CLEAN ENERGY SOLUTIONS CENTER
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Enabling Enterprise Development: A Selection of Best Practices in Harnessing Distributed Energy for Productive Uses

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Webinar Panelists

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Jean Billant	Geres
Tobias Zwirner	GmbH
Karl Kolmsee	GmbH

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Eric — Hello, I'm Erick Lockhart with the National Renewable Energy Laboratory, and welcome to today's webinar, which is hosted by the Clean Energy Solutions Center in partnership with the United Nations Foundation's Energy Access Practitioner Network and the Africa-EU Energy Partnership. Today's webinar is focused on exploring the role of distributed energy solutions and enabling and promoting enterprise development in Sub-Saharan Africa.

Before we begin I'll quickly go over some of the webinar features. For audio you have two options: You may either listen through your computer or over your telephone. If you choose to listen to your computer, please select the "mic and speakers" option in the audio pane. Doing so will eliminate the possibility of feedback and echo. If you choose to dial in by phone, please select the "telephone" option and a box on the right side will display the telephone number and audio PIN you should use to dial in. If anyone is having technical difficulties with the webinar, you may contact the GoToWebinars Help Desk at 888-259-3826 for assistance.

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posted to the Solutions Center training page within a few days of the broadcast and will be added to the Solutions Center YouTube channel, where you will find other informative webinars as well as video interviews with thought leaders on clean energy policy topics.

Finally, one important note of mention before we begin our presentation is that the Clean Energy Solutions Center does not endorse or recommend specific products or services. Information provided in this webinar is featured in the Solutions Center's resource library as one of many best practices resources reviewed and selected by technical experts.

Today's webinar agenda is centered around the presentations from our guest panelists, Yasemin Erboy Ruff, David Lacoque, Tobias Zwirner, Karl, Kolmsee, and Jean Billant, who have joined us to discuss best practices in harnessed and distributed energy for productive uses. The format today will be slightly different than usual. We'll start with an introduction from Yasemin, which will be followed by presentations from the other four panelists and a short discussion. We'll then turn to audience Q&A and follow that with a brief overview of the Clean Energy Solutions Center. At the end of the webinar you will be automatically prompted to fill out a brief survey as well, so thank you in advance for taking a moment to respond. And with that, I will turn it over to Yasemin.

Yasemin Thank you very much, Eric. And good morning, everyone—or good afternoon, depending on where you're joining us from—and Happy New Year. Welcome to the first webinar of our usual Practitioner Network webinars. Today we will be looking at enabling enterprise development, and we've very happy to be partnering with the Clean Energy Solutions Center as well as AEEP. Next slide, please.

So, I'm sure I don't need to go over the importance of energy access for anybody who is joining us for this webinar, but I'm going to give a few brief remarks about our work at the United Nations Foundation's on Energy Access and the Energy Access Practitioner Network just to set the context for the rest of the speakers. Next slide, please.

So, many of you may be familiar with the—with our Energy Access Practitioner Network or are members already. If you are not, feel free to join us via energyaccess.org following the webinar. But the Practitioner Network is basically a platform for practitioners, energy service providers, anybody who's working to scale energy access in developing countries using decentralized energy solutions. And much of our work is focused on sharing knowledge through channels such as this webinar; building partnerships between practitioners, as well as practitioners and investors; and catalyzing access in this space. We've grown from just 20 members in 2011 to over 2400 today, and we continue to welcome more members every month. Next slide, please.

So, as I mentioned, in this webinar we'll look at the role of distributed energy solutions in enabling enterprise development and the productive uses of energy. And we're very happy that we'll be kicking off a new Practitioner

Network webinar series, which will be looking at sharing best practices in different geographic and thematic contexts. So, this is only the first in hopefully what will be a good series of best practices that we hope to share with you going forward. Please note that we are live tweeting the webinar and you can follow us via @energyaccessPN and join the conversation using #PNwebinar. Next slide, please.

So, just a quick note: This is a heat map courtesy of the Sustainable Energy for All that shows the access deficit in their high-impact countries, just to give you an idea of the regions that Sustainable Energy for All is looking at, as well as just obviously to touch on the fact that regional learnings and the scale that we are able to achieve is key to achieving universal energy access globally. Next slide, please.

As many of you may know, we conducted our annual survey during the summer of 2016, and we are very soon about to share all of the data publicly. But I wanted to tease a few things here just to show that while there's great diversity within the Practitioner Network and beyond, of course, in the decentralized energy space, a lot of the focus is still on the smaller scale solutions, and larger systems are needed to be able to support productive uses and enterprise development, which we'll be talking about today. Next slide, please.

Again, another quick graph showing that the—of the sustainable energy for all tiers that were supported by respondents to our survey, you can see that many focus on the first two tiers, which are, again, the smaller systems, and the larger systems that require more power are less represented. Next slide, please.

Finally, showing sort of the distribution of end uses that are member C in terms of the products that they distribute or support. Again, phone charging, education, entertainment at home are the highest by far, and you'll see sort of more community uses, enterprise uses, and productive uses coming down further. So, I guess the message here is that our results show that the higher tiers of Sustainable Energy for All or higher power requirements are less represented in this space. So, again, it goes to show the importance of the case studies that we'll be hearing about today that show the need and potential, especially regarding productive energy uses. Next slide, please.

With that, here is how you can find us. We hope that many of you, if you are not members yet, will consider joining. And with that, I will turn it over to my colleague David from ARE to give an overview of AEEP.

David Yes, hello, everyone. This is David Lecoque speaking. I am the Policy and Business Development Manager at the Alliance for Rural Electrification here in Brussels, and we are the custodians of the energy access work stream of the Africa-EU Energy Partnership. As –

Eric Sorry to interrupt.

David Yes?

Eric Sorry to interrupt, David. Do you have a—we just see the Solutions Center email up on the screen. If you have your slides to open up, perchance?

David Aha. Is that better?

Eric Indeed. Thank you.

David All right. Sorry for that. So, yes, I would just like to preempt the case studies and emphasize a bit and contextualize where this is coming from. So, essentially, the Africa-EU Energy Partnership is, as you can see on the screen, basically the long-term political dialogue framework to discuss energy issues between Africa and the European Union, the main goal of which is to improve energy access. And by "energy" this is meant as, well, basically clean, climate-friendly, cost-effective, and reliable energy—hence, focusing on these different topics. Basically, leading initiatives itself as well as complementing existing national, regional, and continental objectives and strategies in Africa.

Specifically with regard to the energy access target, the AEEP's goal is to bring access to modern and sustainable energy services to at least a 100 million additional Africans by 2020 by focusing on a number of the issues that we see as being very, very promising, including of course powering of productive activities, which is the topic of today's webinar.

Now, under the AEEP there is a thematic work stream, specifically on energy access, which is the AEEP Energy Access work stream, where basically this is a network of organizations which are, let's say, stakeholders representing, if you will, the different nonpublic stakeholders in the debate. From the private sector you have ourselves as ARE. From the public sector you have the AEEP itself and the Club ER, which is the African network of rural electrification authorities and agencies. On the NGO side there is the British-based NGO Practical Action. And on the academic side it's Strathmore University. So, collaboratively, if you will, we formed this work stream and of course are very happy to welcome more people to help us, help the AEEP reach its target. So, what is our main core mission is to basically also focus on empowering Africa with renewable energy.

In short, I would say as, let's say, the non-state stakeholder group working on energy access, we really want to get a maximum amount of, well, stakeholders from the private, public, NGO, and academic sector on board to discuss together and feed into all these different fora and discussions we have about the right policies, about the right framework conditions that we all need to achieve what is basically our common goal of clean energy access. This is why we are well attending and participating in a good number of events. I think having panels there and so on to keep energy access as a topic well on top of the agenda. And they're also organizing even in two weeks' time in Lusaka the Sustainable Energy Southern Africa Forum, which will have a business day on the one end and then more of a political day on the other end.

In addition to engaging stakeholders, we also focus on sharing knowledge and capacity building. Of course, our core work in this regard is this best practices

publication, which we have launched very recently and which some of the case studies of which will be presented here today. This is complemented by, well, let's say, keeping the topic alive through all our communication channels—so, reaching these very different types of audiences.

Finally, I would already like to flag that during the ARE's Lisbon forum, which will take place end of March in Portugal we will also, let's say, celebrate young leaders that have—that are making a substantial contribution to actually delivering energy access on the ground in Africa. So, you are hereby all more than invited to join us on this occasion.

With this short introduction I very much thank you for your attention, invite you to our upcoming events, and then gladly pass on the word to the people who do the real impact on the ground, if I can say. So, here, the case study presenters, over to you. Thank you so much.

Eric Great. Thank you very much. We'll turn it over to Tobias.

Okay, we see your slide. We don't hear you.

What—

Tobias Can you hear me?

Eric Yes. Great.

Tobias Hello? Okay?

Eric Yes, we can hear you now.

Tobias Okay. Hello, everybody. I am talking about business opportunities with solar systems. My name is Tobias Zwirner. And I have to see if that works… yeah, it works. Okay.

Business Opportunities with Solar Systems is in other words what we call also *productive use*. We just thought because we are very much focused on solar technology to rename that in a bit. And the objective is that we supply with small solar systems, off-grid energy in un-electrified areas, which are used to generate income, and implementing and improving services and therefore to create jobs in rural areas.

Therefore, we developed over years: We started in 2012 with the first developments, some different solar solutions. We call them BOSS: Business Opportunities with Solar Systems. And there, we figured out—as we have seen already before in the screen—we figured out that especially the agricultural sector is interesting to process the products further on in order to generate more income and higher value. And on the other side we have the entertainment and the service area, where we developed, for example, mobile phone charging stations and what you see here: the BOSS Kit Projector. That's a mobile cinema which can be used to present films or TV to a bigger group of people. And then, all the cooling sector, where we can cool on the

hand food, but can we also use on the other hand in kiosks where you can sell cool drinks, and for sure in the pumping area where you pump drinking water and process drinking water or even purify polluted water to a drinking water stage.

Here, because time is quite short we just present a small business case. This is a BOSS system in Somaliland. We have there a long partnership with a company that's called Horn Renewable Energy. And that's a private company, and all the systems we sell, they are on the natural growing private market. The first system we installed in July 2012; that is a cooling system. It's purchased from a kiosk owner, and he invested in this cooling system to offer as a first—further step cooled soft drinks instead of uncooled.

And I just switched to the next slide… that's the kiosk owner, and you just have a simple solar-driven refrigerator box from Seca, which has 166 liters. And from that moment on, he offered cooled drinks. And the uncooled drinks until he sold for $0.50 and just added on for the cooled drinks $0.15—so, he sold for $0.65 the cooled drinks. And based on this investment—it was, the whole system, $1,800.00—he could increase his overall business to 40 percent, and the payback of the whole system he could achieve within 11 months, which was stunning us since we hadn't expected that it goes that quickly. Based on his success he added on more investment. He purchased a mobile phone charging station in addition, and later on he also invested in a ceiling fan and some TV sets. That's his present business.

In Somaliland, we also offered to the fishers some cooling system. It's more or less the same, and they are cooling their fishes which they bring out every day from the sea.

So, that's just a small introduction, since time is quite limited. What we also do—Phaesun is located in Germany. We are just a wholesaler and a system integrator, and that's why we are very much interested in this BOSS solution, since each of the solutions are somehow customized and each of the owners, they have a different business model, and this has to be—to this business model, the systems have to be adapted. And that's what we're doing, and that's what we like a lot.

And good, we can come later to questions. More introduction: this is my small promotion, but what I wanted to do is—we do the Off-Grid Experts Workshop every two years, and this is this year, in September 27-29, and you are all very welcome to meet us there to go more into the details. And there time is not as limited as the webinar, and we can also even show you physical samples.

Thanks a lot for your attention, and then I hand over again to the next presenter.

Eric Thank you very much. We'll turn it over to Karl now.

Karl Hello, everybody. Good morning, good afternoon. I'm Karl Kolmsee from Smart Hydro Power. Smart Hydro Power is a company with two proprietary products, as the name says. We have a small hydrokinetic turbine which has been developed by ourselves in 2013, plus we have developed a distribution system. So, we are very keen in whatever is productive use because we strongly believe that productive use is a key for sustainable project management, because as Tobias already explained, it's the only way that makes people being able or enabled to pay back one time their systems. We are heading for slightly bigger systems than Phaesun, and we are trying to install hybrid systems. The case study I am going to present if from a rice mill in Bhamane, India. This is Karnataka in the Western Ghats from India, so it's in the southwest of the country.

A very short executive study of what we've been doing and what were the main results. We were powering a rice mill in Bhamane. The project development has been done together with local project developers—very important—together with us. So, there were people on the ground doing a lot of social community work. The community itself decided to install the rice mill because this was the main activity missing at the local farmer's community and they had to walk 20 km to the next mill, which means they were spending a lot of time and money on processing their main agricultural good, which in that case is rice.

The community selected an entrepreneur—a miller—and an energy committee. Why is that so important? Because community activity always goes along with the technical employment of whatever installation has to be done. We actually employed a hybrid hydro-PV installation. It's India, which means there is a very strong monsoon from June onwards until September, and then you have a lot of water from December, which goes along with not having any sun. So, hybrid is the only solution that really gives you energy all year round. There is a sustainable operation financed by tariffs and it's run by a community organization which is called a "social trust," so there is a professional operation in place in Bhamane.

Where is it? What has been going on? This is where you find this little village—so, in case you want to visit it. It's three hours from Goa; it's a wonderful place to go. It's—Bhamane itself has 30 households. It's mainly farming activities. It is really rice farming; there's very little else in that area and they completely depend on the rice farming. Up to the point where we installed that rice mill there was no local food processing and there was no electricity in the village. There were kerosene lamps and there was one—actually, there was one diesel gen set for one family.

We had from the very beginning a very strong community support. And again, I believe that one of the main reasons why this project has been so extremely successful: the cooperation with Gram Oorja was fantastic. It's one—India is one of the countries where you really have the entire value chain of project developers and project operators and you can trust and build projects upon it. And the village, or the community itself, decided on what's a rice mill, how as the local entrepreneur selected, who was selected by the

community. They embedded this local entrepreneur in an energy committee, which looked after the infrastructure itself. So, before starting any installation, we built up—we empowered the community together with local organizations which afterwards as well took over the operation—or are taking over at this moment the local operations of the grid infrastructure and the mill.

From our perspective, whatever project of productive use, as well as rural electrification in more general terms, should start with demand-side management. So, having a limited budget we prioritized between the productive use and the residential. So, it's really—the project itself is centered around the rice mill, and excess energy goes to the residential and to the community services, which mainly is lighting—street lighting.

The tariff system is based on kilowatt hours, residential service, and the mill itself pays it back. So, those meters are installed [audio cuts out]. In this case it's serving a three kilowatt capacity and three kilowatt peak PV capacity installed. So, there is a possibility, as everything is very modulary, there is a possibility if demand would increase above those six kilowatt installed capacity, it's possible to install a second inverter set, including some more generation capacity. The important thing with the installation, technical-wise—again, as I said, more important than anything else is embedding the system productive use in the social community. But technical-wise, all of that is prewired. All of that is completely standardized. And it's—what you can't see on the photo—it's a distribution system which is 220 volt but three-phase. So, this means it enabled a standard mill or a standard pump, and the people can buy whatever electrical devices they wish to integrate them in the standard 220 volt single-phase grid which runs from the mill to each of the households. The local servicing of the grid is done by the social trust, which has been trained by us together with Gram Oorja.

Lessons learned from that project, which is one out of many but very similar projects that Smart Power is running all over the world in Latin America, Africa, and India. You need a clear business case. In this case, it's a very strong business case: 20 kilometers to walk and having very little chance to really process your rice or building up a rice mill in your own town, which does not only serve your own community but as well six smaller communities that are around Bhamane. So, there is a business case that is paying back at least the operational expenses and over the time as well kind of the reinvestment needed.

A strong community interest, including the willingness and ability to pay. So, there is definitely the villagers saying, "We want to pay for it and we'll do that." There's the local value chain in place, the community electricity committee, by Gram Oorja and the social trust. So, this is people where we can trust upon who built the project and who takes the project further on. We are a technology supplier, we are second tier service suppliers, but we are not the ones speaking in the—and working in town.

And finally, the lesson learned—the final lesson learned, proven after the last monsoon, a hybrid, standardized, modular technical approach is needed for productive use because it's the only possibility to really run a system independent of the season and allowing productive use with standard devices to be integrated.

Thank you.

Eric Great. Thank you very much. Okay. We see your slide, Jean.

Jean Hello, everybody. Can you hear me now? Yeah?

Eric Yep. Thank you.

Jean So, hello, everybody. I'm Jean Billant from Geres and I'm working as a private sector engagement. Today I am going to tell you about the best practices of one of our projects: the Green Business Area in Mali.

So, Geres is a French NGO created 40 years ago employing 150 people in more than 15 countries. Our main aim is to provide clean energy solutions a for dual purpose: improving the livelihood of the most vulnerable population and protect the environment. In West Africa we focus more on the productive uses of energy in rural areas, and notably with solar and biofuels energy. And I will tell you a bit about Konseguela, where the Green Business Area is located. So, Konseguela is an insulated community in the south of Mali without access to the grid and where MSME—micro, small, and medium enterprises—in the region rely mostly on oil for their energetic needs and are just really vulnerable to oil price volatility.

So, from our understanding and as I was saying, Karl, we think that the first steps for rural education project for productive uses is to conduct a thorough diagnostic of the area—so, looking into the socioeconomic contexts, identifying the stakeholders, and have a greater understanding of the energy needs and the energy demands. So, we deeply studied business activities, analyzing the specific electricity and electric equipment needs of MSMEs, as well as with mainstream to—the potential. And this phase permitted us to identify the entrepreneurs that later joined the project inside the electricity infrastructure _____ to the _____.

So, on the strength of this information we came up with the solution of the Green Business Area, as you can see in the picture on the right. So, the Green Business Area provided 100 percent renewable energy—solar PV and Jatropha—to MSMEs in Konseguela. And the structure of the Green Business Area itself, gathering the micro enterprises in the same bio-kinetic building, acts as an incubator and provides a vibrant center and attractive ecosystems for entrepreneurship development.

Some key features about the Green Business Area: The electricity infrastructure is comprised of solar panels with a power capacity of 12.5 kilowatts and a 16 kVA Jatropha oil generator. For the structure, the Green Business Area is built with bio-kinetic construction techniques, providing

enhanced working conditions for MSMEs and—while decreasing the negative impact on the environment.

So, after one year of operation we could—so, several results. Sixty percent of the working spaces were pulled, with eight small local business installed. So, there is one biofuel local unit, one bakery, one cold unit run by a woman selling juice and ice, a computer room, a tailor, restaurant, rural radio. And 65 jobs were created or secured over the year of operation of the project. On the investment side, we can situate two sides to—of investment, meaning the electricity and infrastructure—the building—and the soft side, which is more about the capacity building and the assessments of the area and all the training and these things. And the total investment is totaling €450,000.00. And after one year of operation, the turnover of all MSMEs was totaling €65,000.00. And on average, one megawatt hour of electricity produced generates a turnover of €10,000.00.

So now, we're getting to—going to the best practices and the lessons learned from our project. The first thing, and really important, is you need to develop a project that is adapted to the local businesses' needs in rural areas, and for this an assessment of the local contacts is very important, as well as engaging the local stakeholders. The governance is also a key aspect, to ensure the sustainability of the project and also produce beneficial impacts on local economy developments in the long run. In our case, the Green Business Area is owned by the commune—the social commune of Konseguela. And the _____ is given to an association gathering civil society actors, local authorities, and businesses in order to secure and to have a broader control on the operation. And the operational management is delegated to private operator with—dealing with the maintenance and also selling the energy.

Another key point is the quality of electricity, and this is the feedback that we had from entrepreneurs, the rural entrepreneurs in all of the development projects, that the quality of electricity matches more than the price, as most of the time they are able to recoup their investments with the development of activity. And also, there's a great deal of the infrastructure, which allowed us to incorporate a great diversity of enterprises with varied _____. So, the diversity is important, but as well it's important to target some few strategic enterprises with stable energy consumption in order to ensure the economic sustainability of the model.

On the business development support side—oops, sorry—we have been getting in collaboration with all the actual technical and managerial capacity building—so, for the MSMEs present in the area but also for the delegated operators to enforce its—reinforce its capacity. And what's pretty unique in the Green Business Area is the permanent presence of a business development advisor that is providing ongoing and onsite advice to the MSMEs at every step of their business development.

We also developed—built a partnership with the local microfinance institution in order to provide loans with interest rates to the MSMEs in order for them to buy energy-efficient electric equipment and for their—all their investment needs. We are also collaborating with the rural MSMEs to help

them in saving some energy and using better equipment. And as well, Green Business Area capitalizes on the energy mix—Jatropha oil and PV—and capitalizes on the complementarities of both energy sources.

And so, this is a pilot that we developed in one commune, but we are really going to replicate this pilot in different contexts, different countries, and with different actors, to prove the viability of the concept and foster its large scale applications. So, for example, we are now working on another project in Mali in collaboration with _____ and _____. So, we are working on existing mini-grids currently providing electricity for domestic households, and we are adapting it to provide electricity for productive uses. We have another product in Mali and also leads in other countries, but as I was saying, we are really going to collaborate with private sector enterprises, with investors, with donors, with other NGOs. So, if you are interested as well, please get in touch with it.

Thank you very much for your attention. And yeah, this is my e-mail address if you need it.

Eric Good. Thank you very much, Jean. So, we'll go over to Yasemin to moderate a little bit of debate and discussion between the panelists.

Yasemin Thank you, Eric. So, it looks like we have at least 10 to 15 minutes for—to delve into these case studies a bit more. Thank you to all of our Practitioner Network members for presenting such diverse case studies, both in terms of geographic context as well as the types of productive uses that were showcased. In putting together this best practices series our goal is not only to showcase the great work that our members and others in this space are doing, but also to reach broader learnings to facilitate skill in the sector. So, I'll just ask some questions that should be relevant to all of our panelists, and I'll leave it to our attendees to also get a bit more into detail, perhaps, about specific case studies if you're interested, or questions for all of our panelists. Feel free to type those in the chat box that you'll see on the webinar platform while we're doing the moderated Q&A.

But I want to start with a question around an issue that has come up from some of our members already prior to the webinar, and that's a question around to what extent enterprise development training was part of your respective project design—and not just looking at installation but also capacity building, specifically around bringing in female entrepreneurs to use power more effectively. And along that vein, if you could take the time to explain a bit more about the differentiated energy needs that you've seen by gender in your case studies—or David, if you want to pitch in about the reports of other case studies as well and what implications these might have for energy access practitioners as well as the system makers trying to improve the framework conditions for renewable energy solutions in different countries.

So, feel free to pitch in at any point.

Karl I would like to answer that question, at least partly. It's Karl Kolmsee. It's a very interesting question because whenever we talk about electricity and employing electricity in rural areas, men feel attracted. I mean, it's—in general and as a global phenomenon, technic—new technology is always linked somehow to men. We noted that in our project as a case of experience, projects are more sustainable if we achieved—integrated the women of the communities. So, for us, enlarging the value chain towards a business model has been a question of making the projects more sustainable, because men love technology, but after the party they forget cleaning the panels or the hydropower plant. So, for us, it is—or, it has been a question how to integrate business models where women feel more attracted or by tradition are more attracted or are more integrated into this kind of a business model.

Food processing in many cultures is such a business model. So, we have defined as a technology supplier, we have defined a standard interface which works with different devices for food processing, whether it's the mixer, a pump, a fridge, or—as in our example—a mill. This allows us to integrate men mostly on the technical side—this is an electricity system—and women on the usage of the electricity. Both are trained in the same training program using the technology behind, and the women receive a specific entrepreneurial training on using the mill and commercializing the products of that food processing.

So, we strongly believe that you have to integrate men and women into these types of programs to make it more sustainable. It will not be sustainable if you just forget half of the villagers. And to do so you need to go beyond the connection which makes productive use so extremely interesting, because specifically food processing is an area that attracts many women and where they already have a lot of knowledge and experience which just has to be scaled to make it market-relevant and allows the community to increase income.

Jean Maybe I will take it from here, but I think, yeah, you said most of the thing. And I think we completely agree with the fact that in order to bring long-term economic development to an area it needs to be inclusive, and "inclusive" meaning integrating the women, but also the youth, the elder, and bringing everyone together to work on the same activities. And just about our case study—so, as I was saying, I believe we see during the implementation, we worked with interesting women _____ working in the agro-processing industry, and they identified the opportunity to do some other activities thanks to the Green Business Area. So, we built the capacity and supported them to develop a cold unit activity in order to sell the juices and sell ice, a service that was not available in their community.

[Audio buzz obscuring conversation from 0:44:23 to 0:44:37]

Yasemin – I think one of your—okay, great. I was going to say there was a—Tobias, did you want to come in?

Tobias I just can confirm what was said. What we have to consider always that's just a small side announcement is that the equipment for the entrepreneurs must

be of high quality—so, low quality products are too risky—in order to safeguard that the entrepreneur is able to repay the installments to the institute which gives him the finance, or at least the sponsor. And if the equipment is of poor quality or even cannot be repaired, then he has a double problem: on one hand, no income, and cannot any longer produce or offer his service, and on the other hand the problem is that he cannot pay back the installments and he gets big problems on that side. So, I want to announce that it should be always considered that the higher quality is more important than the price, since the price, if it's only—if it's a bit more than cheap products, it's just a question of the time of the payback and it just ends up in—at the end in more installments or in a bit higher installments, depending on the business model. Thanks.

Yasemin Thank you. And I think we were getting some feedback from somebody's microphone. So, if you're not speaking, if you could just mute yourself that would be great just so we have equal quality for the recording afterwards.

David Yasemin, if—

Yasemin So, moving on to the—oh, go ahead, David. Sorry.

David Yes. So, if I can just pitch in quickly here because I think—yes, and thank you for raising that topic of, indeed, the consideration of gender in what is a traditional infrastructure sector, let's say. I think it's been increasingly recognized as also being, well, absolutely important—not just for the sake of it but also in terms of—well, if you ever want to achieve a sustainable market and deliver on clean energy access, you cannot just ignore the needs that can be specific to basically half the population. And in this regard I would like to flag that ARE has very recently developed a position paper specifically on the topic of woman and sustainable energy in which we make a number of recommendations, both to policymakers and to businesses, let's say, on how to, well, let's say, well consider this—the gender aspect in both—well, on the one hand the policies and on the other hand the business model. So, that's, well, shortly available on our website.

And while speaking, I would like to make also use of the opportunity to thank especially Charlie Taylor and Lucy Stevens over at Practical Action for helping us make this webinar a reality in collaboration with—well, with the UN Foundation and Clean Energy Solutions Center, for which I will thank you very much. And another small point is that you can of course download this best practices report with all the case studies that includes some of them gender aspects, such as the one from _____ in Mozambique, from both the AEEP website and our own website. I'm happy to—please drop me an e-mail, of course, if you cannot directly identify it.

Thank you very much, Yasemin.

Yasemin Thank you, David. And I think a hyperlink was provided in the webinar description page as well via the Clean Energy Solutions Center, so everybody who has registered should be able to reach that page and get the case studies that way as well.

So, a number of you have already touched on the question of replicability, but I wanted to delve a bit deeper into what elements from your respective case studies—or, again, David, from other case studies in the report—that you would say are replicable to other countries and contexts and have the potential for scale, especially, of course, looking at productive uses. And to delve into that a bit more, I guess, what do you wish you knew before you were starting your projects? What were your top barriers as off-grid product developers when developing the productive use projects, and how did you overcome them? What would be your advice to others who might be interested in working in the countries that you are familiar with?

Any takers?

David

Well, I'm happy to step in. So, well, of course, Yasemin, as you rightly point out, the question of replicability—and I would add to that the question of scalability—obviously is very crucial when you want to basically achieve the clean energy access targets. And I think these are topics that we—both on the energy access work stream side and also as an organization for ARE are very much pushing for. Let's say that when—especially on the policymaker side, that when they go and design, laws and regulations and incentive schemes and so on that they—that it's not just one-off subsidies for a project left and right but that there is really a systematic approach into building a market so that at the end of the day the organizations, the companies that are building these products can, let's say, step into a real economic web in which it will be possible for them to do more projects, to make more projects depending on the local needs and so on. You cannot do that just with only a one-off subsidy, that type of approach. And so, through our advocacy and our policy recommendations in a way, this is of course a topic that we very well want to capture.

I would add to that that from the business side—and please, Jean, Tobias, and Karl, please feel free to comment—but the question of replicability and scalability is evident for any business, let's say, to be considered. Every business wants to do more projects, wants to do more things, and hence replicate its project insofar as they work well and scale them up. This essentially entails that you need to have a proper business model from the start, which when done, of course, entails that a company is doing good business while having a good social and environment impact. I don't know if the other panelists would like to complement with an element from their own case study on the replicability, perhaps?

Tobias

Yes, I would like to put some additional comments on it. So, we are always looking on natural markets because we believe that only a natural market is sustainable at the end. So, subsidies always lead to difficulties in the local markets, and in most of the cases they destroyed already existing structures, so that's why it's also a sensitive case. And at the end, sustainability in developing countries will only come based on entrepreneurs, and these entrepreneurs we try to support with solutions. On the other hand, we are much more interested in solutions which are developed, let's say—business cases which are developed by the local entrepreneurs by themselves, because

we are a system integrator, and for us it's more interesting to see what kind of solutions will be developed by the entrepreneurs themselves. That's the very exciting part of it. And this is difficult since we see that the basic—the education makes it difficult to find enough entrepreneurs. That's why it's a bit easier in the agricultural sector because the farmer himself is already an entrepreneur.

Yasemin Thank you, Tobias. Karl, did you want to come in?

Jean Yep.

Yasemin Go ahead.

Jean You know, I completely agree with Tobias. And just about the case of _____ and a bit of our strategy in terms of replicability and scalability, obviously this example is a pilot on which we have done extensive monitoring and technical and economic sides. And we got out a lot of data that we are now using to build the case for private sectors—so, entrepreneurs to step in and now replicate the business that we have. And although there is a great effort to do on the—to replicate with each context, it also—the solution is easily replicable.

Yasemin Thank you, Jean. Karl, did you want to add anything?

Karl Yes, very briefly. I think Tobias made a very important point; I just want to stress that. It's natural—it's local markets, it's natural markets, and whatever we implement to make it scalable, it has to be part of that market. We cannot completely build a new value chain without being integrated into that market. So, a cassava market in Africa is completely different from the yucca market in some parts of Central America, and we have to see how each of these specifically agricultural markets works, and then we can implement a certain solution, and it will be replicable once it responds to a market need that is already there. Maybe there is something missing—like financing, in many cases. But in—even if some parts of the value chain are missing, the most important part is responding to the demand already existing in the local market, and we have to understand the local market to really be scalable. So, just stressing the point that Tobias made very clearly.

Tobias Yeah, thanks, Karl. What I think in addition is what we want to achieve or what we want to find are entrepreneurs which have a long-term commitment and have an interest, yes, in—to follow their own ideas and their business model. And that's—which is carefully to handle because if we just bring a business model based on subsidies from the European Union or from the World Bank, it's very dangerous that it's at the end and sustainable, because at the end the core is the commitment of each single entrepreneur. That's what I wanted to add on.

Yasemin Thank you. I'm going to follow up on a word that Karl mentioned, which I'm sure is on everybody's mind, which is *finance*. That is the biggest challenge that we hear from our Practitioner Network members, as well as partners and obviously beyond in the energy access sector. But I just wanted to ask, to the

extent that you feel comfortable sharing, if you wouldn't mind telling our audience: What kind of risk mitigation measures did you take on the project level? How did you attract financing for your project? Maybe what form of finance that it was—a loan, a grant, equity investment. And approximately, what the time frame was between the project idea and implementation idea, just so people have some sense of what the expectations should be in the different countries that have been mentioned.

Tobias Shall I start? So, we started in 2012 and we are still fully at the beginning, and we're learning and adapt every day. The finance, I think, the—let's say in donations is—the donations is [inaudible due to poor audio quality] and gifts are working as drugs: They are making the people depending, and they [inaudible due to poor audio quality]—which is _____. So, that's a very dangerous tool. From our perspective, it should be starting capital and has to be paid back with—from the entrepreneur based on his time. We tried to avoid any gifts and to be very sensitive with the [inaudible due to poor audio quality] which is the core [inaudible due to poor audio quality]. Our perspective is not as important as it looks like, because an entrepreneur which has an enthusiasm himself and he is convinced of his [inaudible due to poor audio quality] back in two to three years. So, that's the advantage of solar technology and of [inaudible due to poor audio quality].

Karl I admit I am not fully agreed, because, I mean, in many of the markets we are active in financing is completely missing. And even if it's €2,000.00 or €5,000.00, it's too much for many entrepreneurs to be taking out of their own pockets. So, the lack of financing markets is a challenge for employing productive use systems. I fully agree with Tobias that the financing should not go as donation or not-repayable grant, if not for security reasons—I mean, the soft loan is different from a complete grant.

I do see in some areas financing and cross-subsidies which we do believe have a strong impact, which work a little bit like the cross-subsidies at the beginning of electrification in whatever industrialized country. I mean, there are certain areas in whatever country that are more difficult and more expensive to electrify, and as a tradition in these countries—take Austria or Germany or whatsoever, they are islands and mountainous villages—the governments try to keep tariffs at the same level. And I strongly believe that this kind of subsidizing concessions in remote areas is a way to bring electricity to all the people and allow entrepreneurs within microgrids to more easily develop their activities given a level of tariffing which allows to be comparative to products bought from the centers of those countries. Because whatever entrepreneur in remote areas, be it India, be it Africa, if he or she cannot compete against products coming from the center of the country due to the high electricity prices, he or she will collapse.

So, this is where we do see a need for subsidies. We do not see—and this has—and this is where we are completely in accordance with Tobias—we do not see the need for donations. Donations are the wrong way to go. It should be a regulation, a regulatory system which gives the same possibilities and opportunities to all entrepreneurs of an area.

David That's right. Nevertheless, the institutes, they are not yet prepared to get money back, so they have difficulties. If you go to a charity company and tell them, "Look, give your money as an initial investment and be prepared that the entrepreneur pays you back," then they say, "Oh, how should that work?" and "It's very difficult. We cannot take money back from the entrepreneur." And so, that makes it also a bit difficult.

Jean Um—

David If I may add—sorry, please. Please go ahead.

Jean Yes, this was the point—and I think I really agree with Karl on this, is minigrid or electricity provision can be seen as a public infrastructure as well which is providing great employment opportunities and local economic developments and having great impact on the economic growth. So, it can be used by governments and local authorities to develop their territories. We are not saying that is should be the only thing, and the private sector is completely essential, and the entrepreneurs and the wills of the entrepreneurs to develop such systems is great. But well, it can help the local [inaudible due to poor audio quality]. And just—yeah, so we can—we could also think about mixes of grants and equity and debts to finance such projects.

David And this is David. Well, to add, I think, to the discussion, I think there is also a need perhaps to differentiate between what we would say are standalone systems and more minigrid type of systems, because a lot of ones tend to have of course considerably higher capital costs, which obviously makes it significantly harder to finance. So, is certainly the most important, I think, that we try to stress as ARE is for sure the operational expenditure at the very least should be covered by the entrepreneur's business model. Of course, this would require then proper “tariffication” schemes in place in the country to—as Karl has mentioned. This does not preclude any—some sort of assistance for helping to cover the capital costs of, for example, this kind of minigrid.

So, it depends a little bit what is the most sustainable. But yes, as the three gentlemen have pointed out, it is—the goal is, again, to build the market, to help where it is needed because it's still in—I mean, it's growing very fast but comparatively it's still in an early stage, let's say, and the work is tremendously high to actually achieve our targets. So, the question is not so much "Is there money available?" There is money available, but it should be more, and especially what is there should be used in a clever way so as to attract additional finance—this famous leveraging that everybody is not walking about, or blending finance of—as one of the presenters mentioned—of grants and equity. I mean, that's—the whole trick is there. Why does—I mean, for example, eight years ago it worked well—it's, I mean, in my personal view, a form of clever consumer finance, end of story. But it has enabled this whole type of market. So, it's about availability of finance, but especially about how this finance is then put to work, let's say.

Yasemin Great. Thank you all. I have a couple more questions but I'm also aware of the time, so Eric, maybe we can give our audience a chance to ask some questions? And then, if there's any time at the end, I can come back in.

Eric Okay, that sounds good. Great. Yeah, we've got a lot of great questions coming in, I think some inspired by the discussions that you all have been having. I have a few that are directed specifically to a couple of the programs, so I'll ask those together—a few, several questions together for a couple of the panelists to start out. For the Business Opportunity with Solar Systems, for Tobias, one of the questions is about the timing of solar panel replacement and sort of business sustainability over time with the need for capital to replace systems on an ongoing basis or some period. And others, feel free to jump in on that.

Tobias Okay, then I'll answer directly. First, it's depending on the BOSS solution we offer, what is—in which way it is used because there are some mobile systems where you have to take the—build the solar system almost day by day—for a mobile phone charging station, for example. And there are situations like a grain mill or an oil press where the solar system is fixed installed. We always work with local partners together and they sell the system, they train the entrepreneurs how to use the system, and they also offer the maintenance. And the good thing is that we develop our systems always in the way that the systems can be repaired, and spare parts are always available from the partners in the different countries.

But the solar modules themselves, they have—even if they are mobile used, they have a long usage time. So, I would say if you care then easily 20 years can be reached. And the ones who are fixed installed, they might have even a longer lifetime.

Eric Great. Thank you. Would any others like to speak to system longevity or capital turnover?

Karl Yeah, maybe on lifetime cycle. I know there's—and we do it ourselves, kind of stating that the system is for 20 years. I strongly believe one has to expect that there are certain replacements. I personally don't know any inverter that really works for 20 years, so there is the need for replacement, which means as well that you have—as a technology supplier you have to build up some kind of logistics towards a project you're building up, which brings us back to the question that we already discussed: the need of clusters or scaling up projects. If there's only one project in the middle of nowhere, you will not be able to build up any system and it drives the cost of the project; it drives everything. So, the ROI will be tremendously bad. But once you are really able to achieve, let's say, a 20 years life cycle with some replacement in return, it should be a two-digit ROI.

Eric Great. Thank you.

Jean Yeah, I will step in.

Eric Yeah, absolutely.

Jean I will step in just quickly. And it's linked nicely also to the question of grants and debts. As per the investment in the Green Business Area that we—that was our case study, the first investment was a grant. And after—so, a one

year for the duration, there was a delegated authority that was selling the energy and is paying for the operation and the maintenance with the sales of energy. And he was also able to save money for the reinvestment at the end of the lifetime of the electricity infrastructure in 10 to 15 years. So, we are trying to build a model where it's self-sustaining, and not just in the time but in the long—middle to long time periods, and to be able to continue in 15 years after the end of life of the solar panels, for example.

Eric Great. Thank you very much. The next question was posed directly for the BOSS solution, but I imagine that they'd like to hear for others as well. The question is about the scale of operations right now, both for your individual projects and, I guess, for the market in large in terms of how many products or solutions you've been able to get out to the market now and where you anticipate that going. Again, it's directed to BOSS, so maybe we can start with Tobias and then others can chime in?

Tobias Thank you for this question. Yes, we are still at the beginning, so we sold not that many. So, let's say for the BOSS projector kit, the cinema solution, it's maybe around ten. We started that last year to develop it, and the first inquiry was from a charity that was Ahmed. They needed it for some introduction of a film in Eritrea, and from there we started. We have, for example, a milk cooling system, which is the newest, which we developed together with the University in Hohenheim, and there we sold already up to 25 systems now, and this we started two years ago. So, it always needs some time until you find or found the right supplier. Because our systems we tried to base on DC in order to avoid any inverter and guarantee sustainability of the run time of the system, which cannot be corrupted by applying an AC load, which is not part of the BOSS solution.

So, yeah, it's not a huge quantity and we don't expect that this will be a mass market. But for us as a system integrator it's a very exciting market because we learn a lot, and step by step the volume is coming. So, we are quite confident.

Karl Well, we—Smart Hydro Power has established now three times a completely standardized micro grid: one in Peru, one in Colombia, and now one in India. *Completely standardized* means for us that we use the same distribution system, that we have standardized interfaces towards the generation side and towards the demand side. So, it's a 220 volt three-phase system towards the demand side and the—it's a hybrid system working with small PV panels and small wind—or hydrokinetic on the generation side.

Up to now, as I said, it's three times. We are pushing that into the market because we strongly believe that this is the way to make microgrids as such sustainable. But as Tobias said, it's a starting point and it's not hundreds of them out there at the moment. So, we think that one reason of not having scaled up yet—so, we started with that kind of solution two years ago, not hundreds of solutions out there—is at this stage kind of regulation and a standard financing mechanism missing in most of the countries we are in. So, we are quite confident that this will come, but up to that point it's step by step.

David It's always like this: The first million is always the most difficult one, isn't it?

Eric Great. Thank you very much.

Jean So, on our site now we have one running wind in this area—or minigrid, as such—that was built in 2014; it was the first phase of the construction of the building, and then it existed a bit later on. I gave some few numbers already, so—but I can give you some of the answers—for example, at the _____ where I worked, we plan to sell—so, the delegated operator will be able to sell 18 megawatt hours in years four and five—so, in three years' time. And in terms of replication, as I was also mentioning, there is one ongoing project in another area in Mali with an existing minigrid. Another project also in Mali with a private entrepreneur that is interested by the model and wants to replicate it. And our idea is not to develop the project ourselves. The pilot was done and it's more to now give the tools to all those stakeholders to develop it and then help for the replication.

Eric Great. Thank you very much. A question for you, Jean, that's—this is specifically directed to you but others can of course jump in on. One participant said that you mentioned you were working with a utility—or a national grid to increase productive uses. If you could talk a little bit more about that process and how it's structured?

Jean So, no, we are not working with a national grid. So, I don't know, maybe I mentioned that we are working with an existing minigrid, so—but that's not this particular—it's another one. So, it's a minigrid that has been developed and that is providing energy to households and that is working—yeah, like this, and cannot at the moment provide energy for MSMEs because the operator doesn't have the skills and knowhow to deal with rural entrepreneurs as the existing infrastructure is not sized accordingly to provide electricity for users that are from different households than MSMEs. So, we are not dealing directly with the national grid.

Eric Great. Thank you for that clarification. So, we have time for one more question. For the questions that we didn't get to, we'll connect with those participants offline. So, this question, I think, applies across panelists. And we've spoken about it a bit already, but the question is about kind of due diligence for entrepreneurs that you work with and how you identify the right fits for the solutions that you all work on.

Karl Honestly—this is again Karl—we don't do it at all. It's either some cases where a strong community is the cornerstone of the rural development—it's the community itself who are identifying the business case and the most appropriate person to run it. In other cases it has to be, as I was explaining earlier, it's the entrepreneur himself. I mean, he puts—or, he or she puts the money where his or her mouth is, and then she or he should run the business. And we as a technology supplier do develop on our own risk technologies that we believe are fit to certain markets, but we are not the ones choosing the entrepreneurs. We believe and we are very prudent on that that local people are better in doing that. Wherever we have local partners we leave it to them dealing with the communities or the entrepreneurs themselves.

Tobias Yep. And as I mentioned in my presentation, just that the entrepreneurs, they're coming to the local partner. In that case it is our partner from Djibouti or Somaliland, and in other cases it's that diverse as the solutions are diverse. For the milk cooling system it was the dairy who asked because they lost 30 percent of the milk, daily milk, because of bacteria, and the milk heated up too quickly, and that milk cooling system offers them milk cans which are cooled. And in that way, they safeguard 100 percent of the milk, and even the quality is better. So, in that project it came from the dairy side, but that can be totally different. But what Karl said is exactly—mainly it's not our role to find the entrepreneur. It is the entrepreneur itself or they identify the local partner of ours and then we supply the inquired system or even start development of the inquired system.

Jean And then, on our side, yeah, I would agree as well on the importance of working hand in hand with the local partners to—with our site because they are better able to know what are the needs. But also, to—when we've done some deep analysis, as I was saying, so trying to understand what are the value chains—so, different value chains we should look into. A bakery, for example, you need to understand what is electric needs, what—where is the profits done, who are the main clients or providers, where are the profits, in order to see if it can fit—if the _____ can fit with the Green Business Area, because it's something that we saw and we had feedback on as well, and on the research literature it is easy to see: Access to electricity without business development activities such as capacity building or access to finance is—can be either neutral or either have a negative impact on the businesses if they don't know what material to buy or how to invest into equipment. So, it's wise—like, the analysis and the identification upstream of entrepreneurs helps them to help us build the capacity of the entrepreneurs.

Eric Fantastic. Thank you very much. I'd like to thank all of the panelists for great presentations and then a great Q&A session and discussion there. Before we close, I'm just going to do a brief rundown on the Clean Energy Solutions Center for background. The Solutions Center was launched in 2011 under the Clean Energy Ministerial. The Clean Energy Ministerial is a high-level global forum to promote policies and programs that advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy. Twenty-four countries in the European Commission are members, covering 90 percent of clean energy investment and 75 percent of global greenhouse gas emissions.

The Solutions Center is one of nine initiatives of the Clean Energy Ministerial. Other CEM initiatives include 21 CCP and Global LEAP. All of the initiatives work towards three overarching goals: to improve energy efficiency worldwide, enhance clean energy supply, and expand clean energy access.

So, this webinar is provided by the Clean Energy Solutions Center, which focuses on helping government policymakers design and adopt policies and programs that support the deployment of clean energy technologies, and this is accomplished through support in crafting and implementing policies

relating to energy access, no-cost expert policy assistance, and peer-to-peer learning and training tools such as this webinar. The Clean Energy Solutions Center is cosponsored by the governments of Australia, Sweden, and the United States, with in-kind support from the government of Mexico.

The Solutions Center has five primary goals. It serves as a clearinghouse of clean energy policy resources. It also serves to share policy best practices, data and analysis tools specific to clean energy policy and programs. The Solutions Center delivers dynamic services that enable expert assistance, learning, and peer-to-peer sharing of experiences. The Solutions Center also fosters dialogue on emerging policy issues and innovation around the globe. And lastly, the Solutions Center serves as a primary resource for project financing options and information to expand markets for clean energy. This finance technical assistance service of the Solutions Center was announced last year at COP 21.

Our primary audience is made up of energy policymakers and analysts from government and technical organizations in all countries, but we also strive to engage the private sector, NGOs, and civil society.

The Solutions Center is an international initiative that works with more than 35 international partners across its suite of different programs. Several of the partners are listed above and include research organizations like IRENA and the IEA, programs like SE4ALL, of course, and regionally focused entities such as the ECOWAS Center for Renewable Energy and Energy Efficiency.

A marquee feature that the Solutions Center provides is the no-cost expert policy assistance known as "Ask an Expert." The "Ask an Expert" service matches policy makers with one of more than 50 global experts selected as authoritative leaders on specific clean energy, finance, and policy topics. The assistance is provided free of charge, and if you have any questions for our experts, please submit them through our simple online form at cleanenergysolutions.org/expert. We also invite you to spread the word about the service to those in your networks and organizations.

So, on behalf of the Clean Energy Solutions Center I'd like to extend a thank you to all of our expert panelists and to our attendees for participating in today's webinar. We very much appreciate your time and hope in return that there were some valuable insights that you can take back to your ministries, departments, and organizations. We also invite you to inform your colleagues and those in your networks about Solutions Center's resources and services, including no-cost policy support through our "Ask an Expert" service that I just mentioned. And I invite you to check the Solutions Center website if you'd like to view the slides and listen to a recording of today's presentation as well as previously held webinars. Additionally, you will find information on upcoming webinars and other training events, and we're also now posting the webinar recordings to the Clean Energy Solutions Center YouTube channel. Please allow about one week for the audio recording to be posted.

Finally, I'd like to ask you to please take a moment to complete a short survey that will appear when we conclude the webinar. Please enjoy the rest of your day, and we hope to see you again at future Clean Energy Solutions Center events. This concludes our webinar.