Federal Ministry
for Economic Affairs
and Energy

MITTELSTAND
GLOBAL
ENERGY SOLUTIONS
MADE IN GERMANY

Overview of GIZ Project Development Programme‘s Energy Assessment Process

Facilitator

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

The Project Development Programme (PDP)

Sponsor
German Federal Ministry for Economic Affairs and Energy

German Energy Solutions Initiative

- Promoting sustainable energy solutions worldwide
- Contribution to GHG reduction and climate change mitigation

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- Non-profit company, owned by the German Government
- Operates in over 120 countries
- Expertise in various topics: Energy, Climate change, Education, Health, etc.

Project Development Programme (active in 18 countries)

Technical support to

- Humanitarian agencies to explore renewable energy technologies (knowledge)
- Rooftop solar feasibility study (project development)
- Selecting suitable contractors (tendering, evaluation)

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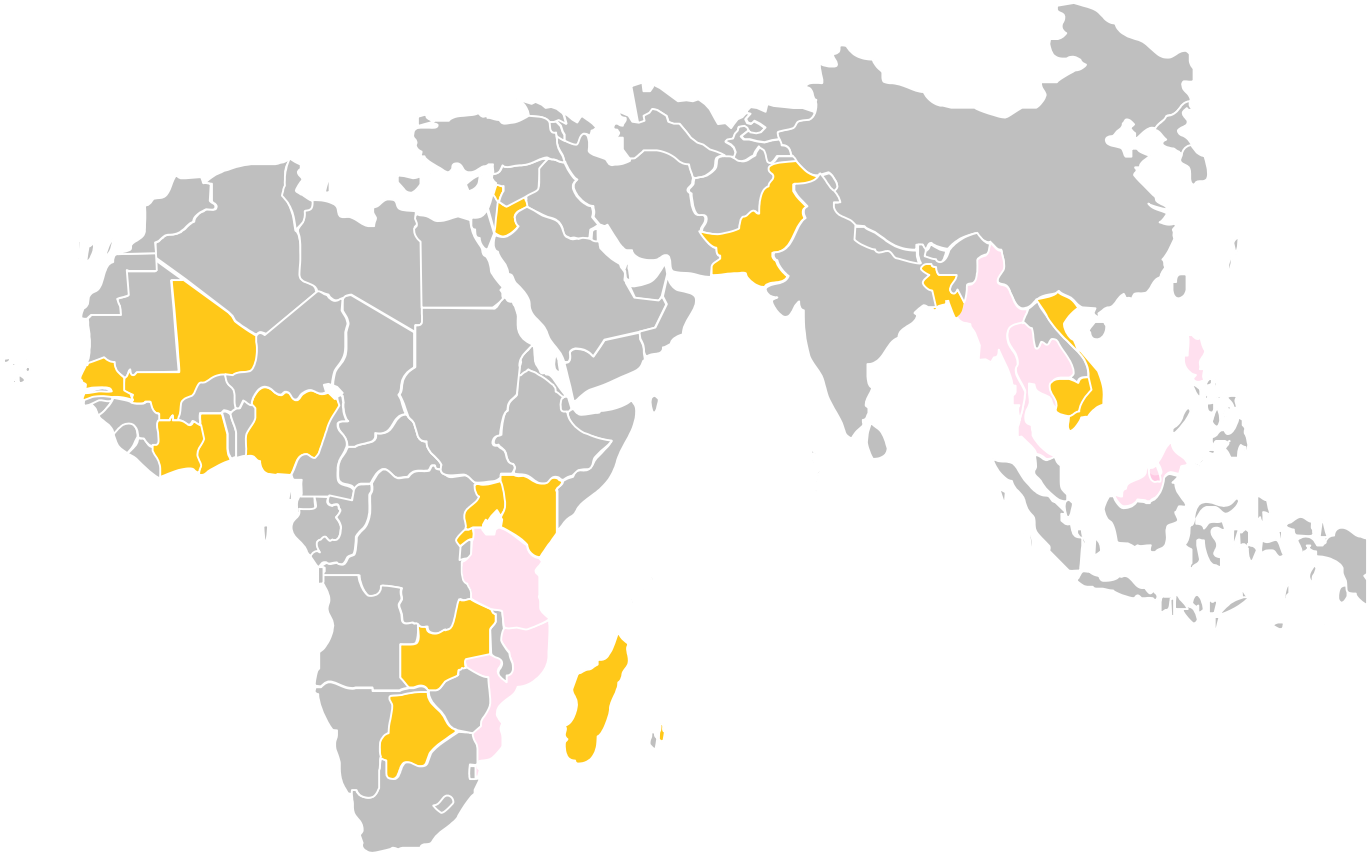
The Project Development Programme (PDP)



Previous countries

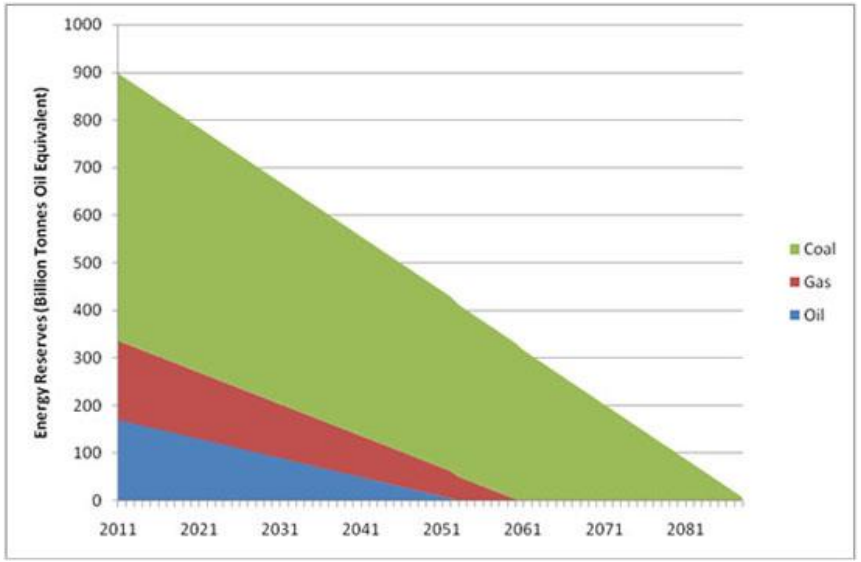
Current countries (18)

Geographic Scope

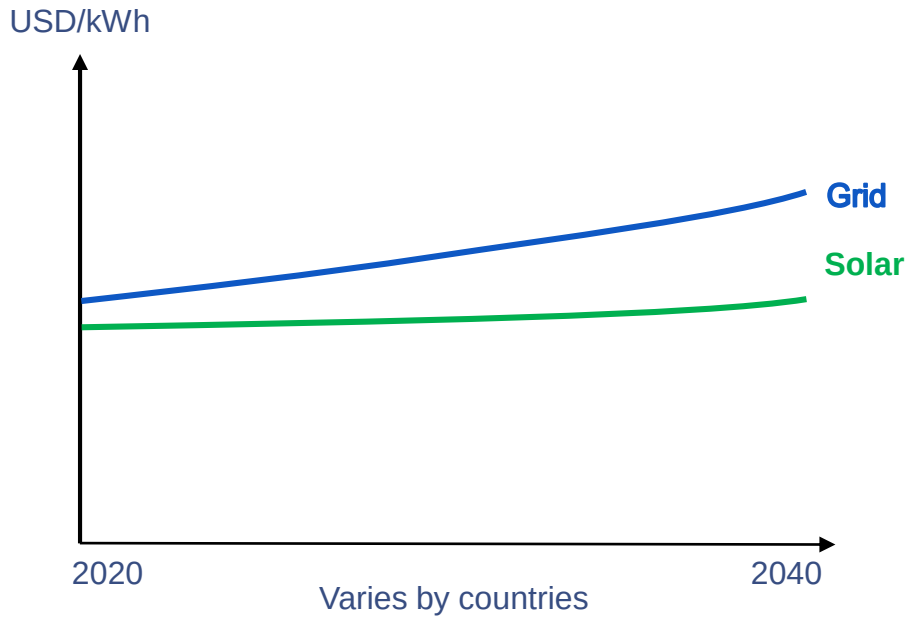
- **Sub-Saharan Africa**
  - Kenya
  - Ghana
  - Nigeria
  - Mali
  - Senegal
  - Côte d'Ivoire
  - Botswana
  - Zambia
  - Mauritius
  - Madagascar
  - Uganda
  - Rwanda
- **Middle-East**
  - Lebanon
  - Jordan
- **Asia**
  - Pakistan
  - Bangladesh
  - Vietnam
  - Cambodia

Why Solar in humanitarian contexts?

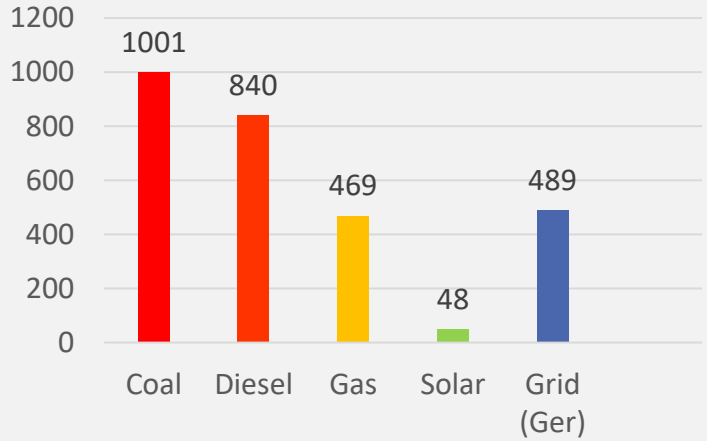
Energy security



Energy cost

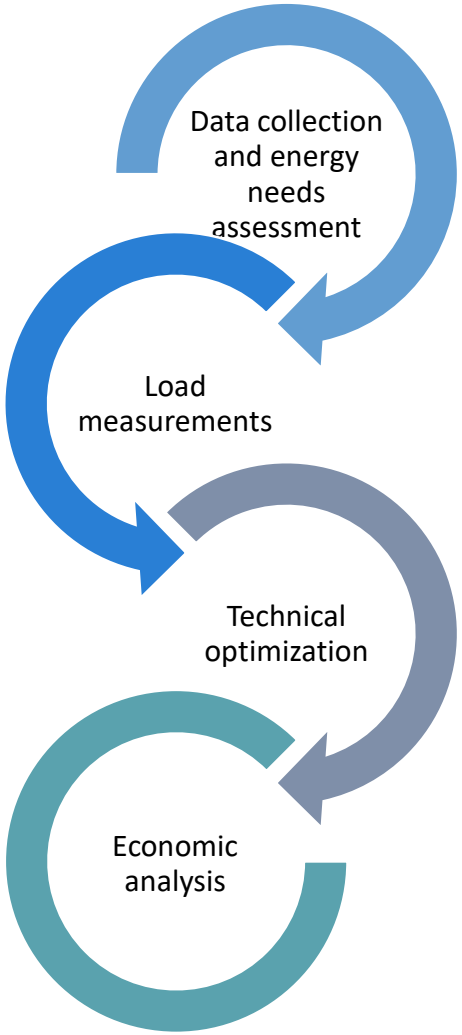


Lower CO_2 emission



- Cost savings
- Energy security
- Risk mitigation from future fuel and grid costs
- Much lower CO2 emission from solar electricity
- Available solutions customized for harsh environments
- Scalable and modular solutions
- Mobile solutions

Feasibility study



	GenSet 1	GenSet 2	GenSet 3
Information from the GenSet Name Plate			
Type of generator (SEG a catalogue purchase)			
Rated capacity [kW]			
Manufacturing Year [YYYY]			

Month	Year	monthly supply [kWh]
Jan	2020	
Feb	2020	
Mar	2020	
Apr	2020	
May	2020	
Jun	2020	
Jul	2020	
Aug	2020	
Sep	2020	
Oct	2020	
Nov	2020	
Dec	2020	

Building / Building complex		
available Area		
In which year the buildings were built/ roofs were replaced?		
Roof material?		
Any device, accessories currently installed on the roof?		
Allowed additional load on the roof (kg/m^2)? Rule of Thumb: 25 kg/m² are the minimum static load reserve for a PV Rooftop installation		

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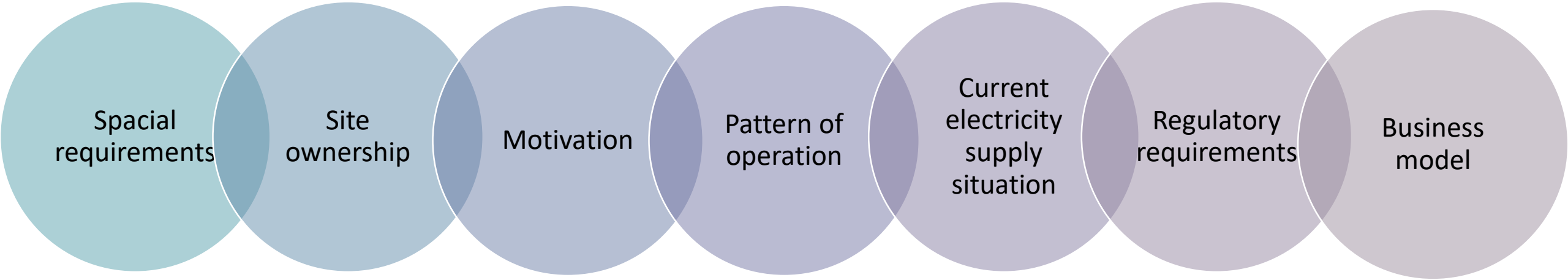
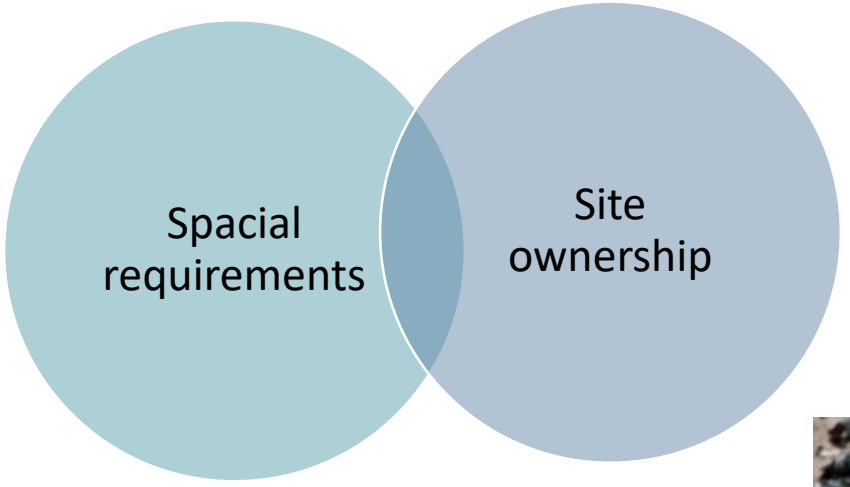
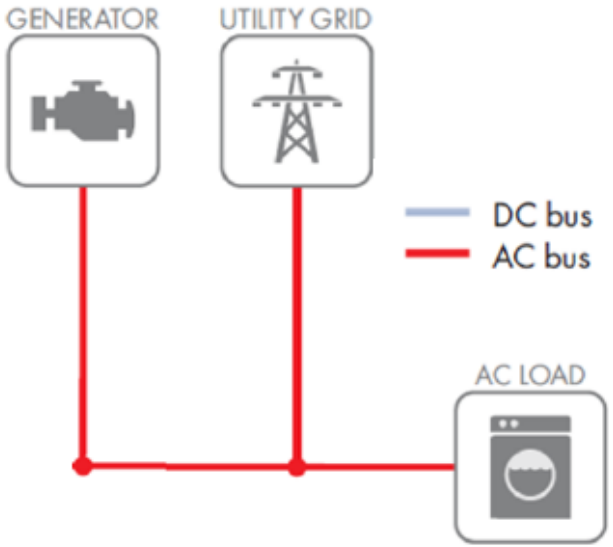
Initial considerations





- Ground and roof available.
- Site owned/ leased/ rented
- Total available land area

Current electricity supply situation



Annual electricity demand

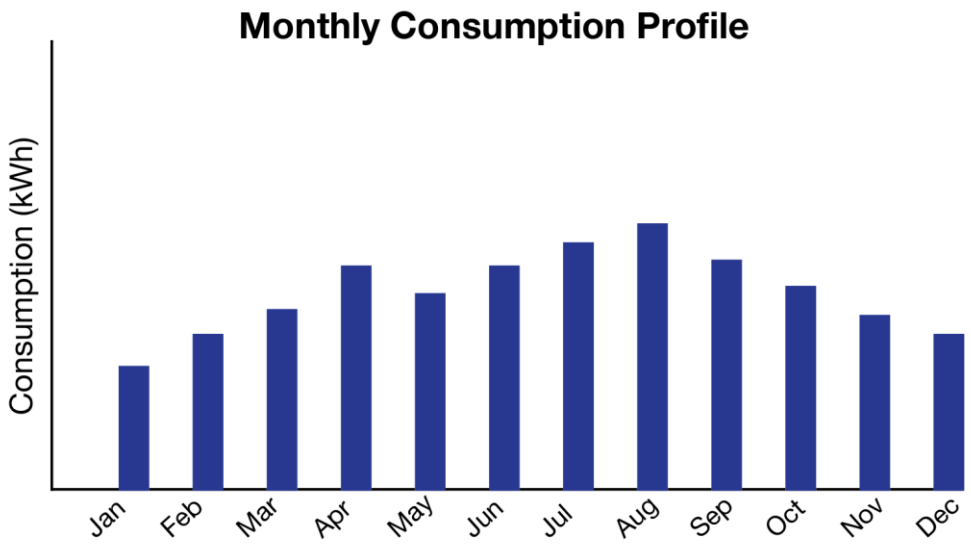
Utility Grid contribution

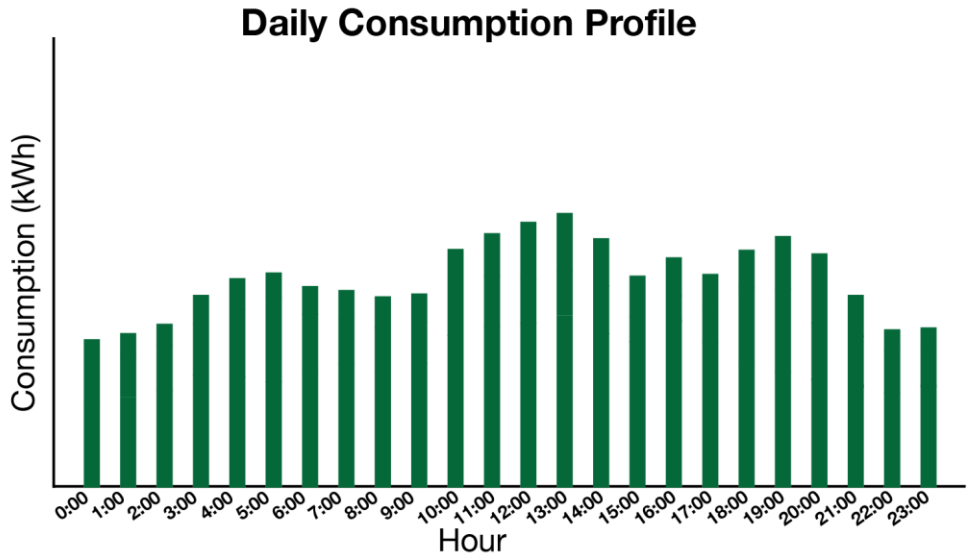
Genset contribution

Electricity price

Diesel generator capacity & consumption

Pattern of operation

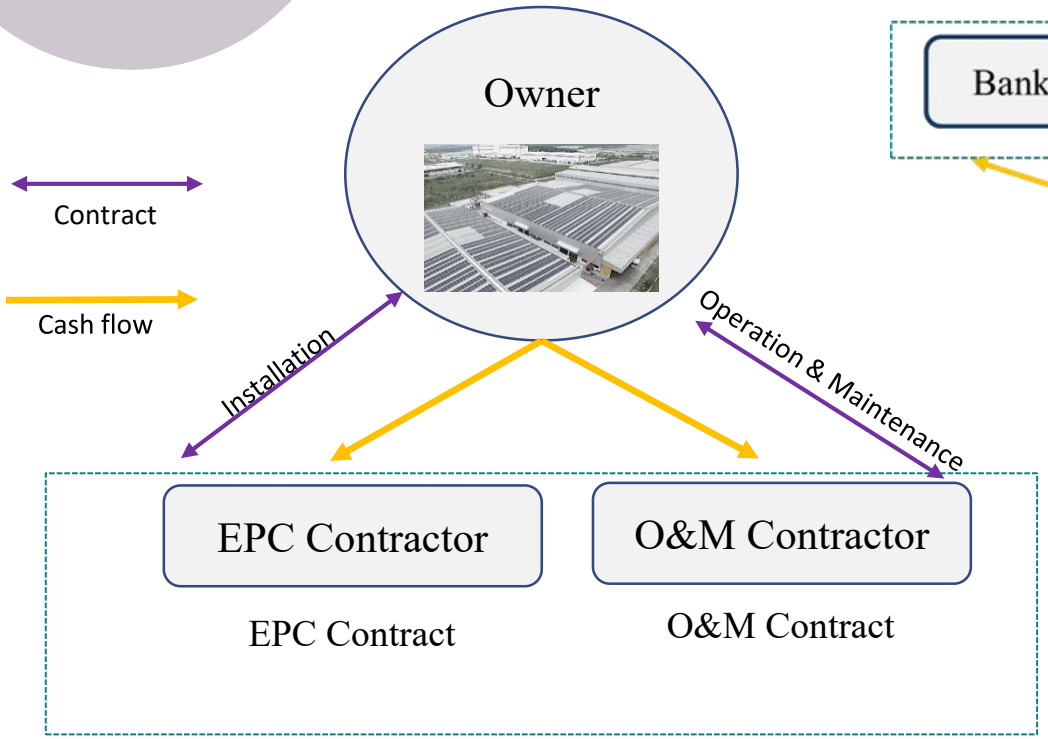




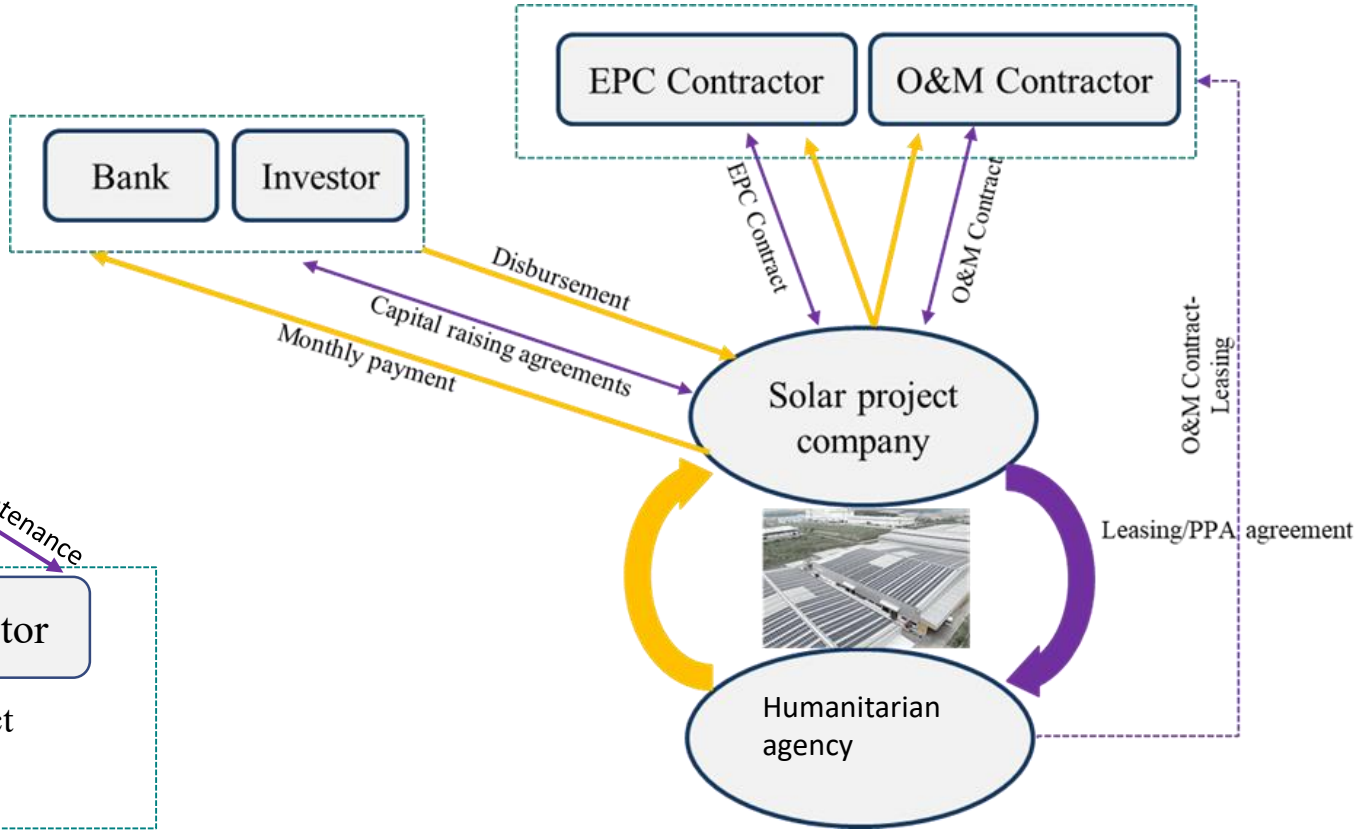
Regulatory requirements

- Net metering allowed?
- Cap on solar PV system size?
- Licensing requirements?
- Limitations on business models?
- What permits are required
- Processing time
- Incentives
- Government strategy on future electricity planning
- ..

Business model



EPC Model



Third Party Ownership Model

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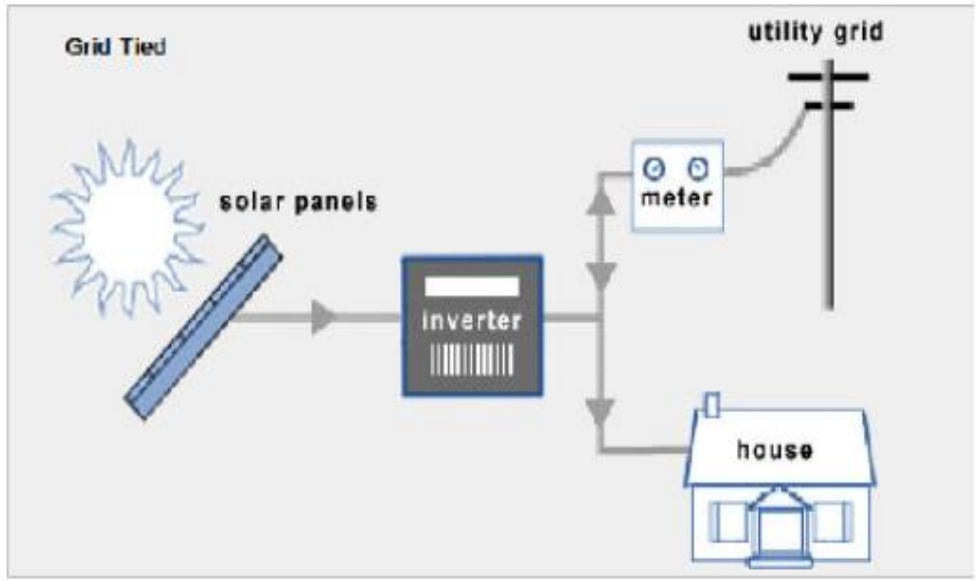
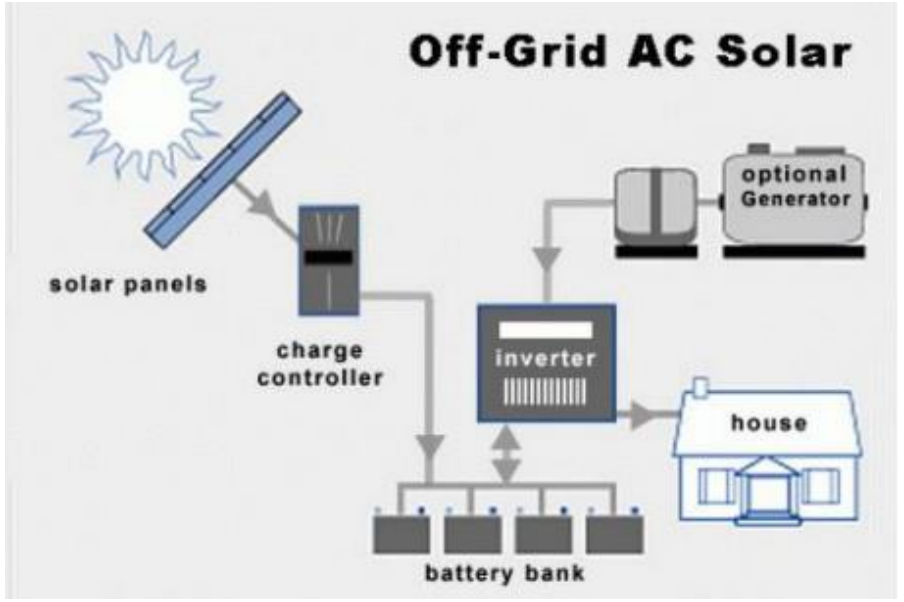
Motivation

Basic Types of Solar PV Systems

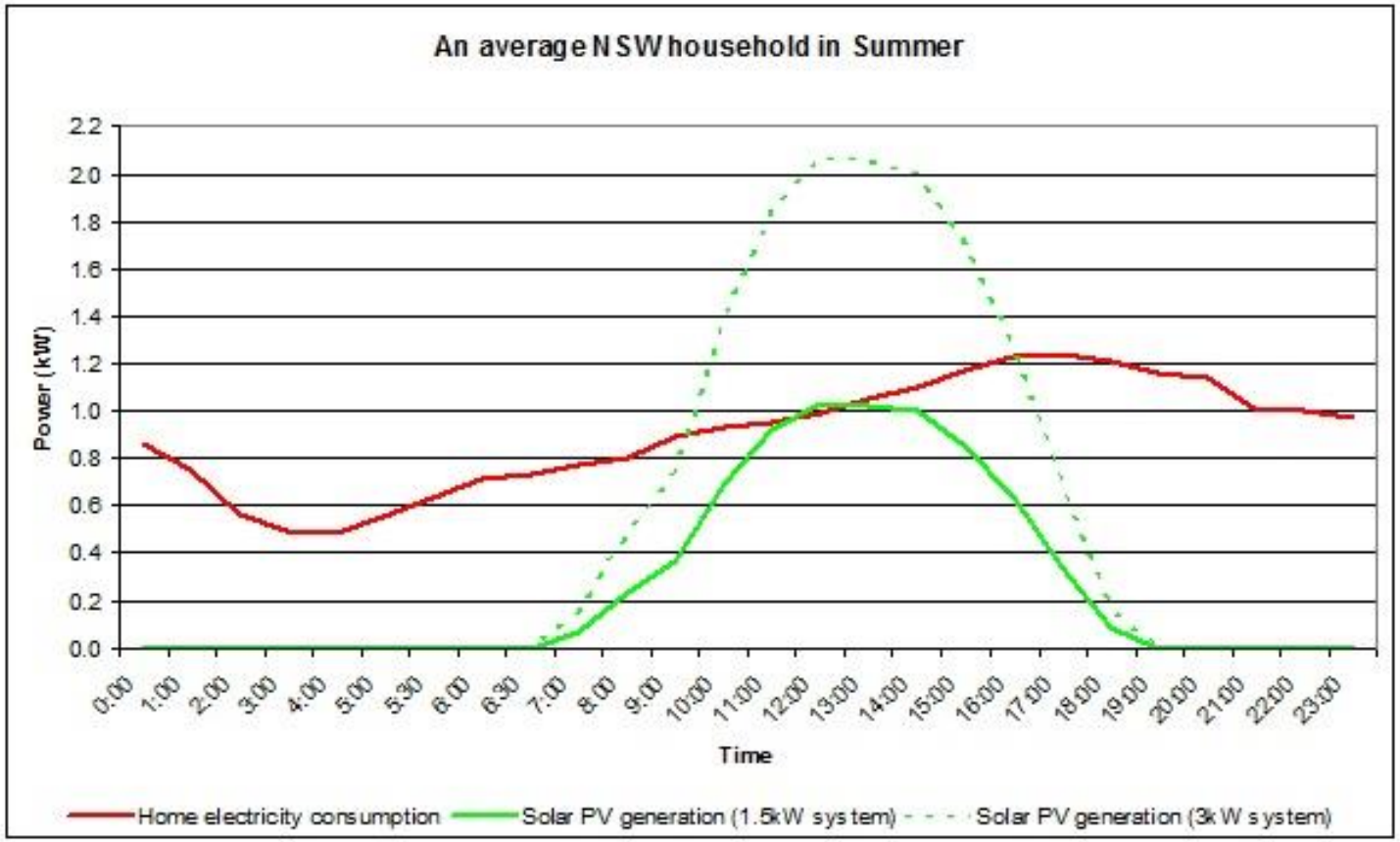


On-grid solar



Off-grid solar

Motivation


An average NSW household in Summer
Power (kW)
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0:00
1:00
2:00
3:00
4:00
5:00
5:30
6:00
6:30
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time
Home electricity consumption
Solar PV generation (1.5kW system)
Solar PV generation (3kW system)

Selected case example

Current Situation: Grid connected with Generator:

Annual electricity demand	**217,680 kWh**
Utility Grid contribution	96%
Generator contribution	4%
Electricity price (EUR/ kWh)	0.12
Diesel generator capacity	70 kVA

=> Proposed case: On grid - 50 kWp Solar PV System

Current Situation: Offgrid with Generator:

Annual electricity demand	**217,680 kWh**
Utility Grid contribution	0%
Generator contribution	100%
Diesel generator costs (EUR/kWh)	0.54
& price (EUR/kWh)	70 kVA

=> Proposed case: Off grid - 120 kWp PV + 100 kWh Li-ion battery + 40 kWp battery inverter

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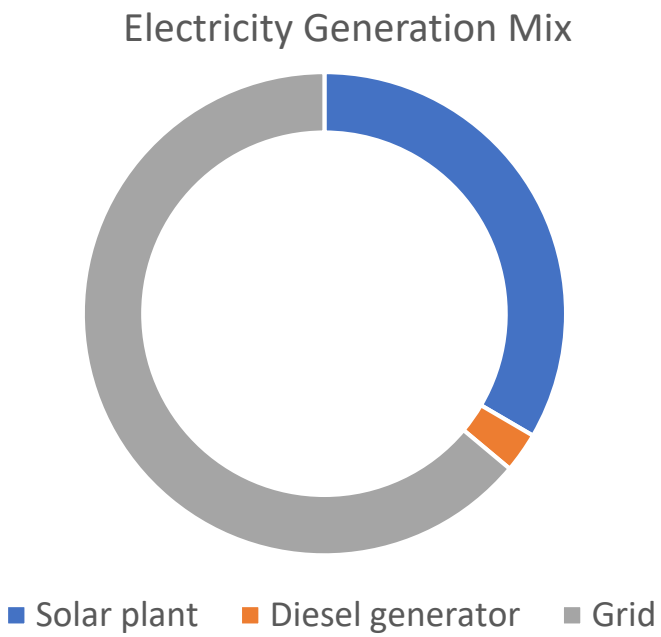
50 kWp Solar PV



Component	Production (kWh/year)	Penetration
Solar plant	84,000	33%
Diesel generator	7,000	3%
Grid purchases	161,000	64%

Key project data:

- Installed system power capacity: **50 kWp**
- Hours of operation: **4,337 hrs/year**
- Operation: **On-grid with no batteries backup**

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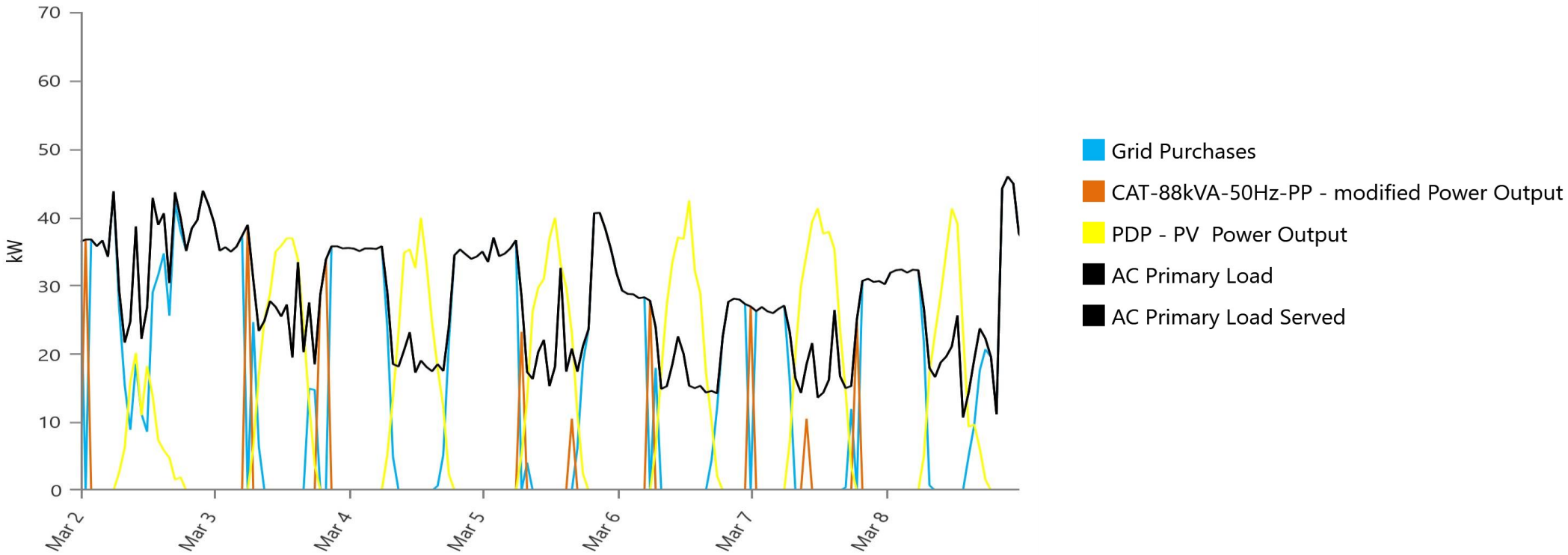
Proposed system supply mix (50kW Solar PV+ Grid + Diesel genset)

Solar PV generation exceeds the demand profile in most instances



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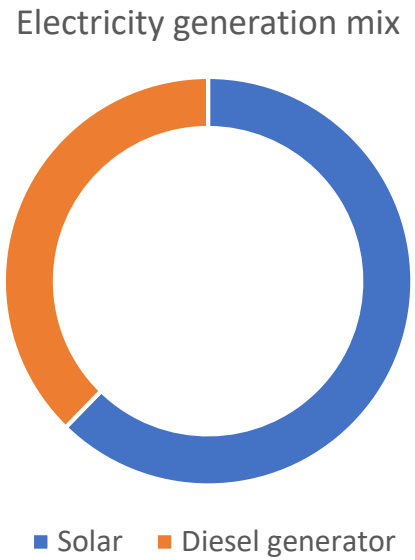
Off grid - 120 kWp PV + 100 kWh Li-ion battery + 40 kWp battery inverter



Key project data:

- Installed system power capacity: **120 kWp – capped with area availability**
- Hours of operation: **4,337 hrs/yr**
- Operation: **Off-grid with 100kWh Lithium Ion batteries backup and 40kWp Battery inverter**

Component	Production (kWh/year)	Penetration
`120kWp Solar Plant	203,000	62%
70kVA Diesel generator	123,000	38%

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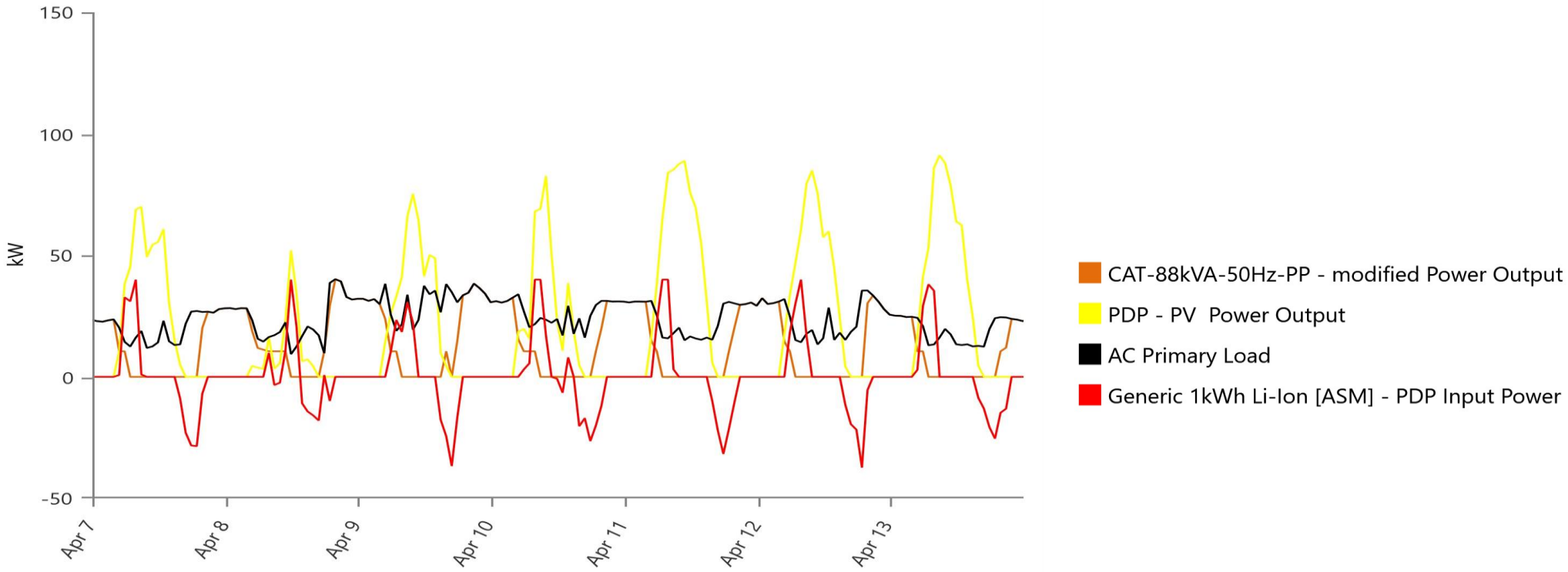
Proposed system supply mix output (120kW Solar PV + Grid + 100kWh Lithium-Ion Battery)

Excess Solar PV generation is stored in the batteries



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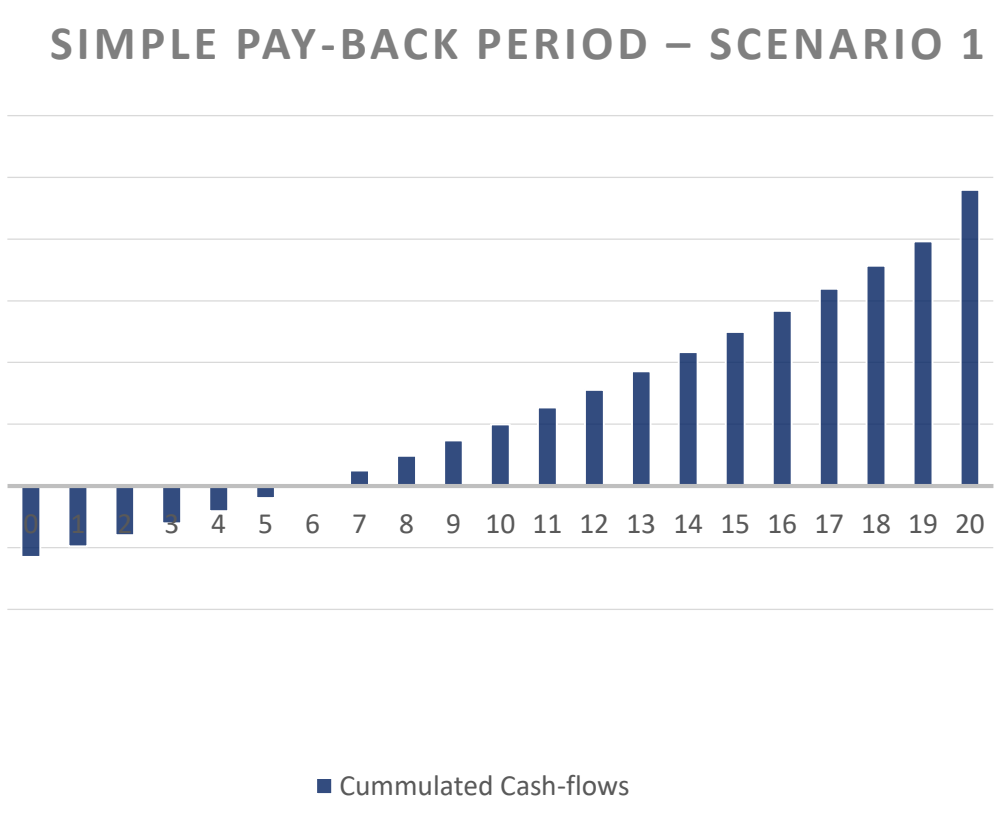
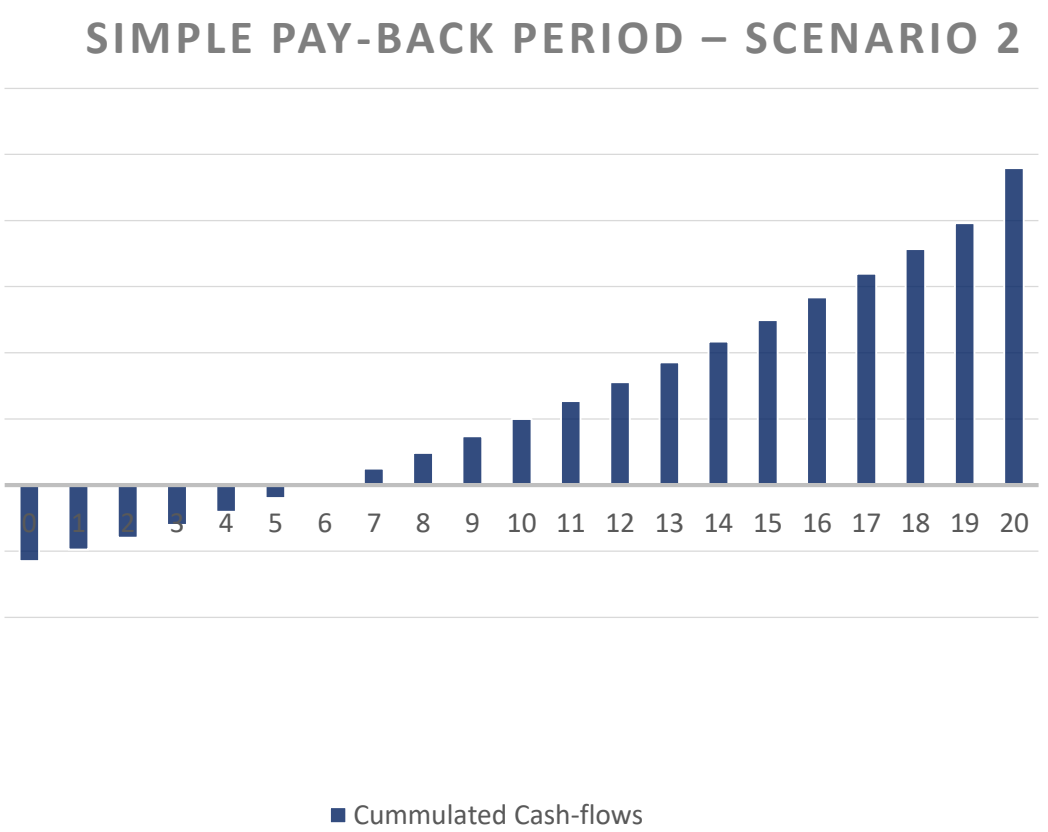
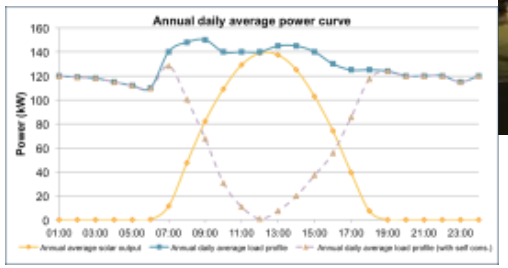
Economical analysis





Lifecycle of the solar project



Feasibility study

Contracting

Financing

Permits and licenses

Procurement, construction and installation

Commissioning

O&M

Decomissioning

PDP supports humanitarian agencies with prefeasibility assessments for projects >100kW.

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Thank you for your attention!

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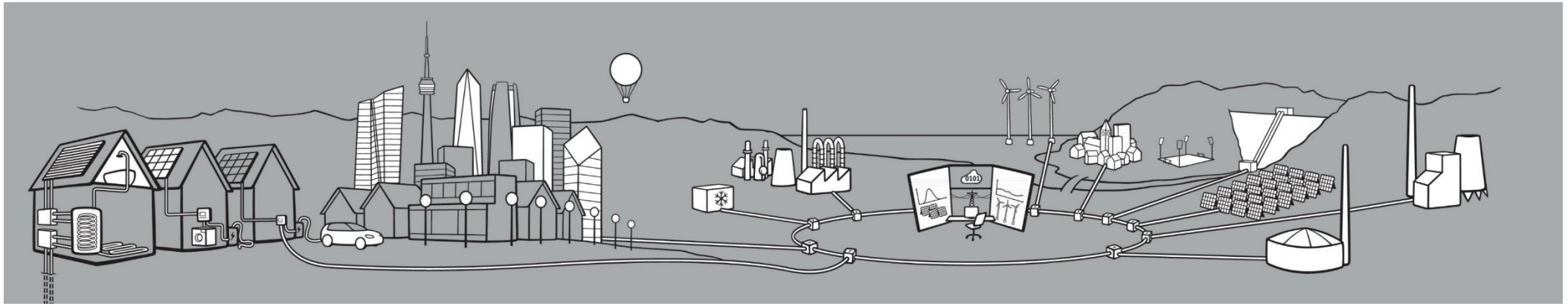
Project Manager – Humanitarian Component

Project Development Programme (PDP)
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH



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