



الهيئة العربية للطاقة المتجددة  
ARAB RENEWABLE ENERGY  
COMMISSION



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# The Future of Renewable Energy and Green Hydrogen in Arab World and Arab Economy integration is Essential for New Era of Eco Social of the Globe

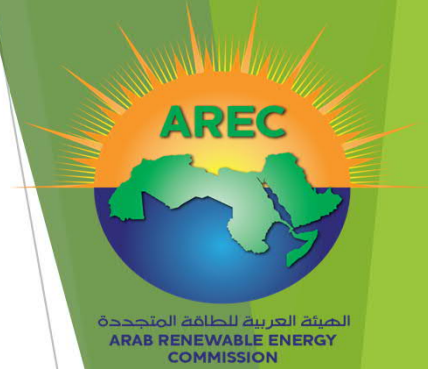
By Eng. Mohammed Al Ta'ani

Secretary General

Arab Renewable Energy Commission

Chairman of the Jordanian Renewable Energy Society

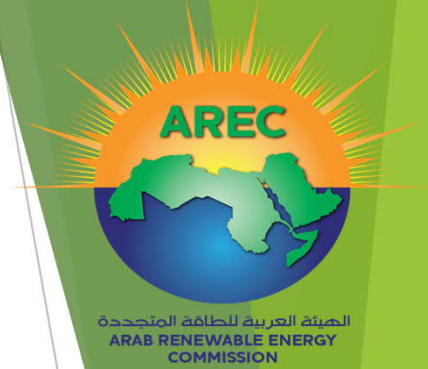
# Renewable Energy & Sustainability in the World



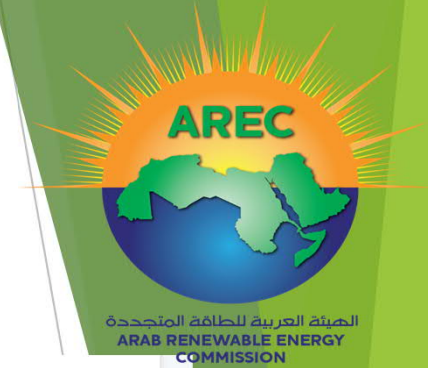
- ▶ The humanity lives nowadays in transition conditions: economy, political, energy social, climate change, and all other crisis issues .
- ▶ All decision makers in the world should work together scientists, politicians, business leaders, and effective people to help in achieving sustainability and peace.
- ▶ One Grid for Electricity Smart Grid International connections will accelerate The new Era of Green Energy RE, EE , EVs and Smart cities.
- ▶ Arab World with lead in both in traditional energy sources and RE Technologies lead by KSA.

# RE & EE investments & Energy Transition in Arab by 2020-2050

- ▶ More than one trillion dollar by 2050
- ▶ Target more 90 Giga watt from RE
- ▶ Jordan 2600 Mwp already achieved until 2023
- ▶ KSA expected 59 Gwp e.g of Renewable Energy About 100 billions dollars Green hydrogen dollars investment in RE , EE Smart Neom city and EVs by 2030 KSA vision
- ▶ EE 20 % by 2025 encourage Smart Grid EWE in the Arab countries.
- ▶ Total expected Electricity demand 300 GW by 2050

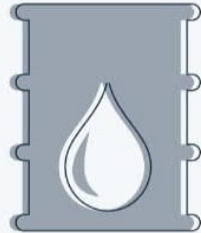
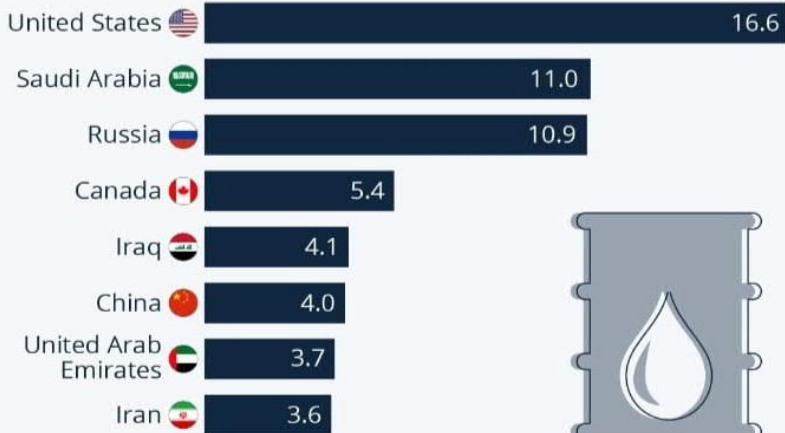


# Relation between EVS and oil producers countries



## The World's Biggest Oil Producers

Oil production by country in 2021 (in million barrels per day)



Includes crude oil, shale oil, oil sands, condensates and natural gas liquids.

Source: BP

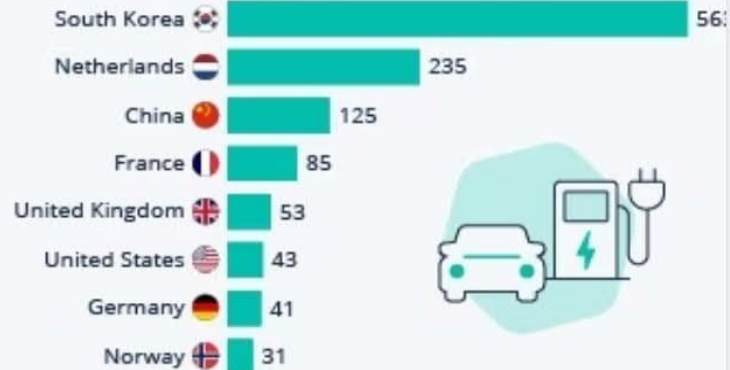


## The World's Largest EV Markets

Sep 25, 2023

### EV Infrastructure: South Korea Leads the Charge

Number of public charging stations per 1,000 plug-in electric passenger cars in 2022\*



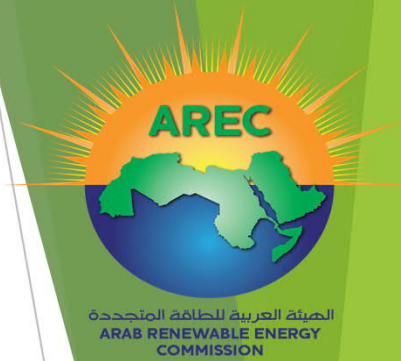
\* Selected major EV markets, incl. battery electric vehicles and plug-in hybrids

Source: IEA

EV Charging



# The Importance of Green Hydrogen technology globalization



The fuel of future

Contribute directly to Climate changes

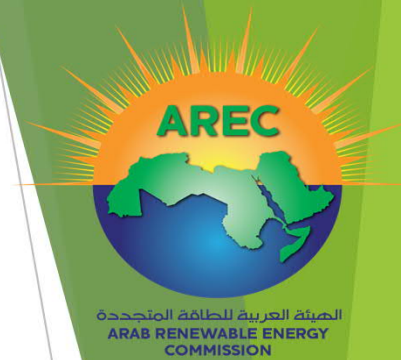
Net Zero Emissions

Decrease Pollutions

Integrated with Renewable energy technology as very good solution for energy storage

Reduce the pollution harmony on the grid from Renewable energy sources

# Green Hydrogen Road map in Arab Countries green is essential Why ???



Location and Renewable Energy sources from Solar Energy. And others

Richness of **oil** and **natural gas** in the Arab world

Lead the green hydrogen market

More independent for sustainability for green generations

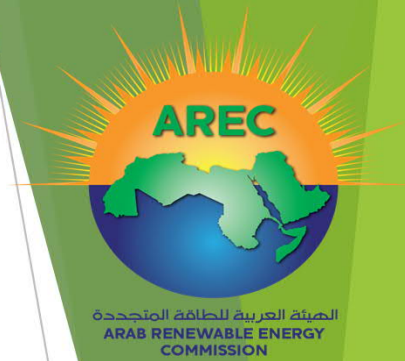
Not to repeat oil and gas scenario ???!! just producing but contribute to industry and technology

New green jobs careers

Sharing in the industry for example green Hydrogen Vehicles

# Green Hydrogen production challenges

## Water Land Cost



Cost of green hydrogen around 7.8 \$ /Kg where grey hydrogen is 1 \$ /Kg

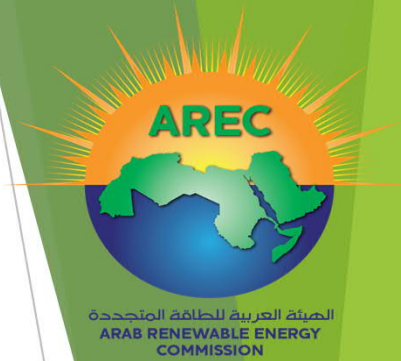
Plant size

Land PEM Electrolyser 8-13 Hectare for 1 GW

Land Alkaline Electrolyser 10-17 Hectare for 1 GW

Water requirements 960 liter per kg of hydrogen

# Social and Economy Aspects for green hydrogen on the Arab Countries



Create new green jobs careers

Replace foreign companies with private sectors gradually

Increase R& D and innovations Institutions

Skilled Engineers and Technicians

Infra structure for Smart cities

Hydrogen and Evs vehicles future up to 300 millions vehicles by 2040 and more than 60 % from hyrogen by 2050



# التنمية المستدامة (Sustainability)

## اساس التنمية المستدامة

UN Sustainable goals

أمن الطاقة. أمن المياه

أمن الغذاء

المحافظة على البيئة

قال رسول الله سيدنا محمد  
صلى الله عليه وسلم :  
"الناس شركاء في ثلاث  
الماء والكلا والنار."

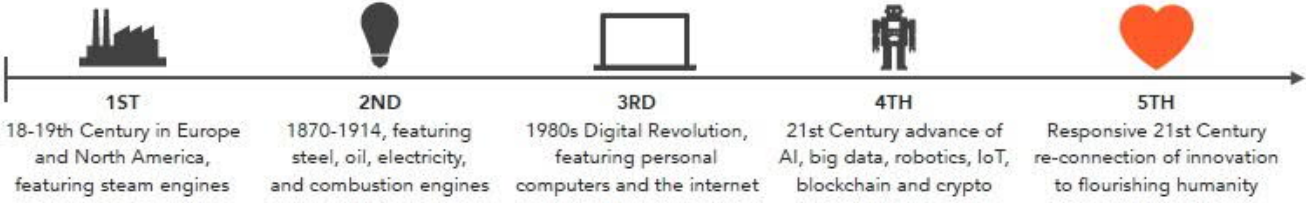
### SUSTAINABLE DEVELOPMENT GOALS



# Industrial Revolutions

The Fifth Industrial Revolution will see much more advanced collaborative interactions between humans, machines, processes and systems for maximum performance optimization industry 5.0 Is All Set to Highlight the Significance of Humanity at Workplace

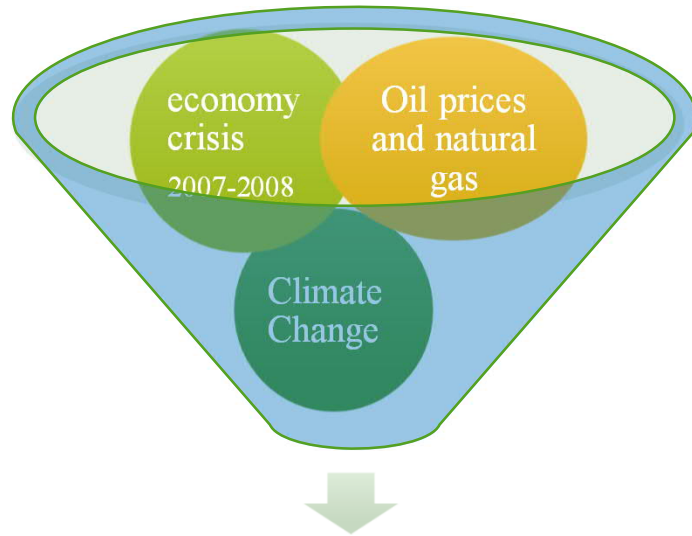
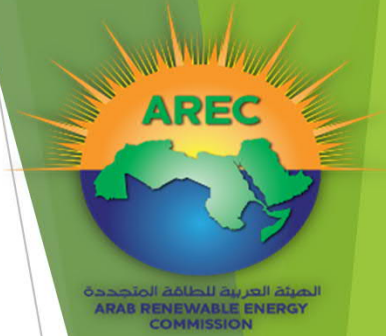
## INDUSTRIAL REVOLUTIONS



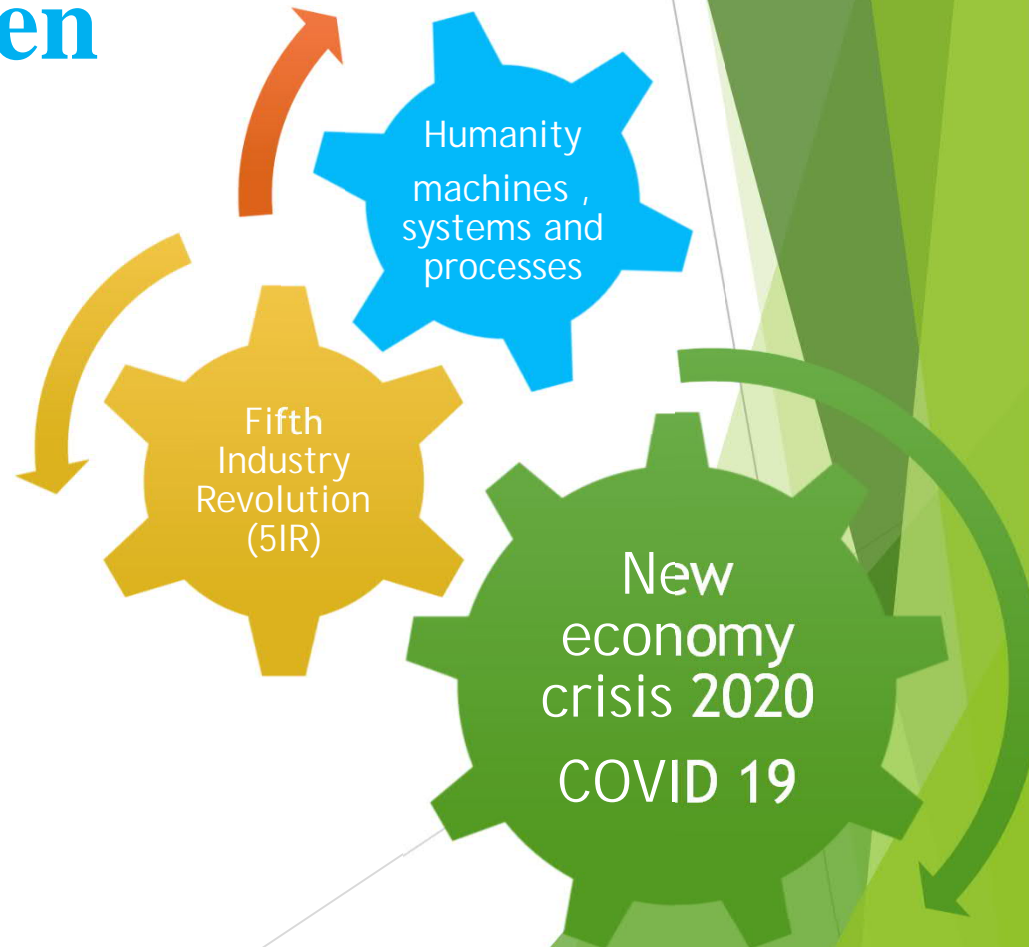
© 2019. 5th Element Group PBC.



# Renewable Energy development History with new Ara of green Hydrogen



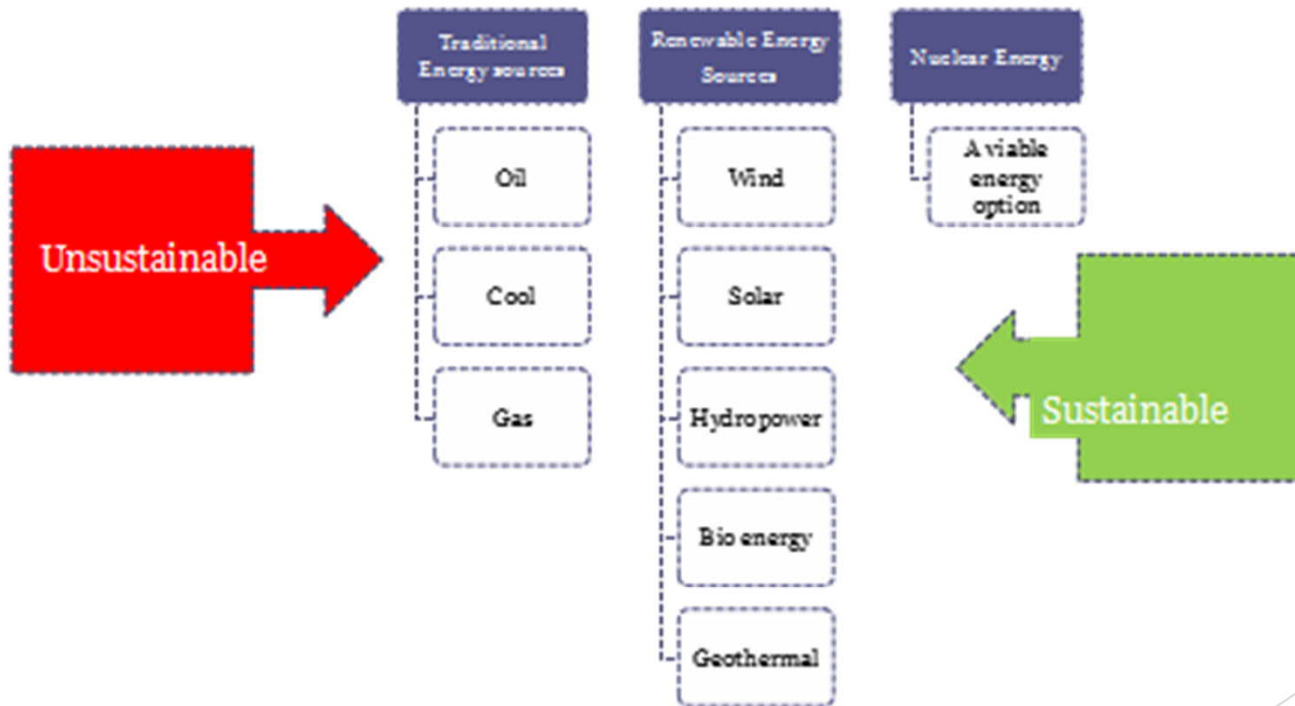
most industrial countries (G8) in 2008 designed economy recovery packages include "green stimulus" measures





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# Global Energy Sources

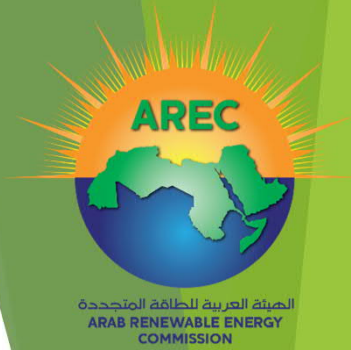


# Solar becomes the new king of electricity...

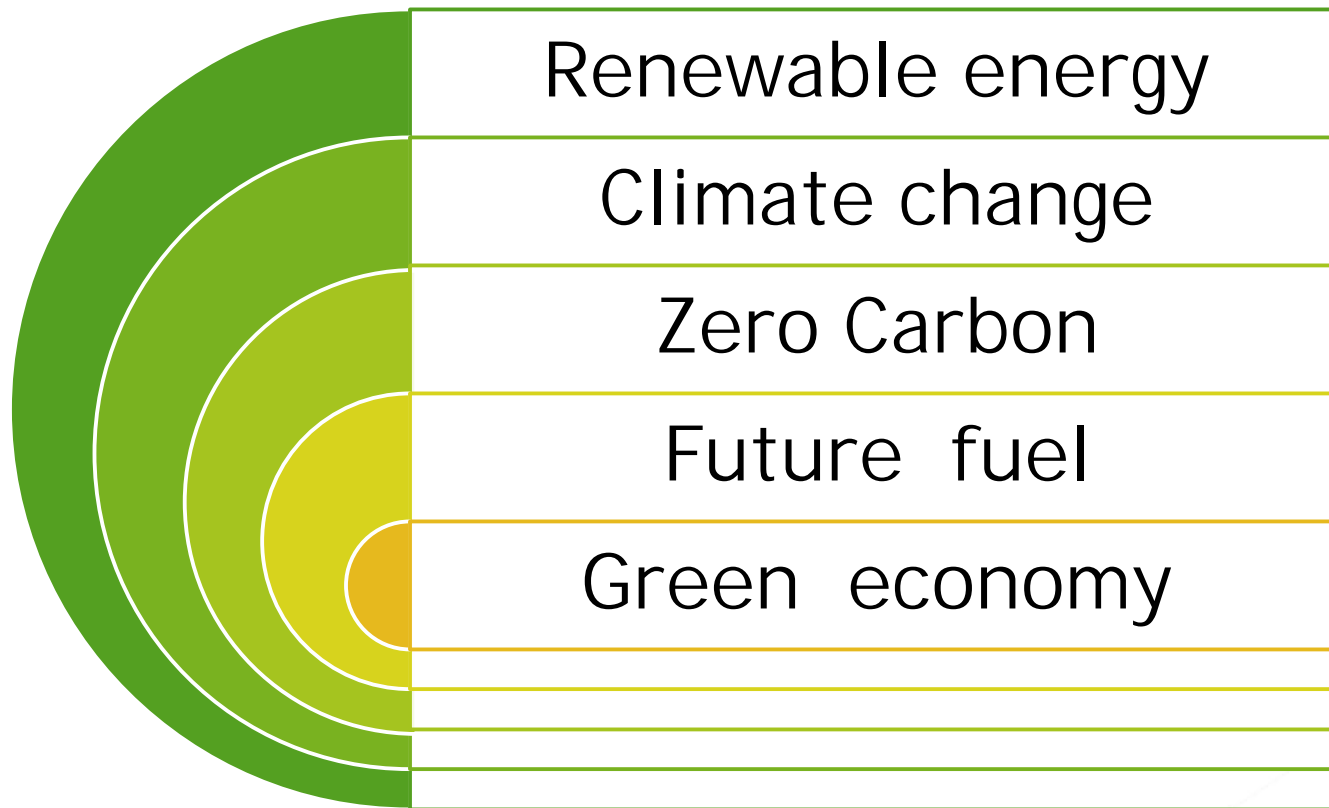
In 1979 Solar watt  
was cost 75 \$  
Nowadays 0.50 \$

Countries in the solar belt are blessing with direct free energy comparing with cool weather countries need 80% energy for space heat .

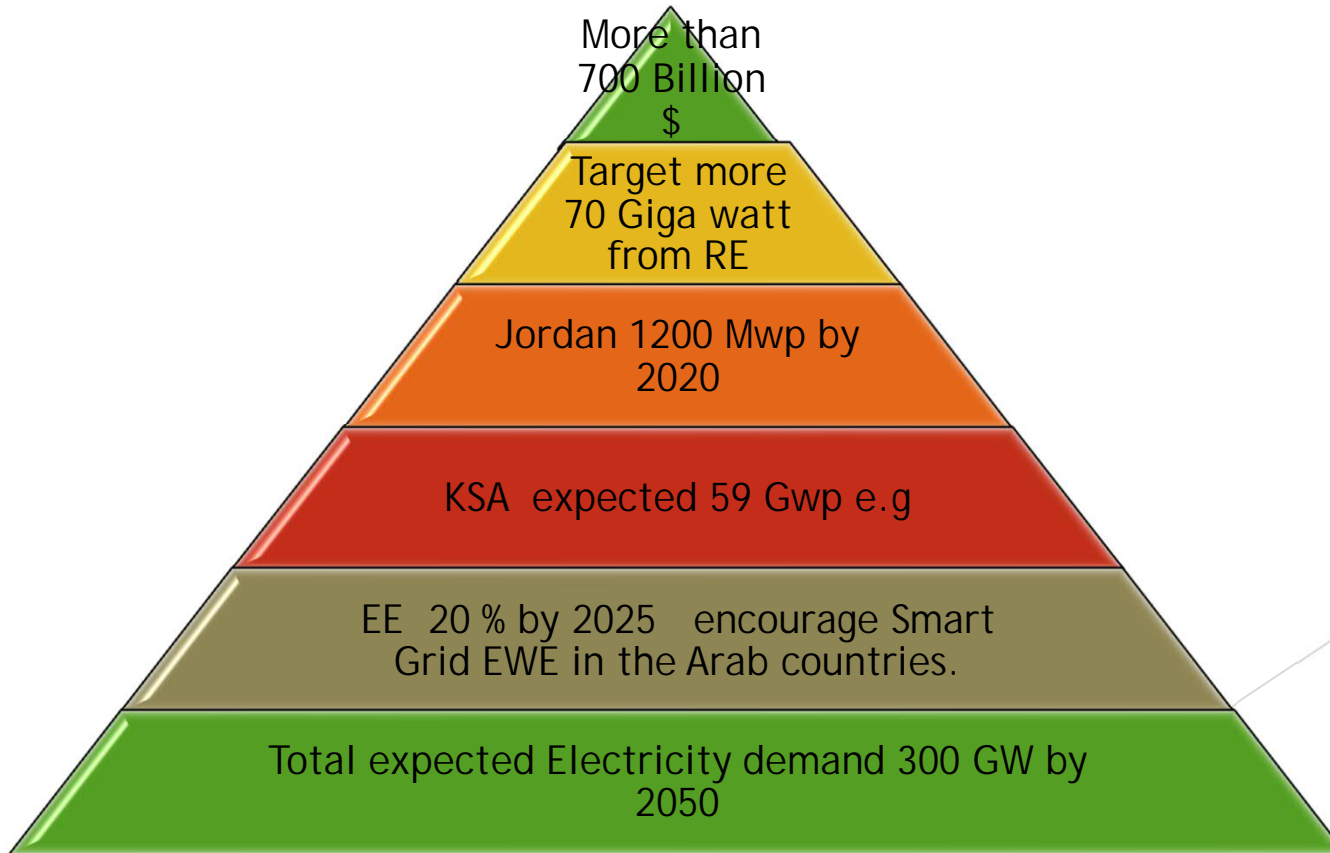
Sun is the main  
source of all  
kinds of energy



# Green Hydrogen future



# RE & EE investments & Energy Transition in Arab by 2020-2050



# Arab RE & EE Strategy



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## Arab Renewable Energy Commission- AREC

**Our target by 2030 for all Arab Countries**

The Proper use of Energy & Energy management should be The policy (Energy Mapping for Energy Mix) for Energy security & Continuity of Energy in all Arab countries

يجب أن يكون الاستخدام السليم للطاقة وإدارتها هو  
سياسة (رسم خرائط الطاقة لمزيج الطاقة) لأمن الطاقة  
والاستمرارية في جميع الدول العربية

**30 % Renewable Energy**

**30% Energy Efficiency**

**40 % Electric Vehicles**

**40 % Smart Cities**



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# Smart Cities



METROPOLIS  
03/26/2019

# Green Hydrogen Generation by Renewable Energy Sources

7:16 PM

... 0.1KB/s



HYDROGE...



Source: [www.hysolutions-hamburg.de](http://www.hysolutions-hamburg.de)

Fourth International Investment Forum for Renewable Energy and Energy Efficiency IIFREEE 2017, 5-7 December 2017 - Jordania.

### 6. POWER TO GAS.

The diagram illustrates the 'Power to Gas' process. It shows an 'ELECTRICITY NETWORK' on the left, which feeds into 'Wind', 'Solar', and 'Other renewables'. This network is connected to 'CHP, Turbines' and 'POWER GENERATION'. A 'NATURAL GAS NETWORK' is shown on the right, which can be used 'for heat' or 'for transport'. The process involves 'POWER STORAGE' and 'Gas storage'. Key components include 'Electrolysis, H<sub>2</sub>-Tank' producing H<sub>2</sub>, a 'CH<sub>4</sub>/CO<sub>2</sub>-Tank (Biogas-Tank)' receiving 'Biogas' from a 'Biogas plant' (which uses 'Biomass, Waste'), and 'Methanation' which produces 'CH<sub>4</sub>' and 'Renewable Power Methane, integrated in a biogas plant'. The final output is 'CH<sub>4</sub>/CO<sub>2</sub>'.

Source: Solar Fuel.

Fourth International Investment Forum for Renewable Energy and Energy Efficiency IIFREEE 2017, 5-7 December 2017 - Jordania.

### 6. POWER TO GAS.

This diagram shows Audi's 'e-gas supply' process. It starts with 'Wind Energy' connected to a 'Power Network'. The process involves 'H<sub>2</sub> Extraction' and 'Generation of e-gas'. The 'e-gas' is then used in an 'e-gas Station' to supply an Audi car. The Audi logo is prominently displayed.

Source: Audi.

Fourth International Investment Forum for Renewable Energy and Energy Efficiency IIFREEE 2017, 5-7 December 2017 - Jordania.

### 7. HYDROGEN AS AN ALTERNATIVE FUEL. DIRECTIVES

DIRECTIVE 2014/94/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
of 22 October 2014  
on the development of alternative fuels infrastructure

# ENERGY BALANCE

Energy Economics  
and Policy  
اقتصاديات وسياسة  
الطاقة

Energy storage  
تخزين الطاقة

RE&EE are the twin  
pillars of sustainable  
energy policy. كفاءة  
الطاقة والطاقة المتجددة  
توأمة الطاقة المستدامة

Energy continuity  
استمرارية الطاقة

Conventional  
energy (oil and  
natural gas) الطاقة  
التقليدية (البتترول والغاز  
الطبيعي)

Main factors of energy transition  
العوامل الرئيسية لانتقال الطاقة  
Energy balance ميزان الطاقة

# Fifth Industry revaluation (5IR) need to apply “9Gs” Concept



- 1- Green Generation
- 2- Green schools
- 3- Green Culture
- 4- Green Buildings
- 5- Green Energy
- 6- Green transportation
- 7- Green Renaissance
- 8- Green Economy
- 9- Green Government



- Smart Solution of EWE grid solutions
- Reduce Green House effect

# Green Generation



# Social aspects of Renewable Energy In Arab Worlds



# 4smart Sustainability 4all

## 2050



- ▶ **Smart Energy**
- ▶ **Smart Grid**
- ▶ **Smart cities**
- ▶ **Smart E vehicles**



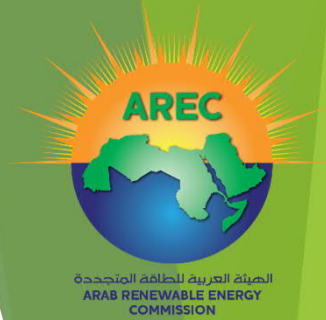
SMART CITY

▶ E World for the 4<sup>th</sup> Energy Generation Revelation and Artificial Intelligence as the entry of Sustainability for all

▶ The expectations of Primary Energy Requests will be down in 2050 compared with from energy requirements nowadays and more demand of electricity today in of electricity for 4Smart renaissance .

▶ **Electricity demand increase by 150 % by 2050**

# 4Smart Sustainability 4all



Smart Energy (Energy management : Savings ,efficiency improvements + Renewable Energy )

Smart Cities (Random and Upgrade the existing Cities)

Smart Vehicles ( Electrical + hydrogen ex: Tesla company 700 billion )

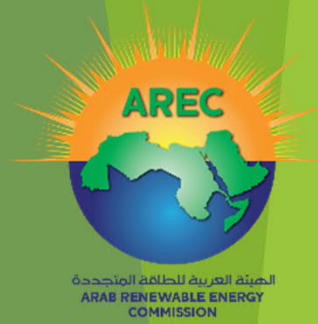
Smart Grid ( Electricity , water , Energy Transition )

SMART Management

Smart : Specific ,Measurable , Achievable ,Realistic , Timely bounded



Thank you



**Think Green**

**Go Green**

**Green Generations**

**Green Schools**

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