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for Economic Affairs
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ENERGY SOLUTIONS
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Sector analysis Uganda
Market opportunities for commercial and industrial PV solar systems

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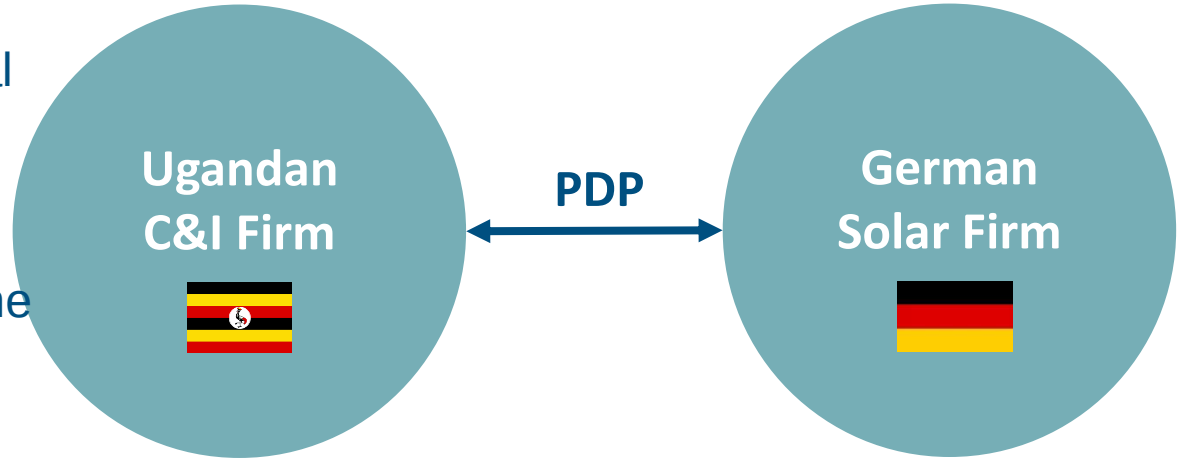
The Project Development Programme (PDP) assists local commercial and industrial firms to access solar from reputable German firms

- The PDP, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, in the framework of the German Energy Solutions Initiative of the German Federal Ministry for Economic Affairs and Climate Action (BMWK), promotes climate-friendly energy solutions in selected partner countries in sub-Saharan Africa, Southeast and South Asia and the Middle East.
- Companies from emerging and developing countries are brought together with experienced providers of climate-friendly energy solutions from Germany.
- In Uganda, the PDP helps to connect local C&I firms with German solar firms



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1. Introduction to Uganda

Capital	Kampala
Area	241,038 km^2
Population (2022)	43,700,000
Official languages	English, Swahili
GDP (2021)	$46.38bn
GDP per capita (2021)	$1,060.43

Source: The Parlamentarian, 2022

- Uganda is a member of EAC, IGAD, COMESA, WTO, OIC and others
- Agriculture employs 68% of Ugandans and contributes 24.1% to the GDP; Industry – 26.8%
- UIA is a one stop shop for investors to register businesses and apply for licences, TINs
- In the last 20 years, UIA has registered over 62 projects from Germany

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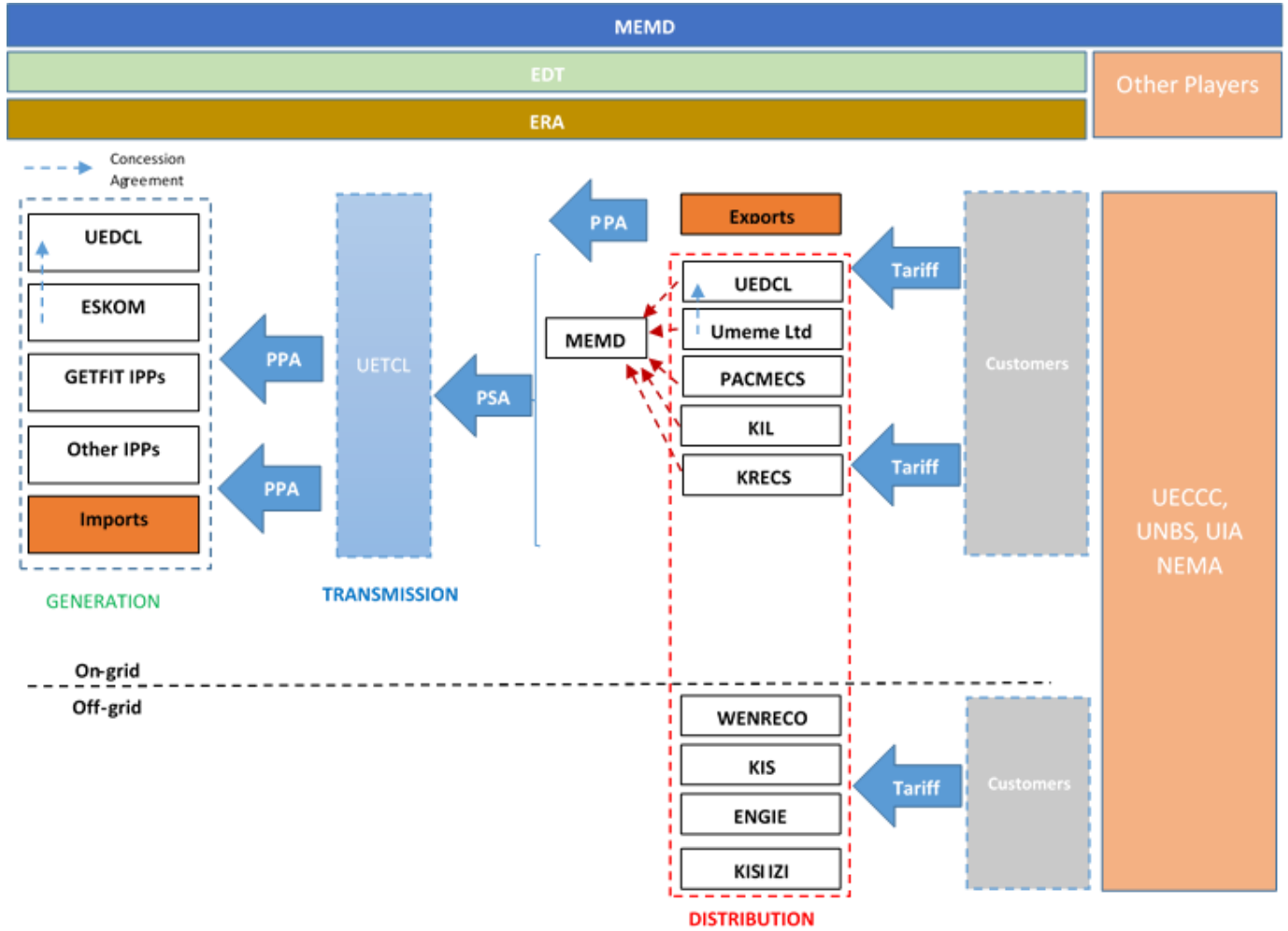
2.1. Uganda‘s Energy Sector Key Players



Source: Graph adapted by INENSUS GmbH, 2022, from MEMD, 2021

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2.2. Key Policies and Regulations in Uganda‘s Energy Sector relevant to Captive Power

- The Electricity Act, 1999 (amended 2022)
- Electricity Policy, 2002 (under review)
- Renewable Energy Policy, 2007 (under review)
- Electricity Licencing Policy
- **Electricity (Isolated Grid Systems) regulations 2020**

2.3. Uganda‘s Energy Sector Electricity tariffs Q3 2022

Category		Peak (EUR/kWh)	Shoulder (EUR/kWh)	Off-peak (EUR/kWh)
Domestic	0.11 – 0.20			
Commercial		0.20	0.16	0.10
Medium Industrial		0.16	0.12	0.06
Large Industrial	Block 1	0.13	0.09	0.06
	Block 2	0.12	0.09	0.06
Extra-large industrial	Block 1	0.11	0.08	0.06
	Block 2	0.09	0.07	0.05

C&I projects are most cost-competitive for commercial, medium industrial, and some large industrial customers

Source: Author’s compilation, INENSUS GmbH, 2022, using data from ERA, 2022

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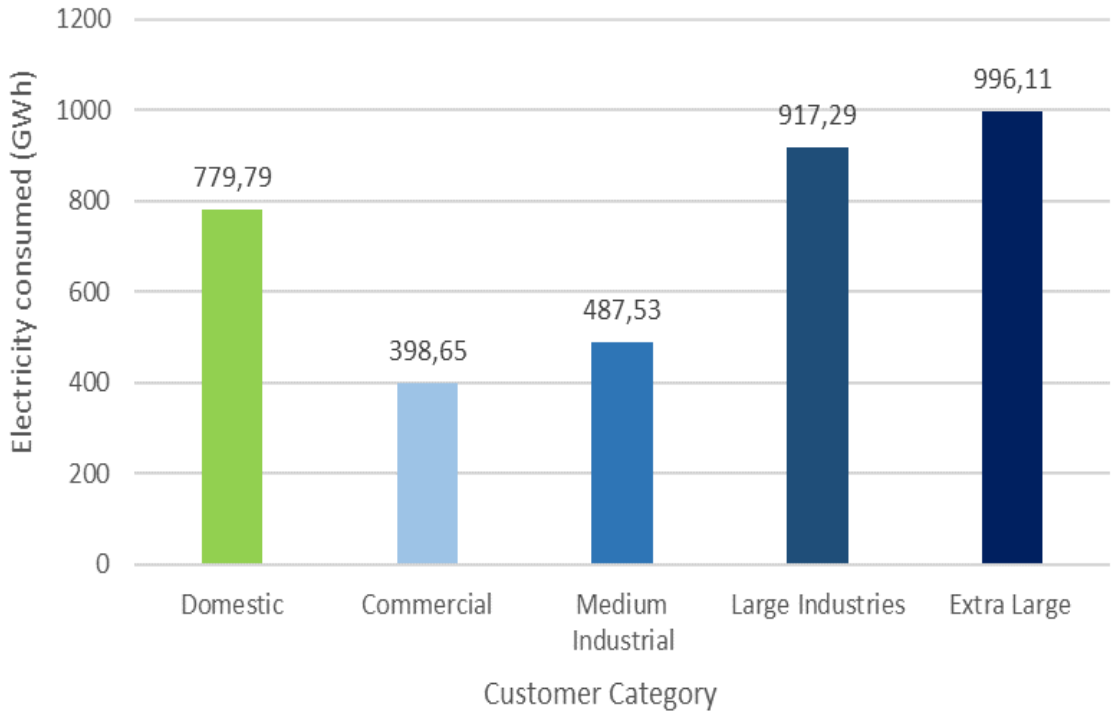
2.4. Uganda‘s Energy Sector Electricity consumption by category



The largest electricity consumers are large industrial and extra-large

Source: Author’s own compilation, INENSUS GmbH, 2022, based on data obtained from ERA

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3.1. Captive solar systems implemented in Uganda

Type of Facility	Category	No. of systems	Total PV Capacity (kWp)
Health and Education	Commercial	29	988
Commercial buildings (office, hotels, markets)	Commercial	13	840
Farm and horticulture	Commercial	11	630
Agro-processing (coffee, dairy, food)	Industrial	8	565.5
Fuel stations and automotive	Commercial	27	400
Factory	Industrial	1	30
Total		**89**	**3,453.5 kWp**

The majority of captive solar systems installed are in the education and fuel station sectors.

Source: Uganda Captive Solar PV Market – Insights Report, Magala et. al, 2022

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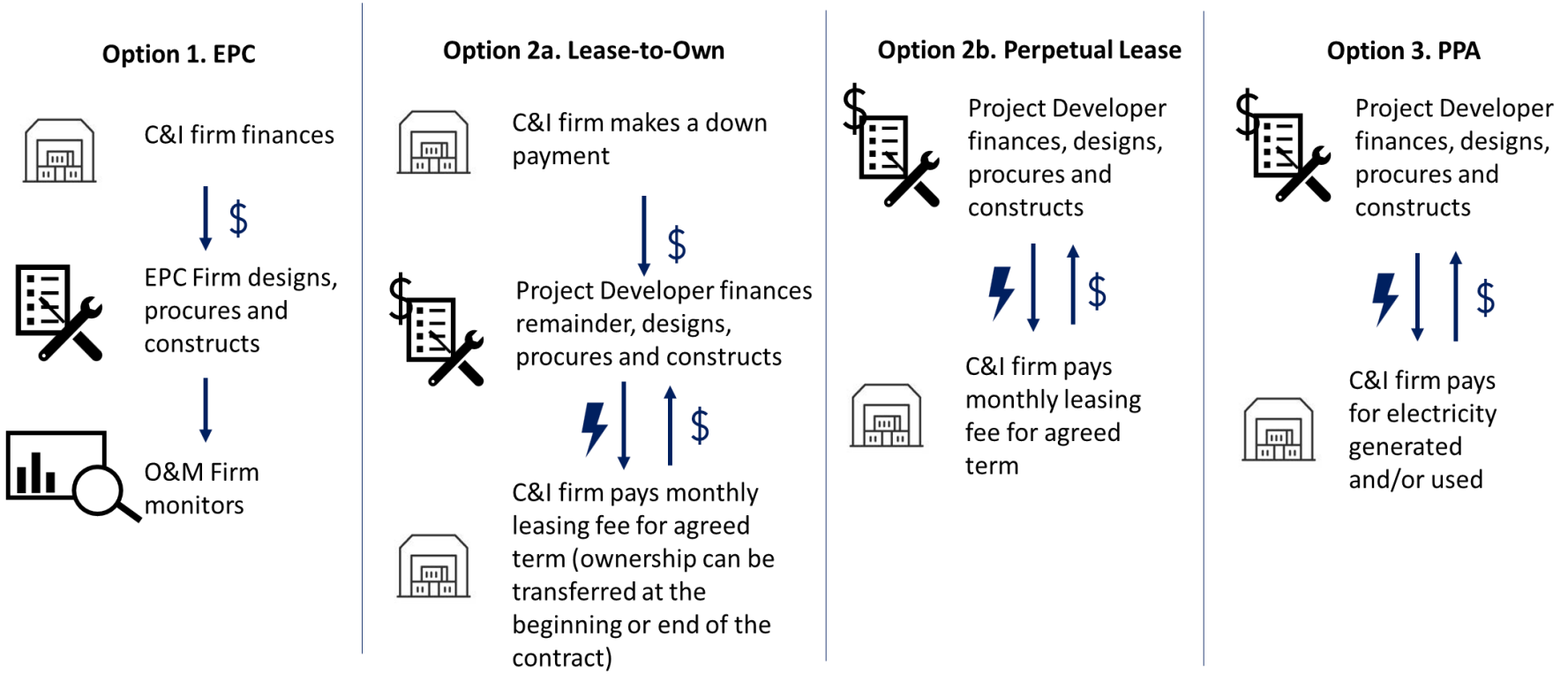
3.2. Options available for captive solar projects in Uganda



All business models, including direct purchase, PPAs, and Lease-To-Own are currently allowed to be implemented in Uganda

Source: Authors own drawing, INENSUS GmbH, 2022

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3.3. How to develop a captive solar project in Uganda

Register with relevant government bodies

- Register with URSB
- Obtain Investment licence from UIA
- Register for taxes with URA and obtain trading licence in project district
- Obtain work permits
- Obtain licences and other requirements from relevant sector government body such as ERA.

Identify potential leads and design systems

- Study the key policies in the energy sector related to captive solar
- Identify clients
- Perform energy assessments, design systems and sign contract with the client

Register captive systems or get a license

- If system is below 500kW, install system and then register it with ERA.
- For systems above 500kW, obtain a generation licence through ERA and then install and commission system.

3.4. Registration and licensing for captive solar projects in Uganda

Registration (for projects <=500kW)

1. **Apply to ERA** to register the plant using the form in Schedule 1 in the Electricity (Isolated Grid Systems) regulations of 2020.
2. **ERA publishes the application**
3. **ERA may approve or reject** the application
4. **ERA issues a certificate of registration**

Licensing (for projects >500kW)

1. **The applicant submits a Notice of Intended Application** (NIA) to ERA.
2. Within 30 days of receipt, **ERA publishes the application**
3. **The applicant shall respond to the comments**
4. **ERA issues a permit** allowing the applicant to carry out studies to prepare an application for a license.
5. **The applicant fills in and submits the application**
6. **ERA publishes the application**
7. **ERA issues a license**

Source: ERA, Licensing Procedure, 2020

3.5. Local capacity to support project implementation in Uganda

Type of Facility	Origin
E-power solutions; Village Energy; Solar Pipo; GRS Commodities Ltd	Ugandan owned and registered
All in Trade	Private Ugandan owned company
Equator Solar Systems	Registered in Uganda but owned by a German Proprietor
Erik Giertsen	Norwegian based with German subsidiary in Kenya
Green Powered International	UK based company
Orb Energy	Orb Energy is registered in Kenya and India
Nexus Green	UK based with an office in Uganda
OFGEN	Branches in Kenya, Uganda, Somalia and Rwanda
Solar Now	Registered in Uganda and in Kenya
En Power.life	German based

Source: Uganda Captive Solar PV Market – Insights Report, Magala et. al, 2022

Uganda Solar Energy Association (USEA) is the umbrella association for local solar PV companies in Uganda.

4.1. Entities contacted and visited during the Sector Analysis in Uganda

Sector/ association	Number contacted/ interviewed	Preferred commercial arrangement	Time of operation	Maximum power demand (kW)
Health facilities	12	Lease and PPA	24hrs/ 7days a week	300-500
Tea factories	8	Direct purchase, lease and PPA	24hrs/ 7days a week	200-500
Coffee factories	2	Direct purchase, lease and PPA	24hrs/ 6 days a week	150 – 500
Dairy farms	3	Not assessed	Not assessed	Not assessed
Flower farms	2	Lease and PPA	24hrs/ 7days a week	500 - 2000
Education (universities)	5	Lease and PPA	8hrs/ 5 days a week	200 -1000
Real estate	1	Direct Purchase, Lease, PPA	18hrs/7 days a week	50 - 1000
Manufacturing	5	Direct Purchase, Lease, PPA	24hrs/ 7days a week	400 – 2000
Coffee associations	2	Yet to decide	24hrs/ 6 days a week	150 – 500
Flower Association	1	Not assessed	24hrs/ 7 days a week	Not assessed
Electricity sector Regulator	1	Not assessed	24hrs/ 7 days a week	Not assessed
Textiles and ginnery association	1	Not applicable	Not applicable	Not applicable
Religious medical bureau	2	Not applicable	Not applicable	Not applicable
Financial institutions	2	Not applicable	Not applicable	Not applicable

Source: Authors' compilation, INENSUS GmbH, 2022, on the basis of interviews conducted

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4.2. Factors for rating the potential of deploying captive solar in Uganda

- Number of companies within a sector
- Maturity of sector
- Competitiveness of the typical LCOE of captive vs tariff from grid
- Push for green energy
- Availability of associations
- Responsiveness of entities
- Presence of captive systems in the sector
- Load Profile

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4.3. Ranking entities interviewed – High Potential

Overall Potential	Sector	Typical customer tariff category (grid tariff)	Number of potential off-takers (approximate)	Maturity of sector	Competitiveness of tariff vs LCOE	Responsive-ness	Name of Association (remarks)	Push for green energy	Presence of captive systems in sector	Load profile
High	**Health facilities**	Commercial and medium industrial	30	Mature	High	High	UCMB, UPMB (Well-formed)	Low	9	Good
	Tea factories	Commercial and medium industrial	19	Mature	High	High	UTA (Well-formed)	Low	4	Good
	Coffee factories	Commercial and medium industrial	40	Mature	High	High	UCF, UCFA (Well-formed)	Low	2	Medium
	Real estate	Commercial and medium industrial	50	Mature	High	High	Association of Real Estate Agents (AREA) (Well-formed)	Medium	11	Good

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4.4. High potential customers for captive solar

Health sector. 9 captive solar systems already installed. Demand for reliable electricity supply for daily operations is significant. Private hospitals have funders, little bureaucracy.

Tea factories. In 2022, GIZ Uganda conducted a detailed study and assessments of many different tea factors. The sector has an active association, Uganda Tea Association (UTA). They are commercial and medium customers.

Coffee factories. Already 2 Ugandan factories have installed captive solar. There are 2 active coffee associations (UCF and UCFA). Want lease and PPA. Export most coffee and with stable revenues.

Real estate. Major drive internationally to solarise office and commercial properties which has spilled over into Uganda. They include residential and commercial buildings such as malls and supermarkets.

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4.5. Medium and low potential sectors

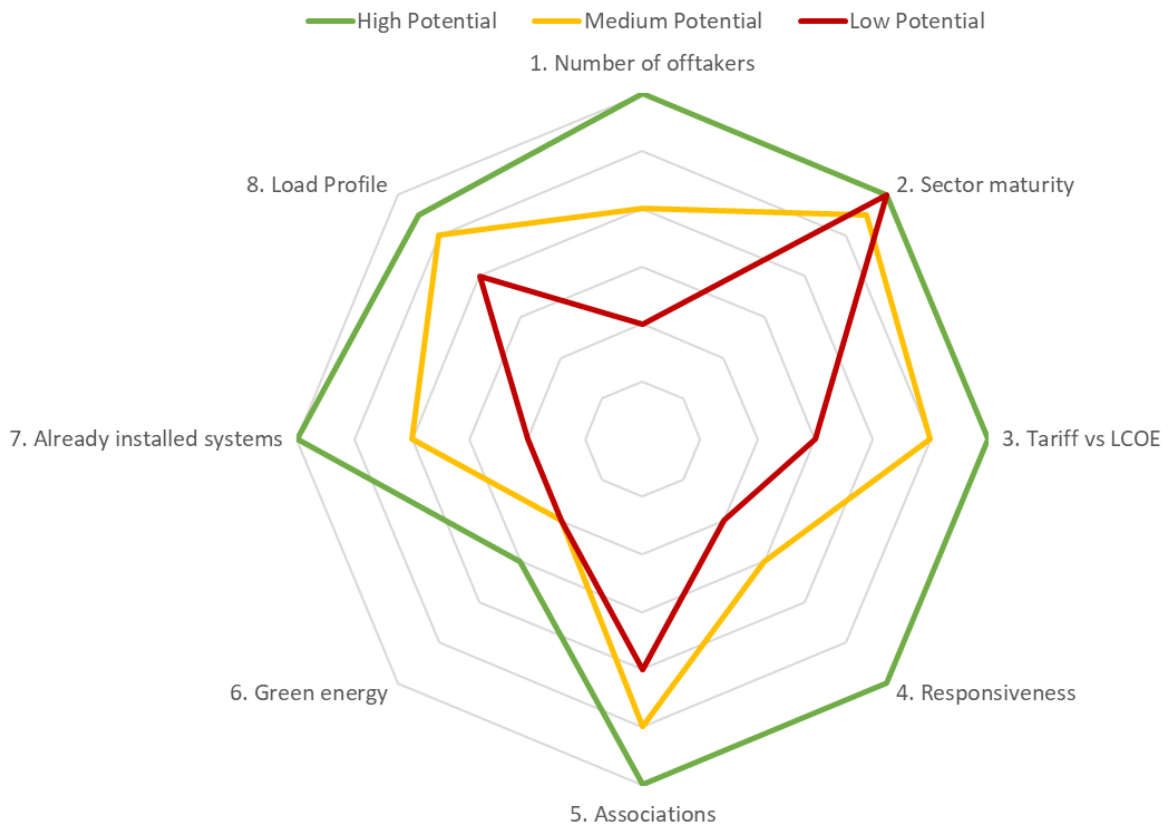
Medium potential

- Dairy farms
- Flower farms
- Textiles and ginnery industry
- Packaging
- Education

Low potential

- Wheat and maize flour
- Sugar factories

4.6. Average rating of companies by potential



Source: Authors' compilation, INENSUS GmbH, 2022, on the basis of interviews conducted

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4.7. Challenges and opportunities for captive solar I

Regulation

- The regulation is silent on technology used

Finance

- Most potential off-takers prefer the lease (to own) and PPA models.
- The tariff during shoulder time enables savings on the bill when solar is used thus reducing over bill and cost of production
- Commercial banks are not aware of captive solar sector and are not yet able to finance the sector. A lot of awareness needs to be done.

4.8. Challenges and opportunities for captive solar II

Design

- No net metering in Uganda and so designs should not allow electricity to feedback into the grid.
- There is need to examine the strength of roofing structures during the design and planning phase
- In some parts of Uganda like the North, the electricity is unreliable and there are unplanned outages which may affect performance of the system. It is advisable to add some battery storage for critical loads.

Market entry approach

- Need to invest in awareness campaigns since this is a new technology that is hardly known by people.
- Advisable to develop customers with several commercial sites and/or develop standardized designs for systems that need little adjustments for each site.

4.9. Recommendations for captive solar

1. **Utilise leads** including associations by the PDP through the sector analysis
2. **Reach out to local (and international) firms** already active in the sector as well as GIZ Energy and Climate Cluster.
3. **Develop partnerships** with local solar companies to develop leads. Local solar companies can also guide through the registration and licensing process with ERA.
4. German companies should become **members of USEA** to benefit from the network of solar companies, as well as advocacy.
5. **Set up offices or franchises in Uganda**. The majority of clients are much more engaged when physical meetings are scheduled. Communication via email and online channels alone is unlikely to lead to success.
6. Approach potential clients with good **financing solutions** such as PPAs and lease (to own) since most off-takers are not interested to invest upfront CAPEX in the solar systems.
7. It is recommended that German companies focus on establishing captive **systems not larger than 500kWp** for the start for regulatory reasons.

5.1. Free Service offered to C&I customers by PDP

PDP‘s offer

Developing and passing on project opportunities for local C&I firms to German solar SMEs

Energy demand assessment

- Analysis of the current and future energy demand
- Estimation of current electricity costs
- Assessment of site suitability

→ Does PV match energy consumption?

Technical optimization

- Type of system
- Optimum system size
- Spatial requirements

→ Optimal system design

Investment models

- Business Case Analysis
- Cash flow model
- Evaluation of investment opportunities

→ Calculation of the economic advantage

Passing on the project dossier

- Project dossier
- Lead presentation
- Access to finance
- Mediation of suitable partners

→ Implementation

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5.2. PDP Examples of successful project development

Copperbelt Energy Corporation, Zambia
1 MWp

Swissport Kenya Limited, Kenya
110 kWp

Emergent cold, Vietnam

308 kWp

Star Aire, Thailand

1 MWp

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Please feel free to get in touch!

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