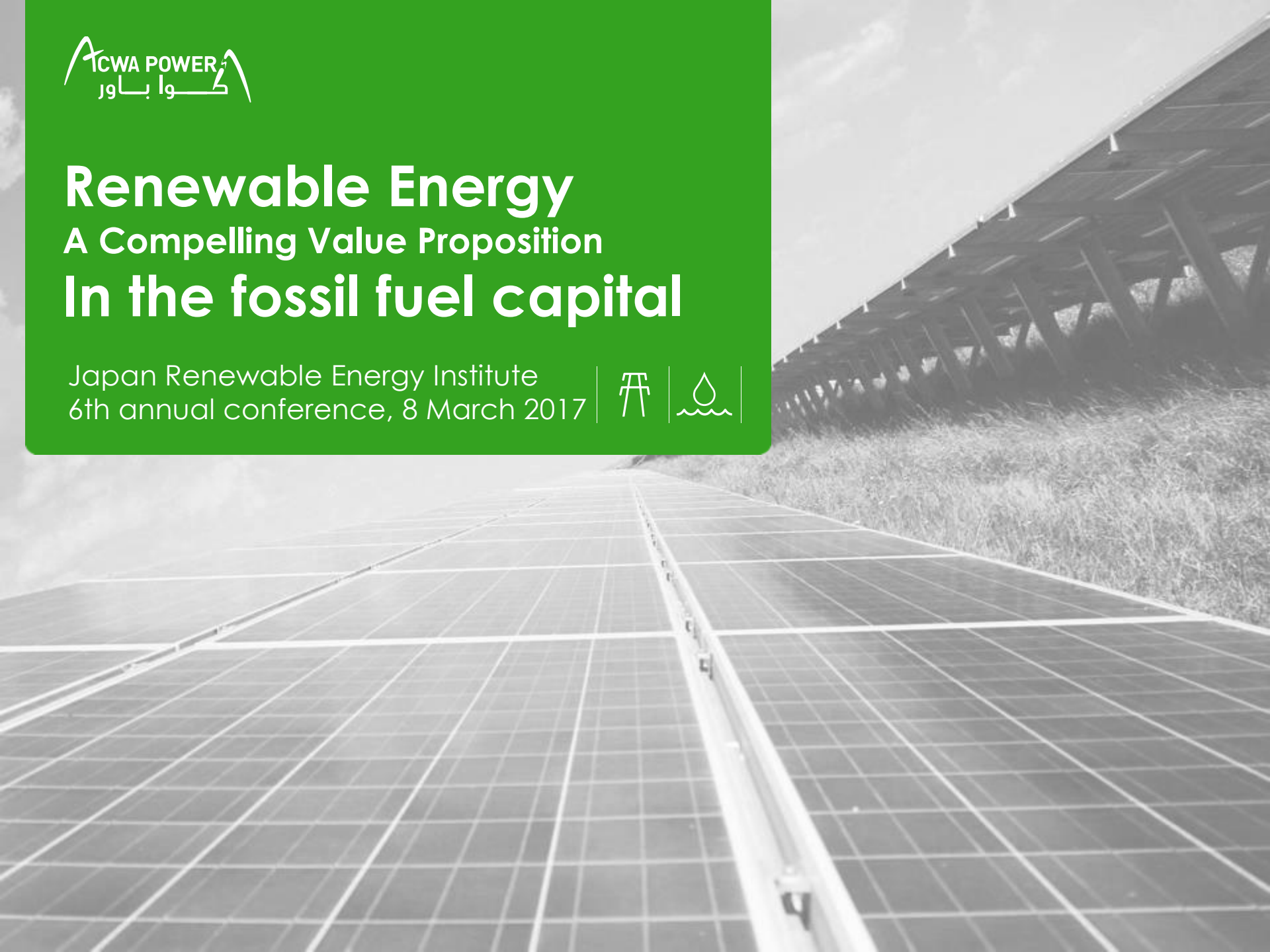


# Renewable Energy

## A Compelling Value Proposition

# In the fossil fuel capital

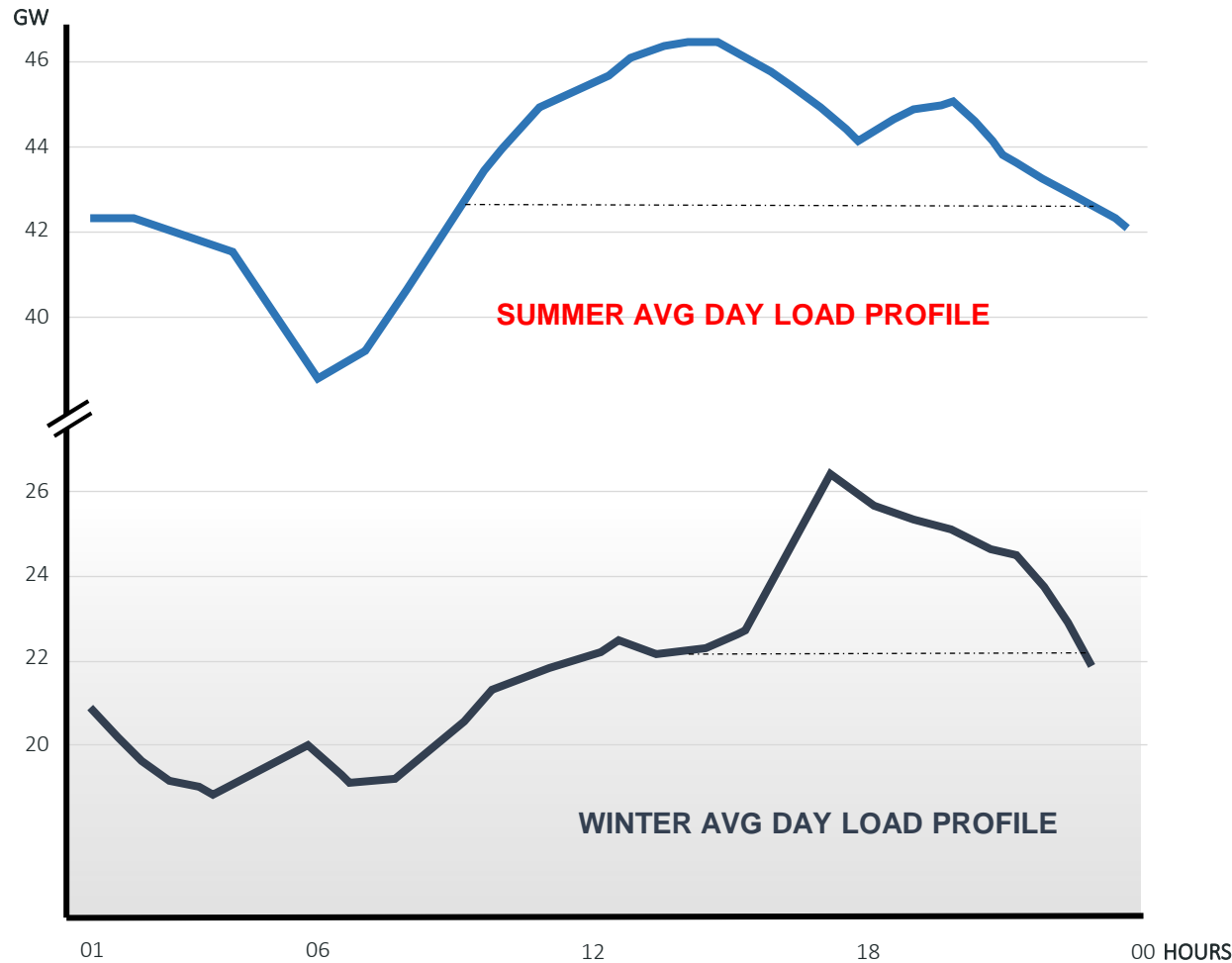
Japan Renewable Energy Institute  
6th annual conference, 8 March 2017



1. Why Renewable Energy Has become a Compelling Value Proposition for the Oil Capital?
2. Renewable Energy is much more than green MWs (with Noor Project in Morocco as a case study)
3. Why is Renewable Energy Starting to Gather Pace in the MENA region
4. The shape & size of Saudi Arabia's own Ambitious Renewable Energy Programme
5. Why ACWA Power is excited?

# 1. 1 Saudi Arabia – Uniquely blessed

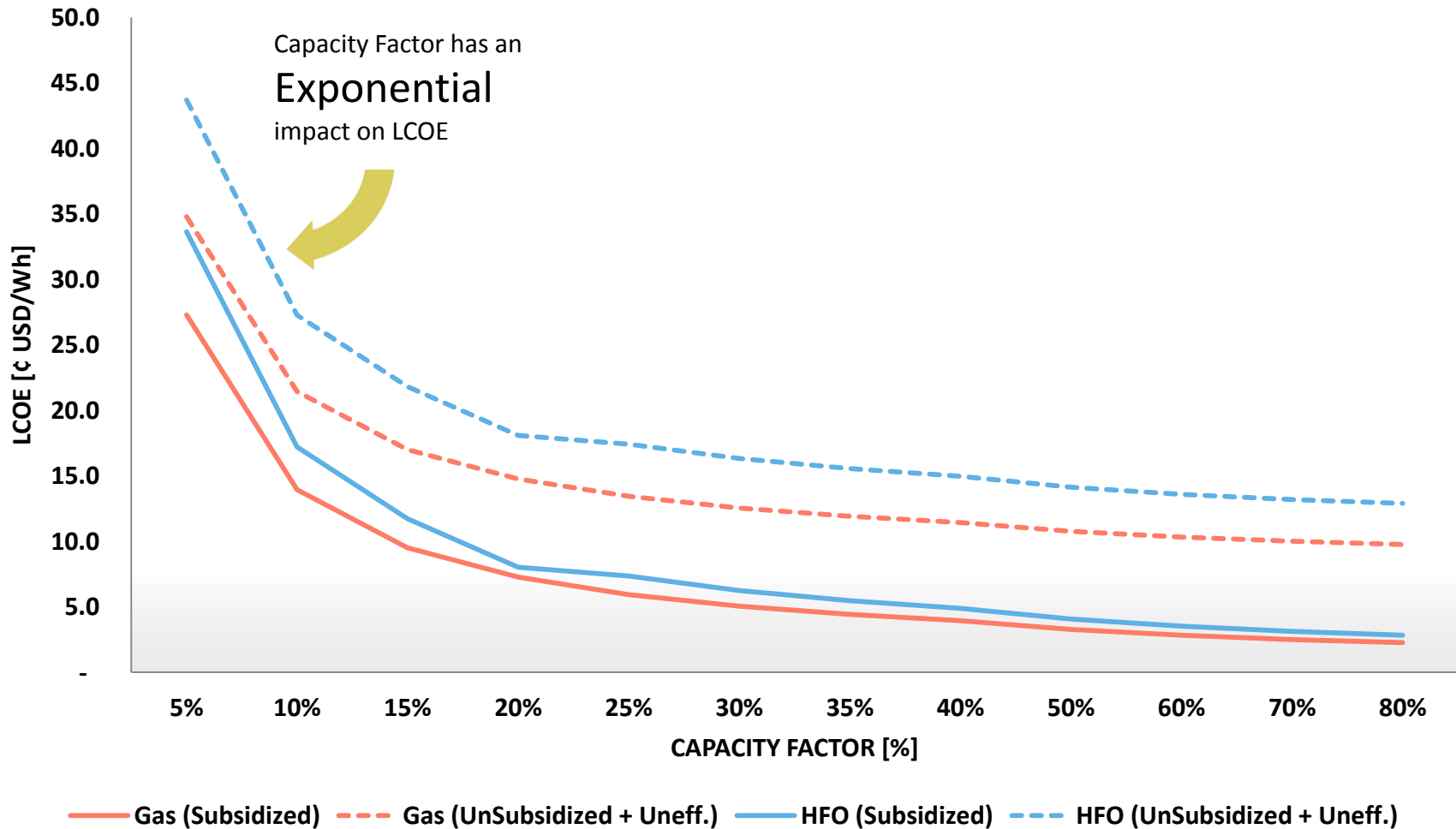
- Unique load profile + Perfect match between the load and resource = unbeatable value proposition



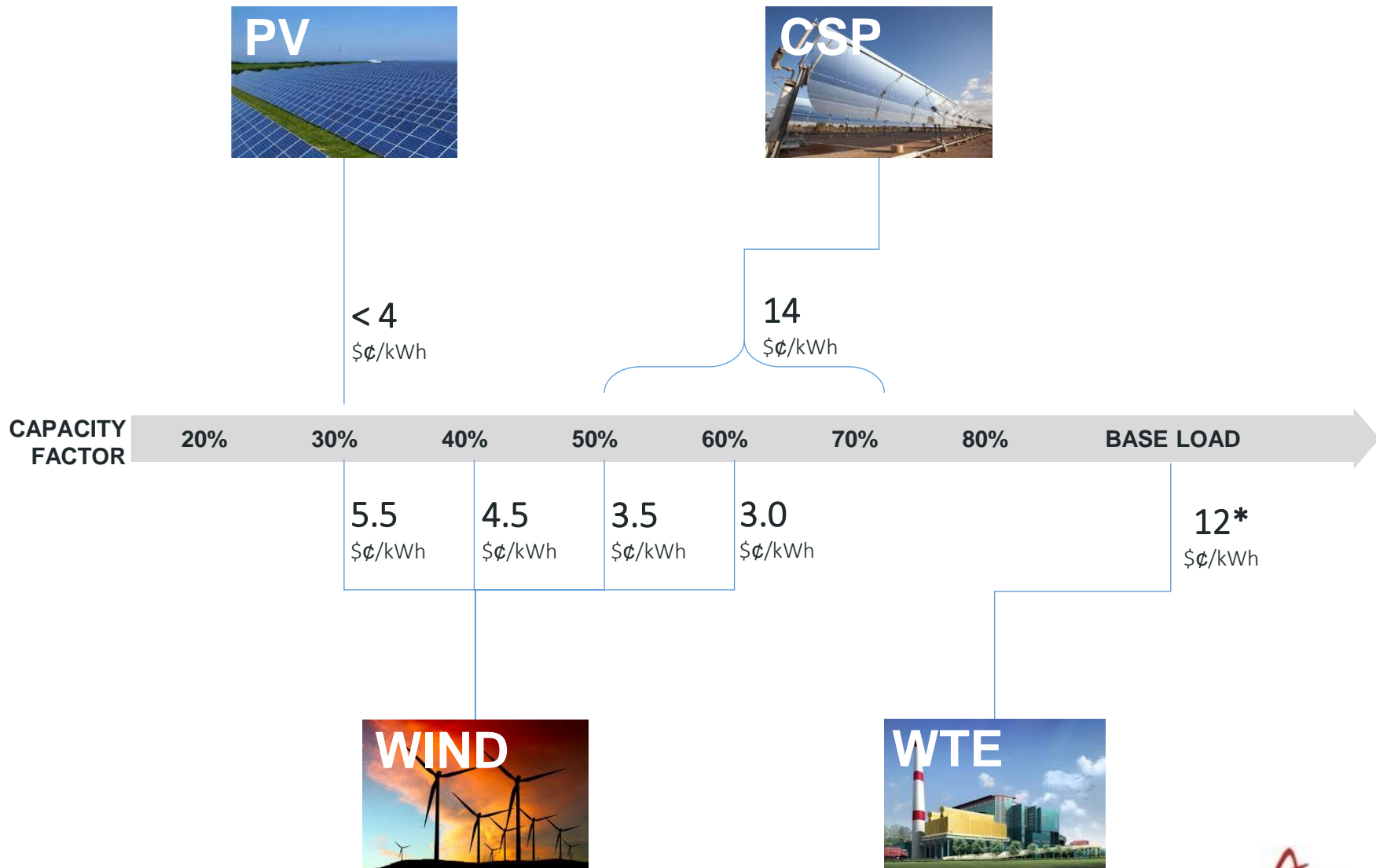
Source: ECRA annual report 2013

- For this segment of load, during a summer day or winter day, one needs to keep a power plant and run it only for these few hours.
- Thus one must reconcile the impact of capacity factor on cost of energy produced.

## 1.2 Capacity Factor (CF) impact on Gas & HFO LCOE

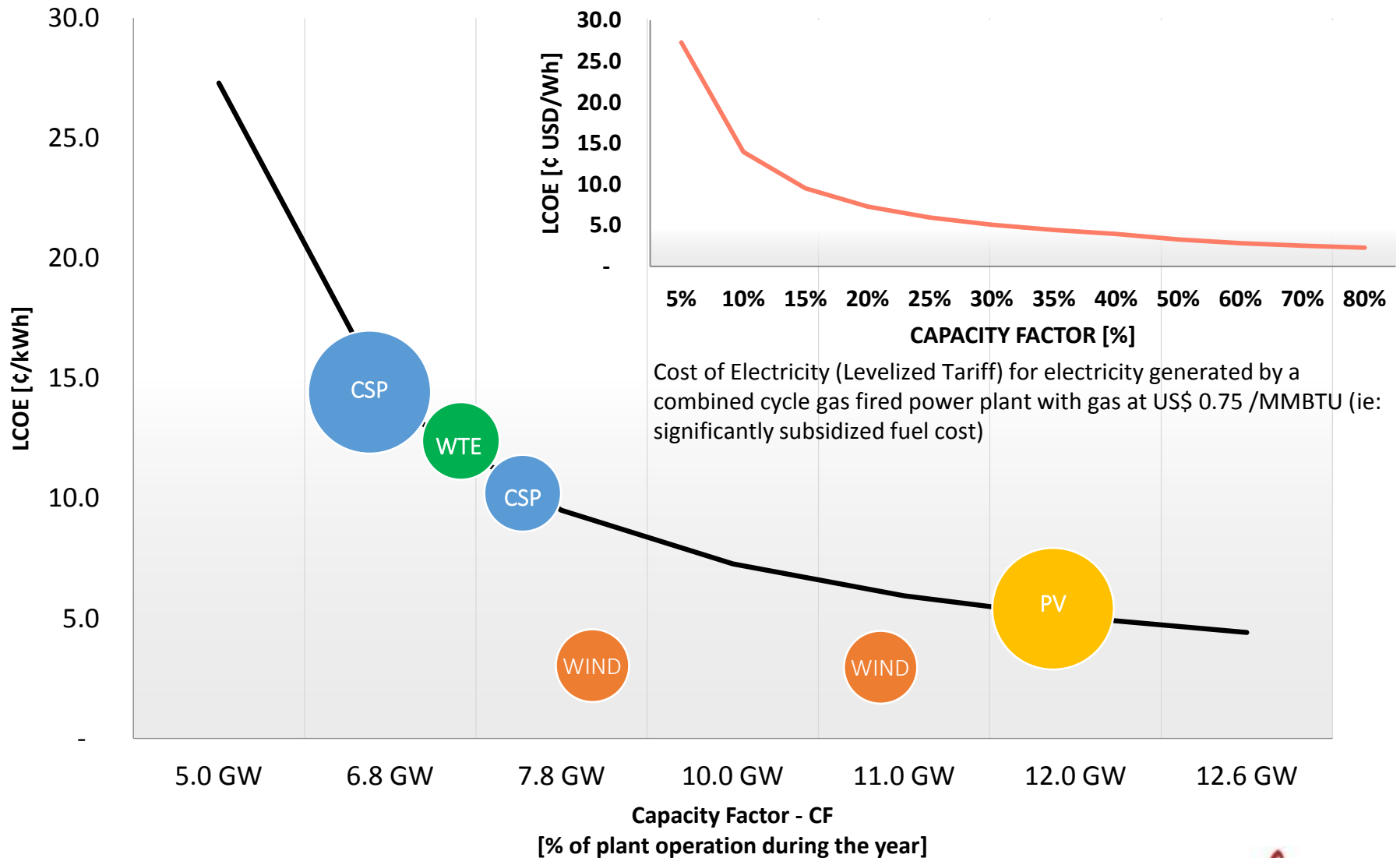


## 1.3 Achievable Levelized Cost of Electricity (LCOE) from Renewables



\* Assumed 30\$ tipping fee per metric Ton

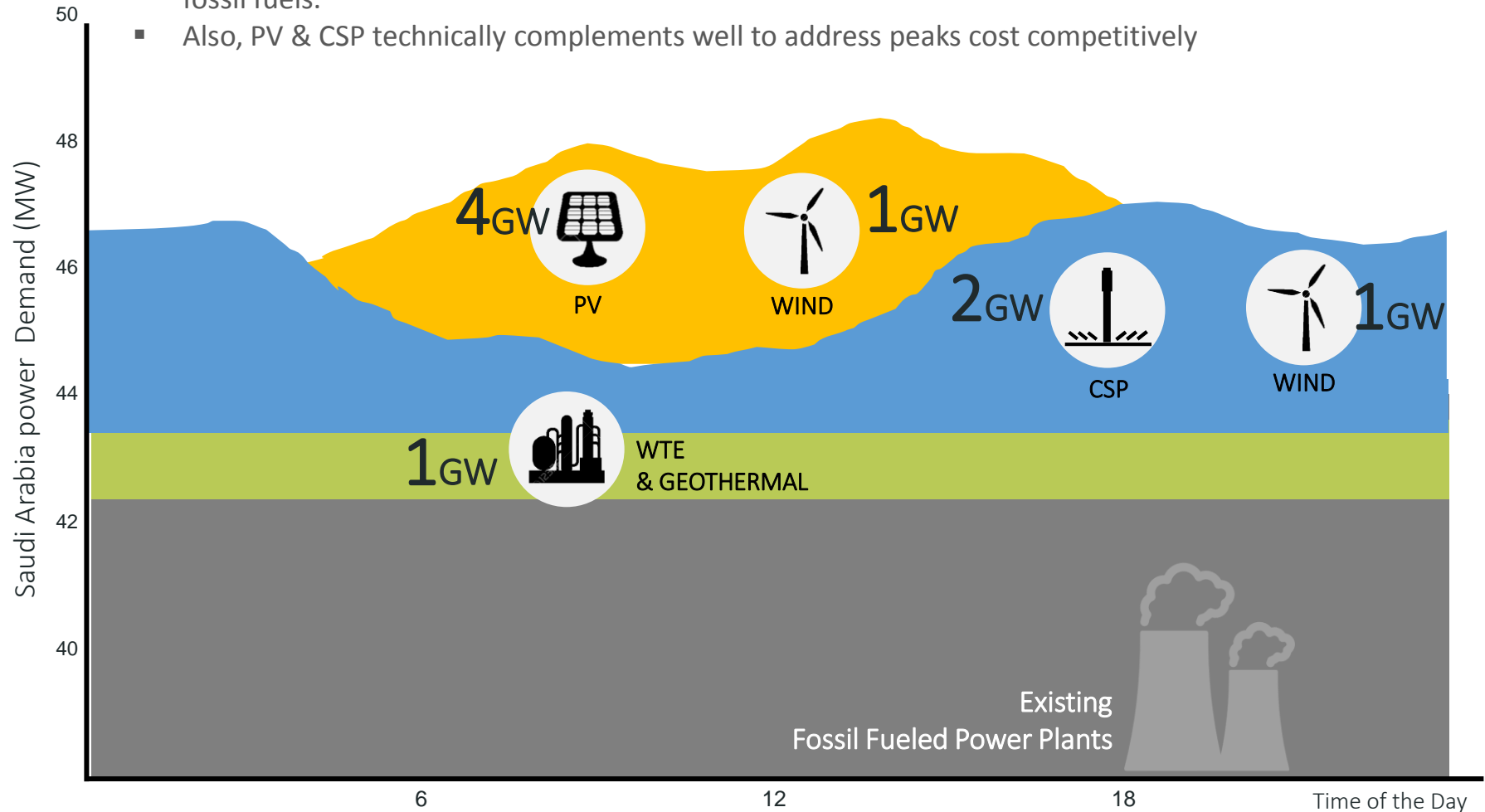
## 1.4 Renewables to Compete with Electricity produced with Subsidized Gas



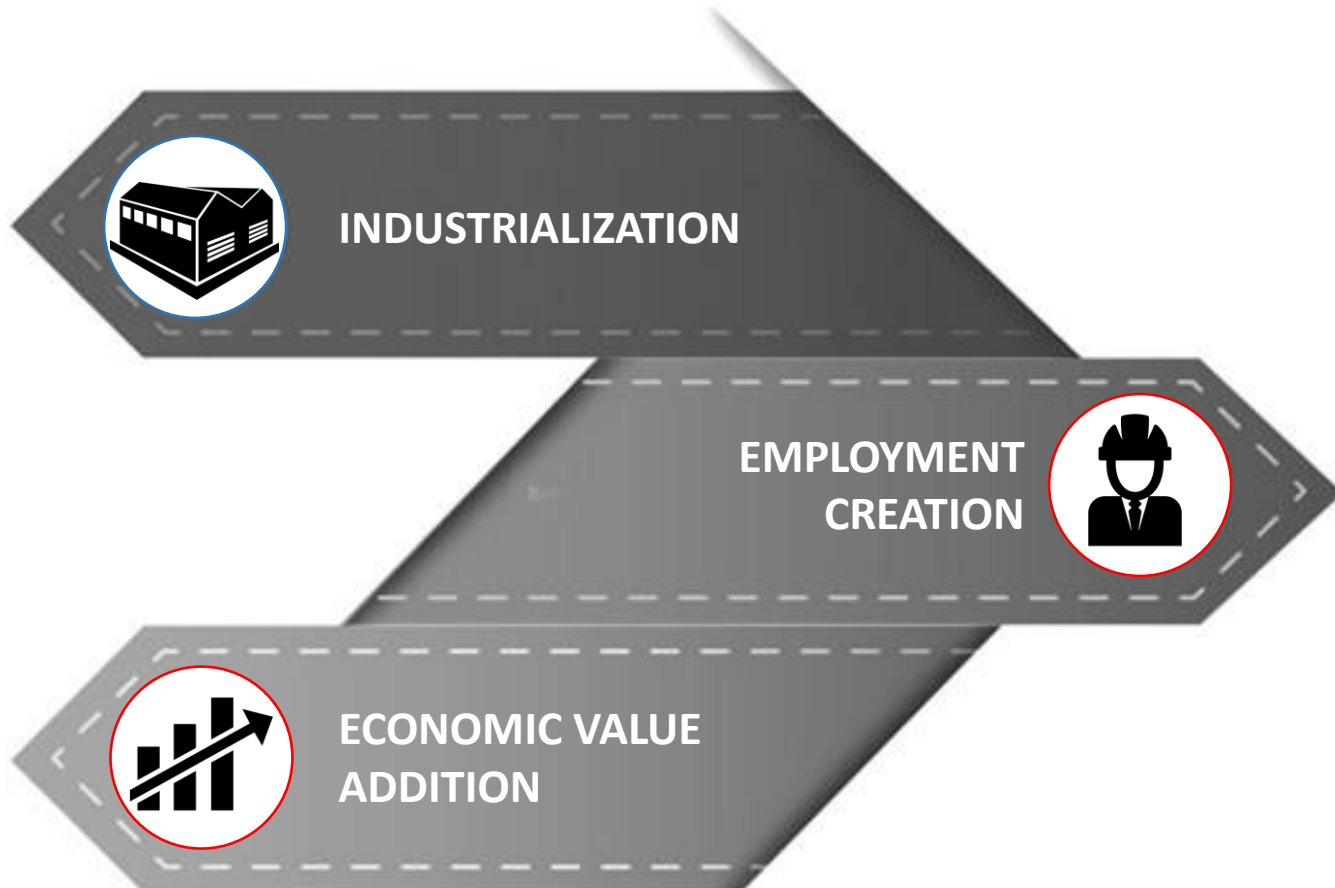
Source: ECRA Report 2013, ACWA Power, SUN & LIFE – See appendix for detailed table source. PV using single axis tracker (30%)

# 1.5 Complementarity of Renewables in the Energy mix

- The picture of what can be justified TODAY purely on cost competitiveness even with subsidized fossil fuels.
- Also, PV & CSP technically complements well to address peaks cost competitively



## 2.1 Renewable Energy is not just cost competitive MWs... but also:







## 2.2 Morocco - NOORo Solar Complex



- Total value of the project: USD 3 Billion
- World's largest solar power complex being developed in three phases
- 510MW with storage for seven hours of dispatch into the night
- Represents 5% of electricity generation capacity of Morocco
- Will supply power to 1.1 million Moroccans by 2018
- When all three phases are fully operational, project will save one million tons of oil equivalent and avoid 3.7 million tons of CO<sub>2</sub> emissions per year (equivalent to emissions of 780,000 vehicles)
- The remote under developed city of Ouarzazate is being spectacularly transformed by this solar plant.
- Phase 1 fully operational - 160MW throughout the day light hours and three hours into the night

## 2.3 Case Study: Noor I CSP Plant (160MW day +3hr @night)

### Localization:

30% Industrial integration  
(Exceeded targets)

\$250M Directly invested into  
Moroccan Economy



Parabolic Trough Collector Structure assembly line

### Job creation and sustainability:

1,800 Workers on site as direct job creation (peak)

80% Local and National

70 Permanent, Local and Skilled Jobs for O&M

### Paving the way Noor II and Noor III

15% Lower tariff than Noor I +10% lower tariff than competitors

50% Solar Field local integration

40% Integration for HTF and Thermal Energy Storage systems



## 2.4 NOORo Solar Complex

# Much More than Renewable Energy

**MOODY'S**  
INVESTORS SERVICE

**Government of Morocco**

World's Largest Solar Power Complex Reduces Dependence  
on Energy Imports

## ISSUER COMMENT

11 February 2016

- “ The harnessing of significant renewable domestic energy resources is credit positive from an environmental sustainability perspective, while at the same time permanently reducing Morocco's balance of payment sensitivity to higher energy prices ”
- “ From an economic perspective, 1 million TOE represents about 4.8% of energy imports in volume terms in 2015. At last year's oil prices, the savings from reduced imports would have amounted to about 0.3% of GDP ”



### 3. IN MENA REGION RENEWABLE ENERGY DEPLOYMENT STARTING TO GATHER PACE. WHY?

#### Cost

- < 6 US Cents/KWh is the new norm in utility scale solar PV
- < 5 US Cents/KWh for utility scale wind
- < 15 US Cents/KWh for dispatchable CSP, day and into the night

#### What is helping us to set new tariff benchmarks

- ✓ Transparent, well structured auctions / bids allowing developers to compete on a level playing field
- ✓ Competitive financing thanks to high levels of liquidity in a context of historically low base rates
- ✓ Improvement in technology, continuous reduction in key component costs, and increasingly efficient construction methods
- ✓ Exceptional wind and solar resource enabling high capacity factors
- ✓ Learning curve on operation and maintenance allowing to optimize cost
- ✓ Reasonable levels of local capacity and capability



## 4. SAUDI ARABIA'S NATIONAL RENEWABLE ENERGY PROGRAMME AT LEAST 9.5GW OF RE ON THE GRID BY YEAR 2023

### First Projects

300MW PV @ Sakaka, Al Jouf Province

400MW wind @ Midyan, Tabuk Province



### First Round 3.45GW

The first 2 projects

Round 2 of 1020MW at 8 locations

Round 3 of 1340MW at 12 Locations

All to be complete by 2020

### By 2023 9.5GW

Procurement by the newly established Renewable Energy Project Development Office @ Ministry of Energy, Industry & Mineral Resources

All IPP with 100% private ownership

Increasing levels of local content

Objective to progressively increase Saudi Nationals in the workforce

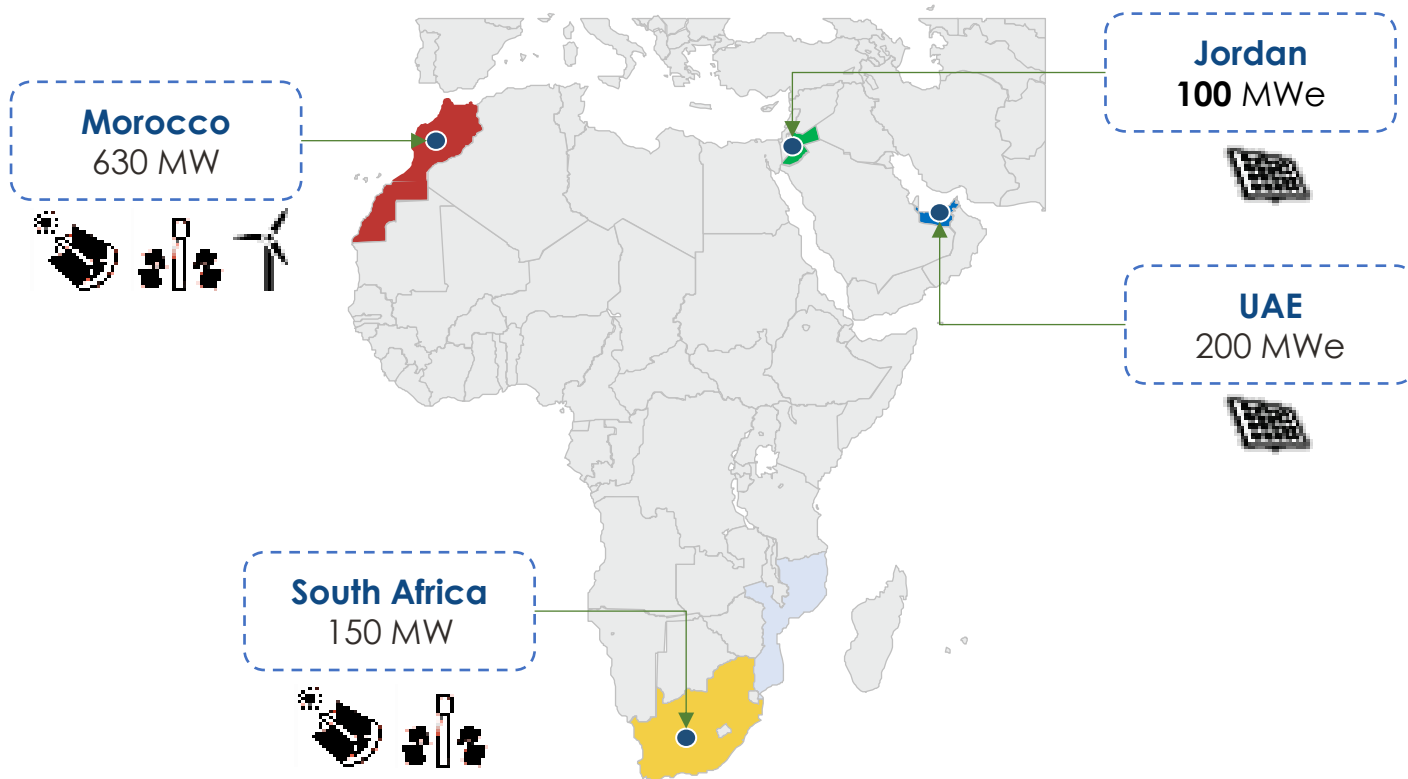


# ACWA POWER

RENEWABLES FOOTPRINT >1000MW



## Diversified Renewables Asset Base (Gross MW)



# Thank you

