

like to take the technology to other GCC countries," says Al-Jaber.

The same goes for commercial solar power. In partnership with Adwea, Masdar is planning to build the Gulf's first – and the world's largest – solar plant. Expected to have capacity of at least 100 MW, the plant is part of a much wider solar drive.

Through the Masdar research network, advanced solar research and development is being undertaken at six institutions in North America, Europe and Japan. In time, the research may well be carried out at the Masdar Institute in Abu Dhabi, which has been set up in co-operation with the Massachusetts Institute of Technology to provide research-driven post-graduate courses. The \$250 million Masdar clean tech fund, launched in 2006 in partnership with Credit Suisse and Consensus Business Group, has invested in German photovoltaics (PV) firm Sulfurcell. And Masdar is working on building a world-scale polysilicon factory in Abu Dhabi to provide feedstock to PV cell and module manufacturing. "We are attacking solar across the spectrum – it is a cornerstone of our technology focus," says Al-Jaber.

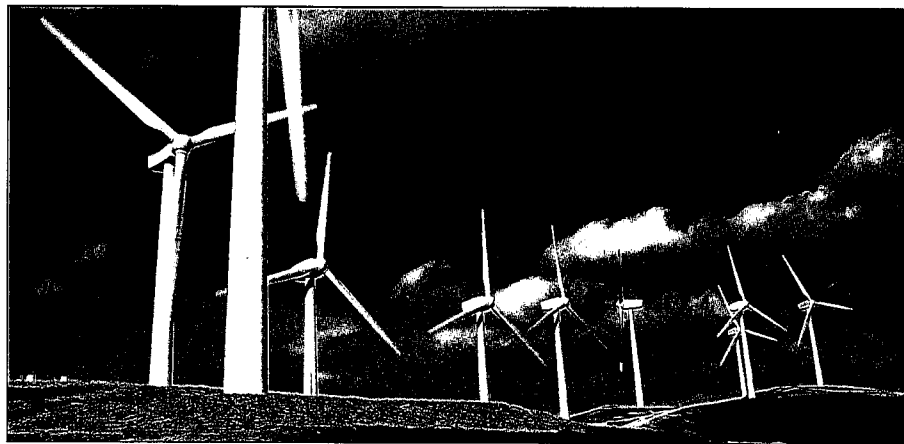
Sustainable and alternative energy programmes have a patchy track record in the Gulf. But Masdar is aiming to change all that. In its favour, the initiative enjoys high-level political support, it has access to the latest technology through its partners and it has strong economic and environmental incentives to succeed. Says Al-Jaber: "With our deep energy experience and financial resources, we are in a very strong position to pursue this initiative in a very aggressive way."

Angus Hindley

RENEWABLE ENERGY

Seeing the light

As the costs of extracting oil and gas rise, the Middle East is looking at alternative sources of energy



Dreamstime

■ **BIG IDEA:** Adopting renewable energy allows oil producers to maximise export potential

In 2005, renewable energy sources contributed about 10 per cent of world supplies, with the Middle East being one of the lowest consuming regions of wave, wind and solar energy. But things are set to change.

With growing public concern about the influence of human activity on the world's climate combining with advances in alternative energy technology, an increasing number of people are changing their views towards alternative energy.

A 2005 study by the German Aerospace Centre (DLR), Med-CSP, projected that energy demand in the Middle East and North Africa (MENA) region would triple by 2050. With dwindling oil resources driving up the cost of hydrocarbons extraction, governments across the region are beginning to consider the merits of meeting domestic energy demand from alternative sources. Not only would this prolong the lifespan of their hydrocarbons reserves, but it also maximises their export potential.

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SPECIAL REPORT: POWER & WATER

"It will take time for the region to embrace renewable energy," says Georg Brakmann, chairman and co-founder of Germany's Fichtner Solar. "But the driving force is there. It makes sense for them to save their oil, so I think they will come round to it."

Solar power has by far the greatest potential for the Middle East. With one or two exceptions – notably North Africa and Oman – the MENA nations enjoy very little wind, and the opportunities for wave and geothermal energy are limited. But clustered as they are around the subequatorial deserts of Africa and south-west Asia, they have no lack of sunlight.

According to the DLR study, the region's current potential for power generated by wind, wave, geothermal and biomass combined is 761 terawatt hours a year (TWh/y – see table). The same study estimates that solar power has the potential to generate 629,875 TWh/y; Algeria alone could produce enough solar power to meet the world's entire energy requirements.

Decisive shift

"It might be a bit early for us to expect an explosion of alternative energy projects in the region," says Henner Gladen, chief technical officer of Germany's Solar Millennium. "But I am convinced that in the years ahead we will see a definite move towards renewables. Solar power is the most elegant way for any country in the world to meet its Kyoto goals."

In remote parts of the region, where the extension of the energy grid is not financially viable, there is a niche for small, photovoltaic



■ BRAKMANN: Region 'will come round'

(PV) generators to supply outlying settlements. But the wider application of PV power is itself limited by high costs and, for the foreseeable future, by the vast proportion of solar power that will come from concentrating on solar thermal plants.

In 2006, Algeria awarded a contract for its first solar/thermal hybrid power plant, and two more are on the drawing board as Algiers drives towards its aim to produce 700 MW a year (MW/y) in renewable energy by 2010 and 7,500 MW by 2020. Egypt and Morocco are set to award contracts for similar schemes in the coming months.

Plans for renewable energy are beginning to take shape elsewhere in the Middle East.

Tehran has been researching options for a solar/gas hybrid since 1997, and although it was forced to downgrade its plans in 2005 after failing to secure funding from the World Bank's Global Environment Facility, it still has plans to build a 17-MW solar field.

Abu Dhabi has commissioned Fichtner to carry out detailed feasibility studies for a solar facility – either hybrid or stand alone – and industry sources suggest that Dubai may follow in its footsteps.

The cost comparison of hydrocarbons versus solar is gradually shifting in favour of the latter.

"Costs are being reduced in three ways," says Gladen. "Technical advances and economies of scale are raising productivity and efficiency, and as the number of solar component suppliers and subcontractors increases, competition will drive down construction costs."

The DLR's study predicts that renewable sources will account for more than 50 per cent of the world's energy supply. Dominated as it is by the trappings of its hydrocarbons industry, it is hard to imagine this being true of the Middle East. But none of the world's regions can ignore the inexorable trend towards cleaner and more sustainable energy.

"If decision-makers in the Middle East are rational, they will move towards renewable energy," says Brakmann. "More and more of our problems are not the limitations on energy supply. It is the climate of the world in which we live, and we are all responsible for it."

Richard Nield

RENEWABLE ENERGY SUPPLY POTENTIAL

(Units=TWh/y)

Country	Hydropower		Geothermal		Biomass		Concentrated solar power		Wind		Photovoltaic	
	Tech	Econ	Tech	Econ	Tech	Econ	Tech	Econ	Tech	Econ	Tech	Econ
Middle East												
Bahrain	5	na	na	na	na	0.2	36	33	na	0.1	na	0.3
Iran	88	48	na	11.3	na	32.7	>	20,000	na	8	na	16
Iraq	90	67	na	na	na	8.6	30,806	28,647	300	10	na	6.8
Jordan	na	0.1	na	na	na	1.6	6,434	6,429	109	2	na	4.5
Kuwait	na	na	na	na	na	0.8	1,525	1,525	na	na	na	2.5
Lebanon	2	1	na	na	na	0.8	19	14	9	0.2	na	1.5
Oman	na	na	na	na	na	1.1	20,611	19,404	44	8	na	4.1
Qatar	na	na	na	na	na	0.1	823	492	na	na	na	1
Saudi Arabia	na	na	na	70.9	na	9.9	125,260	124,560	300	20	na	13.9
Syria	7	4	na	na	na	4.7	10,777	10,210	98	12	na	8.5
UAE	na	na	na	na	na	0.7	2,078	1,988	na	na	na	3
Yemen	na	na	na	107	na	9.1	5,143	5,100	8	3	na	25.8
North Africa												
Algeria	5	0.5	na	4.7	na	12.1	169,440	168,972	7,278	35	na	13.9
Egypt	80	50	na	25.7	na	15.3	73,656	73,656	7,650	90	na	36
Libya	na	na	na	na	na	1.7	139,600	139,455	5,363	15	na	3.9
Morocco	5	4	na	10	na	14.3	20,151	20,146	1,188	25	na	17
Tunisia	1	0.5	na	3.2	na	3.2	9,815	9,244	50	8	na	5
Total	1751	1751	2323	2323	116.9	116.9	629,875	629,875	2363	2363	156.9	156.9

TWh/y=terawatt hours a year; Econ=economic potential: that which could become competitive in the medium-long term due to technical development and economies of scale; Tech=technical potential: that which in principle could be accessed for power generation using current technology; na=not available

Source: German Aerospace Centre (DLR), 2005