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Integrated Resources and Resilience Planning (IRRP)

Annual Progress Report

FY2016 – April 25, 2016 to September 30, 2016

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ACRONYMS & ABBREVIATIONS

AOR	Agreement Officer's Representative
CDCS	Country Development Cooperation Strategy
CLEER	Clean Energy Emission Reduction
DQA	Data Quality Assessment
DSM	Demand-side Management
EC	Energy Commission
ECG	Electricity Company of Ghana
EC-LEDS	Enhancing Capacity for Low Emission Development Strategies
GHG	Greenhouse Gas
GOG	Government of Ghana
GRIDCo	Ghana Grid Company
ICB	International Competitive Bidding
ICF	ICF Inc.
INDCs	Intended Nationally Determined Contributions
IPSMP	Integrated Power System Master Plan
IR	Intermediate Result
IRRP	Integrated Resource and Resilience Planning
KM&L	Knowledge Management and Learning
LE/LCD	Low Emissions/Low Carbon Development
MCC	Millennium Challenge Corporation
M&E	Monitoring and Evaluation
ME&L	Monitoring, Evaluation and Learning
METSS	Monitoring, Evaluation and Technical Support Services (METSS) Project
NAMAs	Nationally Appropriate Mitigation Actions
NCCP	Ghana's National Climate Change Policy
NEDCo	Northern Electricity Distribution Company
PFG	Partnership for Growth

PMP	Performance Monitoring Plan
PURC	Public Utilities Regulatory Commission
RFA	Request for Application
STTA	Short-Term Technical Assistance
T&D	Transmission and Distribution
USAID	US Agency for International Development
VRA	Volta River Authority

I. BACKGROUND AND STRATEGY

I.1 IRRP Project Overview

This Annual Report, a deliverable under Cooperative Agreement No. AID-641-LA-16-0001, describes the activities and accomplishments of the **USAID/Ghana Integrated Resource and Resilience Planning (IRRP) Project** during the period April 25, 2016 – September 30, 2016. Under the IRRP Project, ICF is supporting USAID/Ghana to strengthen the ability of local power sector institutions and enterprises to develop planning tools to support effective deployment of energy efficiency and power supply resources, and transmission and distribution (T&D) infrastructure. It is also intending to support ancillary institutions (such as fuel suppliers for thermal plants, resources for renewable energy generation, etc.) to ensure an integrated approach for power system planning.

I.2 Management

ICF is applying its unique programmatic approach to leverage expertise and ongoing activities related to IRRPs within the planning framework and sectoral reforms in Ghana. A team of Accra-based ICF staff, local partners in Ghana, and short-term technical assistance (STTA) from ICF's U.S.-based offices are implementing this activity. Through this structure, ICF is investing in building capacity among key stakeholders (discussed above) and local partners. Based on ICF's past work in Ghana, we are confident in our ability to identify and partner with suitable organization(s) to support broad capacity development. This approach allows for more funding to flow towards training and capacity building activities that will assure a more sustainable outcome, given that local partners would benefit from expansion of skills in areas related to the development of the IPSMP, including model development and use, addressing climate resiliency, and developing action steps for low carbon development.

The ICF team is led by **Chief of Party, Dr. Ananth Chikkatur**, who has more than a decade of wide-ranging experience in the energy and environmental sector. Using ICF's proprietary models, he has worked on projects in the power and fuel market analysis for project developers, private equity firms, utilities, governments, and international organizations (World Bank, APEC, and the European Commission). Juanita Haydel serves as the **IRRP Senior Advisor and Engagement Manager** for the

IRRP project, and she is also the team lead for the USAID/Tanzania IRRP Project. **Matthew Boyer** provides home office support and is a key part of the operations support for the IRRP project.

A key aspect of the IRRP project requires the use of local Ghanaian staff to implement the IRRP project, and as such ICF is providing capacity building and training to these local Ghanaian IRRP staff. The staff below, along with Dr. Chikkatur, form the ICF's IRRP Team. The current local staff for the IRRP team include:

- Maxwell Amoah Deputy Chief of Party – Operations (DCOP)
- Bernard Modey Senior Power Expert (seconded to ICF from GRIDCo)
- Maame Tabuah Ankoh Renewable Energy Specialist
- Collins Dadzie Energy Modeler
- Charles Acquah M&E and Capacity Building Specialist
- Edith Mills Tay Office Manager

ICF is also currently in the process of recruiting a Transmission and Distribution Specialist. In addition to these local staff, the IRRP team is seeking to engage with various members of the Ghana power sector agencies, as part of our capacity building.

ICF's IRRP staff in Ghana is supported by a number of home-office based staff on short term technical assistance (STTA). Some of the key STTA staff include **Maria Scheller**, who is acting as the IRRP and Generation Expert, with support from Rajesh Bhana and IPM support team. The transmission and distribution related work is being led by **Ken Collison**, supported by Harjeet Johal, Aatif Musani, and Rakesh Maurya. The Energy Efficiency work is being supported by **William R. Prindle**, with support from Haider Khan and Amit Khare. ICF is also seeking to subcontract with the Energy Foundation on EE/DSM work; however the contract is not yet signed. Work surrounding Climate Risk and Resilience is being supported by **Molly Helmuth-Convery**. Additional short-term technical assistance (STTA) from ICF's home office will be engaged to support specific technical and implementation needs, under the direction of Dr. Chikkatur.

1.3 IRRP Project Objectives

- **Increase energy efficiency and DSM analytical support** – Energy efficiency is an important element of the IRRP that offers an often overlooked opportunity to reduce demand, increase reliability

within the current system, and enable resources to go toward expanding generation and service for unserved populations. While integrated resource planning typically considers current and future demand, ICF's IRRP process is designed to assess opportunities to meet commercial and industrial energy demands through increased efficiency, rather than only through increased generation. Providing access to this level of analysis, and developing local expertise to best apply it, is an important opportunity and primary objective of this project.

- **Develop a process for least-cost generation expansion planning through an Integrated Power System Master Plan (IPSMP)** – ICF developed the concept of an IRRP to improve long-term planning and decision-making in the power sector in the face of increased risk and uncertainty in the sector. By incorporating risks and reliability concerns throughout the analysis process, an IRRP is designed to deliver a more robust set of data and information to inform scenarios and, ultimately, action plans. Low-cost development of the power sector is assessed within a “least regrets” framework that assesses a broad range of potential uncertainties, or “stressors”, to the system, including changes in climate, fuel price and availability, technology costs, and energy regulations. Combined with a low-carbon goal and the Clean Energy Emission Reduction (CLEER) protocols for calculating GHG emissions, the model will provide guidance on development of specific actions in the short, medium, and long term. This will help Ghana to meet its reliable electrification goals within the context of Ghana’s Intended Nationally Determined Contributions (INDCs), and to support transition to international competitive bidding (ICB) to procure generation. These innovations will provide guidance on development of specific actions in the short-, medium-, and long-term.
- **Establish a culture for IRRP across the power sector** – ICF will strengthen the emerging culture of resiliency planning through focused stakeholder collaboration and targeted training programs. Effective analysis, planning, and implementation through an IRRP process results in significant benefits, affecting policy and regulation, power infrastructure expansion, suppressed demand, and low-emission development goals. ICF will work throughout the project to build awareness and understanding of these benefits among partners and stakeholders. This effort will include working closely with a Steering Committee consisting of representatives from key GOG power sector agencies, as well as through a potential “secondment” program. While doing so, we will identify specific challenges and try to build planning-related skills and expertise that can be incorporated into standard practice in the future. The IRRP project for Ghana utilizes ICF’s significant subject-matter expertise and experience through a group of supporting experts who will provide short-term technical assistance. ICF’s local Project Team

in Accra will provide targeted training for project counterparts and stakeholders, and mentor local partners on all aspects of this program.

- **Plan and establish metrics for moving the energy sector toward a low emissions/ low carbon development (LE/LCD) pathway** – The IPSMP will provide the basis for a Program of Action, which will support the objectives of Ghana’s National Climate Change Policy (NCCP). ICF will provide recommendations and assistance on developing the Program of Action to achieve LE/LCD goals. In addition, ICF proposes specific energy efficiency and DSM support to accelerate near-term LE/LCD activities in the market, as part of our technical assistance for tariff implementation.

1.4 Key Results and Outcomes

Key results during and the conclusion of the project include:

- **Increased capacity among key Ghanaian stakeholders to produce and manage IPSMPs** – ICF will utilize a number of strategies to build capacity among local partners and key stakeholders. These include:

- **Targeted Training** – The IRRP team will assess current training needs among stakeholders, existing mechanisms to provide training and skill development, and challenges among staff to participating in training opportunities, including any gender-specific barriers. We will use this assessment to design training to reach the targeted stakeholders and provide the greatest impact. ICF will also utilize its STTA technical experts to enhance knowledge transfer, collaboration, and idea-sharing. Stakeholders will gain skills that include an increased understanding of the inputs to the least cost/low carbon model and learn how to update the model with new data. They will also be able to independently assess the implications of policy decisions prior to policy development in the power and resources sectors.
- **Steering and Technical Committees** – To build ownership and commitment to the IRRP process, improve access to data and dissemination of project information, and ensure future collaboration on the IPSMP, ICF will set up a Steering Committee and a Technical Committee, with representatives from key stakeholder groups. During the Inception phase, ICF will work closely with USAID and the Steering Committee members to identify the focal GOG agency for the IRRP project. These Committee members will be points of contact within the key agencies for ICF during this project and they will also serve as a conduit for the IRRP project to receive government data and studies.

- **Secondment** – ICF has planned for a secondment program, where staff from key power sector stakeholder organizations are identified and embedded (“seconded”) for full or limited time with the IRRP Project Team in Accra. In this way, they will learn skills and get hands-on experience in the activity involved in developing and implementing an IRRP model.
 - **Study Tours** – Subject to interest of the stakeholders, ICF will develop opportunities to visit and engage with counterparts in the U.S., where similar planning approaches are being pursued. Such an IRRP Training Program will be planned with stakeholders and will include travel to visit utilities in the United States.
 - **Sustained technical support** – In addition to training the local IRRP staff, ICF will work with a local partner(s) to develop and implement concepts for offering continued technical support to key stakeholders.
 - **Whitepapers:** As part of our Technical Assistance and Capacity Building, we will develop short publications such as Whitepapers, Reports, and Fact Sheets to address basic questions on elements of power sector planning, and/or regular training sessions.
- **Increased capacity among key Ghanaian stakeholders to improve resilience of energy and power systems** – Stakeholder collaboration and training related to selecting the model and inputs (Activity 3) will also focus broadly on risk to the energy and power system, including those related to climate. Participants will learn about these concepts related to resilient infrastructure and impacts of various risks including climate change, through workshops and training sessions. Through their continued involvement and use of the modeling tools to assess these risks, they will be able to learn about mitigation options that can reduce the impacts of the risks.
 - **A least-cost, low-emissions model for energy development and IPSMP aligned with the NCCP/INDC** – Through the project, ICF will move toward developing a Ghana-specific power planning model and IPSMP. Ultimately, these will be the tools provided to GOG counterparts to use, via their training, in continuing to advance and expand Ghana’s energy and power sector, transform generation procurement to a least-cost, low-emission ICB, and grow economic development along a low-emissions pathway. It is expected that these activities will be conducted by the GOG counterparts on their own in the future, with little future support from ICF.

The linkages of the performance indicators to the various results areas as per the Project M&E Plan is shown in Table 5 of Annex B.

I.5 USAID-IRRP M&E Results and Summary

ICF's approach is focused heavily on building capacity amongst various stakeholders, in order to assure a more sustainable outcome, given that local partners would benefit from expansion of skills in areas related to the development of the IPSMP, including model development and use, addressing climate resiliency, and developing action steps for low carbon development.

The USAID-IRRP Project contributes ultimately to Development Objective 2 of the Country Development Cooperation Strategy (CDCS) by working towards a project goal of "Increased Investment and Improved Performance in the Power Sector of Ghana". Four Project Intermediate Results (PIRs) contribute to this goal. The performance indicators and the Project intermediate results are linked by the two project sub-intermediate results where applicable. These PIRs are described below.

PIR 1: Develop a process for least-cost generation expansion planning developed through an Integrated Power System Master Plan (IPSMP)

Indicator 1: Person-hours of training completed in technical energy planning fields

The IRRP as part of activities towards the development of an Integrated Power sector Master Plan, held some training modules on power sector planning during the Launch and Awareness workshop. These modules would be built upon in subsequent training sessions. Again, a working session was held on the determination of a modeling tool to use for the IRRP project. The STTA staff took the participants through the fundamentals of ICF's Integrated Planning Model (IPM®) and did a comparative analysis with other modeling tools like the LEAP and the MESSAGE. The performance of the indicator as demonstrated in Figure I below illustrates the number of person hours of training during these two workshops. Similarly, the number of people trained is also indicated.

It is important to note that, though activities commenced in most of the other results areas, as at the end of FY2016, those activities had not translated into indicator results. In view of this the other seven (7) indicators as shown in Table 5 did not register any results during the reporting period.

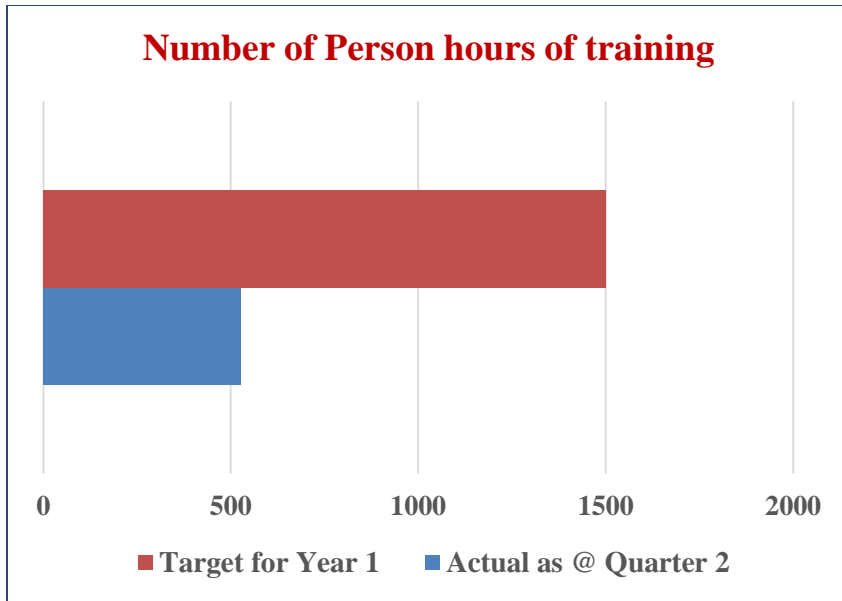


Figure 1: Illustration of performance on “Number of Person hours of training”
Indicator 2: Number of Persons (unique) trained in technical energy planning fields

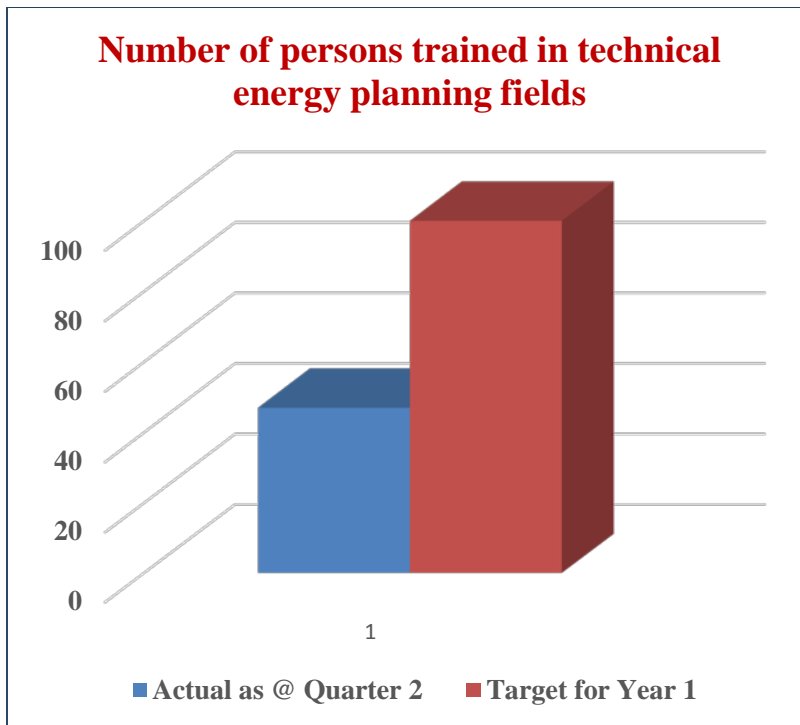


Figure 2: Illustration of performance on “Number of persons trained in technical energy planning fields”

2. Updated Planned Activities for Year One

Table I below shows the activities planned for Year I, which is updated from the schedule indicated in the Final Year I Work Plan submitted to USAID. It is imperative to note that these planned activities are expected to be implemented from April 25, 2016 to April 24, 2017. Given the extensive need for stakeholder activities, some of the schedule has shifted.

Table I: Planned Activities for Year One Work Plan

Activity/Deliverable	Timeline
Activity I: Mobilization and Inception	
a. Conduct necessary activities to operationalize the ICF office in Accra and begin stakeholder introduction and engagement with the IRRP project.	April 24 – May 1, 2016
Activity 2: Literature Review and Data Collection	
Review of the existing plans developed by GOG and its entities, USG agencies, multilateral agencies, and others during the past 5 years, and establish adequacy and areas of further work	Ongoing
Activity 3a: Electricity Demand Analysis and Forecast	
Collection of existing models, input data and results from counterpart staff	July-December 2016
Interviews with selected counterpart staff, as part of ICF's review and validation of existing models	August 2016
Review of existing demand models by IRRP team	August-September 2016
Training of IRRP team and counterpart staff through a workshop on demand forecast principles, modeling, data collection for updating forecasts, and best practices	September 2016 (IRRP Launch Event)
Evaluation of climate-related impacts on demand forecasts	September- November 2016
Recommendations for Reference Case Demand forecast presented to Steering Committee for review and approval	November 2016
Develop a memorandum stating ICF's final recommendations for demand scenarios for IRRP modeling, and options for updating future demand scenarios.	January 2017

Activity/Deliverable	Timeline
This memorandum will be included in Demand section of the Power Sector Master Plan Annex	
Activity 3b: Demand-Side Resource Analysis	
Evaluation of DSM options	September 2016 - February 2017
Energy Audits – Training and audits of selected customers	January - March 2017
DSM TOU Rate Structure Model Capacity Building	November 2016
Memorandum on DSM recommendations and implications on potential energy savings and demand reduction	April 2017
Activity 4a: Generation Resource Assessment and Inventory	
Review Ghana's existing least-cost resources plan and policy/procedure for procuring generation	August 2016
Create database of existing and planned/committed generation resources	Aug-Oct 2016
Develop unplanned generation resource assumptions	Sep-Dec 2016
Activity 4b: Fuel supply Analysis	
Review the fuel supply requirements for thermal power generation, and assess the existing and planned arrangements for meeting the same, including but not limited to gas supply through pipeline from domestic and regional resource, LNG imports, coal imports, etc. Existing work shall be utilized to a large extent.	November 2016 – March 2017
Activity 4c: Standalone Off-grid Systems	
Evaluate the status of pilot micro- and mini-grids;	January - April 2017
Develop recommendations for further improvements and expansion of off-grid systems	April to June 2017
Review current plans to expand grid to un-electrified areas	Feb to Apr 2017
Develop options to augment existing grid expansion plans.	Apr to Jun 2017
Participate in Study Tour on distributed generation	April 2017
Perform more focused evaluation for one or two selected areas	June 2017
Participate in sessions on off-grid activities in IRRP workshops and training. This may include Workshop on assessments of off-grid activities and	To be planned in the future

Activity/Deliverable	Timeline
recommendations to expand off-grid systems and also to extend grid to un-electrified areas.	
Prepare memorandum on current off-grid activities, opportunities to expand off-grid systems, and options to extend the grid to currently un-electrified areas	July 2017
Activity 5a: Transmission Network Analysis	
Data Collection and Validation	September – December 2016
Training of IRRP team and GRIDCo staff on transmission analysis principles and modeling, through case study evaluations for transmission analysis in the U.S.	January 2017
Transmission Security and Transfer Capability Assessment for Years 1 to 5	Dec 2016 – March 2017
Identify Incremental Transmission System Improvements and Develop Transfer Capabilities for IRRP Modeling	Nov 2016 – March 2017
Review Results of IRRP Modeling	WILL DEPEND ON SCHEDULE OF IRRP MODELING
Perform Power Flow and Transfer Capability Analysis to Determine if Additional Upgrades Required	
Transmission-related sessions in IRRP workshops and training	
Finalize Transmission System Analysis and Provide Draft Report on Transmission Section of Power Sector Master Plan	
Activity 5b: Distribution System Analysis	
Data Collection and Validation	Sep-Dec 2016
Training of IRRP team and ECG/NEDCo staff on distribution system analysis	Feb – Apr 2017
Training and capacity building on other aspects of distribution system planning requested by ECG	Jan 2017 to Sep 2017
Distribution System Reliability and Resiliency Assessment	Mar to Dec 2017
Identify Incremental Distribution System Improvements Needed for Reliability and Resiliency	Sep to Dec 2017
Finalize Distribution System Analysis and Provide Draft Report on Distribution Section of Power Sector Master Plan	Sep to Dec 2017
Activity 6: Least Cost / Low Carbon Modeling	

Activity/Deliverable	Timeline
Review of power sector models and modeling discussions with Technical Committee	Sep – Oct 2016
Workshop on power modeling and IRRP (as part of Launch event)	September 2016
Selection of IRRP model	November 2016
Reserve margin determination	January 2017
Develop Ghana Reference Case	September 2016 – March 2017
Reporting and Documentation	Jan - May 2017
Activity 7: Review Ghana's Climate Change Commitment System	
a. Undertake a review of energy-sector NAMAs / INDCs committed by Ghana at COP-21 and develop the framework for implementation consistent with the IPSMP.	September 2016 to March 2017
b. Identify potential risks associated with climate change impacts on the power sector, as well as potential options to mitigate them.	November 2016 – March 2017
c. Provide training on how the CLEER Protocol, and associated GHG accounting approach and calculators can also be used to determine the GHG emissions resulting from the outputs of the modeling.	April – July 2017
Activity 8: Resilience Assessment	
Identification of risks and risk mitigation options, and evaluation metrics	January – February 2017
Workshop on risks, mitigation options, and metrics	March – May 2017
Workshop on climate change impacts and building resilience to climate change in the power sector	March – May 2017
Memorandum of risk and resiliency in Ghana power sector	August 2017
Modeling of alternate scenarios and development of least-regrets strategies	March – July 2017
Formal training workshop	Year 2
Meetings with GOG and Steering Committee on implications of IRRP on PCB	Year 2
Activity 9: Integrated Power Systems Master Plan	

Activity/Deliverable	Timeline
a. Identify the policy, regulatory and institutional framework to implement the Integrated Power Sector Master Plan including potential revisions to the existing frameworks.	Year 2
b. The transmission component of the IPSMP would outline the transmission lines, grid stations and other associated investments needed to meet the IPSMP.	
c. The distribution component would present the outline for grid-based augmentation and expansion of distribution networks, substations, and associated infrastructure.	
d. The Off-grid and Renewable energy component shall outline indicative investments in different technologies for the strengthening and expansion of access.	
e. Develop the procurement framework, along with the associated commercial and financial framework, to enable GOG stakeholders to solicit necessary investments in generation, transmission, distribution, and renewable energy sub-sectors.	
f. Provide the outline of implementation of infrastructure and resilience planning, and coordination among GOG institutions.	

3. Operations

The project performance was engineered by the administrative structures established at the Ghana Office. The key deliverables under the operations aspect of the project are categorized under Administrative set-up, recruitment, and branding.

Activities Conducted

Administrative Set-up:

- a. Office space, initiated make-ready construction, and started lease negotiations to secure operations for the full two year period of performance. ICF's new office is co-located at the UNOPS office, which is located at 65A, 7th avenue extension, adjacent teachers Fund, North Ridge, Accra. ICF is housed in the entire ground floor and UNOPS has the first floor.
- b. ICF procured furniture and other office equipment in July 2016.
- c. ICF Ghana staff received their IRRP laptops and necessary installations made.
- d. ICF's Ecobank bank account and payroll accounts are operational in August 2016.
- e. Salary payment arrangements successfully completed with Deloitte & Touche for payment of Staff salaries.
- f. Registration with SSNIT, GRA, Petra Trust completed in August 2016.
- g. Agreement signed with Nationwide and funds transferred to their accounts in August 16, 2016; Health Insurance Cards received on August 17, 2016.

Staff and Recruitment

- a. For the Accra-based project office, ICF posted the job descriptions for seven positions, including:
 - Senior Power Expert
 - Energy Modeler
 - Renewable Energy Expert
 - M&E and Capacity Building expert
 - Deputy Chief of Party, Operations
 - Office Manager
 - Transmission and Distribution Expert (open)
- b. The ICF team completed more than 10 in-person interviews of short-listed candidates in May/June 2016, and continues to recruit for the open T&D position.
- c. COP Ananth Chikkatur returned back to Accra (with his family) on July 6, following the pack out of his home in Virginia.
- d. Maxwell Amoah (Deputy Chief of Party - Operations) started work with ICF on Monday July, 4 2016, and has started to develop procedures and manuals for the ICF Accra office.
- e. Charles Acquah (M&E and Capacity Building specialist) joined the IRRP project on Monday July 11.
- f. Collins Dadzie (Energy Modeler) joined in August 2016.
- g. Edith Mills will joining ICF on July 18th as the Office Manager.
- h. Mr. Bernard Modey joined the team on secondment from GRIDCo in August 2016, although the formal agreement was signed in October. Mr. Modey was selected through our recruitment process to be the Senior Power Expert.
- i. Maame Tabuah Ankoh joined the team as the Renewable Energy Specialist on October 10, 2016.

Branding:

- a. Final version of stationery items submitted to USAID for branding approval.
- b. Obtained USAID approval for new design for sign post, business cards and frosted glass design using ICF template.



Figure 3: Sign post at the IRRP Project Office Entrance

4. ACTIVITY IMPLEMENTATION PROGRESS

4.1 Activity I: Project Mobilization and Inception

Following the award of contract to ICF to implement the IRRP Project, a number of activities were executed to ensure a successful take-off of the project. Prominent amongst these included the recruitment of local staff, acquisition of office space and engagement with key stakeholders. The activities related to operationalization of the project were described above, and further related activities are described below. While stakeholder engagement will be an ongoing process, all of the other elements of Activity I are now complete.

Other Activities

In addition to the operations-related activities covered in the previous section, Activity I featured progress on several other components: Mobilization of the Chief of Party to Accra

- Mobilization of the Start-Up team to Accra, which included the Start-Up Specialist (Matt Boyer), the Recruitment Specialist (Adriana Brockman), and the T&D expert (Ken Collison)
- Formal launch meeting and agreement review with AOR and additional supporting USAID/Ghana staff
- Presentation of the IRRP program concept to key stakeholders as a part of the initial project Dissemination Meeting; included over 25 representatives from USAID/Ghana, the Energy Commission, Volta River Authority, MiDA, Electricity Company of Ghana, GRIDCo, Ministry of Power, Ghana National Petroleum Corporation, and others
- Following the Dissemination Meeting, Dr. Chikkatur and the Start-Up team held one-on-one meetings with all of the key power sector stakeholders to better understand the Government of Ghana's priorities and ongoing initiatives
- Dr. Chikkatur spent a whole day with five members of the policy and planning division of the Energy Commission to review the ongoing update of the demand section (Volume I) of the Energy Commission's 2016 Strategic National Energy Plan (SNEP).
- Finalization of formal project registration with the GOG to ensure compliance with local laws, policies, and procedures
- Secured VAT & NHIL tax exemption and reimbursement certifications
- Development of an updated project M&E plan to establish performance indicators and tracking metrics; as well as partnering with the METSS project to ensure integration with the larger PFG, MCC, and MiDA portfolio targets

4.2 Key Stakeholder Consultations during Mobilization Phase

The key Stakeholder consultations held during the period under review are as indicated in Table 2 below.

Table 2: Key Stakeholder Consultations during mobilization phase

Key Stakeholder and Partner Institutions	Consultation Dates	Discussion Summary
USAID/Ghana	-May 16 -May 20 -May 30 -June 3 -June 10	-Agreement review and project kickoff with AOR and key staff -Discuss progress on work plan design and key program priorities -Discuss activity design and steering committee -Start-Up team and recruitment progress de-brief -Update of IRRP activities and recruitment
Energy Commission	-May 20 -June 14	-Follow-on to dissemination meeting to discuss ownership of IRRP
USAID METSS Project	-May 16 -May 19 -June 2 -June 6	-Establishment of initial M&E plan design -Review of draft plan and indicator development -Review of indicator definitions and reference sheet development -Review of PIRS
Ministry of Petroleum	-May 17	-Introduction of the IRRP and priorities of the ministry
Ministry of Power	-May 20	-Follow on to dissemination meeting regarding integration of IRRP
USAID PATRP Project (Nexant)	-May 20	-Collaboration with ongoing activities and leveraging work to date
MiDA/MCC	-May 16 -May 31 -June 16	-Project kickoff and review of IRRP's role in Compact II -Discussion of MiDA as IRRP co-owner and key milestones - Discussion of IRRP activities and role of Steering Committee, importance of EE in IRRP
ECG	-May 27 -June -June 13	-Overview of IRRP and PPA -Discussion of distribution planning -Discussion of capacity needs at ECG system planning

Key Stakeholder and Partner Institutions	Consultation Dates	Discussion Summary
GRIDCo	-June 7	-Discuss transmission planning and modeling
VRA	-June 9	-Discuss modeling tools used by VRA
Ghana EPA	-June 14	-Discuss role of IRRP and INDCs
GNPC	-June 7 -June 13	-Discuss role of gas in the context of IRRP
Energy Foundation	-June 1	-Discuss EF's potential roles and responsibilities as a partner
Praescient Limited	-June 1	-Discuss Praescient's potential roles and responsibilities as a partner
Africa Center for Energy Policy	-June 10	-Learn about ACEP and their role in the Ghana Energy Sector.
World Bank	June 16	-Discuss current WBG activities and ways in which the IRRP project can leverage ongoing work from the Bank
Lands Commission	June 16	-Discuss GIS capabilities in the Lands Commission, and potential relevance for IRRP work

4.3 Project Management and Reporting

As per USAID statutory requirements, the IRRP project was required to develop and submit the Year I work plan, Project M&E plan and bi-weekly reports. Key amongst the major deliverables for the period under review were preparation and submission of the Final Year I Work Plan and Performance Monitoring and Evaluation Plan on August 26, 2016 and July 26, 2016, respectively. The project also maintained an internal reporting process by producing weekly reports for internal weekly evaluation as well as outlook for the ensuing week. As per contract requirements, bi-weekly reports were submitted to the USAID every fortnight

Activities Conducted

Quarter 1 of Year I (April – June 30, 2016)

- a. Engaged and established working relationships with the key stakeholders which include MOP, MOPET, MESTI, MOF, VRA, GRIDCo, ECG, NEDCo, EPC, EC, MiDA, and METSS
- b. Developed and submitted draft Year I Work Plan
- c. Developed and submitted draft M&E Plan
- d. Worked with USAID and the Ministry of Power to conceptualize the establishment of Steering and Technical Committees for the IRRP Project
- e. Prepared and submitted bi-weekly reports on project performance to USAID

Quarter 2 of Year I (July – September, 2016)

- a. Year I work plan finalized and submitted to USAID on August 26, 2016; work plan was subsequently approved following the integration of comments from USAID
- b. M&E Plan finalized and submitted to USAID on July 26, 2016; M&E Plan was subsequently approved
- c. Steering and Technical Committees were established, and the first meetings held respectively on September 6 and September 8, 2016
- d. Launch and Awareness Workshop held from September 13 – 14, 2016
- e. First working session held on September 15, 2016
- f. Prepared and submitted bi-weekly reports on project performance regularly

4.4 Steering and Technical Committees

A key strategy to the implementation of the IRRP project was the establishment of the Steering and Technical Committees. The Steering Committee was set up to provide overall policy guidance in the implementation of the project while the technical Committee provided the needed technical inputs and data collection support amongst others.

Activities Conducted:

- a. The team coordinated with the Ministry of Power to issue formal invitations for the establishment of the IRRP project Steering and Technical Committees in June 2016. This included developing a clear mandate and scope for each committee, as well as reaching consensus on the formal designation of the Energy Commission as the focal institution for this project. ICF subsequently sent out emails with a scanned letter from the Ministry.
- b. IRRP Team continued to work with the Ministry of Power to keep track of the letters (responses) that were received from the various entities. As of August 5, 2016, the team had received responses from VRA, ECG, and NEDCO regarding the nominations for the two Committees. Follow-ups were done on the response from GRIDCo, GNPC, Ghana Gas, and the Ministries (MoP, MoPet, MESTI, and MoF). This was done through maintaining an open line of communication with the MOP with follow-up meetings and phone calls.
- c. Based on discussions with the AOR and the Energy Commission, IRRP team held a Steering Committee meeting on September 6, and a Technical Committee meeting on September 8. These meetings were held prior to the Launch Event. The meetings were held at the Energy Commission.
- d. The team, along with stakeholders, settled on September 13 and 14, 2016 as the finalized dates for the Launch and Awareness workshop following discussions with all the key stakeholders
- e. A draft letter (on the composition of the Steering and Technical Committee) was sent to the Ministry of Power for onward submission to the relevant Ministries and Agencies.
- f. The First Steering Committee meeting was held on September 6, 2016 at the Energy Commission Conference room from 2pm to 4 pm. Twenty five participants from 14 entities: MOPE – 1, MiDA – 1, GRIDCo – 2, GNPC – 3, MESTI – 1, ICF – 1, VRA – 1, IRRP – 5, EC – 6, BPA – 1. The members agreed to hold the Steering Committee meetings every other month for the next 4 meetings to ensure a smooth take-off of the project. The meeting also reviewed the Agenda for the Launch. The minutes of the Steering Committee was subsequently shared to all those who attended the meeting following the review by the Chair (Dr. NDK Asante)

- g. The first Technical Committee meeting was held at the Energy Commission on September 8, 2016. Twenty four participants from 11 institutions were present at the meeting: MOPE-1, GRIDCo-2, VRA-1, EC-9, Enclave Power – 1, NEDCo- 1, JICA – 2, MESTI – 1, BPA – 1, IRRP -4, and ICF – 1. The meeting finalized the Agenda for the Launch and Awareness workshop, and also confirmed the individuals to make the presentations at the Launch and Awareness. Minutes of the Technical Committee and Working Session was shared with the members after review by the circulated to the chair (Dr. Essandoh).

4.5 IRRP Project Launch

Towards creating the needed stakeholder awareness and generating the appropriate momentum for the implementations of the IRRP Project, the key stakeholders decided to hold a Launch and Awareness workshop from September 13 – 14, 2016. The workshop was held at Alisa Hotel in Accra. The meeting assembled stakeholders from the Ministry of Power, Ministry of Petroleum (MOPET), Ministry of Finance (MOF), Ministry of Environment, Science and Technology (MESTI), Energy Commission (EC), other power sector-related agencies, Development Partners (DPs), and other stakeholders. The workshop was graced by the presence of the Honorable Deputy Minister of Power, John Abdulai Jinapor, and the US Ambassador, Robert P. Jackson, USAID Mission Director, Andy Karas, and the Chief Director of Power, Solomon Asoalla. Several STTA staff from ICF prepared presentations and presented the work, as shown in Annex D.

Figure 4 below shows a section of the participants at the workshop.



Figure 4: IRRP Chief of Party, Ananth Chikkatur; addressing a section of the participants at the Launch and Awareness Workshop

The number of individuals from the various stakeholder who participated in the workshop and the distribution by sex is shown in Table 6 in Annex C.

All in all, the number of the participants for Day One was relatively higher than that of Day Two. This was because Day One had the benefit of the dignitaries who participated in the Opening Session. Being a typical energy professionals' workshop, the number of female representation was rather encouraging. Figure 5 below shows the representation of males and females at the Launch and Awareness workshop.

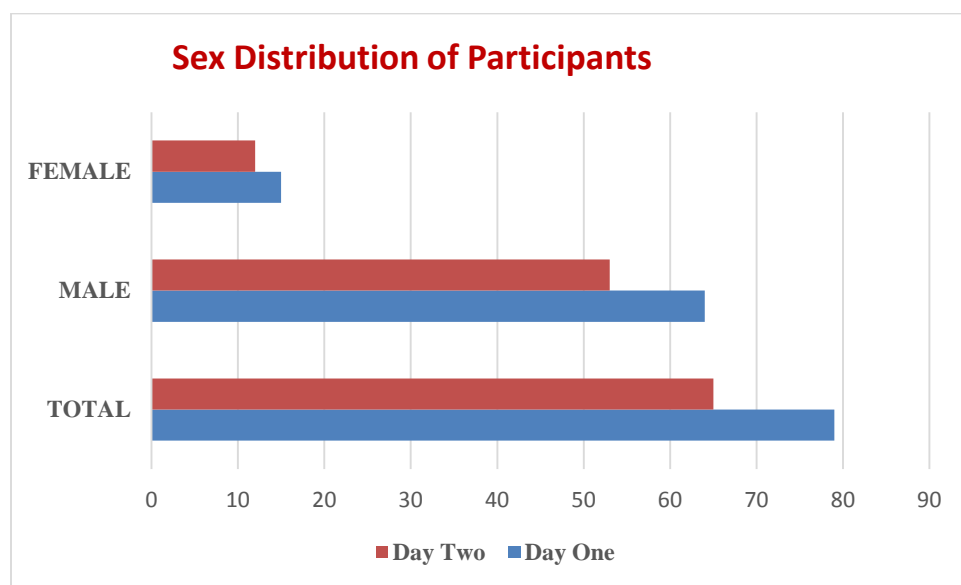


Figure 5: Sex Distribution at the IRRP Project Launch and Awareness Workshop

Highlights of Presentations at the Launch and Awareness Workshop:

The approach to the workshop, after the opening sessions was presentations on relevant issues in the sector followed by open-forum discussions. This presumably put the whole IRRP project implementation in perspective while providing the impetus for the project implementation. Experts from ICF headquarters also provided the global perspective to most of these topics – via presentations and contributions to discussions. The highlights of the presentations made at on Day One and Day Two of the workshop are as indicated as per Table 7 and Table 8 in respectively in **Annex D**. The full meeting report attached here as **Annex E**. Based on participant response to an evaluation questionnaire, all of the participants were extremely satisfied with the workshop, and requested additional capacity building training to be completed.

Activities Conducted

Quarter 1 of Project Year I

Conceptualized the Launch and Awareness workshop.

Quarter 2 of Project Year I

- a. IRRP Team developed an initial draft agenda that was shared with USAID, and further updates to the agenda made based on the comments provided.
- b. Invitations letters for the Launch workshop were sent to stakeholders
- c. Draft speaking points were prepared for the Hon. Deputy Minister and the US Ambassador
- d. Skype meetings were held with ICF Washington staff to discuss their presentations at the Launch and Awareness workshop
- e. Meetings were held with the following to discuss the launch as well as the Steering and Technical Committee meetings:
 - Prof Akabzaa, Chief Director, Min of Petroleum;
 - Mr. Solomon Asoalla, Chief Director of MOP;
 - Mr. Fredua Agyeman, Director Environment at MESTI;
 - Samuel Sarpong, Exec Secretary, PURC; and
 - Jabesh Amissah-Arthur CEO, BPA
- f. The IRRP Launch and Awareness workshop was held on September 13 – 14, 2016. In attendance were the Deputy Minister of Power, the Chief Director of the Ministry of Power, USAID Mission Director, the USAID EG Office Director, and the US Ambassador. Day one had 79 participants while Day two assembled 65. There was media attendance from Viasat 1, TV3, and GTV

4.6 Activity 2: Literature Review and Data Collection

One defining attribute of the IRRP precept concept is to investigate what is available, identify the possible deficiencies and make appropriate recommendations towards addressing these deficiencies. This strategy would be applied throughout the life of the project. For the period under review, the IRRP team collected and reviewed a number of plans and reports from existing work done by various players in the sector – GoG entities, USAID, other Development Partners, and independent Consultants. This afforded the team the opportunity to assess the adequacy of the work that has been done, as well as areas of new work that

the IRRP team could conduct with recourse to existing budget limitations. The team also collected relevant data to facilitate initial analysis as well as potential input into models.

Generic data collected during the reporting period for the IRRP project activities include:

- GRIDCo Hourly load forecast from January 2010 to August 2016
- Hourly actual consumption from January 2010 to August 2016 from GRIDCo
- Gas Masterplan Plan – December 2015 from GNPC
- PURC Gazetted Tariffs – June 2010 to October 2015
- Population and Housing Census 2010 - Summary Report
- GLSS 6 – Main Report
- Ghana’s INDC and Explanatory Notes – September 2015
- Ghana Share Growth and Development Agenda – Volumes 1&2
- IBES I Summary Report
- Ghana in Figures 2005 by GSS
- Ghana Economic Performance in Figures - 2010
- Rebasing of Ghana’s National Accounts Reference Year 2006
- GSS Annual GDP (Various Editions)

Aside from this, a comprehensive data request sheet has been developed which would be used to request for relevant data from the appropriate institutions.

Activities Conducted

Quarter 1 of Project Year I

- a. A number of documents were collected based on internet research from ICF’s home office, as well as during the Startup Trip. These documents were helpful in determining the workplan and stakeholder meetings during the Mobilization phase.

Quarter 2 of Project Year I

- a. A detailed data request form for the Ghana IRRP project was developed to prioritize and streamline data collection. Subsequent to this, a detailed data sheets was developed for each institution.
- b. *Data Request from GSS:*

- The IRRP team met with the Director of Economic Statistics of the Ghana Statistical Service and other officials to discuss available data at GSS for the IRRP Project activities. On the counsel of the Director of Economic Statistics at GSS, the team made a formal request to the Government Statistician to request for specific data for the IRRP project activities. This was followed up with a request for a technical meeting with the Government Statistician to explore the possibility of technical assistance from the GSS to support the needs for the IRRP work.
- This process was followed up with data request and TA request to GSS. The Head of Data Centre asked that we contacted him on Tuesday, October 4, 2016 for discussions where a date would be set for a potential meeting to explore the areas of technical support to the project

4.7 Activity 3a: Electricity Demand Analysis and Forecast

The IRRP project, with support from the STTA staff commenced a situational assessment of load forecasting and modeling in Ghana.

As part of Ghana's effort towards developing long-term plans to inform strategic decision in the power sector, long term peak load and energy forecasts have been developed. These plans have been undertaken by Ghana's power sector utilities and the EC, often in partnership with external consultants essentially to meet their respective institutional needs. As part of this process, long-term load forecast reports are published by the utilities which usually covers a period of about ten (10) years. These load forecast reports are updated annually by reviewing the underlining assumptions for consistency with emerging trends.

The IRRP team, supported by USAID/Ghana, reviewed a number of recent load forecast reports as part of efforts to evaluate the potential for their use in the project implementation. The IRRP project's resource and resilience planning requires a consensus-based reference demand forecast, which should consider the potential for demand side management, energy efficiency, and climate change. This review analysis is a first step in such a process.

The IRRP team collected and reviewed the current load forecast reports of the various Ghana power agencies, essentially to assess their adequacy for the IRRP Project. The rationale for the exercise was to determine the amount of work done, potential deficiencies, and how to improve the on the existing work. In effect, the review of the existing reports sought to:

- understand the methodologies and assumptions used;
- identify commonalities and differences;
- understand the benefits and challenges associated with each model;
- understand the geographic distribution of growth; and
- develop a reference case demand forecast.

The load forecast reports reviewed over the period are as indicated in Table 3 below.

Table 3: Load forecast report reviewed

No.	Institution	Report	Year of Publication	Forecast Period
1	Volta River Authority	Load Forecast, Final Report	October 2014	2015 to 2030
2	Ghana Grid Company	Generation Master Plan Study For Ghana	November 2011	2011 to 2026
3	Ghana Grid Company	Transmission System Master Plan For Ghana	February 2011	2010 to 2020
4	Electricity Company of Ghana Limited	2015 Energy and Demand Forecast Review; Ten Year Energy Forecast	October 2015	2015 to 2024
5	Northern Electricity Distribution Company	Long-Term Load Forecast	April 2015	2015 to 2024
6	Energy Commission	[Draft] Strategic National Energy Plan (SNEP II); Energy Demand Projections for Ghana; Final Draft II	To be Published	2015 to 2035
7	USAID/Nexant	[Draft] Electricity Demand Forecasting and Suppressed Demand Estimation Study	To be Published	2015 to 2030

Summary of review exercise:

The analyses revealed that generally, all the forecasts had an upward trend, following similar trajectory. Largely, electricity demand in Ghana was expected to grow between 2.5 to 3.0 times the current consumption over the next 15 years. The most optimistic demand growth was forecast by the EC, as its demand forecasts are bottom-ups and did not consider the potential constraints (supply, network, price impacts, etc.) in the system. The VRA forecast is about the same as the Energy Commission forecast from 2016 to 2020. From 2021 onwards, the EC forecast moved higher than that of VRA. GRIDCo's Generation Master Plan forecast followed about the same trend as that of the USAID/Nexant forecast from 2017 to 2026. Of interest though was the Generation Master Plan forecast which seemed slightly lower than that of the Transmission Master Plan, though the latter study was undertaken first.

Many of these differences could be accounted for by the different assumptions for GDP growth and the regression methodologies used by these forecasts. As noted earlier, apart from the EC forecast all the other reviewed forecasts used linear regression analysis to forecast demand.

Generally, all the regression models used different combinations of three main explanatory variables: GDP, Population, and Retail Price; although these variables were used differently by different institutions. For instance GRIDCo's Generation Master Plan used previous year's GDP, population, and current year GDP per capita; whereas, GRIDCo's Transmission Master Plan used only current-year GDP as a variable to forecast demand. Similarly, ECG used population, price, and current-year GDP to forecast its load, whereas VRA used GDP from two years prior to forecast ECG's load in its forecast.

The above revelation informed the next phase of the analyses would include:

- Analyse data from GSS on economic and population growth to determine sectoral and regional (historical and projections) electricity demand growth
- Develop appropriate regions for modelling based on transmission constraints, infrastructure constraints, etc.
- Analyse role of electricity price and self-generation
- Analyse impacts of climate change, EE, DSM on demand drivers in the future
- Develop energy and peak demand forecasts for these regions under different scenarios
- Review and develop "baseline" demand forecast with the Steering and Technical Committees

Ultimately, final report would be developed and recommendations in consultations with the Technical Committee; with the requisite guidance from the Steering Committee.

Activities Conducted

Quarter 1 of Project Year I

No related activity in Quarter I

Quarter 2 of Project Year I

- a. The team met with the EC to hold further discussions, specifically on the synergies between IRRP and the SNEP, and also identify areas of collaboration going forward. The EC sent the IRRP team the final updated demand chapter of the SNEP report for comments. The draft SNEP report was reviewed and comments submitted to the Energy Commission. A meeting was held with the EC LEAP Team to discuss the data and assumptions that went into the LEAP modelling. The EC also shared the revised SNEP demand report, which had updated population data
- b. Review of the demand forecast section of the GRIDCo Transmission Masterplan was completed
- c. Review of demand forecast section of the GRIDCo Generation Masterplan was completed
- d. NEDCo's Long-Term Forecast Report was reviewed
- e. The IRRP Team held a meeting with ECG's Manager for System Planning (Godfred Mensah) to understand the inputs used in their 2015 report. He agreed to make available the EVIEWS software and input data used for ECG's load forecast
- f. A presentation is being put together to highlight the main findings of the review exercise
- g. Met with Enclave Power On Friday August 5, 2016 to discuss their participation in the project activities. The team discovered that Enclave Power did its own load forecasting which they promised to send copy to the IRRP team. They also agreed to be actively involved in the activities of the technical committee
- h. The project team received the input data used for ECG's load forecast. A copy of the EVIEWS software was also received and successfully installed. Following this, a meeting was held with the planning officials of ECG to understand inputs used for the 2015 load forecast.
- i. The presentation on the load forecast review (for the launch event) was also being done. An interim report which highlighted the outcome of the review of forecast reports was also being developed.
- j. IRRP commenced the development of a write-up on the review of load forecasts

4.8 Activity 3b: Demand-Side Resource analysis

The IRRP Project with the support of the STTA staff commenced activities on Demand-Side Resource Analysis. The engagements were geared towards identification of the specific energy efficiency and demand function resources to support reliability and adequacy of the Ghana electricity system. DSM activities were expected to help manage peak demand, improve utilization of existing generation, reduce the extent of peak period outages, and improve the quality of customer service. It would also contribute towards Ghana's climate change goals, as it reduces the need for additional generation and waste in the T&D system. To this end, initial discussions were held with the Energy Foundation (EF) and Energy Commission.

Activities Conducted

Quarter 1 of Project Year 1

No activity

Quarter 2 of Project Year 1

- a. COP, Bill Prindle (EE expert) met with Ernest Asare of EF to discuss scope of work and way forward on contracting with ICF. Additional meetings were held during the Launch Event to finalize scope. ICF is awaiting LOE and rates in order to move forward with EF, with approval from USAID.
- b. Time of Use (ToU) Tariff: On September 19, the IRRP team met with PURC to discuss planned TOU activities. PURC requested for information from ICF's previous work on ToU. Following this request, ICF commenced deliberations/work to determine the best spreadsheet to share with PURC, as additional work from Tanzania on ToU could be useful to PURC. ICF also planned to share spreadsheet with PURC, ECG, and NEDCO, while working with PURC to determine the best approach to this exercise.
- c. Held several meetings with Energy Foundation on the details of their schedule and some cost estimates on their work roll-out. Bill Prindle, Modelling Expert, COP, and Senior Power Expert were in attendance
- d. The team also held a meeting with the Head of Energy Efficiency, Kofi Agyarko on previous activities and plans for future which include a shift from appliances to emphasis on industry.

4.9 Activity 4b: Fuel Supply Analysis

As part of generation resource assessment, ICF planned to assess the fuel supply at a high level, based on a review of existing studies, analyzing new data where possible, best practices and case studies, and evaluating the implications of the modeling results. Most of this work would be technical assistance, as the PATRP team at USAID is conducting much of the capacity building.

The project initiated steps towards a supply workshop in November 2016, with an objective of assessing the supply situation as well as plans and projects made. This would be a critical input into the modeling work of the IRRP Project.

Activities Conducted

Quarter 1 of Project Year 1

No activity conducted in quarter 1

Quarter 2 of Project Year 1

Supply workshop:

As part of activities towards a comprehensive analysis of fuel supply coupled with guidance from USAID; the IRRP Project is planning a supply workshop in November 2016. The workshop will assemble various power generators i.e. VRA, BPA, and the IPPs. Other relevant Agencies such as the GNPC, GNGC, MoPet, MoP, and PURC are also expected to participate. The objective of the workshop is to do an initial assessment of the fuel supply options in Ghana's power generation plans. This information (data and assumptions) would inform the modeling and the exercise and ultimately the fuel supply plan to meeting projected electricity demand.

A draft agenda and scope has been developed and shared with key stakeholders for review.

4.10 Activity 5a: Transmission Network Analysis

The activities under this component are essentially to verify that the transmission network has adequate transfer capability and can operate without reliability criteria violations over the next 5 years, and use this analysis as inputs for developing transmission-related assumptions for the IRRP modeling; and build capacity within GRIDCo and other key stakeholder institutions to continue transmission planning activities related to IRRP. The project team held initial discussions with GRIDCo in that regard. This informed the data request to GRIDCo pending more extensive assessment and engagements.

Activities Conducted

Quarter 1 of Project Year I

No activity in Quarter I

Quarter 2 of Project Year I

Mr. Ken Collison/Senior Power Expert held meetings with the Manager, System Planning of GRIDCo on September 19. Other Engineers from System Planning and Market Operations were in the meeting. A request was made for some information that will be formalized

4.11 Activity 5b: Distribution System Analysis

Activities here are expected to provide technical analysis in distribution system planning and analysis using the CYME modeling tool in order to verify that the ECG and NEDCo distribution system would be capable of operating reliably over the next 5 years, as part of the representative analysis. Build capacity within ECG, NEDCo, and other key stakeholder institutions to continue distribution system planning.

The team help preliminary discussions with NEDCo on this. More extensive work is planned for the next quarter.

Activities Conducted

Quarter 1 of Project Year I

No activity in Quarter I

Quarter 2 of Project Year I

The Senior Power Expert (Bernard Modey) and Transmission and Distribution Expert at ICF (Ken Collison) held a meeting with the Planning Engineer of NEDCo. This was subsequent to an earlier interaction with Mr. Moses Tawiah, Director of Engineering at NEDCo

4.12 Activity 6: Least Cost/Low Carbon Modeling

This activity aimed to evaluate and select a commercial power sector modeling tool that is flexible enough to be used by the Ghanaian power agencies for the IRRP, and develop a Ghana Reference Case modeling framework. The development and the use of the selected IRRP model would be led by the IRRP team in Accra, and training would be provided to the Technical Committee members (and their designees) over the course of the two years, in order to ensure that the Ghanaian stakeholders understand and are able to use the model independently.

A first working sessions was held in September 2016 to discuss the options for the modelling tool. This sessions was also used to provide some fundamental training on the IPM modeling tool.

Quarter I of Project Year I

No activity in Quarter I.

Quarter 2 of Project Year I

- a. **First working session:** The first working session for the project was held on September 15, 2016. Participants included 15 people from the Power Sector Agencies (EC – 7, ECG -2, BPA -2, NEDCo-I, PURC- I, VRA -I, and GRIDCo – I) attended, the technical staff IRRP, and the ICF staff who attended the Launch and Awareness work shop. The meeting discussed the options for a tool for the IRRP modelling. The meeting shortlisted three (IPM, MESSAGE, and LEAP) for further discussed before one is selected and presented to the Steering Committee for approval. Most were of the opinion however that IPM should be selected because of its comparative advantage – can do transmission expansion modelling. It also provides opportunity for capacity building.
- b. On September 29, as part of the process for selecting a Modelling Tool, IRRP Team held a meeting with the Planning unit of Energy Commission on the use of their LEAP model and the MESSAGE manual

5. Additional Stakeholder Engagements in Reporting Period

- a. On May 16th, ICF team had a formal agreement review and launch meeting with the Agreement Officer Representation (Waqar Haider) and a team from USAID/Ghana's Office of Economic Growth.
- b. ICF Team also met with Millennium Development Agency (MiDA) representatives, Embassy State Department representative, and USAID/Ghana Energy and Environment Team Leader (Robert Buzzard) to discuss the IRRP project and to initiate discussions on how this project will support the MCC Compact II objectives.
- c. On May 18th, at the Dissemination Meeting, Ananth Chikkatur presented the project concept and planned activities to 25 USAID/Ghana and key Ghana power sector stakeholders, including representatives from the Energy Commission, Volta River Authority, MiDA, Electricity Company of Ghana, GRIDCo, Ministry of Power, Ghana National Petroleum Corporation, etc.
- d. As a follow on to the Dissemination Meeting, Ananth Chikkatur held one-on-one meeting with the Meeting participants and other power sector stakeholders to ensure that IRRP project is incorporating Government of Ghana priorities and to learn about how the IRRP can build on going Government of Ghana activities.
- e. On May 25th, Ananth Chikkatur spent a whole day with five members of the policy and planning division of the Energy Commission at the City Escape hotel to review the ongoing update of the demand section (Volume 1) of the Energy Commission's 2016 Strategic National Energy Plan (SNEP).
- f. On 23 September, COP met with JICA to discuss the request from MOP to JICA on master planning.
- g. On 28 September, COP met with other DPs, as part of the planning for the Energy Sector Working Group
- h. Senior Power Expert and COP held a meeting with Dr. Nii Moi Thompson, Director General of NDPC.
- i. Chief of Party, Senior Power Expert (Bernard Modey) and Transmission and Distribution Expert at ICF (Ken Collison) help a meeting with the Executive Secretary of PURC and his team to discuss the role of PURC in the IRRP project. PURC is actively interested in the project.

6. ENVIRONMENTAL COMPLIANCE

The Final IRRP Work Plan noted that all planned IRRP Project activities would fall under the initial environmental examination (IEE) intervention category entitled, “Support to Government Policy and Capacity (Excluding Extension Services); Data and Studies” or “Support to Governance”. This determination was established given the IRRP Project’s narrow focus on providing technical assistance (TA) to strengthen the ability of local power sector institutions and enterprises to develop and deploy planning tools; the IRRP Project will not provide any TA to design, review, or provide direct financial support related to infrastructure.

As such, there are two EMMP conditions for the IRRP project to address:

- a. Policy, investment and regulatory TA must fully integrate and advance strong energy sector environmental and social performance as a core value; and
- b. Significant TA tasks for developing, reviewing or reforming energy resources policy, energy sector investment frameworks, and energy sector regulation must involve outlining potential environmental and social issues and impacts.

During the reporting period, the IRRP project has established that the potential impacts of climate change on Ghana’s power sector is a key area of concern for the project. We have ensured that the power sector stakeholders are aware of how climate change could affect long term power planning, by dedicating an entire session of the IRRP Launch Event on climate change. See Section 4.5 and Annex E. Therefore, we have provided initial capacity building and training to the Launch Event attendees on climate change.

Additional TA and capacity building activities will be implemented in the following year, specifically on understanding the implications of climate change on power demand and on increasing supply-side risks. We will also be conducting an assessment of environmental risks, in general, for various supply options in the next fiscal year.

7. ANNEX A: PROGRESS SUMMARY

The summary of indicator performance for as at September 2016 is as shown in Table 4 below.

Table 4: Performance Indicator Tracking Table (PITT)

Indicator No.	Indicator	Reporting Frequency	Baseline data		Year 1 Performance				Year 1 Target	Year performance to Date	Year Performance 2				End of Project Target
			Year	value	Q1	Q2	Q3	Q4			Q1	Q2	Q3	Q4	
Indicator 1	Person-hours of training completed in technical energy planning fields	Quarterly				528.00			1500	35.2%					2000
Indicator 2	Number of persons trained in technical energy planning fields	Quarterly				47			100	47%					150
Indicator 3	Integrated Power Sector Master Plan developed, based on set of sequential milestones accomplished through collaboration with GoG stakeholders in the power sector	Quarterly							0						1
Indicator 4	Number of institutions with improved capacity in power sector planning.	Quarterly							5						9

Indicator No.	Indicator	Reporting Frequency	Baseline data		Year 1 Performance				Year 1 Target	Year performance to Date	Year Performance 2				End of Project Target
			Year	value	Q1	Q2	Q3	Q4			Q1	Q2	Q3	Q4	
Indicator 5	Number of institutions with improved capacity to incorporate climate change impacts into ongoing planning activities.	Quarterly							2						4
Indicator 6	Number of days of technical assistance provided in support of Ghana's Intended Nationally Determined Contributions (INDCs)	Quarterly							20						55
Indicator 7	Expected potential lifetime energy savings from energy efficiency or energy conservation activities resulting from adoption of project recommendations	Quarterly							TBD*						TBD*
Indicator 8	Number of recommendations made to inform laws, policies, strategies, plans,	Quarterly							5						15

Indicator No.	Indicator	Reporting Frequency	Baseline data		Year 1 Performance				Year 1 Target	Year performance to Date	Year Performance 2				End of Project Target
			Year	value	Q1	Q2	Q3	Q4			Q1	Q2	Q3	Q4	
	or regulations addressing energy planning														
Indicator 9	Number of recommendations made to inform laws, policies, strategies, plans, or regulations addressing climate change impacts (mitigation or adaptation)	Quarterly							0						5

8. ANNEX B

Table 5: Linkage of Performance Indicators to Results

Project Intermediate Result	Sub-intermediate Results	Indicator	Assumption	Type of Indicator	Category
PIR 1: <i>Increase energy efficiency and DSM analytical support</i>		1. Expected potential lifetime energy savings from energy efficiency or energy conservation activities resulting from adoption of project recommendations	The focus of the indicator is potential lifetime savings energy savings from energy efficiency or energy conservation activities resulting from adoption of project recommendations	Outcome	Custom
PIR 2: <i>Develop a process for least-cost generation expansion planning through an Integrated Power System Master Plan (IPSMP)</i>	<i>PIR 2.1</i> <i>Increased capacity among key Ghanaian stakeholders to produce and manage IPSMPs</i>	2. Person-hours of training completed in technical energy planning fields	The technical training here is in electric power planning fields	Output	Custom
		3. Number of persons trained in technical energy planning fields	The technical training here is in electric power planning fields	Output	Custom
		4. Integrated Power Sector Master Plan developed, based on set of sequential milestones accomplished through collaboration with GoG stakeholders in the power sector	The milestones include: Step 1: The first step in the comprehensive planning process is a plan for planning. Key factors associated with this step include the allocation of time, human resources, money, and energy to the effort	Output	Custom

Project Intermediate Result	Sub-intermediate Results	Indicator	Assumption	Type of Indicator	Category
			<p>Step 2: Structure and Schedule the Process</p> <p>Step 3: Ensure that related Activities in the Work Plan are completed.</p> <p>Step 4: Identify Problems, Issues, and Concerns (PIC's)</p> <p>Step 5: Develop a "Vision" for the Plan</p> <p>Step 6: Develop Plan Goals and Objectives</p> <p>Step 7: Generate and Evaluate Plan Options using selected modeling tools.</p> <p>Step 8: Select and Develop a Preferred Plan</p> <p>Step 9: Generate recommendations for implementation, along with a proposed schedule</p>		
<p>PIR3: A culture for IRRP establish across the power sector</p>	<p><i>PIR 3.1 Increased capacity among key Ghanaian stakeholders to improve resilience of electric power and power systems</i></p>	<p>5. Number of institutions with improved capacity in power sector planning.</p>		Outcome	Custom

Project Intermediate Result	Sub-intermediate Results	Indicator	Assumption	Type of Indicator	Category
		6. Number of recommendations made to inform laws, policies, strategies, plans, or regulations addressing energy planning	Number of recommendations made to inform laws, policies, strategies, plans, or regulations addressing energy planning will be counted. These will be presented to the technical and or Steering Committee Focus will be long term electric power planning	Output	Custom
PIR4: Metrics for moving the energy sector toward a low emissions/ low carbon development (LE/LCD) pathway planned and established		7. Number of institutions with improved capacity to incorporate climate change impacts into ongoing planning activities	Indicator will target addressing Climate change Adaptation related to power sector planning	Output	Custom
		8. Number of recommendations made to inform laws, policies, strategies, plans, or regulations addressing climate change impacts (mitigation or adaptation)	Number of recommendations made to inform laws, policies, strategies, plans, or regulations addressing climate change impacts (mitigation or adaptation) Focus on power planning		

Project Intermediate Result	Sub-intermediate Results	Indicator	Assumption	Type of Indicator	Category
		9. Number of days of technical assistance provided in support of Ghana's Intended Nationally Determined Contributions (INDCs)		Output	Custom

9. ANNEX C

Table 6: Matrix of Stakeholder participation and distribution by sex for Day One & Day Two

Institution	TOTAL		DAY 1		DAY 2	
	Day 1	Day 2	MALE	FEMALE	MALE	FEMALE
Agence Francaise de Developpement	2	2	1	1	1	1
BPA	2	1	1	1	0	1
ECG	2	2	2	0	2	0
Embassy of Japan in Ghana	1	1	1	0	1	0
Embassy of Spain in Accra	1	0	1	0	0	0
ENCLAVE POWER	1	1	1	0	1	0
Energy Commission	11	11	9	2	9	2
Energy Foundation	2	3	2	0	3	0
EPA	1	2	1	0	2	0
GIZ	2	2	2	0	2	0
GNGC	1	0	1	0	0	0
GNPC	3	2	1	2	0	2
GRIDCo	5	5	3	2	4	1
ICF/IRRP	11	11	8	3	8	3
International Finance Corp	1	1	1	0	1	0
JICA	1	0	1	0	0	0
KfW Office Ghana	1	0	0	1	0	0

Institution	TOTAL		DAY 1		DAY 2	
	Day 1	Day 2	MALE	FEMALE	MALE	FEMALE
MCC	1	0	0	1	0	0
MESTI	1	3	1	0	1	2
MiDA	4	3	4	0	3	0
MoP	4	3	4	0	3	0
MoPET	2	2	2	0	2	0
NEDCo	3	2	3	0	2	0
NEXANT	2	2	2	0	2	0
Petroleum Commission	0	1	0	0	1	0
PURC	4	4	4	0	4	0
The World Bank	3	0	2	1	0	0
US Embassy	3	0	2	1	0	0
USAID/GHANA	3	1	3	0	1	0
VRA	1	0	1	0	0	
TOTAL	79	65	64	15	53	12

10.ANNEX D

Table 7: Highlights of Presentation of Day One

No.	Topic	Presenter	Institution	Highlights
1	<i>Need for IRRP in Improving Power Sector Planning in Ghana</i>	Jabesh Amissah Arthur ; PFG Co-chair, Power Team	Bui Power Authority (BPA)	<ul style="list-style-type: none"> a. Why IRRP? b. Power Sector Planning - Principal Information Needs; Changed circumstances; and Objectives.
2	<i>Role of Energy Commission, Steering Committee, and Technical Committee</i>	N.D.K Asante	Energy Commission (EC)	<ul style="list-style-type: none"> a. Mandate of the Energy Commission b. Strategic National Energy Plan (SNEP) – 2006 to 2020 c. Update of the SNEP – 2016 to 2035; currently ongoing d. Indicative Energy Planning – the big picture; captures energy demand from both formal and informal sectors; and estimates the total Unconstrained National Energy Demand e. Strategic planning f. Comparison of SNEP and IRRP g. Role of EC in IRRP: focal institution, represents GoG interest; provides guidance to IRRP Team through Chairmanship of the Steering Committee; convene and host Steering and technical Committee meetings and foster stakeholder consultation and collaboration; share data from SNEP to facilitate IRRP activities.
3	<i>Power Sector Planning, Climate Change, & IRRPs</i>	Mark Lee: Senior Vice President	ICF	<ul style="list-style-type: none"> a. Overview of ICF b. Evolution of Energy Planning

No.	Topic	Presenter	Institution	Highlights
				<ul style="list-style-type: none"> c. How Climate is Changing Energy Planning d. Overview of Integrated Resource and Resilience Planning (IRRP) e. Examples of IRP / IRRP f. IRRP in International Development Context g. IRRP in International Development Context: Lessons Learned
4	<i>Overview of Ghana IRRP Project – Objectives, Working Relationships, and Key Activities</i>	Ananth Chikkatur	ICF/IRRP	<ul style="list-style-type: none"> a. Background & Context b. IRRP Objectives in Ghana c. Principles of Operation d. IRRP Team e. Outline of Planned Activities f. Timeline of Activities
5	<i>Overview of Power Sector Planning in Ghana: Brief history to current Process - From the periscope of Energy Commission</i>	Joseph Essandoh-Yeddu	Energy Commission (EC)	<ul style="list-style-type: none"> a. Energy Planning in Ghana b. National Energy Board (NEB) - 1986-1994? c. A growing power demand and market initiated the need for Power Sector Reform d. Emerging power market made NEB law repealed; new Regulators established e. First Integrated Energy Plan (SNEP)

No.	Topic	Presenter	Institution	Highlights
				<ul style="list-style-type: none"> f. Strategic goes beyond Traditional g. EC or SNEP looks at not only Power but also Petroleum, Renewables and Traditional fuels as well h. Strategic Energy Planning Roadmap i. Geological similarities with Brazil's pre-salt attract investments to Western Africa j. SNEP Planning process
6	<i>Overview of Power Sector Planning in VRA</i>	Kwaku Wiafe	Volta River Authority (VRA)	<ul style="list-style-type: none"> a. Brief History of Planning in Ghana b. VRA's Planning Approach c. Lessons Learnt
7	<i>Overview Of Planning Function in GRIDCo & Key Improvement</i>	Frederick Okang	Ghana Grid Company Limited (GRIDCo)	<ul style="list-style-type: none"> a. Introduction b. GRIDCo Engineering and Power System Planning c. Power System Planning structure d. Studies e. Potential Options for improvement
8	<i>Overview of Power Distribution System Planning in ECG</i>	Ing. Godfred Mensah	Electricity Company of Ghana (ECG)	<ul style="list-style-type: none"> a. Introduction b. Evolution of the ECG System Planning Tools c. Past & Recent Technical Studies d. Current System Planning Functions

No.	Topic	Presenter	Institution	Highlights
				e. Potential Options for improvements in the Distribution Planning Assignments in ECG
9	<i>Power Markets and the Role of Planning and Modeling</i>	Juanita Haydel	ICF	a. The importance of planning b. Power markets and planning c. Planning at the national/state level for policy making d. Models and Data e. Tanzania IRRP
10	<i>Energy Demand Forecasting</i>	Mawunyo Dzobo	Energy Commission (EC)	a. Introduction <ul style="list-style-type: none"> • The EC mandate; • EC energy planning studies; b. SNEP Update <ul style="list-style-type: none"> • General and specific objectives; • Base year data collection; c. Analysis of the country's future energy system <ul style="list-style-type: none"> • Development of scenarios; • Choice of methodology; • Application of methodology; • Electricity demand results

No.	Topic	Presenter	Institution	Highlights
11	<i>Review of Demand Forecasting in Ghana</i>	Ananth Chikkatur	ICF/IRRP	<ol style="list-style-type: none"> a. Context b. Review of recent demand forecasts in Ghana c. Geographical breakout of electricity demand d. Load duration curves – review of history e. Demand and electricity price correlations? f. Next steps
12	<i>Best Practices in Electric Load Forecasting</i>	Juanita Haydel, Senior Vice President & William Prindle, Vice President	ICF	<ol style="list-style-type: none"> a. The importance of load forecasting b. Determinants of short/long term load forecasts c. Alternative load forecasting methodologies--pros and cons d. Integrating demand side management into load forecasts e. Case studies: <ul style="list-style-type: none"> • ERCOT System Planning—Long-term hourly peak demand and energy forecast • South Africa Systems Operations and Planning—IRP 2010 Energy Forecast Revision 2 • Tanzania—Three Examples

Table 8: Highlights of Presentations of Day Two

No.	Topic	Presenter	Institution	Outline of Presentation
1	<i>Overview Of Energy Efficiency & DSM In Ghana</i>	Kofi Agyarko	Energy Commission	<ul style="list-style-type: none"> a. History of Energy Efficiency and DSM programs in Ghana. b. Recent programs for promoting end-user energy efficiency in Ghana c. Lessons
2	<i>Energy Efficiency and Demand Side Management</i>	Ernest Asare	Energy Foundation	<ul style="list-style-type: none"> a. What is Energy Foundation b. Composition of the Council c. Activities: Public education, Energy Efficiency in industry, surveys, advocacy d. Potential benefits of energy efficiency e. Outlook f. Challenges g. Cooperation with ICF
3	<i>Best Practices in Energy Efficiency and DSM</i>	William Prindle Vice President, ICF	ICF	<ul style="list-style-type: none"> a. Definition of Energy Efficiency b. Efficiency as a Climate Policy Resource c. Energy Efficiency as a Power Resource d. Efficiency as an Economic Resource e. Needed: Efficiency “Building Blocks” f. Key role for DSM in Advancing EE g. Energy Efficiency/DSM Case Studies in Ghana

No.	Topic	Presenter	Institution	Outline of Presentation
				<ul style="list-style-type: none"> h. What is “DSM”? i. Basic types of DSM j. DSM Program Planning k. Develop Customer End Use Data l. Develop customer load profiles m. Develop DSM Measures n. DSM Program Planning o. Project achievable demand impacts (MW) p. Project achievable energy impacts (GWh) q. Project program costs (\$ Millions) r. DSM Program Planning/Design s. Time of Use tariffs: a cost-effective first priority for developing countries t. DSM Program Design/Implementation u. Funding and regulatory issues v. Goals for EE/DSM in Ghana IRRP w. A longer view of DSM in Ghana
4	<i>Impacts of Climate Change in Ghana</i>	Yaw OPPONG-BOADI Director and	Environmental Protection Agency (EPA)	<ul style="list-style-type: none"> a. Introduction <ul style="list-style-type: none"> • United Nations Framework Convention on Climate Change (UNFCCC) and its Objectives

No.	Topic	Presenter	Institution	Outline of Presentation
		UNFCCC Focal Point, Ghana		<ul style="list-style-type: none"> • Ghana's ratification of the UNFCCC and the Kyoto Protocol (KP) <p>b. National Implementation of UNFCCC</p> <ul style="list-style-type: none"> • Initial National Communication • Greenhouse Gas Inventory • Technology Needs Assessments • Climate Change Scenarios • Vulnerability And Adaptation Assessments • Mitigation Assessments e.g Nationally Appropriate Mitigation Action(NAMA) • Second and Third National Communication • National Climate change Adaptation strategy <p>c. International climate change Negotiations</p>
5	<i>Role Of Power Sector and Renewable Energy in Meeting INDC Goals</i>	Joseph Essandoh	Energy Commission	<p>a. The impacts of climate change is real in Ghana</p> <p>b. Not all is Climate Change!</p> <p>c. Renewable Energy Resource Potential</p> <p>d. INDC Policy Actions by Sector</p> <p>e. Renewable Energy Initiatives under Ghana iNDC</p> <p>f. Ghana Energy Policy Target – 2020</p> <p>g. Renewable Energy Policy Objectives</p>

No.	Topic	Presenter	Institution	Outline of Presentation
				<ul style="list-style-type: none"> h. The Renewable Energy Act 2011 (Act 832) i.
6	<i>Planning implementation of GH-NDC</i>	Daniel Benefoh EPA, climate change unit	EPA	<ul style="list-style-type: none"> a. Tracking our footsteps (big picture) b. Next steps for NDCs implementation – very crucial stage c. Summary of Ghana’s NDCs – National climate action plan d. Building blocks for NDC Implementation e. (I)NDC policy actions - “Investment areas” f. Mitigation actions g. Mobilization of funds – sources h. INDC policy anchor i. Dodowa Post-COP debriefing meeting j. International cooperation (signing ceremony) k. Mobilize GCF Funds l. Priority actions for partnerships – early implementation m. Scaling from pre-2020 efforts: Ground actions - demonstrating early results for take-off

No.	Topic	Presenter	Institution	Outline of Presentation
7	<i>Overview of Climate Change Impacts and Resilience Options in the Power Sector</i>	Dr. Molly Hellmuth (Climate Resiliency Lead)	ICF	<ul style="list-style-type: none"> a. ICF's Leadership in Climate Risk Management b. Why is it important to understand and address climate change risks to the power sector today? <ul style="list-style-type: none"> • Implications for power planning • Specific risks to power components c. How can planners build resilience across the power sector? <ul style="list-style-type: none"> • Approaches to understanding and managing risks • Specific adaptation measures for different power system components d. Examples of adaptation in the power sector and data needs for analysis
8	<i>Clean Energy Emission Reduction (CLEER) Introduction: Resources to Advance LEDS Implementation (RALI)</i>	Ananth Chikkatur and Juanita Haydel	ICF/IRRP	<ul style="list-style-type: none"> a. Introductions b. RALI & CLEER Overview c. Web Tool Introduction <ul style="list-style-type: none"> • Annual Reporting • Projections d. Using Planning Models e. Questions

No.	Topic	Presenter	Institution	Outline of Presentation
	<i>Power Distribution System Planning Processes in ECG</i>	Ing. Godfred Mensah	Electricity Company of Ghana (ECG)	<ul style="list-style-type: none"> a. Role of System Planning Division in ECG b. Current System Planning Functions of the Division c. Distribution Planning Processes in ECG d. Conclusion
9	<i>An Overview Of GRIDCo's Transmission Planning Processes</i>	Benjamin K. Ahunu, Systems Planning Engineer	GRIDCo	<ul style="list-style-type: none"> a. Purpose Of Planning b. Transmission Planning Overview c. Challenges Of Planning d. Components Of Transmission Planning Models e. Functions Of System Planning f. Key Projects Executed
10	<i>Distribution System Planning Processes in NEDCO</i>	Tampuri Tayeb, System Planner	NEDCo	<ul style="list-style-type: none"> a. Overview of NEDCo's Distribution Network b. Overview on NEDCo's Org Chart (Planning Section) c. Overview of NEDCo's Planning processes d. NEDCo's Planning Criteria e. Load Forecasting f. Network Analysis g. Financial & Economic Evaluation h. Challenges Facing NEDCo's Planning Unit i. The Way Forward

No.	Topic	Presenter	Institution	Outline of Presentation
11	<i>Transmission and Distribution Planning (Best Practices and Case Studies)</i>	Ken Collison Vice President, ICF	ICF	<ul style="list-style-type: none"> a. Overview of U.S. Bulk Power System b. Case Study – Transmission : South Africa and Malaysia c. Case Study – Distribution: Eskom (South Africa) d. Renewable Energy Integration

II. ANNEX E: REPORT OF THE IRRP LAUNCH EVENT