
Energy Efficiency Policy

Implementation Challenges: Investing in Energy Efficiency

Hisham Mikhi on behalf of Ennis Rimawi

Catalyst Private Equity

Millennium Energy Industries

Catalyst and Millennium Energy

- **Catalyst is an Arab region energy and water technology (cleantech) fund based in Jordan. Catalyst invests in small and medium enterprises that provide energy efficiency technologies, products, and services.**
- **Millennium Energy Industries (MEI) is a regional solar solutions company based in Jordan. MEI develops and invests in alternative energy projects and technologies.**
 - **Projects include: The development of a 100MW CSP project in Maan, various solar thermal heating projects for clients in Jordan including industrial and commercial clients. MEI does work with JEDCO.**
 - **Technologies include: In addition to solar heating/cooling technology, MEI invests in other related “practical” technologies such as geothermal, efficiency tools/controls, PV.**

Key Point # 1

We are primarily investing in “commercially viable” energy efficiency technology such as solar heating/cooling, that does not require “subsidies” to be viable. The payback is 3-7 years, but the benefits can be accelerated through such subsidies.

1. We call this the “Low Hanging Fruit”! It’s not sexy, but it is extremely effective. JEDCO has been a leader in supporting industrial solar thermal projects in Jordan.
2. Ilyas Hosh of PMC Chocolate is an example (and on the panel) is an example of a leader who implemented and benefited QUICKLY, WITHOUT any SUBSIDY/SUPPORT.
3. Our view here is that although these projects DO NOT need subsidies to be viable, subsidies will accelerate the awareness and benefit until “critical mass” in the market is reached
4. These subsidies should be for mid-sized projects, \$250K - \$1M, in the form of grants and low interest loans to private sector primarily, for many projects.
5. Areas include solar heating, solar cooling, geothermal heating/cooling, light sensors, control systems, etc.

Key Point # 1 Continued

The social, environmental, and economic benefit of support for such “commercially viable” items is SIGNIFICANT vs. “non-commercially viable” items:

For example,

- \$5M support for solar thermal heating will result in about 10MW capacity.
- \$5M support for solar PV electricity will result in about 1MW capacity.

Since we have very little of either solar power or solar heating today, the benefits of each 1 Euro subsidy for solar thermal heating is 10 x greater.

Also such efficiency technologies are usually bottom up, large in number and directly useful, and can lead to a services/product export industry!

Key Point # 1 Last Slide

Special “support” (grants, loans, etc.) for such smaller projects needs to be efficient (minimal paperwork)

and

quick (few weeks to 1 month)

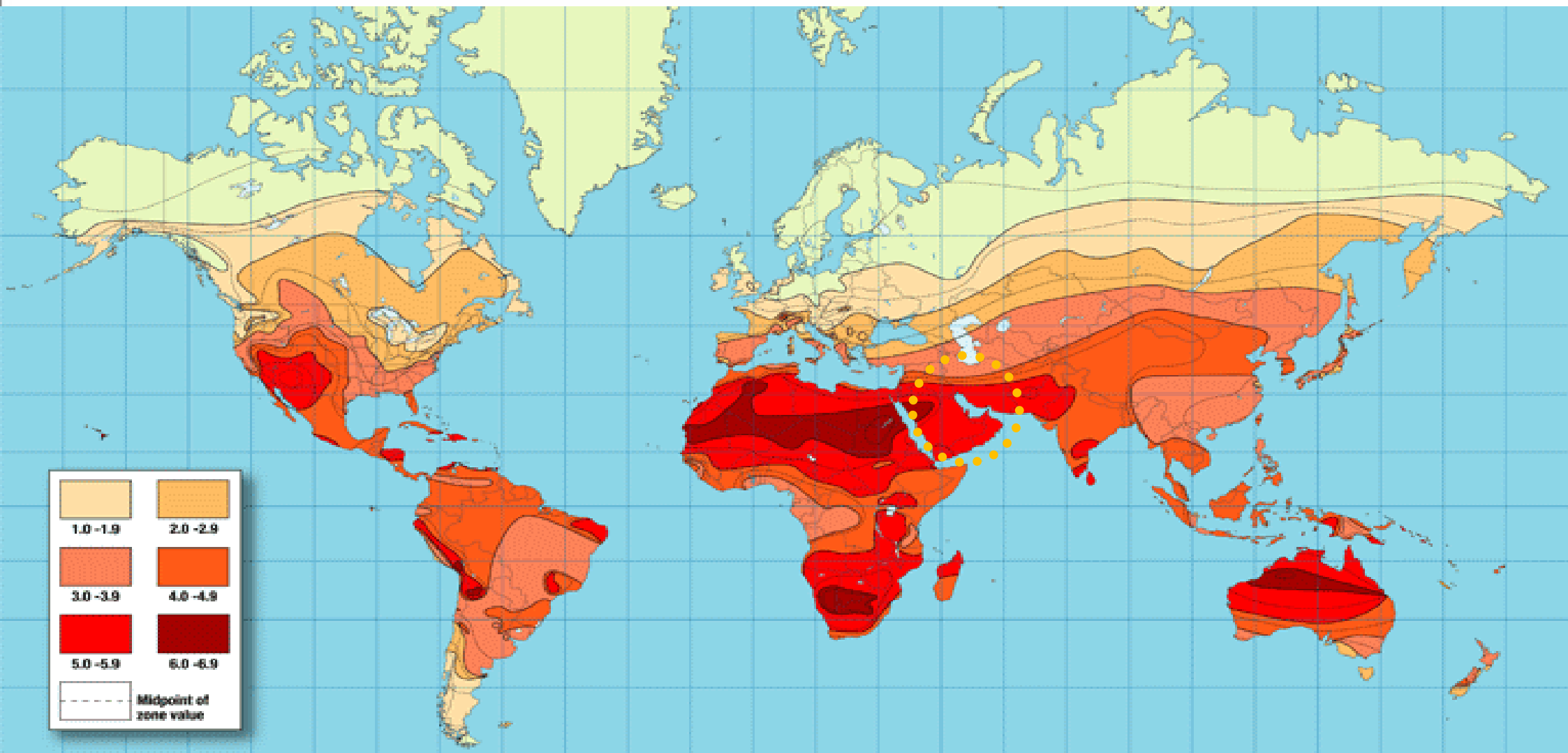
otherwise it defeats the purpose of the support!

Key Point # 2

We are also developing and investing in a large scale solar power project in Jordan, and such technologies REQUIRE subsidies to be viable today.

1. There will be very little investment for such projects without subsidies, and our view is that although expensive, some projects **MUST** be subsidized as key examples, diversification of energy supply, and knowledge transfer.
2. These subsidies would be to Governments (PPA) or the Project Consortium in the form of grants and low interest loans, size \$5-50M for a few select projects.
3. For example the 100MW CSP Project in Maan which will require over \$200M in debt and equity investment. The Jordan Government who would be the buyer of the electricity would require support, or the investor consortium would require subsidy support.

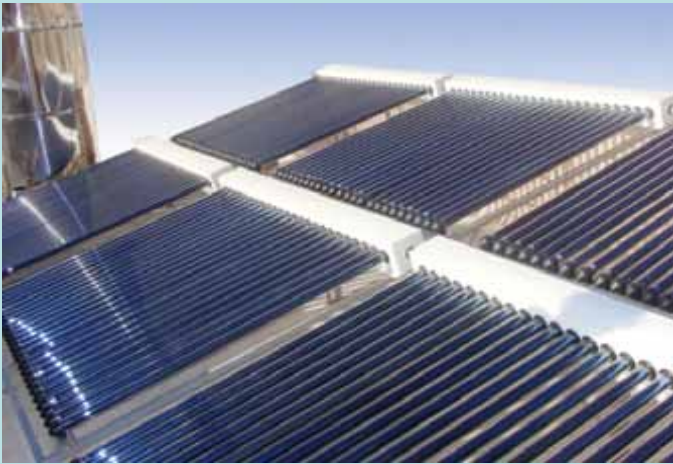
World Solar Insolation Map



Solar Energy Applications

Thermal

- Space Heating
- Hot Water Systems (domestic or centralized)
- Swimming Pools Heating
- Solar Cooling*



Concentrated Solar Power (CSP)

- High pressure steam
- Industrial heating
- Water treatment
- Electricity

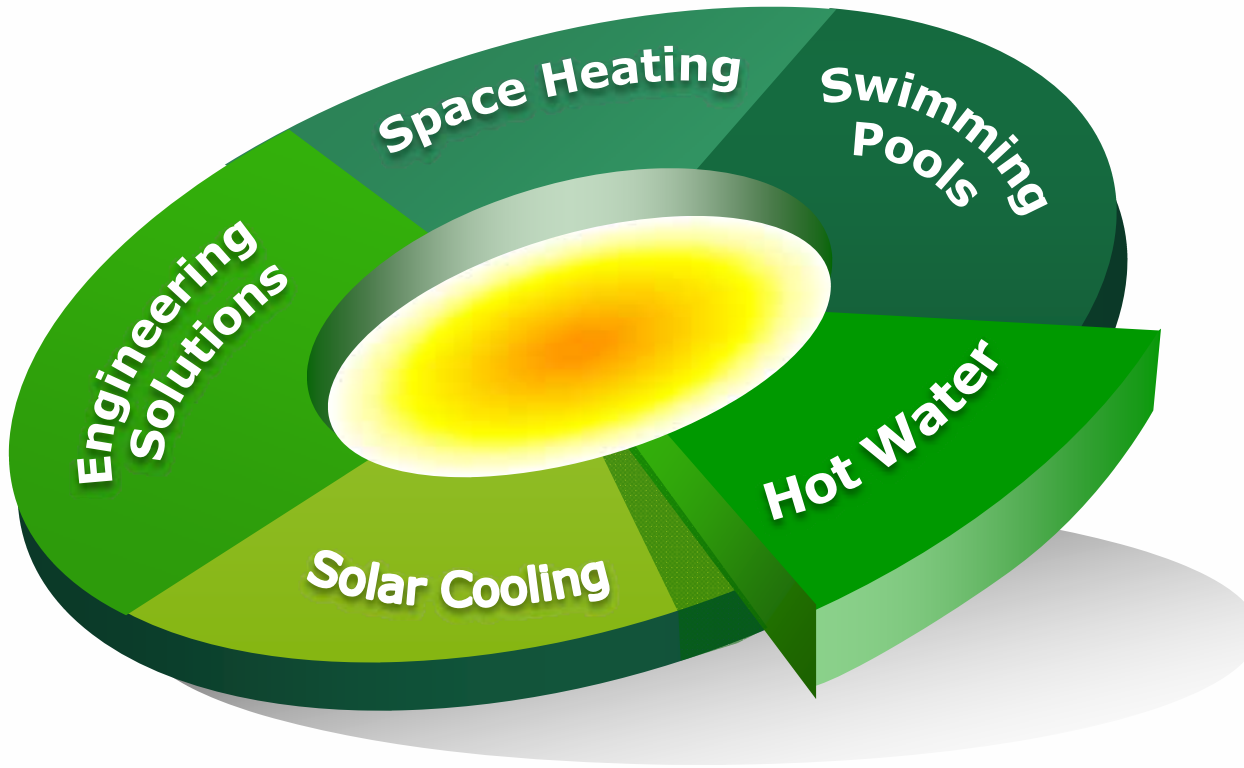


Photovoltaic

Electricity DC/ AC



Solar Thermal Applications



****** 70% of all thermal applications are solar hot water.

Case Study 1: 2 bedrooms Flat Water Heating

Using Conventional Heating: System Cost Analysis...

No.	Description	Unit Price (\$)	QTY	Total Price (\$)
1	Electric Water Heater 80 Liter	120	2	240
2	Electric Water Heater 30 Liter	75	1	75
3	CP Angle Valve	4	6	24
4	CP Flexible Hose Pipe	3	6	18
5	Electrical Connection for each heater which includes (wiring, conducting, electrical breakers (ELCB), outlet for heater connection, switch indicator and labor efforts	130	3	390
6	Plumbing & Installation charges (Heater only)	40	3	120
7	Electrical Hook up as per local authorities (500Dhs/kW)	200	3	600
Conventional Total Cost (\$)				1,467

Case Study 1: 2 bedrooms Flat Water Heating

Using Solar Heating: System Cost Analysis...

No.	Description	Unit Price (\$)	QTY	Total Price (\$)
1	Solar Water Heater 16 Tubes/ 150L Linuo Paradigma	685	1	685
2	Solar Controller / Linuo Paradigma	85	1	85
3	Electric Element 1.5kW/ Linuo Paradigma	40	1	40
4	Mg Anode/ Linuo Paradigma	15	1	15
5	Electrical Hook up as per Abu Dhabi local tariffs (500Dhs/kW)	200	1	200
Overall Total in (\$)				1,025



Case Study 1: Two Bedroom Flat Water Heating

- **Saving \$442 on capital investment per each flat.**
- The electrical operation cost is reduced by two thirds.
- Low maintenance cost and no interruption of work inside flat.
- Green system and environmentally friendly.

Case Study 2: Worker Community Water Heating

BEFORE, using conventional heating...

- Over 50 buildings of 4 levels each, 25,000 residents.
- Total hot water requirements 1,300,000 Liters/ day peak times.
- Existing central heating via calorifiers.
- Budgeted capital investment including piping and installation cost is approx. AED 22 Million for hot water supply system
- Designed electric demand load 11.8 MW hr/ year
- Power connection fees based on average AED500 per KW AED 5.9 Million
- Estimated annual running cost AED 1.77 Million

Case Study 2: Workers Community Water Heating

AFTER, using solar heating...

- Using 2800 collectors units (4 m²) – 30-40% of roof space due to high density of accommodation
- Cost of solar heating as per original design AED 15 Million including 30% electric back up.
- 30% demand load is 3.54 MW hr/ year
- Power connection fees based on average AED500 per KW AED 1.77 Million
- Estimated annual running cost using back up electricity AED 530,000

Case Study 2: Workers Community Water Heating

SOLAR vs. CONVENTIONAL

- Saving on capital cost over AED 7 Million
- Saving on annual running cost AED 1.24 Million
- Saving on demand electric load AED 8.26 MW hr/ year
- Savings on Power Connection fees AED 4.13 Million
- Live green and save money!

- **Modern Residential City – Abu Dhabi**
- **Total built area 350,000 SQM**
- **Hot Water Supply - 1.3 Million Liters per Day**
- **Payback Period - Immediate**
- **Savings - USD \$ 2,000,000 on Capital Investment**



Saraya Aqaba - Labor Camp Project

27,000 liter/ day Hot Water Supply



- Arab Model Schools - Jordan
- Central Hot Water System/ Swimming Pool Heating
- Semi Olympic Swimming pool
- Conventional heating supply off line as of Feb 2008





Marriott Dead Sea Resort & Spa

- Domestic hot water
- Swimming Pools Heating
- 120,000 Liters/ Day designed demand capacity
- Annual energy yield 1,250 MWh/a
- Estimated annual consumption 350,000 L
- Estimated solar Energy yield 3600 KWh/Day
- 67% savings on fuel weekend peak time.
- Utilization of High Efficiency CPC collectors
 - ✓ Total aperture area 825 sqm
 - ✓ Roof area of 1100 sqm
 - ✓ Withstands 295 °C temperature



JORDAN VALLEY
DEAD SEA RESORT & SPA

Marriott





THANK YOU

Contact: Ennis Rimawi, ennisr@catalystpe.com