

#	Topic & duration	Existing material & team
1	<u>Off-grid rural electrification:</u> ground knowledge 1 day	- Role of off-grid: - o Present the technical options available and their pros and cons (SHS, MGs, grid extension) and explain that there are complementary and should all be combined to reach the goal for electrification - o Explain the role of setting an electrification plan: give a clear direction for the country and identify the spaces given to each technology - o Explain the phases of the deployment: identification of sites, feasibility studies, tender, EPC phase and ESIA, O&M phase - Country of past implementation: Burundi - Who is involved? Roles of public and private sector - o Present the different PPP Models in rural electrification with pros and cons (expertise, speed of deployment, tariff) - o Financing of the projects: present the different structures with pro and cons (share of grant, impact on tariff and viability of projects) - o Role of the private sector in the different phases: identification of sites (ex: VIDA), feasibility studies, tender (ex: transaction advisor), EPC phase, O&M phase - Countries of past implementation: Gambia, Benin - Review and additional material to be developed from experience in Benin and Zambia
2	<u>Overall understanding of MG:</u> business models 1 day	- Basic knowledge: - o Mini-grid PPP model, Development of MG projects, MG management, Project risks and their mitigation, Lessons learned and recommendations. - o This training can include case studies of mini-grid procurement in different countries (e.g Nigeria), highlighting lessons learnt. - Countries of past implementation: Burundi, Nigeria (for case studies of mini-grid procurement and lessons learnt) - Review and additional material to be developed from experience in Nigeria (for case studies of mini-grid procurement and lessons learnt)
3	<u>Off-grid procurements:</u> introduction 1 day	- General Procurement Procedures for goods and services: - o International Procurement Procedures and Logistics; Open procedures, Restricted procedures, Competitive dialogue, Competitive procedure with negotiation, Negotiated procedure without publication. - o National Procurement Procedures and Availability of components: National competitive bidding, Shopping and direct contracting, Force account. - o Experience from Benin case study and EIB international procedures. - Countries of past implementation: Burundi
4	<u>Off-grid procurements:</u> deep-dive	- Eligibility of Bidders and Qualification Criteria and Technical Requirements and Rated Evaluation:

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	2 days	Training on the elements of mini grids for which there are generally technical requirements and performance standards (to be specified in tender documents) including a discussion of why each is important, what levels have been chosen in other countries, and what some of the trade-offs are (e.g. cost vs. electrical efficiency; cost vs. longevity). The key principle is to ensure quality and safety while not restricting innovation. Presentations could include photographs of good and bad practice to illustrate the difference. Perhaps include equipment specification sheets either handouts or as images in slide deck and have participants discuss whether a particular component (e.g. solar panel, inverter, etc.) meets the specifications. - Other aspects to be considered - o Contract management - o Due diligence of mini-grid projects - o Environmental impact assessment - o Productive Use of Electricity (PUE) - o Gender aspect into account in electrification projects - o Comparison between Ethiopia, Nigeria, Rwanda and Haiti - Countries of past implementation: Burundi, a brief version (more like half an hour) has been presented in Rwanda. - Additional material to be developed on bidding design strategy for mini grids (introductory session of 4 hours): This would primarily look at what variable to fix and what variable to allow the bidder to bid on, and the implications of that choice. The main choices seem to be around fixing the subsidy and letting the bidder bid on the tariff; or fixing the tariff and having bidders bid on the subsidy level (minimum subsidy tender). There could be a practical exercise in which the participants are split into 2 or 3 groups. A scenario is presented and each group needs to come up with a rough bidding design and present it to their peers. - Review and additional material to be developed consisting of (i) memo of concrete and specific factors of success and failure stemming from international practices; (ii) memo recapping the usual magnitude or range of consistent techno-economic and financial ratios¹ of mini-grid projects stemming from international experience; (iv) memo highlighting the typical points of attention for bids evaluation; Experience sharing from Benin

¹ Example of **technical assumptions**: lifespan of PV equipment, DoD, PV installation efficiency, size ratio between generation and demand, share of diesel genset generation in the total consumption, number of connections per km of LV lines in rural, peri-urban and urban areas, average unit demand (power and energy) per household or connection, minimum days of battery autonomy with diesel backup and without, battery capacity per kWp, % of technical and commercial losses, typical timeline highlighting studies, procurement, installation, licensing phases.

Example of **economic and financial assumptions**: global CAPEX per connection, CAPEX power plant per kWp installed, CAPEX grid per km of LV line, CAPEX metering/wiring per connection, OPEX % of the investment, mini-grid tariffs versus national tariffs (connection and consumption), WACC, payback time, IRR, usual grant and equity levels, etc.

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		- [Option] Training on procurement platforms Odyssey²: hands-on training in which temporary licenses are secured for participants and each can follow along on their own computer to explore a mock procurement 2 hours – with the Odyssey team themselves
5	<u>Financial Models and Business Plans</u> 2 days	- Generic module, based on a model case for financial modelling and reference to the tariff study done by GET.transform in Uganda. - o Financial analysis of a mini-grid project. - o Capital investment, operation and maintenance costs for mini-grids. - o Revenue generation and tariff structures. - Country of past implementation: Burundi - Review and additional material to be developed consisting of Didactic/analytic memo explaining the impact of subsidies, grants and taxes on the tariff and if possible, PUE investments on the tariff;
6	<u>MG Technical details design</u> 1.5 day	- Practical training on technical MG design with software: - o HOMER Pro³ or other bankable software like PVsyst for mini grid design and optimization. - o Specific training on monitoring software and maintenance procedures - Country of past implementation: Burundi (INENSUS), Benin and Zambia (Esteban)
7	<u>Regulation and Policy for Mini-Grids</u> 2 days	- Deep dive into the relevant regulations affecting off-grid procurement in the targeted country: - o Identification of key provisions, highlighting their effect on the practicality of off-grid procurement - o Licensing and regulations surrounding mini-grid operation and tariffs, understanding of how tariffs for mini-grids are derived - o PPP models and contractual framework for Mini grid procurement - o Issues around land ownership and leases for mini grids - Best Practice and local context (to be developed with local lawyers.) - o Best Practice for mini grid regulations: key considerations of inclusions in regulations for bankability of mini-grid projects - Country of past implementation: Nigeria - Review and additional material to be developed from international experience
8	<u>Micro-grids & standalone systems' innovative</u>	- Context: mini and micro grids business models - o Costs and Revenues: Sensitivity analysis of a business model - o Safety, Reliability and Affordability: Finding the sweet spot of mini-grids - The service approach: electricity + leasing of appliances - o The impact of energy efficient appliances: SHS case study

² <https://odysseyenergysolutions.com/>

³ A pared down version of HOMER is also available as an API in Odyssey. Participants should bring their own computers with a 21-days free trial version of HOMER to download. The base license price is \$187 per month with a 33% discount for annual billing (\$1500) (<https://homerenergy.com/products/pro/pricing/index.html>)

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	<u>business models</u> 1.5 day	○ Driving profits: productive hubs and rural development ○ How to regulate the service approach suitable for micro-grids with leasing of appliances - Access to energy for scattered household customers ○ Least-cost strategies for distant residential customers ○ Interconnectivity of on-grid and off-grid energy systems - Country of implementation: Namibia (currently under implementation) - Review and additional material to be developed with insight into meshed AC and DC networks