Solar Powered Water Systems in Humanitarian Context – Types and Configurations

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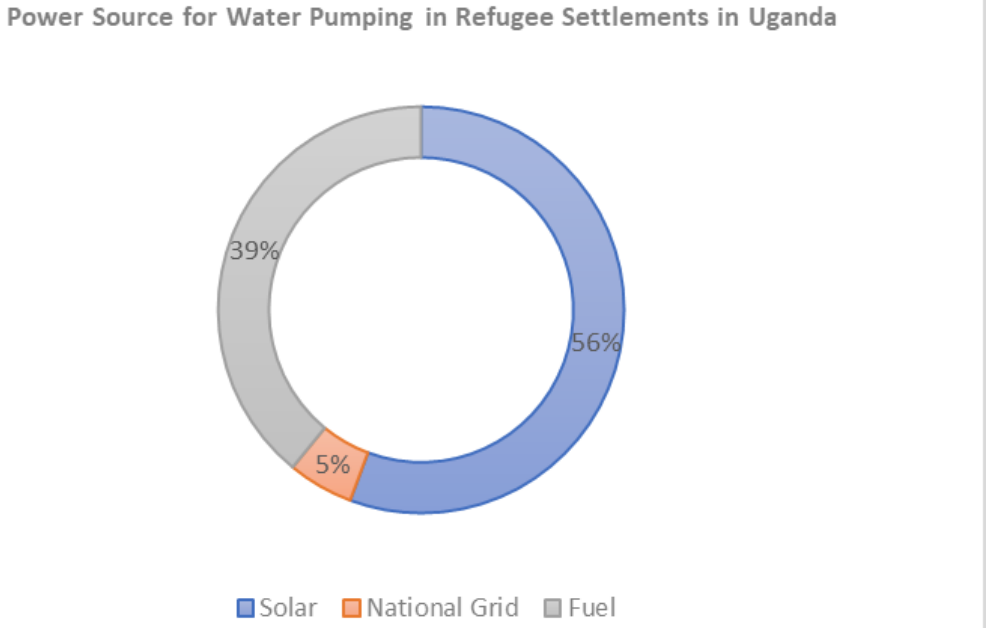
SCOPE

of water schemes:174
# of Solar/Solar Hybrids: 164
# of Grid/Fuel : 5
# of Fuel:5

Daily Average Production September 2020: 13,939 m3



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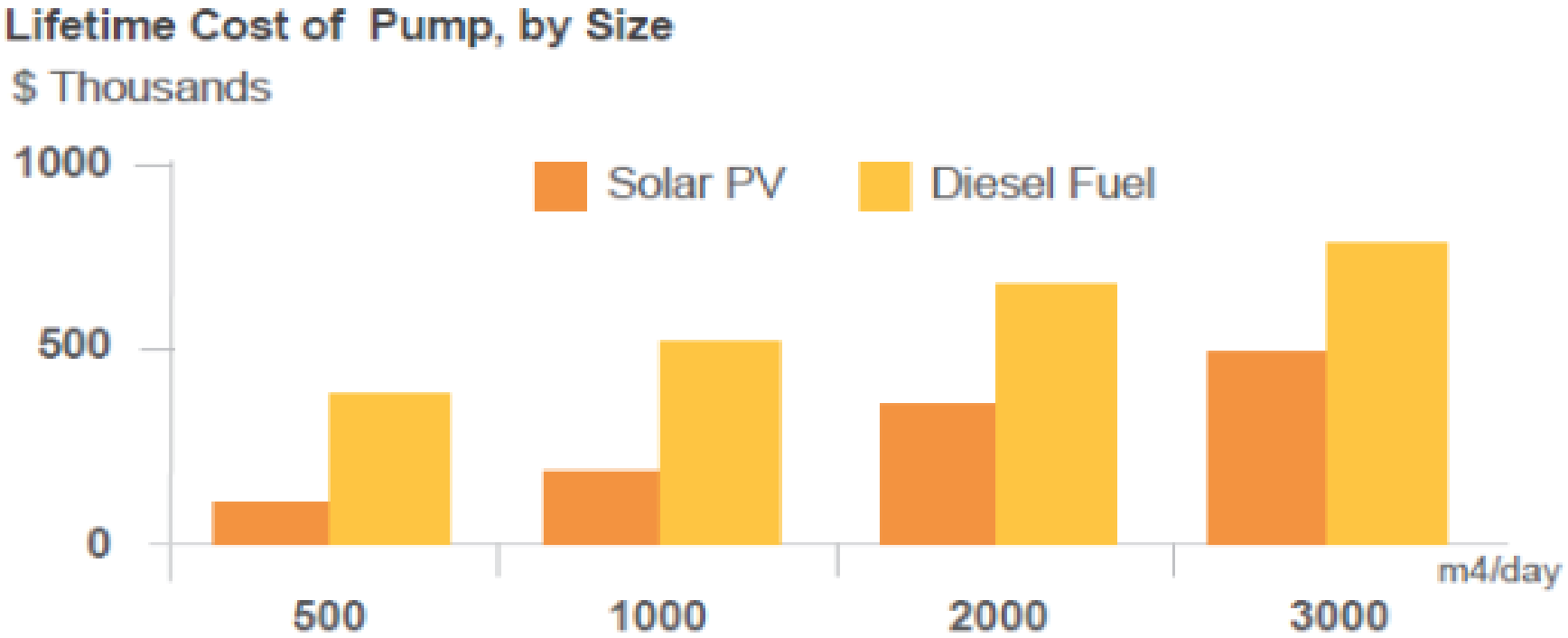
Key drivers to wider adoption

- Cost Analysis - LCCA
- Solar Pumping Market Place
- Environmental Considerations

Cost comparison between solar PV and diesel pumps



Source: *https://www.ace-taf.org/wp-content/uploads/2019/10/ACE-TAF-UGANDA-SOLAR-WATER-PUMPING-REPORT-SCREEN-1.pdf*

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Column1	1	2	3	4	5	6	7	8	9
System Design Scenario	Gen Only (9,5h) (10k people)	Solar Only (10k people)	Solar-Gen (0h) Standby (10k people)	Solar-Gen (4h) Hybrid (10k people)	Solar Only (33k people)	Solar-Gen (0h) Standby (33k people)	Solar-Gen (4h) Hybrid (47k people)	Solar-Gen (13h) Hybrid (80k people)	Gen Only (23h) (80k people)
CapEx	$ 186.000	$ 224.000	$ 261.000	$ 234.000	$ 615.000	$ 669.000	$ 812.000	$ 1.061.000	$ 828.000
O&M 1st Year	$ 31.803	$ 5.000	$ 7.741	$ 14.234	$ 10.000	$ 15.059	$ 35.623	$ 95.024	$ 156.581
Total Initial	**$ 217.803**	**$ 229.000**	**$ 268.741**	**$ 248.234**	**$ 625.000**	**$ 684.059**	**$ 847.623**	**$ 1.156.024**	**$ 984.581**
Total after 10 Years	**$ 567.828**	**$ 284.031**	**$ 353.934**	**$ 404.889**	**$ 735.061**	**$ 849.805**	**$ 1.239.690**	**$ 2.201.866**	**$ 2.707.923**
People	10.000 People	10.000 People	10.000 People	10.000 People	33.000 People	33.000 People	47.000 People	80.000 People	80.000 People
$$/People Initial	22 $$/P	23 $$/P	27 $$/P	25 $$/P	19 $$/P	21 $$/P	18 $$/P	14 $$/P	12 $$/P
$$/People/Year	**6 $$/P/Year**	**3 $$/P/Year**	**4 $$/P/Year**	**4 $$/P/Year**	**2,2 $$/P/Year**	**2,6 $$/P/Year**	**2,6 $$/P/Year**	**2,8 $$/P/Year**	**3,4 $$/P/Year**
Cubic Meter / Day	150 m3/Day	150 m3/Day	150 m3/Day	150 m3/Day	495 m3/Day	495 m3/Day	705 m3/Day	1.200 m3/Day	1.200 m3/Day
Cubic Meter in 10 Years	547.500 m3	547.500 m3	547.500 m3	547.500 m3	1.806.750 m3	1.806.750 m3	2.573.250 m3	4.380.000 m3	4.380.000 m3
$$ / Cubic Meter	1,04 $$/m3	0,52 $$/m3	0,65 $$/m3	0,74 $$/m3	0,41 $$/m3	0,47 $$/m3	0,48 $$/m3	0,50 $$/m3	0,62 $$/m3
UGX / Cubic Meter	**3.837 UGX/m3**	**1.919 UGX/m3**	**2.392 UGX/m3**	**2.736 UGX/m3**	**1.505 UGX/m3**	**1.740 UGX/m3**	**1.783 UGX/m3**	**1.860 UGX/m3**	**2.288 UGX/m3**
UGX / 20 Liter	**77 UGX/20L**	**38 UGX/20L**	**48 UGX/20L**	**55 UGX/20L**	**30 UGX/20L**	**35 UGX/20L**	**36 UGX/20L**	**37 UGX/20L**	**46 UGX/20L**
O&M Percentage	**67%**	**21%**	**26%**	**42%**	**16%**	**21%**	**34%**	**52%**	**69%**

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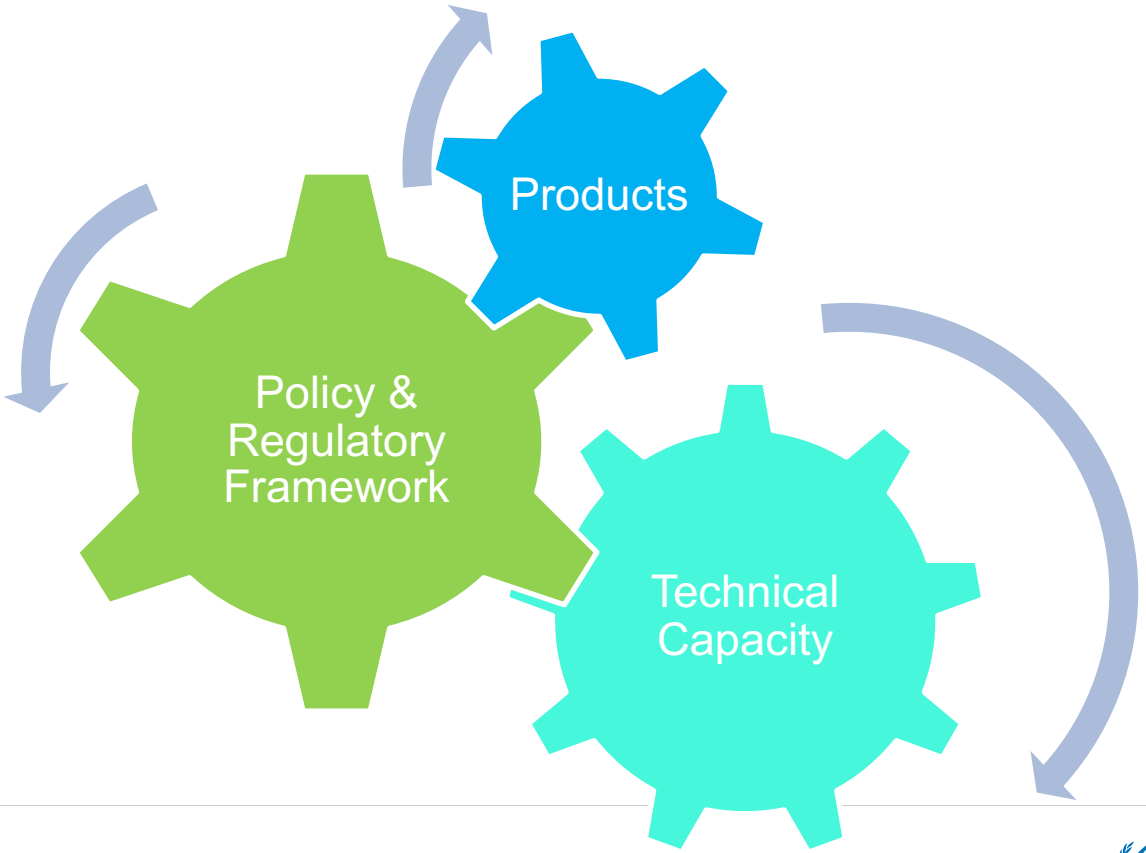
Solar Pumping Market Place



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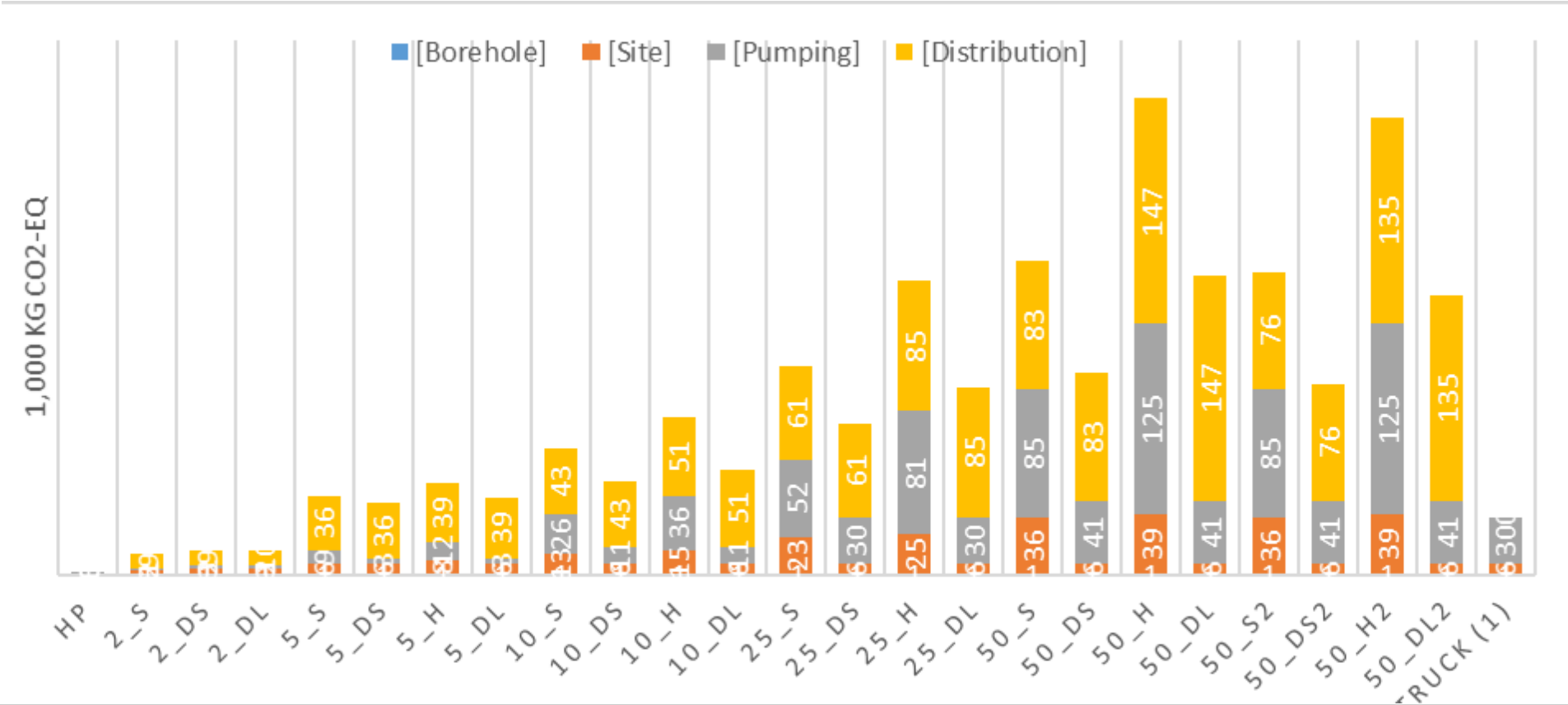
Environmental Consideration



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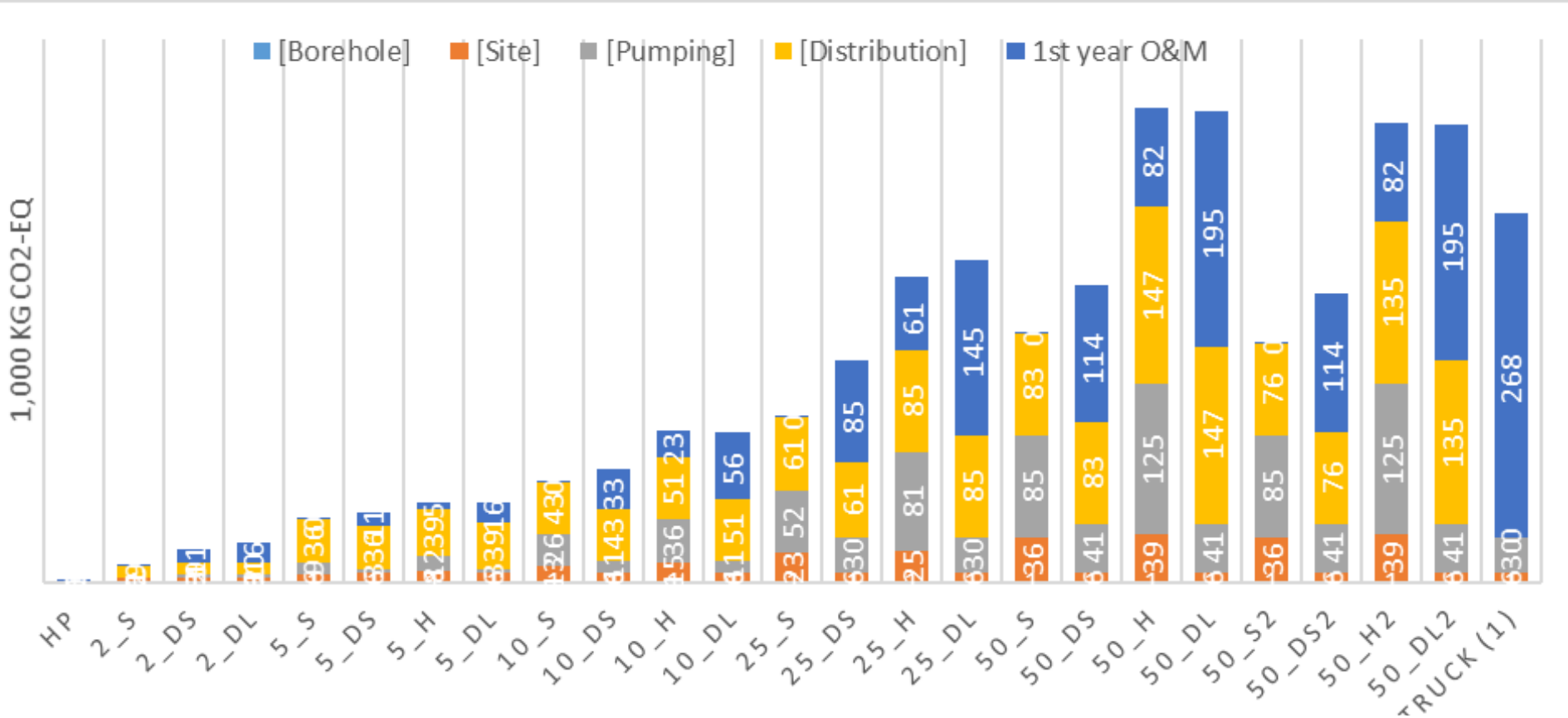
Environmental Consideration



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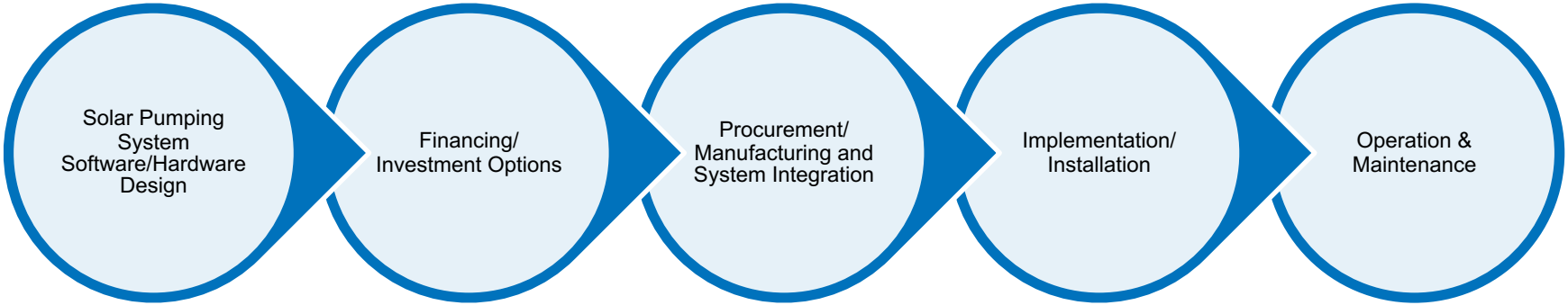
Solar Powered Scheme Value Chain in Humanitarian Setting



Performance

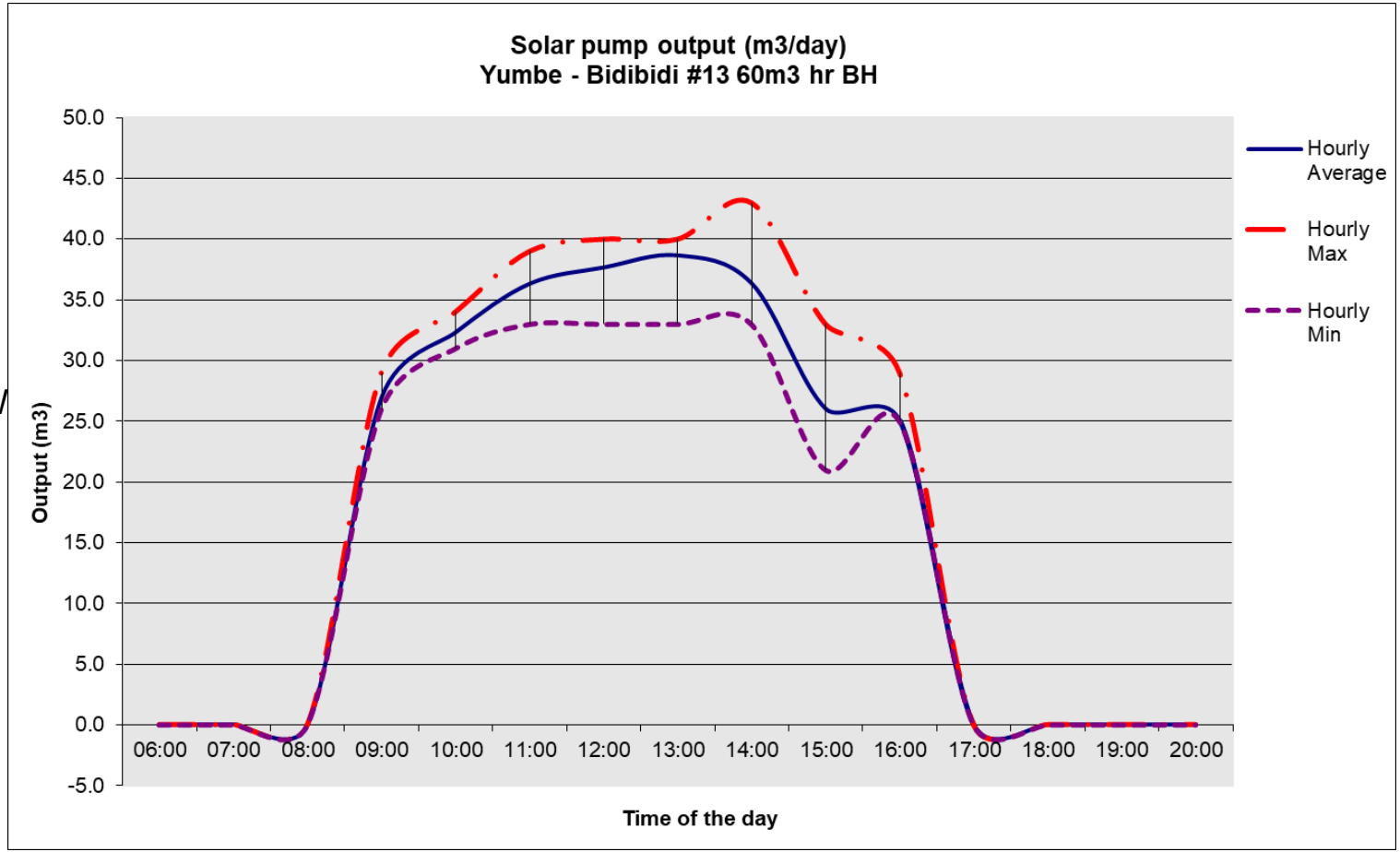
BH: 60m3/hr

Pump installed: 40m3/hr

Solar Array: 41.8 KW

Max Output: 266 m3/day

Avg Output: 259m3/day



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Performance

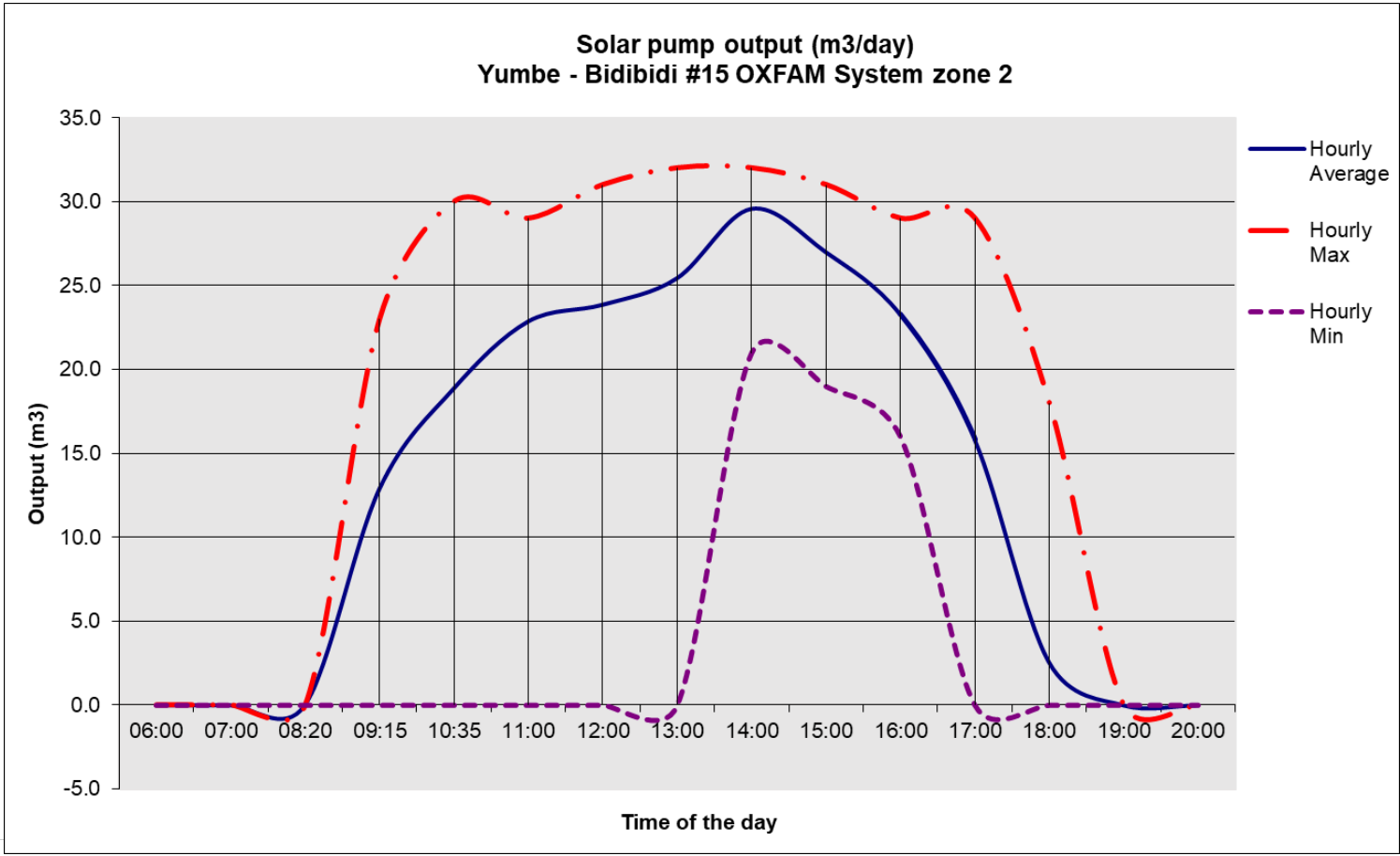
BH: 45m3/hr

Pump installed: 30m3/hr

Solar Array: 30KW

Max Output: 284 m3/day

Avg Output: 202 m3/day



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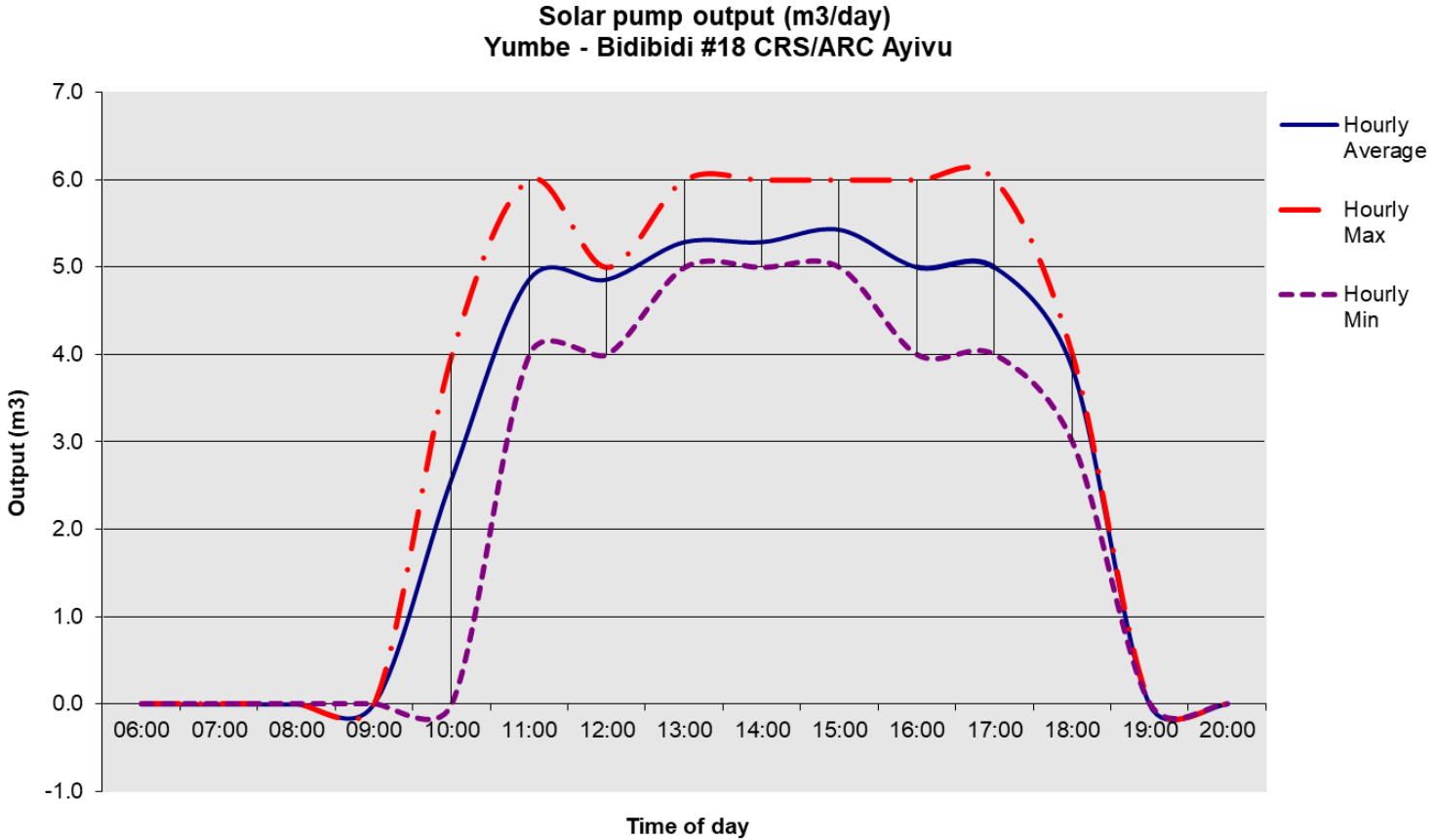
Performance

Pump installed: 6.05m3/hr

Solar Array: 17.9KW

Max Output: 49m3/day

Min Output: 42.1 m3/day



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Opportunities for Growth

Risk	Mitigation
Solar irradiation during the rainy seasons	Complement with rainwater harvesting and HH water treatment
Low technical Capacity to monitor performance effectively	Remote monitoring/IoT technologies
Over design/under-design: Inadequate data for optimized design	Agility and Optimization of systems based on analytics: Data collected…
Long Investment Payback Periods: Economics in rural areas	System Integration: drinking water pumping + Irrigation pumping+ Lighting+ Charging electronics+++ (leverage on CAPEX costs)

Discussion Points

Is it more efficient to have 2 smaller pumps rather thank one big pump (irradiation vs Output)

Is 1:1 configuration of pumps and solar array more efficient than a higher wattage to capacity of pump in terms of Output per day?

Join the conversation

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