

# WITT SOLAR

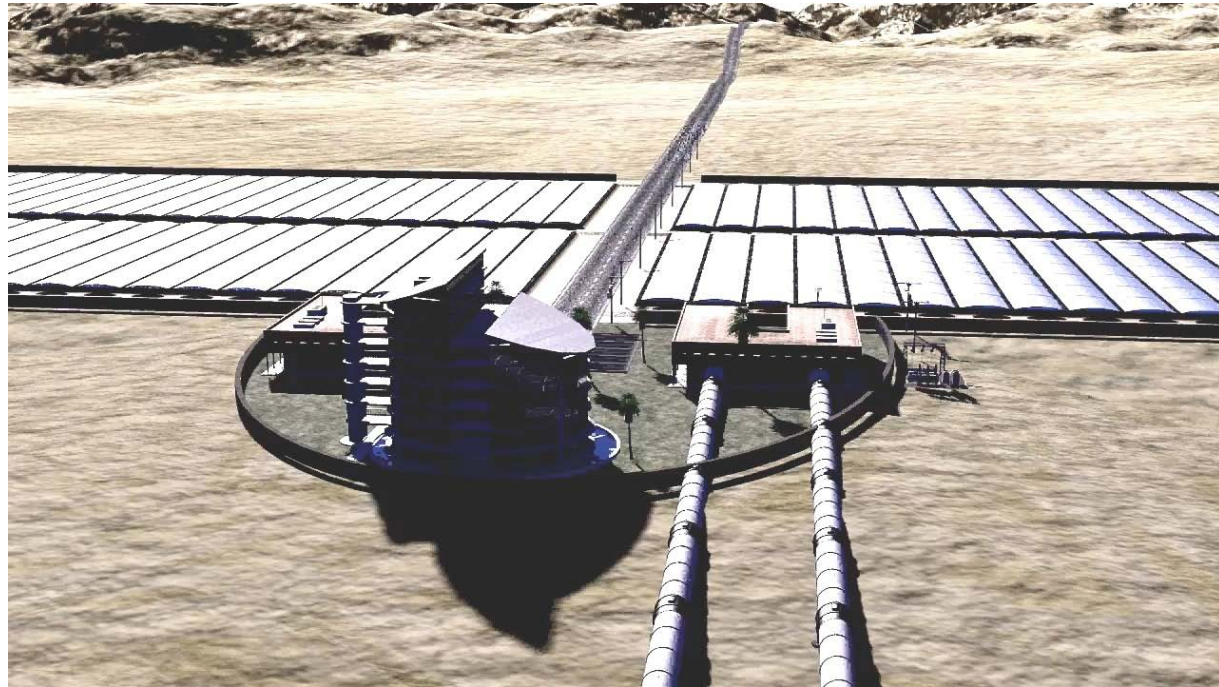
ENERGY SYSTEMS AND SEAWATER DISTILLATION



**Lecture at SAUDI WATER &  
POWER FORUM 05.12.2011,  
Jeddah:  
Multi-Effect-Solar (MES)  
Technology – endless low  
cost Electricity and Water for  
the GCC**

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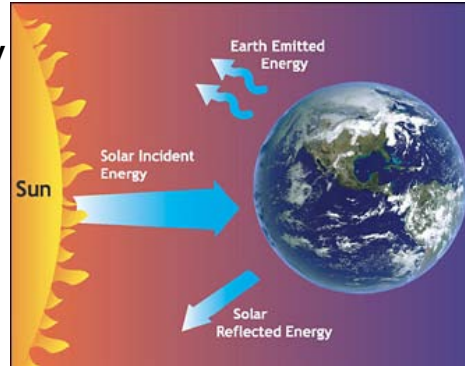


# Introduction

- **WITT SOLAR** is a technology company that has invented and patented the **MULTI-EFFECT-SOLAR (MES) Power Plant**, the first solar thermal power plant having an integrated desalination and a 24h energy storage.
- **WITT SOLAR** also works as a consultant for Governments that are not sure about their road map to enter solar age with the lowest total cost for solar power and drinking water.
- The **Multi-Effect-Solar (MES) Power Plant** is the first solar power plant technology that allows the production of electric energy during night hours and marks a milestone in energy production from renewable energy sources.
- **MES** are able to produce per each kW<sub>peak</sub> between 5.000 and 7.200 kWh each year or with other words between 5.000 and 7.200 FLOH (FULL-LOAD-OPERATING-HOURS PER YEAR).
- Once a **MES** is started, it will run for decades without interruption of power and water supply.
- Due to its base-load operation capabilities, **MES** produce electricity at lower cost than oil-fired power plants at world market prices and produce drinking water much below conventional desalination processes like RO, MSF or MED installed in GCC.
- A 1000 MW **MES** has a total cost advantage of nearly 120 billion € compared to oil or gas-fired power plants during their life span. Thus MES can contribute to keep oil exports in GCC on the level of today.

# What is needed in GCC?

- To reduce the oil and gas consumption for electricity and water production
- Predictable and dispatchable renewable energy
- Renewable energy running on base load at 7.000 hrs
- Modular increase of power generation ahead of demand
- Full replacement of older fossil-fired power plants
- Cost-effective power & drinking water production



## What you have:

- Best solar radiation in the world
- Local companies
- Well-trained people
- Flat land
- Seawater

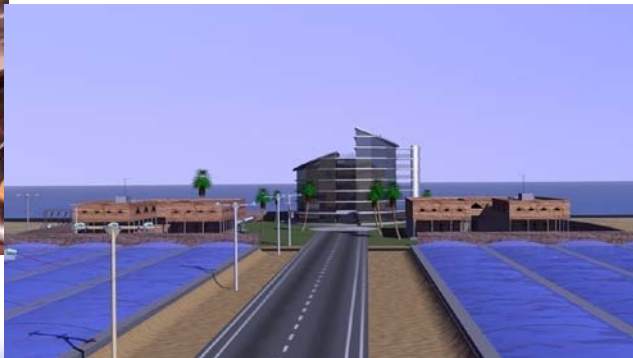
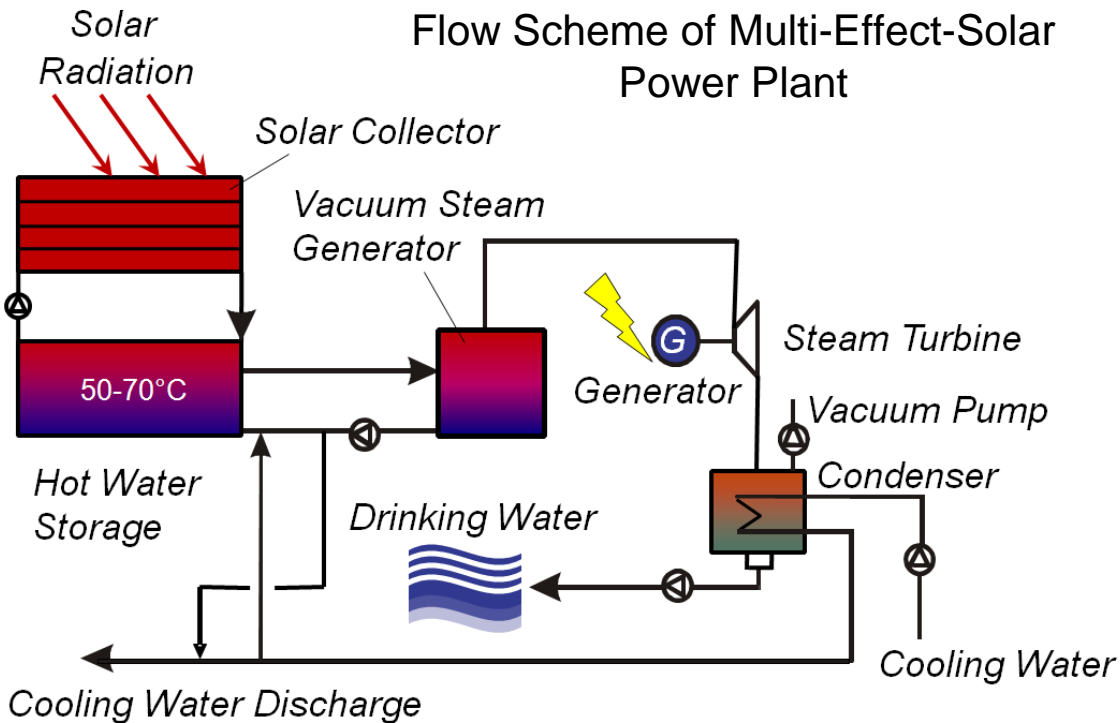


How can we fulfil what you need with what we have?

## With **MULTI-EFFECT-SOLAR (MES)** Power Plants

- = 1. effect: electric power
  - = 2. effect: 24h energy storage
  - = 3. effect: drinking water
- to be built at the coast with local companies
  - powered by the sun
  - cooled with seawater

### Flow Scheme of Multi-Effect-Solar Power Plant

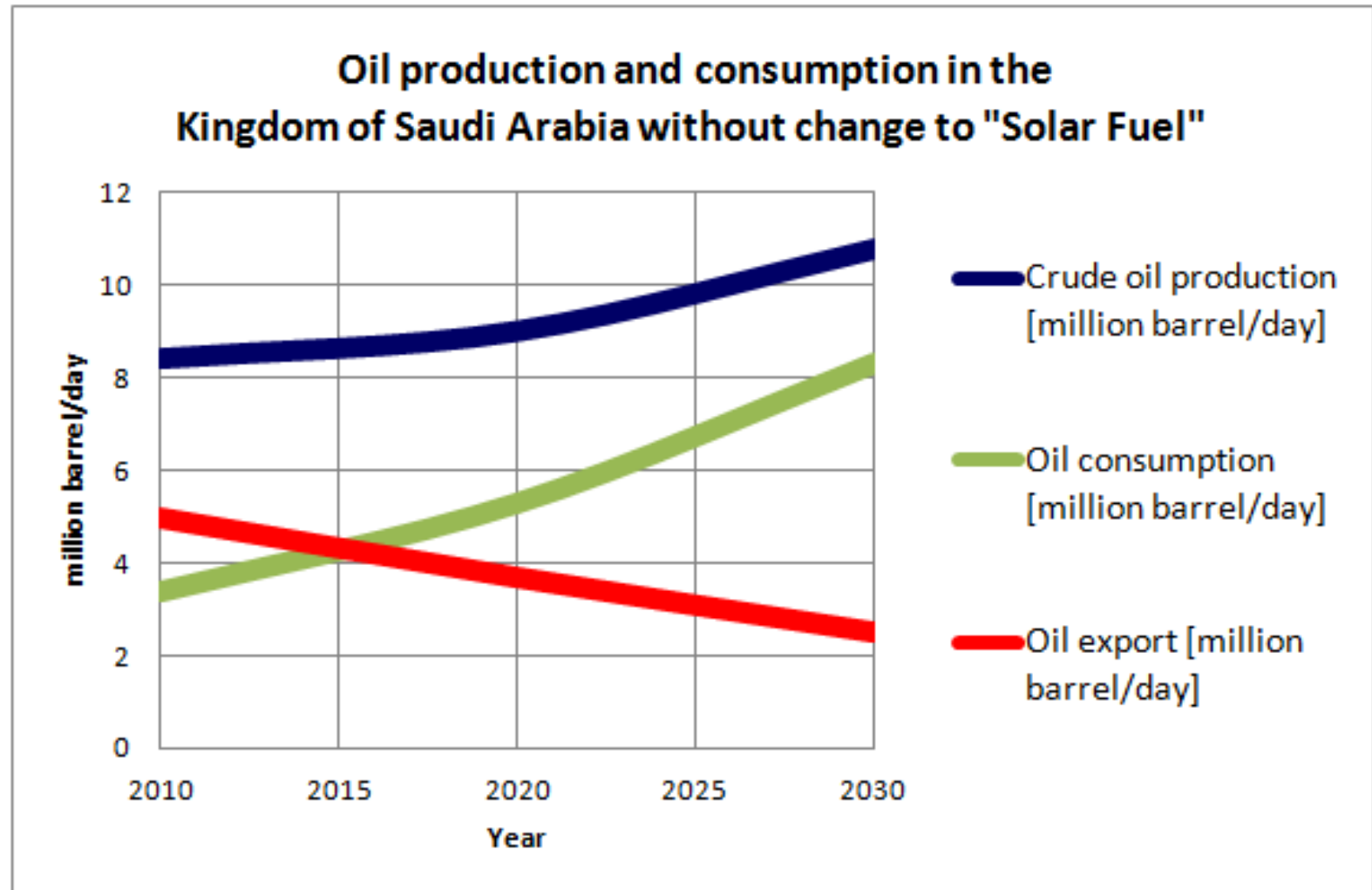


European Patent 1 108 191 B1  
US - Patent 6,367,257 B1

# What are the recent news about the actual situation in the Kingdom of Saudi Arabia and the expected development?

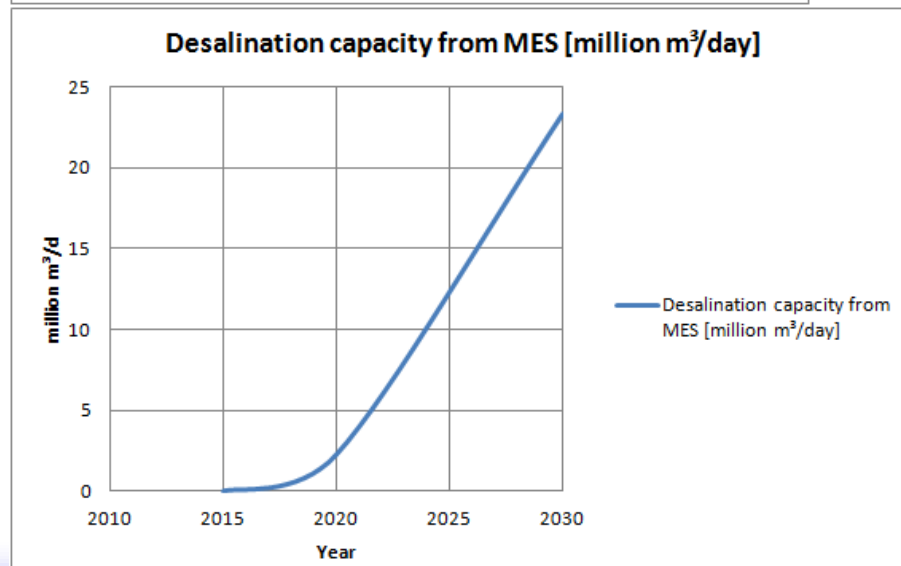
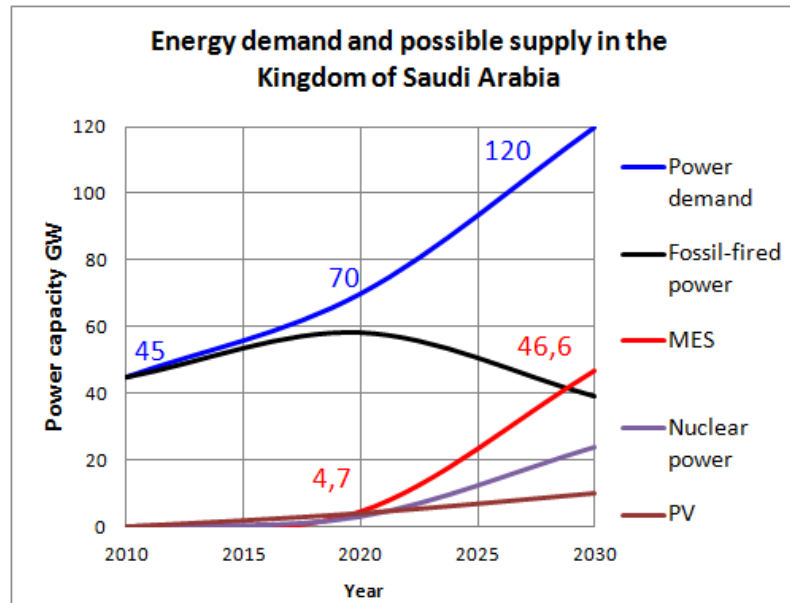
- “The Saudi government is spending nearly SR50 billion (\$13 billion) a year to subsidize power and water consumption for citizens (2011)” (<http://www.emirates247.com/news>)
- “The country expects domestic power demand to triple over the next two decades”
- “The Kingdom uses currently 1.5 million barrels of oil per day to operate some 30 desalting plants” (Harvard International Review) a - tremendous amount of energy with a value of more than 150 million \$/day and 57 billion \$/year (@ 105 \$/bbl)
- “... if unchecked, domestic demand in the kingdom would increase nearly 250 per cent by 2028 to 8.3m barrels a day.” (*arabiangazette*) – this is very close to the production of today
- “Gulf oil producers are seeking new ways to generate power because they prefer exporting valuable crude to maximize income”
- “Energy other than oil, gas and other fossil fuels may account for more than half of the kingdom’s supply by 2030”
- “The Kingdom, which has been looking at solar power generation as an important alternative energy resource, is expected to generate over 5 GW of solar energy by 2020”
- “The kingdom has plans to build a total of 16 nuclear reactors over the next 20 years, spending an estimated sum of \$300 billion” (*EMIRATES 24/7*)

What is the effect on oil export resulting from the expected increase of own oil consumption?



# How could the future power and water demand be supplied by **MES**?

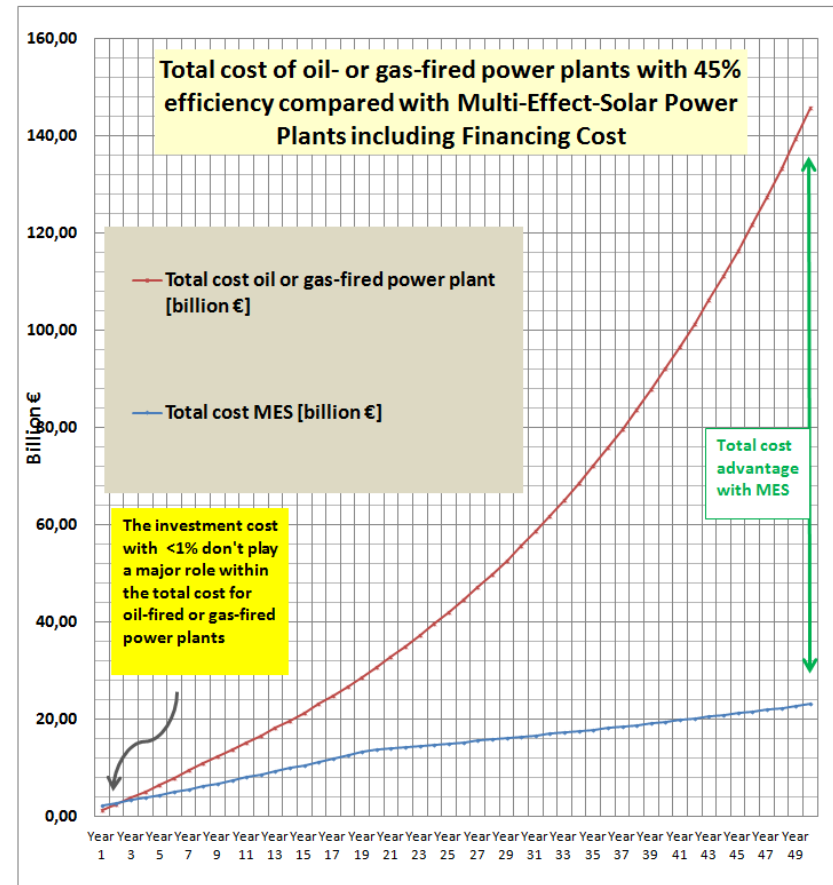
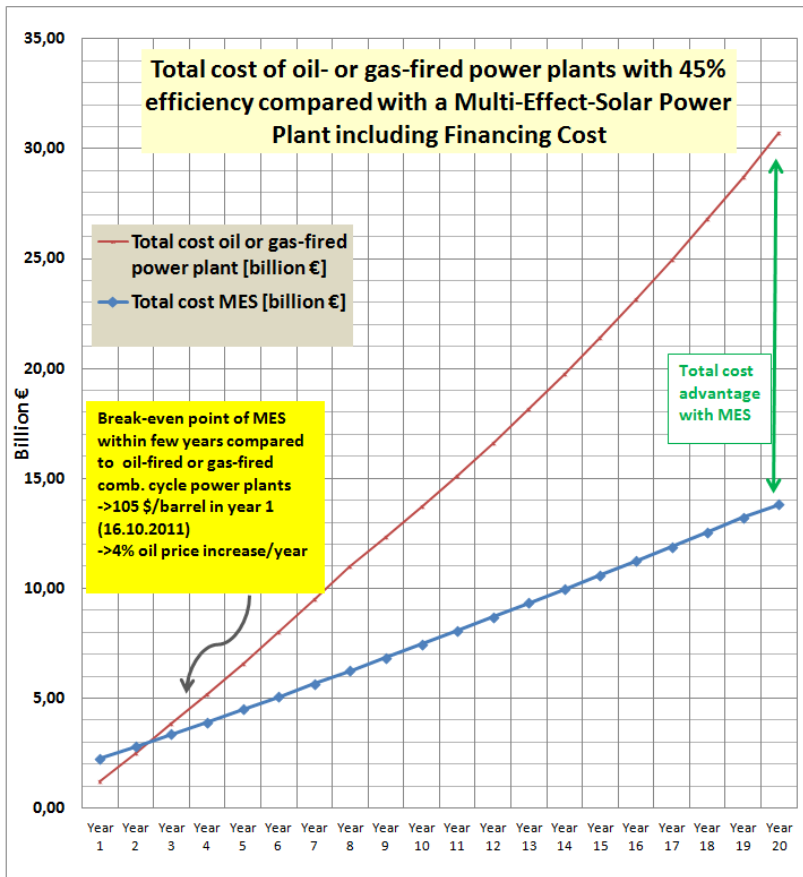
- By 2030 **MES** can generate 46,6 GW and 24 million m<sup>3</sup>/d of drinking water
- This is equal to the water production in Saudi Arabia of 2010
- The actual oil demand is 1,5 M barrel/d, worth 57 billion \$/year to generate 4 Mm<sup>3</sup>/d of drinking water
- This can be produced by **MES** with 8 GW installed



# MULTI-EFFECT-SOLAR Power Plants

## Stand-alone features

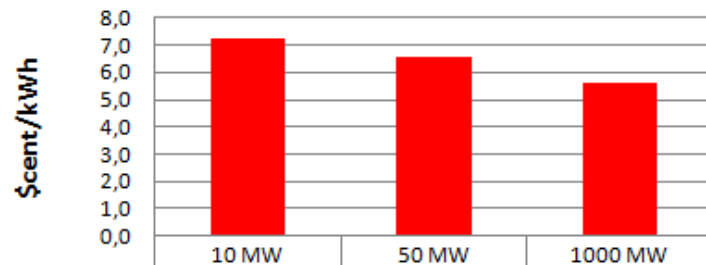
Capacity Power	MW	1.000	Total cost ratio oil power plant/ MES	6,3
Capacity Desalination	m <sup>3</sup> /d	634.810	Ratio oil total cost/ investment	178,7
FLOH	hrs	7.303	Investment oil power plant/ total cost	0,6%
Total cost advantage 50 a	Billion €	122,8	Total cost advantage	Bln €/km <sup>2</sup> 1,0





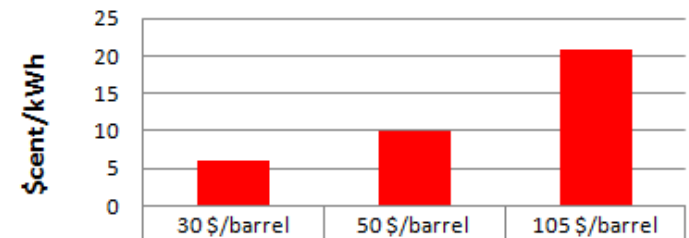
Power and water production cost by **MES** compared to oil- or gas-fired combined cycle plants (30 years, 4%/year)

**Levelized cost of electricity (LCOE) from MES [\$cent/kWh]**



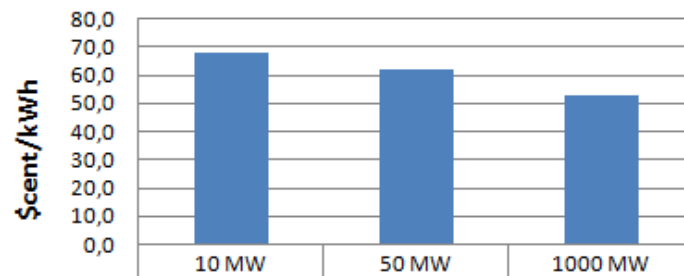
■ Levelized cost of electricity (LCOE) from MES [\$cent/kWh]

**Levelized cost of electricity (LCOE) from CCPP only oil cost [\$cent/kWh]**



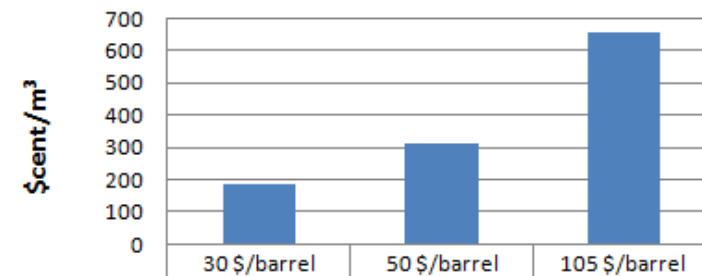
■ Levelized cost of electricity (LCOE) from CCPP only oil cost [\$cent/kWh]

**Levelized cost of water (LCOW) from MES [\$cent/m<sup>3</sup>]**



■ Levelized cost of water (LCOW) from MES [\$cent/m<sup>3</sup>]

**Levelized cost of water (LCOW) from CCPP only oil cost [\$cent/m<sup>3</sup>]**

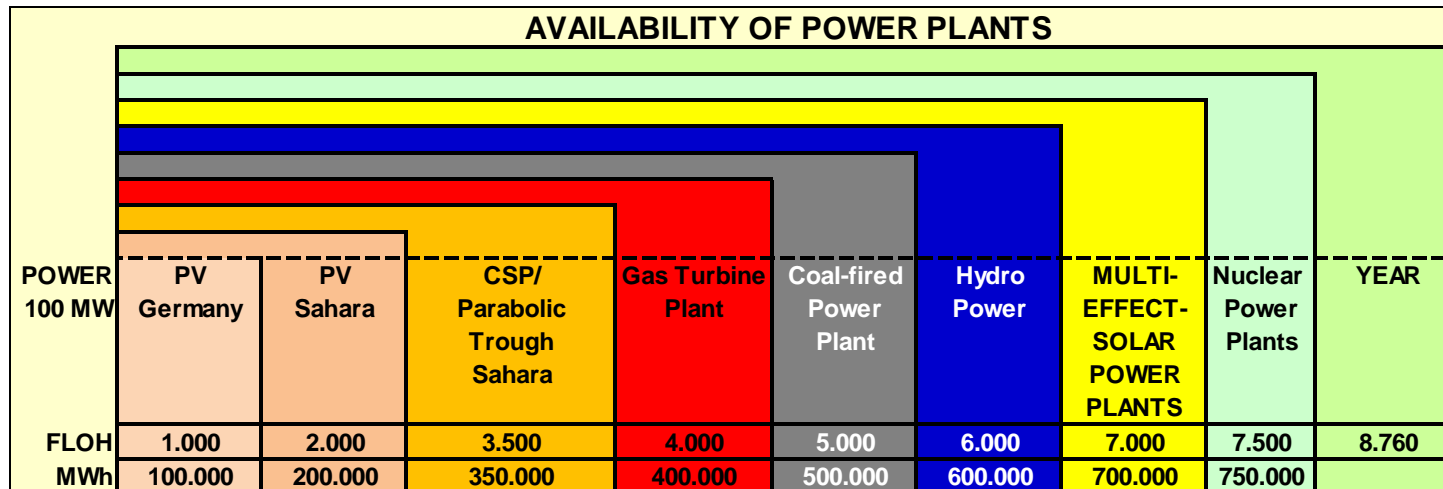


■ Levelized cost of water (LCOW) from CCPP only oil cost [\$cent/m<sup>3</sup>]

# MULTI-EFFECT-SOLAR Power Plants

## Stand-alone features

- ✓ Less power and water production cost, compared to existing technologies
- ✓ A 24h energy storage allows base-load operation during day and night with controlled production of dispatchable energy
- ✓ Simultaneous power generation and drinking water production in a single process step
- ✓ Quick start and stop within 10 min, capable to balance fluctuations from wind and PV
- ✓ 4 times higher energy production per kW than with PV panels
- ✓ Use of standard parts which are running in other power plants
- ✓ High local value-added from construction and assembly
- ✓ Components that can be produced locally
- ✓ WITT SOLAR AG offers maintenance & service contracts and operation for **MES**
- ✓ Supply time for a 10 MW demo plant is 12 months, for a 50 MW plant 24 months



## Conclusions and outlook of Multi-Effect-Solar (**MES**) Technology – endless low cost Electricity and Water for the GCC

- ✓ The increasing demand of oil in GCC will reduce the exports
- ✓ **MES** is capable to supply a big part of the base-load power and drinking water demand and to fully replace oil-fired plants
- ✓ In case the framework for an effective introduction of solar energy is done within the first half of 2012, then:
  - first investor financed **MES** plants can start in 2015 with
  - substantial contribution to the power and water supply by 2020
  - and generating more electricity than from oil and gas by 2030.
- ✓ After substantial losses in oil exports expected in the next years, it is essential for the Kingdom and other GCC countries that **MES** helps bringing them back to the export level of today or more
- ✓ The Kingdom of Saudi Arabia - after supplying the domestic market - may become an exporter of **MES** technology
- ✓ WITT SOLAR AG is pleased to enter a JV for the manufacture of **MES**



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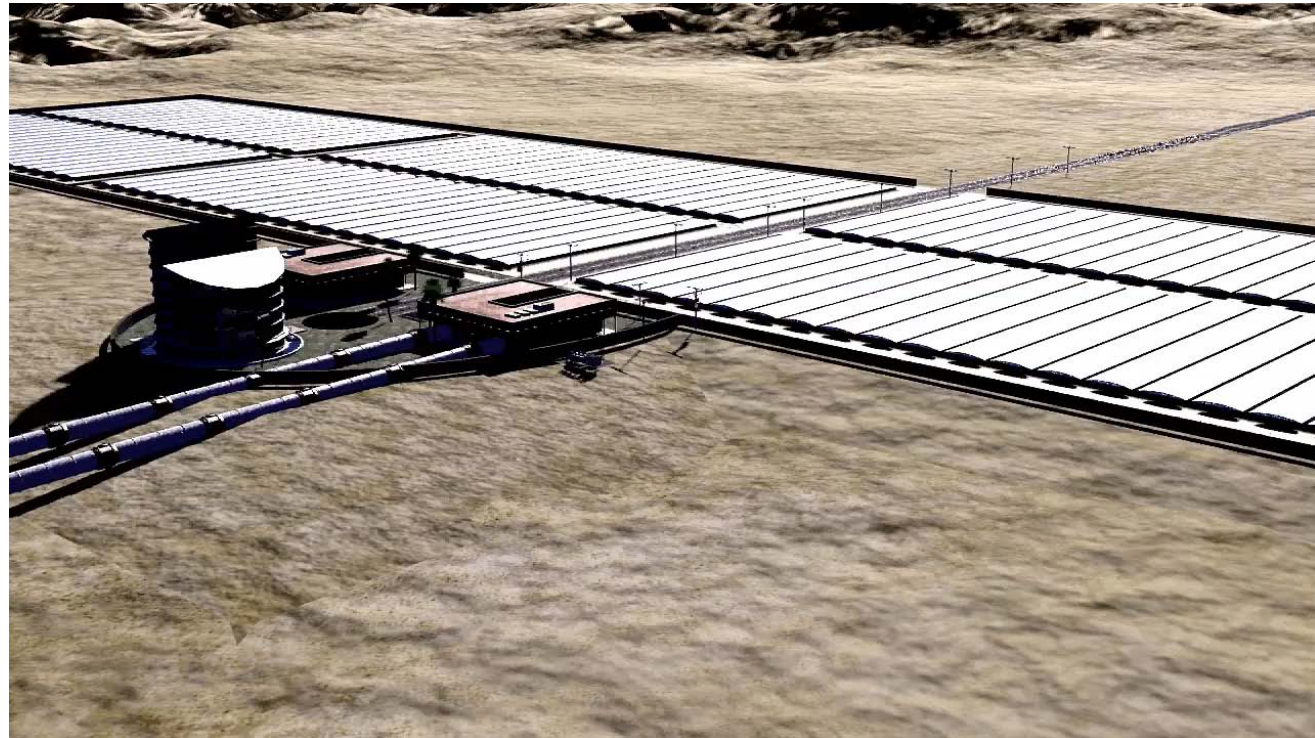
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Let us push the button of **MES** for a  
bright future and  
endless low cost electricity and  
water for the GCC