U.S. ENERGY ASSOCIATION (USEA)

COOPERATIVE AGREEMENT AID-0AA-A-17-00010

ENERGY UTILITY PARTNERSHIP PROGRAM (EUPP)

SEMI-ANNUAL PERFORMANCE MONITORING REPORT

October 1, 2018 – March 31, 2019

Submitted April 2019

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United States Energy Association
Energy Utility Partnership Program
Cooperative Agreement (AID-0AA-A-17-00010)
Semi-Annual Performance Monitoring Report
October 1, 2018 – March 31, 2019

I. EXECUTIVE SUMMARY

The United States Agency for International Development (USAID) awarded a Cooperative Agreement Award (AID-0AA-A-17-00010) to the United States Energy Association (USEA) on July 21, 2017 to establish the *Energy Utility Partnership Program (EUPP*). The purpose of the United States Energy Association (USEA) Energy Utility Partnership Program (EUPP) is to increase sustainable modern energy services and clean energy production in developing countries through volunteer-driven partnerships that mobilize overseas utilities to better address energy service priorities, while improving productivity and quality of service.

In accordance with the Cooperative Agreement, USEA is submitting a Semi-Annual Performance Monitoring Report for the period October 1, 2018 to March 31, 2019.

Under this Cooperative Agreement, USEA will establish the following programs and partnerships:

Bilateral Utility Partnerships
In a bilateral partnership, a utility or other energy sector entity will form a partnership with a counterpart entity overseas to share best practices and hands-on experience in one or more areas.

- Ethiopia Distribution Partnership
- Rwanda Energy Partnership
- Tanzania Capacity Building Partnership
- Kenya Partnership
- Senegal Wind Integration Partnership
- Kenya Geothermal Partnership
- Uganda Energy Partnership
- Colombia Energy Partnership
- India Greening the Grid Partnership
- Ethiopia Geothermal Partnership
- Honduras Partnership*

* Honduras has been added to our EUPP partnerships with a buy in from the Honduran Mission.

Regional Utility Partnerships
These partnerships will advocate for cooperation among neighboring countries to transition towards improved regional energy integration and cross-border energy trade.

Technical Assistance
Bilateral and regional partnerships will be augmented with targeted technical assistance initiatives to meet the objectives of EUPP and support USAID-assisted country utilities in overcoming barriers to efficient and effective management of electricity infrastructure.

Training
In coordination with USAID staff and developing country utilities, the EUPP will identify high priority topics for in-person and online training.

Private Sector Coordination
Through USEA's network consisting of major players in all sectors of the U.S. energy industry and the subcontractor's extensive experience in the energy sector, a team of experts will serve as a Private Sector Advisory Council (PSAC) for EUPP. The PSAC would provide recommendations for the selection of potential pilot programs as well as guidance and counsel on their implementation. Additionally, Utility- Corporate Partnerships will be formed to implement initiatives to share best practices in corporate renewable energy (RE) procurement.

Knowledge Management
An important part of the EUPP is the preservation and dissemination of key materials developed under the agreement. USEA will continue to distribute information on EUPP activities according to the Marking and Branding plan submitted to USAID.

II. COMPARISON OF ACCOMPLISHMENTS

EUPP assists USAID's Bureau for Economic Growth, Education and the Environment (E3) of USAID's Office of Energy and Infrastructure (E3/E&I) to accomplish its objectives of (1) increasing access to environmentally sound modern energy services by improving policy and legal frameworks to establish necessary market conditions for the private sector delivery of energy services and environmental management services, (2) increasing institutional ability to provide or deliver clean energy and environmental management services in new and enhanced markets, and (3) increasing public understanding of, and participation in, decisions regarding delivery of energy and environmental management services.

Under this Cooperative Agreement and subject to the availability of funding, USEA plans to:

- Establish eleven (11) energy utility partnerships, including the continuation of the GTG India, Senegal, Kenya, Ethiopia and Tanzania partnerships.
  Summary: *To date, USEA has begun the Colombia, Rwanda, Ethiopia, Uganda, Senegal, Honduras, and GTG India partnerships.*

- Conduct one independent assessment of the impact of the EUPP on USAID strategic objectives and developing country development priorities;
  Summary: *This will occur at the end of the Cooperative Agreement.*

- Establish a Private Sector Advisory Council (PSAC)
  Summary: *USEA will discuss the formation of the PSAC with the AOR in FY2019 to finalize the structure and purpose of the PSAC.*

- Establish a Utility Corporate Partnership
  Summary: *USEA will discuss the formation of the Utility Corporate Partnership with the AOR in FY2019 to finalize its structure, purpose, and participant.*

- Disseminate Information on Programs and Results
  Summary: *USEA is currently working on updating the website and has created social media campaigns around activities for external communications.*

According to the cooperative agreement, USEA is submitting "A comparison of actual accomplishments with the goals and objectives established for the period."

A. PROJECTED RESULTS AND ACTIVITIES OF EUPP

For FY 2019, USEA anticipated contributing to USAID objectives by conducting the activities below. Outcomes to date are included.

ACTIVITY	FY 2019 Target	Actual FY19 (10/1/18—9/30/19)	Actual (10/1/17—3/31/19)
Current Partnerships: *Colombia, Ethiopia, Rwanda, Uganda, Senegal, India Coal Flexing, Kenya, Tanzania, Kenya Geothermal, Ethiopia Geothermal, Honduras*	9	11	11
Organize Activities 1st Half FY2018: 10 2nd Half FY 2018: 8 1st Half FY2019: 22	20	22	40
Sponsor Delegates to Workshops/Conferences	0		0
Annual Work Plan *FY 2018: The annual work plan for FY 2018 was submitted to USAID E3 on October 20, 2017* *FY2019: The annual work plan for FY 2019 was submitted to USAID E3 in October 2018.*	1	1	2
Semi-Annual Reports *USEA submits Semi-Annual Performance Monitoring Reports instead of Semi-Annual Reports.* *FY 2018: 2* *FY 2019: 1*	2	1	3

B. EUPP ACTIVITIES – *Conducted between October 1, 2018 and March 31, 2019*

1. BILATERAL UTILITY PARTNERSHIPS

RWANDA PARTNERSHIP

See Section "Training" for Rwanda activities this reporting period.

TANZANIA PARTNERSHIP

See Section "Training" for Tanzania activities this reporting period.

KENYA PARTNERSHIP

No activities in this period under this Cooperative Agreement.

SENEGAL PARTNERSHIP

Project Management Workshop
February 2019

Over the past two years, Senelec has hired over 800 additional employees. Their staff is composed of highly motivated, dynamic, intelligent young employees with the desire to improve their professional skillsets and capabilities. One key challenge presented for the young employees is project management expertise. Senelec's employees indicate a lack of a clear project management system and currently projects are managed based on individuals' personal experience rather than a guiding set of principles. The purpose of this workshop was to enhance the capacity of SENELEC for effective and efficient project management. In particular, the program focused on defining, initiating, planning, executing, monitoring, and closing-out projects.

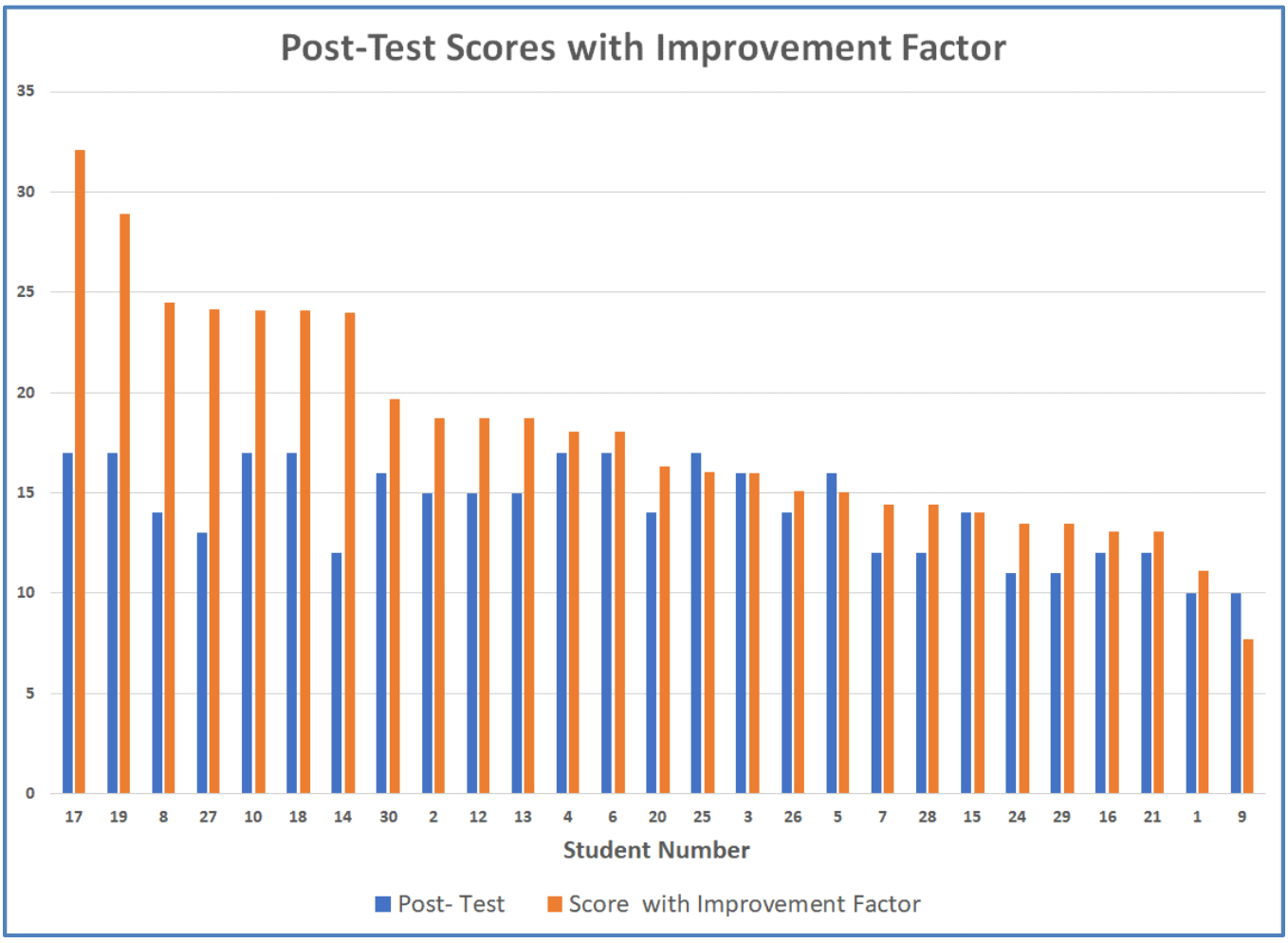
This week-long workshop on Project Management was a follow-on to the Fundamentals of Project Management workshop that was conducted in Dakar in July 2018. Whereas the first workshop focused on an introduction to project management, this workshop went into greater depth, delving into best practices in project management, risk management, procurement, change orders and claims management, and business ethics. The Instructors: Tchegnon Amoussou of EGNON Consulting, Jean Louis Allou of Africa Project Management, and Andre Onana of the Project Management Institute (PMI)-Senegal Chapter, were all PMI Certified experts in Project Management. Lumas Kendrick of Mott MacDonald facilitated the workshop on behalf of EUPP.

The participants of this workshop were split up into six teams: Purple, Orange, Yellow, Green, Blue, and Red. Each team was required to work together throughout the week to work on a real project provided by

Senelec on rural electrification and come up with recommendations and lessons learned from each session. The agenda was designed to follow the steps of developing a project: Day 1) Project Initiation, Day 2) Project Planning, Day 3) Project Execution, Day 4) Project Monitoring, Control, and Close-out, and Day 5) Next Steps and Recommendations.

Results

In order to identify the most improved students who also scored high on the post test, a formula was developed which factored in the improvement. (Score = Post-Test *(1 + % Improved).



Evaluation Comments

Below are the most salient desired topics/actions extracted from the Evaluation Forms completed by the students:

Provide more training on software (MS Project), Cost management, Risk management, and Project Charter. The participants also requested information on how to obtain PMI Certification, more time for presentations, Off-site training, send material in advance, divide into two levels, more microphones.

Cost Share

	Private Business	Recipient Country Government	(blank)	Grand Total
Africa Project Management	13200			13200
EGNON Consulting	13200			13200
PMI Senegal	13200			13200
SENELEC		117600		117600
Grand Total	**39600**	**117600**		**157200**

List of Participants

First Name	Last Name	Title	Department
Alassane	BA	PM	DG
Ibrahima	BADIANE	Chef de projets	Transport
Arona	BALDE	Chef de service	Transport
Marieme Thieo	BASSE		
Mikaella Zenab PEREIRA	DE CARVALHO	Chef de service	RH
Ibrahima	DIACK	Coordonateur de Programme	Smartgrid
Mbène	DIAKHOUMPA	Chef de service	QSE
Ousmane	DIONGUE	Chef de projets	SI
Elhadji Malick	FALL	Chef de projets	Génie Civil
Mouhamadou Doudou	FAYE	Expert Suivi Contrat Maintenance	Production
Aliou	GADIAGA	Chef de département	Distribution
Adama	GAYE	Chef de service	Transport
Ibrahima	GUEYE	Expert Environnement	QSE
Cheikh	KA	PMO Yeesal	DG
Omar	KEBE	Chef de projets	Distribution
Jacques	KENY	Chef de projets	Génie Civil
Ndeye Aida	LETTE	Chef de projets	Transport
Aboubacar	LY	Chargé du suivi évaluation	PASE
Margot Rokhaya	LY	Expert junior Gestion de projets	DG/PM
Madiagne	NDIAYE	Chargé de suivi évaluation	Distribution
Khadim	NDIAYE	Chef de projets	Production
Cheikhou Oumar	NDIAYE	Expert Environnement	QSE
Djibril	NDOYE	Chef de Département	DPFC
Issa	NIANG	Coordonateur Cellule PAMACEL	Distribution
Mamadou	NIASSE	Chef de projets	Génie Civil
Mamadou	POUYE	Chef de projets	Distribution
Momar Awa	SALL	Chef de service	Transport
Khouredia Faye	SECK	Chef de service	RH
Mactar	SECK	Chef de projets	Génie Civil

Djenaba	SIDIBE	Expert Chef de projet Yeesal	DG/PMO
Saidouna Mouhammad	SOGO	Chef de projets	Génie Civil
Mouhamadou Moustapha	TOURE	Expert Environnement	QSE

Deliverables

- All Instructor presentations
- Exam Papers
- Team Presentations
- Evaluations

Unachieved Goals

- Not applicable – the goals for this exchange were achieved

Next Steps

- USEA will sponsor 2 Senelec employees to be certified in project management
- USEA will host a 5-day workshop on portfolio management
- USEA will host a 5-day workshop on contract management, negotiation, and dispute resolution

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ETHIOPIA PARTNERSHIP

See "Training" Section for Ethiopia activities this reporting period.

KENGEN GEOTHERMAL PARTNERSHIP

See Section "Technical Assistance" for KenGen Geothermal activities this reporting period.

UGANDA PARTNERSHIP

Uganda Hydropower Remote Monitoring Executive Exchange
October 8-19, 2018

Only 22% of Uganda's population of 39 million people have access to electricity. The Government of Uganda (GOU) has a goal of increasing access by 80% as the population increases to 71 million people by 2040. Hydroelectricity provides around 75% of total generation in Uganda with an installed capacity of 950MW. In order to meet the GOU's goal, the installed capacity must rapidly increase to 42,000MW. The Uganda Electricity Generation Company Ltd. (UEGCL) is the state-owned utility charged with meeting this generation target. Currently, UEGCL oversees the operation, maintenance, and development these hydropower plants as well as other generation sources within Uganda. However, Uganda has several older hydropower dams that

are inefficient and need retrofitting, such as Nalubaale/Kiira Dam, as well as several new hydropower dams under construction, like the Isimba and Karuma Dams.

A team of 10 UEGCL staff and board members travelled for a two-week Executive Exchange to the USA to engage with different hydropower utility companies and software developers to discuss best practices in hydropower operations and maintenance, dam safety, remote monitoring of generation systems, asset management and integrated resource planning.

The utility companies included Chelan Public Utility District (PUD), PacifiCorp, and Bonneville Power Association (BPA). The team also participated in the 2018 CEATI Asset Management Conference in Newport Beach, Los Angeles in California and held meetings with Oracle Corporation, and Copper Leaf Technologies Inc.

Results

UEGCL developed the following recommendations that they plan on implementing upon returning to Uganda:

- Using the recently developed Shuffled Complex Evolutionary Turbine Optimization Model (SCE_TOM) to quantify the potential gains in efficiency and generation if their turbines are replaced;
- Creating a plan for optimized investment planning of projects;
- Automating many of the critical plant processes (risk-based evaluation);
- Creating a centralized operation process using SCADA across all plants with a centralized database
- Establishing a centralized database framework- contribute to Chelan PUD's Hydro Research Institute
- Purchasing the necessary software applications:
    - Oracle: Human Capital Management Cloud, Enterprise Resource Planning (ERP), Enterprise Performance Management (EPM), Primavera
    - IBM: Maximo
    - Copperleaf: C55 Asset Management
- Applying for membership to CEATI and the International Commission on Large Dams (ICOLD);
- Developing a comprehensive dam safety plan, such as the PacifiCorp model, and practice annual emergency simulations;
- Installing remote monitoring (CCTV cameras) in the powerhouse to improve dam safety of the plant;
- Developing an enterprise-wide generation portfolio of projects in an Integrated Resource Plan in collaboration with the Ministry of Mines and Energy, UETCL, UEDCL, and ERA. This IRP would also include a risk-based prioritization of investment plans. The Government of Uganda will also need to forecast national demand and improve stakeholder engagement;
- Downloading all the free FIST manuals by the U.S. Bureau of Reclamation;
- Developing a dam safety plan in partnership with community leaders and government agencies.

Cost Share

	Non-Governmental NGO	Other Non-USG	Private Business	Recipient Country Government	USG	Grand Total
Bonneville Power Administration					7500	7500
CEATI	15834					15834
Chelan PUD		112000				112000
Copperleaf			11687			11687

Oracle			14495			14495
PacifiCorp			11000			11000
Southern California Edison			2000			2000
U.S. Bureau of Reclamation					2000	2000
UEGCL				28250		28250
(blank)						
Grand Total	**15834**	**112000**	**39182**	**28250**	**9500**	**204766**

List of UEGCL Participants

Name	Title
George Tusingwire Mutetweka	Chief Operations Officer
David Isingoma	Chief Strategy Business Development Officer
Harrison E. Mutikanga	Chief Executive Officer
Joshua Karamagi	Chief Finance Officer
Fredrick Wasike	Senior Civil Engineer
Augustine Mugisa	Electrical Engineer
Peter Otto	Dam Safety Engineer
Flavia Anyiko	Risk Manager
Zeridah Zigiti	Director Board Chairwoman
Proscovia Njuki	Board Chairwoman

Deliverables

- Continued development of Maturity Model for Asset Management Plan (UEGCL's Current Maturity Index = 0.7) -- Goal of reaching a level of 3 by 2023
- Recommendations by participants to implement asset management
- Recommendations by participants on which software to purchase (Oracle suite)
- Recommendations by participants on technology that can be used at Ugandan hydro plants to improve plant efficiency and reliability
- Recommendations by participants on remote monitoring in UEGCL
- Recommendations by participants on developing an Integrated Resource Plan within their Strategic Plan
- Recommendations by participants to improve dam safety

Unachieved Goals

Not applicable – the goals for this exchange were achieved

Next Steps

The next steps for UEGCL to achieve ISO55000 maturity index level of 3 are the following:

- Develop a company-wide roadmap for implementation of asset management (action plan)
- Train key staff for ISO55000 certification with the Institute of Asset Management. Individual accreditation through a week-long training and examination.
- Draft a Strategic Asset Management Plan (SAMP) that identifies the risk, lifecycle, and value of assets;
- Maintain clear communication across the organization and stakeholders the importance of asset management;

- Evaluate the necessity for UEGCL as a whole to be ISO55000 certified – currently, UEGCL has a goad to be certified in 5 years, but the company doesn't necessarily need to be in order to receive the benefits. As long as the company reaches a maturity level of 3 out of 5 and the necessary employees are individually certified, this should be enough. However, since Uganda is a developing country there is discussion that having company-wide ISO certification may attract foreign investment and legitimacy.
- Explore joining CEATI group ($19,000/year) and becoming a member of the Asset Management Interest Group. With this, UEGCL will have access to valuable technical resources for continual learning and improvement;

Other recommended steps UEGCL plans to take include:

- Hiring dedicated Asset Management Staff and then create an Asset Management Department
- Beginning Cascade Management of dams along the Nile River (RiverWare Software) – annual license $6,560
- Creating a UEGCL Hydropower Resource Training Center – "train-the-trainers" workshops on O&M
- Joining the Institute of Asset Management (IAM) – Annual membership is $550
- Contributing data to the Hydropower Resource Institute organized by Chelan PUD
- Internally evaluating the feasibility and appropriate phasing plan for adopting the Oracle cloud solution for integration of all internal processes and Copperleaf's C55 to optimize asset investments. UEGCL will also consider the utilization of IBM Maximo and HydroAMP as the primary software for plant operation and maintenance.
- Developing capacity to identify, assess and evaluate risks for mitigation of possible consequences and maximization of profits.
- Automating of critical operation and maintenance processes as well as optimization of Capital Investment Planning such as using the Turbine Design and Operation Model (Deterministic) and Economic Model (Stochastic) are vital.
- Building capacity on the SCADA system to improve remote monitoring abilities of UEGCL using SCADA, as well as the establishing a centralized database for data storage.
- Instituting a robust dam safety program encompassing continuous training, collaboration with other utilities and membership with subject matter organizations such as the CEATI Dam Safety Interest group and ICOLD to improve Dam Safety. For efficiency, consideration will be for remote monitoring using CCTV and robotic total stations.
- Developing an Integrated Resource Plan (IRP) to inform business plans and strategy. The ABB system optimization tool as well as Planning and Risk Model should be evaluated for possible use in developing this plan. However, this will require a dedicated planning team with the competencies to develop and analyze stochastic models.

Recommendations

- Acquisition of IBM Maximo and Oracle Cloud based applications (Human Capital Management, Enterprise Resource Planning and Enterprise Performance Management) for improving operations and maintenance of UEGCL's hydropower plants and enhancing staff's productivity respectively. This software is expensive therefore UEGCL requests for seed financing to acquire the software, and UEGCL will pay the periodic licensing fees to keep the software operation. However, UEGCL proposes a phased approach in the acquisition of the software in order to avoid redundancies and high overhead costs
- Twinning arrangement with US utilities such as exchange visits by staff from both UEGCL and US utility companies such as Tennessee Valley Authority (TVA). This will include staff placements for capacity building.

- Hiring of Short-Term Experts (e.g. Chelan staff who are about to retire, etc.) to come and work with UEGCL for a period of one or two years in the areas of operations and maintenance.
- Support from US Army Corps of Engineers will also be very beneficial to UEGCL. They presented a very good paper on optimization of generation turbines together with Bonneville Power Administration (BPA) at the CEATI Conference.
- Training of Asset Management Group for certification from an Accredited Asset Management Training Institute.
- Support in establishment of the Research and Development function through benchmarking with Utilities in the USA such as Chelan PUD which is establishing a well-designed R&D Unit.

EAPP PARTNERSHIP

EAPP Scoping Mission
October 1, 2018

USEA met with three executives of the Eastern African Power Pool (EAPP) to discuss the status of the EAPP expansion, upcoming plans, the USEA workplan and future activities.

Results

USEA created a draft workplan based on a Scope of Work. However, it is currently being discussed as many items seem to already be covered under a World Bank program.

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
EAPP			$750	$750
Grand Total				$750

Participants

Last Name	First Name	Organization	Position
Changullah	Lebbi	EAPP	Secretary General
Manirakiza	Patrice	EAPP	Power Engineer
Hashim	Haitham Ahmed	EAPP	Power Engineer

Deliverables
N/A

Unachieved Goals
The Workplan is still not final because of concerns that it covers items already under a World Bank project.

Next Steps

USEA will continue to discuss the Workplan with the World Bank and EAPP to determine what USEA should cover. USEA will change the workplan as needed.

INDIA GREENING THE GRID

Coal Flexing to Support Variable Renewable Energy Integration and Grid Balancing Executive Exchange

January 28-February 1, 2019

India plans to deploy unprecedented levels of renewable energy (RE) on its power grid – 175 GW installed capacity of renewable energy (RE) by 2022. (Current estimates stand at approximately 43 GW of installed RE capacity.) Further, India's Nationally Determined Contributions (INDC) extends this ambition to 40% non-fossil fuels-based electricity generation capacity by 2030. This will greatly reduce the economy's carbon intensity and strengthen energy security. Compared to conventional power, however, India's key RE options are more variable, less predictable and often further from demand centers. Experience in other systems has shown that when penetration of RE reaches significant levels, the capacity of the power grid to manage it has to be addressed to avoid challenges to the reliability and affordability of electricity. Critical to integrating VRE into the power system is rigorous analytical support to identify grid stability issues, options for optimizing dispatch, and sources of potential flexibility.

The objectives of this activity were to create a platform for peer-to-peer dialogue to allow U.S. utilities to share experiences and lessons-learned with their Indian counterparts on the use of coal-powered generation as a flexible resource to balance variable renewable energy generation.

Issues discussed included but were not limited to:

1) Operational Practices to achieve flexible operations
2) Addressing retrofit requirements for cycling
3) Improving Control Systems and Instrumentation
4) Risks and Challenges with flexible operations
5) Capacity building

The participants identified several measures that they would like additional capacity building support. These include:

- Formal roadmap/step-by-step guide on implementing flexibility in a coal generator
- Burner management during low load
- Furnace mapping
- Technical modification of valves, drains, pipelines, etc. including C&I activity
- How to (operationally) ramp up and down units
- How to maintain flame stability at minimum loads
- How to lower the technical minimum of the units
- How to control steam temperature and metal temperature during following
- How to change the mindset of the operators (change management)
- Assessment of cycling damages
- Assessment of water chemistry related issues

- Assessment of real cost of cycling
- Condenser cleaning systems

The participants also identified several obstacles facing India's successful implementation of coal flexing. These include:

- Unpredictable wind energy
- Old power units
- Outdated controls in older units
- Poor coal quality (low in SOx and NOx, but low in BTUs) and unpredictable sourcing (such that coal generator must adjust their handling frequently)
- Mindset of working personnel
- Incentivizing coal flexibility

Results

All 5 delegates gained confidence for operating their own plants flexibly. NTPC delegate Guha has confidence that after seeing the US utilities having successfully reduced their minimum loads without expensive retrofits, he feels confident India can do the same. NTPC delegate Pola reported that his plant has successfully reached a minimum load of 55% but now feels he will be able to reduce to 40%. NTPC delegate Singh is confident now that NTPC's system's flexibility can be improved through taking a systematic approach.

When asked what materials, ideas or procedures the participant plans to use or recommend for use in their organization, USEA received the following responses:

NTPC

Suresh Pola

1. Flexibilization of units
2. Sliding pressure operation – it should be a fairly easy operation to implement
3. Standard operating procedures
4. Tuning of control systems – without this it is very difficult to flexibly handle the units
5. Minimizing mill operation (taking out mill)
6. Sliding mode operation
7. Operating pumps at low loads – NTPC needs to look at this
8. Recirculation valves

Subhashish Guha

1. Systematic approach for bringing down load (as the Duke Foxboro and EPRI's approach modeled). Write a standard operating procedure for reducing to low load and for maintaining at low load.
2. At minimum load, all the controls should remain in auto-mode if possible which is a big learning
3. NTPC needs to start tuning their scanners

Dharmendra Singh

1. Equipment protection approaches (as modeled by Duke)
2. Long term cost calculation (as modeled by Xcel Energy)
3. Benefits of reducing regulatory lag as much as possible to ensure more accurate cost recovery associated with flexing
4. Need to maintain equipment in healthy condition and apply a systematic approach
5. Insolation quality

6. Ensure there are no leakages
7. Develop an advanced knowledge team.
8. Need operating procedure for all levels – low load and regular load

GSECL

PR Patel

1. Power stations should be as clean as is practical without unnecessary clutter
2. The lesson that without investing single operational activities will be reviewed and convection will be done

BA Gandhi

1. Low load operation philosophy
2. Low load operation without major retrofitting
3. Precautions for low load flexible operation
4. Templates of Marshall station to identify units for flexible operation
5. The condition of the plant determines the ability to operate flexibility
6. Form working groups to identify all the issues facing flexibility and brainstorm together to develop solutions

Duke Energy and Xcel Energy provided a variety of recommendations to the delegation. These included:

- Recommend India install more O_2 probes in the boiler outlet now that India is flexing more. India normally has 1-2 vs. US has 5-6.
- Slagging is an issue in coal furnaces. A unit should only blow soot as needed. NTPC tends to do once per week. Duke recommends just doing as needed and it will be necessary more commonly when changing coal. You can set up cameras in furnaces and then look at footage to see if the unit should do more soot blowing. This can be done even a couple of times per day.
- Recommend forming groups of experts to do brainstorming and conduct a risk assessment (and measuring probability and impact) method process. Duke shared how they identified what needed to be tested. Then operators were given all this understanding of risks so the utility can make informed decisions. An example of a question the Indian utilities need to be able to answer – what is more expensive: the damage/cost shortening the lifespan of the part or immediate damage? Need to know this for all parts impacted in order to make an educated decision.
- Xcel Energy's coal-cycling study is publicly available. This process and the discussion with the regulator could be a good case study for the USAID System Flexibility partnership.
- Intertek recommended AGC as the top operational necessity for India.
- Duke Energy's Central Operations will look at the overall architecture of sensors etc. that they want and make GE add them for new installations. Duke has even specified what type of sensors – don't just accept GE recommendations and GE sensors. Want only "open source environment" (OSE) sensors. Duke recommends the Indian utilities use a similar approach to ensure they get what they need.
- India uses the OEM (the numbers given to them by the manufacturer) and consider them actual. However, those numbers are conservative for liability reasons and so the manufacturer can sell upgrades. Duke plants run tests so they know the real numbers and recommend Indian utilities do the same.
- Duke recommends that when running tests and deciding your real minimum operation, need to assume it may be at that minimum for weeks, not just hours. Different issues crop up when running at lower loads for a long time.

- Duke recommends that utilities strategize how to run different units to stay within NO_x limits. Scrubbers become ruined at low loads. Duke is trying to get SCRs to work at low loads.
- US plants do chemical cleaning every 10-15 years vs. India does about every 5 years. Not mandated, so it is best to only do when necessary.
- India may want to consider designing a plant with hardier parts to handle flexibility. For instance, double boilers so can take one off and keep the steam going. This type of plant would be much more expensive, but it might be considered cost effective if you know in advance you are going to run flexibly.
- More flexing leads sensors in the furnace and boiler to be off, so need to check the sensors at least once per year.
- Xcel Energy shared their process/history of working with the regulator to keep the regulator informed of the expected costs of flexible operation. Xcel has worked very closely with the regulator so that they are anticipating as many of the costs as possible, and then pass them through accurately to the customer. It's part of the Integrated Resource Planning.
- Xcel's Pawnee station removes a mill to lower load. It takes about 20 minutes to replace. This enables lower loads without de-commitment. (Note: Emissions control become less stable using this method.)
- When a PPA operator comes in asking for something to be adjusted, Xcel does some horse trading – agrees to what the operator wants and then says to get it, operator has to do Automatic Generation Control (AGC).

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
NPTC India Ltd.			$5,250	
GSECL			$3,250	
Intertek		$1,500		
EPRI	$4,090			
Duke Energy		$18,465		
Xcel Energy		$15,758		
Grand Total	$4,090	$35,723	$8,500	$48,313

List of Participants

LAST NAME	FIRST NAME	ORGANIZATION	POSITION	GENDER
Pola	Suresh	NTPC	AGM (O&M)	M
Singh	Dharmendra	NTPC	DGM (OS), EE	M
Guha	Subhashish	NTPC	AGM (Oprn)	M
Patel	Piyush Kumar	GSECL	SE	M
Gandhi	Bhuvanesh Kumar	GSECL	EE	M

Kumar	Nikhil	Intertek		M
Alley	Thomas	Electric Power Research Institute	Senior Program Manager	M
Caravaggio	Michael	Electric Power Research Institute	Senior Program Manager	M
Sisk	Elizabeth	Electric Power Research Institute	Generation Business Operations Manager	F
Brown	Tranissa	Electric Power Research Institute		F
Espinoza	Neva	Electric Power Research Institute	Director - Generation	F
Immel	Steve	Duke Energy	Vice President Carolinas Coal Generation, Headquarters	M
Oliver	Mark	Duke Energy	Managing Director System Optimization, Headquarters	M
Hoeflich	Peter	Duke Energy	Director Analytical and Program Engineering, Headquarters	M
Julius	David	Duke Energy	Director Technology Development, Headquarters	M
Roper	Rick	Duke Energy	General Manager Regional Stations, Marshall Steam Plant	M
Jones	Chuck	Duke Energy	Sr. Engineering Technologist, Roxboro Plant	M
Tuck	Terry	Duke Energy	General Manager Regional Stations, Allen Steam Station	M
Storm	Stephen	Duke Energy	Central Engineering, Boiler Performance Program Mgr.	M
Dean	Steve	Duke Energy	Analytical and Program Engineering, Lead Engineer	M
Gaba	Peter	Duke Energy		M
Hedges	Greg	Duke Energy	Marshall Plant	M
Parks	Keith	Xcel Energy	Senior Trading Analyst	M
Cunningham	Luke	Xcel Energy	Protection Services Consultant	M
Chapman	Dan	Xcel Energy	Manager Protection Services	M
		Xcel Energy	dispatch room - operator	M
Lyne	Gerald	Xcel Energy	Pawnee Station Director	M
		Xcel Energy	Pawnee - head of operations	M
Brown	Jeff	Xcel Energy	Senior Operations Manager, Comanche Station	M
Jeffington	Brent	Xcel Energy	Comanche Station	M
Pennata	Havier	Xcel Energy	Comanche Station	M
Lutz	Jerry	Xcel Energy	Manager Engrg & Tech Support, Comanche Station	M

Deliverables

GSECL and NTPC will each be writing a lesson-learned/take-aways report, which will be sent on to USEA once completed.

Unachieved Goals

Mr. Patel from GSECL missed the meetings with EPRI and Duke due to receiving his visa to the US later than anticipated.

Next Steps

- Indian generators need to determine the parameters/limiting factors preventing them from reducing their minimum load further and then identify the solutions. Then can increase flexibility step-by-step. (Note: Ramp rate is not as big an issue in India yet. The present ramp rate is about 1%. India utilizes hp bybass, so that the steam bypasses the boiler. This allows them to ramp fairly easily. Germans use the same method. Reducing load is the big issue.)
- There is a big need for simulators that allow the Indian coal generators to practice coal flexing. Currently, all the simulators are for base load operation.
- There is need for capacity building on risk identification and how to quantify from the financial cost of the impacts from flexing and how to get appropriately compensated in the market.
- The delegates would benefit from a greater study of Duke's Roxboro plan that reduced minimum load to 15%.
- NTPC has a cycling monitoring control room. Cycling is usually done on a manual basis. The parameters need to be updated.
- EPRI recommends Indian utilities adjust their asset management strategies. Need to understand what the current fleet is capable of doing and understand its real limitations. Identify what it needs to be able to do in the future - months, years, in the future. EPRI has a REGEN operating tool to help with this. Then assess the potential solutions/workarounds, then incorporate that into the future plan.
- When the delegates were asked what support they feel will be required for implementation of the flex measures, below were their responses:
    - Singh/Pola - Dispatch center/system operators need similar exposure and greater exposure to what the coal generators are doing in the field of flexibility.
    - Pola – Coal generators need a systematic approach paper for implementing coal flexing step by step, similar to a case study (e.g EPRI).
    - Sinha – US plants use natural gas. India use oil for hp bypass but currently the regulator doesn't provide compensation for this oil.
    - Patel – The reality is the SLDC is constantly getting ramping requests, so oil support would be almost constantly needed.

Battery Energy Storage Systems for Grid Applications Workshop November 28-30, 2018

India plans to deploy unprecedented levels of renewable energy (RE) on its power grid – 227 GW installed capacity of renewable energy by 2022. Current estimates stand at approximately 71.33 GW of installed RE capacity.) Further, India's Nationally Determined Contributions (INDC) extends this ambition to 40% non-fossil fuels-based electricity generation capacity by 2030. This will greatly reduce the economy's carbon intensity and strengthen energy security. Compared to conventional power, however, India's key

RE options are more variable, less predictable and often further from demand centers. Experience in other systems has shown that when penetration of RE reaches significant levels, the capacity of the power grid to manage it must be addressed to avoid challenges to the reliability and affordability of electricity. Critical to integrating VRE into the power system is rigorous analytical support to identify grid stability issues, options for optimizing dispatch, and sources of potential flexibility. Battery energy storage is a key solution to mitigating the reliability and stability issues that arise with large VRE integration.

This purpose of this training is for executives from Power System Operation Corporation Ltd. (POSOCO), the Central Energy Authority (CEA), state load dispatch centers (SLDCs), and other relevant stakeholders to gain knowledge of battery energy storage system (BESS) for grid applications. Globally, BESS technology is being used to support grid operation and facilitate integration of variable renewable energy sources.

The objectives of this training were to provide participants with updated information on battery energy storage technology, specifically:

- Policy frameworks from international best practices intended to enable R&D and utilization
- Current economic viability of battery technology
- Uses and benefits of BESS for renewable energy integration and efficient grid operation

The following speakers provided their expertise during the three-day training:

Vibhu Kaushik, Director of Grid Technology and Modernization of Southern California Edison

- Southern California Edison's Vibhu Kaushik provided overview of various utility scale energy storage in SCE's 500 MW energy storage portfolio, use case and applications for each project. This included Transmission, Distribution and Customer connected storage projects. SCE's portfolio also includes the World's 1st Hybrid Enhanced Gas Turbines (EGTs) where 10 MW/4.3 MWh were added to existing peaker plants (LM 6000 gas turbines) to create a positive net present value (NPV) application and reduced plant's lifecycle GHG emissions by ~60%.
- Kaushik's presentation also included 12 energy storage pilots which cover various use cases ranging from renewable integration, and T&D deferral to reliability use case applications. Various battery chemistries, benefit-cost analysis methodology and regulatory mandates for storage development in California markets were considered.

Dia Dean Koujak, Director of Energy at Navigant Research

- Mr. Koujak recommended that all grid-based investments should be viewed from the perspective of the ratepayers that would bear the ultimate cost, on a net benefit-cost basis. Each capital dollar deployed on the bulk power system should be viewed with respect to its opportunity cost – alternative uses in which the ultimate ratepayer may realize greater benefits.
- With respect to planned generation resource additions, all resource options should be considered and evaluated as potential alternatives, including BESS. The capabilities provided by BESS is vastly different, and more extensive than a traditional thermal unit because it does not require inertia to ramp up generation.
- Production cost system modelling of BESS vis-a-vis comparable thermal units may provide a general indication of whether a higher level of system benefits can be realized, while addressing reliability needs.

- While ratepayers may realize significant savings through the deployment of BESS, the benefits may not be directly realized by asset owners through traditional market structures currently in place – which is the case for both India and the U.S. This is because market structures were primarily developed to compensate thermal generation; they are blind to the additional grid benefits provided by BESS.
- Policy direction that clarifies that all resource options should be considered, such as renewables, renewables plus storage, storage alone, and thermal units, will ensure that all decisions are undertaken on a least-regrets basis. In addition, policy direction on other externalities – the value of emissions reduction, etc. – would be needed to determine whether a premium paid, in some instances, for a resource that has benefits that are realized in areas beyond the grid, is prudent. You need to *value stack* the benefits of storage to accurately weigh a cost-benefit analysis – these benefits include avoided costs, emissions reduction, reduced DSM penalty, forced curtailment, ramp-rate controls, self-curtailment to meet ramp-rate limits.

Results

On the final day, the participants were divided into 4 teams to draft a framework of recommendations for India to use for evaluation of potential BESS projects. The framework identified various economic valuation principles, policy, regulation, financing, and technical components for enabling an incremental revenue stream to support the economics of BESS.

The first task required the teams to discuss the principles for valuation and determining BESS capacity in India. Most teams determined that the "value stacking" of applications must be done through a comprehensive cost-benefit analysis. This analysis needs to consider the use of BESS for peak-load management, load shedding avoidance, energy arbitrage, CAPEX deferral for the transmission and distribution assets, managing renewable intermittency as a spinning reserve, frequency regulation, voltage support and reduced carbon emissions. Most teams agreed that BESS should be deployed subsequent to heavy penetration of renewables and it is not envisioned to be installed before 2022. Moreover, the participants thought that BESS should start at the distribution level (large industries/consumer level) rather than the transmission and generation level – this is because BESS should not be owned by the System Operator due to a conflict of interest, therefore, BESS should be owned by the consumers or DISCOMs.

The second task was to determine the policies that needed to be enacted in order to mainstream BESS. The teams stated that there should be a percentage mandate of BESS to be deployed alongside renewables, for example 10% for ramp rate control limits. Others stated that BESS should be added in the IRP planning process as part of the resilient system and disaster management plans. All the teams stated that it should be included under the "Make in India" initiative with tax breaks or subsidies. There was discussion of exploring gap funding through competitive bidding processes (reverse auctions for BESS).

The third task was to determine the roles of the regulator, Central Electricity Regulatory Commission (CERC), and the state regulators, State Electricity Regulatory Commissions (SERC). According to the participants, the regulator needs to clarify the status of BESS as load or generator, as well as define time of delivery and performance-based tariffs to make BESS a valuable asset. Much of the discussion revolved around the need to avoid valuing BESS on a cost-plus basis. The regulator also needs to expand the grid code to include BESS. In addition, these were some other recommendations to the regulator:

- Develop Ancillary market with specific frequency regulation market (CERC).
- SERC to develop a frame work for evaluation of all alternative options including storage while evaluating network upgrade proposals from DISCOMs.

- Clarify energy storage's role in the energy system, e.g. through defining ownership structures and ownership eligibility (DERC).
- Incentivize the co-financing of distributed electricity generation technologies with integrated storage after assessing the risks and benefits of this approach.
- Targeted support for energy storage demonstration projects and financial support of early movers for new commercial-scale projects (e.g. through risk guarantee schemes)

The final task was to discuss the key takeaways and recommendations for implementing BESS in India. These were some of the recommendations:

- Integrate BESS into planning and CAPEX investment proposals
- Clearly define the targets linking de-carbonization of grid, RE addition and storage targets
- Work with the Government of India to access to funding and mandate from institutes similar to what DOE does in the US.
- BESS in combination with conventional generators can provide flexibility, improvement in efficiency and provide spinning reserve
- BESS can improve transmission utilization and defer the need for upgradation
- In order to have large scale deployment of BESS, the SLDCs and POSOCO believe that there needs to be greater capacity building training, development of simulation models, cost-benefit analyses, and pilot projects should be done on the distribution level.

Cost Share

Row Labels	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
BEES			2250	2250
Bihar SLDC			750	750
CERC			2250	2250
Customized Energy Solutions		27000		27000
Delhi			2250	2250
Dept. of Power AP			750	750
Fluence		54000		54000
Gujarat			750	750
HVPNL		3000		3000
ICF		27750		27750
Innolith AG		7000		7000
MP			1500	1500
Navigant Research		27000		27000
NLDC			2250	2250
NRLDC			1500	1500
NRLDC POSOCO			3750	3750
NRPC			750	750
PGCIL			750	750
POSOCO			9550	9550

POSOCO CC			3000	3000
Prayas (Energy Group)	750			750
PSTCL/Punjab			750	750
PSTCL/Punjab			750	750
Southern California Edison		27000		27000
TPDDL			750	750
TS Transco			750	750
UP SLDC			1500	1500
UPSLDC			750	750
(blank)			4375	4375
Grand Total	**750**	**172750**	**41675**	**215175**

List of Participants

Name	Designation	Organization/Location
Sh A P Shah	Ex Engr (SLDC)	Gujarat
Sh S K Chakraborty	Executive Engineer	MP
Sh Sanjay K Mehta	Executive Engineer	MP
Sh. Naveen Kumar	AM	Delhi
Sh. Bharat Kanojia	AM	Delhi
Sh. Saurabh Mishra	J.E	Delhi
Er. N. K. Makkar	XEN / LD & PC	HVPNL
Er. Anshu Jain	AE / APC	HVPNL
Er. Lalit Kumar	AE / APC	HVPNL
Ms. Meenakshi (SCADA)		HVPNL
Shri Abhishek Kumar	EEE	Bihar SLDC
Sh Akhil Singhal	Deputy Manager	NLDC
Sh Mohit Kumar Gupta	Sr. Engineer	NLDC
Sh Dinesh Garg	Engineer	NLDC
Ms Minaxi Garg	General Manager	POSOCO CC
Sh Shailendra Kr Verma	Manager	POSOCO CC
Sh Kailash Chand Saini	Dy. Manager	POSOCO CC
Sh Sumanta Sadhukhan	Engineer	POSOCO CC
Er. Shashi Bhushan	Sr. XENAddl.SE	PSTCL/Punjab
Er. Saurabh Gupta	AEE	PSTCL/Punjab
Sh Surendra Kumar Yadav	Assistant Engineer	UP SLDC
Sh Bipin Gond	Assistant Engineer	UP SLDC
Sh Bhanwar Singh Meena	Executive Engineer	NRPC
K. Vara Prasada Rao	Dimensional Engineer	TS Transco
Mr. Gandhar Ukidve	Research Associate	Prayas(Energy Group)

Mr. Abhishek Ranjan	Ad. V.P. and Head Renewable, BRPL	BEES
Mr. Naveen Nagpal	General Manager	BEES
Sugandhita Wadhera		BEES
Mr. Manish Tiwari		PGCIL
Mr. Tanay Tarany		CERC
Mr. Himanshu Bhagel		CERC
Mr. Ravindra Kadam	Advisor (Renewable Energy)	CERC
Sh K V S Baba	CMD	POSOCO
Sh P K Agarwal	DIR(MO)	POSOCO
Ms Meenakshi Davar	DIR(HR)	POSOCO
Sh S S Barpanda	ED	NRLDC
Sh M A K P Singh	Member Secretary	
Sh G Mishra	Member Secretary	NRLDC
S K Soonee	Consultant	NRLDC
Alok Kumar	Chief Manager	NRLDC POSOCO
Devendra Kumar	DCM	NRLDC POSOCO
Kavita Parimar		
Bibhuti Rhesan Bhod	Manager	POSOCO
M. M. Hassan	Assistant General Manager	NRLDC POSOCO
Ankit Gupta	Senior Engineer	NRLDC POSOCO
Rinku Narana	Technician	POSOCO
Sanjay Kumar Gangwal	Assistant Engineer	UPSLDC
Manoj Kumar Agrawal	Deputy General Manager	NRLDC POSOCO
Vikas Singh Suhag	Research Assistant	ICF
Moli Kamki	Assistant Engineer	Dept. of Power AP
Tushas Gandhi		
Karunakan Jha	Assistant General Manager	TPDDL

Deliverables

Participants developed recommendations to share with their organizations.

Unachieved Goals

N/A – All goals for this training were achieved.

Next Steps

USEA will host a second BESS training in FY2019 for POSOCO and the other SLDCs. There is a recommendation to make sure there is participation from the Ministry of Power, CEA, and CERC since the policy-makers and regulators must be in support of BESS before any implementation occurs.

ETHIOPIA GEOTHERMAL PARTNERSHIP

No activities in this reporting period.

COLOMBIA

XM Executive Exchange on Distributed Energy Resources
October 4-5, 2018

Distributed energy resources and unconventional renewable sources challenge the current planning and operation processes of the Colombian electricity system. Since 2017, XM, Colombia's System Operator has been working intensively on a plan to adapt operating processes to the entry of renewable sources. USAID asked USEA to conduct this program under EUPP for XM, Colombia's System Operator, in order to help it identify the impact of the incorporation of DER into Colombia's grid, and provide examples of best practices for defining and carrying out adequacy and safety studies, as well as in defining the minimum technical and operational requirements necessary to integrate DER into the processes that make possible the reliable and economical operation of the Colombian electricity system.

USEA conducted this third activity with XM on the 4th and 5th of October. The first day of the Executive Exchange consisted of visit to New England ISO and New York ISO. At both of the ISOs, presenters discussed the lessons they have learned from rapid DER expansion in the region, and how DER is being incorporated into reliability planning studies, unit commitment and dispatch procedures, and how they are incorporating the technical requirements of IEEE standard 1547.

On the second day, participants visited FERC, and the DC office of PJM. At FERC, participants met with Dr David Kathan, author of a recent FERC report on DER, and discussed some of the findings of the report, including the impact of the common practice of netting DERs with load, the potential for DER contributing to grid stabilization, and possible impacts on transmission planning, and future regulatory needs with respect to DER. During the meeting with PJM, Senior Business Solutions Analyst Scott Baker, about how PJM is preparing for expect grow of DER on their grid and plans to incorporate IEEE standard 1547 there. The Executive Exchange ended with a brief presentation on the role of DER in Colombia.

In addition, previous to the Executive Exchange, CAISO made a presentation via a webinar on their DER plans, including the implementation of Rule 21 on DER interconnections, and phase 3 of their Energy Storage and Distributed Energy Resources, aimed at enhancing the ability of DER to participate in the ISO market.

Results

Based on the best practices and experiences presented and discussed during these meetings, USEA and XM participants developed a number of possible recommendations for the integration of DER in Colombia, including the following points:

- Promote DER participation in energy markets
- Study how Demand Response can help efforts to integrate DER
- Develop regulations that allow aggregators to participate in markets
- Study the possible need for a distribution system operator
- Look at how coordination between gas and electricity markets could be improved
- Examine how stakeholder consultation processes could be expanded
- Examine the technical requisites for implementing IEEE standard 1547
- Improve forecasts for DER growth, including impacts of energy efficiency and storage
- Ensure that smart grid regulations are sufficient to avoid need for retrofitting down the line

Cost Share

Organization	Non-Governmental NGO	Recipient Country Government	USG	Grand Total
FERC			$5,075	$5,075
ISO-NE	$7,875			$7,875
NYISO	$14,275			$14,275
PJM	$4,600			$4,600
XM Colombia		$13,919		$13,919
Grand Total	$26,750	$13,919	$5,075	$45,744

List of Participants

Last Name	First Name	Organization
Ganugula	Vijaya	NYISO
DeSocio	Michael	NYISO
Lesnicki	Whitney	NYISO
Pigeon	James	NYISO
Gill	Steven	NYISO
Rockway	Jeremiah	NYISO
Ferrari	Michael	NYISO
Walters	Dana	NYISO
Ortiz	Diana	NYISO
Yoshimura	Henry	New England ISO

Johnson	Eric	New England ISO
Connors	Molly	New England ISO
Warman-Gold	Gae	New England ISO
Black	Jon	New England ISO
Baker	Scott	PJM
Gáfaro	Francisco	XM Colombia
Correa	Carlos Mario	XM Colombia
Kathan	David	FERC
Schilling	Cameron	FERC

Deliverables

USEA expects XM will draft a proposal on DER.

Unachieved Goals

We are not aware of an updated proposal from XM yet. We expect one sometime this year.

Next Steps

The next step planned for DER-related activities is a course on DER, to be given in Colombia and aimed at XM, and a workshop on DER, aimed at a more general audience, but USAID Colombia has left the door open for further capacity building activities as requested by the government.

Jornada de Distribucion de Energia Electrica Conference December 5-7, 2018

USEA has been working with USAID Colombia for a year now to help the Colombian government advance their plans to incorporate non-conventional renewable energy (NCRE) onto its grid while maintaining or improving system reliability and accommodating expected growth. We have focused on capacity-building activities around identifying the needed changes in regulations and laws, as well as internal procedures and training, technical assistances on the following topics:

1. Examining how to incorporate expected growth in Distributed Energy Resources (DER) in Colombia into the system operator's operations, planning studies and regulatory proposals
2. Help Colombia's distribution companies get ready for DER
3. Help Colombia's distribution companies and large industrial users get ready to implement and respond to Demand Response (DR) policies
4. Examine best practices to help Colombian government design and implement DR regulations and policies

In an effort to help Colombia address the first topic, regulatory and private sector experts from the United States and Latin America presented their experiences and recommendations in the establishment of regulations and demand response programs. Invited agencies participating in the conference included MME, UPME, CREG, XM, SSPD, and others.

The experts presenting at the workshop were:

1. RICH BARONE, Manager, Demand Response, Hawaiian Electric
2. DAVID KATHAN, Office of Energy Policy and Innovation, Federal Energy Regulatory Commission (FERC)
3. SCOTT COE, Peak Load Management Alliance (PLMA)
4. GUILLERMO BAUTISTA, California Independent System Operator (CALISO)
5. Marcos Aguirre, ITRON

Meeting with the Ministry and other Stakeholders

Prior to the first day of the workshop, USAID arranged a meeting with the U.S. presenters and representatives from the Ministry to discuss the plans Colombia has regarding Distributed Energy Resources (DER). The meeting began with a presentation by Vice Minister Diego Mesa Puyo of the Ministry and Mines and Energy (MME) who gave a brief overview on the initiatives being developed by President Duque. The initiatives will address the issue of meeting the demand with more efficient power by reducing peak hour consumptions and offering differential rates. Under Decree 2469, surplus from large generators will be sold on the national market and under CREG 030, they will be reducing barriers for small scale generators to connect to the grid. Other initiatives presented included:

- Identify new goals and energy efficiency indicators,
- Funds for non-conventional energy sources,
- Developing standards for energy efficient appliances,
- Need for advanced metering infrastructure within the next four years under CREG,
- Advancements in AMI and governance on how the data collected through AMI is utilized;
- Incentives to both developers and sellers of power – demand schemes; and
- Battery storage

The presentation by the Vice Minister emphasized the importance the government is placing on reducing consumption during the peak load hours through energy efficiency and DER.

Following the Vice Minister's brief remarks, the three U.S. experts made presentations to the rest of the audience. David Kathan went first followed by Richard Barone and Scott Coe. Before the Vice Minister had to leave for other meetings, he asked the presenters questions on:

- Differences in how the various regions of the US manage DER, particularly Texas vs the Southeast;
- Was the cost of metering worth the benefits?
- A greater explanation on the wholesale market in the U.S.

After the end of the presentations by the U.S. experts, Todd Hamner of USAID/Colombia asked the attendees to identify some of their needs for the coming year and how they foresee USAID and USEA assisting them. Items identified include:

- Additional assistance in operating the system and demand response.
- Best practices and experience on legal matters regarding cybersecurity and access to data
- Tariff schemes and rate structures (time of use) rates to engage the customers and give them the opportunity to explore options.
- Issues regarding commercial battery storage, open markets

- Better understanding on the relationship of emissions avoided by DR and the markets; impacts on emission reductions because of DR

Meeting with Office of Energy Regulation, MME

At the request of members of the Minister's staff, two separate meetings were held with the U.S. experts to obtain additional information on specific areas. The staff is currently developing a new law for DER in Colombia and wanted to tap into the experience of the experts on the development of DER in the U.S. Both meetings were attended by three members of the Office of Energy Regulation who began with giving a brief overview of the various roles of the energy entities in Colombia and their current discussion on the development of policy guidelines on DR and energy storage as well as a policy resolution on AMI in Colombia.

Currently by 2030, 95% of all customers in the cities will need to AMI installed and in the rural areas, 50% of users will need to have AMI installed. The members of the Office also stated that there is no current discussion on DER; mostly on self-generation and off-grid systems only. Within the next year it is very important for the Ministry to issue a public policy and guidelines for CREG and to develop measures to make the programs more dynamic and feasible. The staff was very interested in understanding what the process should be as they undergo the development of their DR programs. Comments made included:

- Conducting a study with a local firm to understand international experience and an analysis with several countries on implementing DR schemes would be reasonable.
- Regarding the discussion of energy storage, will Colombia need both DR and DER. One of the experts stated that DR is one element of DER along with battery storage, microgrids, electric vehicle charging stations, and others and should not be discussed independently but as part of a larger framework.
- Another US expert recommended starting with DER, since it is measurable, and then phase in battery storage. Don't try to accommodate a technology but instead review how to enable the new technology to provide the services.
- As part of DR, curtailment and consumption don't let you know how to operate your system, they only let you know when the system needs the services.

Results

Recommendations given include the following (as above):

- Conducting a study with a local firm to understand international experience and an analysis with several countries on implementing DR schemes would be reasonable.
- Regarding the discussion of energy storage, will Colombia need both DR and DER. One of the experts stated that DR is one element of DER along with battery storage, microgrids, electric vehicle charging stations, and others and should not be discussed independently but as part of a larger framework.
- Another US expert recommended starting with DER, since it is measurable, and then phase in battery storage. Don't try to accommodate a technology but instead review how to enable the new technology to provide the services.
- As part of DR, curtailment and consumption don't let you know how to operate your system, they only let you know when the system needs the services.

No results have been obtained so far, although it is expected that this activity will contribute to the development of a DER policy in Colombia.

Cost Share

	HIGHER EDUCATION INSTITUTE	NON-GOVT NGO	Private Business	RECIPIENT COUNTRY GOVT	US GOVT	Grand Total
Abogado			600			600
Acce			1200			1200
Acolgen		3600				3600
Andesco		1200				1200
ANDI		1200				1200
Asocodis		6910				6910
Asoenergía			2400			2400
CAISO			9000			9000
Cámara Colombiana De La Energía			2400			2400
Castañeda&Velasco			1200			1200
Cedenar			1200			1200
Celsia			600			600
Cens Sa Esp			600			600
Colciencias			600			600
Colombia Inteligente			600			600
Consultor			600			600
Consultoría Regulatoria Sas			1200			1200
CREG				9600		9600
Dnp				3600		3600
Ecopetrol			400			400
Electricaribe S.A. E.S.P.			1200			1200
Emcali			3000			3000
Emgesa Sa Esp			1400			1400
Enel - Codensa			4600			4600
Energuaviare S.A. E.S.P			600			600
Enertolima S.A. E.S.P			2400			2400
Epm			1600			1600
Essa			400			400
Ey			1200			1200
FERC					13500	13500
GridOptimize			22500			22500
Grupo Energía Bogotá (Geb)			400			400

Hawaii Electric			13500			13500
I Do S.A.S			2200			2200
Independiente			1200			1200
Intercolombia			1200			1200
Internexa S.A			1200			1200
Itron			4300			4300
Julia Rd			800			800
Kapital Financial Services			1200			1200
Landis+Gyr			2400			2400
Markup			1600			1600
Mayaguez S.A.			1200			1200
Metrica			400			400
Ministerio De Minas Y Energía				11700		11700
Naturgas			1200			1200
Optima Consultores			1200			1200
Orvep Consultoría			1200			1200
Pe3			600			600
Power & Energy			2400			2400
Promigas S.A. E.S.P.			800			800
Pti Sa			2200			2200
Rconsulting Group Sas			1200			1200
Regulación De Servicios Públicos Mercados De Energía			600			600
Sanig Servicios			1200			1200
Ser Colombia		1800				1800
Siemens			2400			2400
SSPD				7400		7400
Sumatoria			1200			1200
Termoemcali			1200			1200
Transformadores De Colombia			1200			1200
Universidad De Los Andes	1200					1200
UPME				7800		7800
WEC - World Energy Council Colombia			1200			1200
XM				6000		6000
Grand Total	**1200**	**14710**	**112900**	**46100**	**13500**	**188410**

List of Participants

Last Name	First Name	Organization
Kathan	David	FERC
Coe	Scott	PLMA
Barone	Richard	Hawaii Electric
Bautista Alderete	Guillermo	CAISO
Aguirre	Marcos	Itron
Arcos Rodriguez	José	Abogado
Aguilar Mendez	Marta	Acce
Montoya Holguin	Angela	Acolgen
Restrepo Jaramillo	Ricardo	Acolgen
Triana Arias	Bayron	Acolgen
López González	Mauricio	Andesco
Concha Prada	Jaime Mauricio	ANDI
Manzur	José Camilo	Asocodis
Cruz	Edwin	Asocodis
Restrepo	Jaime	Asocodis
Avila	Carlos	Asocodis
Sebá	Sebastián	Asocodis
Chiappe	María Luisa	Asoenergía
Cajamarca Gomez	Roberto	Asoenergía
Zarruk	Carlos	Cámara Colombiana De La Energía
García	Simón	Cámara Colombiana De La Energía
Castañeda Manrique	Angel	Castañeda&Velasco

Chingual Vargas	Jorge	Cedenar
Cortés Giraldo	Germania	Celsia
Adarme Romero	Willy Alfonso	Cens Sa Esp
Ojeda	Yesid	Colciencias
Molina Castro	Juan	Colombia Inteligente
Acosta Suarez	José Miguel	Consultor
Gómez Machado	Mauricio	Consultoría Regulatoria Sas
Navarro Sánchez	Henry	CREG
Torres Niz	Javier Hernando	CREG
Arango Prado	Juan Fernando	CREG
Hincapié Solís	Johana Alexandra	CREG
Castro Ferreira	Germán	Creg
Herrera	Christian Jaramillo	Creg
Lota	Luis Felipe	Dnp
Rueda Callejas	Catalina	Dnp
Barbosa Lébolo	Helmer Fabian	Dnp
Sarmiento Forero	Angela María	Dnp
Mendoza	Daniel	Ecopetrol
Abdala Tarud	Nancy	Electricaribe S.A. E.S.P.
Quintero Martinez	Ezequiel	Electricaribe S.A. E.S.P.
Jaramillo Velasquez	Gustavo Adolfo	Emcali
Muñoz Lora	Mercedes Patricia	Emcali
Gutierrez Giraldo	Angela María	Emcali
Hurtado Moreno	Charlie Enrique	Emcali

Jimenez Rodriguez	Diana Marcela	Emgesa Sa Esp
Ibañez Prieto	Juan Carlos	Emgesa Sa Esp
Palacios Barreto	Daniel Fernando	Emgesa Sa Esp
Garzón Ramirez	Wilman	Enel - Codensa
Preciado Mosos	Fabian Yezid	Enel - Codensa
Corrales Mendoza	Maira Alejandra	Enel - Codensa
Parrado Morales	Ana Marcela	Enel - Codensa
Echeverri Yepes	Diego Fernando	Enel - Codensa
Gómez Pineda	Manuel José	Enel - Codensa
Molano Torres	Juan Miguel	Enel - Codensa
Santamaria Luna	Fernando	Energuaviare S.A. E.S.P
Hernandez Villamil	Juan Carlos	Enertolima S.A. E.S.P
García Molano	Luis Antonio	Enertolima S.A. E.S.P
Lopez Cardona	Juan Carlos	Enertolima S.A. E.S.P
Yepes Velez	Jorge Antonio	Epm
Lopez Foronda	Juan Rafael	Epm
Buritica Muñoz	Juliana	Epm
Amaya	José Gregorio	Essa
Tautiva Mancera	Camilo	Ey
Moreno Restrepo	Ernesto	Grupo Energía Bogotá (Geb)
Angarita	Paola	I Do S.A.S
Zeledon	Karla	I Do S.A.S
Cubillos	Andrea	I Do S.A.S
Millan Angel	Jaime	Independiente

Polania	Olga Lucia	Independiente
Franco Restrepo	Pablo Javier	Intercolombia
Muñoz Arcos	Carlos Alberto	Internexa S.A
Toro Angel	Carlos Mauricio	Internexa S.A
Sanchez	Ricardo	Julia Rd
Ochoa	Leonardo	Julia Rd
Fernandes	Daniel	Kapital Financial Services
Fernandes	William	Landis+Gyr
Medina Tellez	Hugo Fernando Antonio	Landis+Gyr
Plata Puyana	José	Markup
Castellanos	Rodrigo	Markup
Vargas Ordoñez	John Enrique	Mayaguez S.A.
Balcazar	Alvaro	Metrica
Rodríguez Moreno	Andrés Raúl	Ministerio De Minas Y Energía
Muñoz Ruiz	José Edilberto	Ministerio De Minas Y Energía
Pizón	Javier	Ministerio De Minas Y Energía
Bojaca Pedraza	Diana Mayerli	Ministerio De Minas Y Energía
Martinez	Carlos	Ministerio De Minas Y Energía
Sarmiento	Andres	Naturgas
Lucio Chaustre	Alejandro	Optima Consultores
Ortiz	Javier	Orvep Consultoría
Afanador Restrepo	Juan Eduardo	Pe3
Hurtado Restrepo	Luz Ensueño	Power & Energy
Romero Grass	Andrei Fabian	Power & Energy

Vives Villaquirán	María Camila	Promigas S.A. E.S.P.
Visbal Fernández	María Mercedes	Promigas S.A. E.S.P.
Celis	Juan Jorge	Pti Sa
Arango Cifuentes	Carmen Viviana	Pti Sa
Gómez Suárez	Patricia	Pti Sa
Cespedes	Renato	Rconsulting Group Sas
Giraldo	Ivan Mario	Regulación De Servicios Públicos Mercados De Energía
Fonseca	Sandra Stella	Sanig Servicios
Corredor Avella	German	Ser Colombia
Obando	Carolina	Ser Colombia
Rodriguez Ardila	Mauricio	Siemens
Moreno Parra	Rene Jair	Siemens
Varon Moreno	Alex Nayib	Siemens
Terrassa	Carlos	Sumatoria
Rodríguez Bello	Luis Carlos	Superservicios
Merlano Porras	Carlos Andres	Superservicios
Sanchez	Henry	Superservicios
Sosa Zarate	Alvaro Enrique	Superservicios
Murillo Sanchez	Oscar Javier	Superservicios
Vera Landázuri	Carlos Raúl	Superservicios
Zabaleta Montenegro	Oscar Andres	Superservicios
Pineda Sánchez	Jorge Armando	Termoemcali
Cantero C	Porfirio	Transformadores De Colombia
Benavides	Juan	Universidad De Los Andes

Cadena	Angela	Universidad De Los Andes
Sotelo Sanchez	Cesar Heran	UPME
Beleño Hernández	Andrea Margarita	UPME
Larrotta Cortes	Johanna Alexandra	UPME
Rodríguez Cantor	Andres Alberto	UPME
Baena Cuesta	Angélica María	UPME
Alzate Ocampo	Sandra Milena	UPME
Martínez Moreno	William Alberto	UPME
Camacho Ahumada	Germán Leonardo	UPME
Martínez Gil	Javier	UPME
Jimenez	Antonio	UPME
Rodríguez	Romel	UPME
Morales Rivadeneira	Cristina	Wec - World Energy Council Colombia
Maya Ochoa	Cecilia Ines	Xm

Deliverables

The deliverables received as part of this activity are the presentations given by the presenters.

Unachieved Goals

None.

Next Steps

Another training on Distributed Energy Resources was conducted in Bogota, Colombia February 4-8, 2019.

HONDURAS PARTNERSHIP

Workshop on Learning from Guatemala's Energy Sector Reforms March 25-29, 2019

The Government of Honduras (GOH) has made significant strides improving macroeconomic indicators over the last several years, meeting most of the targets included in the last agreement with the International Monetary Fund (IMF). However, progress has been more difficult in the energy sector, despite a number of important advances, including a General Law on the Electricity Industry (LGIE), in 2014, aimed at restructuring the Honduran energy sector into a competitive, modern electricity market by restructuring the National Electric Power

Company (ENEE), splitting it into separate business units to form Grupo ENEE, which consists of ENEE Holding (a holding company) and generation, transmission, and distribution companies. The LGIE is aimed at the adoption of energy policies aligned with diversification of the energy matrix through the use of renewable energy, efficient energy usage, and increased participation of Honduras in the Regional Electricity Market (MER). It also established a new Energy Ministry, along with an independent regulator and independent system operator.

In early July 2018, President Juan Orlando Hernandez approached the USAID/Honduras Mission Director in Honduras to request assistance with reform of the Honduran energy sector. In response, USAID, after consultation with stakeholders, developed a number of proposals for capacity-building and technical assistance to the sector, with special focus on the Empresa Nacional de Energía Electrica (ENEE), the government-owned vertically-integrated electricity utility, the Secretaría de Energía (SEN) and on coordination with ODS and CREE - to facilitate full implementation of the 2014's LGIE and to bolster transparent management practices for ENEE.

USEA organized a 4-day workshop with USAID Honduras and Honduras' Ministry of Energy to share best practices and experiences from Guatemala's reform process, which offers ideas for constructing a blueprint for the process in Honduras. USEA brought three experts on Guatemala's reform process: Silvia Alvarado de Córdova, principal of Energy Intelligence Consulting, and former director of Guatemala's Regulatory Agency; Elmer Ruiz, International Electric Market Manager for Guatemala's Market Operator (Administrador del Mercado Mayorista, AMM); and Fernando Moscoso, Market and Strategic Project Manager for Guatemala's Electricity Sector Regulatory Agency (Comisión Nacional de Energía Eléctrica, CNEE). These experts discussed Guatemala's electricity sector, including the organizational structure of the overall market and its individual components, internal organization of the AMM and CNEE, and drilled into the details of how transactions are liquidated, what types of contracts the AMM uses, what kinds of subsidies are in use, tariff structure, and regulatory environment, among others. The presentations included frank discussions of the advantages and disadvantages of the Guatemalan system, as well as what aspects of Guatemala's rules and regulations might be useful in Honduras.

The workshop was very well attended, with the number of attendees increasing each day of the workshop, with signed attendance increasing from 46 to 49 to 59 to 61. Despite efforts to ensure that all present signed, it is probable that actual attendance was slightly higher. Furthermore, the workshop attracted very high-level attendees, including the Minister of Energy who attended the morning of the second day, the Vice Minister, who attended all 4 days, several commissioners from the regulatory agency, Comisión Reguladora de Energía Eléctrica (CREE), and senior officials from the system operator, Operador del Sistema (ODS) and the ENEE. Private-sector interest was also very high, with enthusiastic participation from the Honduran Private-Sector Council, Consejo Hondureño de la Empresa Privada (COHEP), including its director; and from the Honduran Association for Renewable Energy, Asociación Hondureña de Energía Renovable (AHER), including the president of the board of directors, and the director.

In addition, the organizers put together 2 stakeholder reunions over dinner, one with the Ing. Moscoso of the CNEE, and one with Ing. Ruiz of the AMM, to give more time to key participants in the reform process in Honduras the chance to discuss in greater detail aspects of the proposed Honduran reform, or to address more sensitive issues with them in a low-key setting. A series of debriefing meetings on the one hand, and planning meetings on the other, were held as well, with USAID and State Department officials, and with Ministry of Energy officials. A detailed work plan is to follow.

Results

One of the most interesting result of the above-mentioned activities was the extremely high level of interest of the Honduran government to a quick and thorough reform of the Honduran Electricity sector. While participants expressed concern about a number of factors, mainly the degree of readiness of the regulator and system operator to take full control and ownership of their roles in the reform, and the degree to which the leadership of Honduras' electric utility, ENEE would be willing to support, or undermine, reform efforts, there seems to be an overall, and overwhelming, consensus that the reform is necessary. There also seems to be a strong consensus that the reform needs to include unbundling of ENEE as well as some degree of privatization, and, most importantly, that the reform needs to include an end to government control over the internal decisions of the electricity company and subsidizing of its deficits. While the stumbling blocks to restructuring of the electricity company are mainly political, further capacity building to mitigate the concerns expressed about the readiness of the regulator and the system operator to take over their assigned roles is well within the scope of USEA capabilities.

The consultant hired to support this workshop made the following recommendations with respect to the proposed reforms:

1. Recommendations for further technical assistance:
    - Support technical exchanges with Guatemalan regulatory and system operator colleagues as soon as possible.
    - Continue to monitor that the GOH complies with the provisions of the newly approved regulatory framework, and that it designates a high-level official to lead this effort who (ideally) does not have any conflict of interest and has credibility with the private sector and the international community.
    - Consider models used by neighboring countries like Guatemala, El Salvador and Panama to engage a private strategic partner in the distribution activity. In order to move forward, facilitate study tours of key decisions makers to Panama to review the experience on this regard, since it seems to offer a particularly successful example of reform in this area.
2. Recommendations for reform:
    - It is key that both CREE and ODS move forward as soon as possible towards functional implementation.
    - The GOH should implement a privatization or capitalization process of the distribution activity. Successful models in the region like Guatemala, El Salvador and Panama should be reviewed and considered.

Cost Share

	Non-Govt NGO	Other Non-USG Public Sector Org	Recipient Country Govt	Grand Total
AHER	11400			11400
AHPEE	7800			7800
AMM		14400		14400
Asociación Compartir	600			600
CNEE		7200		7200
COHEP	5400			5400
Comisión de Seguimiento de Mandatos Presidenciales			1200	1200
Comisión Reguladora de Energía Eléctrica (CREE)			32900	32900
ENEE			22200	22200
Operador del Sistema (ODS)			35400	35400
Secretaría de Energía (SEN)			71700	71700
Grand Total	**25200**	**21600**	**145100**	**191900**

List of Participants

First Name	Last Name	Organization	Position
Roberto	Ordoñez	Secretaría de Energía (SEN)	Secretario de Estado /Secretaría de Energía (SEN)
Leonardo	Deras	Secretaría de Energía (SEN)	Subsecretario de Estado /Secretaría de Energía (SEN)
Nicolas	Rishmawy	Secretaría de Energía (SEN)	Asesor del Despacho Ministerial
Lic. Evy	Gomez	Secretaría de Energía (SEN)	Directora de Cooperación Externa
Lic. Gloria	Alvarenga	Secretaría de Energía (SEN)	Analista de Cooperacion Externa
Angel	Pozuelo	Secretaría de Energía (SEN)	Formulador de Proyectos de Cooperación
Sindy	Salgado	Secretaría de Energía (SEN)	Directora Nacional de Planeamiento Energético y Política/SEN
Jorge	Cárcamo	Secretaría de Energía (SEN)	Especialista Energético DNPEPES/SEN
Tannia	Vindel	Secretaría de Energía (SEN)	Especialista Energético DNPEPES/SEN
Lesvi	Montoya	Secretaría de Energía (SEN)	Economista Energético DNPEPES/SEN
Roberto Emilio	Argueta	Secretaría de Energía (SEN)	Economista Energético DNPEPES/SEN
Miguel Angel	Figueroa	Secretaría de Energía (SEN)	Director de Electricidad y Mercados /SEN
Moises	Martinez	Secretaría de Energía (SEN)	Especialista Energético DGEM/SEN
Jair Nazar	Alfaro	Secretaría de Energía (SEN)	Oficial Técnico en Energía DGEM/SEN

Roberto A.	Zapata	Secretaría de Energía (SEN)	Especialista Energético DGEM/SEN
Delvin	Lemus	Secretaría de Energía (SEN)	Oficial Técnico en Energía DGEM/SEN
Diana	Solís	Secretaría de Energía (SEN)	Directora de Energía Renovable y Eficiencia Energética/SEN
Xiomara	Pinto	Secretaría de Energía (SEN)	Especialista Energético DGEREE/SEN
Christian	Irías	Secretaría de Energía (SEN)	Especialista Energético DGEREE/SEN
Oscar	Posadas	Secretaría de Energía (SEN)	Especialista Energético DGEREE/SEN
Ericka	Molina	Secretaría de Energía (SEN)	Secretaria Legal SEN
Cesar	Vigil	Secretaría de Energía (SEN)	Director Legal SEN
Vera	Cano	Secretaría de Energía (SEN)	
Jorge	Núñez	Operador del Sistema (ODS)	Gerente de Planificación
Carlos Josué	López	Operador del Sistema (ODS)	Gerente de Operación del Sistema
Marco	Gómez	Operador del Sistema (ODS)	Jefe de Unidad Legal
Rolando	Castillo	Operador del Sistema (ODS)	Presidente Junta Directiva Distribucion
Fidel	Torres	Operador del Sistema (ODS)	Miembro Junta Directiva Distribución
Gilberto	Rámos	Operador del Sistema (ODS)	Miembro Junta Directiva Generacion
Lucas	Rámos	Operador del Sistema (ODS)	Miembro Junta Directiva Transmision
Amaru	Contreras	Operador del Sistema (ODS)	Miembro Junta Directiva Transmision
Keny	Giron	Operador del Sistema (ODS)	Especialistas en Planificacion
Ada Suyapa	Cerna	Operador del Sistema (ODS)	Especialista en Planificacion
Jorge	Morazán	ENEE	Gerencia de Generación
Amy	Guardiola	ENEE	Subgerente de Administracion de Contratos
Raúl	Pino	ENEE	Gerencia de Planificación y Gestión
René	Barrientos	ENEE	Gerencia del Centro Nacional de Despacho
Magda	Cantor	ENEE	Administracion de Contratos
Cynthia	López	ENEE	
Teresa	Flamenco	ENEE	Jefatura depto energía térmico
Noel	Martínez	ENEE	Jefatura depto energía hidro
Elisuá	Torres	ENEE	Jefe departamento de energía renovable
Rosa María	Castro M.	ENEE	Asessora legal de la sub-ger de contratos de generación
Rosa María	Díaz H.	ENEE	Ing. administrador de contratos
Nubia	Maradiaga	ENEE	
Ninfa	Hernández	ENEE	
Hector	Flores	ENEE	Ing. especialista medición y facturación
Maryory	Valk	ENEE	
Josué	Rodríguez	ENEE/FOSODE	Ing. supervisor
Robert	Rodríguez	Comisión Reguladora de Energía Eléctrica (CREE)	
Francisco Javier	Sánchez	Comisión Reguladora de Energía Eléctrica (CREE)	
Ana Carolina	Zuniga	Comisión Reguladora de Energía Eléctrica (CREE)	

Eddy	López Dela O	ENEE	Jefe depto de cobranzas de generación
Samuel E.	Rodriguez	AHER	Comisionado
José	Morán	Comisión Reguladora de Energía Eléctrica (CREE)	Comisionado
Oscar	Gross	Comisión Reguladora de Energía Eléctrica (CREE)	Comisionado
Roque	López	Comisión Reguladora de Energía Eléctrica (CREE)	Jefe unidad de mercados
Edwin	Mejía	Comisión Reguladora de Energía Eléctrica (CREE)	
Jocelyn	Mendoza	Comisíon Reguladora de Energía Eléctrica	Asesor técnico
José A.	Silva	Comisión de Seguimiento de Mandatos Presidenciales	Gerente Centro de Investigaciones Economicas y Sociales
Santiago	Herrera	COHEP	
Yeny	Antunez	COHEP	Oficial Político Económico
Rosa	Perez	Asociación Compartir	Director Ejecutivo
Kevin	Rodriguez	AHPEE	Director Ejecutivo
Mario	Valladares	AHPEE	Miembro
Thelma	Rivera	AHPEE	
Elsia	Paz	AHER	Presidenta JD
Sandra	Salazar	AHER	Directora Ejecutiva
Francisco	Membreño Pineda	AHER	Fiscal
Samir	Siryi	AHER	Asesor
Thila	Zolaya	ENEE	

Deliverables
None.

Unachieved Goals
None.

Next Steps
USEA was requested to put together an ambitious package of capacity building for Honduras.

REGIONAL UTILITY PARTNERSHIPS
USEA received new funding for SARI/EI under this period, and have started planning for FY 2019 activities. A scoping mission is planned for December 10-14 to Sri Lanka and Bangladesh.

EAST AFRICA GEOTHERMAL PARTNERSHIP (EAGP)

EAGP Planning Meeting
October 1-5, 2018

EAGP Director Andrew Palmateer and Senior Program Coordinator Caity Smith met with USAID, KenGen, and Power Africa to plan the FY19 activities for EAGP.

Results
USEA updated a draft workplan for FY19 activities.

Cost Share
N/A

List of Participants
N/A

Deliverables
N/A

Unachieved Goals
N/A

Next Steps
Approval of the workplan by all stakeholders.

Geothermal Resources Council (GRC) Annual Meeting
October 15-17, 2018
Reno, Nevada

EAGP Director Andrew Palmateer and Senior Program Coordinator Caity Smith attended the GRC Annual Meeting.

Results
N/A

Cost Share
N/A

List of Participants
N/A

Deliverables
N/A

Unachieved Goals
N/A

Next Steps
N/A

6th African Rift Geothermal Conference
October 31-November 2, 2018
Kigali, Rwanda

Senior Program Coordinator Caity Smith gave a presentation titled "Sharing Best Practices in Community Engagement for Geothermal Development." This presentation highlighted our Kenya/New Zealand Partnership.

EAGP Director Andrew Palmateer was a panelist on Plenary Session I: Global Geothermal Towards Sustainable Development.

Results
N/A

Cost Share
N/A

List of Participants
N/A

Deliverables
N/A

Unachieved Goals
N/A

Next Steps
Approval of the workplan by all stakeholders.

POWER-GEN International 2018
December 4-6, 2018
Orlando, Florida

Senior Program Coordinator Caity Smith gave a presentation titled "The Transformational Power of Geothermal in East Africa's Power Sector." This presentation was an overview of the geothermal potential and installed capacity in East Africa as well as the transformational effect that additional development could have on the region by creating jobs and increasing electricity access.

The paper was given during the session: 16K – Technologies Utilized in Emerging International Markets.

Results
N/A

Cost Share
N/A

List of Participants
N/A

Deliverables
N/A

Unachieved Goals
N/A

Next Steps
N/A

2. TECHNICAL ASSISTANCE

EAST AFRICA GEOTHERMAL PARTNERSHIP (EAGP)

KenGen Olkaria Reservoir Consultancy
November 5-9, 2018
As part of Kenya's "Good to Great" strategy, KenGen plans to add an additional 500MW of geothermal energy generation to the Olkaria field by 2023. While preparing for this rapid increase in production, there is a need for accurate reservoir modeling to ensure that the development of the reservoir is sustainable. KenGen has worked with numerous outside consultants and international aid agencies to build and improve the reservoir model for Olkaria, however with the recent and planned accelerated development, a need has been identified to have the past reservoir modeling work reviewed and verified.

KenGen owns over thirty power generating plants with a combined installed capacity exceeding 1,300MW from diverse generation modes comprising of hydro, thermal, geothermal and wind technologies.

In the first of two one-week trips under this consultancy, 4 consultants traveled to KenGen's offices in Naivasha to conduct five days of meetings. During this time, KenGen presented their current conceptual and numerical models for the Olkaria Geothermal Field. During these meetings, the consultants collected data from KenGen in order to perform an initial data quality

review of the main datasets used to construct and calibrate these models. Each consultant also spent time in the office and field to observe their data collection practices in order to better assess the data quality during the data validation portion of the consultancy.

After leaving Kenya, the consultant group conducted a review of the datasets to assess acquisition methods, data quality, data validation, and review of stat quality management systems in places. Each of the four consultants prepared a data validation report for their area of expertise that was submitted to USEA and KenGen approximately one month after the initial visit. There will be a second trip with the same consultant group in May 2019 to present these reports and provide training to KenGen on areas that would help to strengthen their reservoir models to assist in future geothermal development of the Olkaria Geothermal Field.

Results

The consultant team was able to obtain all necessary data for the data validation review during the trip an in the weeks following. Based on discussions during the week, there is a good chance that KenGen will contract directly with Thermochem for assistance with their Tracer Flow Test (TFT) procedures in the future.

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
KenGen			$17,500	
Grand Total			$17,500	

Deliverables

Consultants prepared a data validation report for each of the following geoscience specialties:

- Geochemistry
- Geology
- Geophysics
- Reservoir Engineering

Unachieved Goals

n/a

Next Steps

A second trip is in the planning stages for mid-2019 to discuss the data validation report findings, provide training on data collection techniques, and further feedback on the reservoir models. A final report summarizing the strengths and weaknesses of the current models will be prepared after this second trip.

ETHIOPIA GEOTHERMAL PARTNERSHIP

Geothermal Data Management Technical Assistance
February 25-29, 2019

The Government of Ethiopia (GOE) passed the Geothermal Resources Development Proclamation (GRDP) in 2016. This new law enacted regulations regarding the country's geothermal resources. In addition, the law called for the creation of a new geothermal entity, one that brings together the geothermal directorate of the Geological Survey of Ethiopia (GSE) and the geothermal department of Ethiopia Electric Power (EEP). The new geothermal entity will report directly to the Ministry of Water, Irrigation and Electricity (MoWIE).

In 2017, Tetra Tech completed an assessment of GSE and EEP's current data management practices, systems, and procedures for the United States Energy Association (USEA) under the East Africa Geothermal Partnership (EAGP). This project included an assessment of human resources within both organizations and a review of the Information and Communication Technology (ICT) systems (hardware, software, and human resource/skill set capabilities) that is the necessary infrastructure on which the geothermal data management system would be developed. One of the key findings of this assessment is that GSE/EEP staff expressed a strong desire that their geothermal data be truly interconnected and accessible, not, as it is currently constituted, isolated and disconnected ("siloed") inside individual departments. The assessment provided recommendations for improvement and a plan for the development of a geothermal relational database management system (RDBMS) (Tetra Tech, 2017).

The scope of work for this assignment is based on the 2017 recommendations (Tetra Tech, 2017) for the first year of the implementation plan of a geothermal data management system and includes:

- Identify team leaders among GSE and EEP staff and identify database Data Custodians (DCs) for each of the main data types contained in the RDBMS,
- Provide virtual mentoring and capacity building to the DCs and team leaders,
- Two in-country visits for training and mentoring as well as virtual training, and
- Support the development of a geothermal RDBMS to international best practices and standards.

Cost Share

	Recipient Country Government	Bi/Multilateral	Grand Total
EEA	$1,200		$1,200
EEP	$,3200		$3,200
GSE	$10,000		$10,000
JICA		$400	$400
Grand Total	**$14,400**	**$400**	**$14,800**

List of Participants

Last Name	First Name	Organization	Position	M/F
Kebede	Solomon	GSE	Manager	M
Geddi	Masresha	GSE	Director General	F
Woldemariam	Fikru	EEP	Manager	M
Kassa	Tesfaye	EEA	Director	M
Addissie	Asaye	GSE	IT Director	M
Melka	Hundie	GSE		M
Ejiju	Kassahun	GSE		M
Feleke	Fikre	EEA		M
Hadush	Weldeyohannes	EEP		M
Abebe	Zelalem	GSE		M
Gsnetu	Anaualom	GSE		M
Melesse	Woyeneshet	GSE		F
Abera	Birhan	GSE		M
Habtamu	Adubra	GSE		M
Tefera	Bekete	GSE		M
Haile	Abraham	GSE		M
Ali	Salahadin	GSE		M
Demissie	Selomomih	GSE		M
Keede	Frehiwot	GSE		M
Tadesse	Deanseu	GSE		M
Besfat	Denberu	GSE		M
Misgie	Abebe	GSE		M
Nigussie	Teka	EEP		M
Makda	Kinfe	GSE		F
Kahsai	Kifle	JICA		M
Haile	Abraham	GSE	Deputy ICT Director	M
Esuotu	Anahalem	GSE		M
Birbirda	Dibaha	GSE		M
Moges	Dereje	EEP		M

Marcos	Zinash	GSE		F
Aklilu	Bizuayehu	EEP		M
Admassu	Getinet	EEP		F
Afework	Feleke	EEP		M
Adam	Mohammed	EEA		M
Mengiste	Andarge	GSE		M

Deliverables

- The data domains to be included in the RDBMS have been mutually agreed upon and consist of 1) geology, 2) geochemistry, 3) geophysics, 4) wells and reservoir engineering, and 5) licensing.
- The geothermal data management team has been formed, with Data Custodians assigned for each data domain. The principal DC for each data domain is a GSE employee while the deputy DC for each data domain is an EEP employee. The exception is the licensing data domain, where both the principal and deputy DC are EEA employees.
- Senior advisors (four) have been selected and assigned to the geothermal data management team.
- Geology DC Woyeneshet Melesse provided EAGP a copy of the standards that GSE uses for geology field investigations ("Standards for Geothermal Geological Studies of Geothermal Areas", October 2007)
- Biweekly virtual web conference calls were agreed upon (3 PM East Africa Time (EAT)) and began on March 12th.

Next Steps

The team leader for the GSE/EEP data management team still needs to be determined. However, at this phase of the project, it is premature to nominate a team leader. The EAGP team will discuss the roles and responsibilities of the team leader with GSE/EEP senior managers and will plan to work on nominating a team leader during the next in-country visit.

The location of the server storage for GSE/EEP data still needs to be determined. The preferred storage location would be on GSE servers. EEP managers have indicated that servers at EEP could be used, but in a backup capacity. The EAGP team will work to resolve this issue by requesting ICT personnel participate during the web-conference calls with the goal of having an ICT plan in place and agreed upon during the next in-country visit.

3. TRAINING

RWANDA PARTNERSHIP

NETWORK MODELING AND LONG-TERM PLANNING PROJECT

The electrical energy sector in Rwanda is undergoing a process of reform and a comprehensive program to enhance the grid operation performance. The grid operation records indicate a history of network outages which have either caused partial and total network loss.

The Rwanda Energy Group is forecasting additional electrical generation capacity from several projects including methane gas 75 MW, MAMBA peat to power 80MW, RUSUMO HPP 80 and RUSIZI III HPP 147 MW. The addition of this new generation will require additional network modeling to: 1) determine the effect on the electrical grid; and 2) identify improvements required to maintain grid system stability.

USEA hired consultants – Belgrade-based Electricity Coordinating Center (EKC) – to develop and validate simulation models, necessary for further new power plants integration studies, to perform current state network stability analyses, and to recommend mitigation measures to overcome existing network instabilities that were introduced after commissioning of several power plants in the period 2013-2016. The consultants will then work with the Energy Development Corporation Limited (EDCL), another REG's subsidiary, to develop planning models for the 5 and 10 years horizon, to further enhance skills and knowledge of EDCL engineers in Network Modeling and Grid compliance studies, and will conduct a study to analyze the future system behavior and develop possible technical and engineering solutions to avoid continuous network instability that might be caused by the integration of new generation facilities. This work, performed in network planning software, will allow for better integration of the new generation, will help detect grid issues before they become a problem, allow greater regional integration and ultimately power trading, and will create an enabling environment for additional generation to meet Power Africa's goals.

USEA has previously facilitated 2 activities within the framework of this project: 1) a 5-day training on the National Load Flow and Dynamic Models held in February 2018; and 2) a 3-day presentation of the National Load Flow and Dynamic Models held in July 2018.

Workshop on the System Reliability and Stability Study for Current Network State Oct 31-Nov 2, 2018

The 3-day workshop aimed to achieve the following objectives:

- To present and discuss the preliminary results of the system reliability and stability study for the current state of the Rwanda's network;
- To identify bottlenecks and other issues with reliability and stability of the Rwanda's network and to discuss how these issues can be remedied by utilizing the load flow models developed by the consultants and provided to EUCL;
- To present the results of dynamic load flow model data collection completed during the last activity;
- To train EUCL participants in including this data into the dynamic load flow model;

- To discuss the Rwandan network's expected behavior when interconnected with Uganda (an introduction to operations within interconnection).

Results

EKC consultants finished collecting data for planning load flow models for the 5 and 10 year horizons.

In addition, EKC had several recommendations resulting from the analyses of the study that are summarized below:

- The current operational practice in EUCL is to switch-off the 110 kV line Karongi – Kilinda (or Karongi – Kibuye T/off) in regular network topology due to relay protection issues. It is highly recommended to mitigate identified relay protection issues and switch-on the aforementioned line(s) in regular network topology to form a "ring" structure 110 kV network instead of the existing radial one. This will significantly increase the level of security and reliability of the Rwandan system and mitigate system islanding and load interruptions.
- In order to keep the system frequency within stable limits as well as to avoid partial or total system collapses, the following is recommended:
    - Regular network topology of the 110 kV grid should be with the 110 kV line Karongi – Kilinda (or Karongi – Kibuye T/off) switched on – ring structure.
    - The system frequency should be kept between 49.8 and 50.2 Hz by manual activation of available frequency restoration reserve.
    - EUCL should set mandatory requirements for all generating units to participate in primary control (frequency containment reserve).
    - EUCL should set detailed primary control requirements in the terms of active power range related to rated capacity, frequency response insensitivity, frequency response deadband, droop, the time delay in initial response and time for full activation.
    - The current settings of turbine governor systems that provide primary control (frequency containment reserve) in the Rwandan system should be assessed and tested for compliance with EUCL requirements.

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
Energy Utility Corporation Limited (EUCL)			$4,000	$4,000
Grand Total				$4,000

List of Participants

Last Name	First Name	Organization	Position
Bizimungu	Silas	EUCL	Protection Engineer
Nkusi	Geoffrey	EUCL	Acting Protection Specialist

Ntwari	Bertrand	EUCL	Protection Engineer
Rurangwa	Damas	EUCL	Acting Chief Engineer
Siame	Clement	EUCL	Protection Expert
Tuyizere	Valence	EUCL	Senior Engineer, Distribution

Deliverables

The activity produced the following deliverables:

- Workshop materials, including presentations and all other materials distributed to the participants;
- Digital copy of the System Reliability and Stability – Current State report.

Unachieved Goals

There were no unachieved goals for this activity.

Contingency Analyses and Reactive Power Planning Training
January 28 – 31, 2019
Kigali, Rwanda

The 4-day training aimed to achieve the following objectives:

To perform advanced contingency analyses;

- To examine issues of voltage stability;
- To examine reactive power planning;
- To examine implementation of renewable generation and simulate its effect on the grid.

Participants worked toward acquiring and enhancing the following professional skills during this training:

- Advanced understanding and working knowledge of the basic principles of contingency analyses, including preliminary activities, running automatic contingency analyses and interpreting reports;
- Advanced understanding and working knowledge of issues of voltage stability, including voltage stability, PV and QV curve analyses;
- Advanced understanding and working knowledge of reactive power planning, including issues of compensation and control;
- Advanced understanding and working knowledge of issues related to implementation of renewable generation, typical challenges and effects on the grid.
- Demonstrated ability to run dynamic simulations in PSS/E.

An informal working session was held on Friday, February 1st (a public holiday in Rwanda) to allow EUCL engineers and EKC consultants to collaborate on updating the existing models and completing additional calculations to further enhance EUCL's capacity. The following results have been achieved:

- Updated the load flow models – both steady state and dynamic – for 2020 and 2025;

- Developed an intermittent model – both for steady state and dynamic – to bridge 2018 and 2020;
- Calculated and updated peak and off-peak regimes for each year;
- Started short circuit calculations.

Results

The activity produced the following results:

- EUCL engineers are now capable of developing and modifying their national planning models to make them suitable for integration into a planned regional model;
- EUCL engineers are now capable of performing static analyses and calculations in PSS/E that are necessary to develop a defense plan for the Rwandan power system. These static analyses include contingency analyses, remedial action analyses to resolve identified critical contingencies and prevent cascading effect of contingencies in the network, total transfer capacity calculations and voltage stability;
- The participants completed a number of all hands-on exercises, significantly improving their PSS/E skills.

The recommendations, resulting from this activity, are summarized below:

- EUCL should practice regular day-to-day usage of the PSS/E software tool, practice the network element modeling, and perform various load flow studies, including analyses of network element loads, analyses of voltage profiles, calculations of active power losses on the system level, contingency analyses, etc.;
- The EUCL load flow model created for 2019 should be regularly maintained and updated by EUCL staff, following the development and commission of new elements in the transmission network;
- EUCL participants should collect additional dynamic data necessary to upgrade the newly created draft dynamic stability model;
- An additional training session should be conducted on short circuit calculations, advanced dynamic modeling and stability analyses with the goal of further increasing PSS/E capacity of EUCL staff.

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
Energy Utility Corporation Limited (EUCL)			$9,500	$9,500
Energy Development Corporation Limited (EDCL)			$1,500	$1,500
Grand Total				$11,000

List of Participants

Last Name	First Name	Organization	Position
Bizimungu	Silas	EUCL	Protection Engineer
Niyonshuti	Innocent	EDCL	Standards Specialist
Nkurunziza	Mathias	EUCL	Project Engineer
Nkusi	Geoffrey	EUCL	Acting Protection Specialist
Ntwari	Bertrand	EUCL	Protection Engineer
Rimenyande	Patrick	EDCL	Planing Engineer
Rurangwa	Damas	EUCL	Acting Chief Engineer
Rwigimba	Jean Baptist	EUCL	Senior Engineer
Siame	Clement	EUCL	Protection Expert
Tuyizere	Valence	EUCL	Senior Engineer, Distribution

Deliverables

The activity produced the following deliverables:

- Workshop materials, including presentations and all other materials distributed to the participants;
- Digital copy of the System Reliability and Stability – Current State report.

Unachieved Goals

There were no unachieved goals for this activity.

Next Steps

The next (and last) activity – a 3rd workshop on the System Reliability and Stability Study for Respective Network State – will be organized in Kigali, Rwanda, in June 2019.

ETHIOPIA PARTNERSHIP

SUBSTATION OPERATION AND MAINTENANCE "TRAIN-THE-TRAINERS" SERIES: TRAINING 2: SAFETY AND ISOLATING EQUIPMENT

October 8-12, 2018

One of the most urgent challenges facing EEU is an insufficient level of professional skills, knowledge and experience among technicians and engineers operating EEU substations across the country, which leads to substantial economic and sometimes human losses. In 2017, USEA facilitated three USAID/Power Africa funded training courses on basic and advanced knowledge and skills needed to perform electrical operations and maintenance on a medium voltage distribution substation, established safety procedures, and best utility practices on equipment maintenance for some of the EEU substation personnel. While these trainings were considered extremely useful, they only scratched the surface and showed that it would not be cost-effective to attempt to train all of the EEU substation personnel. A different model – helping EEU build its capacity by preparing their own "in house" trainers – is necessary to maximize the effect and ensure sustainability of the project.

Therefore, in 2018 the format of the substation operation and maintenance training was shifted from general training offered to large groups of EEU technical personnel to the "Train-the-Trainers" strategy. In the new model, small groups of EEU technicians and engineers with advanced skills are engaged in short, specialized courses focused on specific electric safety and maintenance issues and provided with techniques to share their knowledge with others. The series focuses on 5 major issues:

- Safety;
- Grounding/Earthing;
- Isolating Equipment (Circuit Breakers);
- Transformer Maintenance;
- Switching.

The 5-day training focused on general issues of electric safety and technical questions of operating and maintaining isolating equipment (circuit breakers), including:

- Basics of Switching, Isolating & Earthing Devices in LV, MV and HV Switchgear;
- Functional Understanding of Circuit Breaker including Control Schematics;
- Operation & Maintenance of HV, MV and LV Circuit Breakers;
- Routine Testing of Circuit Breakers;
- Indoor Switchgear (Metal Clad) & GIS;
- Development of Maintenance Program for Major Substation Equipment.

The training also included 2 site visits – to a medium to high voltage (15KV to 220 KV) transmission and distribution substation Sebeda 1 and to a medium to extra high voltage (15KV to 400KV) transmission and distribution substation Suluta. These site visits allowed practical demonstrations of safety practices for isolation, grounding and restoration of equipment after outage, and of procedures for safety preparations and testing of circuit breakers.

Considerable time was dedicated to the development of EEU participants' training skills, including discussions of qualities expected in an effective trainer, building of training content and effective training delivery, as well as presentation practices.

Results

See deliverables.

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
Ethiopian Electric Utility			$26,625	
Grand Total			$26,625	

List of Participants

Last Name	First Name	Organization	Position
Abera	Solomon	EEU	Senior Energy Audit
Asfaw	Masresha	EEU	Head, Energy Management
Ashagre	Anteneh	EEU	Substation Officer
Bireda	Miseganu	EEU	Substation Supervisor
Degefa	Mekonnen	EEU	Substation Supervisor
Dereje	Getachew	EEU	Health & Safety Officer
G/Mariam	Yodit	EEU	Planning Engineer
G/Eyesus	Addis	EEU	Substation Supervisor
Kebede	Muluken	EEU	Substation Coordinator
Kassaw	Endris	EEU	Substation In Charge
Megersa	Tamiru	EEU	Substation Supervisor
Megerssa	Tesfaye	EEU	Substation Operation
Mamo	Tewodros	EEU	Substation O&M, In Charge
Muche	Mulugeta	EEU	Substation Coordinator
Negash	Belayneh	EEU	AJ/GGKV In Charge
Nigussie	Biruk	EEU	Substation Technician
Tadesse	Merid	EEU	Substation Coordinator
Teshager	Sisay	EEU	Substation Supervisor
Tezera	Zerihun	EEU	Substation Supervisor
Tibebu	Solomon	EEU	Substation Supervisor
W/kidan	Tesfaye	EEU	Substation Supervisor
Zeleke	Gizachew	EEU	Substation Supervisor
Zewdie	Tomase	EEU	Social Analyst

Deliverables

The activity produced the following deliverables:

- Full training curriculum, including manuals and all other training materials, provided by the trainers. At the end of the training series these materials, combined with materials from the other three trainings, will be used by EEU to develop their own "in-house" training capacity;
- Tata Power report on the training and recommendations for next steps.

Unachieved Goals

There were no unachieved goals for this activity.

Next Steps

The next two trainings – on Safety and Transformer Maintenance and on Safety and Switching – will be organized in Addis Ababa, Ethiopia in July and November 2019.

LEADERSHIP TRAINING
November 5-9. 2018

As Ethiopia strives to achieve universal electricity access by 2025, EEU has identified leadership development for its management personnel as one of the key capacity building areas necessary for improving the company's overall management practices and increasing productivity and profitability.

To support EEU in this effort, USEA will facilitate several leadership development activities including a series of trainings and an executive exchange in the United States and in Ethiopia. The first leadership training took place in Washington, DC in February 2018.

The 5-day training, developed by the IIR Management Development and delivered by IIR training consultant, Mr. Simon Roskrow, aimed to provide mid-level EEU management personnel with a solid toolkit of skills in people management techniques, building high performing teams, measuring and managing performance as well as change management.

Fifteen EEU executives from ten regions of Ethiopia as well as the Addis Ababa Headquarters worked towards acquiring the following leadership skills:

- Understanding the roles of leaders and managers, learning to apply situational management and leadership techniques and to influence and motivate others;
- Managing their time more effectively through delegation and focus on strategic objectives;
- Building better teams by improving their communication skills, improving relationships, coaching and developing others, and dealing with conflict more successfully;
- Learning to appraise and improve performance, set clear objectives and goals, give constructive and influential feedback, diagnose and manage performance issues;
- Helping others and themselves through change.

The training also featured a working session on the "Electric Utility of the Future," based on a mix of traditional and distributed resources and focused on innovation and integrated resource planning (IRP). This session was facilitated by a team of experts from the Rocky Mountain Institute (Boulder, CO, USA).

Results

At the end of the program, the delegates recorded a "video diary" of the changes to their leadership styles and approaches they were committing to. These commitments are summarized below:

- To become a better – authentic – leader by helping team members understand the overarching purpose of the company and its shared values, building trust and improving communication by opening myself to the team, and developing accountability;
- To organize a good governance training for team members in order to increase knowledge of their rights and responsibilities that would lead to improved performance;
- To improve communications within a team by scheduling regular meetings to discuss current issues and challenges and come up with solutions;
- To improve the working environment for a team by addressing possible disfunctions of the team, identifying and remedying root causes of conflict, building trust, providing more support to team members, and improving coaching practices;
- To improve morale and performance by engaging all team members in drafting a strategic development plan;

- To improve morale and performance by helping team members see the "big picture" and the importance of the team's role and contributions to the company's strategic goals, and gain an understanding of common responsibilities;
- To focus on a team instead of results only by improving relationships with team members, building trust, encouraging cooperation and promoting common goals;
- To improve team engagement and performance by making team members part of solutions and increasing delegation;
- To improve coaching of team members by implementing some of the techniques acquired during this training, such as demonstrating, asking more questions, encouraging independent thinking and taking initiative;
- To build a better team by providing training opportunities to team members;
- To build a better team by paying more attention to team members' personalities and taking advantage of their personality traits;
- For the able and willing team – to motivate and encourage better performance by providing public recognition of team members' achievements; for the somewhat unable but willing team – to help team members identify and remedy causes of unsatisfactory performance by changing approach and improving communication with the team.

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
Ethiopian Electric Utility			$18,125	$18,125
Rocky Mountain Institute	$1,750			$1,750
Grand Total				$19,875

List of Participants

Last Name	First Name	Organization	Position
Abdulselam	Ferid	EEU	Executive Officer, Harari Region
Alemayehu	Fikre Mariam	EEU	Executive Officer, Dire Dawa City
Alemayehu	Meaza	EEU	Director, Finance & Investment
Aman	Chala	EEU	Director, Engineering, Design, R&D
Dender	Esayas	EEU	Director, HR Administration & Development
G/medhin	Mesfin	EEU	Executive Officer, Tigray Region
Geremew	Getu	EEU	Executive Officer, Oromiya region
Kebede	Kasahun	EEU	Executive Officer, Benshangul Gumuz Region
Melaku	Anteneh	EEU	Executive Officer, Somali Region
Misganaw	Lmelem	EEU	Director, Distribution System Technical Support & Customer Service
Negash	Kenfe	EEU	Executive Officer, SNNP Region

Tasew	Solomon	EEU	Executive Officer, Amhara Region
Tsegaye	Meazagenet	EEU	Director, Women, Children & Youth Affairs
Wakjira	Bikila	EEU	Executive Officer, Gambella Region
W/mihiret	Muluberhan	EEU	Executive Officer, Afar Region

Deliverables

The activity produced the following deliverables:

- Full training curriculum, including presentation slides, provided by the trainers.
- IIR Management Development report on the training and recommendations for next steps.

Unachieved Goals

There were no unachieved goals for this activity.

Next Steps

The next two activities – an Executive Exchange the U.S. focused on leadership development and issues of governance and organizational structure optimization in public utilities and the 3rd session of the Leadership training in Ethiopia – will be organized in 2019 – 2020.

EAST AFRICA GEOTHERMAL PARTNERSHIP (EAGP)

ARGEO C-7/EAGP Reservoir Management Course III
October 29-30, 2018

With an estimated 15,000 MW of potential geothermal capacity in East Africa - a clean, reliable, baseload power solution – geothermal energy is critical to East Africa's economic development especially as a base-load power source. The first steps in developing this geothermal capacity is ensuring that countries have the skills to properly collect and manage data related to their geothermal reservoirs in order to make informed decisions regarding locations for drilling and power plants. As many countries along the East African Rift are still in the early stages of geothermal development, enhancing these skills will allow them to make more informed decisions, leading to projects generating power sooner than they would be without these skills. In order to increase the geothermal production throughout East Africa, it is imperative that countries develop accurate and complete conceptual and numerical models of their geothermal reservoirs. This will ensure that reservoirs are developed in a responsible and sustainable manner.

On behalf of the United States Energy Association (USEA), Mr. Jonathan Hernandez and Mr. Richard Holt served as geothermal experts and course instructors for the ARGeo C7 conference held in Kigali, Rwanda. Their course was given October 29th and 30th, 2018 in the MH3 expo hall at the Kigali Convention Centre. This "Short Course" was to provide two days of instruction related to the identification, understanding, analysis, and modeling of geothermal reservoirs for high-enthalpy commercial power generation. The course was successfully carried out with continuing instructor-student interactions during the lectures, allowing for detailed discussions of real-world examples and concerns when dealing with drilling designs and

reservoir models. The course was provided in English and was met with positive response from students during subsequent days at the conference, and the participants came from various backgrounds, and were university students, mining engineers, geologists, geophysicists, reservoir engineers, and project managers.

Results

The Diagnostic Exam covered various topics, including reservoir models, software, geothermal drilling placement concepts, thermodynamics, fluid dynamics, and geoscientific concepts, as well as a few scenarios dealing with geothermal reservoirs. The idea was to capture a snapshot of each student's understanding, and to give students an idea of what the curriculum would cover. The Diagnostic Exam also served as a great tool to measure student progress at the end of the course, as the same exam was given again at the end of the course. Pre-Instruction attendance was 15 students from 6 countries and resulted in an average score of 11.5 out of a possible 19 points. The Post-Instruction attendance for the Diagnostic Exam was 16 students from the same 6 countries, yielding an average score of 13.5 out of 19.

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
EEP			$1,250	$1,250
GDC			$2,500	$2,500
GSE			$1,250	$1,250
KenGen			$2,500	$2,500
Ministry of Energy and Mineral Development			$2,500	$2,500
ODDEG			$2,500	$2,500
TGDC			$2,500	$2,500
Grand Total			$15,000	$15,000

List of Participants

Name	**Organization**	**Country**
Fahman Abdallah Hassan	ODDEG	Djibouti
Mouna Abdillahi Omar	ODDEG	Djibouti
Andarge Mengiste	GSE	Ethiopia
Teka Nigussie	EEP	Ethiopia

Gideon Gitonga	KenGen	Kenya
Dennis Chirchir	GDC	Kenya
Philip Omollo	KenGen	Kenya
Jeremiah Kipng'ok	GDC	Kenya
John Lubuva	TGDC	Tanzania
Amani Christopher	TGDC	Tanzania
James Francis Natukunda	Ministry of Energy and Mineral Development	Uganda
Deus Katomi Muhwezi	Ministry of Energy and Mineral Development	Uganda

Deliverables
Participants showed proficiency in early stage development reservoir engineering and management skills.

Unachieved Goals
n/a

Next Steps
EAGP will continue work in Kenya with KenGen on reservoir engineering and management.

ARGEO C-7/EAGP Reservoir Management Course IV
October 29-30, 2018
The objective of the course is to enable participants to learn the techniques of conceptual modelling and of the analysis and data interpretation required to inform the modelling and power density evaluations. Workshop participants will review the data from the case studies and, in teams, will decide what conceptual models are possible, what extent and size of resource is implied by the models, and what the next sub-surface exploration steps would be. Their analysis will then be checked against what actually happened and, with the value of hindsight, whether alternative exploration strategies would have delivered a better balance of cost and risk management.

Results
The teams designed and presented six MT surveys, of which five would have cost-effectively mapped the resource. For the second exercises, individuals and teams built 32 initial resource conceptual models and presented 6 median models and optimistic variations to justify predrilling power capacity and well targeting assessments. All of the teams' models and power capacity estimates were sufficiently realistic to justify drilling and all would have discovered the resource with their first or their second proposed well target (the actual developer drilled four wells before having an economic producer). Four of six teams discovered the upflow with their second or third wells (the actual developer drilled eight wells to find the upflow). All groups completed an assessment of the well test results and constructed revised conceptual models

but two had not yet decided on their most confident and most likely models in order to present a final resource capacity and well target assessment. The three groups that did produce final assessments successfully targeted the upflow and committed to build a 35 MW power plant, the most reasonable option presented based on the known outcome.

Cost Share

	Non-Governmental NGO	Private Business	Recipient Country Government	Grand Total
EEP			$1,250	$1,250
GDC			$5,000	$5,000
KenGen			$5,000	$5,000
TGDC			$1,250	$1,250
Geological Bureau of Comoros			$1,250	$1,250
Goma Volcano Observatory (Ministry of Research and Technology)			$2,500	$2,500
ODDEG			$6,250	$6,250
EDCL			$2,500	$2,500
Zesco			$1,250	$1,250
KIST			$1,250	$1,250
MEMD			$1,250	$1,250
DGSM/MEMD			$1,250	$1,250
Grand Total			$30,000	$30,000

List of Participants

Name	**Organization**	**Country**
Adaine Anlil-Wafa	Geological Bureau of Comoros	Comoros
Antony Wamalwa	GDC	Kenya

Ayan Ahmed Suge	ODDEG	Djibouti
Cosmas Rutto	KenGen	Kenya
Danson Warui	KenGen	Kenya
Deflorah Kangogo	GDC	Kenya
Dereje Moges	EEP	Ethiopia
Emmanuel Ngetich	KenGen	Kenya
Emmanuel Turinimana	EDCL	Rwanda
Hassan Mohamed Magareh	ODDEG	Djibouti
Isa Lugaizi	MEMD	Uganda
Jeannette M. Zaneza	KIST	Rwanda
Lucy Njue	GDC	Kenya
Didas Makoye	TGDC	Tanzania
Musenge Choma	Zesco	Zambia
Nasrasin-Ahmed Ibrahim Ahmed	ODDEG	Djibouti
Pacifique Mukandala Syakengwa	Goma Volcano Observatory	DRC
Peter Mawejje	DGSM/MEMD	Uganda
Rokiya Houssein Hassan	ODDEG	Djibouti
Samod Youssouf Hassan	ODDEG	Djibouti
Thecla Mutia	GDC	Kenya
Timothy Koilege	KenGen	Kenya
Titus Habiyakare	EDCL	Rwanda
Wiseman Kambale Kavyavu	Goma Volcano Observatory	DRC

Deliverables

Participants will be able to contribute to decision making on the nature and size of the geothermal resource and on the development of plans for sub-surface exploration in their home countries.

Unachieved Goals

n/a

Next Steps

While EAGP does not have plans in the FY2019 workplan to continue work on this topic, the following recommendation was made by the short course instructors:

The experience of the Geothermal Resource Decision Short Course at ARGeo-C7 suggested several improvements for any similar hands-on workshops that USEA might support in future. Based on responses by participants, we would expect that most would benefit from completing the follow-up Modules 3 through 6.

Participants from Kenya, Ethiopia and Djibouti would particularly benefit from attending the Decision Workshop Module 7, currently in preparation, that is based on a developed field that is more analogous to the magmatically heated systems of the Eastern Branch of the EARS.

TANZANIA PARTNERSHIP

Energy 101: Global Best Practices
February 12-15, 2019

The Members of Parliament (MP) that sit on Tanzania's Parliamentary Energy Committee lack knowledge of the energy sector. Many are serving on the committee with little to no knowledge on natural gas and electricity. These MPs are expected to develop and pass legislation to increase energy access in Tanzania, integrate renewable energy, and develop policies to encourage private sector participation in Tanzania's energy sector.

This training was designed as introductory for Members of Tanzania's Parliament (MPs) that sit on the legislature's Energy Committee. Topics that were covered included:

- Global energy sector overview
- Electricity generation, transmission, distribution (broad overview)
    - Mini-grids
- Natural gas- upstream, midstream and downstream (broad overview)
    - LNG and how this differs
    - Tanzania's natural gas reserves and LNG plans
- Energy sector reform—how is the energy sector changing worldwide
    - Unbundling national utilities
- Renewable Energy—wind, solar, hydro, biomass, and geothermal
    - Integrated resource planning
- Private sector participation in the energy sector—IPPS, PPPs
    - Renewable energy auctions
        - Update on Tanzania's auction plans

Results

After a week of presentations and informal conversations, the speakers were able to offer the following key takeaways to the MPs:

1. Measure TANESCO's performance whether the utility is unbundled or bundled.
2. Unbundling of the utility needs to be managed politically.
3. Tanzania's regulator needs to be independent from all levels of government and be able to hold TANESCO accountable.
4. Tanzania has potential for geothermal electricity generation and direct use of geothermal.

The MPs were able to improve their energy sector knowledge through this 4-day training course. Through written evaluations/ surveys of the program, the MPs stated that the most value of the program were the sessions that went over renewable energy and its various generation types. The MPs in attendance also shared an interest in future trainings on unbundling and energy sector reform.

Cost Share

	NGO	Private Business	Recipient Country Government	Grand Total
Ecofys		$6,650		$6,650
Energy and Water Utilities Regulatory Authority			$7,800	$7,800
Frontier Energy		$800		$800
GeothermEx		$5,700		$5,700
Matleng Energy Solutions		$7,200		$7,200
Ministry of Energy			$2,400	$2,400
Parliament of Tanzania			$148,800	$148,800
Tanzania Renewable Energy Association	$600			$600.00
Grand Total	**$600**	**$20,350**	**$159,000**	**$179,950**

List of Participants

Last Name	First Name	Organization	Position
Frank	Enighenja	Parliament of Tanzania, Energy Committee	Committee Secretary
Frank	Felister Mjonja	Parliament of Tanzania, Energy Committee	Committee Secretary
Luoga	Innocent	Ministry of Energy	Acting Commissioner for Energy and Petroleum Affairs
Chibulunje	Godfrey	Energy and Water Utilities Regulatory Authority	Director of Electricity
Mzuzuri	Mariam Ditopile	Parliament of Tanzania, Energy Committee	Member of Parliament

Msabaha	Maryam	Parliament of Tanzania, Energy Committee	Member of Parliament
Juma	Hamoud Abuu	Parliament of Tanzania, Energy Committee	Member of Parliament
Juma	Mwantakaje Haji	Parliament of Tanzania, Energy Committee	Member of Parliament
Abdallah	Hamida M.	Parliament of Tanzania, Energy Committee	Member of Parliament
Ajali	Rashid Akbar	Parliament of Tanzania, Energy Committee	Member of Parliament
Khatib	Mohamed Juma	Parliament of Tanzania, Energy Committee	Member of Parliament
Komba	Yosepher F.	Parliament of Tanzania, Energy Committee	Member of Parliament
Mayeye	Kiza	Parliament of Tanzania, Energy Committee	Member of Parliament
Mwakajoka	Frank	Parliament of Tanzania, Energy Committee	Member of Parliament
Gulamali	Seif Khamis	Parliament of Tanzania, Energy Committee	Member of Parliament
Heche	John	Parliament of Tanzania, Energy Committee	Member of Parliament
Lwakatare	Wilfred	Parliament of Tanzania, Energy Committee	Member of Parliament
Dihoni	Juma Hamisi	Parliament of Tanzania, Energy Committee	Member of Parliament
Mtolea	Abdallah	Parliament of Tanzania, Energy Committee	Member of Parliament
Sakuru	Zubeda Hassan	Parliament of Tanzania, Energy Committee	Member of Parliament
Kitandula	Dunstan	Parliament of Tanzania, Energy Committee	Member of Parliament
Millya	James	Parliament of Tanzania, Energy Committee	Member of Parliament
Kanusu	Mikali Saidi	Parliament of Tanzania, Energy Committee	Committee Secretary
Pondeza	Ussi Salum	Parliament of Tanzania, Energy Committee	Member of Parliament

Next Steps

There will be no follow-up to this activity. Further engagement with the Government of Tanzania will focus on the Ministry of Energy and with the national utility TANESCO.

COLOMBIA PARTNERSHIP

Distributed Energy Resources Training
February 4-8, 2019

Through its Energy Utility Partnership Program (EUPP) Cooperative Agreement with USAID, USEA selected Tuatara Group, an energy advisory firm, to deliver a five-day DER preparation training course for over (50) mid- and senior-level personnel from the key Colombian

stakeholder organizations in Bogotá, Colombia with an emphasis on XM, the system operator. The training program was designed with a focus on the aspects of DER integration issues from system operator's perspective to give the participants a clearer idea of the steps to follow for a successful integration of DER in Colombia.

The Tuatara Group team of Pamela Peseux, Chris Villarreal, Juan Gers, and Rao Konidena developed the program based on the proposed objectives and with XM's input. The team then travelled to Colombia February 4-8, 2019 to implement the training. Each trainer brought a unique skill set and experience to ensure that the training was well organized and thoroughly covered the topics from various perspectives. The training program topics were organized as follows:

Day 1: Introductions and Overview of Distributed Energy Resources
Day 2: Integration of DER Into the Electricity Markets
Day 3: Planning the Bulk Power System for High DER Penetrations
Day 4: Interconnection and Operations
Day 5: Outlook for DER, Future Actions, and Conclusion

While the training was designed primarily for XM and with XM representatives' input and direction, USAID Colombia invited key stakeholders in addition to XM leadership to attend the training and to provide comments and input at the end of each day. This input not only assisted the training team to better understand some of the key sectoral issues -- opportunities and challenges surrounding DER expansion -- but also elevated the week-long event from a general training session to a Colombia energy stakeholder discussion on DER expansion.

The afternoon of the last day of the training was dedicated to a small group activity to begin the development of an action plan for integrating DERs in Colombia. The participants were divided into four groups and were tasked with identifying the benefits of DER, their role in Colombia, what were their objectives and way forward to meet these objectives. Each team was also asked about how DERs could assist in the Electricaribe case.

Results

The group action plans had common themes for objectives and recommendations, such as:

Promote Competition

- Achieve greater competition in the market, aiming at maximum use of resources and efficiency in prices
- Promote more competitive prices at all levels, wholesale market to end user
- Dynamize the competition at the retail level in the electricity market.
- Regulatory changes in the wholesale and retail market that encourage user participation
- Creation and implementation of the intraday market
- Implement smart meters
- Educate the consumer in the benefits of being an active user in the market
- Centralize information through robust and interactive platforms
- Encourage the change of roles or the appearance of new roles in the market (2- 3 years)

- Make adjustments to the electricity market for the incorporation of DER (allow competition at the retail level) (2-3 years)
- Implement wholesale energy market and spot markets or another approach that allows the fulfillment of the objectives

Improve the Quality of Service/ Improve Reliability

- Improve the quality of electric power service
- Improve the quality and reliability in the attention of the demand
- Achieve efficiency, quality of service and demand participation in the short term, in the medium and long term obtain the reduction in user fees.
- Improve the reliability and flexibility of the country's electrical system
- Make available energy supply options according to the particular or local needs of the users
- In radial configurations, implement DER technologies according to need
- Encourage the use of DER for relief of restrictions and losses
- Create policy guidelines for the development of DERs that solve reliability problems
- Make adjustments to the market for the incorporation of DER (create aggregators)
- Define through regulatory and regulatory changes the technical requirements of equipment, infrastructure and guarantees of compliance with requirements
- Define regulation for the delivery of DER information, preparation of forecasts and administration of the same.
- Know the "hosting capacity" of each distribution system and make the adjustments for the integration in this distribution system.
- Modify Resolution 106 of 2006 for the connection of new generation plants that is in line with these changes.
- Define an updated Technical Regulations for Electrical Installations (RETIE) for the implementation of new generation technologies.
- Define and implement National Operation Council (CNO) agreements for the operation and compliance with technical requirements.

Diversify Energy Mix

- Diversify the energy matrix, including new types of generation such as non-conventional renewable storage
- Decrease the risk of variability (speculation) of prices through the diversification of technologies in the energy portfolio
- Make regulatory changes that allow for long-term contracts for the provision of service with DER
- Generator that are both energy sellers and buyers
- Tax benefits that encourage the implementation of new technologies
- Define the technical requirements for the connection of resources

Expand the coverage of power in the country

- Implement microgrids

- Generate business models to guarantee the installation of DER in non-interconnected areas
- Strengthen funds to promote DER in non-interconnected areas

Contribute to the Reduction of Emissions

- Create economic incentives (price signals) for technology change.
- Develop an emissions market

Overall Recommendations

- Facilitate convergence with other sectors (transport, communications, financial, others) - also leveraged the digital age for the management of large volumes of information
- Clarify the role of current and future actors
- Culturalization on the issue at all levels (government, society, economic sectors, etc.)
- Simpler solutions that can be developed in a short period of time, such as open regulations with clearly defined guidelines that do not limit the continued development of DER.

Recommendations for Further Technical Assistance

Over the course of the training, the Tuatara Group team has identified the following areas that could benefit from further technical assistance:

- Energy Storage Development
    - Develop standards
    - Develop Interconnection Agreement
    - Assistance in modeling/legal support
    - Develop operating recommendations for switching the facilities on and off

- Interconnection Tariff Modeling Assistance and Support
    - Document review process
    - DER integration

- Load Forecasting Technical Assistance and support for:
    - Long-term load forecasting
    - Hosting capacity forecasting/location

- Assistance to help prepare regulations and resolving technical issues including but not limited to aspects such:
    - Defining DER categorization
    - Handling transmission line congestion
    - Excessive number of roof-top installations
    - Metering technologies

- Long-term Strategy for XM
    - Develop long, medium, short term goals
    - Develop action plan for meeting those goals
    - Identify responsible parties

- Develop strategies to guarantee reliability in electrical service, in particular for Electricaribe. Pilot projects could be considered to determine the efficacy of the new technologies and especially energy storage options which have a very fast response time when outages occur. Handling of roof-top PV and their effects could also be first analyzed with pilot projects and/or network simulation model.

Cost Share

	Non-Govt NGO	Private Business	Recipient Country Govt	Grand Total
Acolgen	$ 2,100			$ 2,100
ASOCODIS	$ 4,800			$ 4,800
CAC	$ 1,425			$ 1,425
CELSIA		$ 4,275		$ 4,275
CI	$ 950			$ 950
Colombia Inteligente	$ 5,400			$ 5,400
CREG			$ 3,400	$ 3,400
DNP			$ 3,000	$ 3,000
DNP			$ 2,100	$ 2,100
EBSA		$ 3,800		$ 3,800
Enertolima		$ 3,000		$ 3,000
EY		$ 600		$ 600
MME			$ 7,800	$ 7,800
SER	$ 2,400			$ 2,400
SSPD			$ 5,100	$ 5,100
SURE/Optima consultores		$ 600		$ 600
UPME			$ 6,900	$ 6,900
XM			$ 41,500	$ 41,500
Grand Total	**$ 17,075**	**$ 2,275**	**$ 69,800**	**$ 99,150**

List of Participants

Last name	First name	Position	Organization
Machuca	Alejandra	Profesional	Acolgen
Triana	Byron	Director Regulacion	Acolgen
Sanchez	Juan Camilo		Acolgen
Cruz	Edwin	Asesor	ASOCODIS
Restrepo	Jaime	Profesional	ASOCODIS
Ramìrez	Elkin		CAC
Cañaveral	Christian	Asesor	CELSIA
Korman	Abraham		CI
Molina	Juan David		Colombia Inteligente
Castellanos	Carlos Andrés		CREG
Ramos Osorio	Daniela		CREG
Cortés	Mateo Alejandro		CREG
Barbosa	Fabian	Profesional Subd Energìa	DNP
Sarmiento	Angela	Profesional Subd Energìa	DNP
Palacios	Daniel		EBSA
Plata	Ronald		EBSA
Ortiz	Jasson	Director Nuevos Negocios	Enertolima
Tautiva	Camilo	Gerente	EY
Curtas	Bibiana	Profesional	MME
Gutierrez	Julia	Profesional	MME
Rojas	Julian	Profesional oficinas de asuntos regulatorios y empresariales	MME
Zuluaga	Julian	Jefe oficina asuntos regulatorios y empresariales	MME
Socha	Manuel		MME
Rozo	Natalia		MME
Obando	Carolina	Coordinador Regulatorio	SER
Corredor	German	Director	SER
Mozo	David	Ingeniero	SSPD
Ossa	Diego	Director tecnico energìa	SSPD
Guzman	Esteban	Ingeniero	SSPD
Murillo	Oscar	Ingeniero	SSPD
Lucio	Alejandro	Electricity markets expert	SURE/Optima consultores
Jimenez	Antonio		UPME

Hernandez	Luis Alfredo		UPME
Martinez	William		UPME
Zapata	Henry		UPME
Carbo	Julio		US Dept of Trade
Diaz Garces	Alexander		XM
Jaramillo Velez	Andres		XM
Borda Zapata	Carlos Eduardo		XM
Maya Ochoa	Cecilia Ines		XM
Perez Orozco	Diana Maria		XM
Zapata	Jaime		XM
Calderon Guarin	Jose Luis		XM
Arbelaez Zapata	Juan Camilo		XM
Ramirez	Lina	Especialista	XM
Tamayo Gil	Lizeth Johanna		XM
Carvajal Mendoza	Luz Dary		XM
Castrillon Gutierrez	Neby Jennyfer		XM
Paez Fuentes	Rafael Jose		XM
Palacio Garces	Victor Alfonso		XM

Deliverables

The presentations given by the presenters, and a report by the consultant.

Unachieved Goals

None.

Next Steps

There will be a training on Battery Storage scheduled to be conducted in Bogota, Colombia in May 2019.

5. RESULTS FROM PREVIOUS ACTIVITIES

UGANDA PARTNERSHIP

Hydroelectricity provides around 75% of total generation in Uganda. UEGCL oversees the operation, maintenance, and development these hydropower plants as well as other generation sources within Uganda. However, Uganda has several older hydropower dams that are

inefficient and need retrofitting, such as Nalubaale Dam, as well as several new hydropower dams under construction, like the Isimba and Karuma Dams. UEGCL requested a training on how to form a team of engineers to do O&M and create a strategic asset management plan to properly manage these generation assets.

In May 2018, USEA brought two experts from Chelan Public Utility District, John Yale and Janel Ulrich, to Kampala, Uganda to discuss how Chelan PUD operates and maintains their three hydropower dams in Washington State and develops an asset management strategy.

Janel Ulrich worked with UEGCL staff to complete a maturity assessment using the Institute of Asset Management (IAM) framework and building a roadmap to help them reach ISO 55000 certification and a timeline to implement UEGCL's Asset Management Strategy.

The following chart is the UEGCL timeline for the next year to create an Asset Management Strategy.

S/No	Activity	Difficulty	Q1	Q2	Q3	Q4	Q5	Q6	Continue	Resources
1	Dedicate Staff (AM Team)	easy								Board, CEO, training budget
2	Form Governance Teams	easy								Cross-functional
3	Create AM Objectives	medium								Governance Team
4	Develop Policy	medium								Governance Team
5	Develop SAMP	a bit hard								Governance Team
6	Develop & Continuously Improve Processes	vary widely								Working Teams - Gov. oversight
7	Build long term plan	a bit hard	TBD							AM team w. Gov. Team
8	BSc Management	ongoing								Existing - Bus Perf Team
9	Finalize and keep EAPs updated	ongoing	Ongoing							Existing - Dam Safety Team
10	Develop asset strategies	difficult								AM team w. Gov. Team
11	Implementation of Practices (PMs, project, etc)	ongoing								AM team w. Gov. Team

LEGEND Ongoing outside of AM System AM System Development

USEA followed up with UEGCL and specifically asked them to inform USEA which of these items have been completed. Since the executive exchange in May, UEGCL self-reported that they have achieved:

Created asset management objectives (#3)
Developed asset management policies (#4)
Developed and continuously improve processes (#6)
Built long term asset management plan (#7)
Created a BSc Management (#8)
Developed asset strategies (#10)
Implemented asset management practices (#11)

The progress towards creating an asset management strategy is a significant step. Asset management is the coordinated activity of an organization to realize value from assets. It focuses on the cost, performance, and risk that an organization takes in obtaining, using, and disposing of an asset. Asset Management is designed to ensure that value is derived from assets. It looks holistically at maintenance, operations, risk/condition, repairs, replacements, etc. to ensure that all assets are being optimally managed from a strategic perspective. Without it, it is possible to over invest or under invest time and/or money in assets in a manner that doesn't support the overall goals of the organization. It creates alignment between who the organization is and what they are trying to do and the manner in which they manage their assets. It covers, amongst other things, risk management, project management, operations & maintenance, asset information/data collection, planning, and organizational skills and capabilities. As such, when properly implemented it will support all of their highest level Key Performance Indicators (KPIs) -- reliability, safety, cost effectiveness, cost efficiency, etc.

GREENING THE GRID PARTNERSHIP

India plans to deploy unprecedented levels of variable renewable energy (VRE) on its power grid – 175 GW installed capacity of renewable energy (RE) by 2022. (Current estimates stand at approximately 43 GW of installed RE capacity.) Critical to integrating VRE into the power system is rigorous analytical support to identify grid stability issues, options for optimizing dispatch, and sources of potential flexibility. USEA held two bootcamps in New Delhi and an executive exchange to the United States in March 2018.

Since then, India's Central Energy Authority has developed a coal flexing working group to focus on policies and next steps for India's transition, and the regulator is reviewing its current mandate for state-owned coal generators' minimum operational load capacity to be more tailored to the capabilities of the particular generator. Additionally, through the capacity building, many of the coal generators have proven able to successfully decrease their minimum capacity load levels beyond their historical experiences.

USEA is following up to get more specific details on these results.

ETHIOPIA PARTNERSHIP

USEA has held 5 "train the trainers" workshops in Ethiopia. The training series aims to enhance EEU personnel's professional skills essential for safe and efficient operation and maintenance of substations, as well as help EEU further build its capacity by preparing their own "in house" trainers – which would maximize the effect and ensure sustainability of the project.

As a direct result of this training, two of Ethiopian Electric Utility's senior substation personnel have trained 534 EEU substation supervisors, technicians, and engineers from various distribution substations across Ethiopia on issues of electrical safety.

USEA is following up to get more specific details on these results.

6. PRIVATE SECTOR COORDINATION

No private sector coordination has occurred in this reporting period. USEA will develop these programs with the AOR.

7. KNOWLEDGE MANAGEMENT

An important part of the EUPP is the preservation and dissemination of key materials developed under the agreement. The materials will capture lessons learned, best practices, and key technical and policy findings identified during EUPP activities. On a quarterly basis, EUPP will produce a newsletter highlighting all of the EUPP activities conducted during that period.

USEA will use existing digital communication tools including its website, email contact lists, and social media accounts to publicize and disseminate the information. Reports, research, online training programs, factsheets, and other useful information on a variety of energy topics will be maintained on the USEA website in searchable, filterable formats that allow users to easily access them, and will be created and curated with climate resiliency initiatives in mind. USEA will continue to feature their "Women in Energy" series by highlighting the achievements of both U.S. and international women who have risen to senior positions within the energy sector.

In addition, USEA will initiate and manage a EUPP database of participants and technical experts to track participation in EUPP activities, contact information, and other relevant pieces of information (e.g. speakers' areas of expertise), resulting in a comprehensive report of all EUPP participation. Participant information can also be added to USEA's already existing database of email addresses and will be used for dissemination of information about EUPP activities.

USEA is planning to undergo a website overhaul to allow for integrated webinars and more robust dissemination of information. The communications team will work with USEA's web developer to present information in a user-friendly format, employing search engine optimization (SEO) to increase the visibility of the information to the general public.

In addition to online dissemination of information, USEA will continue to reach an audience of energy sector stakeholders and decision makers by hosting public events, forums and briefings.During the time period covered under this Semi Annual Report, USEA has created media campaigns around EUPP activities using LinkedIn, Twitter, Facebook, and Instagram where applicable and has continued to update the website with information about programs and Requests for Proposals (RFPs). Following please find USEA's knowledge management report outlining our external communication. For ease of reporting, USEA has combined the social media platforms into campaigns and will report on those rather than individual platforms.

8. COMMUNICATIONS

Twitter

USEA has the following reach on Twitter: 2,213 followers (was 1,883 in the last reporting time period)

LinkedIn

USEA and EUPP staff have the following reach on LinkedIn:

USEA: 1,797 followers (was 1,607 in last Semi Annual)
Marina Barnett: 396 followers (was 353 in last Semi Annual)
Tricia Williams: 1,015 followers (was 863 in last Semi Annual)
Johanna Koolemans-Beynen: 1,028 followers (was 903 in last Semi Annual)
Elise Voorhis: 501 followers (was 425 in last Semi Annual)

Instagram:

USEA has the following reach on Instagram: 979 followers (was 722)

Facebook:

USEA has the following reach on Facebook: 262 followers (was 193)

Social Media Campaigns

Women In Energy

October - Proscovia Njuki of Uganda
Twitter: https://twitter.com/USEnergyAssn/status/1049400966410395649
Facebook: https://www.facebook.com/USEnergyAssn/photos/a.133856054621440 2/2187972321273216/?type=3&permPage=1
Instagram: https://www.instagram.com/p/Bow9HXUgi-H/?utm_source=ig_web_button_share_sheet
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6455887192664391680
Website: https://www.usea.org/article/women-energy-proscovia-njuki

November – Majida Mourad
Twitter: https://twitter.com/USEnergyAssn/status/1064969929743577089
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6470741671586906112
Facebook: https://www.facebook.com/USEnergyAssn/photos/a.133856054621440 2/2270148416388939/?type=3&theater
Website: https://www.usea.org/article/women-energy-majida-mourad

December – Linda Breathitt
Website: https://www.usea.org/article/women-energy-linda-breathitt

January – Minaxi Garg
Twitter: https://twitter.com/USEnergyAssn/status/1087815455128080385
Website: https://www.usea.org/article/women-energy-minaxi-garg

LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6493935415416934400

February – Merribel Ayres
Twitter: https://twitter.com/USEnergyAssn/status/1098658178546446341
Website: https://www.usea.org/article/women-energy-merribel-ayres
Instagram: https://www.instagram.com/p/BuMf2ZZgwvi/
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6504424322608746496
Facebook:
https://www.facebook.com/USEnergyAssn/photos/a.245688320771545 8/24568832543821 20/?type=3&theaterhttps://www.facebook.com/USEnergyAssn/photos/a.245688320771545 8/24568832 54382120/?type=3&theater

Partnership Media Campaigns

Uganda Asset Management and Hydropower Maintenance – October 2018
Twitter: https://twitter.com/USEnergyAssn/status/1050444310527791104
Twitter: https://twitter.com/USEnergyAssn/status/1053325884072046592
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6456211853986054144
Facebook:
https://www.facebook.com/USEnergyAssn/photos/a.133856054621 4402/219347479072 2969/?type=3&permPage=1

Ethiopia Substation Training – October 2018
Twitter: https://twitter.com/USEnergyAssn/status/1050483262316077058
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6456249930460786689

Executive Exchange on ISOs for Colombia – October 2018
Twitter: https://twitter.com/USEnergyAssn/status/1049721873150427136

Ethiopia Leadership Training – November 2018
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6469231962811883520

ARGeo-C7 Conference – November 2018
Twitter: https://twitter.com/TriciaW90155933/status/1058370789890838528
https://twitter.com/USEnergyAssn/status/1059296718628548608

Training on Load Flow Models for Rwanda – November 2018?
Twitter: https://twitter.com/USAIDRwanda/status/1057567494624423936
https://twitter.com/NelsonClaireN/status/1057575345191301120

Tanzania Reverse Auction result (retweet of Kristen Madler) - November 2018
Twitter: https://twitter.com/kristenedi/status/1060193321992228864

https://twitter.com/kristenedi/status/1060192949647130626

Load Flow Model Training for Rwanda – January 2019
Twitter: https://twitter.com/USEnergyAssn/status/1090308198702219265
https://twitter.com/NelsonClaireN/status/1090947947490103296
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6496059606433878017

Executive Exchange on Coal Flexing for India – February 2019
Twitter: https://twitter.com/USEnergyAssn/status/1092543059634601986

Workshop on Distributed Energy in Colombia – February 2019
Twitter: https://twitter.com/USEnergyAssn/status/1096152049476141057

Energy 101 Training for Tanzanian Members of Parliament – February 2019
Twitter: https://twitter.com/USEnergyAssn/status/1096153257318199296
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6502194908235907072

Project Management Training for Senegal – February 2019
Twitter: https://twitter.com/USEnergyAssn/status/1096463703845810176
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6501908257345466368

Energy Sector Reform Workshop for Honduras – March 2019
Twitter: https://twitter.com/USEnergyAssn/status/1110575254831812608
https://twitter.com/USEnergyAssn/status/1113899597024378880
https://twitter.com/USEnergyAssn/status/1113901817656692746
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6519661238564241408
https://www.linkedin.com/feed/update/urn:li:activity:6516718861033750528

Website

USEA listed the following RFPs on our website:

Local Electricity Sector Expert Support – Afghanistan Electricity Sector Governance and Management Assessment – February 2019

Short Term Logistics Support – Afghanistan Electricity Sector Governance and Management Assessment – February 2019

Afghanistan Electricity Sector Governance and Management Assessment – February 2019

Briefings

"Central American Energy Markets" – February 13, 2019

Twitter: https://twitter.com/USEnergyAssn/status/1095732369804484622

"Women In Energy Roundtable" – March 8, 2019

Twitter: https://twitter.com/USEnergyAssn/status/1101528590905237504
https://twitter.com/USEnergyAssn/status/1103744065357733891
https://twitter.com/USEnergyAssn/status/1104029441787871233
https://twitter.com/USEnergyAssn/status/1104039103572701188
https://twitter.com/USEnergyAssn/status/1104043176669732870
https://twitter.com/USEnergyAssn/status/1104047665237708807
https://twitter.com/USEnergyAssn/status/1104050264925974529
https://twitter.com/USEnergyAssn/status/1104052591099551746
https://twitter.com/USEnergyAssn/status/1104054438132678657
https://twitter.com/USEnergyAssn/status/1104058514731945986

Sheila Hollis (retweeted by USEA):
https://twitter.com/energylawgirl/status/1101579945329987585

https://twitter.com/energylawgirl/status/1104080483854487552

AGA – 24,100 followers (retweeted by USEA):
https://twitter.com/aga_naturalgas/status/1104055965505241089

The Foster Report - 357 followers (retweeted by USEA):
https://twitter.com/Foster_Report/status/1104075892488327169

LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6507274331175944192

"Investment Opportunities in West Africa" – March 26, 2019

Twitter: https://twitter.com/USEnergyAssn/status/1110576336580628480
LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6511299417746784256

Webinars

CAISO made a presentation via a webinar on their DER plans, including the implementation of Rule 21 on DER interconnections, and phase 3 of their Energy Storage and Distributed Energy Resources, aimed at enhancing the ability of DER to participate in the ISO market.

USEA Now

USEA Now was sent to our members and non-members list each month.

Newsletter
None during this time period.

Fact Sheet
Completed the fact sheet about EUPP during the last reporting period.

Special Announcements
None during this reporting period.

Media Outreach
None during this time period.

a. FY 2018 IMPACTS AND INDICATORS

USEA intended to meet specific indicators for FY 2018 planned activities. The tables below will reflect the planned indicators as well as the actual FY 2018 indicators to date. Table 2 breaks down the indicators by country/revenue stream.

When assessing USEA EUPP activities' impact or relation to climate change, USEA includes any activities that focus on clean energy best practices or climate change mitigation.

Table 1(a): PMP Indicator progress - USAID Standard Indicators and Project Custom Indicators Total for Entire EUPP Program

EG.12 Climate Change - Clean Energy											
Indicator	Data Source	Baseline data		FY 2019		Quarterly Status – FY 2019				Annual Performance Achieved to Date (in %)	Target Justification for Fiscal Year of this Annual Report
		Year	Value	Annual Cumulative Planned target	Annual Cumulative Actual	Q1	Q2	Q3	Q4		
EG 12-1 Number of people trained in clean energy supported by USG assistance											
12-1a: Male	Sign in sheets	2018	0								
12-1b: Female	Sign in sheets	2018	0								
EG 12-2 Number of institutions with improved capacity to address clean energy issues as supported by USG assistance											
12-2a: National Governments	Sign in sheets	2018	0								
12-2b: Sub-National Governmental	Sign in sheets	2018	0								
12-2c: Other	Sign in sheets	2018	0								
EG 12-3 Number of laws, policies, regulations, or standards addressing clean energy formally proposed, adopted, or implemented as supported by USG assistance											
12-3a: National, proposed		2018	0								

Table 1(b): PMP Indicator progress - USAID Standard Indicators and Project Custom Indicators

EG.12 Climate Change - Clean Energy											
Indicator	**Data Source**	**Baseline data**		**FY 2019**		**Quarterly Status – FY 2019**				**Annual Performance Achieved to Date (in %)**	Target Justification for Fiscal Year of this Annual Report
		Year	**Value**	**Annual Cumulative Planned target**	**Annual Cumulative Actual**	**Q1**	**Q2**	**Q3**	**Q4**		
12-3b: National, adopted		2018	0	0							
12-3c: National, implemented		2018	0	0							
12-3d: Sub-national, proposed		2018	0	0							
12-3e: Sub-national, adopted		2018	0	0							
12-3f: Sub-national, implemented		2018	0	0							
12-3g: Regional or international, proposed		2018	0	0							
12-3h: Regional or international, adopted		2018	0	0							
12-3i: Regional or international, implemented		2018	0	0							
EG 12-4 Amount of investment mobilized (in USD) for clean energy as supported by USG assistance											
12-4a: Public, domestic		2018	0	$0	0	0	0	0	0	0%	Partnerships are just beginning in FY 2018. These results will take more than 1 year to achieve.
12-4b: Public, international		2018	0	$0	0	0	0	0	0	0%	
12-4c: Private, domestic		2018	0	$0	0	0	0	0	0	0%	
12-4d: Private, international		2018	0	$0	0	0	0	0	0	0%	

Table 1(c): PMP Indicator progress - USAID Standard Indicators and Project Custom Indicators

EG.12 Climate Change - Clean Energy											
Indicator	**Data Source**	**Baseline data**		**FY 2019**		**Quarterly Status – FY 2019**				**Annual Performance Achieved to Date (in %)**	Target Justification for Fiscal Year of this Annual Report
		Year	**Value**	**Annual Cumulative Planned target**	**Annual Cumulative Actual**	**Q1**	**Q2**	**Q3**	**Q4**		
EG 12-5 Clean energy generation capacity supported by USG assistance that has achieved financial closure											
12-5a: Solar		2018	0	0	0	0	0	0	0	0%	
12-5b: Wind		2018	0	0	0	0	0	0	0	0%	
12-5c: Hydro		2018	0	0	0	0	0	0	0	0%	
12-5d: Geothermal		2018	0	0	0	0	0	0	0	0%	
12-5e: Biomass and biofuels		2018	0	0	0	0	0	0	0	0%	
12-5f: Other		2018	0	0	0	0	0	0	0	0%	

Table 1(d): PMP Indicator progress - USAID Standard Indicators and Project Custom Indicators

Power Africa Indicators											
Indicator	Data Source	Baseline data		FY 2019		Quarterly Status – FY 2019				Annual Performance Achieved to Date (in %)	Target Justification for Fiscal Year of this Annual Report
		Year	Value	Annual Cumulative Planned target	Annual Cumulative Actual	Q1	Q2	Q3	Q4		
10 – Total funds leveraged by USG for energy projects											
Public funds	Cost share sheets	2018	0		$470,016	$167,016	$303,000				Cost shares
Private funds	Cost share sheets	2018	0		$211,450	$151,500	$59,550				Cost shares
Male	Sign in sheets	2018	0		6536	2464	2884				
Female	Sign in sheets	2018	0		1188	512	676				
		2018	0								

Table 1(e): PMP Indicator progress - USAID Standard Indicators and Project Custom Indicators

Custom Indicators											
Indicator	**Data Source**	**Baseline data**		**FY 2019**		**Quarterly Status – FY 2019**				**Annual Performance Achieved to Date (in %)**	Target Justification for Fiscal Year of this Annual Report
		Year	**Value**	**Annual Cumulative Planned target**	**Annual Cumulative Actual**	**Q1**	**Q2**	**Q3**	**Q4**		
Number of new software programs installed	Utility	2018	0	1	0						Uganda/ Geothermal
Development of load flow models	Utility/ contractor	2018	0	1	0						Rwanda PSSE

Table 2: PMP Indicator progress by Country

AFRICA											
	Ethiopia/ Utility	Uganda	Tanzania	Kenya	Senegal	Kenya Geo	Ethiopia Geo	Rwanda			
Cost shares leveraged: Total Amount	$46,500	$204,766	$179,950		$157,200			$15,000			
Cost shares leveraged: Priv. Bus.		$39,182	$20,350		$39,600						
Cost shares leveraged: Priv. Phil.											
Cost shares leveraged: Other Priv.											
Cost shares leveraged: NGO	$1,750	$15,834	$600								
Cost shares leveraged: Higher Ed.											
Cost shares leveraged: Recipient	$44,750	$28,250	$159,000		$117,600			$15,000			
Cost shares leveraged: Bi/Multi Donor											
Cost shares leveraged: Other Non-USG											
Cost shares leveraged: USG		$121,500									
POWER AFRICA INDICATORS											
10 – Total funds leveraged by USG for energy projects	$46,500	$204,766	$179,500		$157,200		$62,500	$15,000			
Public funds	$44,750	$149,750	$159,600		$117,600		$62,500	$15,000			
Private Funds	$1,750	$55,016	$20,350		$39,600						
14 – Person hours of training completed in technical energy fields supported by USG assistance	1520	800	1400		1504		488	544			
Male	1360	560	1080		1208		376	544			
Female	160	240	320		296		112	0			
19 – Number of policy reforms/laws/regulations/administrative procedures drafted and presented for public/stakeholder consultation to enhance sector governance and/or facilitate private sector participation and competitive markets as a result of USG assistance	0	0	0		0		0				
USAID STANDARD INDICATORS											

	Ethiopia/ Utility	Uganda	Tanzania	Kenya	Senegal	Kenya Geo	Ethiopia Geo	Rwanda			
EG 12-1 Number of people trained in clean energy supported by USG assistance	38	10	27		35	50		16			
12-1a: Male	34	7	19		28	43		16			
12-1b: Female	4	3	8		7	7		0			
EG 12-2 Number of institutions with improved capacity to address clean energy issues as supported by USG assistance	2	1	1		1	20		2			
12-2a: National Governments			1								
12-2b: Sub-National Governmental	2	1			1	20		2			
12-2c: Other											
EG 12-3 Number of laws, policies, regulations, or standards addressing clean energy formally proposed, adopted, or implemented as supported by USG assistance											
12-3a: National, proposed											
12-3b: National, adopted											
12-3c: National, implemented											
12-3d: Sub-national, proposed											
12-3e: Sub-national, adopted											
12-3f: Sub-national, implemented											
12-3g: Regional or international, proposed											
12-3h: Regional or international, adopted											
12-3i: Regional or international, implemented											
EG 12-4 Amount of investment mobilized (in USD) for clean energy as supported by USG assistance											
12-4a: Public, domestic											
12-4b: Public, international											
12-4c: Private, domestic											

	Ethiopia/ Utility	Uganda	Tanzania	Kenya	Senegal	Kenya Geo	Ethiopia Geo	Rwanda			
12-4d: Private, international											
EG 12-5 Clean energy generation capacity supported by USG assistance that has achieved financial closure											
12-5a: Solar											
12-5b: Wind											
12-5c: Hydro											
12-5d: Geothermal											
12-5e: Biomass and biofuels											
12-5f: Other											
CUSTOM INDICATORS											
Number of new software programs installed											
Development of load flow models											
ASIA											
	GTG-India										
Cost shares leveraged: Amount	$282,638										
Cost shares leveraged: Priv. Bus.	$215,698										
Cost shares leveraged: Priv. Phil.											
Cost shares leveraged: Other Priv.											
Cost shares leveraged: NGO	$4,865										
Cost shares leveraged: Higher Ed.											
Cost shares leveraged: Recipient	$62,075										
Cost shares leveraged: Bi/Multi Donor											
Cost shares leveraged: Other Non-USG											
Cost shares leveraged: USG											
USAID STANDARD INDICATORS											
EG 12-1 Number of people trained in clean energy supported by USG assistance	72										
12-1a: Male	66										

	GTG-India										
12-1b: Female	6										
EG 12-2 Number of institutions with improved capacity to address clean energy issues as supported by USG assistance	20										
12-2a: National Governments	1										
12-2b: Sub-National Governmental	16										
12-2c: Other	2										
EG 12-3 Number of laws, policies, regulations, or standards addressing clean energy formally proposed, adopted, or implemented as supported by USG assistance											
12-3a: National, proposed											
12-3b: National, adopted											
12-3c: National, implemented											
12-3d: Sub-national, proposed											
12-3e: Sub-national, adopted											
12-3f: Sub-national, implemented											
12-3g: Regional or international, proposed											
12-3h: Regional or international, adopted											
12-3i: Regional or international, implemented											
EG 12-4 Amount of investment mobilized (in USD) for clean energy as supported by USG assistance											
12-4a: Public, domestic											
12-4b: Public, international											
12-4c: Private, domestic											
12-4d: Private, international											
EG 12-5 Clean energy generation capacity supported by USG assistance that has achieved financial closure											
12-5a: Solar											

	GTG-India										
12-5b: Wind											
12-5c: Hydro											
12-5d: Geothermal											
12-5e: Biomass and biofuels											
12-5f: Other											
CUSTOM INDICATORS											
Number of new software programs installed											
Development of load flow models											

LATIN AMERICA AND THE CARIBBEAN											
	Colombia	**Honduras**									
Cost shares leveraged: Amount	$333,304	$191,900									
Cost shares leveraged: Priv. Bus.	$125,175										
Cost shares leveraged: Priv. Phil.											
Cost shares leveraged: Other Priv.											
Cost shares leveraged: NGO	$58,535	$25,200									
Cost shares leveraged: Higher Ed.	$1,200										
Cost shares leveraged: Recipient	$129,819	$145,100									
Cost shares leveraged: Bi/Multi Donor											
Cost shares leveraged: Other Non-USG		$21,600									
Cost shares leveraged: USG	$18,575										
USAID STANDARD INDICATORS											
EG 12-1 Number of people trained in clean energy supported by USG assistance	187	70									
12-1a: Male	141	44									
12-1b: Female	46	26									
EG 12-2 Number of institutions with improved capacity to address clean energy issues as supported by USG assistance	79	8									

12-2a: National Governments	2	1									
12-2b: Sub-National Governmental	13	3									
12-2c: Other	64	4									
EG 12-3 Number of laws, policies, regulations, or standards addressing clean energy formally proposed, adopted, or implemented as supported by USG assistance											
12-3a: National, proposed											
12-3b: National, adopted											
12-3c: National, implemented											
12-3d: Sub-national, proposed											
12-3e: Sub-national, adopted											
12-3f: Sub-national, implemented											
12-3g: Regional or international, proposed											
12-3h: Regional or international, adopted											
12-3i: Regional or international, implemented											
EG 12-4 Amount of investment mobilized (in USD) for clean energy as supported by USG assistance											
12-4a: Public, domestic											
12-4b: Public, international											
12-4c: Private, domestic											
12-4d: Private, international											
EG 12-5 Clean energy generation capacity supported by USG assistance that has achieved financial closure											
12-5a: Solar											
12-5b: Wind											
12-5c: Hydro											
12-5d: Geothermal											

12-5e: Biomass and biofuels											
12-5f: Other											
CUSTOM INDICATORS											
Number of new software programs installed											
Development of load flow models											
REGIONAL											
Cost shares leveraged: Amount											
Cost shares leveraged: Priv. Bus.											
Cost shares leveraged: Priv. Phil.											
Cost shares leveraged: Other Priv.											
Cost shares leveraged: NGO											
Cost shares leveraged: Higher Ed.											
Cost shares leveraged: Recipient											
Cost shares leveraged: Bi/Multi Donor											
Cost shares leveraged: Other Non-USG											
Cost shares leveraged: USG											
INDICATORS											
USAID STANDARD INDICATORS											
EG 12-1 Number of people trained in clean energy supported by USG assistance											
12-1a: Male											
12-1b: Female											
EG 12-2 Number of institutions with improved capacity to address clean energy issues as supported by USG assistance											
12-2a: National Governments											
12-2b: Sub-National Governmental											

12-2c: Other											
EG 12-3 Number of laws, policies, regulations, or standards addressing clean energy formally proposed, adopted, or implemented as supported by USG assistance											
12-3a: National, proposed											
12-3b: National, adopted											
12-3c: National, implemented											
12-3d: Sub-national, proposed											
12-3e: Sub-national, adopted											
12-3f: Sub-national, implemented											
12-3g: Regional or international, proposed											
12-3h: Regional or international, adopted											
12-3i: Regional or international, implemented											
EG 12-4 Amount of investment mobilized (in USD) for clean energy as supported by USG assistance											
12-4a: Public, domestic											
12-4b: Public, international											
12-4c: Private, domestic											
12-4d: Private, international											
EG 12-5 Clean energy generation capacity supported by USG assistance that has achieved financial closure											
12-5a: Solar											
12-5b: Wind											
12-5c: Hydro											
12-5d: Geothermal											
12-5e: Biomass and biofuels											
12-5f: Other											
CUSTOM INDICATORS											
Number of new software programs installed											

Development of load flow models											