Iraq solar thermal energy

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In October 2012, the Iraqi government announced plans for 400 MW of solar in Iraq at a cost of $1.6 billion, inviting a range of international companies to submit studies. One justification for this, aside from the obviously high solar irradiance that Iraq receives, was that the power plants would not require fuel, which would gradually offset the initial investment cost from the government.

This plan never gained momentum, but Iraq is now re-visiting this unexploited potential. Iraq"s 2018 Reconstruction and Development Framework envisioned over 400 MW over seven installations and while there are still obstacles to achieving this target (touched upon here) circumstances are much more favourable due to the rapid cost reduction in solar power since 2012.

We asked energy expert and 2018 Iraq Energy Forum speaker Martin Healy to discuss some of the challenges and opportunities facing solar power in Iraq, with a particular emphasis on its range of applications across the region and how these might be applied in Iraq.

IEI: When we talk about solar power as a solution for countries with high solar irradiation, high energy intensity due to AC demand and growing per capita income, it"s often simply discussed as "solar energy." But that encapsulates an array of options for a country like Iraq and every arid country faces different choices when it comes to maximizing solar"s potential, ranging from combined cycle plants to concentrated solar power and using solar for enhanced oil recovery. Can you explain more?

MH: Yes, you"re exactly right. Iraq gets an enormous amount of sunlight, with high solar irradiation - or power per unit area received from the sun - and over 3,000 hours of bright sunshine per year. Solar power should be considered one of Iraq"s greatest national resources and harnessed to the greatest degree possible.

As you note, however, not all solar energy is created equal. Most people are familiar with solar photovoltaics (PV), which usually comes in the form of panels that include the PV cells and associated equipment that convert sunlight directly into electricity. There are a few different types of PV, and costs are dropping radically as the technology gets much more efficient and manufacturing uses fewer materials and becomes more automated. The problem with PV, however, is that you only get power when the sun is out. So, you either need some type of battery to store the power for later use or build enough capacity into your grid to cover the periods of solar intermittency.

Another type of solar power is concentrating solar thermal. This technology uses mirrors to focus the sun"s light on a working fluid, which creates steam that can be used directly as heat or to drive a turbine to produce electricity. There are a few ingenious ways to do this, from sky-high solar "power towers" that concentrate light from thousands of mirrors on a collector tower to smaller solar troughs that focus light on a heating tube. While not as cost competitive as PV in generating power, solar thermal comes with a unique ability to use and

store energy in the form of heated fluids. So, each form of solar power has its own unique advantages.

I particularly like the idea of solar power for Iraq because of its synergistic use with the oil and gas industry. Studies have shown that nearly 10% of extracted oil is ultimately consumed in the process of oil production, transportation, and refining. The oil should be conserved and monetized to the greatest extent possible. Solar PV plants could help electrify most of the equipment at the wellpad through a microgrid, as well as powering part of the transport and compression along pipelines.

You mentioned enhanced oil recovery (EOR), or the process of reinjecting pressure into an oil well to increase flow. U.S. company Glasspoint Solar is building a huge 1 GW EOR solar thermal facility in Oman, where aging oil wells need constant repressuring. It"s basically a huge greenhouse, which protects the mirrors used to create the steam for the well. The Glasspoint facility will produce about 6,000 tons of solar steam each day for thermal EOR operations when complete. This will avoid the use of gas to create the steam.

Using natural gas with solar is even more complementary. Gas plants can be started and stopped relatively quickly, and ramped up and down to efficiently match power demand, which works well to complement solar when there is no sun. Solar thermal plants in particular can be integrated with combined cycle plants. Both technologies essentially create steam to drive a turbine, and integrated gas/solar plants use a super-sized turbine to create more power. Iraq flares an inordinate amount of natural gas and, if and when that gas is captured and used for domestic power, solar/gas hybrid plants should be built to provide the most efficient supply of power.

IEI: In a recent report, Frost and Sullivan suggested Iraq may be able to install 5GW of solar by 2028. They calculated this might cost $50 billion (a figure which also includes 1 GW of wind power.) On an annual basis, that is more capital expenditure than Iraq currently injects into electricity development. What are the challenges for a country like Iraq, with high energy subsidies and a lagging legal framework for energy investment? Is solar any different to other sources of energy in this regard?

MH: I"ve seen the Frost and Sullivan report, and just to be clear the $50 billion investment figure is for all energy sources, from capacity expansion to desperately needed upgrades to transmission lines and substations. It"s a lot of money, but to properly build a modern network and get power to the people you have to address the impact of years of war on the grid. Iraq"s technical line loss is estimated at around 50 percent, so you essentially have to produce about two kilowatts of power to get a kilowatt of power through the lines to the end user. Another 20 percent or so is lost to poor revenue collection. Not very good economics.

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