



ASSESSMENT OF SOLAR AND WIND ENERGY POTENTIAL IN QATAR

02nd JOINT QATAR-JAPAN ENVIRONMENT SYMPOSIUM(QP-JCCP)
21 JOINT GCC-JAPAN ENVIRONMENTAL SYMPOSIUM
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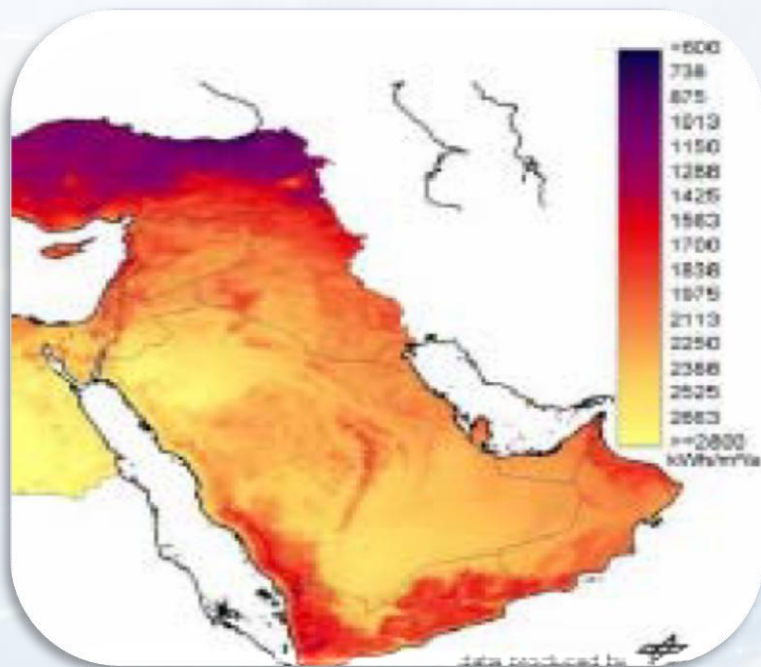
GCC Area

Population of GCC is 0.6% of the world.
GHG emissions from the region is 2.4% of the World.



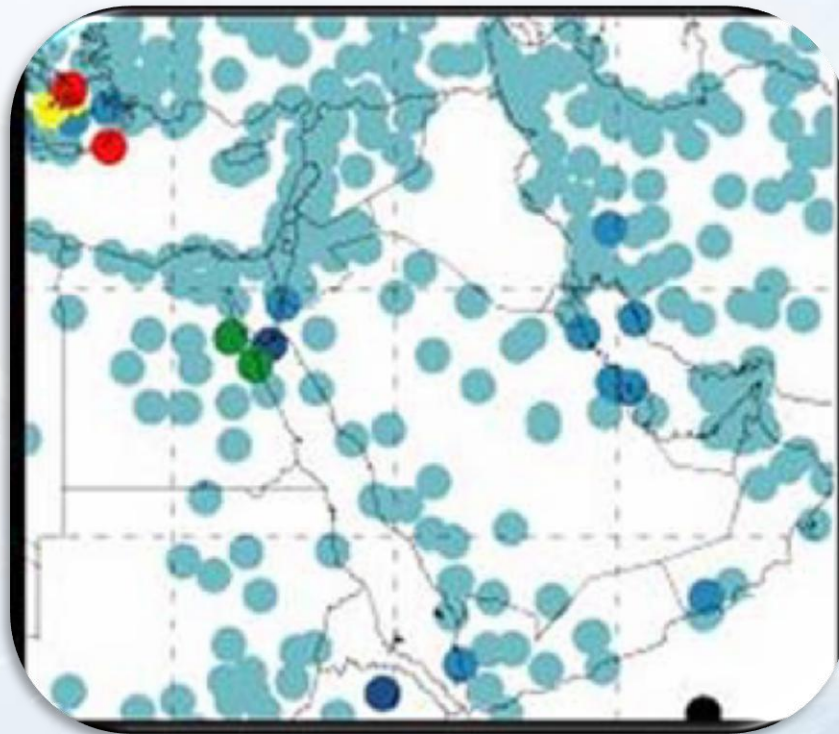
Per capita emissions from GCC countries is large. Therefore, there is a need to reduce emissions. Major contribution to GHG emissions is power generation sector where opportunities exist.

Annual Direct Normal Irradiance (DNI) in GCC



- DNI of Qatar is 2008 kWh/m²/y
- Qatar Global Solar Radiation is 5100 W/m²
- Energy per day is 5.5 kWh/m²
- Average sunshine duration is 9.4 hr/day

Average Wind Speed over GCC



Wind classes at 80 m

- 1 ($V < 5.9$ m/s)
- 2 ($5.9 \leq V < 6.9$ m/s)
- 3 ($6.9 \leq V < 7.5$ m/s)
- 4 ($7.5 \leq V < 8.1$ m/s)
- 5 ($8.1 \leq V < 8.6$ m/s)
- 6 ($8.6 \leq V < 9.4$ m/s)
- 7 ($V \geq 9.4$ m/s)

Wind speeds over Qatar

1

Annual mean wind speed over land is 4.3 m/s

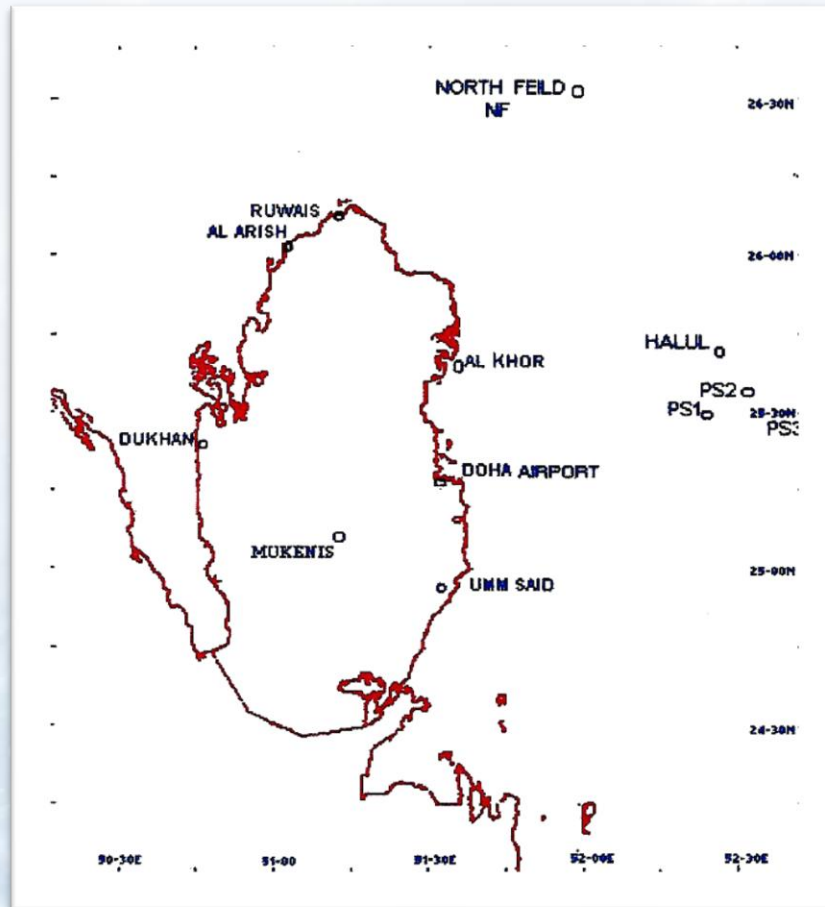
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Over off-shore areas, mean annual wind speed is 5.7 m/s

3

Wind energy potential for 5 m/s is 150 W/m²

Wind monitoring network in QATAR

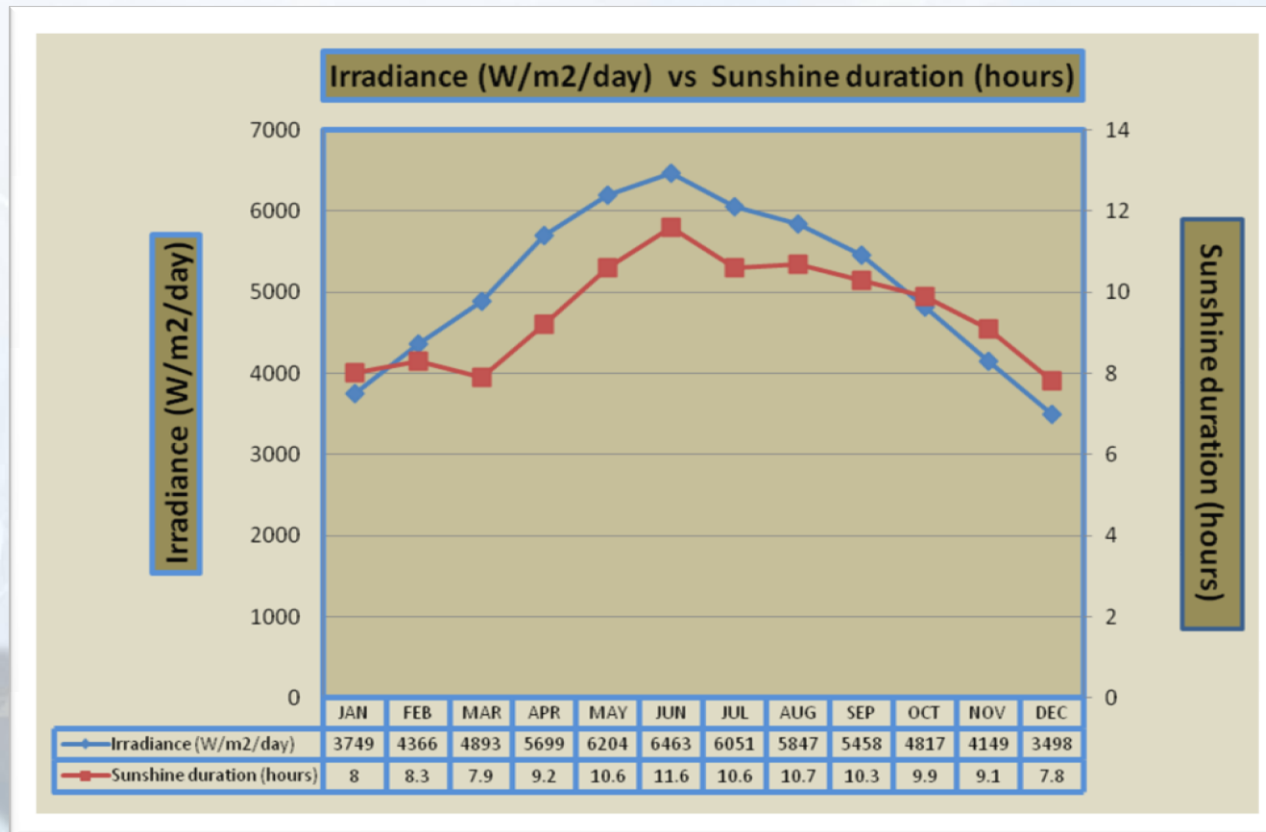




Details of Wind Monitoring Network and Data Averages

S No.	Station Name	Latitude	Longitude	Data averaging
		Degree N	Degree E	Period
1	Doha Intl AP	25 15	51 34	1974-2000
2	Al Arish	26 04	51 05	1984-1993
3	Al Khor	25 41	51 30	1983-1992
4	Dukhan	25 25	50 47	1981-1995
5	Mukenis	25 07	51 13	1985-1995
6	Mesaieed	24 56	51 34	1984-1993
7	Halul Island	25 40	52 25	1984-1996
8	PS1	25 30	52 23	1984-1996
9	PS2	25 36	52 32	1984-1996
10	PS3	25 26	52 44	1984-1996
11	PS4/North Field	26 32	51 57	1992-1996

Solar irradiance and sunshine duration at Doha



Special weather at Doha

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
FD	3.3	2.5	1.1	0.3	0.4	0.6	0.6	0.6	1.4	2.0	1.3	3.0
CD	1.7	2.4	4.3	2.5	0.7	0.0	0.3	0.2	1.0	3.1	2.2	1.4
SS/HZ	0.3	0.2	0.5	0.5	0.3	0.9	0.9	0.3	0.1	0.1	0.2	0.2

Solar Energy Feasibility

UNEP study showed:

- ❖ DNI of 1800 kWh/m²/year is enough for CSP (Concentrated Solar Power) plants
- ❖ DNI of 2000 kWh/m²/year is considered feasible
 - DNI of Qatar is 2008 kWh/m²/year
 - For PV plants, Qatar is highly suitable.

Economics

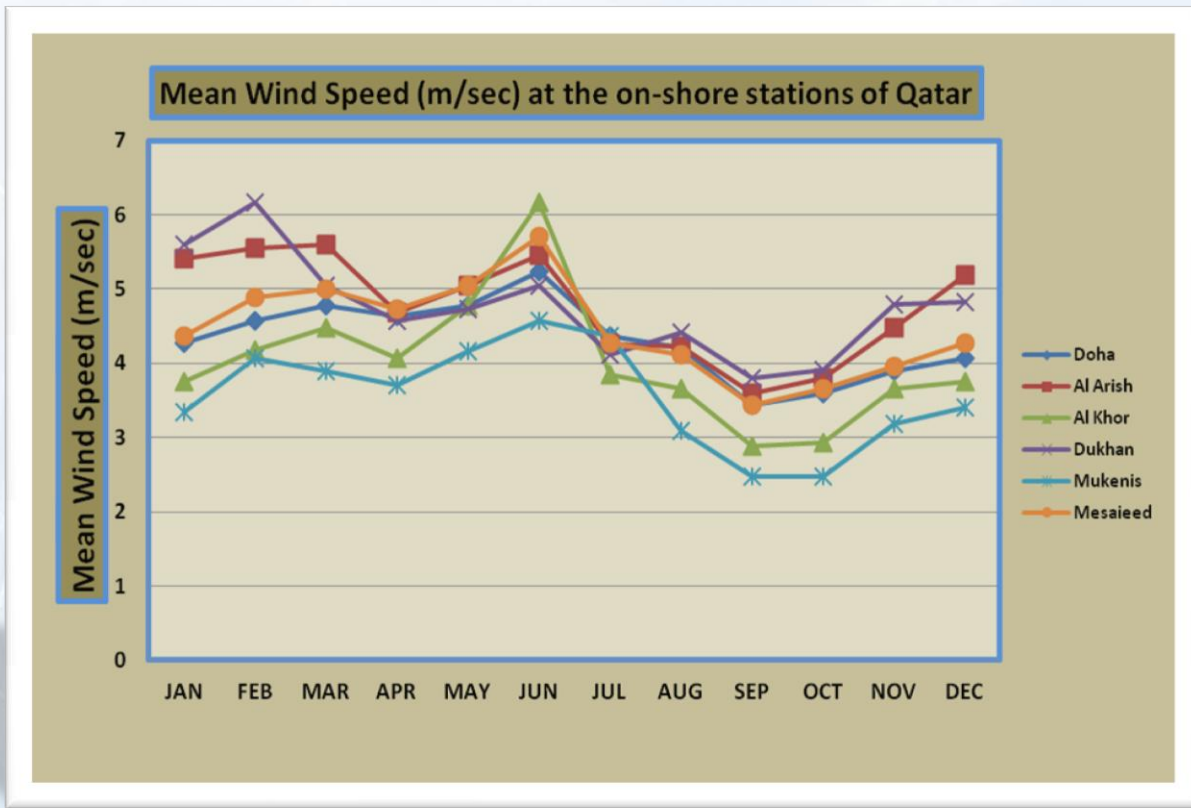
- ❖ For generation capacity of 100 MW
- ❖ PV based power generation is about 0.121 US\$ per kWh (no emissions during generation)
- ❖ Gas based power cost is 0.0537 US\$ per kWh (with emissions to environment). Also, gas reserves are limited in time period.
- ❖ PV generation need 4 acres of land for one MW power generation and it is more for CSP. Maintenance cost is more in CSP
- ❖ Cost factor for PV generation 2.25 (with gas based)

Qatar's voluntary initiatives

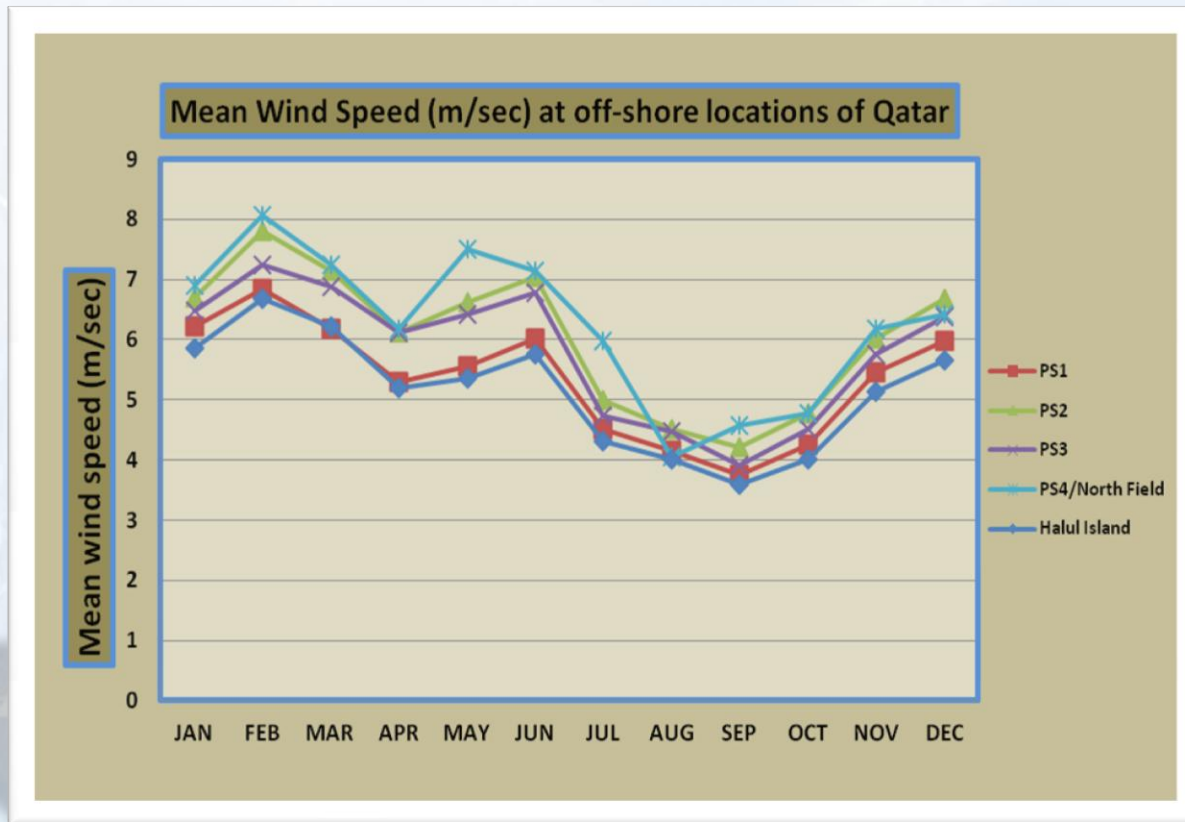
- ❖ US\$ 1 billion investment for producing 8000 MTPY of poly silicon at Ras Laffan
- ❖ 200 MW power project plan by Kahramaa
- ❖ 2022 FIFA cup in Qatar will be first carbon neutral world cup using solar energy for air conditioning and fan zones
- ❖ QN Food Security program is to use solar power desalination plants
- ❖ **New Student Complex of Qatar Foundation to use solar power**
- ❖ **Mushereib Properties to use solar power**



Mean monthly wind speed over on-shore stations in Qatar



Mean monthly wind speed over off-shore stations of Qatar



Wind energy potential in Qatar

- ❖ 80% of the time wind speed over Qatar is over the critical speed of 3 m/s
 - ❖ Economic feasibility value of full load hours is 1400.
 - ❖ Full load hours in Qatar is 1421
- (Bahrain: 1360, Kuwait: 1605, Oman: 1463, UAE: 1126, KSA: 1789)
- **Wind power generation is (8%) lower than gas fired electricity**
 - **Cost at off-shore locations is 10% less than gas based generation.**
 - **QATAR CAN HAVE MEDIUM AND SMALL WIND TURBINES**

Initiatives in Qatar

- ❖ No immediate plan for wind turbines
- ❖ However, during COP18, MOU signed with International Renewable Energy Agency (IRENA) for Global Renewable Energy Atlas Initiative.
- ❖ COWI feasibility study showed a large potential exist along Qatar-Bahrain Causeway (both wind and solar)

Conclusions

- ❖ Large solar energy potential exists in Qatar. Some initiatives were already taken.
- ❖ Good and economically feasible wind energy exists in Qatar. Medium wind turbines can be adopted immediately.
- ❖ Proposed Qatar Bahrain causeway project provides large opportunity for both solar and wind energy projects for both the countries.

Qatar-Bahrain Causeway (40 km) to support both railway and road



Architect view of Qatar-Bahrain Causeway



Model view of Qatar-Bahrain causeway



CSP model for Qatar-Bahrain causeway





Typical Off-shore wind turbines(Denmark)



Typical PV generation station(USA)





04 December 2012 - Peninsula
Kahramaa plans 220MW solar power project

Tenders by first quarter of 2013

DOHA: Qatar General Electricity and Water Corporation (Kahramaa) has announced the launch of a 220 megawatts (MW) solar energy power project at the COP18/CMP8 here yesterday. The estimated \$30m worth initial phase of the project would be tendered in the first quarter of 2013. The second phase would be completed over the next eight years, Essa bin Hilal Al Kuwari, President of Kahramaa, said in the presence of Minister of Energy and Industry H E Dr Mohammed bin Saleh Al Sada.

Renewable energy is a one of the strategic choices that reflect Kahramaa's commitment to the international efforts to address the environmental problems and issues, particularly climate change. Although the State of Qatar is one of the world's main exporters of oil and natural gas, and that a large part of its economic interests is linked to these vital resources, it is aware of its global responsibility.

Al Kuwari said the energy production in Qatar is mainly based on the use of natural gas as a fuel to produce electricity. It is sold to power plants at subsidised prices that are much lower than the international prices. Generating one kilowatt of electricity from other renewable resources, such as solar energy, represents a saving in the cost of production.

"So we can take advantage of gas sale in the world market at international prices instead

addition, it will result in positive environmental benefits in reducing emissions of harmful gases, mainly CO₂, in the light of fulfilling the requirements of economic and environmental development in line with the Qatar National Vision 2030".

Al Kuwari said the proposed 200MW solar project would be implemented in two phases: the first includes the implementation of five to 10 megawatt pilot projects costing about QR109.5m or \$30m. The engineering, construction and operation projects of this phase will be tendered in the first quarter of next year.

The second phase will include review and study the business model based on the results of projects of the first phase to consider the possibility of involvement of the private sector investment that will provide mutual benefit to the Corporation and the private sector.

"We will implement projects with a production capacity in the range of 150-200 megawatts over the next eight years at the corporation's stations and its lands. The project implementation will help make use of the under-utilized lands.

"Kahramaa, ever since its inception in 2000, have been acting in accordance with best international and local standards as Qatar National Vision 2030 envisages environment management that ensures the harmony between economic and social and development. Al



Minister of Energy and Industry H E Dr Mohammed bin Saleh Al Sada (right) and President of Kahramaa Essa bin Hilal Al Kuwari during a press conference at Qatar National Convention Center yesterday. (SHAIVAL DALAL)

Qatar cautious on fuel subsidy: Al Sada

DOHA: There is no question of Qatar reforming its energy and water subsidy policies before assessing its possible impact on local economy. The country has to consider the health of its economy while discussing any reforms in its subsidy issues, Minister of Energy and Industries H E Dr Mohammed bin Saleh Al Sada said here yesterday.

Dr Al Sada was replying to a question whether Qatar has

supplies, as the reform in the subsidies has been cited as one of the best solutions to contain the emission rate.

The notion of cheap and expensive is relative to different economists. The issue of Qatar's subsidy is closely linked to our local economy. We are looking it at how a change in the subsidy would impact the local economy in terms of inflation and other fundamentals, Dr Al Sada said.

We have to look into many

decision. "If you look at Qatar, we have adjusted our energy tariffs a number of times, depending on how the economy would react to that decision. Of course, we are moving ahead... but would definitely look at the health of economy before taking any decision on fuel subsidies..", the minister said.

A series of side events held as part of the COP18 saw animated discussions how further momentum could be created for the reform of fossil-fuel subsidies in



Qatar joins project to map renewable

DOHA: The Ministry of Energy and Industry, in partnership with the Qatar National Food Security Programme (QNFSP), yesterday signed a Letter of Interest (LoI) signifying Qatar's participation in the Global Atlas for Solar and Wind Energy project of the International Renewable Energy Agency (IRENA).

Issa Shahin Issa Al Ghanim, Director of Qatar Petroleum's Strategic Planning & Policy Directorate, signed the LoI in the presence of Adnan Amin, Director-General of IRENA, and Fahad bin Mohammed Al Attiya, Executive Chairman of the QNFSP. The signing ceremony was held at the Qatar National Convention Centre on the sidelines of the United Nations Climate Change Conference (COP18/CMP18), which is being held in Doha.

Under the terms of the LoI, Qatar will share solar data with IRENA in partnership with the QNFSP, which is the custodian of



Issa Shahin Issa Al Ghanim, Director of Qatar Petroleum's Strategic Planning & Policy Directorate, Amin, Director-General of IRENA, exchange signed documents in the presence of Fahad bin Mohammed Al Attiya, Executive Chairman of QNFSP.

such data. The sharing of data will be coordinated by the New Energy Department of QP's Strategic Planning and Policy Directorate.

The Global Atlas for Solar and Wind Energy project aims to create a collaborative internet-based geographic information

system (GIS) for wind resources that can enhance cooperation scenarios and strat

energy resources

support decision-making, especially in areas where existing information is insufficient.

The idea for the Global Atlas first took shape in a series of international workshops in 2010. The project is an initiative of the Clean Energy Ministerial's Solar and Wind Working Group, which is backed by ministers from 24 countries and aims to accelerate the global transition to clean energy. IRENA is playing a lead role in the creation of the atlas by working with other international institutions.

Once completed, the Global Atlas for Solar and Wind Energy will enable users to conduct a technical analysis of the renewable energy potential at any geographic scale, such as globally, per continent, by region, or country. In addition, it will also allow real-time calculation of specific indicators, including CO2 reductions, total investment, market volumes and employment volumes.

The potential end-users of the

Global Atlas for Solar and Wind Energy will range from policy-makers and government authorities, investors and developers, academics and the interested public.

Fahad said the existing maps and data collections of renewable energy resources are often narrowly focused, inconsistent and limited. Data consistency is crucial to compare and develop strategies and to take joint decisions. "As of now, there is no single reliable source that would give an idea to the investors where to put their money in the renewable sector. The mapping would give an opportunity for both the domestic and international investors how to exploit Qatar's renewable sources in a sustainable manner".

He hoped the mapping would accelerate progress towards harnessing Qatar's vast solar and other renewable sources, in order to meet its growing domestic demand and to promote sustainable energy use.

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Alternative energy key topic at Arab power me

DOHA: The private sector is set to play a key role in the development of the Arab region's emerging renewable energy sector.

SMEs will be another active player, top policy makers announced at the opening session of the 4th General Conference of Arab Union of Electricity and exhibition that got underway here yesterday.

Delivering the key note address, the Minister of Energy and Industry H E Dr Mohammed bin Saleh Al Sada said Qatar is committed to launch a leading Arab initiative to support alternative energy resources. There would be broad partnerships between public and private sectors that would be contributing to this sector.

Dr Al Sada said the tenders for Qatar's proposed 150GW solar power generation project would be floated during the first quarter of 2013. The project will be implemented in two phases. The second phase might be restructured based on the assessment of the outcome of the initial phase. There will be massive involvement of the private sectors and corporations in terms of investments, he said.

The Assistant Secretary General for Economic Affairs of the League of Arab States Dr Mohammed bin Ibrahim Al Twajri said the private sector would emerge as a major force in investments in the region's hugely projected renewable energy generation.

He said the region would see a major leap in the generation of renewable energy in the coming years. The Arab Fund for Economic and Social Development has already launched a feasibility study of its proposed programme. The study is expected to be completed this year. The World Bank is conducting a parallel study. The study



The Minister of Energy and Industry and Chairman and Managing Director of Qatar Petroleum H E Dr Mohammed bin Saleh Al Sada cutting the ribbon to open the 4th general conference of Arab Union of Electricity and in Doha yesterday.

would look into the possibilities of a common electricity and gas link of the Arab Union, he said.

Dr Mohammed said the Arab Fund's meeting scheduled to be held this month in Riyadh would also discuss the possibilities of issuing uniform guidelines in the utility of power. The use of nuclear power in the desalination process is another issue to be discussed in the Riyadh meet, he said.

The President of Arab Union of Electricity Mohamed Ridha ben Mosbah noted the region's solar energy resources are spread across a vast 300 sq km area. By 2011, the Arab region was expecting to generate 69GW of solar energy, an annual increase of 50 percent.

Egypt, Tunisia, Morocco are going in a big way. The region is also going in full force for the establishment of smart grids.

At least 4 million sm have been installed across the region, in 2011. This is a 100 per cent increase compared to the previous year.

Taner Yildiz, Minister of Energy and Natural Resources of Turkey, Essa bin Ibrahim Al Kuwari, President of the Arab Union of Electricity and Gas Corporation (Kahran) spoke.

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08 Jan 2013

Thank You