Scaling up Rooftop Market
– an local Omani perspective

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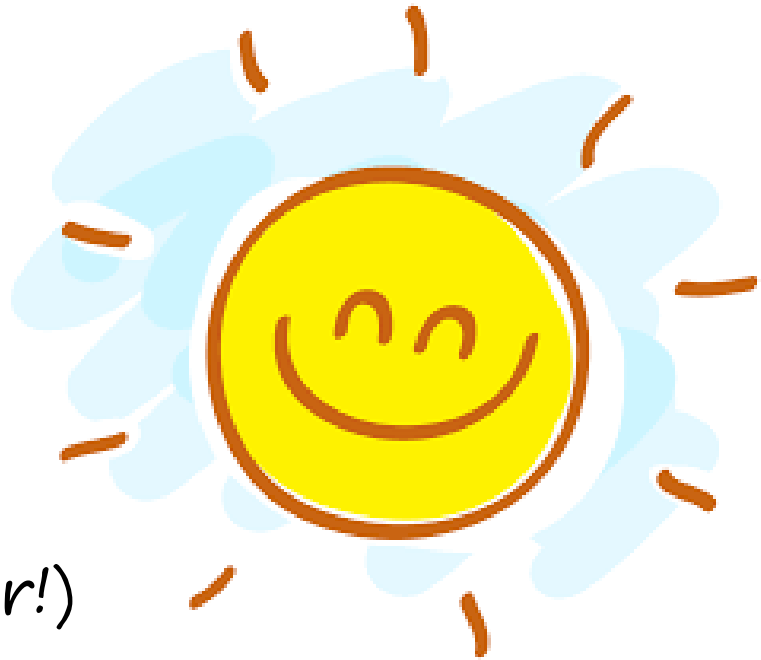
Agenda

- Why solar?
- Benchmarking rooftop solar against grid
- Constraints in scaling up solar
- Importance of unlocking Oman’s rooftop solar potential

Why Solar?

Environmentally friendly!

I'm in control!



More reliable!

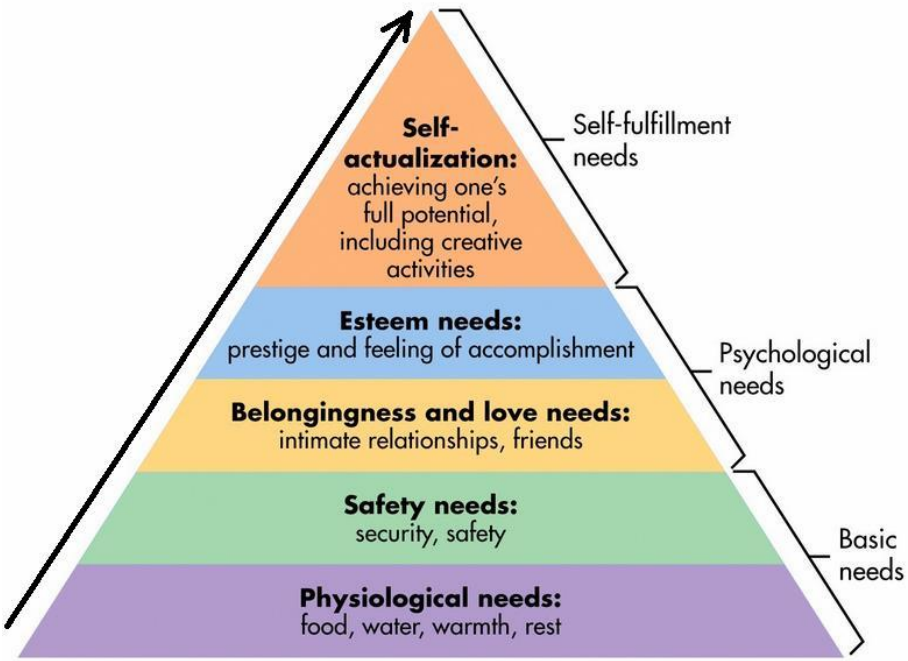
Free!
(well Cheaper!)

Time saving!

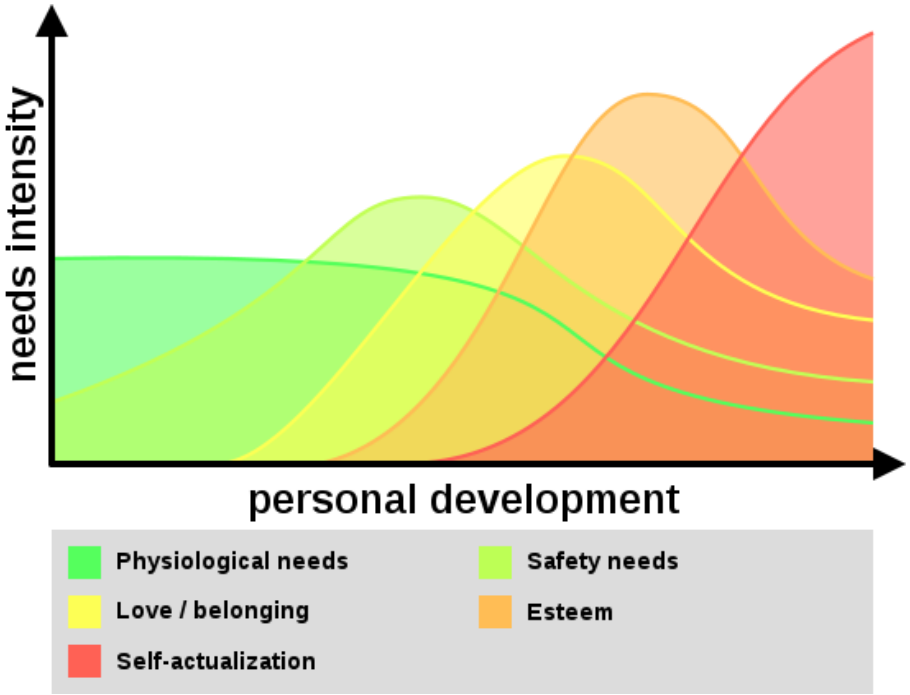
Adds to Oman's GDP and employment

Ref: Client survey conducted in Oman

Why Solar?



Ref: Saul McLeod



Ref: Philipp Guttmann

Mass adoption of any idea, product or service is driven by human needs

Where do the reasons we discussed belong?

Why Solar?

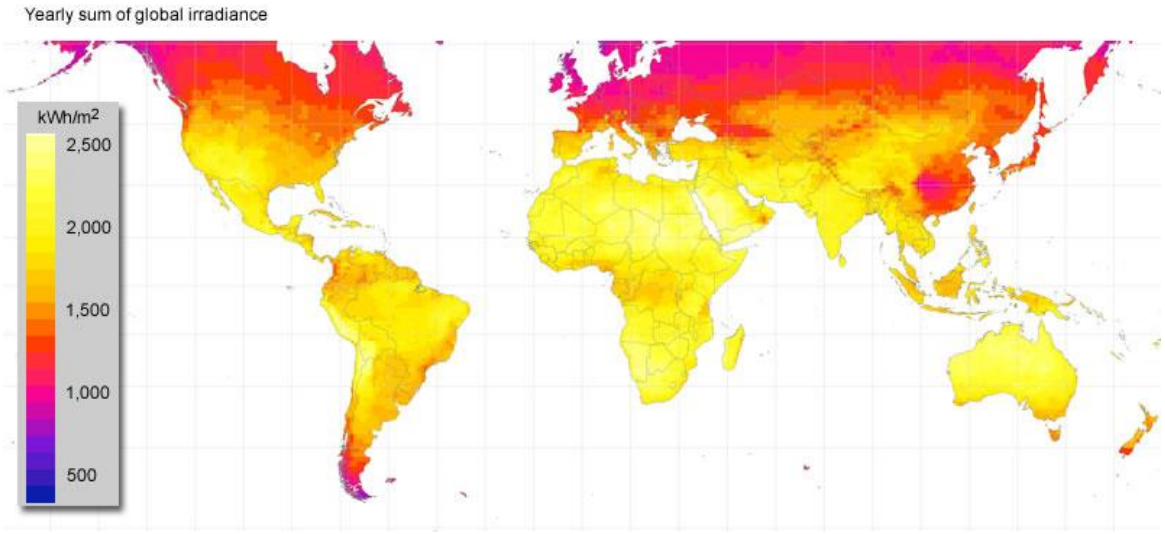
Cost benefit (financial security)

is the key criteria for mass adoption in Oman

Benchmarking rooftop PV

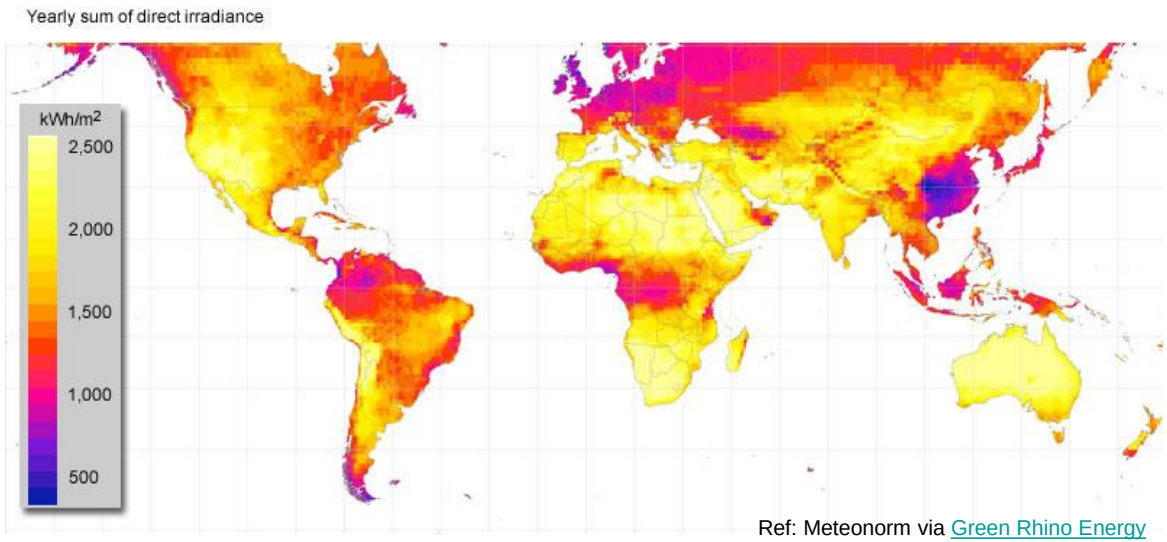
- Factors impacting the levelized cost of electricity generated from rooftop PV
  - Energy generation potential
  - Hard costs of implementation
  - Soft costs of implementation
  - O&M costs
  - Availability
- Additional factors for investment
  - Long term regulatory commitment
  - Clear risk mitigation mechanisms

Energy potential in Oman



Global irradiance is very good over most of Oman

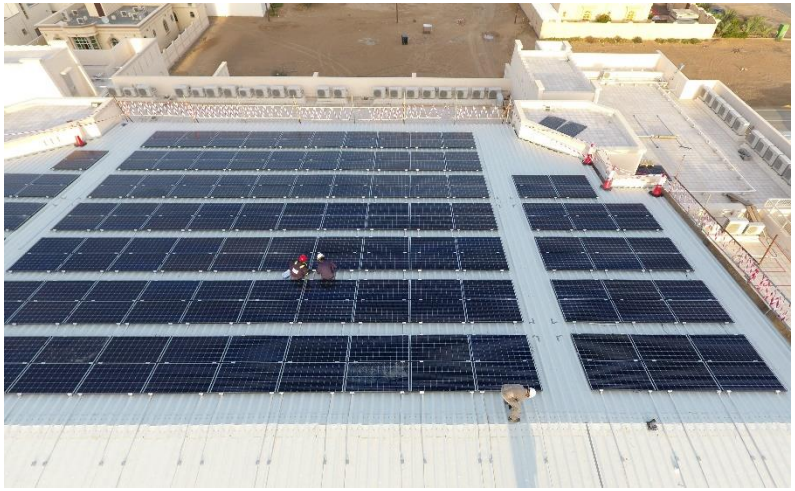
Direct Irradiance is very good over parts of Oman



Ref: Meteonorm via Green Rhino Energy

Energy potential in Oman

- Specific Production in Oman would range between 1450 to 1800 kWh/kWp/yr
- In addition to irradiance depends on PV generator design, system efficiency and installation / O&M quality



Ref: HTC, Sultan Qaboos School in Buraimi; and Khawala bint Hakeem School in Salalah – part of Shell Development Oman's Solar into Schools initiative

Hard and Soft Costs

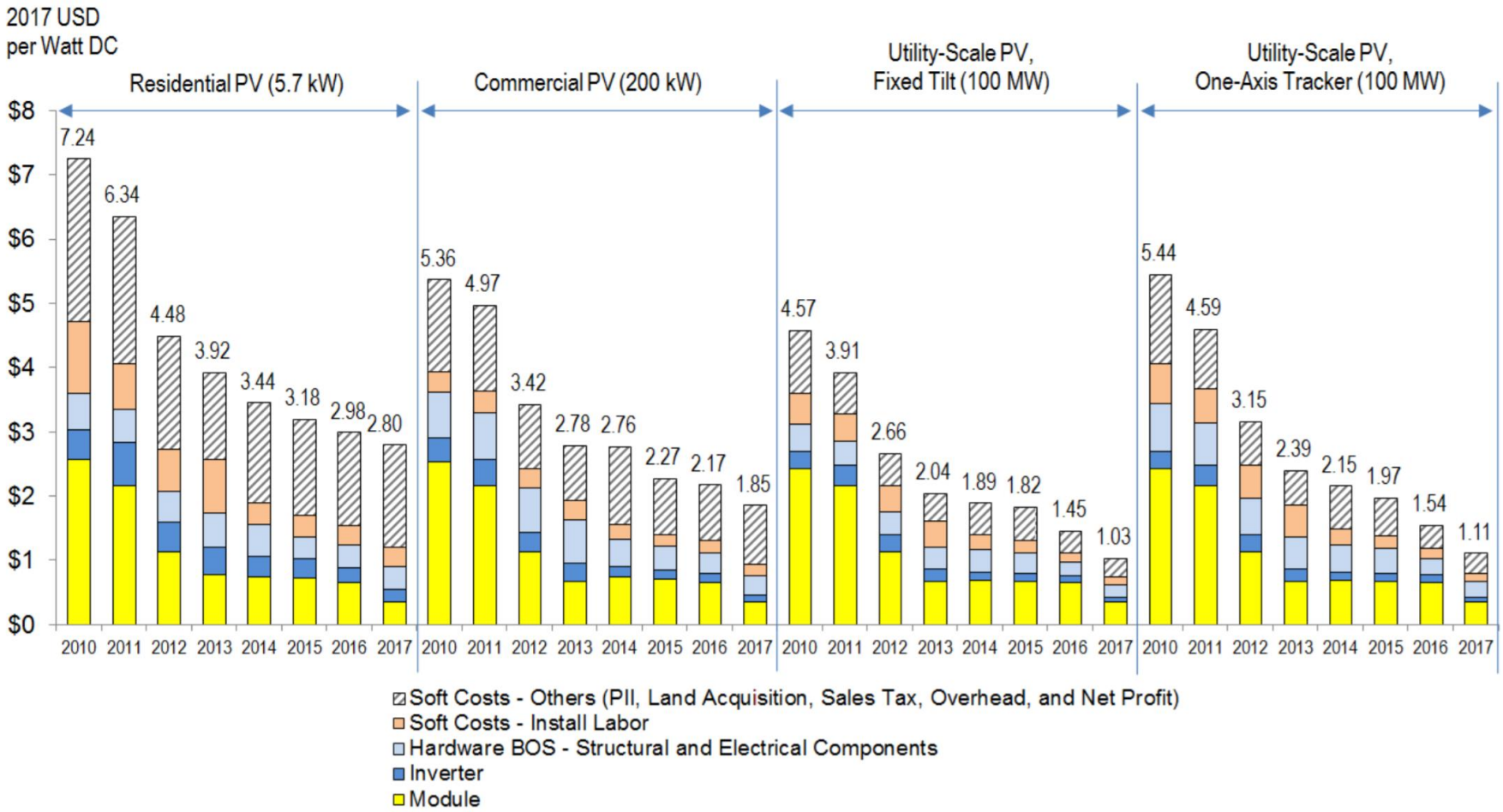


Figure ES-1. NREL PV system cost benchmark summary (inflation adjusted), 2010–2017

Ref: NREL

Detail of Hard and Soft costs

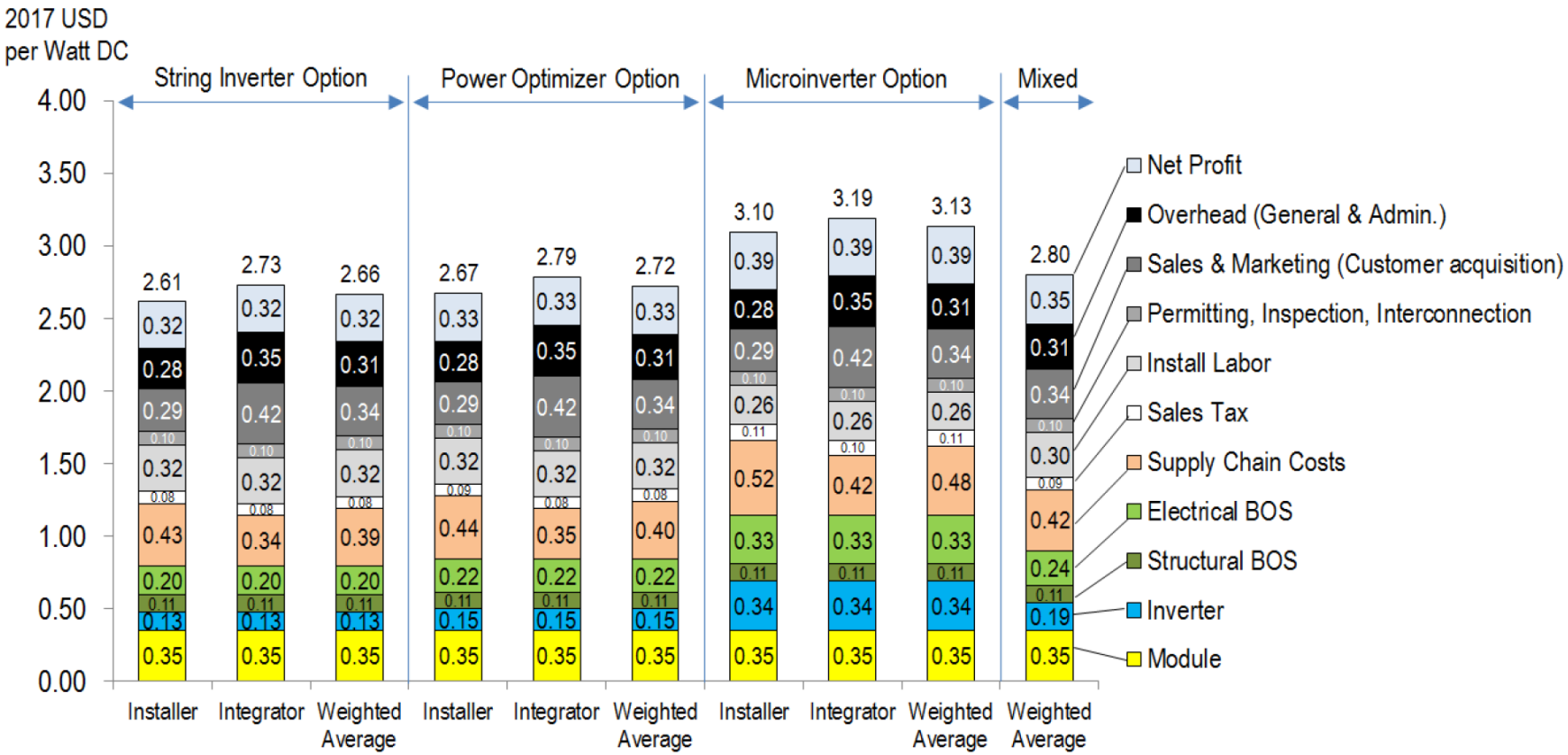


Figure 14. Q1 2017 U.S. benchmark: 5.7-kW residential system cost (2017 USD/Wdc)

Ref: NREL

Levelised cost matrix in Oman

Scenario assessment (bz/kWh)

Project Lifetime	20

Specific Production kWh/kWp/yr	Over project lifetime kWh/kWp/lifetime
1450	29000
1500	30000
1550	31000
1600	32000
1650	33000
1700	34000
1750	35000
1800	36000

1000	1500	2000	2500	3000	3500	$/kWp
385.5	578.25	771	963.75	1156.5	1349.25	RO/kWp
13.29310	19.93966	26.58621	33.23276	39.87931	46.52586	
12.85000	19.27500	25.70000	32.12500	**38.55000**	44.97500	
12.43548	18.65323	24.87097	31.08871	37.30645	43.52419	
12.04688	18.07031	24.09375	30.11719	36.14063	42.16406	
11.68182	**17.52273**	23.36364	29.20455	35.04545	40.88636	
11.33824	17.00735	22.67647	28.34559	34.01471	39.68382	
11.01429	16.52143	22.02857	27.53571	33.04286	38.55000	
10.70833	16.06250	21.41667	26.77083	32.12500	37.47917	

Above calculation is intended as a rough measure only.
It does not include: plant non-availability, plant degradation, financing costs, O&M costs, NPV effects on generated energy, etc.

Levelised cost matrix in Oman

Scenario assessment (bz/kWh)

Project Lifetime	25	1000	1500	2000	2500	3000	3500	$/kWp
Specific Production kWh/kWp/yr	Over project lifetime kWh/kWp/lifetime	385.5	578.25	771	963.75	1156.5	1349.25	RO/kWp
1450	36250	10.63448	15.95172	21.26897	26.58621	31.90345	37.22069	
1500	37500	10.28000	15.42000	20.56000	25.70000	**30.84000**	35.98000	
1550	38750	9.94839	14.92258	19.89677	24.87097	29.84516	34.81935	
1600	40000	9.63750	14.45625	19.27500	24.09375	28.91250	33.73125	
1650	41250	9.34545	**14.01818**	18.69091	23.36364	28.03636	32.70909	
1700	42500	9.07059	13.60588	18.14118	22.67647	27.21176	31.74706	
1750	43750	8.81143	13.21714	17.62286	22.02857	26.43429	30.84000	
1800	45000	8.56667	12.85000	17.13333	21.41667	25.70000	29.98333	

Above calculation is intended as a rough measure only.
It does not include: plant non-availability, plant degradation, financing costs, O&M costs, NPV effects on generated energy, etc.

Benchmarking solar vs grid

- Small sized rooftop plants (5kWp) not optimally designed will generate electricity at around 45bz/kWh
- Medium sized rooftop plants (~150kWp) optimally designed will generate electricity at around 25bz/kWh

- Residential grid tariffs average to ~18bz/kWh
- Commercial and industrial tariffs average to ~25bz/kWh

Why is rooftop solar expensive?!

- Subsidised grid is the main obstacle
- New Ecosystem
  - Regulations are new
  - Process of the different stakeholders (DCRP, DNOs, MRM, MM, CD) isn't ironed out
  - Permitting process is long and therefore expensive
  - Lack of distribution increases supply chain costs
  - Few role models and examples
  - Scarcity of trained local contractors
  - Lack of general awarness

Why is rooftop solar expensive?!

- O&M costs
  - Costs of telecom solutions
  - Large spread of Oman and remoteness of project sites

What’s next

- Teething problems will be resolved – all stakeholders are committed to enabling renewable energy
- Many public and private initiatives are taking place to bridge the gaps.

The future will be bright!

Thank you!

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