

# Powering Healthcare: Approaches to Delivering Sustainable Energy Solutions in the Health Sector

—Transcript of a webinar offered by the Clean Energy Solutions Center on 28 February 2017—  
For more information, see the [clean energy policy trainings](#) offered by the Solutions Center.

## Webinar Panelists

<b>Luc Severi</b>	United Nations Foundation
<b>Tinyan Ogiehor</b>	Solar Nigeria Programme
<b>Virginia Taborda</b>	SolarKiosk
<b>Laura Stachel</b>	We Care Solar

**This Transcript** Because this transcript was created using transcription software, the content it contains might not represent precisely the audio content of the webinar. If you have questions about the content of the transcript, please [contact us](#) or refer to the actual webinar recording.

---

**Sean** Hello, everyone. I'm Sean Esterly with the National Renewable Energy Laboratory and welcome to today's webinar which is being hosted by the Clean Energy Solutions Center in partnership with UN Foundation's Energy Access Practitioner Network. And today's webinar is focused on the sustainable energy solutions for health facilities. And before we begin I'll quickly go over some of the webinar features for you. For audio, you have two options. You may either listen through your computer or call in over your telephone.

If you choose to listen through your computer, please select the mic and speakers option in the audio pane. Doing so will eliminate the possibility of feedback and echo. And 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 that you can use to dial in. If anyone is having technical difficulties with the webinar, you may contact the GoToWebinar's helpdesk at the number at 888-259-3826.

If you'd like to ask a question of our panelists, we ask that you use the questions pane where you may type in your question and submit it and we will ask those during the question and answer session at the end of the webinar. And if you're having difficulty viewing the materials through the webinar portal you will find PDF copies of the presentations at [cleanenergysolutions.org/training](http://cleanenergysolutions.org/training) and you may follow along as the

speakers present. Also, the audio recording of the presentations will be posted to the Solutions Center training page within a few days of today's broadcast.

And we'll also be adding the recording to the [Solutions Center YouTube channel](#) where you'll 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 Solution Center's resource library as one of many best practices resources reviewed and selected by technical experts.

And today's webinar agenda is centered around the presentations from our guest panelists, Luc Severi, Tinyan Ogiehor, Virginia Toborda, and Laura Stachel who have joined us to discuss approaches to delivering sustainable energy solutions in the health sector and we thank them very much for joining us. We will begin with short presentations from each panelist followed by a discussion led by Luc before returning to the audience question and answers.

Before we jump into the presentations I just want to provide a quick overview of the Clean Energy Solutions Center and Clean Energy Ministerial who are sponsoring this webinar. And then following the panelist presentations we will have a question answer session where the panelists will address questions submitted by the audience. And at the end of the webinar you will be automatically prompted to fill out a brief survey and we just thank you in advance for taking a moment to respond to that.

So the Solutions Center was launched in 2011 under the Clean Energy Ministerial. And 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. There's 24 countries including the European commission as members and covering 90 per cent of clean energy investment and 75 per cent of global greenhouse gas emissions. And the Solutions Center is one of the nine initiatives of the Clean Energy Ministerial. Other initiatives include ISGAN, 21CPP and Global LEAP. And all of the initiatives work towards the three overarching goals of improving energy efficiency worldwide, enhancing clean energy supply and expanding clean energy access.

And now for an overview of the Solution Center. This webinar is being provided by the Clean Energy Solutions Center which focuses on helping government policy makers design and adopt policies and programs that support the deployment of clean energy technologies. 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. And 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.

And there's five primary goals for the Solution Center. First goal is to serve as a clearinghouse of clean energy policies resources. Second is to share policy best practices data and analysis tools specific to clean energy policies and programs. Third goal is to deliver dynamic services that enable expert assistance, learning and peer to peer sharing of experiences. And the Solutions Center also fosters dialogue on emerging policy issues in innovation around the globe. And then finally, the Solutions Center serves as a primary resource for project financing options and information to expand markets for clean energy. Our primary audience is made up of energy policy makers and analysts from governments and technical organizations in all countries. But then we also strive to engage with the private sector, NGOs and also civil society.

And the Solutions Center is an international initiative and we work with more than 35 international partners across a suite of different programs. Several of the partners are listed above and include research organizations like IRENA and the IEA, programs like SE4ALL and regionally focused entities such as the ECOWAS center for renewable energy and energy efficiency. And one of the marquee features that the Solutions Center provides is its no cost expert policy assistance known as the Ask an Expert program. And the Ask an Expert program matches policy makers with one of the more than 50 global experts that we've selected as authoritative leaders on specific clean energy finance and policy topics.

For example, in the area of energy access we're very pleased to have Katherine \_\_\_\_\_ from Accessible Energy serving as one of our experts. So if you have a need for policy assistance in energy access or any other clean energy sector. We do encourage you to use this valuable service. And again, this assistance is provided to you free of charge. So if you have a question for our experts please submit it through our simple online form at [cleanenergysolutions.org/expert](http://cleanenergysolutions.org/expert). We also invite you to spread the word about this service to those in your networks and organizations.

And now I'd like to go ahead and provide some brief introductions for today's very distinguished panelists. First up today is Luc Severi who leads a multiyear, multi-country intervention focusing on the deployment of sustainable PV energy solutions in primary healthcare facilities at the UNF. And then following Luc we will hear from Tinyan Ogiehor who is a technical advisor for solar PV at Solar Nigeria Program where he brings to bear a wide breadth of renewable energy experience both locally and internationally.

And then our third speaker today is Virginia Taborda who is the director of business development at Solar Kiosk and is responsible for the interface with all business to business partners to bring solar kiosk solutions to the base of the pyramid in other underserved communities. And our final speaker today is Laura Stachel who is the executive direct of We Care Solar which she cofounded to bring simple solar electric solutions to maternal and child healthcare in regions without reliable electricity. And so, with those introductions I'd now like to welcome Luc to the webinar.

Luc

Good morning, good afternoon or good evening depending on which time zone you're calling in from. Just give me one second to pop up my screen. There you go. It should be shared right now. I'll just start off this webinar with a quick introduction to the energy access practitioner network and also of course the topic of the day which is powering healthcare. Energy is essential to development but today more than one billion people still suffer from a lack of energy access. Many more experience frequent outages and generally have unreliable access which further hampers social and economic development.

In 2011, the UN foundation launched the Energy Access Practitioner Network to help address the energy access challenge. It is the largest global network with now more than 2,500 members consisting of civil society, government, academia but primarily private sector actors and then especially a large number of small and medium enterprises. Now we will be launching the results from our annual survey of which we have been starting to communicate a bit more in recent weeks at the SE4ALL forum at the start of April but here's already a quick sneak peek that does show that healthcare is an important end use for the off-grid products that are being sold.

The potential impacts of energy on health service delivery include the list you see on the screen right now ranging from increased improved medical services to more operational and administrative aspects of healthcare such as for example keeping patient records or inventories for medical supplies. However, in a recent study across 11 sub-Saharan African countries for which data was available, an estimated 26 per cent of health facilities did not have any access to electricity. And similarly, only one in three hospitals was deemed to have reliable electricity provision which means without any major outages in the week prior to the visit.

Now together with WHO and UN Women, UNF coordinates a multi-stakeholder partnership in support of SE4ALL called Energy for Women and Children's Health. Under the umbrella of this partnership UNF has carried out several activities in this space ranging from carrying out energy needs assessments in four countries in now more than 300 health care facilities to currently managing a health facility electrification project in collaboration with the organization the Solar Electric Light Fund in Ghana and Uganda. And in this project, we're also—we're mirroring that with an impact assessment on the health side to try and uncover some of the linkages between delivering energy interventions on the one hand and on the other hand seeing improvements in health outcomes.

We will of course talk more about these activities in future webinars. But today this webinar will explore different approaches to delivering energy to health facilities in resource constrained environments. It is part of a series and follows on an earlier webinar organized in July of 2016 where we introduced some of the main barriers in the energy health nexus. But in the next few months and years we expect to organize several more webinars, each with a specific subtheme relevant to powering health facilities. Today, we talk more about the design stage as we discuss different approaches to delivering

sustainable energy solutions in health sector with representatives of weaker solar, solar kiosk and then the next speaker from Adam Smith International's Solar Nigeria program.

We encourage everyone to join the conversation. You have the opportunity as Sean already mentioned to ask questions, most of which hopefully we will be able to already address today. You can also join the conversation on Twitter using the #PNwebinar and #PoweringHealthcare. Now without further ado I would like to pass the controls to Tinyan to talk more about the Solar Nigeria program.

## Tinyan

Good day, everyone. Good day, everyone. My presentation today will be focusing on the Lagos solar project with emphasis on the clinic. The Lagos solar project is Nigeria's largest solar project implemented to date really with basic aim of improving healthcare, enhancing education while reducing CO2 emissions. This project was done in collaboration with the Lagos state government of Nigeria and the UKDFID where both parties contributed 50 million pounds each to achieve the project. Lagos electricity board helped implement the project on behalf of the Lagos state government and Solar Nigeria for which I am speaking helped implement the project on behalf of UKDFID.

The project is completed and has an approximate installed capacity of solar PV panels of about five megawatts which makes up for about 10 per cent of the total power generated by Lagos state government in Nigeria today. Like I said, the project has been completed and it has a total of 872 public—it has solar installed in 872 public secondary schools and 11 primary health centers of clinics. But for the purpose of today's discussion I'll be focusing on the clinics. This project commenced in September of 2014 and was completed in February of 2016.

Now let's take a closer look at the approaches to actually implement this particular project. We took six major steps. One was to identify the opportunity and partner with a suitable partner, in this case the UKDFID partnered with Lagos state government. Counterpart funding was made available by both parties. Agreements were put in place as to how to go about executing the project and the agreements like operations and maintenance agreements were also drafted to aid sustainability of the project. Then we went to the next step which involved the actual site selection and energy audits. A total of 615 Lagos secondary schools and 85 clinics were audited and they were audited for their energy needs, the need for 24-hour electricity especially for the clinics, available space in these facilities, population size in the location equipment that was present and needed electricity to power, access roads to the sites, adequate security, so on and so forth basically.

Then we moved on to the actual system design and then the design was done in three phases. We had the design for the civil works which involved all the design of the support structure for the solar PV panels and the cabins that would house the inverters and charge controllers and batteries. Then we also had a design for the electrical retrofit which involved designs to improve the energy efficiency of the selected sites before the solar PV units were installed.

Then we had the actual solar PV unit design which involved the calculations for all the number of inverters, charge controllers, batteries, solar PV units for each particular site.

Procurement, shipping and asset management was done by crown agents as contracted by DFID. They procured all the equipment, shipped it over to sites and then the actual implementation of this project was handled by the Lagos state electricity board where local technicians from this state were trained by original equipment manufacturers and deployed to each particular site for the project to be executed. Now post installation gave rise to the operations and maintenance agreements to go into effect, removed monetary and devices that were previously installed were activated so that the systems can be monitored remotely by these technicians and maintained. Further training took place such that technicians now know how to maintain the systems from simple things like cleaning systems to checking battery levels and things like that.

Then Solar Nigeria now carries out a bi-annual beneficiary monitoring exercise to help check the benefits of these systems in using these systems to beneficiaries and how it has improved health and education outcomes. Now at this point I think it would be important to note that Lagos state government has maintained the yearly recurring budget for the operations and maintenance of the systems to date to ensure that the systems are sustainable.

Now because we're talking about healthcare using solar to improve healthcare systems we're talking particularly about the Epe Clinic which happens to be the very first site that was completed in Lagos. It was completed in December of 2014. The Epe Clinic presently employs about 24 staff and it records an average of about 6,000 patients which includes mothers for antenatal care. In the past, this site which has a laboratory, a cold storage unit, really did not enjoy these equipment because the Epe community had only about two hours of electrical power from the grid every day. And in some cases, when the grid is really low that would be worse. The women who use this facility especially for delivery had to come with kerosene lanterns or candles and in some cases, they even had to come with cans of diesel to power the facility's generator just to give birth.

Now the solar system units that are installed is a 72-kilowatt capacity unit which consists of about 240 solar panels of 300 watts each. Now the impact of this solar system installation, the solar units is it has greatly impacted nighttime delivery especially. Prior to the installation of the solar PV we, the facility rather recorded about an average of 12 babies born every night—12 babies born monthly rather. And from the first beneficiary monitoring exercise that we carried out in April of 2015 that average improved to about 30 babies delivered at night. And as of December of last year, that improved to 114 babies delivered at night.

There's also been a 20 per cent increase in the number of new patients that have visited the facility. There has been significant increase in drug and vaccine storage and the cold storage unit has grossly improved. To emphasize this, there's even a case where the general hospital had to move its fridges to the primary health center to increase the storage of vaccines and drugs at this

site. Foil pouches which used to average about \$200.00 monthly in this particular clinic has now been reduced to zero because the facility is powered 24 hours by solar. And we also have CO2 emissions that have also been reduced to zero. Thank you.

**Sean**

Great. Thank you Tinyan. And we'll now turn to Virginia for her presentation.

**Virginia**

All right. Thank you, Sean. So I'll start with a welcome from Solar Kiosk. We're actually delivering the webinar from our headquarters in Berlin. And I'll start off with just a little introduction on Solar Kiosk and then focus on the connected solar clinic solution that we recently deployed in Jordan. So Solar Kiosk. Hold on a minute. It's not letting me move the page. There we go. Solar Kiosk really started out with a model to bring solar energy as well as quality goods to last mile communities in Africa. And we really call ourselves the energy and connectivity gateway and last mile distribution network for underserved communities.

And it's our E-HUBB which is the silver structure you see there that we use as a platform to offer renewable energy products and services such as phone charging and other things, consumer goods, connectivity such as Wi-Fi connectivity, financial inclusion projects as well as our solutions for education and in healthcare which I'll come on to. And really all with a goal to enable and empower communities. And as I mentioned we really started our focus in Africa but we've expanded out to Southeast Asia and recently in the Middle East and Jordan.

So Solar Kiosk has a range of energy infrastructure solutions. As I mentioned we have our E-HUBB which is what we use to run our retail and service business that we run across really six countries in Africa. And each of these units may have between one kilowatt peak of power on a single structure itself and then a canopy that can add an additional kilowatt peak of power enabling two kilowatt peaks of power. And here we can power a 240-liter refrigerator, phone charging, a TV, a fan, lights internally and externally as well as other businesses. And now we really an approach to connect others in the community and give them energy services of their businesses so they can set up around the kiosk. And we create a hub of activity as well as potentially for productive use and communities.

From the E-HUBB we've evolved a couple of different infrastructure with automated with atomic energy solutions that we've deployed as a clinic and then also as a school. So our clinic solution which I'll go into detail really is to provide both the infrastructure as well as the energy services to deliver healthcare either off grid or in displacement settings. The connected solar school each year can deliver both energy as well as connectivity to really enhance the ability to deliver with education as well as vocational training and other aspects. We've also deployed our school unit in Jordan in a refugee camp there working with a couple of humanitarian partners to really increase the type of education and innovation opportunities they can offer the students.

So if we look at Solar Kiosk in general, we were founded in 2012 here in Berlin as I mentioned. We have over 175 of the E-HUBB or kiosk type units in our own operations and we work with various partners to deliver 20 different third party solutions to across countries outside of our core network. As I mentioned, we have the school and a clinic that we most recently implemented as demonstrations of our infrastructure with autonomous energy. So for our focus on the clinic which is really the subject of today's discussion, these are images from the recent inauguration of the clinic in Jordan.

This is actually an eight-kilowatt peak structure as you can see by the considerable number of panels on the canopies. And this eight-kilowatt peak was needed so that we could control the temperate inside the clinic. Of course, in Jordan the temperature range is much greater than in Africa so we needed to include an air conditioning and heating system to ensure that it would be optimal temperature for the medical equipment as well as for the patients.

So this project was really made possible through our partners and really this project was very complex because it involved a lot of different partners. But I think that also enabled it to succeed. So we worked primarily with Siemens Stiftung who was the donor for the clinic and we worked with a couple of Siemens' healthcare partners for the equipment inside the clinic which I'll come onto. And most importantly we worked with administrative health in Jordan who now owns and operates the clinic in Jordan. And it was very important to involve these various partners throughout various stages of design and of course the overall implementation and long term use of the clinic.

So inside the clinic we have in addition to a refrigerator which is possible in all our solutions, we have urine analysis, a hematology lab, an ultrasound device as well as a Wi-Fi system that can be used both by the doctors and medical personnel for telecommuting or remote health analysis connecting with hospitals and clinics in other areas for diagnostic activity. It is also this connectivity that allows us to monitor the energy production and energy usage to make sure that everything is going well inside the clinic. So that connectivity I think is really essential and really enhances what can happen inside the clinic. So that is an insight into Solar Kiosk and a little bit about our clinic. And finally, this is another picture of another connected E-HUBB that we have in one of our countries. So we're really coupling our infrastructure and energy solutions also now with connectivity solutions.

**Sean**

Great. Thank you, Virginia. We'll turn things now over to Laura for her presentation.

**Laura**

I'm just trying to get the full screen up. Can you see my screen with or without the GoToWebinar control panel?

**Sean**

Yes. We can see just the slides. We don't see the panel.



## Laura

Ok. Great. Well, hello everybody. My name is Dr. Laura Stachel and I'm the executive director of We Care Solar. We started working in the realm of energy for healthcare in about 2009 and incorporated in 2010. And the focus of our work is actually specifically maternal and childcare. So we are most interested in trying to find a scalable solution to stem the tide of pregnancy and delivery related deaths. And around the world about 303 women die every year from pregnancy related complications. And most of those complications are things that are actually quite treatable, things like bleeding, infection, a condition that's related to high blood pressure in pregnancy called eclampsia, obstructed labor which means the baby is too big and also unsafe abortion. And in sub-Saharan Africa young women face a 1 in 38 chance of dying from a complication of pregnancy and when I started this work that number was much higher.

In 2008 I was invited to spend time as an obstetrician just observing care in a hospital in northern Nigeria and I spent two weeks, about 10 to 14 hours a day just watching what was happening in this room labor and delivery as well as in this room which was the surgical ward. And one of the things that struck me was that the hospital which was serving a city of 1.5 million people did not have electricity for 12 hours of each day. So this operating theater for example could not use its overhead lights, its suction machine, its cautery devices and instead relied on the ambient light from windows in order to perform C-sections.

There were other complications from not having diagnostic equipment and not having communication equipment so that when a woman needed to have an emergency procedure like this one, there was no way to even reach out quickly to health providers and rather a hospital messenger was sent to track down a doctor that might be on call to help when emergencies arose. And at night this was the only light that was available. There were other options actually which were candles but there was no good source of light and this is the room that is showing the maternity ward which has 12 mothers and babies behind this particular midwife.

In an effort to try and help this first hospital, we designed a stand-alone solar electric system that would target the operating room, delivery room, the labor ward and also the laboratory to bring in a blood bank refrigerator. We designed it to be 12 volt DC, primarily to have high storage, to be very easy to maintain. The operating room went from looking like this to this and we found that the health providers actually liked LED lights more than the original fluorescent lights we had thought of in the design. And we realized this needed very little power. This is only 15 watts to provide the lighting for the operating theater. And we saw that over the next year when the hospital now had a blood bank and lighting for these crucial areas, the maternal deaths in the hospital went down by 70 per cent and the hospital was no longer turning patients away.

After that one experience, many surrounding health clinics came to us and said "Why are you only helping the big hospital? We are also delivering babies in the dark." And that was the moment where we realized we needed

to come up with something that was going to be more cost effective and able to scale. And at first, we hand designed small portable solar electric kits that we fit inside of suitcases that had many of the elements of the original system. Everything was just made much smaller. Over time demand for these continued to grow and we started to assemble them in a backyard assembly line but finally we ended up working with a factory to actually produce these at scale to the point that we have now distributed more than 2,200 of these solar electric kits around the world.

So these are called solar suitcases and they include solar panels, of course, batteries for storage, we now use lithium ferrous phosphate batteries, a charge controller and we have the end appliance included. We have either two or four medically designed lights that actually are designed to be very sturdy to direct lights towards procedure and also to have good color rendition in the event of the need to use the lights for surgery. The solar suitcase also includes a fetal Doppler to listen to a baby's heartbeat. It includes LED headlamps that can be recharged from the system as well as phone charging equipment. And in specialized projects we're also able to use the device to power other things such as computers for medical records as well as for ultrasound when that's needed by changing the size of the panels that go with the system and the size of the battery.

I'm sorry. I'm just having a \_\_\_\_\_. So with the solar suitcase now midwives do have the light that they need to perform procedures at night. As I mentioned the lights are very effective also for surgery. By putting in articulating gooseneck arm, we're able to use a lot of the overhead surgical lighting equipment that lays dormant in many countries. This is a picture from Uganda. We also feel that the phone charging is an essential element of providing care to first line health centers that need to call when there's emergencies and also to summon ambulances when patients need to be referred. And we include a fetal Doppler which is a device to listen to a baby's heartbeat to detect whether a baby might be in distress or not.

Now none of these would work without having an education system to train the midwives how to use the equipment effectively. And as we scaled we realized that women needed to do more than just train people to use them. They needed to get on the roof and do the installations. To that end, we ended up developing a brigade of female solar ambassadors that were trained to lead train the trainer programs in countries around the world. This was done through a six-week online course followed by a one-week in person course to prepare these women and they have now subsequently had follow up training courses as our equipment has changed and our organization has grown. At our training sessions, we are often teaching people about solar electricity for the first time.

We call upon partners from UN agents, NGOs, as well as local district health technicians to become our solar installers. Sometimes this is the first time they've ever used power tools. They may never have been on a roof before. So we teach a lot of safety skills and when the course is over we go to several health facilities and actually do full installations having them train health

workers to use the equipment, do all the installations before they have a graduation.

Key to our model is that we had a product that was designed in the field that incorporated a lot of user feedback and we constantly get additional feedback to try and change and improve our basic solar suitcase. It's important for us to select appropriate facilities and do audits as others have mentioned and we then need to train people on how to use the equipment. As we've grown, the only way we've been able to reach and scale to many regions of the world is to work with partners and these partners as mentioned are UN agencies. They are NGOs like Save the Children, Care, \_\_\_\_\_ and they are Ministry of Health partners both at the federal level and at the local level as we rely on them to help us select appropriate facilities to actually conduct the installations, to maintain the equipment and service it over time and to do research activities with us so we can monitor and evaluate our programs.

Here's an example of some of the partners that we've used in different countries. Most of these activities have been in Africa but we've also done activities in Nepal with On Heart Worldwide and in the Philippines with Stiftung Solar Energy Foundation. So for a map of where we've been working, the larger partnerships are the ones where the countries are outlined in yellow and the orange countries are showing where we may have been able to donate some solar suitcases but there's not really an established program the way there are in these other countries. To date we've equipped about 2,400 health centers with solar suitcases. We've trained more than 9,000 people to be our technicians and our users on the ground and we estimate that we have served about 900,000 deliveries so that's mothers and infants that have benefitted from having healthcare with light.

And we saw a lot of the same kind of findings that Solar Nigeria saw that when you provide light at night your much more likely to have utilization of the clinics. You're also more likely to improve healthcare worker morale. We could not do this without fantastic partners. This is a picture of partnerships that started in 2011 in Liberia. This week I'm going back to Liberia, actually tomorrow, and we're going to be launching a program where we intend to ensure that every health center doing primary care in the country has a reliable source of light or a solar suitcase. So we're actually bringing hundreds of solar suitcases to that country right now to try and electrify all the areas.

Two very brief additions. The fact that this is a suitcase means that it can either be used as a portable device as we've used it sometimes for example in the Ebola crisis it needed to be used with tents. And as another example of that after the earthquake in Nepal we had this as a portable device used inside tents but that yellow cabinet also becomes a permanent fixture that can be mounted to the wall. In Nepal in this picture there were more than 130 of these that went in and 130 more are coming. And this was the first baby that was born with solar lights in Nepal. And I'll stop there.

**Sean**

Thank you very much for the presentation. I'd like to turn things over again now to Luc who is going to lead a panel discussion.

**Luc**

Great. Thank you so much Laura and Virginia and Tinyan for your presentations. Also, thank you for keeping it down. I know we could talk about this for days and I think we will but just not today. We will talk about it for days over the next couple of months and years in future webinars and future conversations and events because this is a very important topic. And clearly, we're not done speaking about this at this point. I think in future webinars we will definitely delve in deeper on the impact, on the results, on the outcome of these types of interventions and why they matter so much. But today we would like to take a couple of steps back and really focus more on what is important when you are considering these types of interventions, why—what are certain aspects that you need to take into consideration because you're working in a specific environment, be it more in a humanitarian setting, in Jordan for example with Solar Kiosk or whether this is just a public health facility in a very rural area where you're not even replacing anything. You're bringing something completely new.

So with that being said I would like to ask the first question to our panelists revolving stakeholder engagement and especially on the public side but not limited. But we know that the facilities and the solutions that all three of you have presented, there's an element of public ownership involved or public management because you are talking about public health facilities. And I would like to hear from you and maybe Tinyan we can start with you because you clearly mentioned Lagos state government not only as an active participant but even as a co-funder in this project. To get a little bit of information from you in terms of how did that relationship work, how is it approached both at the design stage and the implementation stage. And from you also what is your opinion in terms of the appropriate level of involvement of stakeholder engagement not only at the central level but also at the district level or at the local level. Tinyan, over to you.

**Tinyan**

Thanks, Luc. Can you hear me?

**Luc**

Yes. We can. We can.

**Tinyan**

Ok. Beautiful. Just like you mentioned really, one of the key aspects that we considered especially while designing this project was we wanted something that would be sustainable. These are large systems that were deployed over time and is expected to run year in and year out. So there was no way we could do this without public ownership, public management of the systems so that's why in the case of Lagos state government we got the counterpart funding from the government and their buy in to support the operations and maintenance. While this project was being designed at the very early stages the issue of operation and maintenance was hammered on so strongly because we knew that that was the only way we can keep this project going.

What the Lagos state electricity board is doing at the moment is to carve out a part of the energy commission which is a part of the state and maybe have a budget for the maintenance of these systems where they have now contracted local technicians that have been trained on how to manage the systems going forward. Now the electricity board has decided to take it a step further than that. They are also looking at ways in which private organizations can take

this up as a business and the state can get to now pay in \_\_\_\_\_ for the maintenance of these services even while they expand the solar facility into other primary health centers that have not—that don't yet have solar PV and solar in them. So stability is like the bedrock of this kind of an installation. So public ownership is always key.

**Luc** Thank you, Tinyan. Virginia, any thoughts or any comments in terms of your experience in Jordan and getting the Ministry of Health involved and engaged and how did that process work? Were there any particular challenges in that set up?

**Virginia** Yes, Luc. I think I mean our project was focused on serving really migrating populations coming through Jordan as well as local Jordanians so in this case we sought out to work with the Ministry of Health rather than a particular humanitarian organization because of really the dual purpose of the center really to help serve the overflow of patients using the Jordanian health system. But I think it definitely has its challenges as it does with working with any organization that has a lot on its plate in that the response time is not always as quick as you would like and you aren't able to move things along as fast as you hope. But I think that the key thing is to find a champion inside of an organization, really any organization that can be your focal communication point. But it's very important for them to be involved in the original design face and really kind of agreeing step by step that you're moving in the right direction.

Of course, there's a lot of hierarchy when you're dealing as we know with governmental institutions and I think you need to understand that and respect that and work through those processes. I think that one of the key things for us was that we were lucky to have our Siemens partners on the ground in Jordan that could really help us by physically going to the Ministry of Health and talking with them, getting their feedback, getting their signature on documents and that was critical to the success of the project. And I think that's something that's really having that assistance on the ground is key.

**Luc** Great. I wrote down the word champion because I think it's something that is indeed crucial also talking from UNF's experiences and the building of the relationship with those public stakeholders, with the public partners as being key. Laura, you mentioned the project rollout in Liberia which I assume is also in a partnership with the Ministry of Health. Any added comments on this, on the stakeholder engagement from Liberia?

**Laura** Yeah. So I would echo a number of things that Virginia said. In fact, I had on my own notes the idea of the champion. I think that some of the challenges that have been involved is that not so far in Liberia but in other countries we've worked in there's been quite a turnover. And so, sometimes you can feel like you've made quite a bit of progress with the people and then there's a change, people are now gone and it's almost like you're staring at the beginning again. So that is very difficult and it means that you'll do better if you actually have engaged a number of people rather than just one where your history is going to go out the window when that person is transferred.

For us, because we're doing projects that involve many, many health facilities and we're trying to penetrate deep into countries, we work in addition to the federal ministry with the district ministries and those are the ones that we really need buy in for sustainability of the program so they can put things like maintenance and replacement of batteries into the budgets that they are asking for. These are also the people that are helping us with implementation so they need to be releasing some of their staff to get trained by us and to work with us. And wherever we can try and piggyback on to existing structures, we feel like this strengthens our program.

So for example, if the coal technicians in the district are the ones that are visiting health centers most regularly and have technical skills, those coal technicians are perfect for learning how to do installations and maintenance of the solar suitcase and they already have reasons to go to a clinic so that will help with follow up and maintenance. And the other thing we feel is that it's important to have the health workers and the community feel a sense of ownership and to feel empowered by this for the fact that this is going to be their equipment. And sometimes it's a bit tricky in the government because the health workers are not the owners.

So we have found where we've put these into private health centers people will take a sense of personal ownership right off the bat. But we actually need to work with the health workers, with the handover ceremony, with giving them a certificate after they've learned to use it, with having them feel a sense of ownership so that they'll both know how to use it properly but also notify us if there's any things that need to be repaired or fixed. So those I would say would be my most, the highest level points to share of this question.

**Luc**

Perfect. And that leads us to the next one as well but just by the way for our listeners as well, please feel free to ask questions in the chat box and we will try to address as many as possible after this moderated conversation. Yeah. So following on what Laura said it's—Maybe Virginia maybe you can start this off. What are some of the other project components that you from the beginning highlighted as, or highlighted as being crucial for the success or for guaranteeing success and for minimizing risks?

So Laura already mentioned it's much more about—it's much more than just dropping a solar energy solution or an energy solution at the clinic and then leaving. There's a whole support services side around it. There's a softer side around it in terms of community mobilization, in terms of ownership and training. So I just want to get a sense from you whether what type of project components or activities that you highlighted as being key especially given that this is the first of this type of clinic and most of the work that Solar Kiosk has done is more on the commercial side in terms of using these kiosks for commercial purposes. Virginia?

**Virginia**

Sure, Luc. I think the key element I would say at the very beginning is to size the system and the infrastructure properly. Actually, in our original design, we hadn't considered the air conditioning and heating aspect but in our discussions with the Ministry of Health it became that that was essentially given the conditions in Jordan particularly to ensure the equipment were

properly—so then we actually changed the clinic and enhanced it to be able to offer more energy. Excuse me. I think one of the other big aspects is training. So training how to take care of the clinic in terms of cleaning the solar panels as well as—[coughing] excuse me—the interface of the equipment with the electrical system. And those are key aspects as well to ensure that the clinic—that you really get the 15-year life out of the clinic as its built.

**Luc**

Great. Tinyan, any input here in terms of how your clinic system or I would actually say hospital system given the sizes that you mentioned, how they differ from the other interventions you've done, for example the schools?

**Tinyan**

In terms of how they differ, for the schools we do not necessarily provide 24 power for the entire school. What we do is we provide 12-hour intervention for the academic and academic parts of the schools and the classrooms which we run for just the daytime. And then for schools that have the boarding facilities attached, they also have solar power that runs throughout the night. But for the clinics it's 24-hour power solution round the clock for the clinics. Just to add to what Virginia also mentioned as a crucial part of the project really is for us it's really a proper—carrying out a proper audit of each facility so we can right size and then adequately anticipate what loads will be added in the future.

But added to that, another crucial part for us has also been communal ownership. We've been able to replicate this project in two other locations in Nigeria. One is in Kaduna state where we have deployed 34, solar power to 34 clinics which was just completed as a few weeks ago. And then we've also extended this to deploy solar PV in three hospitals in the Boko Haram effected northeastern Nigeria. But to get this moving, we have realized that involving the community to aid security of the systems, to optimize the operations of the systems, to ensure that there is maintenance going forward we always get the local community involved from the get go.

**Luc**

Thank you for that. A little bit linked to this but going a bit, delving a little bit deeper—and maybe Laura you can kick this one off. Are there any elements or preconditions be it external or internal which you say for We Care Solar this needs to be in place before we will consider an intervention? Be it government buy in or a certain level of staffing at the health facility or certain level of need or services that are being offered?

**Laura**

Yes. Absolutely. First of all, before we work in a country, we really want to choose countries that have appropriate need. And as an organization focusing on maternal healthcare we tend to select countries that have high rates of maternal and newborn mortality as well as big issues with energy poverty so there's a selection that even starts at the level of a country for us and we want to have a government that also looks like they could be a good partner with us. Are they interested in working with us on this issue?

As opposed to the approach that both of the other speakers talked about where you do a large energy audit and size your system, our system is more of a standardized system that is trying to reach many, many health centers over a short period of time. So we might put in 100 solar suitcases in clinics within a

couple of months. So for us, the selection process is can we find the appropriate type of health facility where the amount of electricity that we have to offer can be transformative. So we look for places that have no electricity whatsoever or who have very unreliable electricity. The health center needs to be—typically we like it to be one that has a one-story height because we're having not professionals do these installations but people that have been trained quite recently so we don't want them to be on super high rooftops. We of course want it to be unobstructed sunlight on top of the roof. There needs to be health providers that are doing deliveries and the clinic needs to be able to be open around the clock.

So it's the selection of the clinic that becomes very, very important. We need to have an excellent partner to work with because we are only in the country in terms of meeting the partners and doing the trainings and providing support technically but we're not there every single day. So selecting appropriate partners to work with, establishing very clear roles and responsibilities and having a signed contract in place is important. And one that should be obvious, there needs to be funding in place. Sometimes we started programs because we've led completely with our heart assuming that we'll be able to find a funder to backfill and we have found that to be very challenging. So now we do recommend that there's funding in place before we begin. We're also importing equipment into the country so understanding issues with importation, knowing people in the government that can help us to get duty free importation is also very, very important.

**Luc**

Excellent. Thanks for that. That's very clear. I would like to talk a little bit about the lessons learned and how they shape—lessons from previous interventions be it similar interventions or be it interventions in another sector, how they've shaped your current interventions. Perhaps Virginia you want to kick this one off.

**Virginia**

Sure. Well, as I mentioned the—our solution is an infrastructure and energy solution so I think again the learnings that we had in the field with our solution in the E-HUBB really as a retail outlet helped us to then be able to evolve that into solutions like the clinic and the school. And really the unique thing about our design is that its modular. So in Jordan we—the solutions is actually two kiosks so to speak put together with a series of canopies. But it could have been additional kiosks to allow for additional rooms. So I think that really, we owe a bit to the original design of our E-HUBB solution that it is applicable to many different types of use cases. So I think there that's very interesting.

I think also as I think the energy side is really built to have the machines, the machines capability and enable different types of appliances. So I think again it's something where really sitting and working with a partner who will actually be operating the solution is key to understand what types of equipment they are familiar with, to be able to use and also to be able to uphold over time. So I think really, it's really the original design of our solution that allows it to lend itself but we continue to evolve it very much based on our experience in the field moving to a different type of battery for



instance or also to a different sized inverter or different systems that allow for connectivity. So I think it's something that I think any good design will continue to evolve the more you use it and as technology evolves as well.

**Luc**

Tinyan, do you have anything to add to that in terms of how lessons learned have shaped your current intervention, especially the one at the hospitals and clinics?

**Tinyan**

Ok. This being our first project of this kind, we have rather taken from the lessons learned from this and improved on future designs like in the other two projects I mentioned in collaboration with the Kaduna state government and the Borno state government. One of the—what we have done basically is we have been able to improve contracting such that we now contract to—we contract better now so that we can also improve project timeline, the timeline of project delivery.

We've also improved the technology behind the systems. We've switched from the lead acid battery types to the lithium ion battery types in our future projects. We've been able to also insure that there is a strong government buy in prior to interventions. We want a situation where governments actually have signed agreements that can transcend from one administration to the next really. So their systems can actually stand the test of time and operation and maintenance contracts can be in place irrespective of the change in power. So basically, those are lessons learned that we have applied in future projects going forward.

**Luc**

Excellent. I want to ask one more question but Laura, perhaps you want to chime in as well on lessons learned. And I know you have a project \_\_\_\_\_ from your slideshow that your product has evolved somewhat but in essence it's the same product with the same goal in mind but clearly there's much more to it as a product in terms of the training and how it's being delivered. Anything you want to add at this point on lessons learned and how your approach has potentially changed?

**Laura**

Well, I think our approach has changed from one where literally I would personally go and bring a handful of solar suitcases to a few people to help me put them in to one where we now can ship 100 or 150 solar suitcases to an implantation partner and then we need to do the logistics and management about how to do a selection of health centers over a full district or two districts that engage a lot of other stakeholders. So I would say that some of the lessons learned have had to do with how to work effectively with partners especially when we're based in the United States and working with people in other sides of the world, how to create standardization in a lot of our operating principles. We now have these sheets that lay out very clear roles and responsibilities for ourselves and our partners to have the expectations clearly understood before we get going.

Very often our partners will do some element of cost sharing on the programs. That needs to be very much articulated so people don't have misunderstandings later. We work with our partners at the end of our program to understand what worked well and what things we'd want to change for the

future so we try and learn from that. And we've actually done now two separate reviews of partnerships. We've done a total of 40 partnerships now and we did a lessons learned after the first 25 and then we applied them to the next 20 or so and then we're now looking again to say what can we learn from this. We find that in terms of working with partners it's important to find partners that do have the capacity to take on a large project like this, that can communicate in a timely fashion, that are open to the challenges that can happen along the way and able to improvise when needed, that there are going to be partners that stay in that area for an ongoing presence, that they both know the place historically but that they'll be continuing there for the duration and beyond of the project.

And we have found that as far as our interest in trying to boost maternal child health, it seems easiest for us to work with health care partners because they are the most adept at identifying which health centers need help. They can help us train people on using the fetal Doppler. They can help us collect the kind of stories we need about health workers and how these things have impacted their lives. So we are sometimes using solar companies as technical support for the program. But as far as the large implementing partners they tend to be maternal child health oriented as well.

Luc

Perfect. Thank you for that. So we started this conversation talking about stakeholder engagement so for my last question—and after this question, after we've answered this then we'll open it up and Sean will lead up through the Q&A. So I want to bring it back full circle on the stakeholder engagement, a little bit wider than your actual intervention or your actual project and talk a bit about the coordination between stakeholders, between actors in this space be it public, be it private with—if I want to look at it positively to identify and explore synergies but from a negative point of view to at least avoid duplication? Because I think we all know there is always a risk of duplicating efforts because of a lack of coordination, because of a lack of information sharing.

Just to give you one example to—and then I will open it up to the three of you. In the project that we are currently managing in Ghana and Uganda on health facility electrification we organized a multi-stakeholder meeting, an inception meeting which we opened up to both health organizations as well as energy actors and then both public and private, civil society, etcetera. And in both Ghana and in Uganda during that inception meeting, already a potential risk of duplication was identified purely because you may be coordinating with different public agencies. One might focus more centrally. The other one more on the district level.

So I think that's my question to you is what is your current level of coordination within this sector in the countries that you're working in or in the regions that you're working in? Is it sufficient? What would you expect to see especially at that level? But please feel free to also add in international coordination and exchange of information and learning from each other. Maybe Tinyan, you want to start this one?

**Tinyan**

Ok. I would use the particular example of the intervention we're carrying out in the northeast as an example here because we are heavily involved in a lot of information sharing and coordination to achieve this. The location is still very sensitive security wise. There are a lot of sporadic terrorist attacks still going on. So for the focus of everyone carrying out the installation and moving goods to site we have found ourselves that we had to coordinate with other international donors, the UNICEF, the UNDP who happen to be part of reconstruction for these particular states. We have also been in touch with other international organizations like the international Red Cross to find out how exactly and which locations exactly are they supporting in terms of the internally displaced persons that need improved healthcare.

So we also get involved with coordination meetings with state security, federal security because of this and the safety of this location. So it's not something we can avoid. To what we do basically is we have monthly coordination meetings amongst these different partners to keep everyone abreast of what we are—the level of involvement or the stages the project has gotten up to. We also try to be sensitive about how we move goods and personnel to these locations and try to inform each other on what exactly is happening on site at what point in time. So it's not something we can particularly avoid to make this happen.

**Luc**

Virginia, any information in terms of coordination in Jordan or any exchange you've had with other stakeholders that helped shape your intervention?

**Virginia**

I think actually I would say that kind of once our intervention was there, there was a lot of interest from many different players in the clean energy space in Jordan. I think that we were lucky that at the inauguration of the clinic we were able to attract the interest of various potential technical partners as well as others in the renewable field that are also working in humanitarian and development context. So I actually found that by putting the clinic on the ground it really has opened a lot of doors for potential collaboration in the future.

But what I'll also say, in general I think that there's a lot of forums in terms of clean energy and solar. But I think something that really could help a lot of us in this space is to work a little bit with on policy with various governments, particularly for duties and taxes paid on bringing solar and solar components into various countries. I think this can be an inhibitor to really allowing the scalability of solar energy and I think it's something that we've seen in countries that have been duty free and tax free implication has really been powerful. So I would say that that's something in general kind of worldwide that we could all as a greater group work on to ensure that it would be as cost effective as possible to use solar as a renewable energy solution across many different countries.

**Luc**

Perfect. Thank you for that. Laura, I'm keeping you for last because you mentioned Liberia and in a previous life I implemented a project in collaboration with the department of infrastructure within the ministry of health while simultaneously somebody was implementing a project with the health management information systems unit at the Ministry of Health. And

let's just say it took too long to figure out that we had quite a high risk of duplication.

So Laura and especially for you because you, when you roll out you roll out to hundreds of clinics. Of course, it doesn't mean that if the solar suitcase is implemented in a clinic that by default it shouldn't receive a solar system for say vaccination, water pumping or other energy dependent services. But any information that you want to give in terms of coordination and how you manage that and how you share information, how you learn from others?

**Laura**

Yeah. I think it's really an excellent question. And you're right. When we work with hundreds of facilities that means that's a lot of places that we're trying to both be doing assessments on. And in countries that have received attention from a lot of other agencies, private NGOs, UN agencies, there tends to be when there's not a crisis like an earthquake, there tends to be a real lack of coordination. And so, it's very hard to go to any one place and know what's going on. And we have typically been working with the Ministry of Health to give us information, their assessments of which health centers have different types of electricity and their levels of reliability. And I can tell you, it's a bit of a coin toss as to when we go to a clinic whether that information is going to be correct or not.

So for us now, the very first stage of our programs is to go and do an audit at each of the health centers that we are considering to be including in the program and realizing that we may have information that we can verify from the Ministry of Health or it may be completely different. I didn't think of going to the Minister of Infrastructure. That's a really good idea, Luc. So probably we haven't even reached out to as many groups as we should. On the other hand, because our unit is quite specialized, the lighting is designed specifically for medical procedures, it also can be an excellent adjunct system to other programs that are going on. So it doesn't mean necessarily that a clinic would be ineligible. But if there is reliable power and a recently installed solar electric system that covers the whole unit, we will usually not do an installation and keep moving on.

So we actually train our installers to be aware of what is the right candidate clinic because sometimes our assessments may have been done three to six months before we do the actual installation in a given clinic. And so, if there have been new interventions that have happened since that time, it can be a problem. Right now, in Liberia we have a set of three implementation partners and the government and we meet every month to be discussing the program. So hopefully we are going to be avoiding the possibility of having some very new initiative happening simultaneously. We also have the Ministry of Health having signed this at the highest level and I'm going there next week to launch this program officially. And we've invited the ministry of lands, mines. We did the ministry of gender, the finance minister and the health minister all together so that at least we had at least one point in time when everybody should be informed of this program.

**Luc**

Perfect. I think that's a perfect point to end this conversation. I want to thank all three of you, Virginia, Tinyan and Laura. We talked about champions. We

talked about coordination and lessons learned. And with that I would like to pass controls back to Sean. Thank you very much, all of you.

**Sean**

Yeah. Just thank you everyone. Like to echo Luc's thanks. Great discussion. We do have a number of questions from the audience so we'll use our remaining time to go through those. So these are open to any of the panelists. This first question that we received asks so what are some of the technology challenges that we still face? We talked quite a bit about some of the implementation and policy and other challenges. But what issues do you find that you run into particularly with the Solar Kiosk and We Care Solar technology wise? What room for improvement is there? Perhaps we'll start with Laura for this one.

**Laura**

So for us, we spent the first few years looking at everything that could possibly fail in the solar suitcase and trying to improve it to make it stronger and trying to think about the fact that these were going to be in very remote settings where there wasn't going to be the possibility of just buying the new part if it was needed. So for the example one of the earliest solar suitcases, there were fuses there. We've now replaced those with circuit breakers. We have—for the devices that use batteries we use rechargeable batteries and include a battery charger so that people don't have to buy replaceable batteries. We also similar to the Solar Nigeria project have moved from sealed lead acid batteries to lithium ferrous phosphate batteries. That's allowing our batteries to have a life span of at least five years so its decreasing the need for maintenance.

We've developed lights. The lights that we first had were manufactured by another company. They said that these were ones that were used in bus stations and they were very durable for outdoor use. And we found that when we put them in Africa it was so hot much of the time that the voltage was higher in the system than I think these lights which were 12-volt DC lights were used to. And a lot of them had LEDs that burned out. So we had to remanufacture the lights completely so that they would have a large heat sync so that they would have the ability to accommodate the voltages that we were seeing in our 12-volt system. So I'd say there was a lot of times where we had opportunities to learn from mistakes and make things better.

I'd say one of the biggest challenges that all of us face in this field is the sustainability challenge both in terms of recognizing when there's problems and then having mechanisms to solve those problems. So one of the technologies we're in the process of developing now is a remote monitor so that we can know at a given time whether or not there's issues, whether a battery is going to be needing replacement, if there's a light that has any problems. The suitcase is made to be pretty durable and it hasn't been cost effective to try and send someone every few months to a health facility. The transport costs are so high for that. So if we can have some sort of an automated information system to let us know where we need to target help, we think that's going to be an effective enhancement of our systems.

**Sean**

Thanks, Laura. Virginia, anything to add?

**Virginia**

Yeah. I would say like Laura our solution, we've continued to evolve it in the field. We've had our E-HUBB solution in the field for over four, almost five years. And I think you continuously for us improve the both the construction side as well as the energy generating side. We do have remote monitoring but of course that's a challenge if you don't have any network. So that's why we also looked at satellite solutions both for monitoring the energy usage and consumption or sorry, the production and consumption as well as for use by those working within the unit. So I think that again remote, having units in very remote locations is a challenge. And so, we've been working in countries like in Jordan where we don't have our own technical team on the ground. We've been working to find local partners that can ensure a response time of 24 hours or less.

But I think that we saw a revolution in the really the solar panel side and I think we continue to see improvements on the side for the batteries. So technically it will continue to evolve. I think probably what's similar to the suitcase and our E-HUBB or kiosk is that it's integrated, the infrastructure and the electrical system and energy generation is integrated together. So that can provide some durability and also I think security. I think something that we know happens is that solar panels of course are very valuable. So you have to ensure that you—that they are kept safe and that they can't be stolen from the system.

**Sean**

Great. Thank you very much Virginia. We'll actually stick with you for the next question. One of our attendees is wondering how much the Solar Kiosks cost. And if it's not a set price, how do you go about determining the cost per installing those?

**Virginia**

Yeah. So as I mentioned with the kiosks we really have a range of offerings. So we've actually—our original units in the field were one kilowatt peak with the size of the kiosk that you saw in the pictures. We actually now are developing a new offering that will be about half the size and half the energy capacity. And our offerings go up to the size right now of the clinic that you saw in the pictures as well, eight kilowatt peak. So the pricing really depends on the amount of infrastructure and then energy generation. So you can have as I mentioned liked a mini kiosk that would start at something like \$12,000.00 and going upwards towards the clinic.

And I think it also depends as well on what's, what type of equipment is inside. Of course, for the clinic you have equipment that's going to be more expensive than in perhaps the school or in an E-HUBB say that's used for a retail business. So it really depends but of course also there's considerations on where it needs to go and the ease of implementing it. But our solution, our standard one kilowatt peak or two kilowatt peak solutions can be implemented in about two days with a crew of four people. So it's really meant to be a solution that is ease and is quick.

**Sean**

Great. Thank you both. This next question is for Tinyan and it asks for the Lagos state case, if you had to summarize what were the key lessons that you learned as an opportunity for improvements in future similar projects?

## Tinyan

One key lesson learned it to get more private firms involved in this process and turning it commercialized, commercialize the opportunity in collaboration with the state government, that there's actually a possibility that especially in a state like Lagos we realized that because of the size of the project and the way in which it is actually providing solution to the clinics and the primary health centers, private organizations have indicated interest to the Lagos state electricity board that they would like an opportunity to deploy the solution and then the government can pay them overtime for the maintenance of the system, running into the years.

We also realized that the government buy in especially going into future projects is key really. We will continue to emphasize that over and over again. The only way the systems have proven to be sustainable, especially in the states that we have deployed them is because we have state governments like the Kaduna state government and the Borno state government who are just—who we are now in collaboration with have actually bought into these projects. Without this we really can't have systems of this size and this nature be operational.

## Sean

Great. Thank you very much Tinyan. We are out of time so to any attendees who we didn't have the chance to ask your questions I do apologize. I will gather those together and email them along to the panelists so that they can have the chance to respond. So we will go ahead and wrap up now. On behalf of the Clean Energy Solutions Center I do just again want to thank our presenters for taking the time today. Great presentations, great discussion. We really appreciate you taking the time to do that. And also to our attendees, thank you again for joining in today for the webinar. I invite everyone to check the Solutions Center website if you'd like to download a PDF version of the slides.

We'll be posting those as well as a full recording of the webinar to that, the training page within about a day or two. Also, just a reminder, we're now posting webinar recordings to the [Clean Energy Solutions Center YouTube channel](#). We have over 100 videos out there of our previous webinars and other clean energy topics as well. And finally, just want to remind you as you exit the webinar a short survey will pop up. We very much appreciate your responses to that. And so, with that, I hope everyone enjoys the rest of your day and we hope to see you again at future Clean Energy Solutions Center events. And this concludes our webinar.