The Covenant of Mayors in Sub-Saharan Africa

Training Module:

The Proactive Roles of Local Governments in Delivering Climate Actions:

Solar Projects

rooftop photovoltaic panels and solar water heaters

Covenant of Mayors
in Sub-Saharan Africa

Support to CoM SSA – Component III
is co-funded by:

german cooperation
DEUTSCHE ZUSAMMENARBEIT

MINISTERIO DE ASUNTOS EXTERIORES, UNIÓN EUROPEA Y COOPERACIÓN
aecid
Cooperación Española

OBJECTIVES

TRAINING MODULE ON SOLAR PROJECTS

ASSESS RELEVANCE

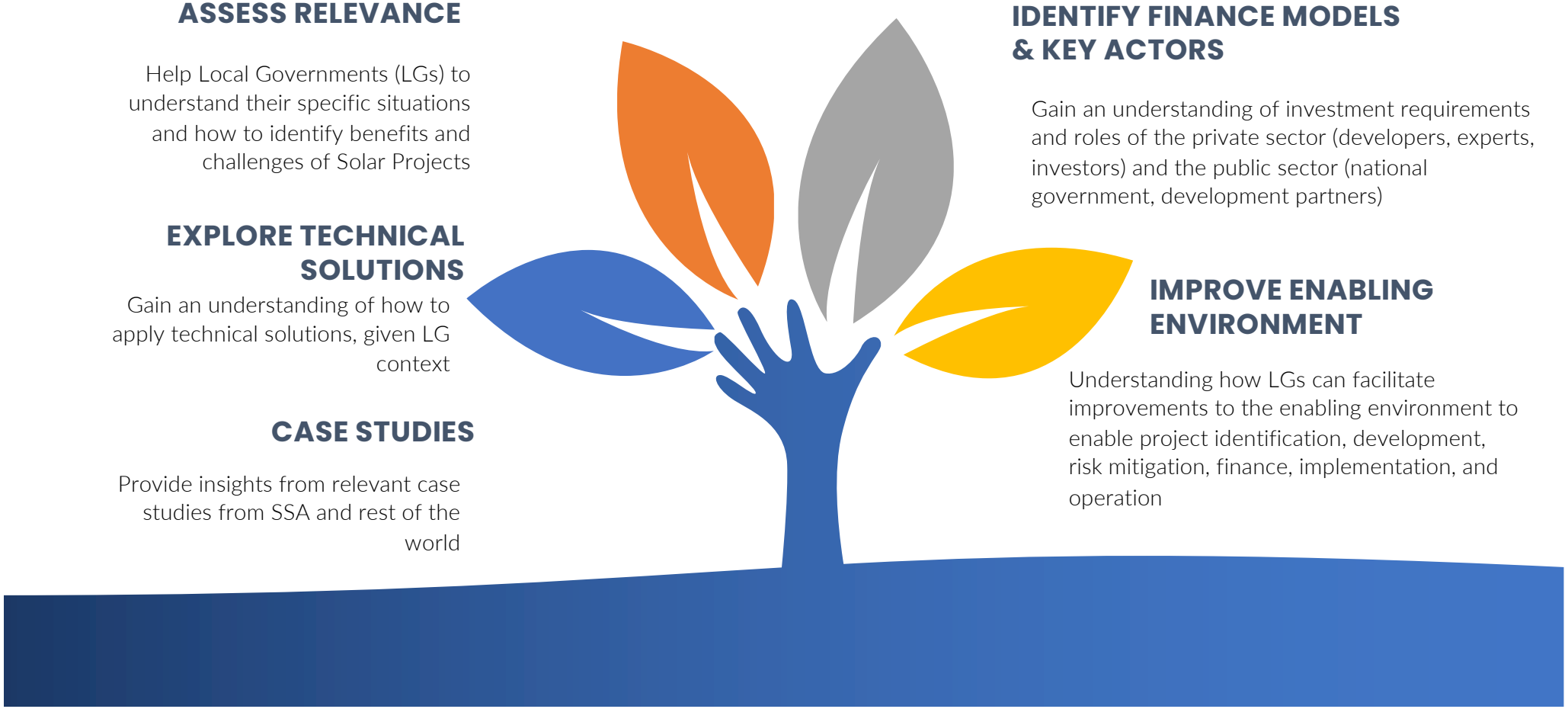
Help Local Governments (LGs) to understand their specific situations and how to identify benefits and challenges of Solar Projects

EXPLORE TECHNICAL SOLUTIONS

Gain an understanding of how to apply technical solutions, given LG context

CASE STUDIES

Provide insights from relevant case studies from SSA and rest of the world



IDENTIFY FINANCE MODELS & KEY ACTORS

Gain an understanding of investment requirements and roles of the private sector (developers, experts, investors) and the public sector (national government, development partners)

IMPROVE ENABLING ENVIRONMENT

Understanding how LGs can facilitate improvements to the enabling environment to enable project identification, development, risk mitigation, finance, implementation, and operation

AGENDA

1.0	**WHAT ARE SOLAR PROJECTS?** Understanding benefits of Solar Projects and assessing relevance to your LG	8:00 – 8:30
1.1	**BREAKOUT & FEEDBACK SESSION 1**	8:30 – 9:15
2.0	**HOW TO IDENTIFY SOLUTIONS?** Examples of typical project processes and how to assess relevance to your LG	9:15 – 9:45
2.1	**BREAKOUT & FEEDBACK SESSION 2**	9:45 – 10:30
3.0	**HOW TO IDENTIFY FINANCE OPTIONS?** Unpacking potential finance mechanisms & their benefits and disadvantages for your LG	11:00 – 11:40
3.1	**BREAKOUT & FEEDBACK SESSION 3**	11:40 – 1:00
4.0	**WHAT LG ACTIONS ARE REQUIRED?** Unpacking action steps required for LGs to implement a Solar Project	14:00 – 14:40
4.1	**BREAKOUT & FEEDBACK SESSION 4**	14:40 – 16:00
5.0	**HOW TO IMPROVE THE ENABLING ENVIRONMENT?** Identifying key enabling factors for both national and local governments	16:15 – 16:40
5.1	**BREAKOUT & FEEDBACK SESSION 5**	16:40 – 17:30
6.0	**WRAP UP** Open discussion on how to move forward	17:30 – 18:00

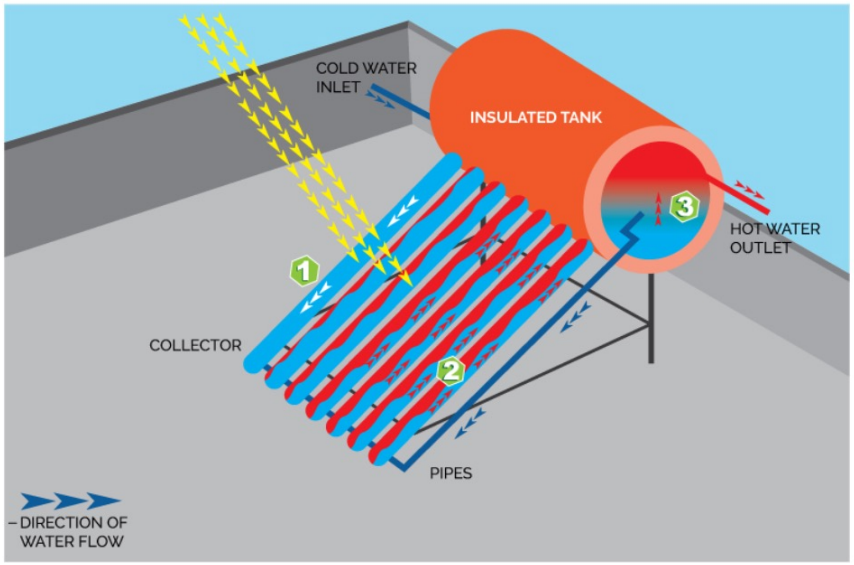
1.0 WHAT IS A SOLAR PROJECT?

Covenant of Mayors
in Sub-Saharan Africa

DEFINITION OF SOLAR PROJECTS

Solar Projects include two types of solar interventions, namely rooftop photovoltaic (PV) panels and solar water heaters (SWHs). While both PV panels and SWHs work by absorbing sunlight, PV panels convert sunlight into electricity and SWHs covert sunlight into heat that is used to produce hot water. Even though the two systems work differently and have distinct purposes, they both make use of renewable energy instead of traditional dirtier power sources.

Rooftop Photovoltaic Panels (grid tied)



Solar Water Heater

DIRECT BENEFITS OF SOLAR PROJECTS

SAVINGS

Solar Projects offer significant long-term savings as they reduce LG spend on electricity and O&M

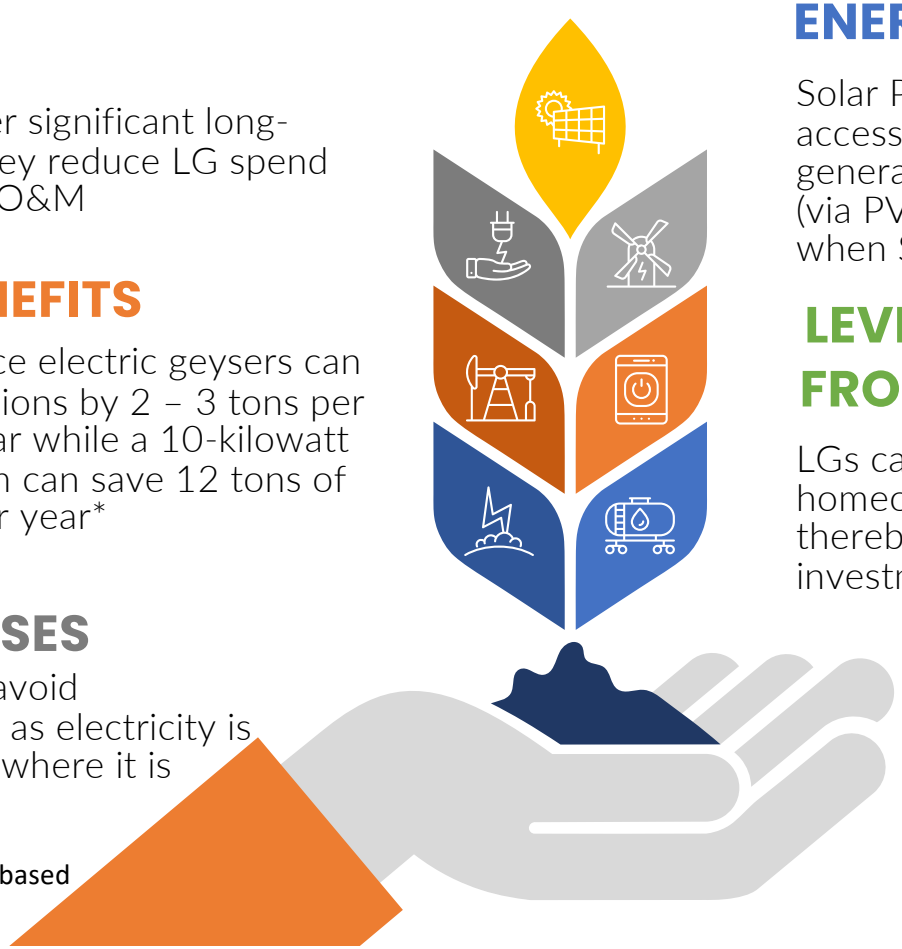
CLIMATE BENEFITS

SWHs that displace electric geysers can reduce CO_2 emissions by 2 – 3 tons per household per year while a 10-kilowatt rooftop PV system can save 12 tons of CO_2 emissions per year*

AVOIDED LOSSES

Solar Projects can avoid transmission losses as electricity is used at or close to where it is generated

* Where electricity source is coal-based



ENERGY SECURITY

Solar Projects can improve energy access and security within the LG as generation capacity is either increased (via PV panels) or energy use is reduced when SWH replace traditional geysers

LEVERAGE FUNDING FROM HOUSEHOLDS

LGs can create enabling environments for homeowners to invest in Solar Projects thereby leveraging private capital for investment in SWHs and PV panels

What benefits were delivered by the City of Cape Town's Green Taxi Rank?

CLIMATE, DEVELOPMENT & LG/ECONOMIC BENEFITS

CLIMATE

- GHG emission savings
- Conserves natural resources
- Improved air quality
- Reduced water consumption

DEVELOPMENT

- Lower energy consumption frees up budgets
- Lower O&M spend frees up budgets
- Improved security of supply
- Reduced burden on existing infrastructure
- Reduced transmission losses

LG/ECONOMIC

- Create opportunities for SMEs (installation, maintenance)
- Create green jobs
- Increased access to electricity can stimulate economy, generating more revenues for LG

Opportunity: A Solar Project could access climate finance (grants and concessional debt) from either a climate facility or a DFI provided the project demonstrates significant GHG emission reductions. Climate funders will want to understand how many tons of CO_2 will be avoided for every US$ of funding provided.

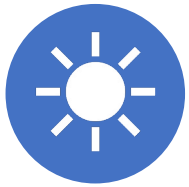
UNPACKING CHALLENGES TO IMPLEMENTING SOLAR PROJECTS

BUDGETS

- Competes with various other services and priorities for limited funding
- LGs are often reliant on grants from National Governments to fund new infrastructure

REVENUES

- Solar Projects do not generate new revenue streams for LGs, but can achieve significant electricity savings
- LGs need to be able to reallocate existing electricity budgets to pay for higher upfront costs



UPFRONT INVESTMENT

- While solar interventions offer significant long-term savings, they require significant upfront investment
- High up-front investment costs are a major barrier for LGs with limited CAPEX budgets

DEBT FUNDING

- Banks often not familiar with Solar technologies and therefore hesitant to lend
- Cost of due diligence required to lend to a project may not be justified given the small size of a typical project

ESCOs

- The ESCO market is nascent in SSA and local ESCOs do not usually offer funded solutions

DATA & ASSET REGISTERS

- Baseline data is required to quantify potential savings
- LGs need to document the location and condition of LG owned electrical geysers and rooftops

ASSESSING RELEVANCE TO YOUR LG

ASSESS TECHNICAL NEEDS, SERVICE DELIVERY MODELS

BUDGETS & TARIFFS

- What LG capital and operational expenditure budgets are available?
- Are electricity tariffs cost reflective?
- Are electricity tariffs expected to increase by more than inflation in the future?

GENERATION & HEATING

- Which Solar technologies have been implemented in your LG?
- Are all LG buildings currently connected to the grid?
- Does your area suffer frequent power outages?
- Does LG-owned social housing stock use electric geysers?
- Are electric geysers used in other LG buildings?

NATIONAL PROGRAMMES

- Are any national or regional government programmes available that your LG can leverage?
- Are any standardized designs/contracts available that your LG can access?

CAPACITY TO DEVELOP PROJECT

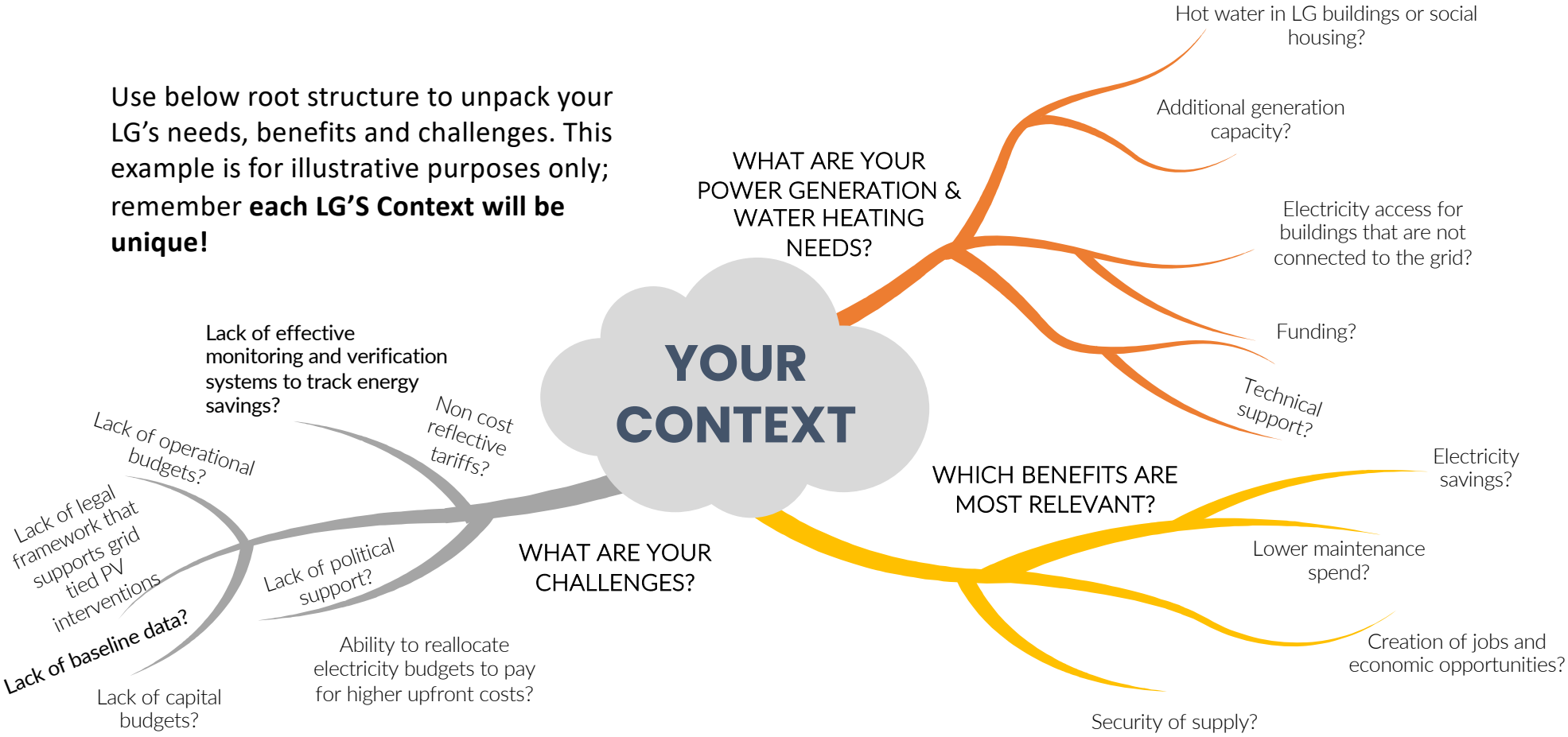
- What technical and project development capacity is available within your LG?
- What budgets are available to contract experts?
- Is baseline data available?

1.1 BREAKOUT & FEEDBACK SESSION 1

Covenant of Mayors
in Sub-Saharan Africa

EXERCISE 1: IDENTIFY NEEDS, BENEFITS & CHALLENGES

Use below root structure to unpack your LG's needs, benefits and challenges. This example is for illustrative purposes only; remember **each LG'S Context will be unique!**



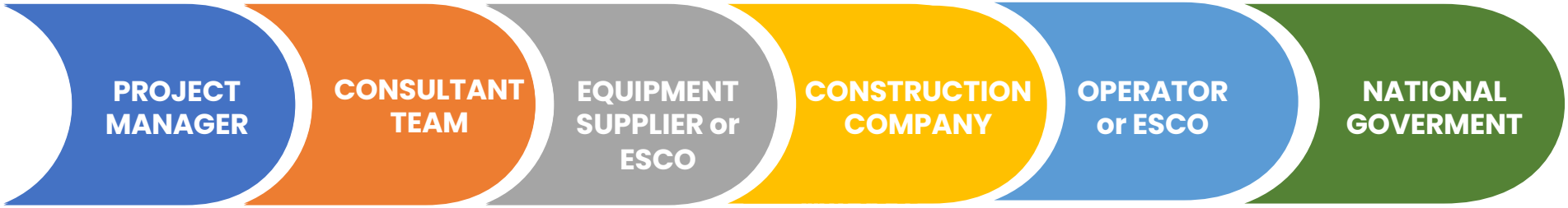
EXERCISE 1: FEEDBACK FORM

Context – Questions from prior slide	Answers (with numbers of how many people shared that issues)	Examples
Needs		
Challenges		
Benefits		

2.0 HOW TO IDENTIFY TECHNICAL SOLUTIONS?

Covenant of Mayors
in Sub-Saharan Africa

TECHNICAL ACTORS IN A TYPICAL SOLAR PROJECT



Role:
LG official that champions the project and forms the main point of contact between the LG, NG, consultants and private sector parties during the development phase

Skills required:
Project management, contract management, understanding of budgeting processes, understanding of solar technologies and M&V

Role:
Develops technical options for the LG that will be assessed to conclude on affordability and technical suitability

Skills required:
A track record of designing and delivering energy efficiency projects in SSA. The consultant team should comprise different skillsets, including engineers, environmental scientists, a financial expert, etc.

Role:
Supplies equipment that will represent a large portion of project costs

Requirements:
A track record of supplying equipment, backed by a strong balance sheet (i.e., a company that has significant assets net of liabilities)

Role:
Constructs and installs infrastructure required for the project such as foundations and mounting systems

Requirements:
A track record of constructing similar infrastructure, backed by a strong balance sheet (i.e., a company that has significant assets net of liabilities)

Role:
Operates and maintains the equipment. Commits to meeting performance targets and is penalized for not doing so

Requirements:
Track record of maintaining energy efficiency projects of a similar size and complexity. Required technical skillsets may justify the appointment of a private sector operator rather than an individual/ inhouse team

Role:
Ensures adherence to national standards and regulations

SOLAR WATER HEATERS – KEY TERMS

A solar water heater comprises three main parts: the collector, the storage tank, and energy transfer fluid

COLLECTOR

Captures solar energy as heat. Flat plate collectors have been around for more than 50 years while evacuated tube collectors are more efficient, but with a limited track record

ACTIVE vs. PASSIVE

An active system uses a pump to circulate the fluid/water between the collector and the storage tank while passive system uses natural convection

TRANSFER FLUID (DIRECT vs INDIRECT TRANSFER)

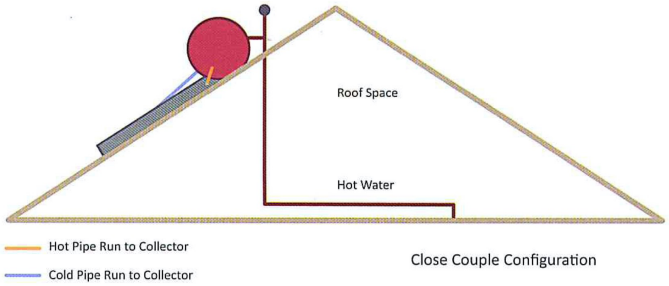
Heat is transferred to water either directly, or indirectly. In a direct system, the collector heats the water directly. In an indirect system, the collector heats a transfer fluid that surrounds the storage tank

HIGH PRESSURE vs. LOW PRESSURE

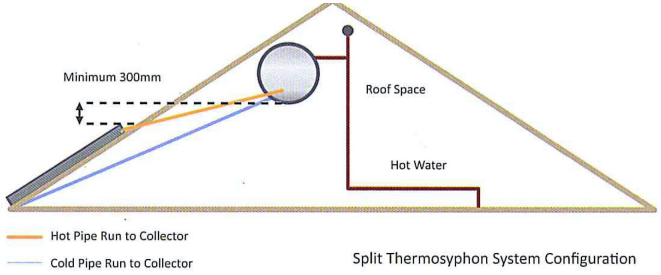
High Pressure (HP) SWHs are more expensive than Low Pressure (LP) SWHs as HP systems require superior materials that can withstand high pressures. LP systems are 'gravity fed' and unless mounted high will dispense water at a lesser pressure which can cause issues

CLOSE vs. SPLIT COUPLED

Close coupled system consists of a roof-mounted solar collector, combined with a horizontally-mounted storage tank above the collector. In a split coupled system, the storage tank is situated elsewhere (usually within the roof)



Close Couple Configuration



Split Thermosyphon System Configuration

SOLAR PV ROOFTOP SYSTEMS – KEY TERMS

A PV system comprises one or more solar panels, an inverter, mounting hardware, and wiring

SOLAR PANELS

A solar panel consists of many solar cells with semiconductor properties encapsulated within a material to protect it from the environment. Most solar panels are made from crystalline silicon

INVERTER

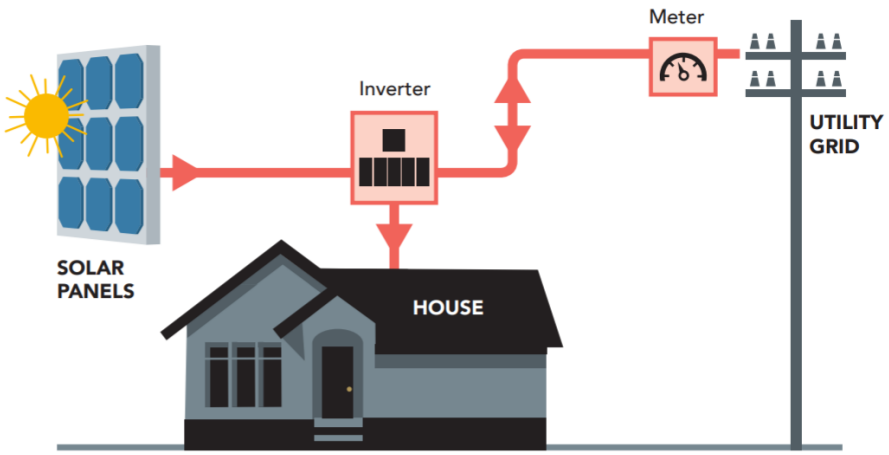
A device that converts direct current (DC) to alternating current (AC). Most modern uses of electricity require AC while PV panels produce DC

OFF-GRID vs GRID-TIED

An off-grid system is isolated from the local electricity grid and generates electricity for own use. When generation exceeds use in an off-grid system, excess electricity is either lost or can be stored in batteries. A grid-tied system feeds surplus power into the local grid

MOUNTING HARDWARE

Mounting hardware (also called solar module racking) is used to fix solar panels on roofs



NET METERING/BILLING

A policy that allows home or building owners to receive the full retail value for the electricity that their system produces and feeds to the grid

Source: *Solar Rooftop PV Generation* in Municipalities: *Frequently Asked Questions* (South Africa-German Energy Programme - SSEG)

COMPARISON OF SWH & PV SYSTEMS

DESCRIPTIONS	BENEFITS	DISADVANTAGES
SWH SYSTEMS	• Lowest upfront investment cost • LG benefits from energy savings	• Only produces hot water
PV SYSTEMS	• More versatile than a SWH System as it can power all electrical appliances and lights • LG benefits from energy savings and/or additional generation capacity	• Higher upfront investment cost than for SWH
OFF-GRID PV SYSTEM	• Avoids the use of expensive batteries that have limited life expectancy	• Building owner needs to buy grid supplied electricity at night or when irradiation levels are low • Excess electricity cannot be stored or sold to the grid
OFF-GRID PV SYSTEM WITH BATTERY STORAGE	• Building can supply all its own electricity needs • Unaffected by power outages	• Highest upfront investment cost • Batteries are expensive and have a limited life (5 to 10 years)
GRID-TIED PV SYSTEM	• Excess electricity can be sold to the grid and electricity can be bought from the grid at night	• Requires legal framework that supports grid-tied systems and net billing • LG needs to put in place supporting policies, metering systems, and processes

KEY CONSIDERATIONS WHEN SELECTING A TECHNOLOGY

ENERGY USE & SUPPLY

Load profile (i.e. the rate of electricity consumption over time) will need to be considered as well as the reliability of the grid

CLIMATE

Local climate (irradiation levels, etc.) will determine whether solar interventions are viable

INSTITUTIONAL CAPACITY

Availability of local skills for design, construction, and O&M

ADAPTABILITY

Whether system is modular, allowing more PV panels to be added at a later stage

ORIENTATION & STRUCTURE

The direction that a roof faces will need to be considered when selecting suitable roof spaces and technologies. The roof's structural integrity will also inform what load it can carry

ENERGY COST

The payback period of interventions will depend on local electricity prices. The higher the cost of electricity relative to expenses, the shorter the payback periods

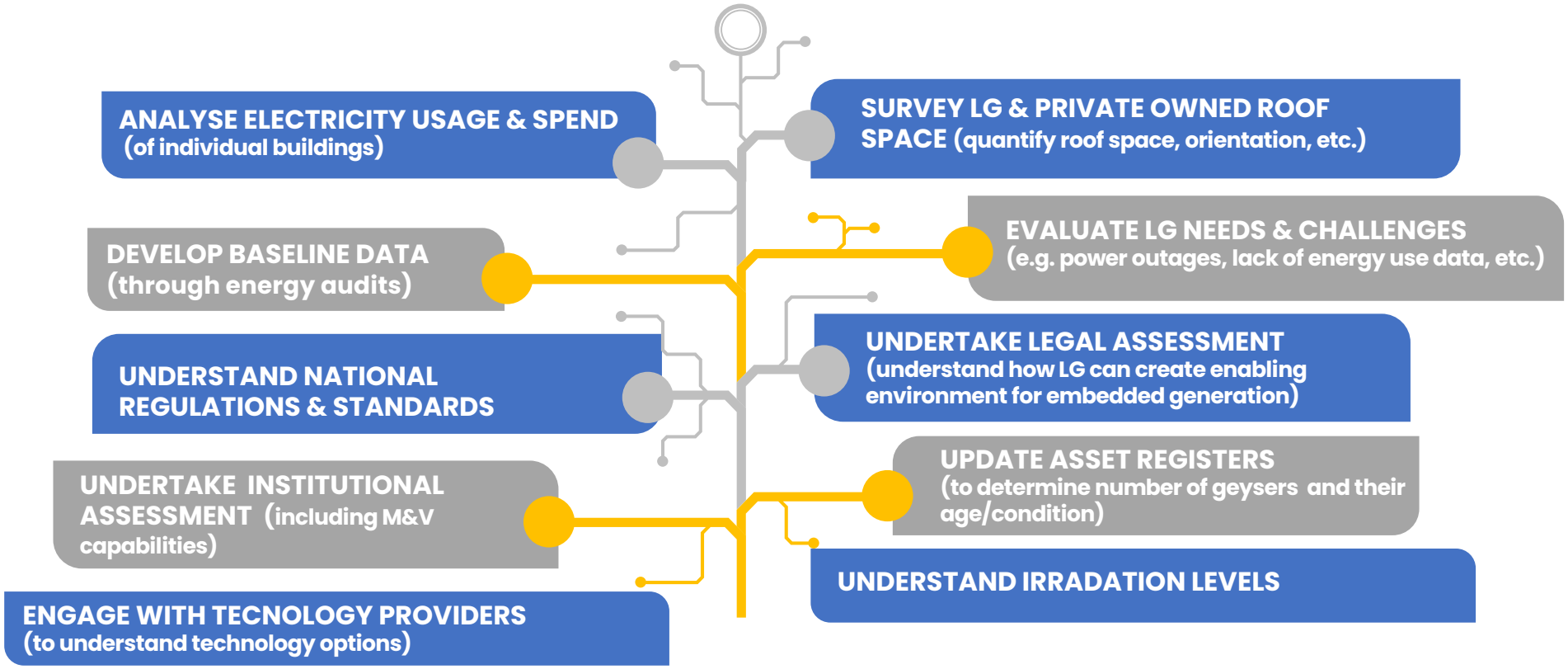
SECURITY

The risk of theft and mitigation options will inform whether certain solar interventions are viable

REGULATIONS

Technology options will be informed by national guidelines and standards

SPECIFIC LG ACTIONS TO INFORM TECHNOLOGY SELECTION



APPOINT A REPUTABLE EXPERIENCED CONSULTANT TO ASSESS TECHNICAL OPTIONS

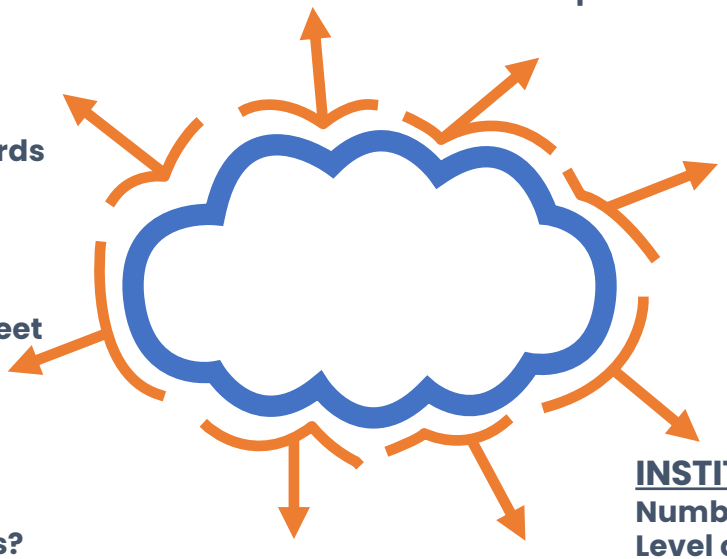
2.1 BREAKOUT & FEEDBACK SESSION 2

Covenant of Mayors
in Sub-Saharan Africa

EXERCISE 2 – ASSESS YOUR TECHNICAL STATUS QUO & POSSIBLE SOLUTIONS

ROOF SPACE
Have suitable LG **owned and private buildings** been identified?
Have buildings been surveyed to assess roof area, orientation, etc.?

ENERGY USAGE
What energy usage data is available?
What is your load profile?
Current tariff (per KWh)?
Expected future tariff increases?



STANDARDS & REGULATIONS
Do national guidelines or standards exist?
What standards do you have to meet?
Are you meeting the standards?
What changes are required to meet standards?

EXISTING INFRASTRUCTURE
Have SWHs or PV Panels been **tested?**
What was the outcome of the trial?
Are irradiation levels known?
What data was collected?

LEGISLATION
Does legislation support Solar Projects and grid-tied PV projects?
Can your LG introduce net billing?
Do LG by-laws need to be amended to allow Solar Projects?

INSTITUTIONAL CAPACITY
Number of staff in department/team?
Level of skills (unskilled, semi-skilled, skilled)?
Knowledge of EE technologies?
What M&V capabilities are available?

POSSIBLE SOLUTIONS
Which technologies are likely to be most appropriate?
What technical assessments have been done to date?

EXERCISE 2: FEEDBACK FORM

Context – Questions from prior slide	Answers (with numbers of how many people shared that issues)	Examples

3.0 HOW TO IDENTIFY FINANCE SOLUTIONS?

Covenant of Mayors
in Sub-Saharan Africa

KEY FINANCE & RISK TERMS EXPLAINED

SERVICE LEVEL AGREEMENT (SLA)

Contract between a LG and private sector service provider to operate & maintain infrastructure

PUBLIC PRIVATE PARTNERSHIP (PPP)

Long term contract (~ 20 years) between a LG and private sector partner that requires the private sector to design, build, finance, and operate infrastructure

ENERGY SERVICE COMPANY (ESCO)

A private sector company that provides technical and operational support over the duration of a Solar Project contract; may also provide funding for projects

PAY-BACK PERIOD

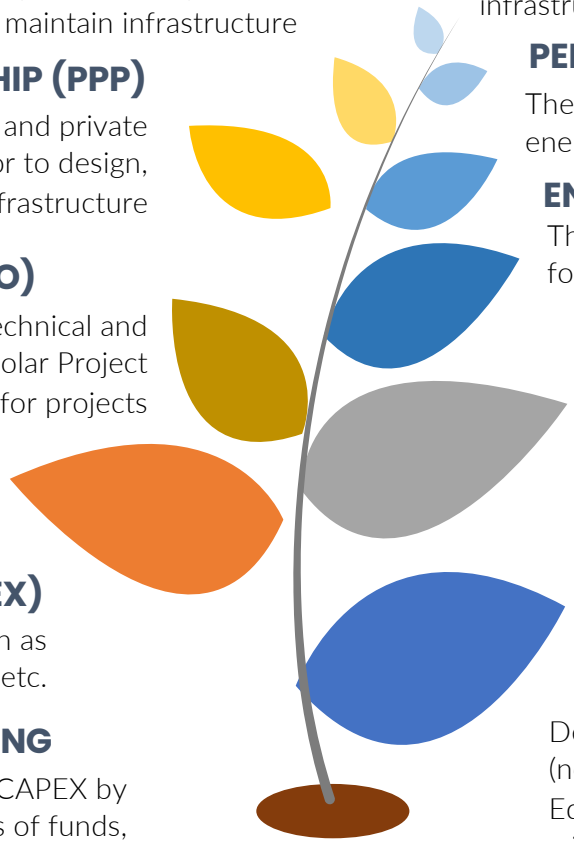
The amount of time it takes to recover the cost of an investment

CAPITAL EXPENDITURE (CAPEX)

Money spent acquiring fixed assets, such as SWHs, PV panels, mounting, inverters etc.

CAPEX FUNDING

Money that needs to be raised for CAPEX by either the LG via a loan, grants, own sources of funds, or the private sector (if a PPP or ESCO Funded)



CAPEX COST OVERRUNS

Risk that the costs budgeted for buying equipment and constructing infrastructure ends up being much higher than budgeted

PERFORMANCE RISK

The risk that the project does not produce as many units of energy saved as forecast

ENERGY PRICE RISK

The risk that actual electricity prices will be lower than forecast, reducing the savings that can be achieved

DESIGN RISK

Risk that the Solar Project's design does not meet national standards or legal and environmental requirements; risk that faulty design results in operational issues

CONSTRUCTION RISK

Risk that construction/installation time exceeds time projected resulting in additional costs or loss of income

DEBT & EQUITY

Debt is an obligation that needs to be repaid to the lender (normally a bank) with interest over several years

Equity is the private sector's own money that it uses together with debt to fund the project

DIFFERENT FUNDING MODELS & ALLOCATION OF ROLES

RESPONSIBILITIES OF LG & PRIVATE SECTOR UNDER EACH FUNDING MODEL

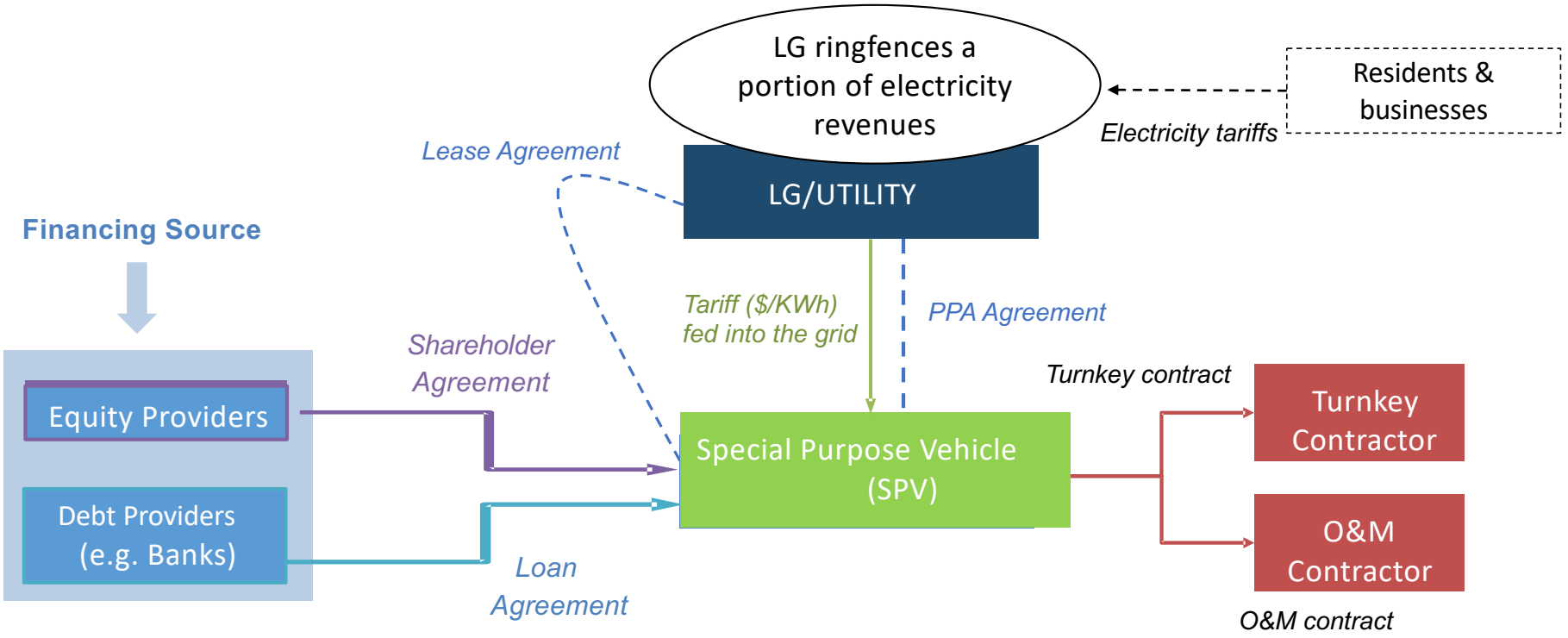
<table>
<tr><th>FUNDING MODELS
Role/responsibility</th><th>PUBLIC OWNED & OPERATED</th><th>PUBLIC OWNED & PRIVATE SECTOR OPERATED (SLA)</th><th>ESCO FUNDED</th><th>PPP (100% private)</th><th>PPP (minority LG ownership)</th><th>PAYG</th></tr>
<tr><td>Design risk</td><td colspan="2" rowspan="3">LG</td><td colspan="4" rowspan="3">Private sector</td></tr>
<tr><td>Construction risk & CAPEX cost overruns</td></tr>
<tr><td>Performance risk</td></tr>
<tr><td>Funding of CAPEX</td><td colspan="2">LG raises grants and debt</td><td colspan="2">Private sector raises debt & equity</td><td>LG funds its share of equity. Private sector raises rest of funds</td><td rowspan="2">Private sector raises debt & equity (and possibly DFI grants)</td></tr>
<tr><td>Grants</td><td colspan="5">LG can raise grants to make funding model more affordable</td></tr>
<tr><td>Operation</td><td rowspan="3">LG</td><td colspan="5" rowspan="3">Private sector</td></tr>
<tr><td>Maintenance</td></tr>
<tr><td>Sales & Marketing</td></tr>
</table>

COMPARISON OF FUNDING MODELS

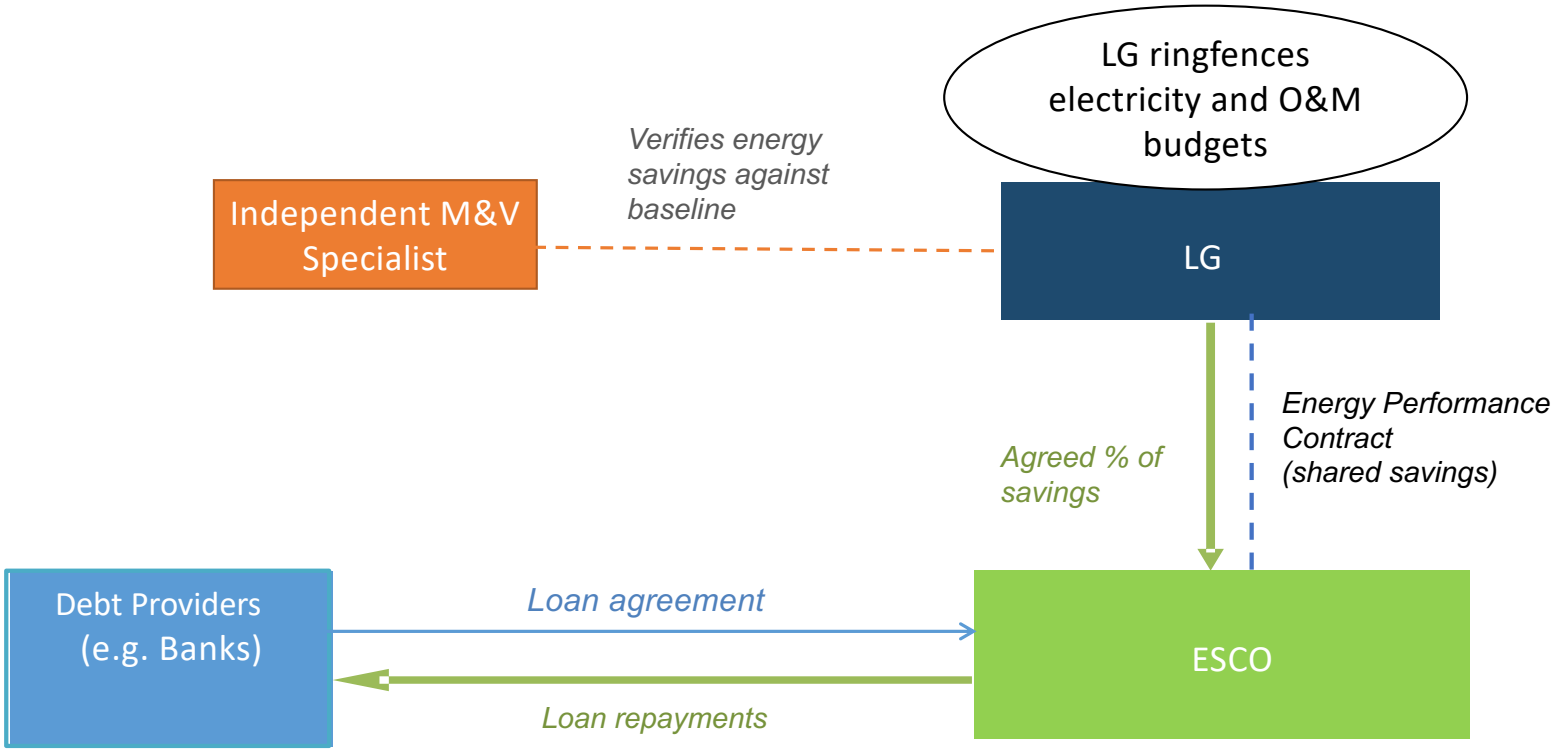
KEY ADVANTAGES VS. DISADVANTAGES

DESCRIPTIONS	KEY ADVANTAGES	KEY DISADVANTAGES
PUBLIC OWNED & OPERATED	• Procurement process is well known • LG controls asset	• LG retains all risks and has to raise 100% of funding • LG may not have required skills (O&M, M&V)
PUBLIC OWNED & PRIVATE SECTOR OPERATED (SLA)	• Project benefits from private sector skills (O&M, M&V) • Procurement process is well known	• LG retains construction risks (CAPEX overruns, design risk) • LG has to raise 100% of funding
ESCO FUNDED	• No funding required from LG • Project benefits from private sector skills (O&M, M&V) and performance risk is transferred to private sector	• Needs well developed ESCO market and banks that are willing to lend to ESCOs
PPP (100% private)	• No funding required from LG • Project benefits from private sector skills (O&M, M&V) and performance risk is transferred to private sector	• Prescribed PPP processes can be onerous and time consuming • Private sector capital can be expensive
PPP (minority LG ownership)	• Private sector can raise majority of funding • Project benefits from private sector skills (O&M, M&V) and performance risk is transferred to private sector	• LG must raise own share of funding • PPP processes can be onerous and time consuming • Private sector capital can be expensive
PAYG	• Private sector raises all funding • LG can play facilitation role (accreditation of PAYG suppliers, awareness campaigns, etc.)	• LG is reliant on private sector's ability to roll out interventions and structure affordable solutions to households

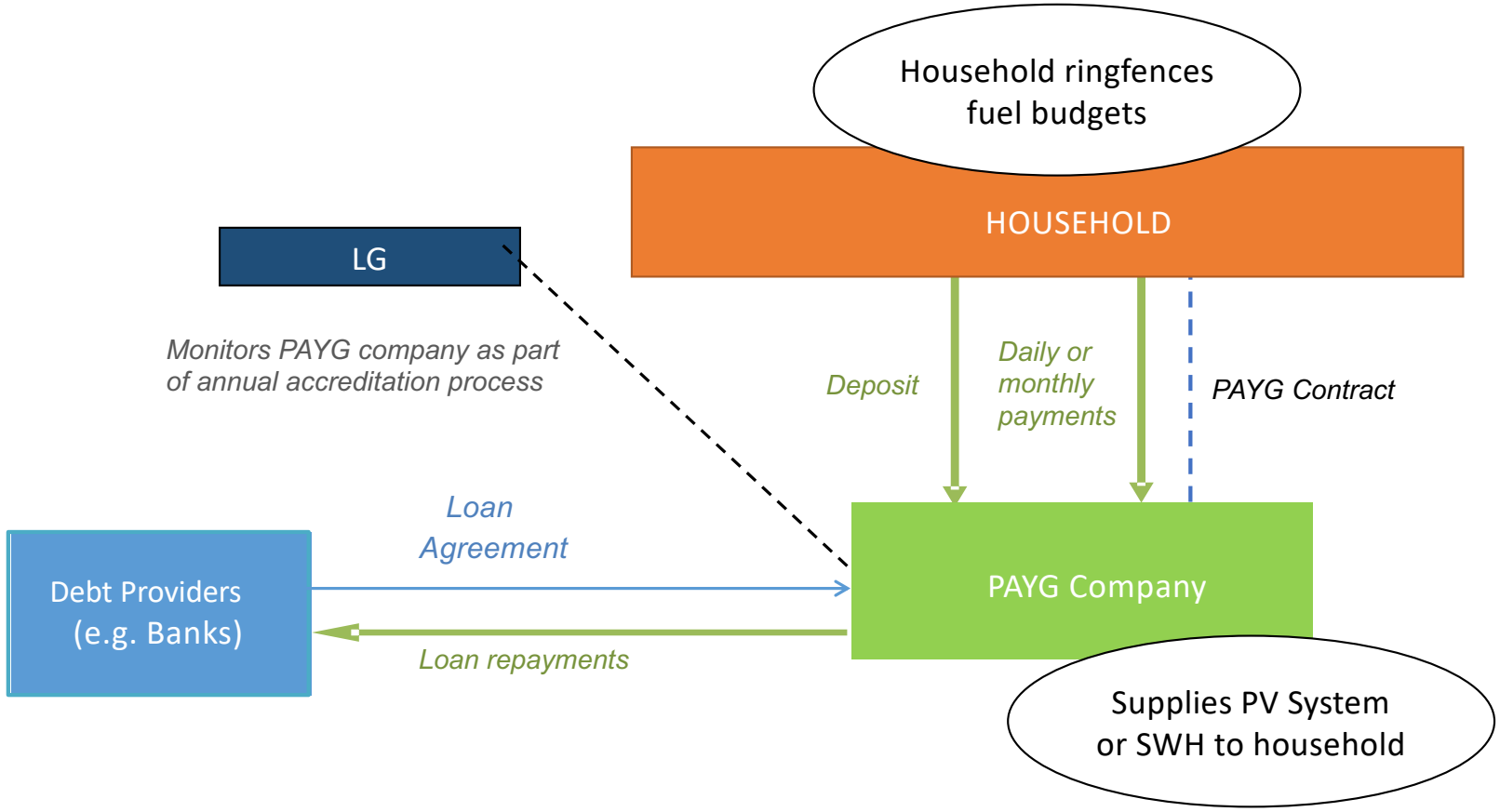
TYPICAL PPP STRUCTURE FOR A PV SOLAR ROOFTOP PROJECT



TYPICAL ESCO FUNDED STRUCTURE (SHARED SAVINGS)

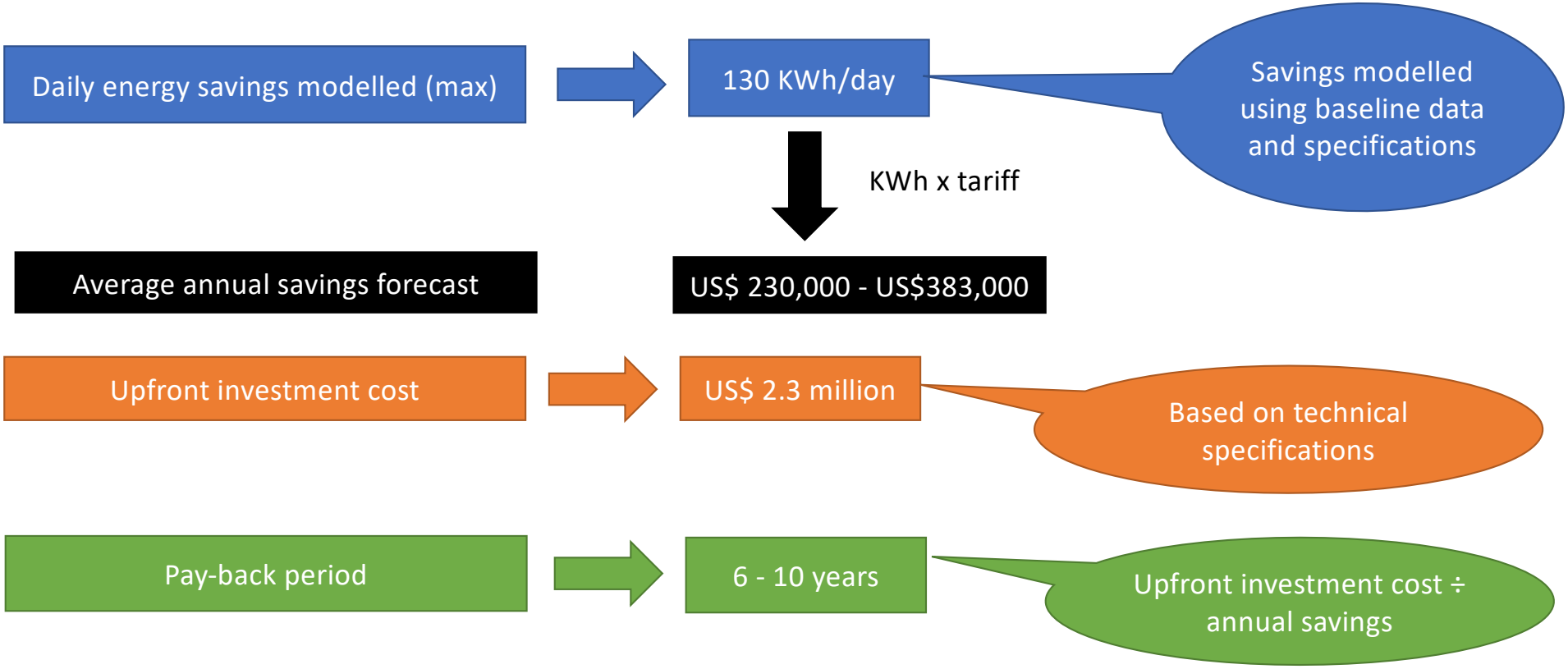


TYPICAL PAYG STRUCTURE



CAPE TOWN'S PUBLIC FUNDED WALLACEDENE TAXI RANK

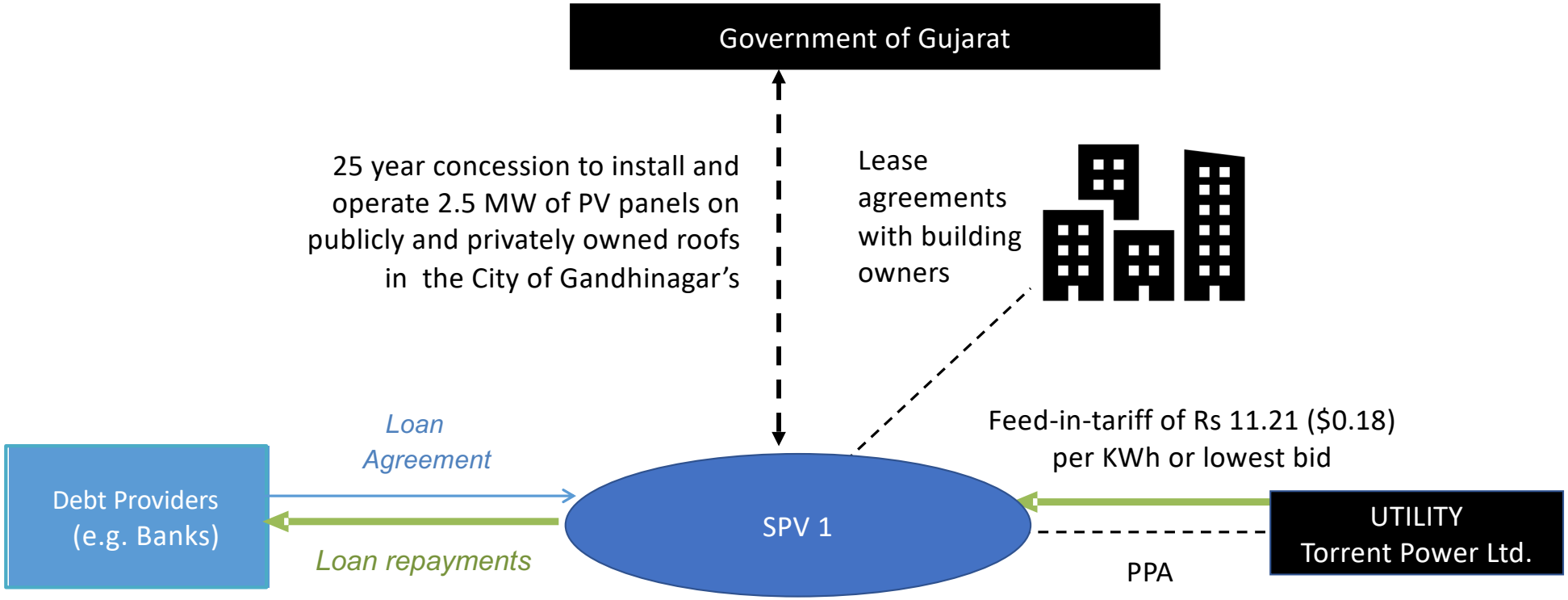
20 KW ROOFTOP PV PROJECT – PAYBACK ASSESSMENT



Insight: Wallacedene Taxi Rank was the first public transport facility to be rated by the Green Building Council of South Africa. The PV system, which includes battery storage with a 72kWh capacity, powers the whole facility (i.e. LED lights, electronic gates at the entrance, and the hydro-boils in the kitchen)

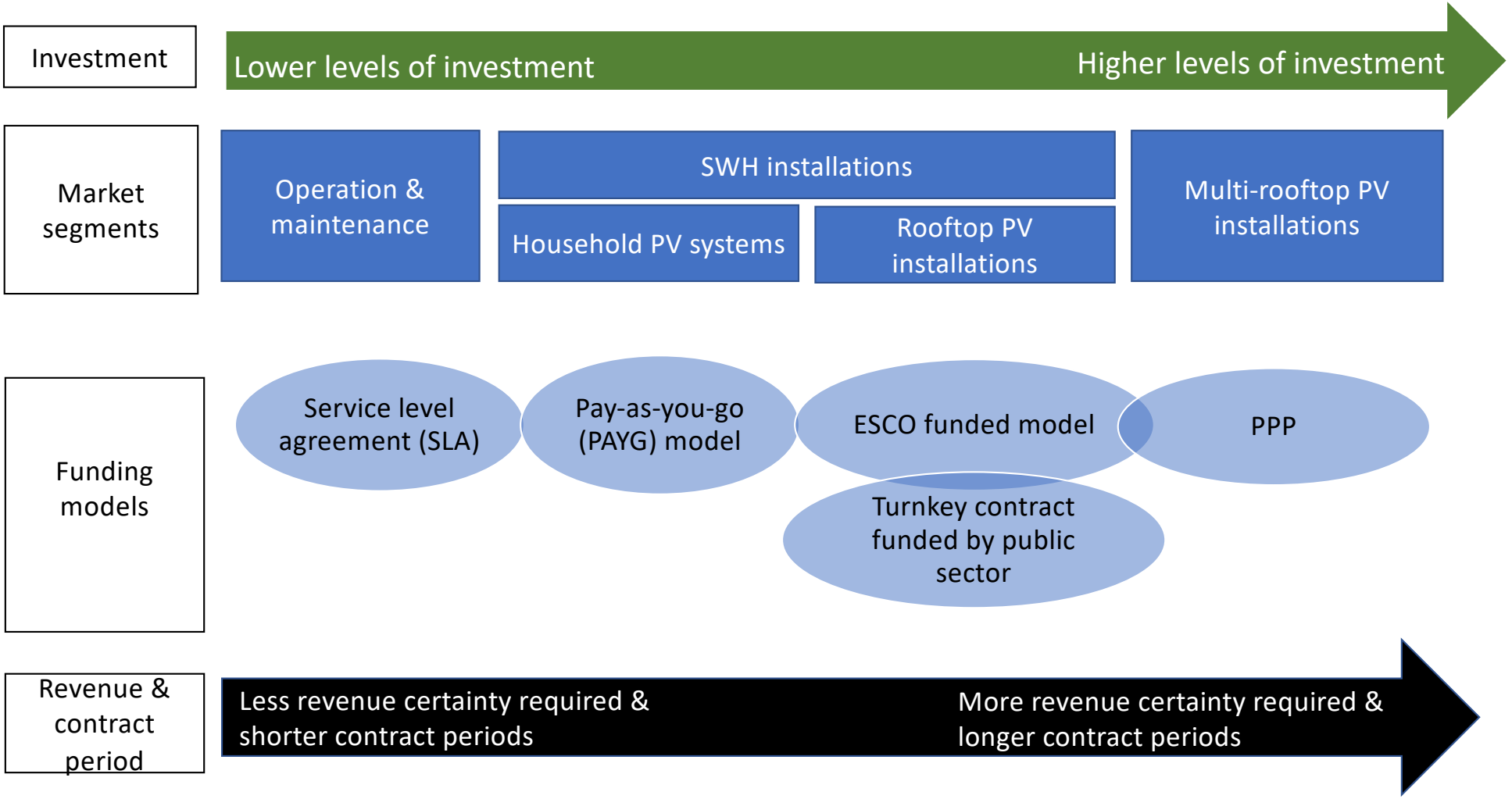
INDIAN ROOFTOP PPP

City of Gandhinagar



Insight: The Government of Gujarat implemented solar rooftop PPPs at 2 of its cities (Gandhinagar and Vadodara). Gandhinagar served as a pilot in 2010 when 5MW of generation capacity was procured from two private firms (Azure Power and SunEdison), unlocking US$ 12 million in private financing. 80% of panels were installed on public buildings and 20% on private buildings.

TYPICAL FUNDING MODELS FOR SOLAR PROJECTS



FUNDING TYPOLOGY: RISK AND REVENUE FACTORS TO CONSIDER

ACCEPTANCE OF TECHNOLOGY RISKS

Considers how familiar lenders are with the technology and therefore willing to potentially finance the project

ABILITY TO MANAGE ENVIRONMENTAL/SOCIAL RISKS

Funders, especially DFIs, will want to ensure that environmental and social risks have been minimized

ACCESS TO CREDIT ENHANCEMENTS

Credit enhancement can increase a project's revenue certainty, allowing the project to access more commercial sources of funding

REVENUE CERTAINTY

Key to understanding whether a project can support debt and private sector equity

ABILITY TO MITIGATE OPERATIONAL RISKS

Considers the project's operational risks and how they can be mitigated to reduce risk for the LG, private sector, and lenders

ABILITY TO MANAGE CAPEX RISKS

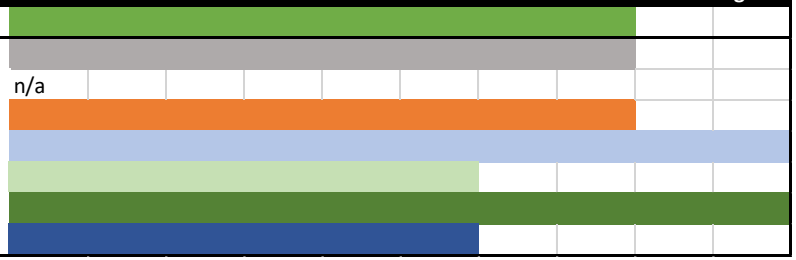
Considers whether construction risk (and therefore cost overruns) have been mitigated and whether revenues will be enough to repay the upfront investment

RISKS, MITIGATION & REVENUE FACTORS – ROOFTOP PPP

CITY OF GANDHINAGAR'S ROOFTOP PV PPP

REVENUE CERTAINTY

Project fundamentals	Low = 0	Medium =3	High =5
Revenue certainty			
Cost recovery through user payments/savings			
Opportunities for generating 3rd party revenue	n/a		
Ability of utility/LG to guarantee revenue			
Ability to manage tariff risk			
Creditworthiness of offtaker(s)			
Predictability of demand			
Predictability of supply			

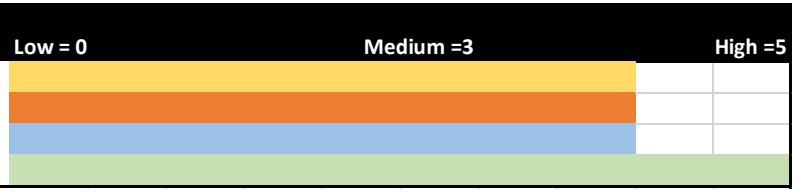


High score (4.2 out of 5) due to:

- Feed in tariffs mean that the project is not exposed to tariff risk
- Demand is verified at required levels

OPEX RISKS

Project fundamentals	Low = 0	Medium =3	High =5
Ability to mitigate operational risks			
Ability of supplier to ensure required inputs			
Predictability of costs (due to FX etc.)			
Likelihood of recovering OPEX via revenue/savings			

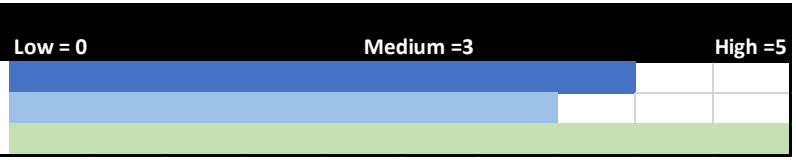


High score (4.3 out of 5) score due to:

- Revenues being sufficient to recover OPEX
- Costs are predictable

CAPEX RISKS

Project fundamentals	Low = 0	Medium =3	High =5
Ability to manage CAPEX risks			
Ability to recover CAPEX investment via revenue			
Ability to transfer construction risk to private sector			



High score (4.3 out of 5) due to:

- Ability to transfer construction risk to the private sector and revenues are sufficient to cover upfront investment

RISKS, MITIGATION & REVENUE FACTORS – ROOFTOP PPP

CITY OF GANDHINAGAR'S ROOFTOP PV PPP

TECHNOLOGY RISKS

Project fundamentals	Low = 0	Medium =3	High =5
Acceptance of technology risks			
Acceptance of technology by lenders			
Suitability as collateral for commercial lenders			

High (4 out of 5) score as:

- Technology was well understood by private sector's lenders and shareholders (most likely corporate financed given project size)

E&S RISKS

Project fundamentals	Low = 0	Medium =3	High =5
Ability to manage environmental/social risks			
Ability to minimise environmental impact/costs			
Ability to minimise social impact/costs			

Very high (5 out of 5) score as:

- Project's overall environmental and social impact is positive

SUMMARY

Project fundamentals	Low = 0	Medium =3	High =5
Revenue certainty			
Ability to mitigate operational risks			
Ability to manage CAPEX risks			
Acceptance of technology risks			
Ability to manage environmental/social risks			
Access to credit enhancement	N/A		
Average			

Overall score of 4.3 indicates that project could be attractive to the private sector and implementable as a PPP

WHAT IS BLENDED FINANCE?

Blended finance - addresses market failures by mitigating risks for private-sector investors and/or improving returns. Blended finance can take various forms, including:

An interest rate subsidy - Makes use of public grants to reduce a project's debt service payments

Concessional loans and/or grants - Can reduce interest costs and offer longer maturities than those offered by private banks, allowing annual repayments to be reduced and spread over a longer period

Subordinated debt - Form of debt that ranks behind 'senior debt' (e.g. bank loans) but before equity providers. It can help to insulate senior debt investors from unacceptable risks and reduces the cost of capital in cases where equity is too expensive

First loss equity - Shields investors from a pre-defined amount of financial losses, making it more attractive for the private sector to fund the project's remaining equity

Guarantees can mitigate various types of investment risks, including political, policy, regulatory, credit and technology risk

Types of guarantees and the risks they mitigate

Guarantee	Political Risk	Policy & Regulatory Risk	Counterparty Risk	Technology Risk	Currency Risk
Political risk insurance	×	×			Convertibility risk only
Partial risk/credit guarantee	×	×	×		
Export credit guarantee	×	×	×	×	
Currency risk mitigation (e.g., swaps, TCX)					×

LESSONS LEARNT FROM EXISTING SOLAR PROJECTS

1 SOLAR PROJECTS PAY FOR THEMSELVES

City of Cape Town's Green Taxi Rank – Financial model showed that project could pay for itself within as little as 6 years

PAYG Models in East Africa – Financing solutions to off-grid households for simple PV systems have a payback period of only 1.2 years

2 GRANTS CAN BE USED TO LEVERAGE PRIVATE SECTOR FUNDING

South Africa's SWH rebate program - Achieved scale by offering significant rebates, funded by National Government, to households that invested in SWHs

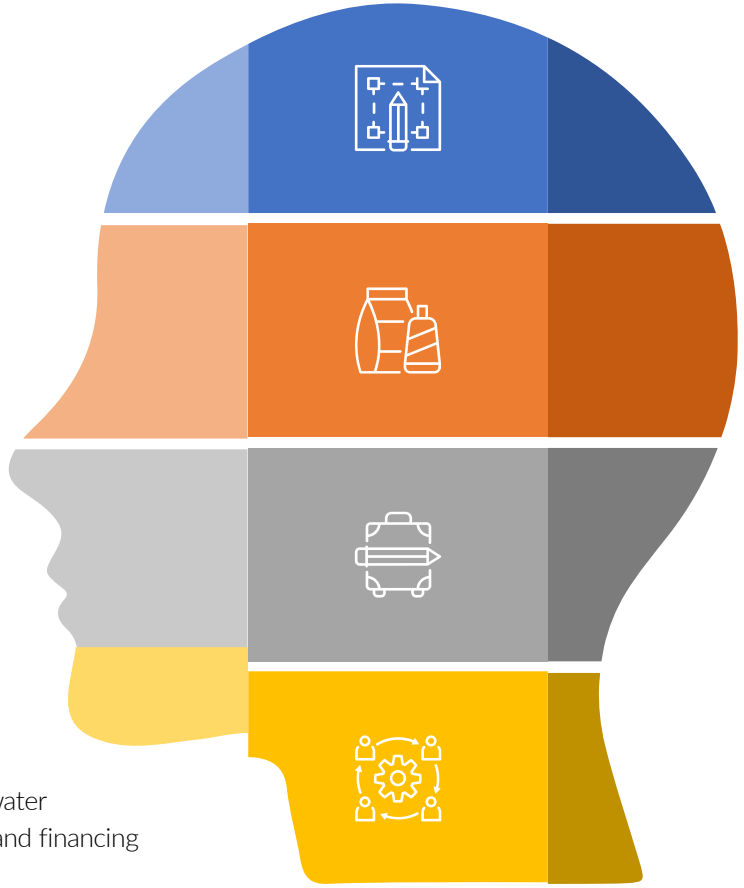
Indian Rooftop PPP – Private sector was offered feed-in tariffs that were partially subsidized by National Government to ensure that the private sector could earn adequate market returns

3 LG ACCREDITATION AND MARKETING CAMPAIGNS CAN LEVERAGE PRIVATE SECTOR FUNDING

Cape Town's SWH Campaign – The City accredited service providers, monitored their performance, and encouraged investment by households in SWHs through targeted communication and education campaigns

4 LEGISLATION MAY BE EFFECTIVE IF COMBINED WITH EFFECTIVE ENFORCEMENT & FINANCING MODELS

Kenya's Energy Regulations (2012) – New regulations made it mandatory for all premises with hot water requirements exceeding 100 L/day to install and use SWH systems. However, lack of enforcement and financing solutions meant that few building owners complied with the regulations



3.1 BREAKOUT & FEEDBACK SESSION 3

Covenant of Mayors
in Sub-Saharan Africa

EXERCISE 3: APPLY TYPOLOGY TO YOUR SOLAR PROJECT

EXERCISE 3: TYPOLOGY TOOL TEMPLATE

Project fundamentals	Score (0 to 5)	Clarification	Score guide
Revenue certainty			
Cost recovery through user payments/savings		Will the LG be able to ringfence electricity tariffs and/or budgets to pay the private sector (under a PPP)? Can LG reallocate its own electricity budgets to fund Solar Projects?	Yes=5,Maybe=3,No=0 If not applicable, "N/A"
Opportunities for generating 3rd party revenue		Are there any opportunities to earn revenue from third parties (e.g. sale of surplus hot water)?	
Ability of LG to guarantee revenue		Can the LG make availability payments to the private sector or guarantee minimum payments?	
Ability to manage tariff risk		Can future revenue be estimated reliably as future tariffs are likely to be predictable (e.g. feed-in tariffs)?	
Creditworthiness of key off-takers		Does the LG have a good track record of paying suppliers on time and in full? Is the LG's balance sheet strong enough to attract investment from the private sector?	
Predictability of demand		Will the LG/utility buy all the electricity generated, even if KWh are greater than forecast?	
Predictability of supply		Are irradiation levels favourable and known?	
Ability to mitigate operational risks			
Ability of suppliers to ensure required inputs (quantities, quality)		Are the suppliers of inputs such as PV panels and SWHs able to guarantee quantity and quality under contract?	Yes=5,Maybe=3,No=0 If not applicable, "N/A"
Predictability of costs		Are operational costs likely to be predictable?	
Likelihood of recovering opex via revenue/savings		Will revenues or savings achieved (by new project) be enough to cover operational costs?	
Ability to manage CAPEX risks			
Ability to recover CAPEX investment via revenue		Will revenue generated by the project be enough to first cover operational costs and then also repay the upfront investment?	Yes=5,Maybe=3,No=0 If not applicable, "N/A"
Ability to transfer construction risk to private sector		Can construction risk be transferred to the private sector via a turnkey contract or another measure?	
Acceptance of technology risks			
Acceptance of technology by lenders		Is this a tried and tested technology that lenders will be comfortable with?	Yes=5,Maybe=3,No=0 If not applicable, "N/A"
Suitability as collateral for commercial lenders		Will lenders be able to find a buyer for the project (under a PPP) if the private sector partner goes bankrupt?	
Ability to manage environmental/social risks			
Ability to minimise environmental impact/costs		Are environmental approvals already in place, reducing the risk of delays?	Yes=5,Maybe=3,No=0 If not applicable, "N/A"
Ability to minimise social impact/costs		Are communities supportive of the project and are they willing to pay higher tariffs (if relevant)?	
Access to credit enhancement			
Availability of guarantees		Can the project access any guarantees from national government/LG/DFIs to improve revenue certainty?	Yes=5,Maybe=3,No=0 If not applicable, "N/A"
Average		**CALCULATE AVERAGE OF SCORES**	

EXERCISE 3: INTERPRETING AVERAGE SCORES

Generic funding mechanisms	Grants (Govt + ODA)	Blended finance, impact investment	ESCO funded + grant /blended	PPP, project bonds
Climate funding mechanisms	Grants	Concessionary loans + grants		Green bonds, equity

4.0 LG ACTION STEPS REQUIRED

Covenant of Mayors
in Sub-Saharan Africa

OVERVIEW OF PROJECT DEVELOPMENT LIFECYCLE

EIGHT STAGES OF DEVELOPMENT

1. IDENTIFICATION

Identify projects based on LG's needs

2. EXPERT ENGAGEMENT

Engage the right experts to assess options

3. IDENTIFY PROJECTS

Identify priority projects

.

4. EARLY PROJECT FINANCE

Secure financial support from LG and National Government. Engage with other development partners.

5. DEMONSTRATE FEASIBILITY

Conduct detailed technical and financial studies to conclude on affordability

6. SECURE FUNDING

Formalize funding commitments with legal contracts or via LG/NG budgets

7. PROCUREMENT

Appoint private sector partner (if PPP) via tender process. Procure Turnkey contractor if public owned, and SLA partner if operated by the private sector.

8. MONITORING

Monitor performance of private sector against contractual obligations. Report on KPIs.

KEY ROLES DURING PROJECT DEVELOPMENT LIFECYCLE (slide 1 of 2)

1. PLANNING

Develop an energy management plan that outlines aims, objectives and targets for Solar Projects

2. EXPERT ENGAGEMENT

Engage the right experts to identify potential projects

3. IDENTIFY PROJECTS

Identify projects that will achieve greatest savings and/or shortest pay-back periods

4. EARLY PROJECT FINANCE

Secure financial commitments from LG and National Government. Engage with other development partners

PROJECT MANAGER

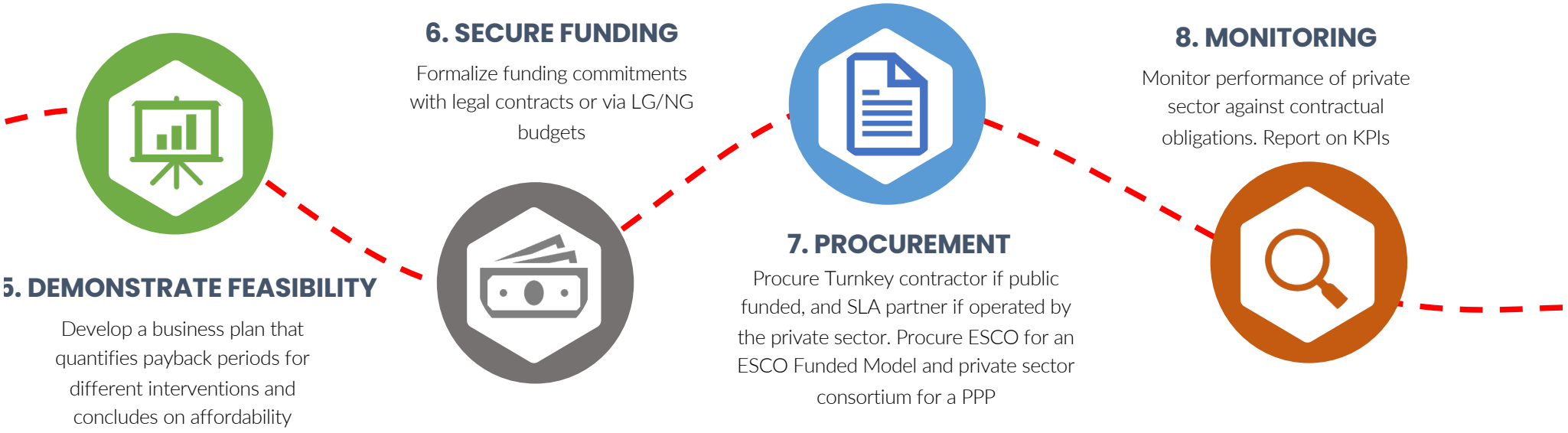
CONSULTANT TEAM (technical and financial experts)

LG's CHIEF FINANCIAL OFFICER

NG

DFIs

KEY ROLES DURING PROJECT DEVELOPMENT LIFECYCLE (slide 2 of 2)



5. DEMONSTRATE FEASIBILITY

Develop a business plan that quantifies payback periods for different interventions and concludes on affordability

6. SECURE FUNDING

Formalize funding commitments with legal contracts or via LG/NG budgets

7. PROCUREMENT

Procure Turnkey contractor if public funded, and SLA partner if operated by the private sector. Procure ESCO for an ESCO Funded Model and private sector consortium for a PPP

8. MONITORING

Monitor performance of private sector against contractual obligations. Report on KPIs

PROJECT MANAGER

CONSULTANT TEAM (various experts)

LG's CHIEF FINANCIAL OFFICER + EXECUTIVE

NG

DFIs

LG's LEGAL/COMPLIANCE TEAM

EQUIPMENT SUPPLIER or ESCO

CONSTRUCTION COMPANY

OPERATOR or ESCO

DETAILS ON STEP 1. PLANNING

The Project Owner needs to unpack the LG's hot water and electricity needs and status quo by answering the following questions:

COST STRUCTURES

What costs are incurred to provide hot water and electricity

ENERGY USE DATA

Assess what energy use data is available that can be used to establish a baseline for each LG building

REVENUE MECHANISMS

What electricity tariffs are paid by households/businesses

BUDGETS

What budgets are available to implement Solar Projects and appoint consultants

DEVELOP ASSET REGISTER

Document existing SWH assets, their ages, and technologies. Survey roof spaces and document their size, orientation, and condition

ENERGY MANAGEMENT PLAN

Document LG's aims, objectives, and targets for Solar Projects

EXISTING PROGRAMS

Which programs or standardised designs/contracts/energy modelling tools can the LG access

MODELS SUPPORTED BY LEGISLATION & POLICIES

Identify which rooftop PV models can be implemented (e.g. net billing and grid-tied PV systems)

Insight/example: In reality, many of the responsibilities listed above are often passed onto experts. Undertaking these steps upfront will allow LGs to better scope work to be undertaken by experts and reduce expert costs.

DETAILS ON STEP 2. EXPERT ENGAGEMENT

HOW TO ENGAGE THE RIGHT EXPERTS

FACTORS TO CONSIDER

- Budgets available to hire experts
- LG's internal capacity
- Complexity of projects
- Capacity to develop terms of reference
- Availability of local experts

TERMS OF REFERENCE (ToR)

- Seek support from development partners with ToR development
- Specify minimum skills and track record requirements
- Consider how requirements will be scored/evaluated
- Clearly define deliverables, timelines and payment milestones

EVALUATION & APPOINTMENT

- Development partner could form part of evaluation committee
- Develop scoring matrix to evaluate bids
- Communicate outcome of evaluation to bidders
- Finalize contract

Insight: If limited budgets are available to appoint consultants, the LG may want to adopt a phased appointment approach. A LG can include a break clause in the contract and require consultants to price the different phases/deliverables separately

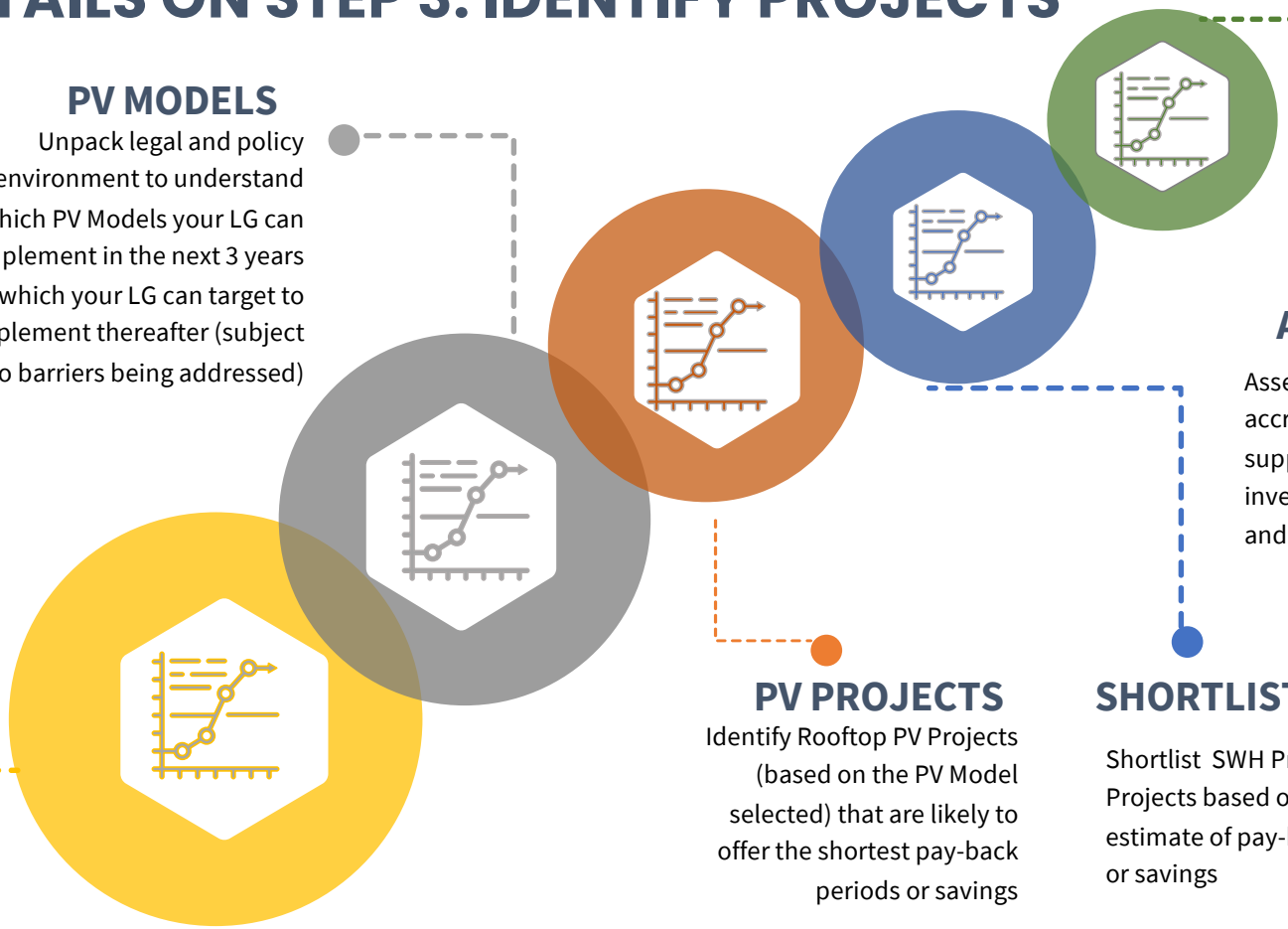
DETAILS ON STEP 3. IDENTIFY PROJECTS

SWH PROJECTS

Identify existing electric geysers in LG owned buildings (including social housing stock) that can be replaced with SWHs or retrofitted as part of a PV Project

PV MODELS

Unpack legal and policy environment to understand which PV Models your LG can implement in the next 3 years and which your LG can target to implement thereafter (subject to barriers being addressed)



ACCREDITOR

Assess need for LG to act as accreditor of SWH and PV suppliers to unlock investment by households and building owners

PV PROJECTS

Identify Rooftop PV Projects (based on the PV Model selected) that are likely to offer the shortest pay-back periods or savings

SHORTLIST

Shortlist SWH Projects and PV Projects based on a high-level estimate of pay-back periods or savings

PROJECT MANAGER

CONSULTANT TEAM (technical and financial

3a. IDENTIFYING FUNDING MODELS

APPLY THE TYPOLOGY TOOL

Project fundamentals	Low = 0	Medium =3		High =5
Revenue certainty				
Ability to mitigate operational risks				
Ability to manage CAPEX risks				
Acceptance of technology risks				
Ability to manage environmental/social risks				
Access to credit enhancement	N/A			
Average				
Generic funding mechanisms	Grants (Govt + ODA)	Blended finance, impact investment	ESCO funded + grant /blended	PPP, project bonds
Climate funding mechanisms	Grants	Concessionary loans + grants		Green bonds, equity

UNDERSTAND REGULATORY ENVIRONMENT & ESCO MARKET

Identify funding models based on the project's revenue and risk profiles

Eliminate funding models that are not supported

CONFIRM MOST SUITABLE FUNDING MODELS

DETAILS ON STEP 4. EARLY PROJECT FINANCE

SECURING FINANCIAL COMMITMENTS

PROJECT MANAGER

CONSULTANT TEAM

LG ENGAGEMENT

- Present shortlist to LG's CFO and discuss target payback periods
- Present accreditation concept and required budgets to LG's CFO (if relevant)
- Seek early commitment for funding from CFO (own sources of revenue, debt, grants, etc.)
- Identify funding gap

NG ENGAGEMENT

- Assess relevance of national grant mechanisms
- Understand grant requirements and processes to access

DFI ENGAGEMENT

- Discuss project with development partners who may be able to support project development or fund the projects
- Verify funding terms
- Discuss need for credit enhancement mechanism(s) that could unlock funding from equipment suppliers or ESCOs
- Develop a concept note to apply for project preparation funding and/or credit enhancement

Insight: Early engagement with developers and equipment suppliers is key to ensuring that a project will be attractive and viable for the private sector. Funding models may need to be reassessed or adapted if the private sector perceives the project as too risky.

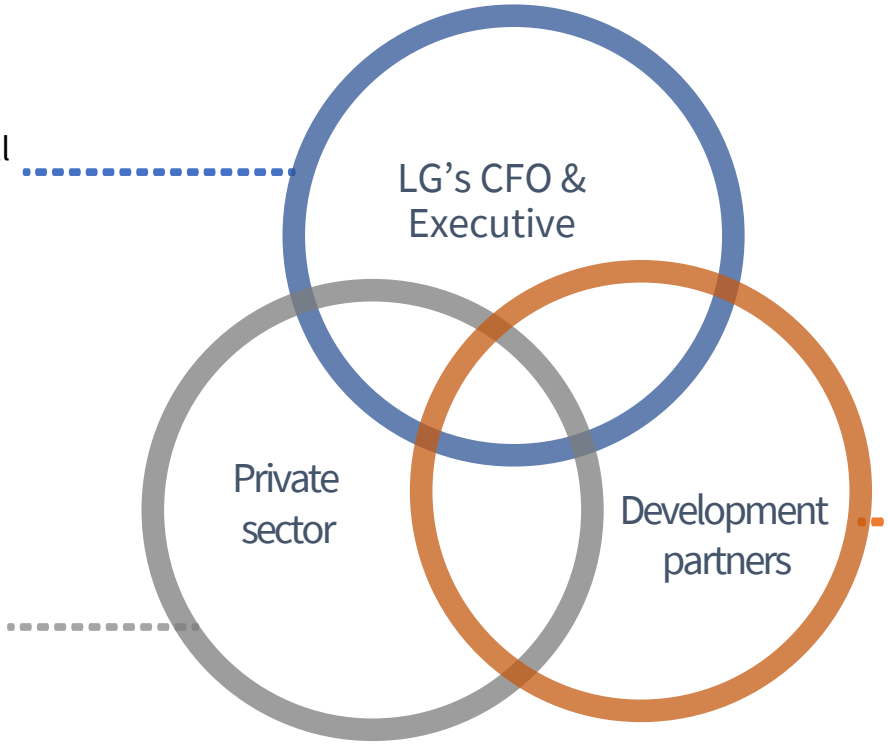
15 MIN BREAK

Covenant of Mayors
in Sub-Saharan Africa

DETAILS ON STEP 5. DEMONSTRATING FEASIBILITY

UNDERSTAND PROJECT VIABILITY REQUIREMENTS AND THE QUESTIONS THAT WILL NEED TO BE ANSWERED

- What the project's payback period is
- What the project's impact will be on tariffs (if selling electricity to the grid)
- How the project aligns with development plans, job creation targets, etc.



- Political support (local & national) for project
- Development benefits (jobs, climate, etc.)
- Whether the project's benefits will be greater than its costs
- How social and environmental risks will be mitigated
- Whether the business model is sustainable

- Whether risks have been allocated appropriately between the private and public sectors
- LG's ability to pay the private sector for services

Insight: Historically, many SSA feasibility studies were led by technical experts with limited inputs from financial experts. This approach often resulted in technically sound, but unaffordable or unfunded solutions.

5.a. DEMONSTRATING FEASIBILITY

STEPS 1 to 3

PROJECT MANAGER

CONSULTANT TEAM (all experts)

ENERGY AUDITS

- Conduct preliminary energy audits on buildings and social housing stock to assess energy efficiency potential
- Install a metering system to capture baseline data

TECHNICAL STUDIES

- Identify most suitable technical solutions
- Quantify each project's capital and operational expenditure under different technical scenarios
- Develop a tariff price path that can be used to quantify future savings
- If funded by the public sector, conduct an investment grade energy audit on preferred project or projects
- Calculate potential energy savings

MODELLING

- Model forecasts upfront investment and O&M costs and energy savings to calculate payback periods
- Payback periods are calculated for different funding models (if relevant)
- Economic modelling (if required) will quantify the project's economic benefits relative to its costs
- GHG modelling will quantify the project's emission savings

5.b. DEMONSTRATING FEASIBILITY

STEPS 4 to 6

PROJECT MANAGER

CONSULTANT TEAM (all experts)

CONFIRM FUNDING MODEL

- The model's outputs will confirm whether a funding model will be affordable to an LG
- Sensitivities test whether funding model remains feasible
- If funding model is not feasible, alternative funding models could be modelled.

M&V CRITERIA

- M&V criteria need to be identified
- GHG emission savings may need to be quantified and reported
- Baseline data will be required

REPORTING

- Business case needs to answer funders' questions
- Report should be concise and contain key findings
- Underlying technical reports or models should form annexures

Insight: Consultants often produce dense reports that have "*thud value*" while shorter punchier reports with annexures are far more likely to be read by funders and stakeholders. The project manager should work with the consultants to develop a report template that will be fit for purpose

6. SECURE FUNDING

PROJECT MANAGER

CONSULTANT TEAM (finance expert)

LG's CHIEF FINANCIAL OFFICER + EXECUTIVE | **DFIs** | **NG**

PUBLIC OWNED & OPERATED

- Submit business case to LG's CFO, Executive, and other involved parties (e.g., investors, National Government, DFIs, etc.)
- Present findings to Executive and obtain written approval for investment
- Present findings from business case to external funders (DFIs, NG, etc.)
- Obtain written commitments from external funders
- Ensure that project's funding requirements are included in LG's budgets
- LG's CFO finalizes capital funding with LG's treasury and completes grant funding processes

PUBLIC OWNED & PRIVATE OPERATED (SLA)

ESCO FUNDED

- Submit business case to LG's CFO, Executive, and other involved parties
- Present findings to Executive and obtain written approval to procure an Energy Performance Contract
- Ensure that LG's future estimated payments to the private sector are included in the LG's budgets
- If relevant, present findings from feasibility study to external funders (DFIs, NG, etc.) to secure grants and/or concessional finance

Insight: Grants from development partners and/or NG can be used to make any of the models more affordable to the LG

7. PROCUREMENT (PUBLIC FUNDED)

PROJECT MANAGER

CONSULTANT TEAM (various experts)

LG's CHIEF FINANCIAL OFFICER + EXECUTIVE

LG's LEGAL/COMPLIANCE TEAM

EQUIPMENT SUPPLIER or ESCO

CONSTRUCTION COMPANY

OPERATOR or ESCO

PUBLIC OWNED & OPERATED

- Technical consultant develops technical specifications
- Expression of Interest (EoI) is issued to shortlist Turnkey Contractors
- Contractors are shortlisted by evaluation committee using evaluation matrix
- Request for Proposal (RFP) issued to appoint a Turnkey Contractor that contains clear evaluation criteria
- Contractors submit tenders that specify price and performance guarantees
- Tenders are evaluated by the evaluation committee
- Preferred bidder is selected
- Turnkey contract is concluded

PUBLIC OWNED + SLA

- Technical consultant develops service specifications
- EoI is issued to shortlist operator
- Contractors are shortlisted by evaluation committee using evaluation matrix
- RFP is issued to appoint operator, clear evaluation criteria
- Operators submit tenders
- Tenders are evaluated and preferred bidder selected
- SLA is concluded

7. PROCUREMENT (ESCO FUNDED)

PROJECT MANAGER

CONSULTANT TEAM (various experts)

LG's CHIEF FINANCIAL OFFICER + EXECUTIVE

LG's LEGAL/COMPLIANCE TEAM

EQUIPMENT SUPPLIER or ESCO

CONSTRUCTION COMPANY

OPERATOR or ESCO

ESCO FUNDED

- Technical consultant develops output specifications
- Expression of Interest (EoI) is issued to shortlist consortia (equipment supplier, construction company, and operator)
- Consortia are shortlisted by evaluation committee using evaluation matrix
- Request for Proposal (RFP) issued to shortlisted consortia with clear evaluation criteria
- Shortlisted bidders are invited to conduct own preliminary energy audit
- Bids are evaluated by evaluation committee
- Preferred bidder is selected
- Preferred bidder undertakes investment grade energy audit
- Energy Performance Contract is concluded

Insight: The Energy Performance Contract must address performance guarantees, the payment structure and model, M&V, and agreement on the baseline for measuring energy savings during the project

8. MONITORING

PROJECT MANAGER

LG's CHIEF FINANCIAL OFFICER + EXECUTIVE

LG's LEGAL/COMPLIANCE TEAM

PUBLIC OWNED & OPERATED

- LG appoints an independent expert to monitor the turnkey contractor
- The independent expert must verify performance after installation/construction is completed
- Final payments are only made to the turnkey contractor once performance is verified
- Performance guarantees/bonds are cancelled following final sign off from independent expert

PUBLIC OWNED & PRIVATE OPERATED (SLA)

- LG establishes SLA monitoring process or appoints consultant to undertake process
- LG processes payments to private sector based on performance

ESCO

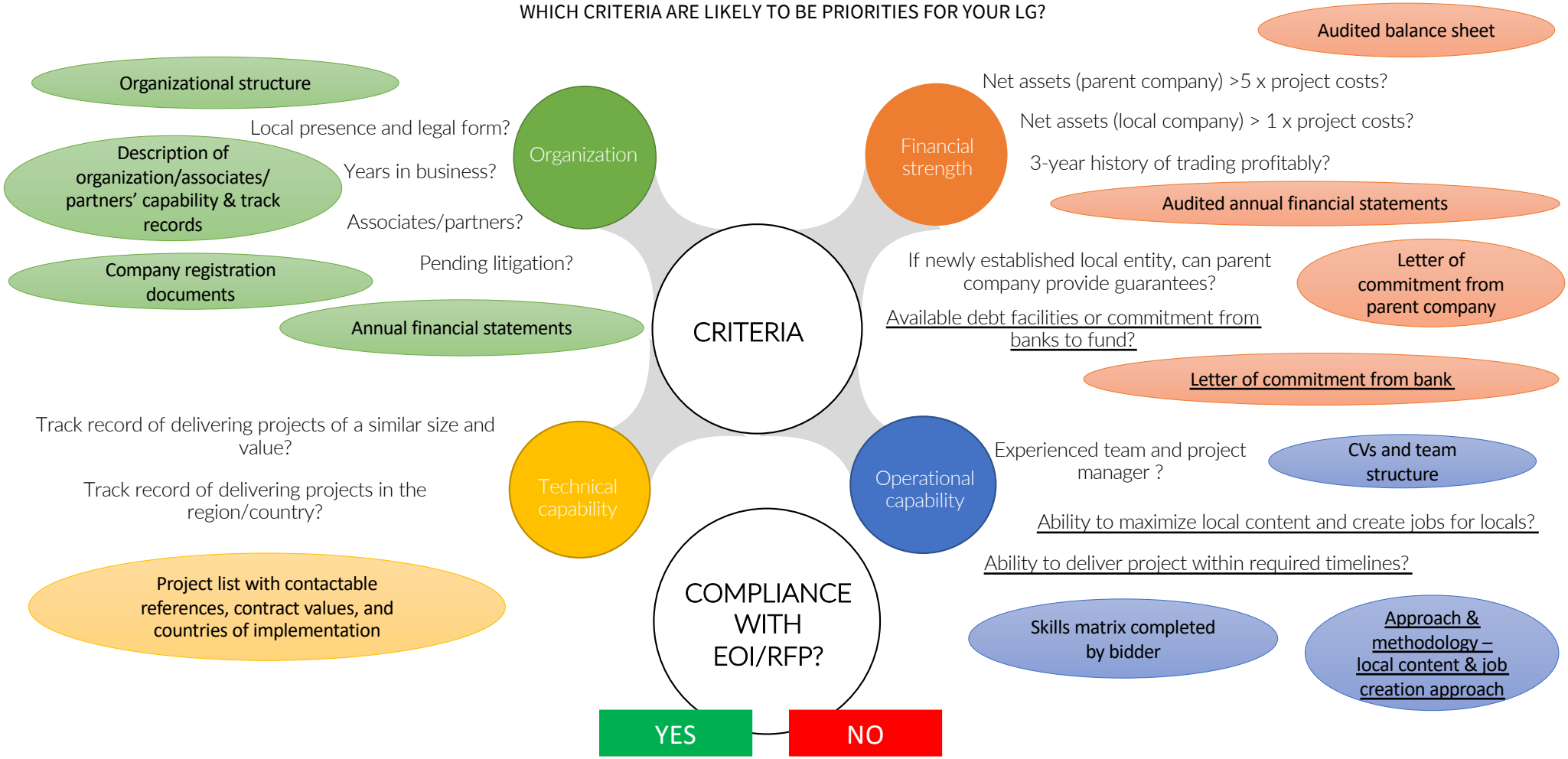
- LG establishes ESCO monitoring process or appoints consultant to undertake process
- LG processes payments to ESCO based on performance

4.1 BREAKOUT & FEEDBACK SESSION 4

Covenant of Mayors
in Sub-Saharan Africa

EXERCISE 4: DESIGN A VENDOR QUALIFICATION MATRIX

WHICH CRITERIA ARE LIKELY TO BE PRIORITIES FOR YOUR LG?



EXERCISE 4: VENDOR QUALIFICATION MATRIX EXAMPLE

CRITERIA	SUPPORTING EVIDENCE TO BE PROVIDED	SCORING APPROACH
Organization		
Identification of bidder	• Company registration documents • Audited annual financial statements	Bid is either compliant or noncompliant
Identification of partners, subcontractors, etc. (if relevant)	• Organizational structure	Bid is either compliant or noncompliant
Tax compliant	• Valid tax compliance certificate	Bid is either compliant or noncompliant
Financial strength		
Net assets (local company) > 1 x project costs or net assets (parent company) >5 x project costs	• Audited balance sheet • Letter of commitment from parent to support local company	Scores commensurate with level of net assets
3-year history of trading profitably (i.e., 3 cumulative years of net profit)	• Audited annual financial statements	Bid is either compliant or noncompliant
Other criteria as required		
Item 1		
Item 2		

EXERCISE 4: FEEDBACK FORM

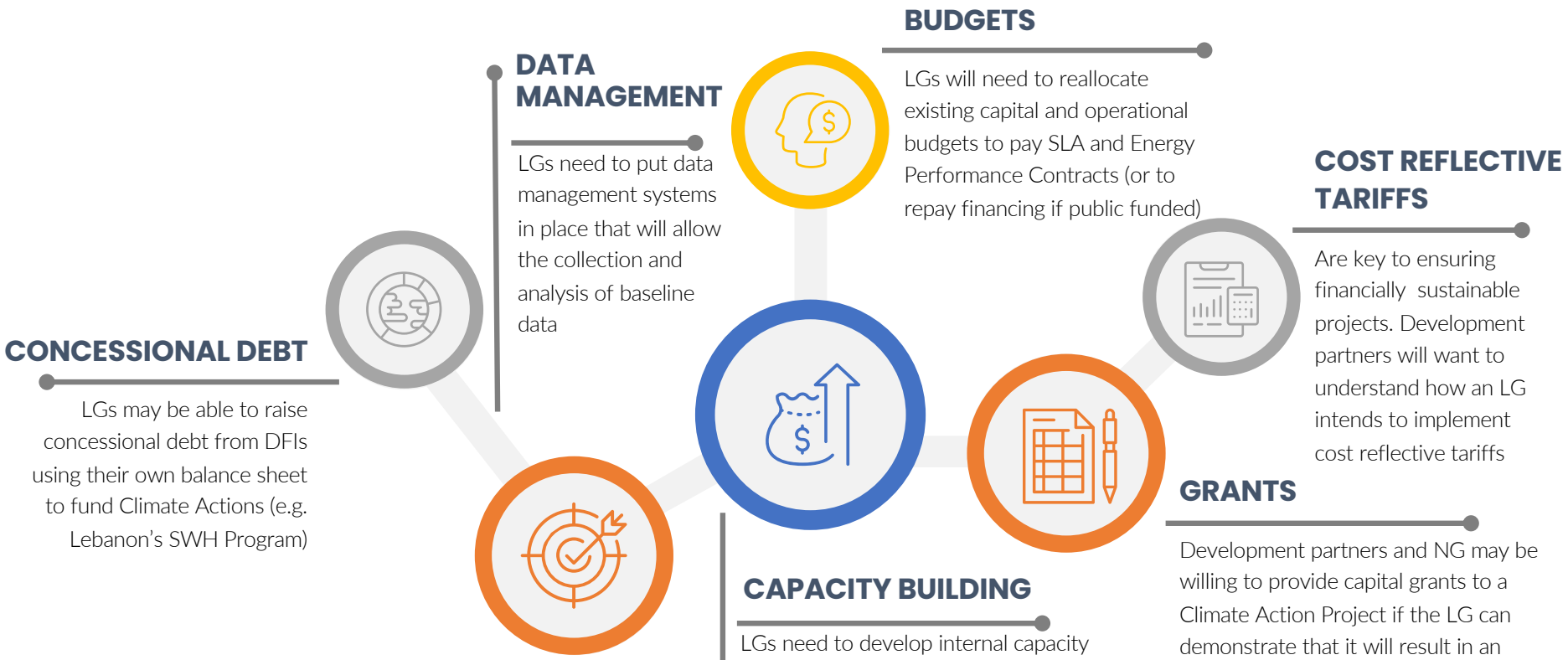
Criteria	Number of people that selected this criteria	Supporting evidence identified

5.0 HOW TO IMPROVE THE ENABLING ENVIRONMENT

Covenant of Mayors
in Sub-Saharan Africa

HOW LGs CAN UNLOCK SOLAR PROJECTS

GIVEN THE IDENTIFIED ISSUES AND CONSTRAINTS



BUDGETS

LGs will need to reallocate existing capital and operational budgets to pay SLA and Energy Performance Contracts (or to repay financing if public funded)

DATA MANAGEMENT

LGs need to put data management systems in place that will allow the collection and analysis of baseline data

CONCESSIONAL DEBT

LGs may be able to raise concessional debt from DFIs using their own balance sheet to fund Climate Actions (e.g. Lebanon's SWH Program)

COST REFLECTIVE TARIFFS

Are key to ensuring financially sustainable projects. Development partners will want to understand how an LG intends to implement cost reflective tariffs

GRANTS

Development partners and NG may be willing to provide capital grants to a Climate Action Project if the LG can demonstrate that it will result in an affordable and sustainable project

CAPACITY BUILDING

LGs need to develop internal capacity to ensure that EE contracts are understood and that M&V processes can be implemented

LGs CAN LOBBY NG TO IMPLEMENT ENABLING CONDITIONS

TAX INCENTIVES

Tax incentives for Climate Actions will make projects more affordable to LGs and will attract investment from the private sector

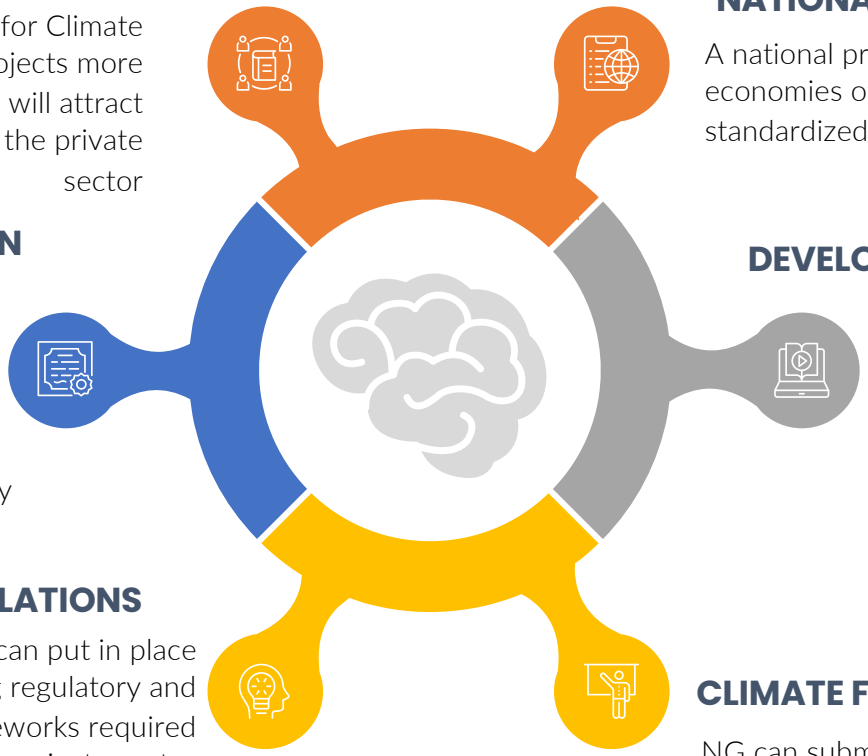
NATIONAL PROGRAMMES

A national programme can achieve economies of scale as LGs can access standardized designs, contracts, etc

LEGISLATION

NG can put into place legislation that promotes private sector investment and energy efficiency

- Energy Act that promotes energy efficiency and renewable generation
- Legislation that protects foreign investors' rights and minimises expropriation and exchange control risks
- PPP legislation
- Legislation that promotes grid-tied PV projects



DEVELOPMENT OF ESCO MARKE

NG can develop the ESCO market by offering capacity building support to the private sector and by structuring a credit enhancement mechanism that will reduce the risk for ESCOs and their lenders

REGULATIONS

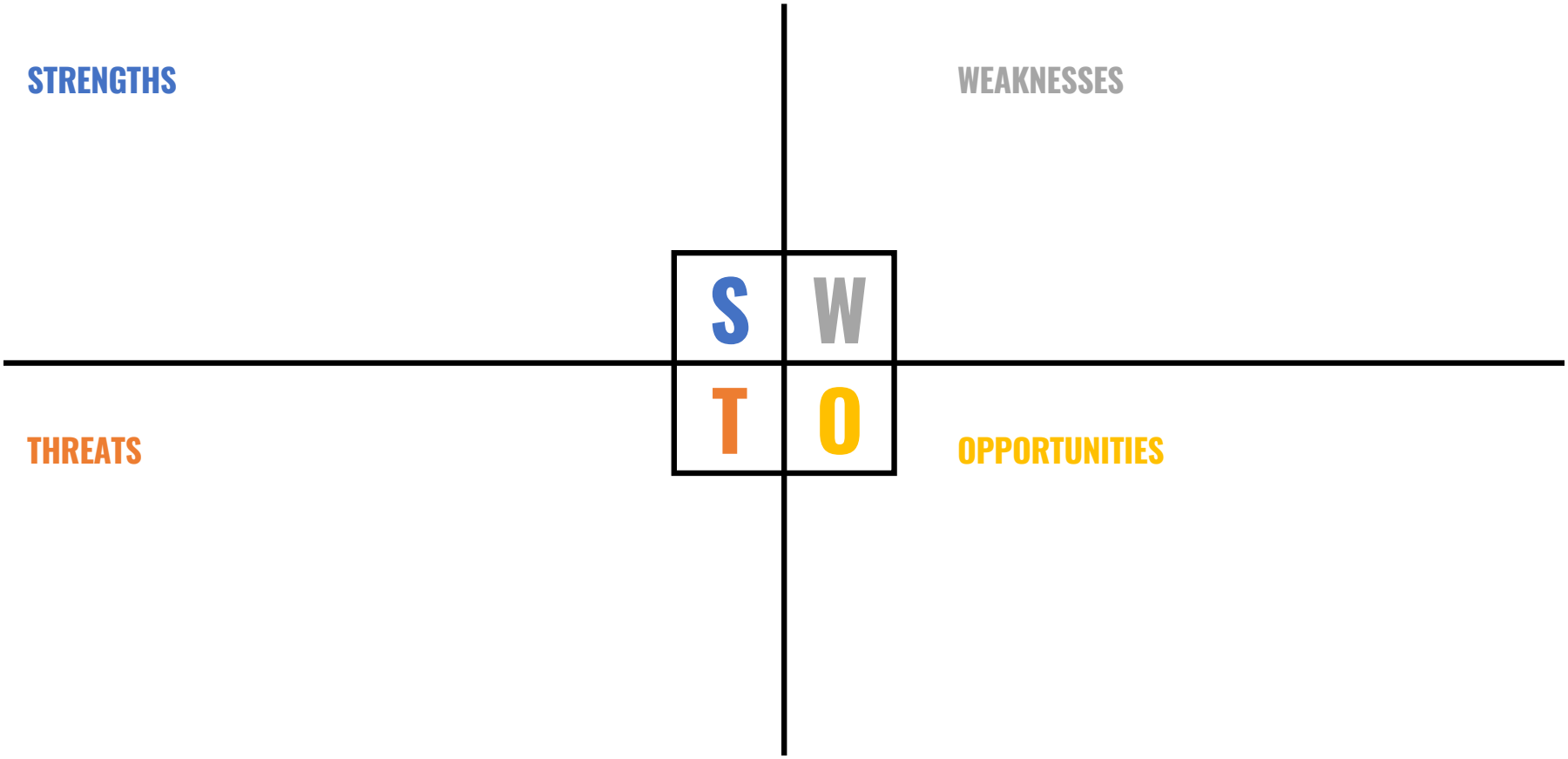
NG can put in place supporting regulatory and legal frameworks required for private sector participation (including energy generation)

- National guidelines and standards for SWHs and Solar PV generation
- Investment policies
- Unsolicited bid policies
- Policies that support net billing

CLIMATE FACILITY APPLICATION

NG can submit an application to the GCF and/or NAMA Facility that would unlock concessionary finance across several LGs

COUNTRY SPECIFIC ENABLING FACTORS



5.1 BREAKOUT & FEEDBACK SESSION 5

Covenant of Mayors
in Sub-Saharan Africa

EXERCISE 5: ENABLING FACTORS EXAMPLE

ENABLING FACTORS BASED ON CAPE TOWN'S GREEN TAXI RANK

Electricity budgets were well understood

The cost of supplying electricity to the Taxi Rank was quantifiable (for both scenarios) and affordability could be demonstrated

Measurement & verification processes had been put in place to monitor performance

The City could raise funding off its own balance sheet

The City's CFO was able to make an investment decision based on the business plan presented

The City can access to concessionary loans to finance green projects

Baseline data was available and adequate data management processes had been put in place

EXERCISE 5: FEEDBACK FORM

Enabling factors – which are most feasible? How to obtain?	Answers (with numbers of how many people shared that issues)	Examples

6.0 WRAP UP

Covenant of Mayors
in Sub-Saharan Africa

ADDITIONAL TOOLS & INFORMATION

How to Finance Roadmaps for 10 Climate Actions

See COM SSA GlobalDF Climate Finance (authored by GlobalDF; sponsored by GIZ, EU) on GlobalDF website www.globaldf.org

6 Training Modules for LG (including this one)

See other training modules (authored by GlobalDF; sponsored by GIZ, EU) on GlobalDF website www.globaldf.org

For more information, please contact GlobalDF through the website contact form on www.globaldf.org

If interested in supporting use of the training modules and their improvement, please contact Dr. Barbara Samuels, Executive Director of GlobalDF at barbara@globaldf.org