



Iraq Energy Forum 2018

Regional Models for Iraq Renewable development

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What's the Challenge?

Finding reliable, cost effective, and realistic renewable solutions for Iraq domestic power generation



Roadmap to Iraq's Solar Potential

- u *What the current power situation?*
- u *Why Solar as a solution*
- u *Possible regional solar power models at a glance*
- u *Need for solar specific laws and regulations*
- u *What's next?*
- u *U.S. commitment*

Domestic Generation Dominated by Hydrocarbons...

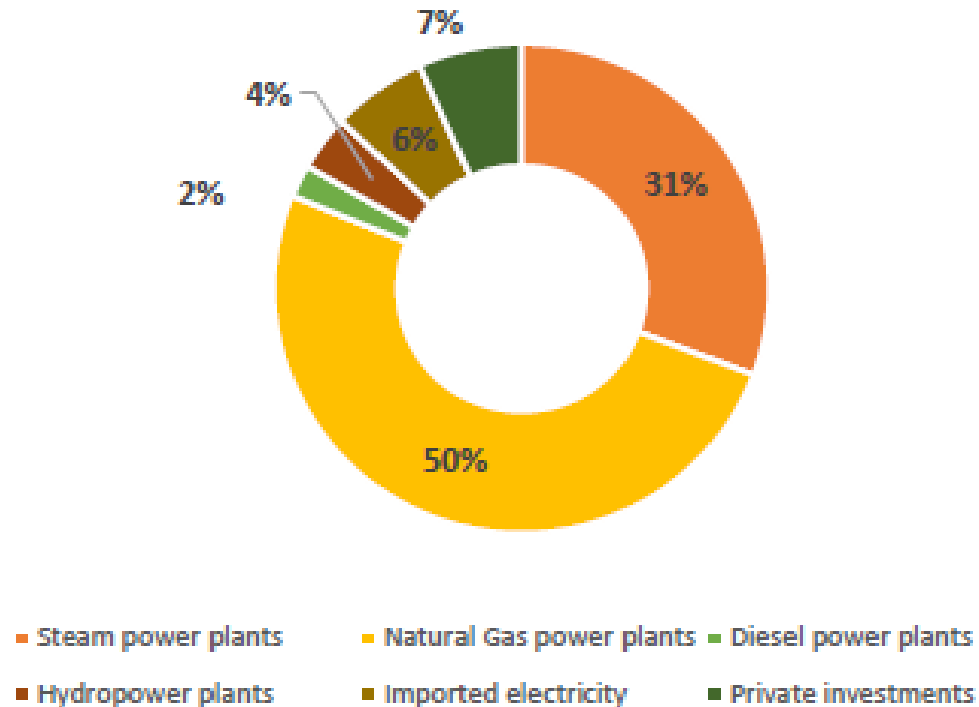
Current Situation

- Power gap significant
- Natural gas power plants dominate
- Steam power plants mainly generated by fuel oil and crude
- Diesel generators cover outage periods
- Around 6% power imported
- Hydro only real renewable

Objective:

Optimize, monetize fossil resources while closing power gap

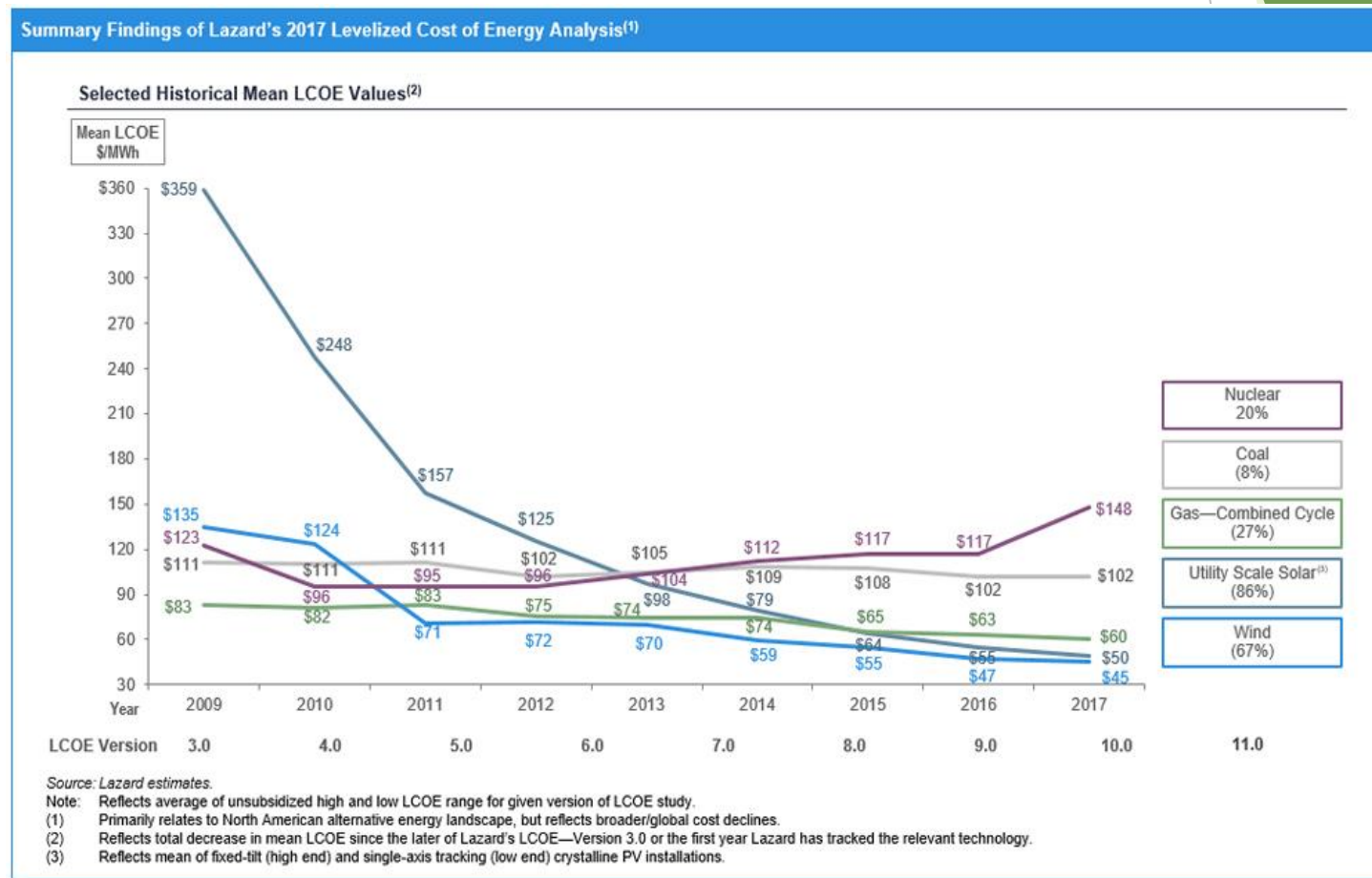
Electricity generation in 2016



Source: UNDP report 2017

..Meanwhile solar power now competitive

- *Plummeting costs now make solar a viable option*
- *3000+ hours of sun per year*
- *Availability of land near cities*
- *Pressing need to monetize or rationalize hydrocarbons*
- *Solar offers different solutions to fit diverse situations and load demand*



Regional innovations offer solutions

- *Integrated Solar Combined Cycle (ISCC) plants: Morocco, Saudi Arabia*
- *Solar Oilfield Projects: Oman*
- *Concentrating Solar Power Tower: Morocco*
- *Minigrids and Distributed Photovoltaics: UAE*
- *Policy Framework: Jordan*

Solar thermal and gas-fired plants

- *Integrated Solar Combined Cycle combines fast start capabilities of gas with intermittency of solar*
- *Both technologies utilize the same steam turbine and other equipment*
- *Existing plants can be retrofitted*
- *Solar usually constitutes up to about 10% of total capacity*
- *New gas to power plan may stimulate new gas-fired investment*



Ain Beni Mathar Integrated Thermo Solar Combined Cycle Power Plant, Morocco 472 [MW_e](#) (20 MW Solar)

Solar thermal and oil installations

Glasspoint, USA 1 GW Miraah project in Oman



An Oil field Solution

- *Enhanced Oil Recovery generates steam to extract more oil*
- *Provides extra power for facilities*
- *Oil installations consume energy equal to about ten percent of its own production*
- *Helps reduce operating expenses while cutting greenhouse gas emissions*
- *Greenhouse structure creates more heat, protects solar mirrors*

Different demand peaks, different solutions

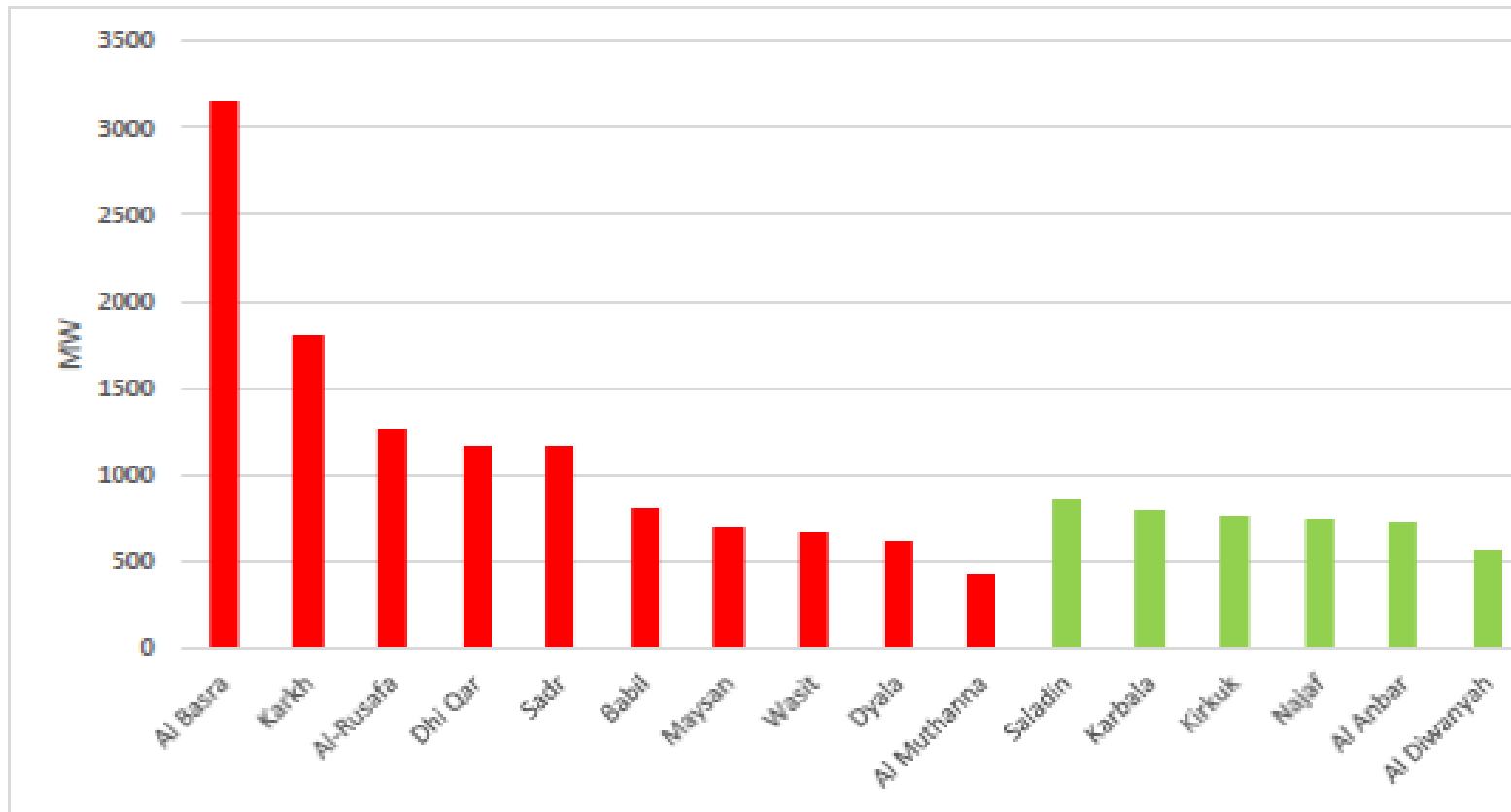


Figure 3: Peak Load by Governorate in Iraq in 2016 (MoE, 2016)

■ Summer peak load ■ Winter peak load

Utility scale Concentrating Solar Power (CSP)

- *Winter peak load, mainly in the north, between 6-9pm*
- *CSP solutions produce steam to generate power*
- *Power tower salt offers storage solutions at competitive cost*
- *Alternative is more common trough-based CSP*



Noor III 510 MW Noor CSP Complex at Ouarzazate, Morocco

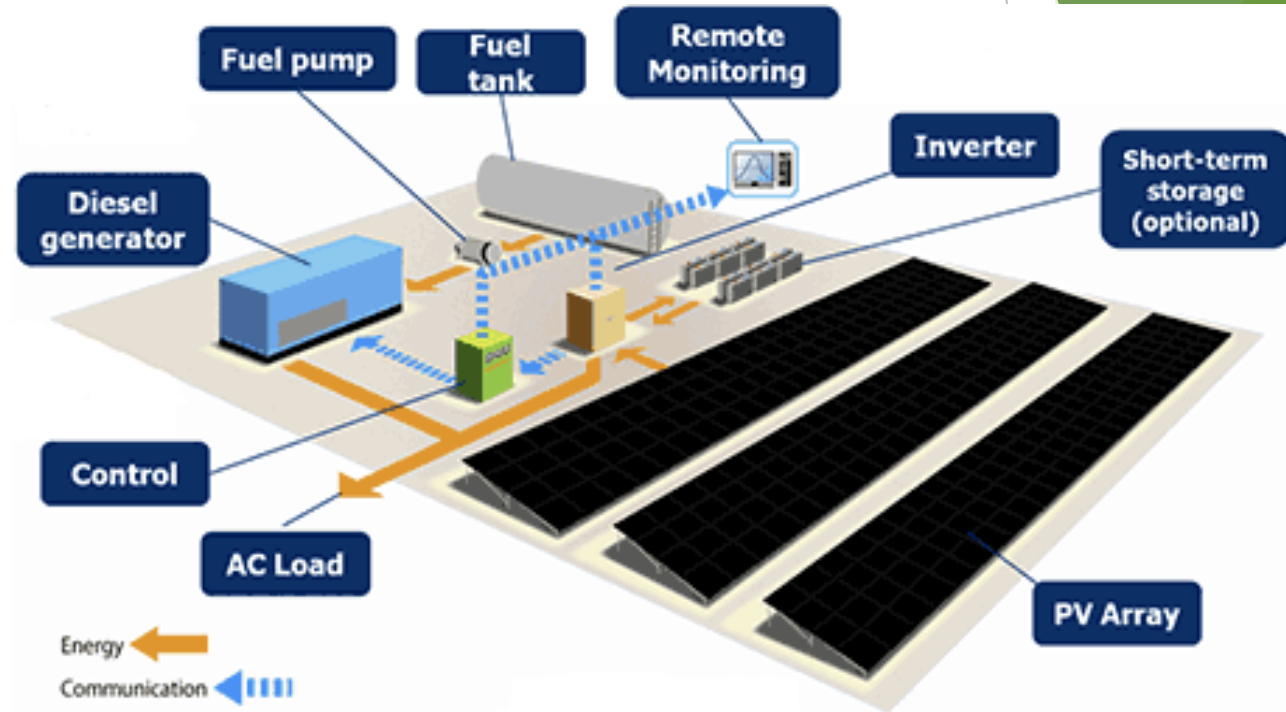
Distributed solar PV an opportunity...

- *Grid coverage widespread, but outages average about 7 hours*
- *About 90% of households rely on private diesel generators*
- *Peak summer periods 12-4pm, at the hottest times*
- *PV offers cost effective residential and commercial solutions*
- *UNDC PV trials underway*



...minigrids could be a solution

- *Distributed network that supplies electricity to a localized group of customers*
- *Can operate connected and disconnected from the grid*
- *Customers can negotiate contract and payment directly with provider*
- *Solar power can save up to 50% of diesel fuel consumption*
- *Hybrid diesel-solar minigrids more reliable than single source*
- *May improve local governance; proven job generator*



PV-Diesel Hybrid Minigrid In Lake Victoria, Tanzania

Tuning policy is critical

Current Incentives for RE projects include:

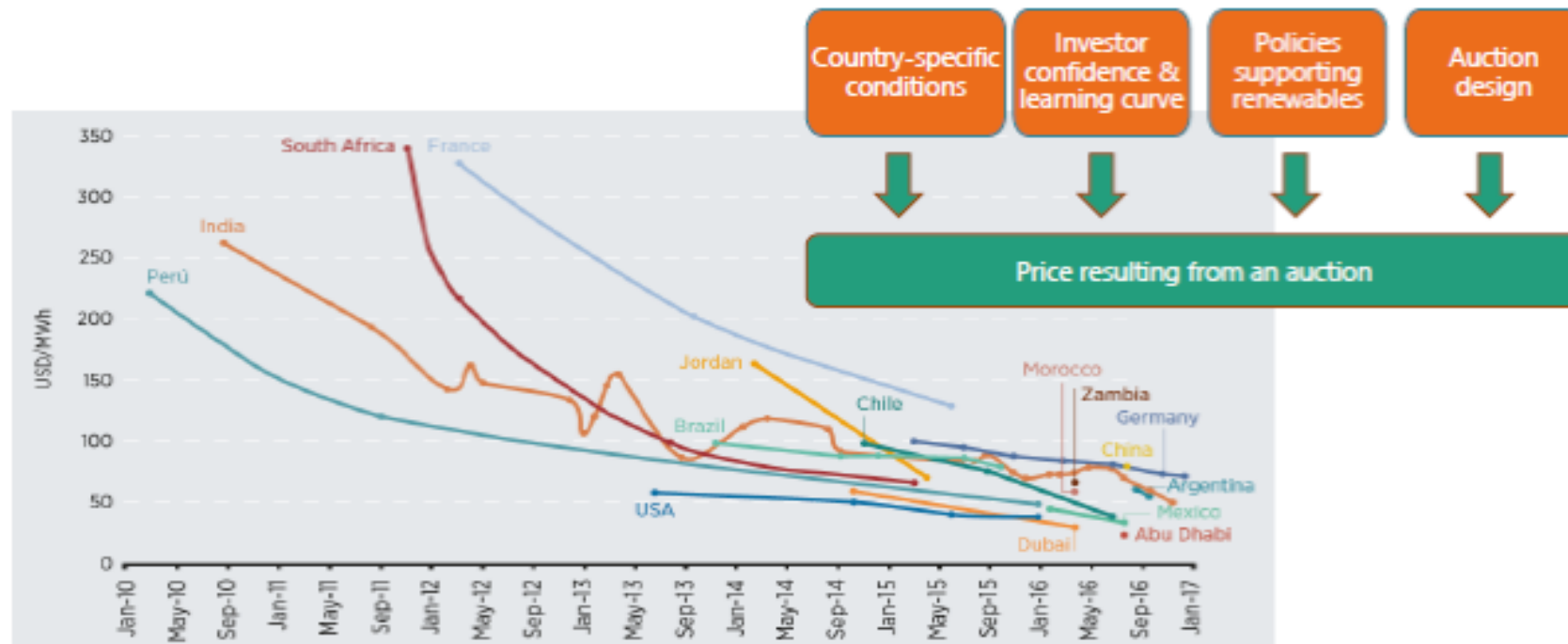
- land lease for projects that cost only 2% of estimated annual lease return
- tax exemptions for the first 10 years
- import duty exemptions for renewable energy equipment

UNDP helping to develop:

- PV Grid code and grid integration issues
- Financial incentive schemes
- Federal and regional regulations

International auctions could help

Factors behind the falling auction prices for solar PV



Source: IRENA, RE Auctions: Analysing 2016, 2017

Price discovery through competitive auctions has been effective in reducing costs along the entire value chain, even in less developed markets.

What's next?

- u *IRENA Renewable Readiness mapping exercise*
- u *UNDP finalizes needed policy and regulations*
- u *Gas to power plan investment plan considered*
- u *Additional solar power sites identified*
- u *Potential international auctions to find the right price points*

U.S. Commitment

- *Fully support increasing oil production and diversifying revenue streams*
- *Ensure the energy security of our allies and partners*
- *Seek opportunities to bring our world class technologies and techniques to maximize the value of Iraq's energy resources*
- *Help create jobs and opportunity in the region*

Thank you

