Shams Ma'an Solar Power Plant

The Prospects of Investment in Renewable Energy in Jordan conference

KAWAR ENERGY

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CEO

KAWARENERGY

Kawar Group

KAWAR GROUP

www.kawar.com

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Kawar Energy Parent Company

- A leading privately-owned business group, with headquarters in Jordan and operating in the Middle East and North Africa
- Today the Group represents a large entrepreneurial enterprise with multiple business interests in the following sectors:
  - Shipping and Logistics
  - Travel and Tourism
  - Information and Communication Technologies
  - Multimedia
  - International Trade and Project Development
  - Healthcare
  - Investments
  - Energy
  - Real Estate

Kawar Energy Activities

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Projects – Services – Investments

- **Renewable:** Solar, Wind, Synthetic Diesel
- **Gas:** LNG, Natural Gas
- **Mining**: Oil Shale, Uranium
- **Water treatment and recycling:** NATIOMEM
- **Consultancy**: Energy efficiency, CDM
- **Investments**

Jordan Electricity Sector

POLICIES MAKERS AND REGULATORY BODIES	GENERATION SECTOR	TRANSMISSION SECTOR	DISTRIBUTION SECTOR
Ministry of Energy and Mineral Resources	Central Electricity Generation Co (CEGCO)	National Electric Power Company (NEPCO)	Jordan Electric Power Company
Electricity and Minerals Regulatory Commission (EMRC)	Samra Electric Power Generation Company (SEPGCO)	Interconnections	Irbid District Electric Company
	Independent Power Producer IPP's		Electricity Distribution Company (EDCO)
	Large Industries		

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* 2017 data

- Total Installed Capacity: 4500 MW (incl. 730MW RE)
- Peak Load: 3320 MW
- Per Capita Electricity Consumption, annual : 1770 KWh
- Total Electricity Generation: 20360 GWh
- Total Electricity Consumption : 17388 GWh
- Electricity Subscribers : 2061000
- Renewables Contribution to Electricity: 1323 GWh 6.5%

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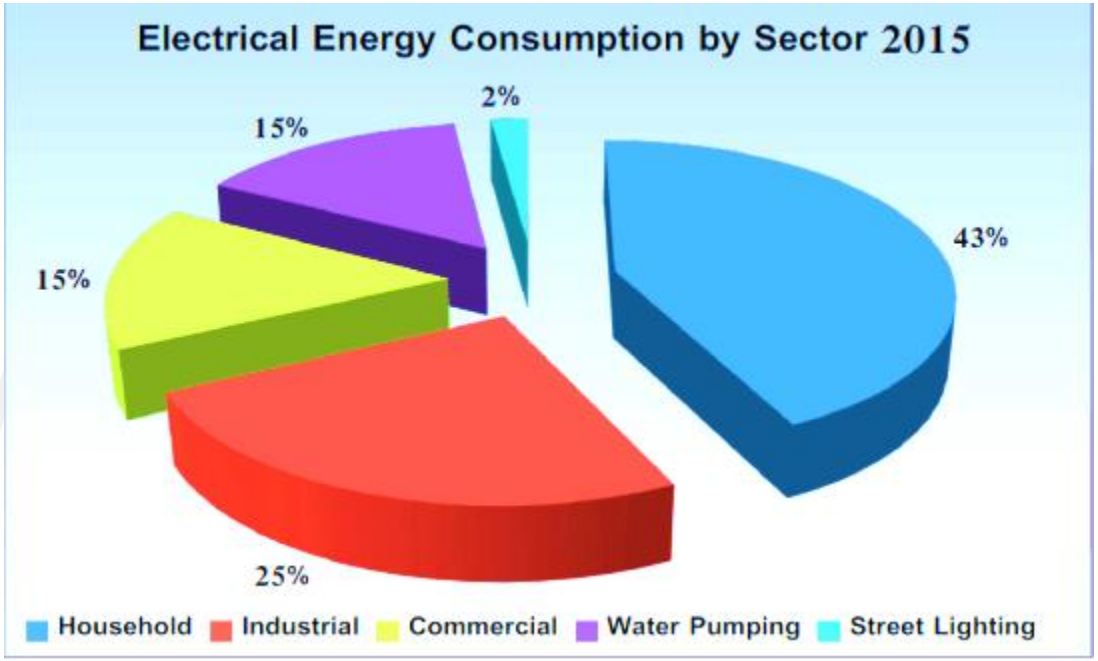
Jordan Electricity Consumption

Current Electricity Tariff:

- Between
71 Fils/kwh ($0.128) – 285 Fils ($0.40).

- Hotels 91 Fils,
- Armed Forces 146 Fils,
- Industrial 71 Fils to 81 Fils
- Commercial 175 Fils
- Mining 237 Fils, 170 Fils night
- Telecoms 273 Fils,
- Household 265 Fils above 1000KWh/month
- Hospitals 273 Fils,
- Banks 285 Fils
- Water pumping 94 Fils



- MEMR report 2015

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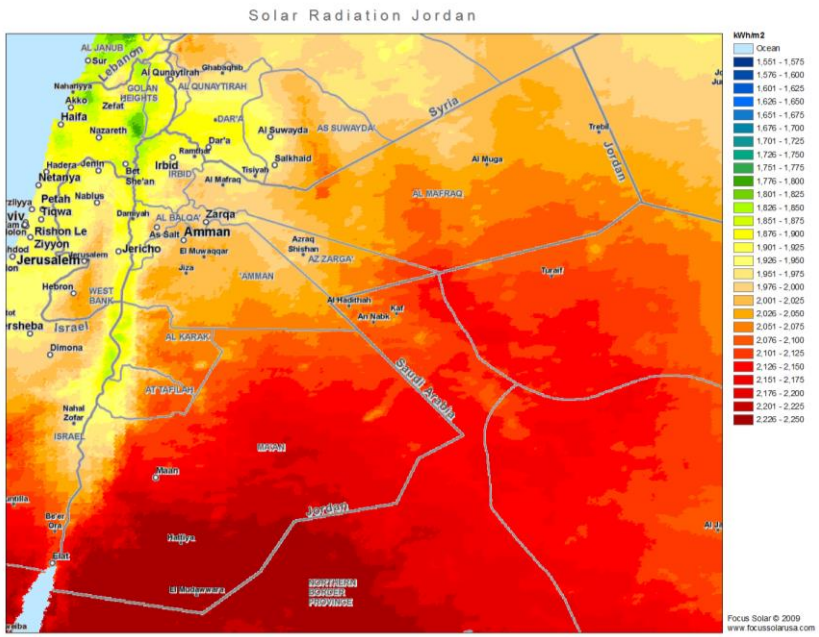
Jordan and Renewable Energy (Solar)



- Renewable energy can **contribute to Jordan's security of supply** and reduction of energy imports by capitalizing on the country's natural resources
  - **High solar index**, which in many areas can achieve more than 2,500 KWh/sqm annually
  - **Extensive desert land** areas that can be used for large solar energy at small or no cost
  - Cost of the **RE technologies is constantly decreasing**
  - **Stable Political and Regulatory Frameworks**
  - Tax Incentive regime, a By-Law was issued on **Tax exemptions for RE and EE systems** and Equipment
  - An **effective legal and financial framework** supporting **RE projects** and development.
  - Among the **Highest Engineers Per Capita** Ratios in the World .

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Political will → Legal Framework → Off Taker → Bankable feasibility → EPC → Commissioning

Jordan Renewable Energy Story

Milestones

2008

Oil prices reach $149 a barrel

2009

EDAMA established as EWE Business Association

2010

REEEL* Passed by Royal Decree

2011 Jan

Arab Spring and Disruption of Gas Supply from Egypt

2011 Jul

1st EOI Issued Resulting in 64 Proposals

2012

REEEL* Law 13 Amended and Approved by Parliament

2014 Mar

12 Solar Energy PPA's Signed For 213 MW + 117MW Wind = Total of **330MW**

2015 May

Financial Close

2016 Aug

200MW PV COD

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- **1000 MW** of Wind and Solar PV projects are currently **under construction**, **730 MW currently operational** (Feb. 2018)

- Over 1.75 Billion $US investments

- 4-tracks-approach to develop renewables:

- Direct Proposals schemes: 432 MW Wind and 658 MW Solar PV
- Competitive Bidding process: 102 MW solar pv small scale distributed
- EPC Turn-Key projects: 80MW Wind and108MW Solar PV
- Small Scale RE Schemes (Net Metering/ Wheeling/ Pooling): **206 MW** Solar PV **Connected**

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* Renewable Energy and Energy Efficiency Law

Solar PV Project Life Cycle

Conceptual phase
- Idea
- Market
- Time
- Business case

Design/ Development phase
- Land
- Permits
- Technology selection
- Yield verification
- Project feasibility
- Risk analysis
- Social and Environmental Impact
- CDM application

Implementation phase
- PPA
- Bankable contract
- EPC
- Financing
- Insurance
- Commissioning
- CDM verification

Operational phase
- Operational monitoring
- Maintenance (Planned/ Unplanned)

Evaluation phase
- Financial
- PPA adherence
- Maintenance
- Possible PPA extension

Decommissioning
- Restore Land
- Recycle plant

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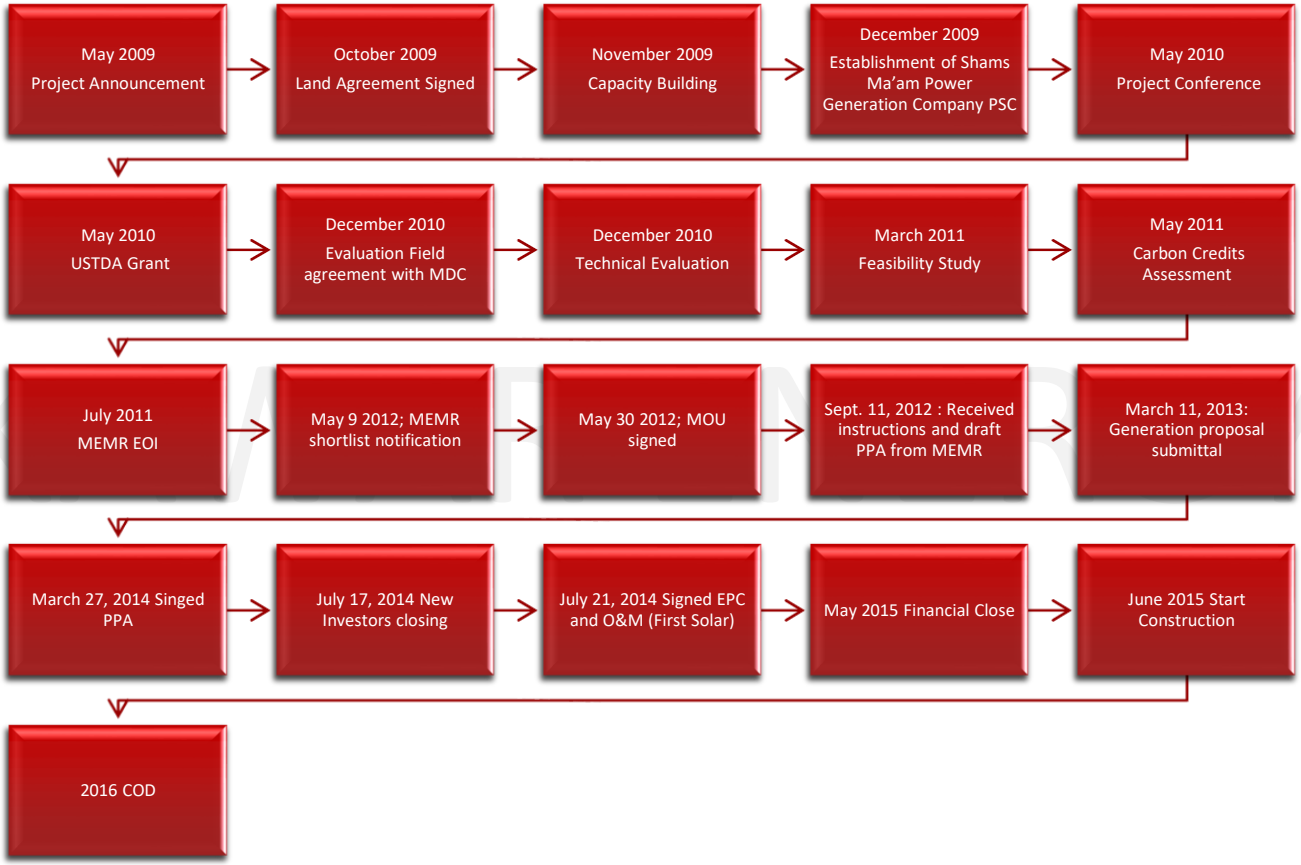
Shams Ma'an in the making



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Technology Evaluation Field – Ma'an

Allocated Land, April 2010

5500 m^2

1st CPV in Jordan, May 2010

Soitec

Top tier Participants, May 2013

Trinasolar, SUNTECH, Hanwha, DAY4 ENERGY, ISOFOTON, SolarWorld, Soitec, First Solar, LG, SolarPark

Shams Ma'an Location

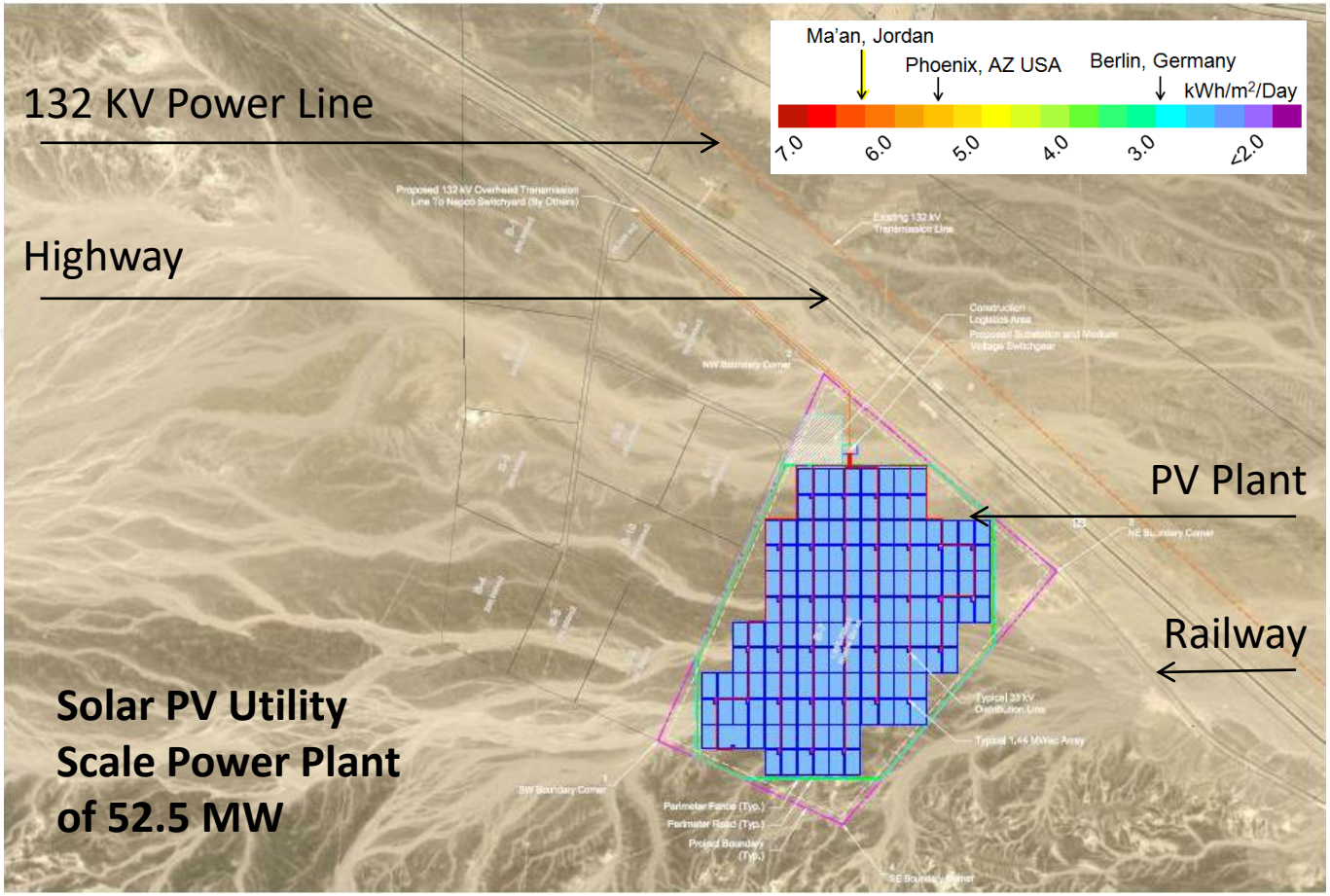
Ideal solar resource (satellite data)

TMY ~ 6.2 kWh/m^2/day

Ground-based resource monitoring

>1 year – DLR

Site data 2011 ~ 6.4 kWh/m^2/day



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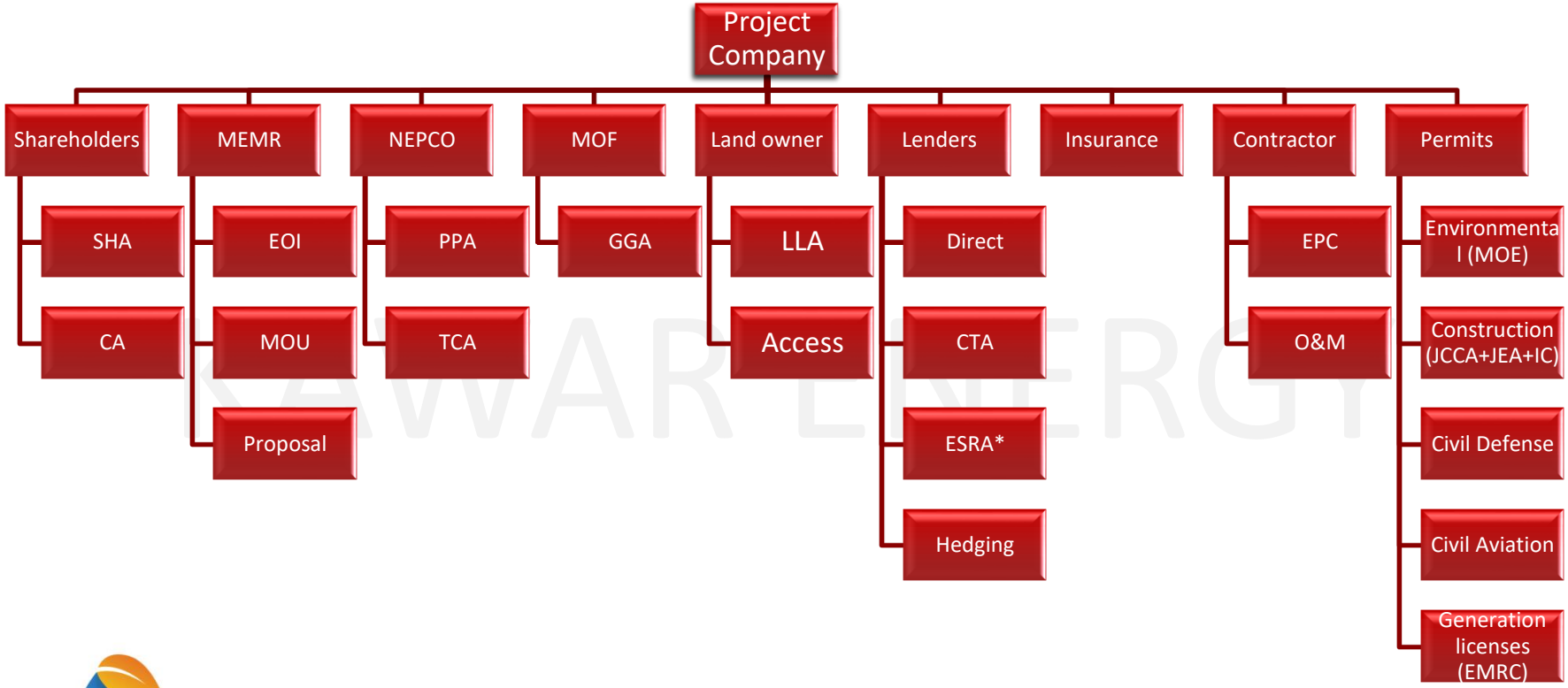
Agreements & Permits



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*Equity Subscription and Retention Agreement

Shams Ma'an Financial Closure

Partners	MITSUBISHI; KAWAR GROUP; Nebras Power
Project Company	shamsma'an POWER GENERATION PSC
Lenders	NEXI; JBIC JAPAN BANK FOR INTERNATIONAL COOPERATION; MIZUHO; Standard Chartered

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52.5 MW Solar PV from First Solar

Launching Ceremony- June 2015

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Production phase announcement on Oct 10, 2016

During an event held at site in Ma’an on October 10th, 2016, under the Royal Patronage and in the presence of the Prime Minister H.E. Dr. Hani Al Mulqi, Shams Ma'an officially announced the launching of the Production Phase for generating electricity from photovoltaic cells where his Excellency removed the curtain on the Foundation Stone at the beginning of the ceremony.

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HM King Abdullah II inaugurates Shams Ma'an May 14th, 2017

- 170 Million $ investment
- 2 million square meters area
- 52.5 MWac, 66MWdc
- 160 GWh annually
- Saving 90K tons of CO2 emission
- 640K solar panels

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Shams Ma’an CSR & Employement

HRH Price Firas Bin Ra’ad Park

Ma’an Orphanage Center

“We Love Reading” Program

Bus Stops

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Ma’an Karate Center

Solar PV for Ma’an High School for Girls

*** Shams Ma’an directly employs 40 locals at the site for several positions ranging from engineers, technicians, and servicemen.**

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Kawar Energy Examples of executed PV projects

Shams Ma'an 52.5 MW PPA

Green House 70.4 KW, Net- metering

Petra University 1.6 MW. Net-metering

Al Quds College 1 MW. Net-metering Car Park

Ayla I 3.2 MW. Net-metering

Ayla II 2.6 MW. Wheeling

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Thank You!

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