

Solar Market Opportunities in Oman

*Solar PV Rooftop Workshop – EU-GCC Clean Energy Technology Network
December 2017*



Enerwhere – Innovative solar technology with an award-winning business model



- Enerwhere is a distributed solar utility – we provide electricity & cooling to commercial/industrial customers
- Enerwhere installs commercial-scale solar systems on an EPC basis & is a certified contractor under DEWA’s Shams Dubai Initiative
- Founded in 2012 in Dubai, ~50 employees in the Middle East & Africa
- Ranked by Forbes Middle East as one the UAE’s 20 Most Promising Startups



- **Grid-connected (rooftop) solar**
- Off-grid solar-hybrid systems



Solar market segments: “Solar rooftop” in the GCC means “medium to large commercial & industrial solar systems”



Residential

3-10 kW

- High installation costs
- Very low residential tariffs in the GCC



- Not economically attractive for installers & the utility



Commercial & Industrial (C&I)

10 kW - 20 MW

- Low CAPEX
- Highly variable soft cost
- Financing can be challenging
- Does not require investments in transmission



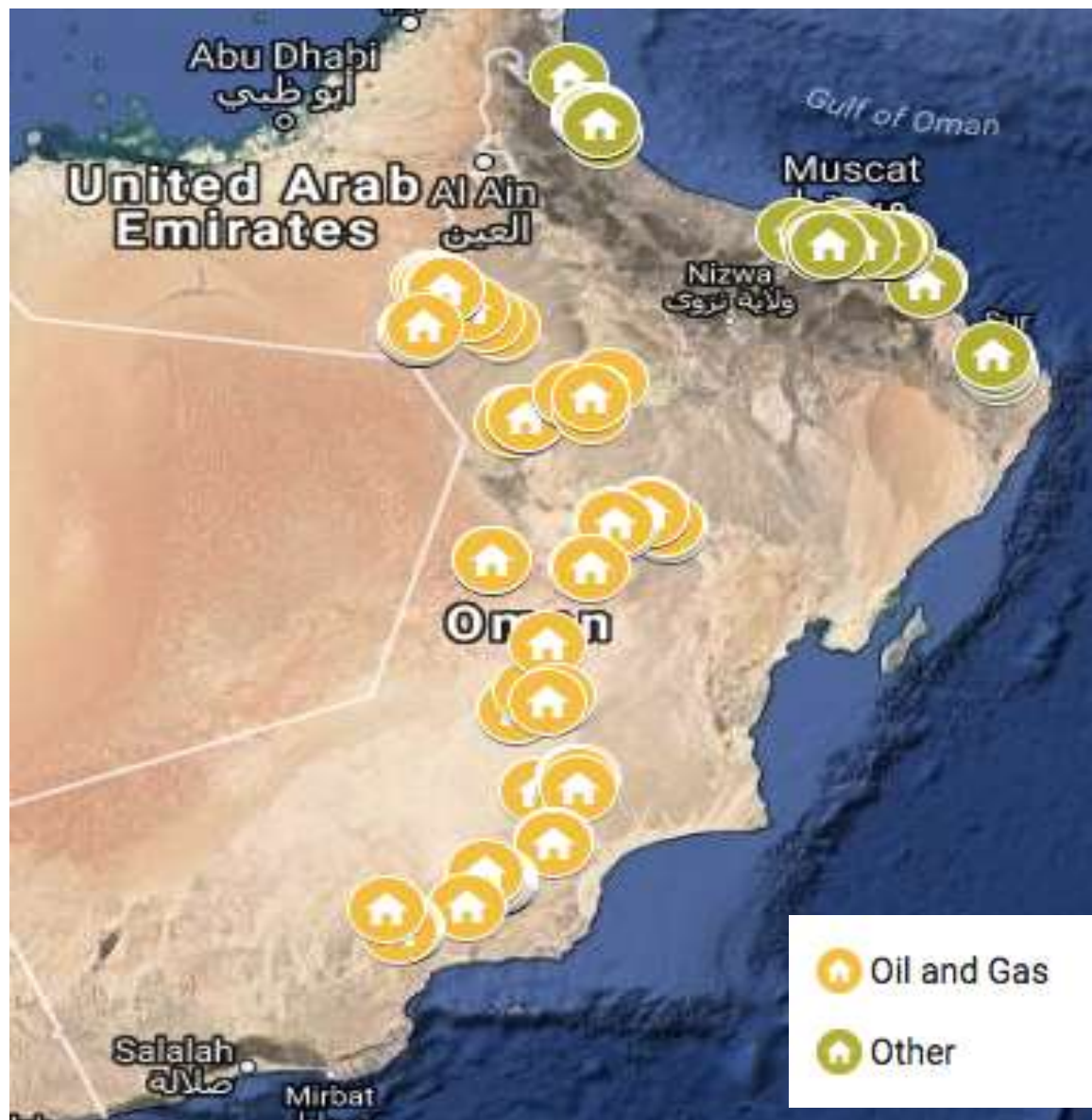
Utility

>20 MW

- Low CAPEX
- Low soft cost
- Proven financing model
- Requires significant transmission/grid investment



A quick scan of Oman on shows over 200 medium-to-large scale C&I solar opportunities worth 100's of MWp



Notes:

Attractive C&I opportunities exist in many sectors, including:

- Industrial areas
- Shopping centres
- Oil & gas industry
- RAECO
- ...

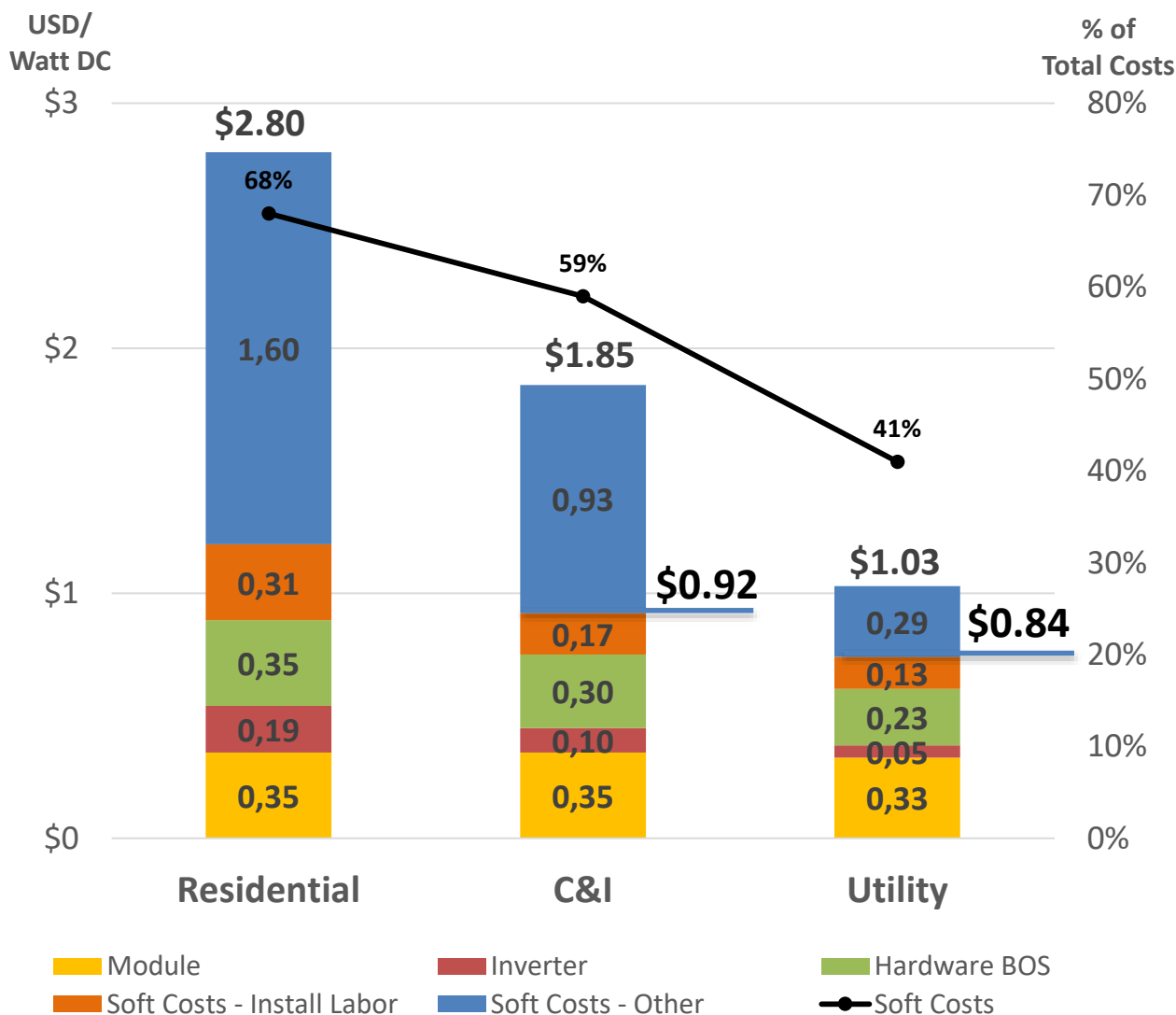


Total load & roof area is sufficient for several 100 MWp of solar

Installed costs vary dramatically across market segments, largely due to variations in “soft costs”



2017 US Cost Breakdown by Market Segment







Notes:

- C&I installed costs are very competitive with those in the utility segment
- In the US specifically, poor regulations made C&I soft costs unnecessarily high
- If regulations are optimized to reduce soft costs, the Oman C&I segment can be as economically attractive as the utility segment

Optimal regulation balances risks between the involved parties and lowers costs across the value chain



Cost factors	Net metering + tax credits 	DEWA Shams net-metering 	Reverse auctions 	Oman net-metering 
Limited risk for clients	✓	✓	✓✓	?
Limited risk for utility	✓	✓✓	✓	?
Limited risk for investors	✓	✗	✓✓	?
Low installed costs	✗	✓	✓✓	?
Low soft costs	✗	✓	✓✓	?
Low financing costs	✓	✗	✓✓	?
Overall cost / kWh	\$0.09-0.12	\$0.08-0.11	~\$0.05	?

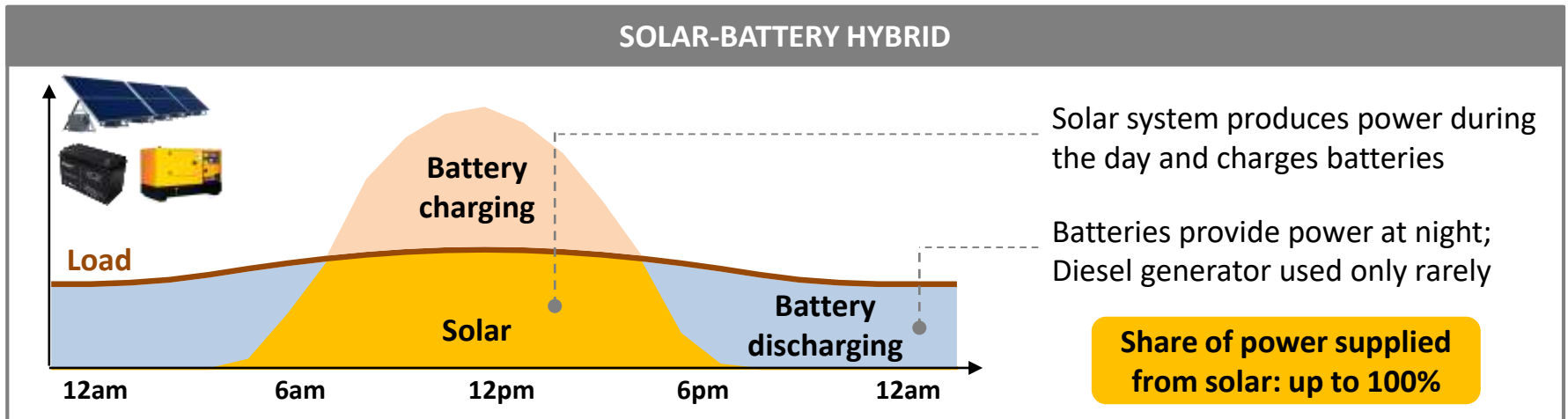
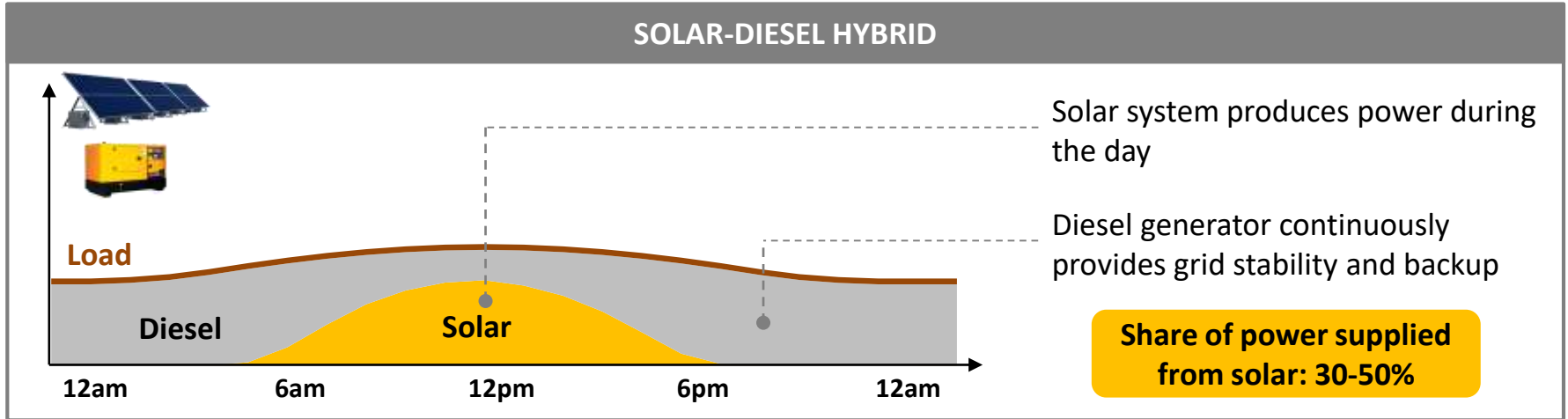
- Grid-connected (rooftop) solar
- **Off-grid solar-hybrid systems**



Diesel generators are a convenient but expensive & extremely dirty source of off-grid power



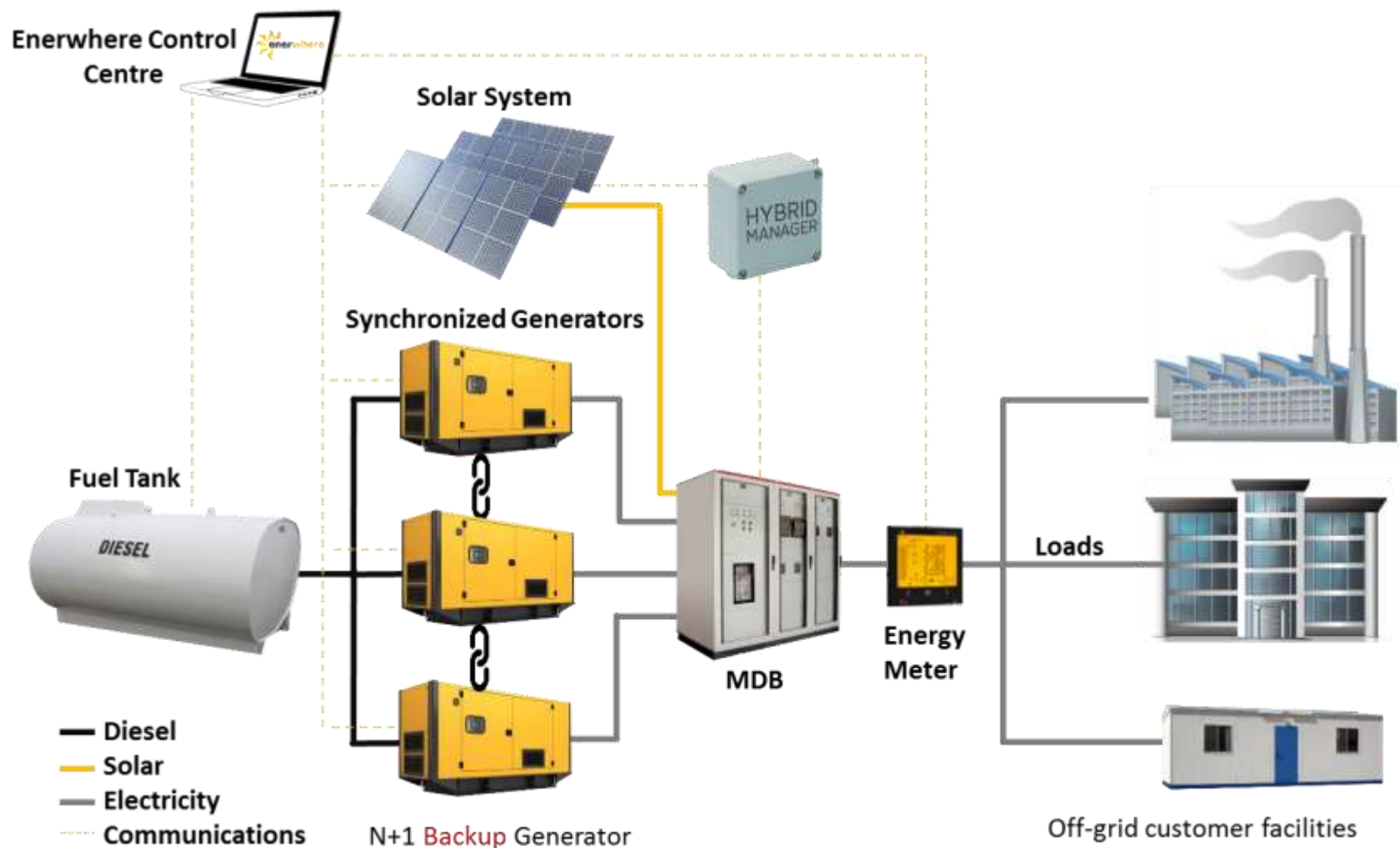
Solar-hybrid systems reduce fuel consumption, cost and emissions



Hybrid plants combine the low cost of solar PV with the reliability of conventional diesel generators



Overview of solar-diesel hybrid system

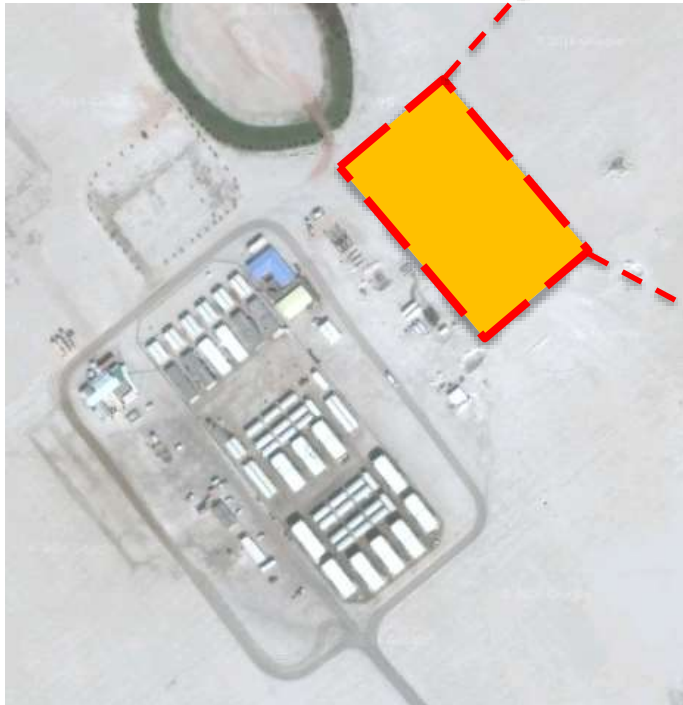


For a typical camp, a hybrid system can save 30-50% of diesel fuel / emissions, and offer 10-15% financial savings



Case Study: SSV labor camp, Sir Bani Yas island, Abu Dhabi

- 600 occupants
- Kitchen, Laundry, STP
- Operating 24/7/365



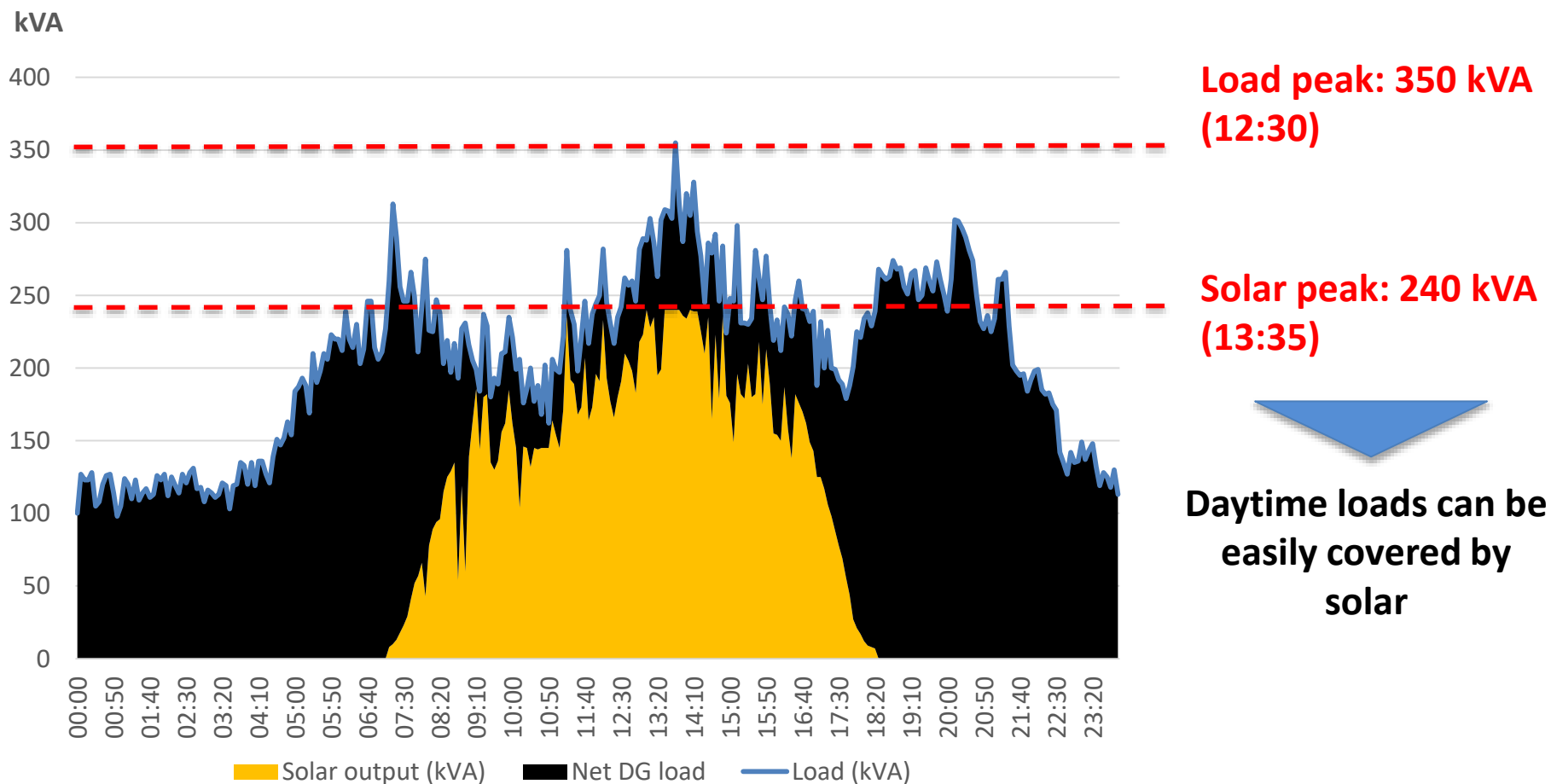
Solar-diesel hybrid plant:

- 350 kWp solar
- 2 MVA diesel generators (incl. backup)
- Enerwhere hybrid manager

In winter, most buildings can be run on >95% solar during the day, even without storage



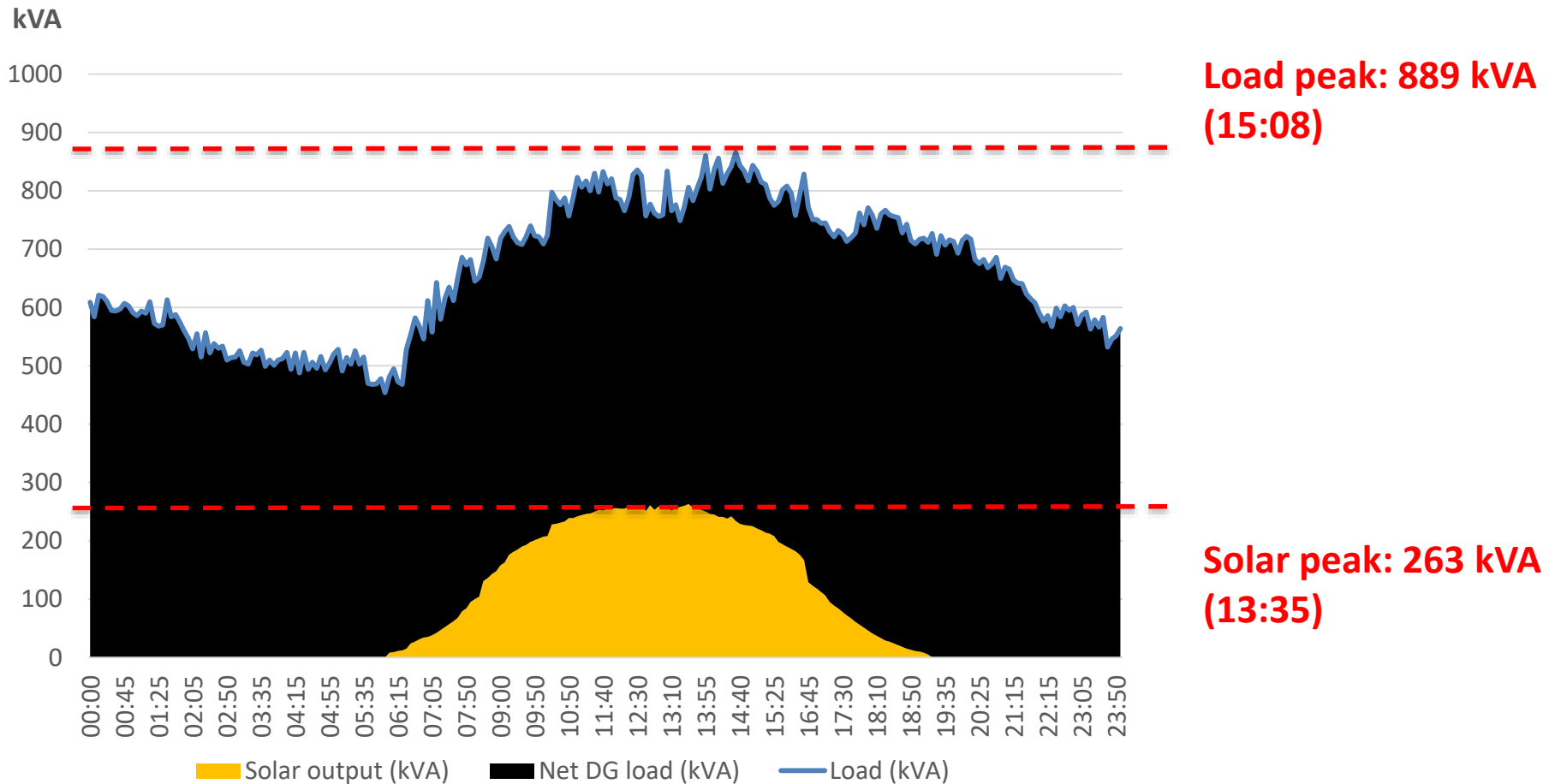
Camps & Villages: Winter load curve
SSV camp, Sir Bani Yas island, Abu Dhabi, 15 February 2016



In summer, solar production and demand from air-conditioners peak nearly at the same time...



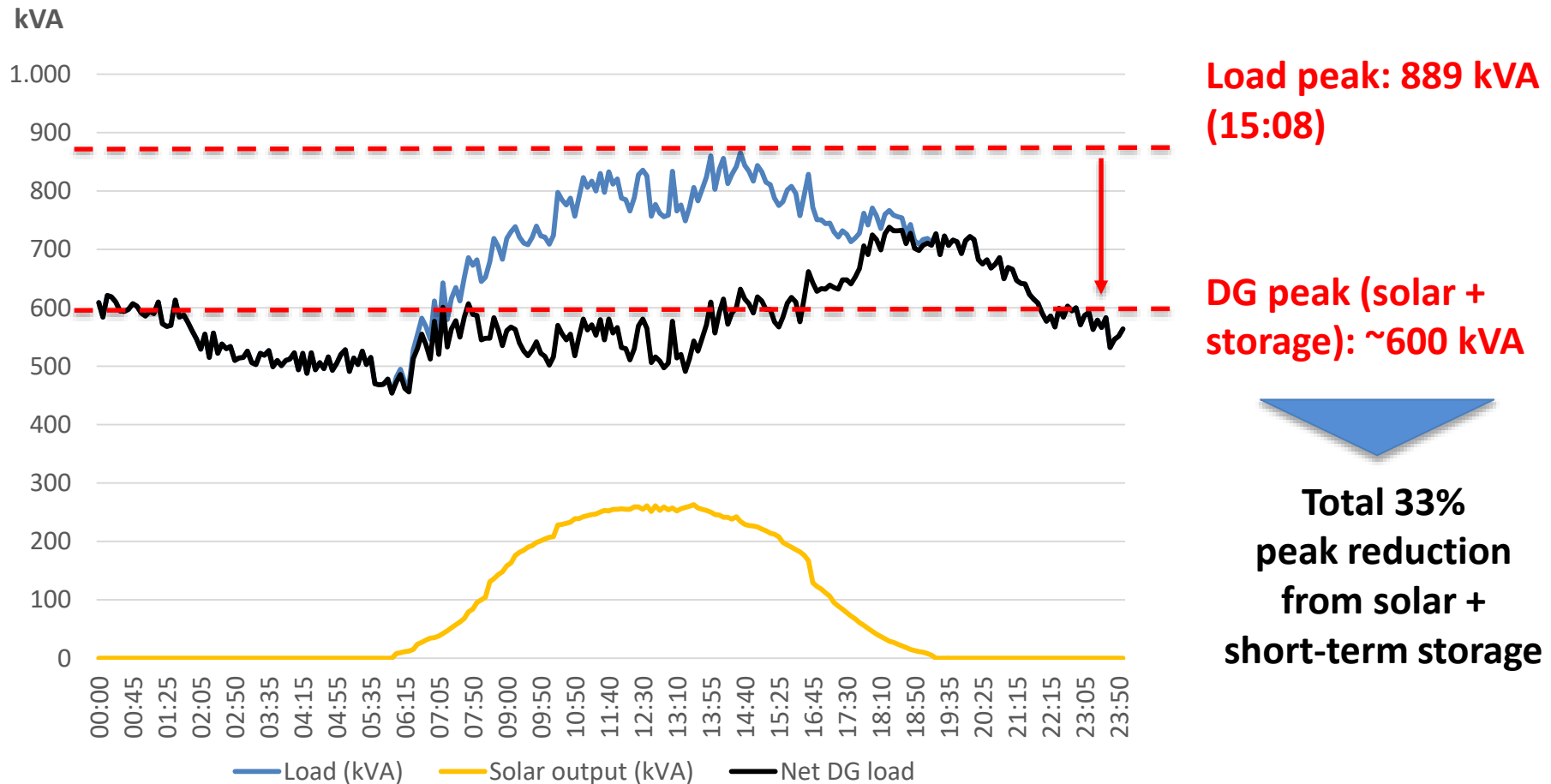
Camps & Villages: Summer load curve
SSV camp, Sir Bani Yas island, Abu Dhabi, 22 July 2016



...allowing solar + minimal amounts of storage to reduce the peak on the generators by around 33%



Camps & Villages: Summer load curve
SSV camp, Sir Bani Yas island, Abu Dhabi, 22 July 2016



**Load peak: 889 kVA
(15:08)**

**DG peak (solar +
storage): ~600 kVA**

**Total 33%
peak reduction
from solar +
short-term storage**

Benefits of solar-hybrid power plants over conventional diesel generators



CLEANER & CHEAPER

Diesel fuel & emission savings of up to 50%



ZERO CAPEX

Fully-financed equipment – no upfront investment from users



TRANSPORTABLE

Fully-containerized for rapid setup & deployment



MODULAR & SCALABLE

25 kW to multi-MW based on a simple “IKEA” principle



PLUG & PLAY

Preconfigured systems for extremely simple on-site installation



RELIABLE 24/7

Through hybridization diesel-generator or battery backup



Thank you!

For more information, please contact:

Daniel Zywietz
CEO, Enerwhere
daniel@enerwhere.com