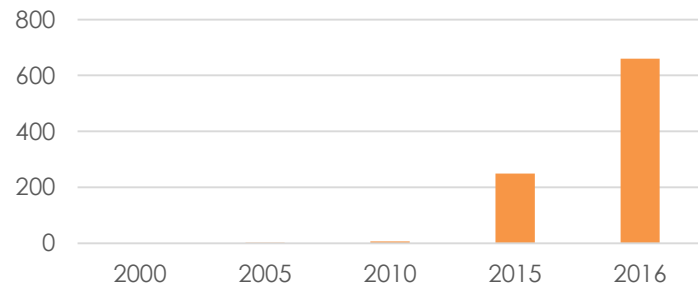
**Middle East:** On-shore wind generation by year (MW)



**Turkey:** On-shore wind generation by year (MW)



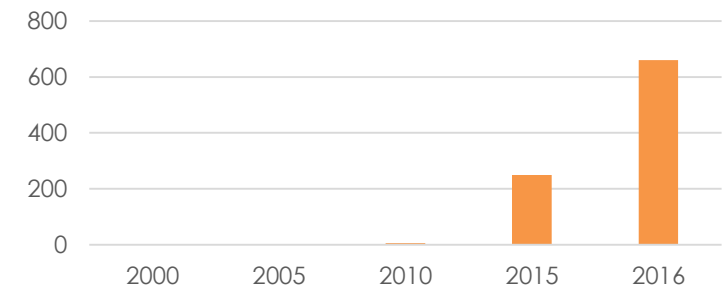
**North Africa:** Solar generation by year (MW)



**Middle East:** Solar generation by year (MW)



**Turkey:** Solar generation by year (MW)





# Integration of RE / interconnecting the markets of Europe, North Africa and West Asia



Dii contributes to better market conditions for renewables, integrating them in the interconnected grids

