This project was implemented by ICF under the USAID Energy Efficiency for Clean Development Program (EECDP) Leader Award

INTEGRATED RESOURCE AND RESILIENCE PLANNING (IRRP)

March 2017

Strengthening a utility's overall resilience requires a deep understanding of complex, interlinked electric and fuels systems, evaluating the potential impacts and risks of climate change and other hazards, and balancing the needs and wants of utility customers and regulators.*

INTRODUCTION

Most developing economies are currently in the process of strengthening and expanding their electricity infrastructure. Some of these economies are currently developing new energy infrastructure that underpins their long term economic development strategies. As such, they are ideally situated to incorporate climate and hazard resilience into their long term energy planning. The use of comprehensive and in-depth climate models and simulations would allow these countries to integrate full lifecycle energy resilience into their planning framework (i.e., power generation through transmission and distribution) –as opposed to using the standard Integrated Resource Planning (IRP) processes.

Since 2014, ICF has expanded the approach of IRP to include climate and system resiliency factors. Integrated Resource and Resilience Planning (IRRP) is a robust and comprehensive method of strategic energy planning that models cost-effective scenarios based on power generation options, projected transmission needs, and anticipated energy demand. It allows governments and utilities the opportunity to develop long-range plans to scale up energy resources, including clean energy sources, as well as to address challenges related to short-term and long-term power sector investment. Effective IRRP enables informed decision making regarding (1) the development of power generation resources (both central-station and distributed), (2) expansion and improvement of the transmission and distribution system, and (3) the use of demand-side management (DSM) and energy efficiency to serve as a "source" of energy.

Framework Overview

ICF has developed a model for IRRPs which emphasizes a stronger feedback loop between resilience assessment, planning efforts, and least-cost planning models. As seen in Figure 1, this approach uses the traditional IRP methodologies to develop an interim Least-Cost Planning Model that incorporates the utility's supply, demand, and transmission performance and cost characteristics. That initial model is then filtered through a more rigorous resilience assessment and planning process that tests against a range of potential threat scenarios. These analyses consider the more likely regulatory, environmental, climate change-related, infrastructure, and political risk scenarios, and are used to generate a "resilience-optimized" least cost model. Utilities can use this optimized least cost model to plan investments, champion infrastructure improvements, and optimize operations that strengthen the reliability of both the supply and demand sides of their operations, reduce the impacts of weather-related outages, and bolster customer service performance even during peak demand and/or service disruptive events.

*"Integrated Resource Planning Models Need Stronger Resiliency Analysis" - Maria Scheller, Ananth Chikkatur. ICF, 2014

USAID FROM THE AMERICAN PEOPLE

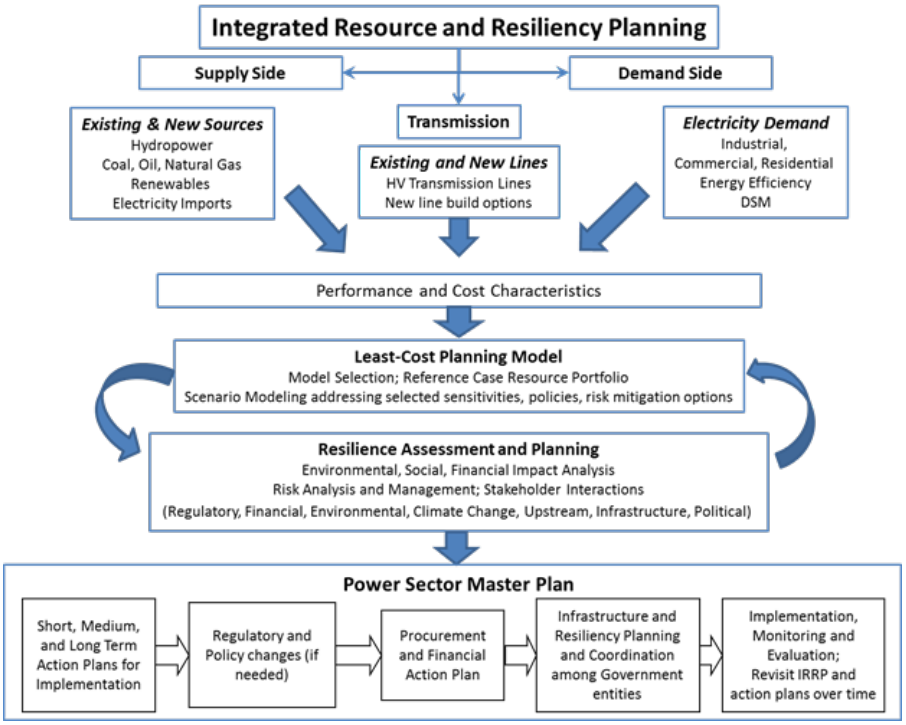
ICF

IRRP

Defining Characteristics of IRRP

- All resources considered on a level playing field
- Covers a long planning horizon
- Explicit treatment of uncertainty and risks, including climate risks
- Considers policy, social, and environmental factors
- Stakeholder engagement
- Periodically reviewed

IRRP Framework



The strength of this approach lies in a practical and realistic assessment of resilience threats from across the entirety of the utility's operations. Weather-related events are modeled for impacts on generation, transmission, and customer energy demand. For example, when looking at Tanzania under prolonged drought conditions, a strong IRRP would consider the ability of a utility to maintain sufficient hydroelectric capability, the energy and water demands from an increased population density, and other, non-energy related water demands.

Project Accomplishments

- Knowledge Sharing
  - ICF delivered two trainings under USAID EECDP, including a full-day workshop on March 6, 2017. Goals of the workshop were to train USAID staff on IRRP concepts, and to develop activities to introduce or strengthen IRRP activities in USAID supported countries. The workshop reviewed lessons learned from early-stage IRRP implementation around the world and shared USAID fieldwork experiences on supporting policy-makers, regulators, and utilities in developing robust energy planning processes.
    - Learning objectives included the following:
      - Explain why IRRP is a fundamental building block of scaling clean energy and how it supports the other building blocks.
      - Articulate what questions an IRRP can answer and what elements are necessary to make an IRRP effective.
      - Detail the typical components of an IRRP and how emerging best practices treat these components.
      - Understand the IRRP planning process--what data and capacity are needed for the tools, inputs, outputs, and stakeholders involved in the process.
      - Understand and communicate how IRRPs can be used to direct investment or other outcomes.
      - Incorporate IRRPs into the design of clean energy technical assistance programs.

IRRP

Periodic Updates:

IRRPs and resulting plans should be re-evaluated every 2 to 3 years. Key drivers of the plan are uncertain and course correction will be required. *Integrated Power Sector master Plans* (IPSMPs) are developed to focus on short-term action plans.

- Associate Award Development
  - Since 2015, ICF has been working to build capacity in the Tanzania power sector. Working with key stakeholders, including the Government of Tanzania (GoT), Tanzania Electric Supply Company (TANESCO), Zanzibar Electric Company (ZECO), the Energy and Water Utilities Regulatory Authority (EWURA), and the Green Building Council (GBC), ICF has developed training, tools, and action/development plans to facilitate improved load forecasting, generation planning, and demand reduction. This activity includes integrated training and analysis to develop short, medium, and long-term implementation plans reflecting the results of the IRRP process. Final project results will include recommendations on needed regulatory and policy reforms, improved procurement and planning framework, risk management plans, and government coordination plans.
  - ICF is also supporting USAID/Ghana in strengthening local power sector institutions and enterprises, planning tools to support effective deployment of energy efficiency and power supply resources, and transmission and distribution (T&D) infrastructure. This includes building the capacity of ancillary institutions (such as fuel suppliers for thermal plants, biomass for renewable energy generation, etc.) to ensure an integrated approach for power system planning.

Recommendations for Replication and Scaling-up

- Develop a process for least-cost generation expansion planning through an Integrated Power System Master Plan (IPSMP)
  - ICF developed the IRRP to take into account increased risk and uncertainty in long-term planning and decision- making. By incorporating risks and reliability concerns in the analysis process, an IRRP is designed to deliver a more robust set of data to inform scenarios and action plans.
- Plan and establish metrics for moving the energy sector toward a low emissions/low carbon development (LE/LCD) pathway
- Increase capacity among key stakeholders to produce and manage IPSMPs. This could be done through:
  - Steering and Technical Committees
  - Targeted Training
  - Identification of key local Subcontractors/Local Consultants
  - Sustained technical support
- Increase energy efficiency and DSM analytical support
  - Energy efficiency is an important element of the IRRP that is often overlooked. Energy efficiency can reduce demand and increase reliability within current systems thus enabling resources to expand generation and service for unserved populations. While typical integrated resource planning considers current and future demand, ICF's IRRP process is designed to assess opportunities to meet commercial and industrial energy demands through increased efficiency, as opposed to 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.