From ‘Desertec’ to ‘Desert Energy’ in North Africa, West Asia and Southern Europe

Eurofes, Malta May 19th, 2017
‘Desertec’ pointed in 2008 at the enormous solar and wind potential in North Africa and West Asia

Middle East
GHI: 1800 – 2300 kWh/m²a
DNI: 2000 – 2600 kWh/m²a
Wind Speed: 4.7 – 5.8 m/s

North Africa
GHI: 1750 – 2300 kWh/m²a
DNI: 2100 – 2500 kWh/m²a
Wind Speed: 4.6 – 6.5 m/s

Turkey
GHI: 1800 – 2300 kWh/m²a
DNI: 2000 – 2600 kWh/m²a
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

Southern Europe - North Africa - West Asia
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
PV / Wind have become competitive:

- Aggressive price drops PV and Wind (e.g. PV from 5.85$ct/KWh in 2015 to 2.4$ct/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

*Based on recently awarded power plant contracts, not considering emission effects*
Today most countries heading for renewables
Today we observe 9.2GW RE in operation (MENAT)

- **Morocco** is aiming a 4GW solar and wind plan until 2020
- **Saudi Arabia** is ramping up with ‘initial target’ of 9.5 GW of renewables, eventually including power export
- **Turkey** is ramping up wind and solar energy to 13GW by 2019
- **Jordan, Iran, Pakistan** offer increased opportunities
- **Bahrain** has announced a target of 5% renewables of its total capacity

- **Algeria** plan to install 3 GW capacity from renewable sources by 2020
- **Egypt** plans around 8.5GW power generation from solar and wind
- **Abu Dhabi** 350 MW Sweihan PV produced historically low bid pushing the cost of renewables to much lower levels
- **Dubai** has massive plans (Al Maktoum solar park) and successfully executing its target of 7% of RE by 2020

9.2 GW includes all solar and on-shore wind installations in the MENAT region
Anticipated project locations in studies Vs actual operational projects

The anticipation by Dii in the past becoming reality now!
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
Thank You For Your Attention!
Evolution of Desert Energy in the Mediterranean

**Development phases**

- **2004**
  - Great Idea! Pre-phase
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  - Studies on the Desertec vision by DLR (Deutsche Luft- und Raumfahrtzentrum) and TREC (Trans-Mediterranean renewable energy Cooperation Studies)
  - Creation of awareness and motivation

- **2009**
  - It works! Concept phase
  - 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

- **2015**
  - First Harvest! Implementation phases
  - 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

- **2015**
  - Acceleration! Scale Up phase
  - 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

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Fast declining costs of Solar PV

Declining PV price

Unsubsidized (cents/kWh)

Source: Clean Technica
Fast declining costs of On-Shore Wind

Decreasing On-Shore wind price

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

Unsubsidized Wind price ($/MWh)

Source: IRENA
Speeding up RE after a period of relative ‘lethargy’

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

Build-up of RE capacity in MENAT\(^1\)

4.5 GW of PV, CSP and Wind power are in operation 2013

8.2 GW of PV, CSP and Wind power in operation 2015\(^2\)

50-70 GW of Solar & Wind capacity is targeted by MENAT countries

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.