

Role of Micro-Grids in Promoting Access to Energy

—Transcript of a webinar offered by the Clean Energy Solutions Center on 24 April 2014—
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Webinar Panelists

Richenda Van Leeuwen	Executive Director, Energy Access Initiative, U.N. Foundation
Dean Cooper	Energy Finance Program Manager, UN Environment Program
Dan Shnitzer	Founder and Executive Director, Earth's Arc International
Fabio De Pascale	Co-founder, Dev Energy

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Sean Hello and welcome to today's webinar which is hosted by the Clean and Energy Solutions Center and the U.N. Energy Foundation and today's webinar is focused on the well of micro-grids and promoting access to energy and one important not of mention before we begin our presentation is that the Clean Energy Solutions Center does not endorse recommends 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 and I just want to go over some of the webinar features for audio you have two options. You may either listen to your computer or over your telephone, so if you choose to listen to your computer please select the mic and speaker options in the audio pane that will just eliminate any feedback and if you choose to dial in over the phone please select the telephone option and a box on the right side will display the telephone number and audio pane that you should use to dial in and panelist we just ask that you mute your audio device while you are not presenting and if anyone has technical difficulties with today's webinar you can contact the Go To Webinar's Help Desk and that number is at the bottom of the slide it is 888-259-3826 and we encourage members of the audience to submit questions. At any point throughout the webinar if you have a question to do so just type in your question in the questions pane and submit it through there and I'll

present those questions to the panelist during the question answer session at the end. If anyone's having difficulty viewing the materials through the webinar portal we will be posting PDF copies of the presentations at cleanenergysolutions.org/training and you can follow along and also audio recording and video of the presentation will be posted to the Solutions Center training page within about a week of today's presentation.

Now today's webinar agendas and around the presentations from our expert guest panelist Richenda Van Leeuwen, Dean Cooper, Dan Schnitzer and Fabio De Pascale, these great panelist have been kind enough to join us today to examine best practices and the potential for long term sustainability of micro-grids in a number of geographic context as well as barriers to projects, sustainability, scalability. Now before our speakers begin their presentations I just want to provide a short informative overview of the Clean Energy Solutions Center initiative and then following the presentations will have a question and answer session where the panelist will address questions submitted by the audience and that's the quick closing remarks and brief survey.

Now the slide provides a bit of background in terms of how this Solutions Center came to be. The Solutions Center is an initiative of the Clean Energy Ministerial and it's supportive with the partnership of U.N. Energy it was launched of April 20, 11 primarily led by Australia the US and other CEM partners so out comes this unique partnership and includes supportive of developing countries to enhancement of resources on policies relating to energy access no cost expert policies assistance in pure to pure learning and training tools such as the webinar you're attending today and there's four primary goals for this Solutions Center. It serves as a clearinghouse for clean energy power and resources. It serves to share polices best practices data and analysis tools the specific to clean energy policies and programs and the Solutions Center dynamics services that enable expert assistance learning and pure to pure sharing of experiences and then lastly the center dialog on emergency policy issues and innovation around the globe and our primary audience is energy policy maker and analysis from governments and technical organizations in all countries, but we also strive to engage privacy sector NGOs and civil society.

This slide shows features at the Solutions Center provides which is an ask and expert service and ask and expert is a valuable service offered at no cost to those requesting it, so we've established a broad team over 30 experts from around the globe who are available to provide remote policy advise and analysis to all countries, so for example in the area of rural electrification we are very pleased to have Ebrahim Redmond director of the social transformation division at the Energy Resources Institute serving as your expert, so if you have a need for policy assistance in rural electrification or any other clean energy sector we encourage you to use this service again it's provided free of charge, so to our assistance simply submit your request by registering to our ask an expert feature at

cleanenergysolutions.org/expert. We also invite you to spread the word about this service to those in your networks and organization, so in summary we have to encourage you to explore and take advantage of the Solutions Center resources, assistances, and services including the expert policy assistance the database of clean air and policy resources subscribe to our newsletter and participate in webinar's like this.

And with that, I would now like to provide some brief introductions for our panelists today. Our first speaker is Richenda Van Leeuwen the executive director of the Energy Access Initiative at the U.N. Foundation and following Richenda we will hear from Dean Cooper, energy finance program manager within the division of technology industry and economics at the United National Environment program and then our third speaker today is Dan Shnitzer who is the founder and executive director of Earth's Arc International and Dan focuses on fundraising, partnerships, and promotes the development of country wide clean energy supply chains and then our final speaker today is Fabio De Pascale, a co-founder of Dev Energy and with those introductions please join me now in welcoming Richenda to the webinar.

Richenda

Thank you very much and a good morning, good afternoon where ever you are joining throughout the world. I hope you can hear me next slide please. I just to provide a few background comments about why we are hosting this webinar and what the aim is all of our work around exploring the value and contribution of micro-grids of different types towards solving issues energy access. As many as you may know there is an initiative which is established by the United Nations secretary general and now also co-lead by the work bank president for sustainable energy by all initiative. Within that, there are three global goals or objectives that have been adopted to really focus global attention and action by 2030. The first one of which is achieving universal access to modern energy services and within that particularly looking at the contribution both of electrification for development as well as adoption of clean cooking solutions and technologist. The second two very much complimentary around doubling global rates of improvement year on year and energy efficiency and doubling the share of renewable energy in the global energy mix and again very complimentary because we are also looking at the holistic growth engaging energy efficient appliance solutions for whatever load that we're putting in as well as the maximum utilization of renewable energy solutions where we can which again is particularly can be relevant and then in case if there is micro-grid setting. U.N. general assembly has declared 2014-2024 as a decade of sustainable energy for all and I would also note today being earth day I think this webinar is very relevant to be holding today.

Next slide please, so just up I went to introduction to what we do here at U.N. Foundation we set up and round the energy access practitioner network which is a network of providing and focusing on delivering various types of energy services to those people who are living off the

grid. We have 160 members since we started that in 2011 and we have many focuses specifically on different types of micro-grid applications in different developing countries. You can know more in fact set through our website at EnergyAccess.org.

Next slide please. Just to begin to dig deeper one of the things that we are focusing on is really looking at emerging best practitioners around micro-grids whether and I'm not going to get into sort of questions around sizing and I will let our forming panelist talk a little bit more about specific case studies of either that their enduring on their own experience or as to Dan Schnitzer apposing on his experience in Haiti, but has also been doing a lot of research in countries like India and so other countries to look at what is the state of micro-grids. The international energy association had projected that micro-grid would be making up the bulk of the solution set potentially for solving energy access, so in terms of our work you're really focusing on helping to research, helping to educate, helping to advocate for the appropriate policy, financing and other supports needed to help micro-grids scale up to the extent that they can be used as a solution around energy access, so delighted to have three panelist this morning who are representing different parts of the world different aspects of a focus on micro-grids and to say that specifically within sustainable energy for all we have what is called the high impact opportunity area focusing explicitly on how we can scale and calculate the use of micro-grids how we can look at the different technologies approaching policy regulations, financing to enable and to scale and calculate more quickly, so we are as the U.N. Foundation we are very much engaged with that the U.N. environment program is another founding partner for this quite impact work we welcome you to join us through the working group we have within the practitioners network that has about one-hundred and forty members focusing on delivering different energy services, so I'll stop there and just say now I would like to welcome Dean Cooper who is going to be talking about U.N. network base thank you.

Dean Hi and thanks very much. Richenda, can you hear me ok now?

Sean Yes we can Dean.

Dean Great thanks, so the title of this slide that was put together today emphasize the focus that we're looking at is that the hybrid aspect of many grids in remote areas in particularly investment opportunity, so it's looking at the prospect for private sector in investment. Now before I get into any of the details some background and I've been told by the organizers I should try to limit the presentation to fifteen minutes maximum, so I've tried to highlight some of the issues on each of these slides which I try to talk about a little bit with more detail obviously questions on any of the other points are very welcome.

So some of the backgrounds that stimulated our activity in this area is really looking at the potential market for mini grids. Slightly different I

guess but the one point three billion people that don't have access to electricity at the moment and many rural Africa many have happened to die in need of such supplies. In particularly this reference often quoted now from International Agency the world energy outlook and in 2011 which was published in 2012 over forty percent of all in stored capacity to achieve universal access to electricity by 2030 will be most economically delivered through mini grids, so that's provided quite a big push for the International community to get involved in this area and we certainly hopefully the initial move is in that. This sort of background events I mentioned and at the slide as well a number of areas increased focus on mini grids. Our first involvement was in powering Africa strategy summit back in 2011 before in fact the I.R.A report came out which is quite interesting gathering with ministers from Africa in addition to CEOs from the private sector and a lot of discussion there have been about what sort of focus could we put in place for energy sector cooperation and even in that time mini grids have come out the priority areas to try to look at.

So on that basis we've tried to explore different areas of activity that we fill that U.N. environment program here can really help to support to push this whole area to have more practical implementation. Now one of the focus areas we've decided on as a result of all that is to look at the commercial viability of such mini grid applications, so a lot of talk about sustainability and commercial viability is just one sort of definition of that on the basis that if an activity is commercially viable then by definitely is going to be continued because it is going to be supported by the private sector investors to stimulate that, so the question then is how do we attract the private investment into this area and a couple of issue which I've highlighted them and one in particular is this policy as we often divide up our attention in this area into finance policy technology, but our conclusion is that you need all of those aspects to be present so you need the right sort of policy environment if you're going to attract the finance from the private sector that we require without that it's to for finances and we're not going to get involved in this area so policy ends up being the key issue that needs to be addressed in the financial technology is also a key to the process that you have to have technology which is going to match the resorted that are available in the need to locations that you're looking at and that's going to be different technology in each case. Different areas of renewable energy can be used and certainly this hybridization, so the use of different renewable energy resources in the same location is something we try to focus on, so again we cannot look at the sustainable aspect in terms of having a commercially viable modern using the local resources on point I haven't highlighted there, but I should just mention specifically is the scale of activity certainly it's going to notice that when we talk about mini grids and micro grids different people have different interpretations of what we mean by that ranging from one kilo watt to several megawatts.

Now in our focus of attracting the private sector investment we try to look at what is going to be most appropriate as far as the problem in putting list onto the other aspect, so what we've found is that you can obviously have a very small caps we can put two and put them together so it makes it difficult to continue what we've tried to decide is that 100 kilo watts is that the limited amount you can use so 100 kilo watts is the last area that we're trying to look at in terms of experience and we basically judging between the 100 kilo watts to about 1000 kilo watts, so that's a general sort of range of activity that we're looking for also they uncertainly is a key issue as it's saying there the risk produced by practically implementation in local commodities. That's sort of issue that needs to be taken into account the uncertainty which creates the risk is there for which needs to be addressed, so we need to try to look at the whole risk area to make sure the people are comfortable with that before we can attract any sort of investment, so really there the finance policy technology nexus is the key area that we need to be looking at. We feel that sort of approach needs to be developed not just imposing and mechanism is like what is the demand and I would look at full day demand every day does it only need to be a number of 1000s each day is it going to be sufficient in terms of the avocations that we want to put in place.

What about the sufficient scale for returns ABC we talk about anchor customers, business customers community and what sort of scale do we need to be looking at in terms of making sure that we have a continuous example so we have an activity that can be duplicated, that can be maintained and then community ownership is a key issue for all of us if we want something that's to go ahead we need to have support from the people that we're addressing and ownership from the community and that's proactive activity needs to be stimulated which means that it needs to be clear customer engagement, clear information in exchange so people understand what the issues are and there only questions for putting forward in activity or a concept and then trying to sell the whole thing to customers rather than to introduce the customers in an early stage of the activity so they can understand what the intentions are and to take into account what their issues are when you're trying to develop on your approach. Again this sort of concept that we're looking at in terms of developing the project areas it's all about identifying opportunities moving through the interaction with local stake outers putting together various models and then implementing and finally obviously learning the lessons from that and seeing the approach taking as of reporting the issues, so it's been important for us to realize that there isn't a simple answer to this a lot depends up the local conditions any specific area that it's chosen, so every location will be slightly different. Therefore, if we try to recognize something if I'm a new actor that's trying to put in place a mini grid of some sort we got to recognize that it doesn't necessarily going to be accurate to have a complete replication of a demonstration project is rather going to be important to have a number of different approaches that's anybody looking for demonstration, for implementation can take out the

key points from each of the demonstration areas and put together their own systems which reflect the needs they have in their own community, so we need to have a number of approaches that demonstrate different ways different possibilities, so as far as that demonstration programs concern all we've done is select different countries that have different conditions that we can show different approaches on the basis of any new countries can then put together the relevant factors from each of these targets that seem relevant to themselves so we're looking at different financial models.

Brownfield and Greenfield, the brownfield model is based on environmental focus and replace themselves existing this old power grids by using clean energy sources. The Greenfield looking at the energy access argument that show people that don't have access to energy sources can be put in place in sort of commercially viable activity using mini grids and as far as the hole bits concern we need to be looking at obviously the access to local resources so there are different management resources that need to be considered bio energy is one of the things that we tried to look at specifically. Especially when we have dependence on solar or on wind, hydro it's often for a limited duration during the day or during the season of the year. The use of bio energy could well be a good back up factor and so combination combining that seems to be a good focus and this food energy-water nexus increasingly is accepted that needs to be considered if we're using bio energy. We've got to be aware of the food and water requirements as well so the aim that is mentioned for us to try to demonstrate in your approach and then to withdraw a neither sustainable market. Some of the business challenges that we're having to face I've highlighted one of the those that their all Greenfield public funding. As far as the Brownfield as it concerned it seems to be good case for private funding and to get returns on some reasonable space of time.

For Greenfield activity there seems to be a thin need for public private partnerships, so their needs to be something put in place support from the private I mean from the public sector to help educate the local communities you've had not access to any before to put in place the initial structure are not in place and that the private sector would be difficult justifying sums of the investment, so the public private partnership that we've trying to focus on as far as the Greenfield's concern and as I often repeated many now it's all about the walking not the talking seems to be lots of lots of talking activity and discussions about this area really we're trying to move out ahead from that and demonstrate an appropriate approach that can be taken for the practical implementation of clean energy mini grids. The target countries that we're looking at that we're focusing on the Brown field areas at the moment. The use of diesel of the replacement of current diesel grids and those countries indicated for the Greenfield sites we're focusing on Southern Africa in particular Botswana, Mozambique, Namibia and South Africa, but we have one or two considerations as well at the moment we are starting soon in Mozambique

and South Africa. The other three countries we're still developing the possibilities and considering on of two of the alternatives that approached us to be part of this Greenfield program, so that's the current targets over in the Greenfield area we still have some scope for other additions.

Then finally these have been intended out comes from out activity, so we're trying to achieve a growing customer demand by introducing this sustainable market so to demonstrate throughout projects that the risks associated with the investment is worth wild and we can demonstrate the returns are possible and in a reasonable time frame that will hopefully attract the private sector. National policy is a clear factor that needs to be in place so we need to work with the public sector and the private sector. Not just for investment, but also to get the policy frame in place that are sufficient for the private sector be attracted to this area and clearly the potential finances needs to be aware of and need to be interested in this whole activity a lot of these organizations that will consider financing of the mini grids also have a lot of rather options for their finances and their for we have to demonstrate that mini grids provide a good opportunity for private sector returns and can meet public sector and goals at the same time, so all of this is aiming in for increased clean energy access from local supplies intention is for sustainable outcome from this process so our success as mentioned in the previous slide is when we can walk away from this process and there will be successfully operating clean and mini grids in the target countries. Two other points I've mentioned obviously from environmental point of view significant benefits and then the social economic agenda upliftment provide additional reasons for getting involved in this. Finally I was also realize we should mentioning the S.E. for all H.I.O. which Richenda has already given some brief details and just to put in a final slide here just some of the points so the targets and to provide forty percent that's all in stored capacity for universal access to electricity by 2030 so it's forty percent is the key target for that.

These are the five main areas of activity which we identified for S.E. for all the intention is that we're all look at launching the first annual meeting of S.E. for all at the beginning of June and we'll launch this high in fact opportunity at that date. Hoping to provide a good foundation for sharing the different experiences and skills that have been developed in this area of the clean mini grids, so I'll leave it at that lots of other details and information I can give, but I know I want to leave lots of time for questions, so I'll won't take any further and so I'll pass it back to the moderator. Thanks very much.

Sean Thank you very much Dean and at this point we will hand it over to Dan Shnitzer for his presentation.

Dan Hi can you guys hear me alright?

Sean Yes we can Dan.

Dan Ok great it's a little bit "glitchy." I don't know if there's too much background noise I can't read my presentation up yet is it up and I just can't see it?

Sean Yeah it is up there right now we're on the first cover slide.

Dan Ok great so this is the cover page for the report that I was the coauthor on with a bunch of folks from U.C. Berkley including Dan Cannon and Richenda and the energy access practitioner or big part of I'm supporting this work and sort of justifying putting this report together, so I just wanted to share with you some of the results from the research which is really based around doing case studies on micro grid operations and India, Haiti, and Malaysia, so next slide please.

So the motivation for this research was about the very recent rapid growth and interest in micro grids even though it's a concept. Micro grids have been around for decades if not for 100 years, but more recently there's been really research deploying micro grids for left furcation. However at the same time there is worth of data on very important things on a practical level, tower structures, their capacities, the business models and the effect of government policies on operations, so we wanted to take a look at what was and what beginning, and to also take a look at the prevailing best practices for the grid operation to determine to what extent they were about in the field based on these case studies. Next slide please.

So I also just wanted to say what the report does not address and for you're interested in selling these other perspectives maybe better resources which would include whether micro grids are the best or a good approach for that there is a recent report by economics associates that the IFC last year that really does a nice address on that based on case studies and then also this question of capital investment on whether none of that is grids in order to even reach sustainable energy for all targets by 2030. And for that there's really nice excerpt from the IEA WEL from 2011. Wonderful show on what sort of levels so anyways next slide please we sort of went to the research it's a generic model of operations and we're all wondering how this would hold up against the different case studies, so if we click through this slide you'll see basically this conception that micro grids have sort of a nominal operating schedule a few days a week, few hours a day customers are charged, parents, volunteers, staff, they have payments and then the operator typically uses those ONM and they need to pay back based on the pedal. We'll get into that a little bit more so next slide.

So we looked at as I mentioned case studies in India, Borneo, and Haiti and we connected to the visits to these places and for each of the seven different developers that we included in our study. I'm sorry six developers including in our study we did a very thorough interview process with them and then we also went at to a number of micro grid sites and we did held surveys for those. Next slide. So this next slide is your brief overview of the different developers that we included in this study I

won't go through each of these in too much detail but it sort of represents a nice variety of public versus private, nonprofit versus for profit and one of the things that really came out of the research was those differences determined the operations of the micro grids, next slide. So here I inserted some of the data from the number of micro grids that each of these developers are operating kind of much installed capacity they have on their grids and what different types of generation they're using, so by number of micro grids, but by capacity really tied between bio mass and diesel. I just wanted to make sure you guys can still hear me.

Sean Yes we can Dan it's coming through there's a little delay every once and a while, but overall

Dan Ok great got it so then going to the next slide. I also just wanted to insert some more data showing the number of customers served by these micro grids and typically how many customers are falling on each of these grids, so we didn't have a whole lot of information that you just think that this is sort of a useful data point differ that most of the grids that we did have data on served less than households per grid, but that there was.

Sean Are you still there Dan? Alright we might have lost Dan our apologizes on that he was calling in. He's in the middle of traveling right now, so we'll see if we can get him back on the line, but at this point we might want to switch over to Fabio for his presentation and we can always come back to Dan if he is able to come back on the line Fabio and actually sorry Dan are you, we lost you for a few seconds there.

Dan Ok I'm still here I'm on slide nine.

Sean Ok great yep we'll continue with your presentation then.

Dan Ok great.

Sean Developer portfolio slide.

Dan Ok maybe we should just skip ahead to the next slide nine The Tier Examples what a lot of the developers are using by design would use tiered structures for their tariffs where a customer can choose how much of a peaked tower they're allotted peak power level they're allowed to consume up to but the corresponding six monthly prices based on that peaked powered consumption level, so you see time out here this is green in Malaysia, Borneo they had quite a few tiered tower levels and one of their micro grids in Boion and then in Terion they only had three-tiered tower levels and then the graph shows how many customers were on each of those tower levels, so you're hoping that capturing the data this would be useful for other perspective for micro developers they might be trying to figure out you know how much they should be charging and their micro grid customers and how much power is a reasonable amount to apply to them at different tiered levels, so next slide.

So the frame work that we ended up putting together through the report was really based around empirical finding since that micro grids tend to follow either a vicious cycle failure of the virtualist cycle to sustain ability and we really found that there were these common factors in both east cycles even across the Malaysia where despite differences we did find a common set of factors kept on popping up and so we examined those factors through strategic planning operators and so the contracts, next slide please. So in this slide we tried to plot out what these cycles look like and how these factors are related and feed into each other and it really served a cycle of financial viability or financial non viability and then how that feeds into the liability of micro grid and basically what the structure says is that if the micro grid developer isn't recovering the cost to keep the micro grid going then it's going to start degrading customers are going to start to use potentially more power than what they should be if they're not collecting enough revenue they're not going to cure their schedule, if they're not going to schedule than customers are going to be less likely to pay because they feel like they're getting bad service, and so on and so forth until the grid stops functioning and this is something that we found actually happening on some of these whereas there were other grids where they had good mechanism for collection, they were able to earn high levels recovery they are able to pay for operations and maintenance and this lead to sort of a virtualist cycle whether it was operation integrating, next slide.

So here we have these different business models into what extent is different factors are relevant to the business models and since this is your particular to get to and they're more interesting parts that pieces get [00.37.50 Inaudible] I'll skip this presentation this is something that we cover a lot in our report these differences between the different types of business models for profit partially subsidized nonprofit and fully subsidized nonprofits, but this is just to say that for our many different types of business models and those different business models are going to inform the goals of the operators and those goals are going to inform how to deal with these different factors, so next slide.

So just an excerpt from a few sections from our report one strategic planning, one for operations, and one for [00.38.31 Inaudible] so in strategic planning there is one factor which popped up which who do micro grids deal with the expansion of central grids, so in one of our key studies the westmen called maneuver energy development agency in the cinderbonds in India. What they kind of display is that when there was even just a lunar that the central grid was going to be arriving. Customers on a couple of their micro grids stop paying and then when the central grid actually did arrive even though it didn't come to their village. They stopped paying completely and this caused the micro grid to go into state of failure because they couldn't cover the cost of maintenance anymore the solar micro grid and then when central grid did arrive to this village which was now home to a failed micro grid that was no longer working

the community members, the village members wanted another micro grid back because they found out it actually wasn't abiding power as frequently as the micro grid had, but the promise and the hope of the central grid cause out to leave this whole grid this was actually have more options and so this is raise some of developers minds which was what was their goal with their micro grid. Is this a permanent solution to electricity access or is this a short-term measure. And so some of the developers really do explicitly as a stop gap measure I think that develop within these agency have a really nice solution which was when the central grid arrived in one of their villages they could actually pick up their assets and move it to another village where was, so next slide.

So from the operation strategy section we covered a lot of different factors on the commercial side of things and a point really big issue that have been coming up which was how cost worthy recovery requirements determine the entire structure and so here I think it's really useful to think about what it means a micro grid to be financially stainable and that the [00.40.49 Inaudible] were into its set a goal and that was for us. In Haiti cost recovery was really the priority was really just covering operating cost, but the tariffs themselves were set too low the income on these micro grids in Haiti failed to cover their diesel expenses and minor maintenance activities and their we're some cases where micro grid might've blown a fuse. Some of the simple fuse at the end they couldn't even afford to buy a replacement fuse in order to start off [00.41.30 Inaudible] and then the other issue the other thing to balance is the ability for the customers to pay so you know having the service balancing factors between being able to cover the expenses you need [00.41.48 Inaudible] and then and also bearing in mind the willingness and the ability to pay of the households that are connect and this was also something that came up as interesting on a case studies by this tremendous subparity from one village to another and what their incomes are and what should we charge it for these services and some could be mindful, next slide. So another extra here is on the technical side which is on demand side management, so most of the developers face problems that could be solved better to management interventions some were successful in their implementation and some of them weren't.

One type of demand side intervention which was very common is the power-based tarents, so really straining how much power your customers can use and sort of setting that portion to what their tarent is going to be. The power base themselves [00.42.58] customer demand otherwise it's essentially useless, so we found that there were either over used penalties, efficient appliances, or load areas which were that the most active [00.43.16 Inaudible] varying levels of success, so.

Sean

I think we may have lost Dan again.

Dan

Next slide, just briefly on [00.43.53 Inaudible]

Sean Hi Dan you're cutting out.

Sean And Dan I think we might've, I think we might've lost you again if you can you're cutting in and out quite a bit.

Sean Yeah it's still kind of cutting in and out a little, but I don't know how many slides do you—did you have a few slides left?

Dan Is this any better?

Sean Um, a little bit yeah

Dan Part of presentation I guess we get connecting this, this is a particularly interesting case

Sean Dan your audio is I think

Sean Dan I'm sorry I think we're losing your audio it's not coming in very well um, so I don't know why don't we move on to Fabio and we'll see if we can try again later to see if we can wrap up your slides maybe um, so yeah lets go ahead with that Fabio if you are ready we're going to move on to your presentation.

Fabio Hi can you hear me?

Sean Yes we can.

Fabio Good so just quickly I think I'm going to just start by introducing what we do at Davagy and then maybe trying to a few points in particular Dean and Dan have wrote up which is very interesting and show I've have quite good in sights on the situation, so my name is Fabio. I am the chief energizing officer Davagy and we our company operates in Kansania and our main purpose is really to provide freedom of choice so that's really what we aim at and we do that providing energy services our main topic are due to households and small businesses so we really do only Greenfield, so we only work in off grid areas so when I say choice we would like to know that people that are living in the villages actually have the choice on whether to spend their money on carrageen and camels and very expensive things charging or instead much of our services and also maybe other things such a sewing machine or a refrigerator, a TV, or stereo any other thing its company so we do have a profiting approaching and we do use only solar power and we glue solar power with our refrigerate technology that enables us to basically reduce of cost of micro grid magically.

What we offer to our customers 24/7 energy access and we see this is quite important to them, so we see customers really appreciate it the 24/7 side of our approach and a particular business has become a very important company that we're taking advantage for our grids before diesel micro grids that you find sometimes in villages. We also found that it's

important to have organic approach to energy services so just to provide energy is not quite enough because very often people don't have appliances to use with the energy that we provide so we really try as much as an integrated approach, but we provide the same time energy and appliances. We also thought with charging so that's our service, but then on top of that many people move on to faster and easier refrigerators, etc. and here that we keep observing the market keep observing what people really want to have and trying to respond to that with providing that particular [00.49.00 Inaudible] what we did innovation we brought to the market is mostly a process which is very natural, but simply could not really be done before we started using our technology the first idea is that we deploy very little power to customers we know we deploy our in the order of watt per customer and then at the same time we enable customers to use much more energy than what we have deployed, so for instance, while these have deployment the customers watts we really allow people to pull up to 200 watts from a day of energy as needed.

This specific trick can be done because we share resources, so we share all these panels and market among all the customers. At that point we mostly measure demand at all times and then we very quickly adopt our supplies so we'd have to capacity to our grids the needs of demand so if we look at this really what this means the first point we have below investment compared to micro grid and also have very little power deployed while still serving mostly same needs so it's interesting that Dean was speaking of sizes starting at 100 kilo watt and very often our grids start at 500 watt and still we serve lighting and phone charging and all the other services I mentioned earlier starting with that. The trick is that just because you share is all so we have average deployed energy which is very grids more but then people can really take all the margins of unused energy from the others and put much more. We also have remote monitoring control and the key for this is the technology we developed that allows us to know at all times how our grids are doing both in the generation all the solar side but also on the consumption side so we really know for every single customer what's the consumption factor and if there is an issue and so on. Finally, we can really adapt very quickly with a capacity so a key point in our design was to make sure that we could deploy more capacity in a matter of hours so whenever we see that we're reaching capacity we can send a technician and normally within 24 hours we increase a capacity by a grid to ensure that it is reliable service.

What do you see here is one of the our generation point we call them this is as you see some panelist and that white box is some batteries and especially our control panelist. Now, these units are really over the village we put one every few houses and they stand just along the streets and really the middle of the village. These are our generation point and all of them are interconnected and then connected to meters like the one you use for one of our agents. These meters are remotely controlled and with our back end of the cloud so we can only know the consumption part really

understand our customers better, but for those we can remotely control them to for instance, have the new tenants have the particular customer or have a power limit or energy limitation. Whatever we can think of and this can be out of technical needs for instance, we see that we are at the limit on our grid so we want to ensure that for the 24 hours in which we cannot really provide the capacity we limit the service a bit or, and this is much more frequent can we a business need so for instance, we have a new promotion we want to try to have a new revenue model and we can just apply rather quickly in much a few hours that we can really implement a new business ideas.

All this together really gives us a perspective which you can see summarize the picture looks a bit messy, here it's one of our villages and here you see how single customers are using their energy and how the greatest way to sign. So for instance, here the red dots our customers are using a lot of energy this is a late night view and this really tells us oh ok we have to work a bit on that area there we have more customers are really using a lot of energy or the other area [00.53.57 Inaudible].

What we really found was it was fundamental to have an integrated sign for our system so when we were putting these all together and our like view design was being put together we we're not thinking about just the meters or just the solar side, but we really thought of the whole chain as a one lumped idea, so we have been working really hard integrating money in many ways. So for instance, in the revenues, so we use them by money on the revenue side, but we use them on the operations so to control it remotely our grids. As I mentioned earlier we also try to take ideas from the promotions so as they have a lot of new promotions coming out and have dynamic marketing and aggressive marketing and approaches where we try to have a similar approach in our grids too.

Finally as I said earlier we also found out that the appliances are part of the micro grid. Making sure that good energy fishing to high quality appliances are distributed to be using our micro grids is the key part of our job. From a customer perspective, we try to keep things very simple and ensure that there is a very low connection fee it's about 10-15 dollars to make sure that there is no waste and we don't install connections that are not really not needed. Finally people do pay a prepay with credit or they can buy the energy bundles and an energy bundle is something like oh yeah I'm going to buy 30 hours' worth of lighting or a month worth of light and phone charging and TV. And sometimes a bundle can even include the appliances themselves in particular TVs we know that there's a high access value because the cost of a TV and the same goes for a refrigerators for instance, so we offer them as a rental module, but after a while if you have paid for a bundle in enough months the appliances actually becomes yours. We normally see that most customers are mainly lights we are going to allow a lot of things and as I mentioned earlier the stereos, TVs, fans, and refrigerators, and sewing machines and whatever reason is demanded by the customers.

Today we have about 1000 customers and our systems are used in two countries and their graded by a company. In total, there are eight villages using our technology and we have started integrations about two years ago and we've been providing reliable access to electricity since two years ago just to close a couple of challenges that we have seen the first one and most importantly surely skilled personnel. The finest personnel is very hard and the personal tool is very small. First of all it's hard to find these persons' and when they can be found these personnel tend to be very expensive, so our answer to that was to keep everything incredibly simple. We have selected a set of bit technologies and glued them together so that even people with training that goes down to I don't know a day or two can really be effective and work on our grids. The second challenge which we find really hard to work with is the fact that there is a lot of reliable commercial systems. This really means there is no companies for instance in the west which can provide you a number of services that will be again out of our lists, so for instance, I'm thinking of distribution sometimes even training activities and these are this means a lot of things must be done in house and this is a hindrance for the companies has options to be able to deal with.

Finally I think I would like to just a minute more to address the sum of the points that Dean had have address earlier. One was in a community engagement I totally agree with Dean that's our key point why I did not highlight that in my presentation, it's probably worth mentioned that in that every time we go a village we at first approach the village authorities and normally it's just a half a day activity, but it makes a complete huge difference that we have approach them first and have their approval altogether we want to follow grid in the village. Later, we recruit and train local agents in every village where we go and they become the point for the customers to the companies this really means that every customer has a direct connection with the company via the local agent someone that they know and trust and these we see is fundamental point.

And finally, we also try to have a lot of vary communication with our customers and really involve them by allowing them to send for instance, ask questions directly which we have a whole customer care reception that replies to these questions whenever they ask. There is one point where which I mentioned earlier Dean said that they tried to focus on 100 kilo watts and more this is something we see a lot in this space idea oh it's a micro grid, hence it must be bigger in size well, we are concerned that this approach ignores a fundamental point which is what do the people need really and a lot of people don't need 100 kilo watt per household our consumption why we do allow people to have a lot of watts in their households we see that most people actually pull between 5 and maybe 15,20 watts. It's having really a focus on energy efficient appliances really focus on the services we provide power we provide made many possible to connect more people at a lower cost and at a much more effective approach through electrification. Finally I think the division circles that I

mentioned earlier are very interesting and indeed, I think one thing that possibly can make it even more is how the local customer support is fundamental. So customers don't want to abandon customers want to be not even too much part of this, but they want to know that they can count on your service and they can really have a place where they can voice their concerns if they have any. Finally on that point on whether the grids are temporary or permanent solution we also have this approach we do really plan to remove our assets in case our grids were reached by the national grid, but of course the best way is just to coordinate them we do that in Tanzania a lot and we try to coordinate our activities energy agency and provide this information. We find that this is in a way something that both national power grid energy should because we try to help them reach in the targets with electrification. This was mostly it and I hope there is going to be a lot of interesting questions thanks for your attention now.

Sean

And thank you Fabio for the presentation and we are going to go back to Dean really quick and he's just going to elaborate on his presentation for a few more minutes.

Dean

Hi thanks can you hear me ok?

Sean

Yes we can.

Dean

Good just wanted to go back to a couple of slides and apologize to everybody distracted unfortunately in presenting it was a bit unfortunate, but also to address Fabio's issues is important, so I mean this slide sums up some or expresses some of the issue that I just want to check with when the final dot points on their were uncertainty. The issue there is if we're looking for private sector investors to come into this area which we believe is the most effective way of having a sustainable application. The difficulties the presents is received risks of the private sector towards something they simply don't know enough about and this uncertainty and hence the risk that was involved is what we found out is a significant barrier attracting the private sector into this area and that's one of the main reasons we want to try to demonstrate the prospects.

We're also understanding that there's no one size fits all in terms of what is an appropriate solution for a community in a particular country concerning we have to demonstrate a range of different applications. In order that another country wants to implement grids mini grids in this way see the different applications and different demonstrations or approaches that have been used and select those elements of those different approaches that are relevant to their situation. As far as the finances are concerned they can see that the applications in the countries can yield the returns not necessarily the highest level of commercial returns, but the range of investors that are willing to look at that, looking at the impact that has been achieved the developmental benefits and sufficient returns from those models can attract that investment.

On the slide I mentioned that the sufficient scale of 100 kilo watts and just following up to what Fabio said, he's very much looking at the customer driven approach which very much is appropriate, but our experiences has been that once people have got some sort of access to energy then they are aware of what they can do and what they can do with an increase apply and therefore the demand increases. Our 100 kilo watt limit which I have to confess is a very arbitrary limit, but it's drawn out from potential investors to say what would be the minimum size for a realistic return on the investment they would put in and basically the capital returns in the industry and therefore the investors have to be satisfied that there is not just the long term policy frame, but the scale that activity will provide them returns on that and as to say it has commercial aspects that's going to be sustainable from that point of view.

Another brief I mentioned a minute or so which is this issue of public funding. So this whole ideal of for a viable business model if we're looking at Greenfield areas unlike the Brownfield side. The Greenfield areas are currently un served populations, our experiences that it's very difficult to put together a private sector financial business case to serve that community so there needs to be some public sector involvement which can address a variety of issues there is guarantees for the initial investment and the policy frame that we spoke about the tarents structure assisting with the economies scale to show how these things can be replicated in different areas. So that's one of the key issues that we think is appropriate getting that public private sector to partnership, it's very an overused term and so we need to look at the specifics and as I say there more often than I should do I think these days is the need for walking not taking is a key issue. It's often that the public sector that is also understands what are the key issues in the business model for the private investors, so understanding the customer demand as Fabio mentioned, raising customer awareness, maximizing optimizing the revenue streams that can be achieved, minimizing the cost exposure the public tend to have resources that can be applied and obviously minimizing the risks which I spoken about previously so those are the points there. That's kind of what I wanted to clarify on the, so thanks for that time, Sean.

Sean

Yeah no problem Dean thank you for clarifying and with that we will move on to the question and answers session of the webinar and I will like to remind everyone for phone if you have any questions you can submit those to the question pane and one thing I would like to add before we get started with the question and answer session is unfortunately Dan Schnitzer is not available for the Q and A. He was kind enough to join us today during the middle of travel, but unfortunately actually had to board a plane, so isn't available for that, but did want to let me know if you have any questions specific for him you can submit those and I will email those to his address and so he wanted to apologize for not being able to make it for the Q and A and, so we will get started with the questions that I received so far and the first question is, which countries are there any

specific countries that have the most compatible policies for implementation right now, are there any examples that you can provide and this question is just for anyone.

Dean

It's Dean here the activities in the Brownfield sites where we were looking at existing diesel power grids and placing those with renewable sources clean energy sources so the countries we've tended to look at for both that and the Greenfield side in some ways easiest countries because they have got a policy frame that is some sort of government, so I'm briefly I think I said on the slide our Greenfield sites are focusing on the southern Africa although we've got other options and the Philippines also been approached I think on the slide I mentioned the countries that we're working and one of the criteria for that is sufficient policies in place to provide the basis for the application as we want to put in.

Richenda

Yeah I would just add, this is Richenda I would just add I would say there is no perfect policy environment, but clearly you do have to have a legislative and regulatory environment that allows and legalizes the contribution and independent path that's can make and I mentioned that specifically because several countries in west Africa are going through that right now and still lack the clarity specifically around how IPPs can operate in terms of sort of broader issues around some of the unbundling of the generation and distribution undertaken right now. Liberia's is one country where that's all very much in process where in fact they have passed the legislation, but it really does not give strong indications about how IPPs operate. I think Fabio's going to mention in this, but Tanzania has been often stilted as a country that has a very robust regulatory framework for micro grids we do see a number of companies operating, but I think only time will tell to see whether it really does become a sort of a role model for good regulatory policy and this environment. Again, in different countries you know we see different types of models whether it's a concession model like we used in the Philippines or whether like in India is simply like more of a licensed to operate and again, I think there are strengths and challenges of the different models that are out there right now.

Fabio

And this is Fabio from Devangry yeah we definitely do Tanzania for I think Tanzania is very prime to be a good example in listening West Africa what we see is that their approach which has been largely supported by the world bank has been to deregulate as a matter of fact produces under 100 kilo watts and apply a light regulation between 100 kilo watt and megawatt. We are very lucky about that it makes our life much easier and we that it is a very strong effort in many parts of the government to actually support a company like ours so that's very nice.

Sean

Great thank you all. And the next question is I believe is directed towards Dean. How can one get involved in Greenfield, is there any partnership?

Dean Most certainly we're keen to talk with anybody that is interested to get involved I can send you some information if whoever wants to just contact me on that as far as the I saw the Brownfield is concerned we quite progressed with that with some 12 months down the line and in terms of the factory is one business standing we've delayed the Greenfield on the basis that we recognizing likely not to be such an easy business case private investment, so the moment we have plans scheduled to start in South Africa or West Africa within the next few weeks, but the other countries are finally be fined and the partnerships toward them we haven't put in place, so if there is anybody interested whether it's suppliers or financiers of that process we are very keen to speak further and to see if we can start those partnerships.

Sean Great thanks Dean. Next question is it was directed towards you. In your program do you focus exclusively in energy supply or also on demand and, what is your on the need of opportunity of coupling mini grid investments with interventions on the demands side?

Dean Well I think very much as I tried to mention in the presentation that we feel activities need to be driven by the potential customers by the end users I think Fabio is mentioning that as well, so it really should not be a supply focus I mean, we're trying to understand what other market dynamics and because the only way to have a long lasting commercially viable sustainable market is we can understand what the business what the customers require. So certainly demand is intended to be the focus and clearly I think Fabio mentioned this as well I mean energy efficiency is a key aspect, so we want to be looking at promotion energy efficient appliances at the same time as bringing in any energy supplies. As far as the link is I mean certainly it is an important aspect for us to take into account the demand should be governing the profile of the supplies that we deliver and therefore that is an important connection. I don't know Fabio wants to say anything further I don't think he has to say much more to scale, but carries equally and important results.

Fabio Actually yes what we see that this is also more general interpretation but, every solution that really involves energy efficiency and in efficient appliances on really seems more likely to be a success mostly because if in terms becomes a driver for low cost and as Dean was mentioning earlier the pool the funding pool that we have available to reached upon in 2030 is limited so we have to be actually careful when we use them and to maximize the number of connections we can do, energy efficiency will have to be a part of the solution.

Sean Great thank you Dean and Fabio and actually the next question is directed towards both of you and it asks if you could speak of what if appears to be a contradiction between, Dean you mentioned that 100 kilo watts is the minimum economic scale and Fabio's modular approach sounds like a lot smaller of a scale than that can you just speak of those differences?

Dean So I can add some more details intrigued myself to be honest of Fabio's experience and just to understand the economics behind his implementation I suppose I should ask Fabio to go first on this one and I can come back and give you a little bit more detail on where we're positioning.

Fabio I'm happy to what looks like a say a discrepancy between the two data points and they're

Actually no be one I think what is happening really is that a model like hours where we

try to follow demand involves a lot of aspects as I mentioned we rely heavily by communication rely on the find or we have divided control micro grids and we have introduced a lot of aspects and the initial question for us was, how would we ask if we were to start today and without any heritage from say the traditional grids and so on? That's how think we found a way that might be most cost effective of course one issue and I think Dean has a very good view on that. One issue and Dean has a great view on this, is that company like ours we definitely only one doing this company like ours are new and it's probably fairly to say that our business models our approach are robust and established. So I do understand the fact that today it's safer to just point out the more established models. I believe that of course and sometimes in probably one or two years we will start considering a model like ours part of the solutions that regulate the governments and any other interested that wants to take part to this can actually can and use. As a matter of fact we we're just included last minute in the latest I think perspective for integration for Tanzania we're by energy agencies contacted us we would like to know if you actually can be a solution for electrification and that's how we started, it's something so new that it takes time to absorb into their established models.

Dean I guess from my point of view I mean we're as I made clear we are very interested to look at different business models and we're trying to demonstrate the range of approaches. Tanzania was a country that we considered and for various reasons we didn't go forward. But, that is still open at the moment and if Fabio's approach can provide an example for as a sustainable investment then certainly we should discuss further Fabio after this and we can try to work something out. In general terms we spent some time trying to look at what would be the smallest application that would be viable again in terms of attracting private investment. When I say that and we have to think about this from a the investors perspective, so they've got funds available from their shareholders, a stakeholders that are looking for an investment. Now even the impact investors are going to be looking for returns of in 5, 10, 15 percent if it's not the 30, 40, 50 percent which the commercial investors are looking for. We still need to make a return on that, and given that mini grids clean energy mini grids are so capital intensive they have to have the right sort of investment conditions I mentioned in the importance of having stable policy frame

work, but if their looking at anything less than 100 kilo watts then that's the general position fairly position we had sort of advice in different areas taking from potential investors and they probably wouldn't consider anything less than that. That's sort of a limit that seems to be appropriate that's we've taken and some where we have a limit of five megawatts on the basis anything more than that is subject to a connection to the main grid even if it's quite a remote location so that's the sort of range we look at with an upper and low level, but I don't want to say that that's casting stone and if other people have or can demonstrate prospects of having a lower scale application which can meet the use of demands particularly with the increasing nature of use of demands we will be very interested to learn more about that and to introduce that into our program.

Sean

Great thank you again and then Fabio a couple quick questions for you that we received a few attendees are wondering are deverties grid DC or AC and then are any deverties projects did say reflect a sustainable business model.

Fabio

They are DC grids we work with level of DC grids with 24 volts and yeah they are actually assisting with business model people. People pay for the energy that they use and bundles as I said earlier and we have a business model that attracted investors we have today a couple investors on board and actually working to close any foundering investment so we should be at the total of 5, 6, investors by the end of the summer and so the returns that Dean was mentioning there earlier asks something that we are unfortunately very aware of and luckily for us we can relate prove that we can make that.

Sean

Great thank you and I know you touched on this already both Dean and Fabio could you just talk a little bit more about the rate of return that a private operator investor usually expects so I can find in lower social economic regions?

Dean

As I said from our point of view we've looked at the range of investors and the fully commercial investors that have different opportunities would generally looking for more than a thirty percent return on any investment whereas there are different investors and as I mentioned impacts which have been particularly our target market after some investigations because they will sort of accept lower returns, but it's still a fully commercially viable opportunity that their looking for and again there are range of people I mean there are I would see other funding organizations even down to the most natural development things we will accept nothing much less than that. There are programs or funding available I'm not looking for any returns at all, but we're not convinced that's a good model to be to be specifying if we're looking for long term to ensure the sustainability we fill that we want to try to attract the commercial sector. It's that range of between about five fifteen percent we're looking for another moment.

Sean

Great thank you attendance and that is all the time we have for questions today I know there's a number of questions we did not have an opportunity to get to, but I will copy those questions and forward them along to our panelist today so apologize if we didn't get a chance to get to yours whether they would be forward along and the panelist will try to answer more questions they can. So, with that I'd like to move on to the brief survey that we have for the audience today and Heather if you can go ahead and display the first question and the attendees you can answer that directly.

The first question is the webinar content provided me with useful information and in sight. Great and the next question the webinar's presenters were affective. And then the final question please Heather is, overall the webinar met my expectations. Very good and so thank you very much for filling out our survey and help us improve our future webinar and on behalf of the Clean Energy Solution Center I would just like to thank all the panelist again and for our attendees for participating in today's webinar and apologize that didn't get your questions, but as I said I will forward those along the panelist and so we very much appreciate you time and I do invite you to check out the Solutions Center website. Over the next about a week we'll have the cording of today's webinar up if you'd like to go back and listen to that any parts of the presentation as well as any previously webinars and we also invite you to inform your colleagues and those in your networks about Solutions Center resources and services including the no cost policies support and so with that I hope everyone has the great rest of their day thank you for joining us and this concludes our webinar.