ERB approved Regulatory Framework for Mini-Grids in Zambia
Question and Answer (Q&A) during the Road-Testing period

Responses by the ERB to specific aspects raised in the open letter by the Mini-Grid Industry Representatives

Item	Specific aspect (s) raised	Response (s) by the ERB
1	**Connection to the Main Grid**: Mini-grids not currently compliant with the proposed rules are required to upgrade into compliance within 24 months after notice from ERB, and it was suggested to cost to upgrade should be passed on to customers through higher tariffs. This suggestion ignores the fact that many Mini-grids serve low-income rural households, making higher tariffs difficult to achieve. We suggest proposing more achievable technical requirements instead	**Response:** The Mini-Grid industry representatives should point out specific clauses and propose achievable technical requirements for consideration by the ERB to amend specific clauses in the Regulations. Under the Scope and Applications of the approved technical guidelines of the Regulations, the provisions stipulate as follows: i). **Referring to Article 1.3.4 of the Technical Regulations:** Existing Mini-grids shall, within twenty-four (24) months of notification of these Regulations, comply with the technical standards and safety measures as per the Regulations or demonstrate that applied technical standards and safety satisfy the requirements of these Regulations. ii). **Referring to Article 1.4.1 a.-c. of the Technical Regulations:** Cluster 1 - Any Mini-grid generation capacity powered by a Hydropower plant has to comply with the Technical Codes at time of application, connection and operation and demonstrate Main Grid readiness at any time. ❖ Cluster 1 Mini-grids are AC Mini-grids at 50 Hz. ❖ Cluster 2 - Any Mini-grid powered by PV Solar, Wind or Bio with a generation capacity of greater than 10 kW, but less than or equal to 100 kW apply to these Regulations and have to demonstrate Main Grid readiness within twenty-four (24) months after agreement with Main Grid operator and notice of the ERB. Any Mini-grid powered by PV Solar, Wind or Bio with a generation capacity of equal or greater than 100 kW has to comply with the Technical Codes at time of application, connection and operation and demonstrate Main Grid readiness at any time. Cluster 2 Mini-grids are AC Mini-grids at 50hz with a three phase Distribution Network at 400V. ❖ Cluster 3 - Any Mini-grid powered by PV Solar, Wind or Bio with a generation capacity of equal or less than 10 kW apply to these Regulations. Cluster 3 Mini-grids are either AC Mini-grids at 50hz with a single-phase Distribution Network at 220V or DC Mini-grids. DC Mini-grid with a generation power of equal or less 2 kW can operate at 24V. DC Mini-grids with a generation power of greater than 2 kW but

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		equal or less 10 kW can operate at 48V or 72V. iii). **Referring to Table 2-8 of the Technical Regulations** (Table 2-8 was slightly revised for clarification after ERB board approval): Cluster 1 Mini-grid developer account for CAPEX/OPEX of Main Grid compatibility. The initiator for Main grid encroachment of Cluster 2 Mini-grids with a capacity of 10 > kW < 100 account for CAPEX/OPEX of Main Grid compatibility. Cluster 2 Mini-grids with capacity of > 100 kW account for CAPEX/OPEX of Main Grid compatibility. The initiator for Main grid encroachment of Cluster 3 Mini-grids account for CAPX/OPEX of Main Grid compatibility. iv). **Referring to Article 2.1. of the Technical Regulations:** Mini-grids in Zambia shall comply with the Technical Codes of Zambia, unless these Regulations set other codes or standards or in absence of national Technical Codes, or MGD demands for exemption from complying with any provision of the Technical Codes.
2	**Reporting:** The requirement for monthly reporting to the ERB from all operating mini-grids represents a significant additional administrative burden upon both the ERB and mini-grid developers. We suggest annual reporting. Additionally, we request further clarity about the level of detail this reporting would entail.	**Response:** The Mini-Grid Regulations have not prescribed a monthly reporting frequency. Reporting frequencies are prescribed in licences that the ERB issues to project developers as part of licence conditions. Furthermore, provisions in the technical guidelines of the Regulations stipulate as follows: i). **Referring the Table 7-2 "Performance Indicators to be submitted to the ERB":** The regulator requests the reporting of 21 Performance Indicators. Referring to 2-7 Table of The Regulations, the MGO is requested to report a maximum of 9 Key Performance Indicators. Referring to 2-7 Table of The Regulations, the MGO is requested to report a minimum of 5 Key Performance Indicators. ii). **Referring to Article 2.10.2 of Technical Regulation:** "MGO has to report to ERB its performance within the annual reporting schedule."
3	**Tariff Setting Model:** Multiple models for tariff setting exit, including kWh billing and flat-rate billing. We suggest that this same flexibility in billing be continued and that these new regulations not include provisions requiring kWh-based billing, which could severely limit investments in this market.	**Response:** Provisions on tariff setting are not limited to kWh-based billing but are flexible and allow for other billing principles such as flat-rate-billing, TOU-**billing or other service charge**. Refer to **Definition of tariff in Article 2.1.19 of Economic Regulation:** "Tariff" – means the tariff or the service charge levied for the provision of a regulated service in line with the principles in Article 15.
4	**Net-Metering:** The proposed requirement that mini-grids utilize net metering-capable meters for mini-grid customers is realistic and applications of net metering within mini-grids is not aligned with mini-grid business models. Furthermore, making allowances for net-metering at this stage introduces unnecessary	**Response:** The Regulations with regards to Net-Metering apply only to Mini-grids with Main Grid compliance and are subject to request by a customer. The customer is the one who needs to initiate the process to connect his energy generation unit to the grid. Refer to the following provisions in the Regulations: i). **Referring to Article 2.1. of Technical Regulations:** Mini-grids in Zambia shall comply with the Technical Codes of Zambia, unless these Regulations set other codes or standards or in absence of national Technical Codes, or

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	certainty, increases cost, more complex technical solutions and incompatibilities with various pricing models. We suggest removing the requirements for net metering, in line with the fact that regulations in leading mini-grid markets such as Tanzania, Kenya, and Nigeria do not have net metering policies for mini-grids.	MGD demands for exemption from complying with any provision of the Technical Codes. ii). **Referring to 2-6 Table of the Technical Regulations:** Cluster 1 Mini-grid are prepared for Net-metering, as Main Grid compatibility is requested. Cluster 2 Mini-grid with a capacity of 10 > kW < 100 are requested to have Net-Metering after upgrade to Main Grid compatibility. Cluster 2 Mini-grids with capacity of > 100 kW are prepared for Net-metering, as Main Grid compatibility is requested. Cluster 3 Mini-grids have no obligation for Net-Metering. iii). **Referring to Article 1.4.1.c of Technical Regulations:** Cluster 2: **Any Mini-grid powered by PV Solar, Wind or Bio with a generation capacity of greater than 10 kW, but less than or equal to 100 kW apply to these Regulations and have to demonstrate Main Grid readiness within twenty-four (24) months after agreement with Main Grid operator and notice of the ERB.** Any Mini-grid powered by PV Solar, Wind or Bio with a generation capacity of equal or greater than 100 kW has to comply with the Technical Codes at time of application, connection and operation and demonstrate Main Grid readiness at any time. Cluster 2 Mini-grids are AC Mini-grids at 50hz with a three phase Distribution Network at 400V.
5	**AC Coupling:** By requiring net metering, the ERB is effectively dictating AC coupled grid architecture, which is more expensive than a DC coupled system. There are also fewer technologies that support this architecture, thereby limiting the type of power electronics available in the market that can be used. In line with eliminating Net Metering requirements, we suggest removing requirements for AC coupled grid architecture.	**Response:** The Regulations allow DC coupling for Mini-grids of up to 10 kW. Refer to item 4 above.
6	**Geographic distance between grids should not affect regulations:** The proposed regulations stipulate that developers who have grids close in physical proximity to one other would be regulated in accordance with the sum total inverter output of the grids. There is no rational basis for the distance between an operator´s grid becoming a determining factor of how heavily regulated they are.	**Response:** There is no such a provision in the Regulations. Where a licensee applies for a geographical area and within that area there are more than one mini-grid system, each system will be subject to licence conditions (technical requirements and tariffs) appropriate for that system. For example, if in one geographical area there are two stand-alone systems– one of 50kW and one of 60kW, each system will be regulated in the <100kW category. However, if the systems are linked (i.e. 110kW), then it will be regulated in the more than 100kW category. In both cases the licensed capacity would be the same - 110kW.

Panel discussion: Practical Capacity Building Workshop of 6th March 2019 by ERB, IAEREP TA1 and TA2 chaired by ERB

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1.	It would be interesting to use international CPI. But this business is likely to be undertake using local currency which implies a very high CPI. This may result in big changes (15%) so this is an important marker. With mobility of customers to move from one supplier/distributor to another and tariffs based on consumption, would it be possible to have guarantees against such encroachment risks?	Regulatory best practice is that indexing should be covered in currency in which the costs are recovered. There are IPP examples where projects in one country are indexed to another. But this is risky as inflation rates and currencies conversions may be different. This talks to what the developers should be able to recover to off-set the currency risks fluctuation risks. Mini-grids are different from Independent Power Producers (IPPs) where Government underwrites the off-taker risks. Mini-grids sell directly to end-users and not the grid. End-users do not provide any guarantee. I don't see a possibility for Government guarantees as there is no contract between the mini-grid operator and Govt. But it is something that we can think about as a mini-grid policy dealing with grid encroachment. There is a need for a plan to determine what is grid area and what is off-grid.
2.	With the high requirements in the regulations, I don't know if many Zambians will be able to participate. Is this deliberate? Moderator: Which requirements specifically?	The minimum size of the EU grant for the Call for Proposals (CfP) is Euro 500,000, i.e. investment would exceed EUR 1 million. These is a possibility that smaller operators and NGOs could team up with larger applications/proposals to have combined projects. A week or two before the CfP a workshop will be held to which local developers and NGOs will be invited. The workshop will explain the rules and the workshop will offer opportunities for collaborations. The regulations deal with safety, quality and reliability issues and protection of the environment. The investor also needs to have a fair return on the investment. We are not compromising on anything. Licensing happens when the infrastructure is set up. There are other institutions that will also be required to provide permits. Other institutions like REA have a rural electrification masterplan and will have to be approached to request how a project development in a specific location by an investor will be affected by the masterplan. Department of Energy (DOE) will have to be approached for policy mechanism guidance. Policy makers are currently undertaking a number of initiatives such as resource mapping. Government may have already mapped the area and have plans to exploit the resources. ZESCO is a key stakeholder and could be planning to run grid to the area under consideration. There are also environmental issues and heritage commission issues. Before you get a licence you will have to approach all the other agencies (such as ZEMA) to get the necessary permits and approvals before you proceed to develop a project.
3.	Can NGOs do mini-grid projects under the CfP?	The CfP is not only for mini-grids but also other forms of energy. Solar home systems (not for sale) but providing a rent to buy service. Also, efficient cook stoves and similar non-electrical energy services. However, to make up to Euro 1 million investment it may be useful to join up with major developers to provide parallel services with them. So, if the major developer is providing electricity an NGO could provide efficient cooking services for example.

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4.	Why does ERB want net metering involved with mini-grids?	There is already a net-metering provision for the main-grid. Zambians can connect their power plant at their home to the grid. If there is a mini-grid near the main grid we want to give the operator the same opportunity. This approach may provide opportunity for lower cost energy for users.
5.	What is the rationale for one-minute data recording interval?	If there is accident and the liability is with the mini-grid operator. When there is damage or harm the operator needs to provide evidence that the operation was within technical requirements. Later the intervals will be extended to the standard 15-minute interval.
6.	What parameters are we targeting and the frequency of recording, what does this imply for data storage?	Data storage is cheap, so this is not a constraint.
7.	ZESCO and REA's aggressive electrification supported by the World Bank and others. ZESCO licences are not geographically defined	Grid encroachment is going to be an issue for mini-grid developers. What is proposed is a licence based on term and geographical area. When the regulations go for Gazetting the use-it-or-lose it principle will be applied. So, an approved mini-grid licensee will carve out a part of the corresponding ZESCO licenced area. If the grid comes close, mini-grid customers may hold out for the grid and the mini-grid may want to opt to negotiate with the encroaching grid. The willing-buyer-willing seller principle would apply (i.e. the parties need to reach agreement on price and what option to follow), but if one of the parties do not want to negotiate, it is foreseen that the Gazetted regulations will force negotiations. Following that, if no agreement is reached on either compensation or the option to follow, a third-party expert will be involved in evaluating the residual value of the grid being encroached and in a process similar to an arbitration, set compensation amounts and the option to implement.
8.	Is anything been done to provide Government guarantees to mini-grids?	There is no provision of guarantees at this point. Other than grid-connected projects, the off-takers are not state-owned entities and hence there are no off-taker guarantees.
9.	How are customers protected from exploitation in category 1 where ERB does not formally oversee the tariff setting?	A key policy issue that regulators have to deal with in approving such tariff frameworks. Mini-grid costs are site and technology system specific. So, tariffs may be different for similar mini-grids attempting to achieve a reasonable return. This will require econometric and other economic assessments. There is consensus for mini-grids <100 kW. Regulators apply the light-handed approach to incentivise the mini-grid developers to invest. With time and the real cost of the mini-grid can be assessed and tariffs adjusted.
10.	ERB splits the licence. So, can I have a licence just for supply?	ERB regime under the Electricity Act and the Energy Regulation Act requires licences for commercial generation, transmission, distribution and supply undertakings. In the off-grid space ERB has combined the licences to reduce the regulatory burden on the developer. You can however get a licence for supply only, for example where generation and supply activities are undertaken by different entities. It will also be a question what your source of generation is and what your main intentions are. For example, will you be a mini-grid or will you be an embedded distributor supplying customers? If the latter, you would have to comply with all the grid tariff setting and other licencing requirements.
11.	There are many grids already in existence. Going forward	All mini-grids will have to have a licence from the ERB no matter the capacity. Even for mini-grids that exist there will be tariffs but the

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	even at the smallest level (category 1) mini-grids are to be regulated (currently according to presentation especially on tariffs, this only needs to be reported. Do you have any comments?	principle is that this will be light-handed. In future, it is envisaged that mini-grids <100kW can apply for conditional exemption from regulation, However, that necessitates *Gazetting* of a corresponding regulation and is not currently an option.
12.	What role can ERB play in establishing an MOU with ZESCO as mini-grids start competing?	There is a challenge with respect to planning. It could also be REA who have a national mandate to provide rural electricity. When it comes to grid encroachment, stakeholder engagement is being emphasised. Engage the institutions ZESCO, REA, DoE explain your plans and find out what are their plans are. REA has the REMP that guides them and this available in the public domain. ERB should not be imposing issues on stakeholders, we rather provide room for negotiation between parties. We want to ensure no party is disadvantaged nor treated unfairly. DOE has the overall policy mandate. DOE can provide guidelines on how to deal with issues.
13.	Can there be separation of the developers undertaking generation, transmission, distribution and supply.	In the mini-grid context this is possible. If it started off as an integrated licence the parties would need to approach the regulator to discuss the amendment to the licence. However, there is nothing that would prevent that. (Please also see the answer under 10 if the mini-grid connects to the grid.)
14.	The underlying principle is that you want more access to supply. Private sector participation needs to be encouraged. If I am wanting to invest, I am expected to run around to all these stakeholders, this needs to be shortened as it could take a year getting official responses. This is a real challenge in Zambia. 15 years ago we did all this work to establish a mini-grid and ZESCO told us there was no money for the development. Then the grid came and we had wasted all that time and money only to lose it over-night.	Encroachment is more of a policy issue. These are national issues with respect to planning. There are separate documents dealing with masterplans, and they may not be consistent with each other. Perhaps what is needed is one Integrated Resource Plan. So, if a developer visits they will be given the same information of the national plan. Zambia is not there yet. I hope that Ministry of Energy (MoE) are taking note of this requirement. It will make planning easier for prospective investors. This will create more harmony amongst the players. Under this project the National Energy Policy will be enhanced. So, some of these issues relating to encroachment can be brought into the policy and dealt with there. Agencies should be able to answer requests in a reasonable time, say 30 days. This can be taken into road-testing. It is important that the running around is decreased if the policy of achieving access to electricity is to be achieved.
Other Q&A		
1.	How are consumers protected from exploitation since tariff is not formally approved by ERB? (Refers to category 1 mini-grid). Where can NGOs working in rural areas where energy is	International experience suggests that the economic approach to regulation varies depending on the categorization or size of the Mini-Grids, as the determination of the tariffs and the costs are largely location, technology and/or system-specific. For each Mini-Grid category, a decision is made based on the likely services that the type of mini-grid is able to offer, the extent to which this service can be substituted by an alternative service and based on the benefits of determining an administratively-set price and weighing it against the cost of introducing

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	needed benefit from this opportunity?	fully-fledged cost reviews for all types and sizes of Mini-Grids, indiscriminately. Attempting to apply a mathematical formula that suits all different sizes of Mini-Grids would be overly complicated and would be a barrier to innovation. It is for this reason that regulators typically apply lighter-touch economic regulation to smaller-sized Mini-Grids, with a more heavy-handed regulatory approach as the size of the Mini-Grid increases.
2.	What is the guarantee that rural communities can afford electricity?	Despite the considerable progress in cost reductions that renewable energy technologies have demonstrated in the past decade, especially in the case of solar and wind, electricity supplied through a mini-grid is likely to be more expensive than that provided from the incumbent utility. There are many reasons for this, but the most common ones are that (i) the Mini-Grid produces electricity from a new, undepreciated technology, especially in the first years of operation and needs to recover the costs of financing this infrastructure; and (ii) incumbent utility tariffs in emerging markets are in many cases not reflecting the true cost of service. The Rule on Tariffs Applicable to Mini-Grids foresees that Mini-Grids should be able to charge a cost-reflective tariff ensuring that they are able to recover their cost of service. This tariff will be adjusted downwards, however, whenever the Mini-Grid benefits from a once-off capital expenditure subsidy or from a recurrent (yearly) subsidy to reduce the costs, which will improve affordability.
3.	Explain the 50% funding and how will this work with the Non-governmental Organizations?	The 50% has been raised to 70% grant. How the NGO might work is outlined in an answer 3, above.
	Does ZESCO have a blanket nationwide, distribution license?	No, for example, Copperbelt Energy Corporation and North Western Energy Company have their own distribution licences. In other areas ZESCO do have licences which we refer to as “brownfield” areas. In those areas ZESCO can encroach on mini-grids. In future, when *Gazetted,* it is proposed that the regulations will have a “use it or lose it” principle, i.e. if the right to supply has not been used and a mini-grid wants supply rights in the same geographical area, then the licensed area can be taken away from the incumbent and given to the mini-grid, subject to applicable policy.
4.	1 MW threshold-what if Mini-grid converts to National Grid-supplies mini-grid less than 1 MW but installed capacity is over 1 MW (excess sold to national grid with PPA).	The question would be what the intention is – is it an embedded generator in distribution network, or a mini-grid selling excess to the grid? In the example it would seem as if it is not a true mini-grid (as the grid anchors the viability of the mini-grid, not the other way around) and hence that the grid rules would apply.
5.	The range of Quality of supply (e.g. voltage unbalance) has a smaller bandwidth than actual technical standard in Zambia (± 10%).	The Quality of Supply depends on the Cluster. Cluster 1 is for all Hydro-Mini-grid. Main Grid quality of supply standards apply for Hydro powered Mini-grid. Cluster 2 and Cluster 3 are for quality of supply for Non-Hydro technologies. The technical requirements resp. technical standard shall be read with care for Cluster 2 and 3. The voltage regulation foresees a target bandwidth of ±6%. For cumulative 8,5h of a week the technical requirement allows a bandwidth of - 15%, which is 5% more than the

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		Main Grid standard. The frequency variations foresee a target bandwidth of ±2%. For cumulative 8,5h of a week the technical requirement allows a bandwidth of ±15%.
6.	Technical Requirement for Planning: Consultation of REA or ZESCO might take very long to receive a formal answer. How can a developer handle this planning requirement?	The Mini-grid developer shall receive from these institutions a formal reply within a reasonable time. 30 days might be reasonable and ERB will consider such requirement in the approval phase It may be sufficient to proof to ERB that the agencies had been consulted to avoid conflict / competition with national development plans and developer has waited a sufficient period of time.
7.	In case of a fossil fuelled back-up system: Is the 80% for Renewable energy share a hard limit?	ERB acknowledges that a fossil fuelled generator might be more attractive than a non-fossil fuelled based back-up system. The Developer has to demonstrate, that his/her design targets the lowest possible energy generation cost under this 80% requirements. When the design enables only a renewable energy share of 75%, the developer might ask for an exemption.
8.	How long will Gazetting process last?	The duration to be taken to gazette these Regulations is not known as certain factors are beyond control of the ERB such as approval by the Ministry of Energy