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ENVIRONMENT

Desert Dreams.

Abu Dhabi is investing billions in oil and gas profits to turn itself into the world's leader in renewable energy

BY BRYAN WALSH

If you want to see the future of sustainable design, drive southwest from Abu Dhabi's international airport, stop when you come to the desert—and use your imagination. You're standing in what will be Masdar City: a radically innovative development powered entirely by renewable energy. Created by the British architect Norman Foster, the new city will be the centerpiece of the Masdar Initiative, a multi-billion-dollar project to promote Abu Dhabi, the hydrocarbon-rich capital of the United Arab Emirates (U.A.E.), as a hub for alternative energy and sustainability.

Masdar City is little more than a dream in the desert today, but the beginnings of Abu Dhabi's transformation are visible in a field of 25 different solar panels sprouting from the sand near the construction site. The shimmering silicon modules are being run through an 18-month field test to determine which kind of photovoltaic technology will work best in this hot and dusty environment. The winner will help power Masdar City - and, eventually, perhaps much of Abu Dhabi, as scientists here learn to tap a renewable energy source that could ultimately be as powerful as the oil that has made this region so wealthy. "I think there is great potential here," says project manager Sameer Abu Zaid, as he tours the testing facility, the call to evening prayers echoing over the empty desert. "This is very exciting for us?"

What's happening in Abu Dhabi could be very exciting for the rest of us, too - and very surprising. The emirate is the world's fifth largest exporter of oil and sixth largest producer of natural gas, making it immensely rich, with per-capita GDP' of \$63,000, compared with \$45,000 in the U.S. and U.K. With global demand surging, the price of Abu Dhabi's exported oil is now about four times higher than in 1999. So the notion of this fossil-fuel colossus supporting alternative energy might seem a bit like a heroin dealer trying to sell aspirin. But the Masdar Initiative is much more than a fig leaf to cover Abu Dhabi's contributions to climate change. Through investments in clean-technology companies, a sustainability research center, major green power developments, and Foster's city, Masdar represents a dramatically new direction for Middle Eastern energy. Fossil fuels won't last forever, and the need to cut greenhouse-gas emissions could force a quicker transition away from petroleum. Middle Eastern nations that want to remain viable in the next century can't rely entirely on hydrocarbons. With Masdar, Abu Dhabi maybe pointing the way to the long-term prosperity of the Middle East.

"People are excited about this," says Maria Carvalho, an analyst at the London-based environmental research firm New Carbon Finance. "Nowhere else in the Middle East has there been such a commitment toward clean energy." Sultan Ahmed Al Jaber, Masdar's intense, 35-year-old CEO, has even bolder ambitions, telling TIME: "We will position Abu Dhabi as the hub of future energy."

It's easy to dismiss these grandiose visions as mere rhetoric. After all, the U.A.E. currently gets none of its energy from renewable sources, and the World Wildlife Fund has sized up its citizens with the biggest carbon footprint in the world. (The government disputes that calculation.) But Masdar has something that green dreams elsewhere in the world tend to lack - vast amounts of money, and a far-sighted government willing to

invest it in projects that may take decades to pay off. Launched in early 2006, Masdar was quickly able to take advantage of hundreds of millions in government funding. But that was just seed money. Last month, at the emirate's inaugural World Future Energy Summit - a sustainability conference that attracted some 4,000 officials, energy experts and businesspeople from around the world - Abu Dhabi's Crown Prince Sheikh Mohammed Bin Zayed Al Nahyan announced that the government would pour an additional US\$ 15 billion into Masdar. That sheer financial tonnage puts Abu Dhabi far above its Persian Gulf neighbors on any green ranking, and positions it as a global player. "They are putting real money on the table to get this done," says Nicholas Parker, chairman of the Cleantech Network, which tracks sustainability investments. "This is how you can tell they're serious."

Masdar won't say exactly how the crown prince's check will be spent, but the program doesn't lack for range. The company has already invested \$250 million in clean-tech companies from around the world, and expects to launch a second and third fund in the near future. Another arm of the company will play the growing carbon market, brokering investments to reduce greenhouse-gas emissions under the U.N.'s Clean Development Mechanism. Larger projects are in the works at home as well. At the Future Energy Summit, Masdar officials announced a deal with British Petroleum and Rio Tinto for the emirate to build one of the world's first commercial hydrogen power plants, a 500 MW operation slated to cost at least \$2 billion. The plant will tap Abu Dhabi's abundant natural gas, transforming it into hydrogen and carbon dioxide, with the hydrogen used for electricity and the CO₂ captured, keeping it out of the atmosphere. The result is clean power from fossil fuels - a Masdar priority—and shows that Abu Dhabi's half-century of experience with hydrocarbons could also lend it powerful expertise when it comes to renewables. "Abu Dhabi is ideally suited to develop this project because of the experience it has with fossil fuels," says Ron Heyselaar, who runs the hydrogen program for Masdar. "It's a match made in heaven."

One of the best hopes for alternative power in Abu Dhabi - and throughout much of the sun-baked Middle East - is large-scale solar energy, and here too, Masdar is preparing investments. Masdar City will be mostly solar-powered using traditional rooftop photovoltaic panels, but the company also plans to build a 500MW concentrated solar power (CSP) plant in the nearby town of Madinat Zayed. CSP is solar with a difference: instead of transforming sunlight directly into electricity, CSP uses vast arrays of parabolic mirrors to collect and focus the sun's heat, which is then converted to power. It's ideal for hot, sunny desert conditions, and it's scalable—meaning that given enough space, CSP plants could potentially supply significant chunks of a country's electricity supply, not the negligible quantities that re-newables mostly contribute today. Algeria already has a 150-MW CSP plant planned for 2012, with grand plans of exporting up to 6 giga-watts (GW) of solar power to southern Europe by 2020. Abu Dhabi's CSP plans are initially more modest than those of its larger North African competitor, with its first plant set for 2010, but Masdar's greater funding and international support make it the better long-term bet. "The region is rich in fossil fuels for the time being," says Klaus Toepfer, the former head of the United Nations Environment Programme. "But this region will be rich in sun for all time—and there could be a new boom here if these

technologies are developed.”



Recycling wealth Profits from Abu Dhabi's fossil fuel ventures, such as the gas line at Tawwelah, left, are funding the emirate's green initiatives.

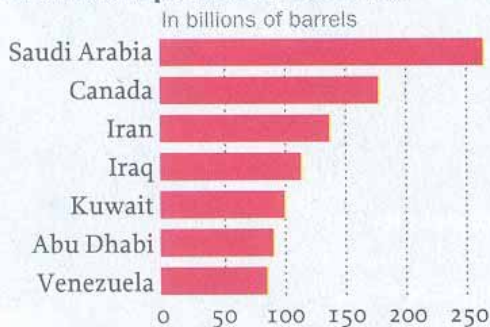
Most significant of all may be Masdar City itself. While Abu Dhabi, like so many hurriedly built cities around the developing world, sprawls with little design and has almost no public transit, Masdar City will be as dense as a circuit board - a 2.3-sq.-mi. (6 sq km) walled community designed to be car-free and served by magnetic trains.

A desalinization plant for water will run on solar power, and conservation needs will keep water use 60% below the norm; all waste will be composted and recycled a major feat in a world that's increasingly awash in trash. If all goes according to Foster's plan, 50,000 people will be living in the city by 2016, many of them working for the renewable-energy businesses that Al Jaber hopes Masdar's environment – and preferential tax scheme – will attract.

With more than half of the world's population now living in cities and the pace of urbanization only increasing, how we build cities will decide how we handle the perils of climate change. Masdar offers a holistic model for future urban development, a way to grow cities without choking on our own exhaust. “No one has been presented with the challenge and the opportunities that exist when you (deal with) the scale, the size of this community”, says Foster. “The waste systems, the sewage, the transport, the desalinization – this has never been done before. It like putting a man on the moon.

Petro Power. With the price of its oil exports surging, Abu Dhabi is one of the richest places in the world

Estimated proved oil reserves



Crude oil export price



GDP per capita



Sources: Oil & Gas Journal; Moody's Investors Service

Foster's dream won't lack for funding. At the ground breaking ceremony on February 9, Masdar announced that its new city will have a budget of US\$ 32 billion, with US\$ 4 billion from the company and the rest through outside investments, including carbon trading that would monetize the greenhouse-gas emissions reduced by the city's creation. Foster is grateful for the canvas that Masdar offers, but he does wonder why the West is merely watching while Abu Dhabi leads the way. "This initiative is] in urban terms the most progressive, radical thing happening anywhere," he says. "Where is America on this? 'Where is Europe? Where is the U.K.?"

Which begs another question: Why Abu Dhabi? An accident of geography made the emirate a world leader in the energy industry, but global warming is hanging the business, with the market for renewables growing rapidly around the world. "We recognize that the energy market is evolving," says Al Jaber. "What does that mean for us? Does that mean a threat, or an opportunity?" Masdar is Abu Dhabi's way of ensuring it's the latter; the government is using the profits of today to prepare its economy for a future beyond petroleum. That means investing not just in technology, but in human capital. Like many of its gulf neighbors, the U.A.E. spends relatively little on research and development. It has been easy to get away with that in the fossil-fuel era, but the alternative-energy sector requires a more high-tech, highly educated workforce. So together with the Massachusetts Institute of Technology, Masdar is also building a graduate-level school devoted to sustainability, which will develop homegrown scientific talent for the renewable age.

The Masdar Institute of Science and Technology (MIST) will be the first tenant in Foster's city, and Al Jaber hopes the academic-corporate connection will help make Abu Dhabi "the Silicon Valley of renewables." "This is an amazing change of direction for a Middle Eastern country," says Russell Jones, a former president of the University of Delaware in the U.S., who was tapped to lead MIST. "This is how you prepare for the end of oil."

Nonetheless, few of Abu Dhabi's neighbors are following the same path. The Organization of Petroleum Exporting Countries (OPEC) did recently launch a \$750 million fund to study climate change, but gulf nations too often remain obstacles to international efforts to reduce greenhouse-gas emissions, fearing that cutting carbon means killing their economies. While a few have begun to follow Abu Dhabi's lead—Qatar is serious about wind and hydropower, and Dubai has a program to mandate the construction of green buildings—most of the Middle East is doing little to address a future beyond petroleum. Egypt is typical—high-ranking officials have spoken of the need to develop alternatives, and the country officially targets producing 20% of its power from renewables by 2020, but little real progress has been made. "The future for oil and gas production is bleak," says Ha-tern Khairy, an Egyptian energy consultant. "We need a national policy decision to have clean energy."

For the foreseeable future, indeed, even Abu Dhabi is convinced that oil and gas will remain the main driver of wealth creation. As impressive as Masdar is, the initiative is

not meant to replace petroleum, just supplement it, and there's little indication that the U.A.E. or any Middle Eastern country is ready for the abrupt shift away from fossil fuels that might be necessary if the world truly wants to fight global warming. In a rare interview, Yousef Omais Bin Yousef, CEO of the Abu Dhabi National Oil Company—which controls the emirate's vast reserves of fossil fuels — smiles serenely when asked if he sees the emirate's focus on renewable energy as a threat. "I don't see Masdar as a competitor, or an alternative," he told TIME. "The world will need more energy, and there is room enough for both. These renewables won't happen overnight." You'd be relaxed, too, if you were Bin Yousef. "Our oil is not run-fling out," he says. "It will stay with us for 80, 90 years, and we can improve on that." Masdar may have \$15 billion to spend, but the U.A.E. earns \$225 million in revenue from petroleum every day.

And that's the catch. What's happening in Abu Dhabi is remarkable—and all the more so because it is happening in Abu Dhabi. But like so much of the action underway elsewhere in the green sector, the excitement doesn't yet match the scale of the economic and social sea change needed to stem global warming. Still, Masdar is a great beginning, and it might just help to rouse laggards like the U.S. into action. You certainly won't hear negativity from Al Jaber, who has nothing but the highest expectations for Masdar. "I want to see us developing solar-power plants in Abu Dhabi and elsewhere," he says. "I want to see the city done. I want to see the institute up and running. I want to see us deploying some of the technologies we are researching. And I want to see the returns from the clean-tech fund we are investing. We have a long list of milestones." If he can achieve all that, then Masdar will prove to be much more than just a beautiful mirage in the desert.

COURTESY – TIME (By Bryan Walsh)