# Integrated Resource & Resilience Planning (IRRP) for the Power Sector

USAID Training – March 6, 2017

USAID
FROM THE AMERICAN PEOPLE

ICF

# Session 1: Power Sector Planning in Relation to Policies & Investments

*Presenters: Juanita Haydel, Bill Prindle, Maria Scheller*



USAID FROM THE AMERICAN PEOPLE

ICF

# Why is an IRRP important to Decision Making?

*Presenter: Juanita Haydel*

USAID FROM THE AMERICAN PEOPLE

ICF

# Tanzania and Ghana: Power Sector Overview

## Tanzania

- Electrification rate of 30% (11% in rural areas). Goal ~75% electrification/60 million connections by 2035
- Widespread load-shedding
- Significant T&D infrastructure requirements; significant losses
- Reduced large hydropower output due to changing rainfall patterns and recent droughts
- Poor financial performance
- Move to competitive procurement process
- Lack of supporting policy, legal, and regulatory frameworks

## Ghana

- Over 70% of Ghana's 28 million people have access to power (50% in rural areas)
- Subsidized power and low tariffs; financial solvency issues
- High transmission and distribution infrastructure requirements; high losses
- Over reliance on hydro and gas
- Increasingly uncertain availability of hydropower resources
- Goal of 10% renewables by 2020; commitment to DSM
- Inadequate regulatory framework in terms of pricing

# Opportunities to Address Challenges in Tanzania & Ghana through IRRP

**IRRP can provide answers needed to help address these challenges and guide decision making:**

- How to minimize costs of meeting future growth while managing risks?
- What is the demand for electricity over the next 10, 20, 30 years?
- Is it possible and cost-effective to actively manage demand to allow better system utilization, improve reliability, and reduce infrastructure requirements and capital requirements?
- What are the mix of resources that should be added to meet this demand and address key challenges (e.g., diversity, climate changes)?
- How quickly do we connect isolated systems? Build out the distribution system?
- How to manage climate and other risks facing the system?
- What are the investment requirements to meet demand? Resulting revenue requirements and tariff implications?
- What policies, laws and regulations are required to support the plan?

# The Electricity Timeline

**"Golden Era"**

- Regulated Monopolies
- Increasing profits
- Economies of scale
- Growth is good

**Market Shocks**

- Rising Prices
- Slowing Demand Growth
- Competition

**Relative Stability**

- Falling Prices
- Rising Demand

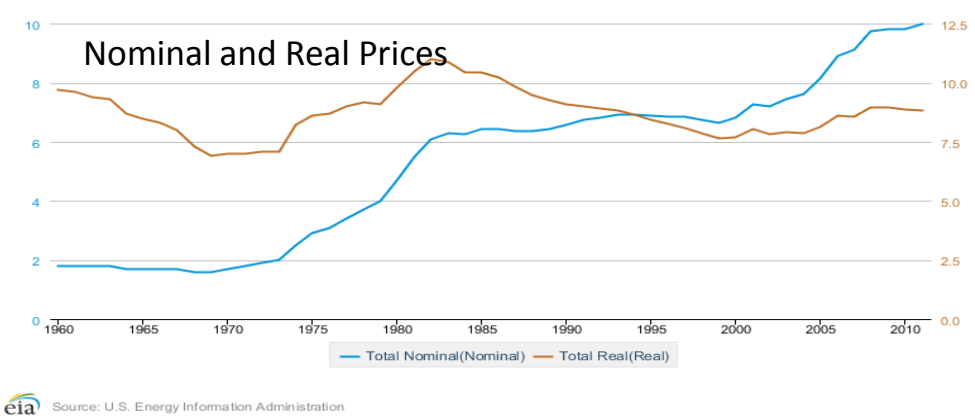
**Deregulation**

- IPPs
- Increased interstate transactions

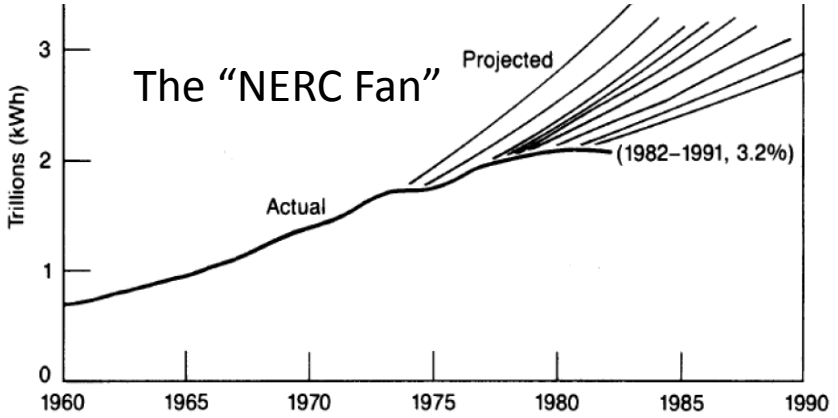
**Transition**

- Energy Efficiency and DR
- Environmental considerations including climate
- New technologies/ innovations

1900 — 1970 — 1980 — 1990 — 2000 — 2010




eia Source: U.S. Energy Information Administration




USAID FROM THE AMERICAN PEOPLE

ICF

# 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 Considers all Resources on a Level Playing Field

| | |
|---|---|
| Supply Side Resources | • Fossil-fired, dispatchable generation<br>• Renewable, intermittent resources<br>• Alterative fuel options |
| Demand–Side Management | • Energy efficiency options<br>• Demand Response<br>• Pricing approaches (e.g., TOU) |
| Distribution Resources | • Storage options<br>• Distributed generation |
| Transmission | • Current and future capabilities<br>• An alternative to new resources |
| Distribution | • Improved efficiency<br>• Reduced losses |

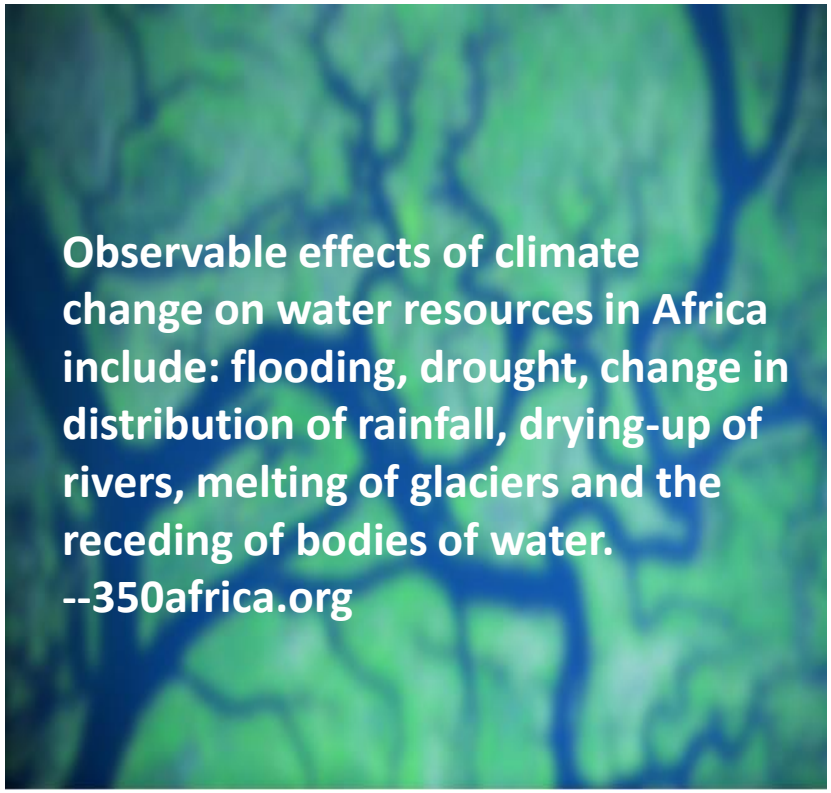
USAID FROM THE AMERICAN PEOPLE

ICF

# Planning Horizon

- Planning horizon – 10 to 30 years
- Investments have long lead time
- Investments are typically long-lived assets
- For DSM, takes time to move the market

# Risks and Uncertainties




## The Power Sector faces several important risks and uncertainties

- Demand uncertainty both in the rate of growth and the underlying load shape
- Fuel price uncertainty
- Technology costs and performance
- Climate risks

# Social, Policy, and Environmental Considerations

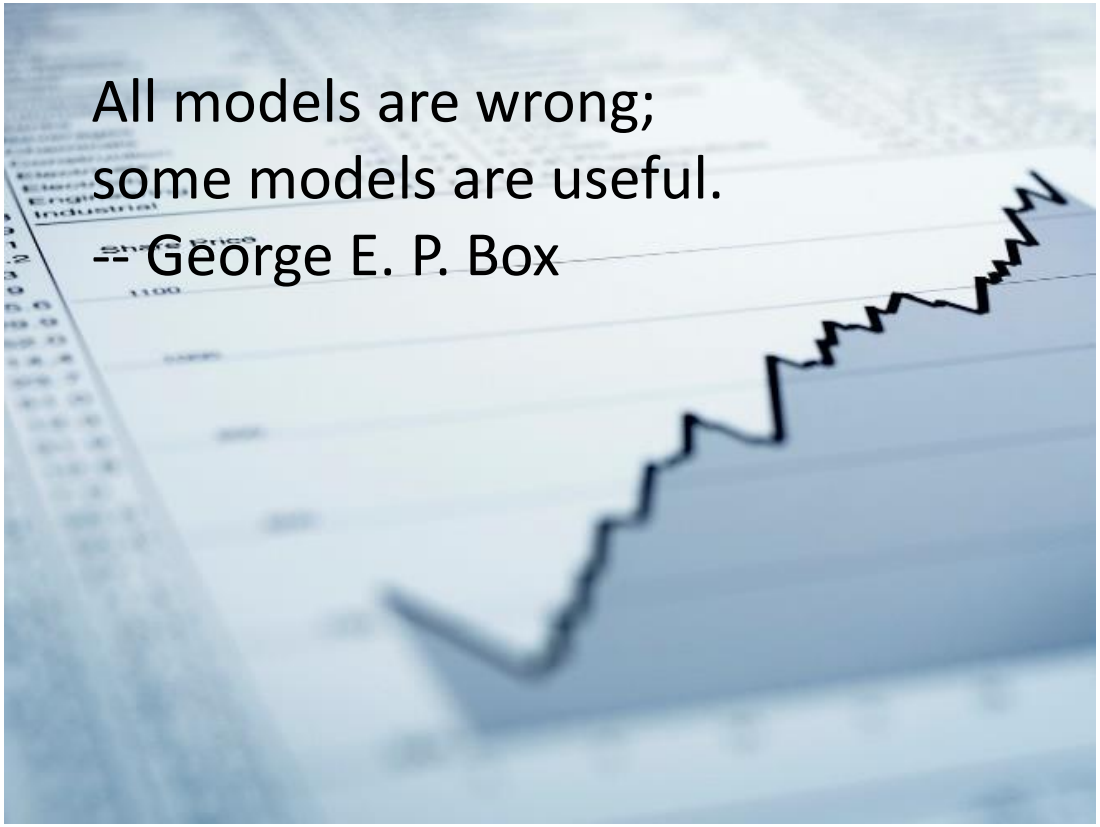
- Goals and objectives not directly related to power sector: *national security*, *diversity*, *social goals*, *economic goals*
- IRRP is a framework to evaluate the "costs" of these
- These goals might include:
  - **-- increased diversity of fuels**
  - **-- carbon emissions goals or limits**
  - **-- reduced criteria pollutants**
  - **-- rate moderation**
  - **-- minimize capital requirements**
  - **-- increased industrialization to support economic growth**

# Stakeholder Engagement

- Source of data, information, scenarios and strategies
- Supports buy-in to process, assumptions and results
- Increases confidence in results and outcomes
- May include Ministries (e.g., Energy, Finance), regulatory bodies, consumer groups, industry groups

# Periodic Updates

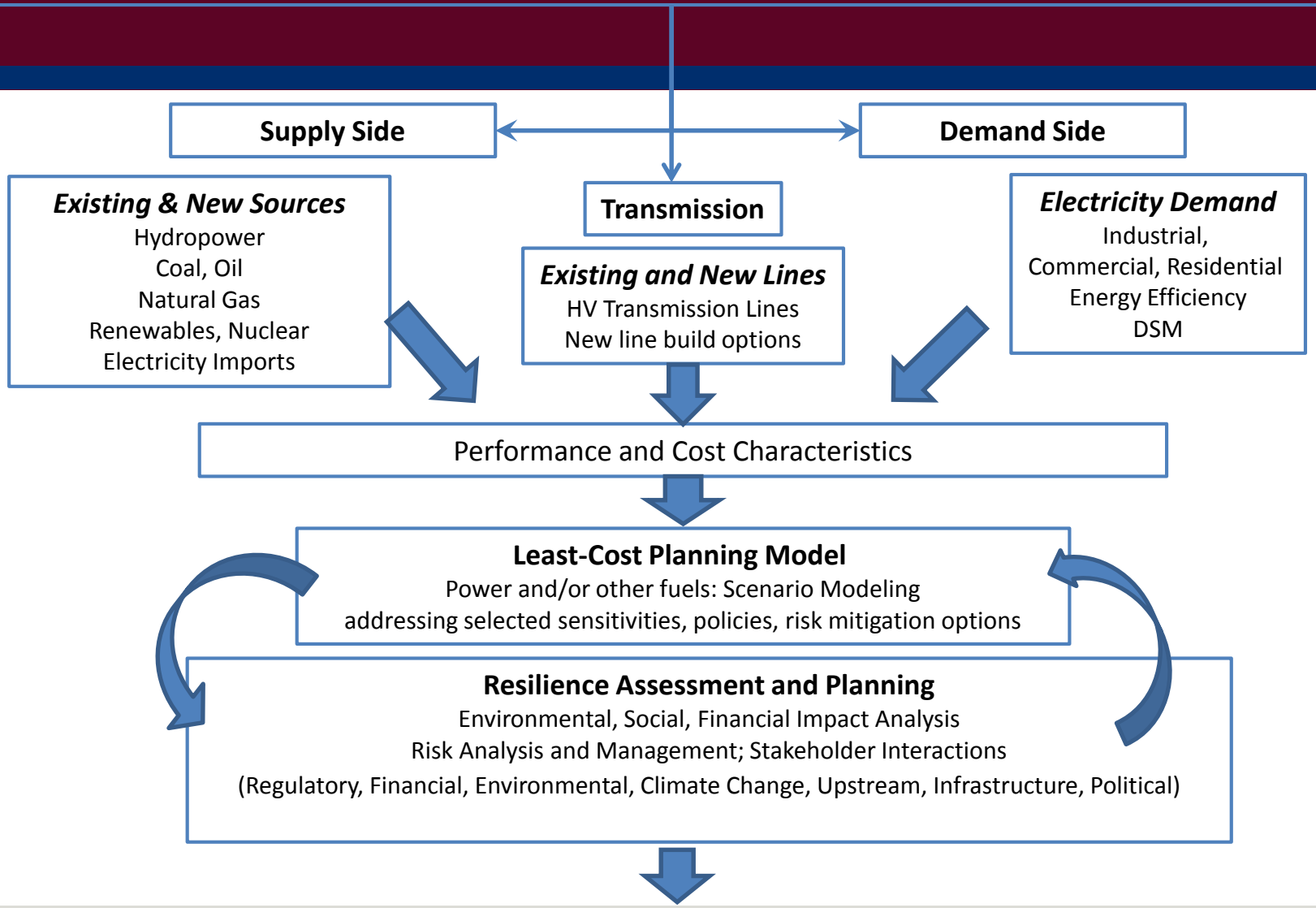
- IRRP and resulting plans should be re-evaluated every 2 to 3 years
- Key drivers of the plan are uncertain and course correction will be required.
- IPSMP focuses on short-term action plans



# Impacts of IRRP on Planning

| Elements of an IRRP | Impact on Planning |
|---|---|
| **Identify Plan Objectives and Metrics for Decision Making** | Provides a structured framework for decision making and a consistent basis for evaluating options |
| **Demand Forecasts** | Provides basis for investment decisions<br>Required for assessment of demand-side resource potential |
| **Resource Option Assessment** | Provides assessment of existing resources and a consistent set of assumptions on future resource options |
| **Transmission and distribution analyses** | Allows explicit assessments of T&D as alternatives to supply; supports operating efficiency for current resources |
| **Least-Cost, System Level Modeling** | Provides a robust basis for comparison of options that reflects long study horizon, changing system, changing drivers (fuels, demands) |
| **Scenario Development** | Explicitly addresses uncertainty; outcome is a more robust plan |
| **Strategy Identification** | Addresses important corporate goals and objectives |
| **Political, Social and Environmental Considerations** | Plan reflects public policy goals or requirements including industrialization, rate considerations, environmental requirements or goals |
| **Regulatory and Institutional Framework** | Helps to identify the required policies and frameworks (e.g., tariffs, legal structures) needed to support the plan |

# Integrated Resource and Resiliency Planning




USAID FROM THE AMERICAN PEOPLE

ICF

# What are DSM policy implications and other considerations?

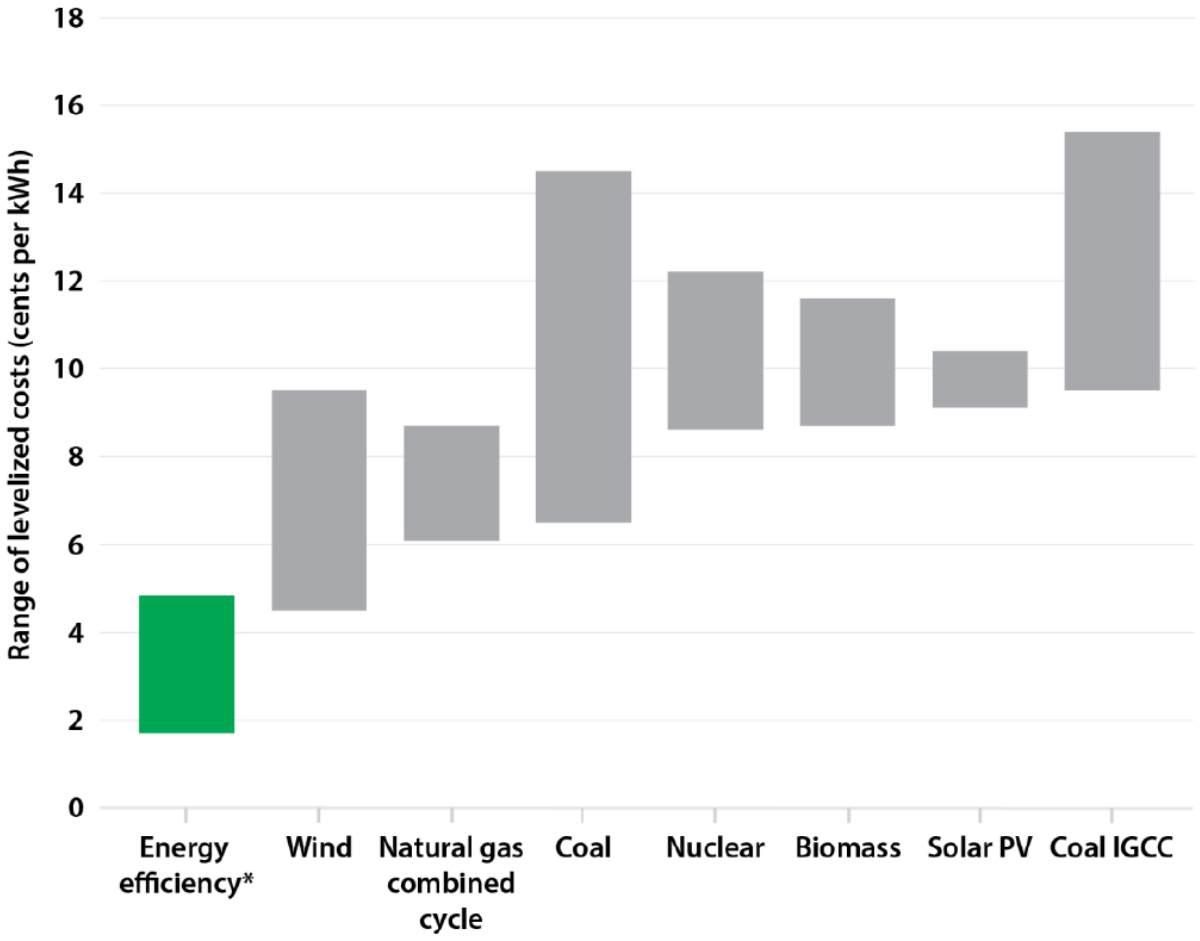
*Presenter: Bill Prindle*

USAID FROM THE AMERICAN PEOPLE

ICF

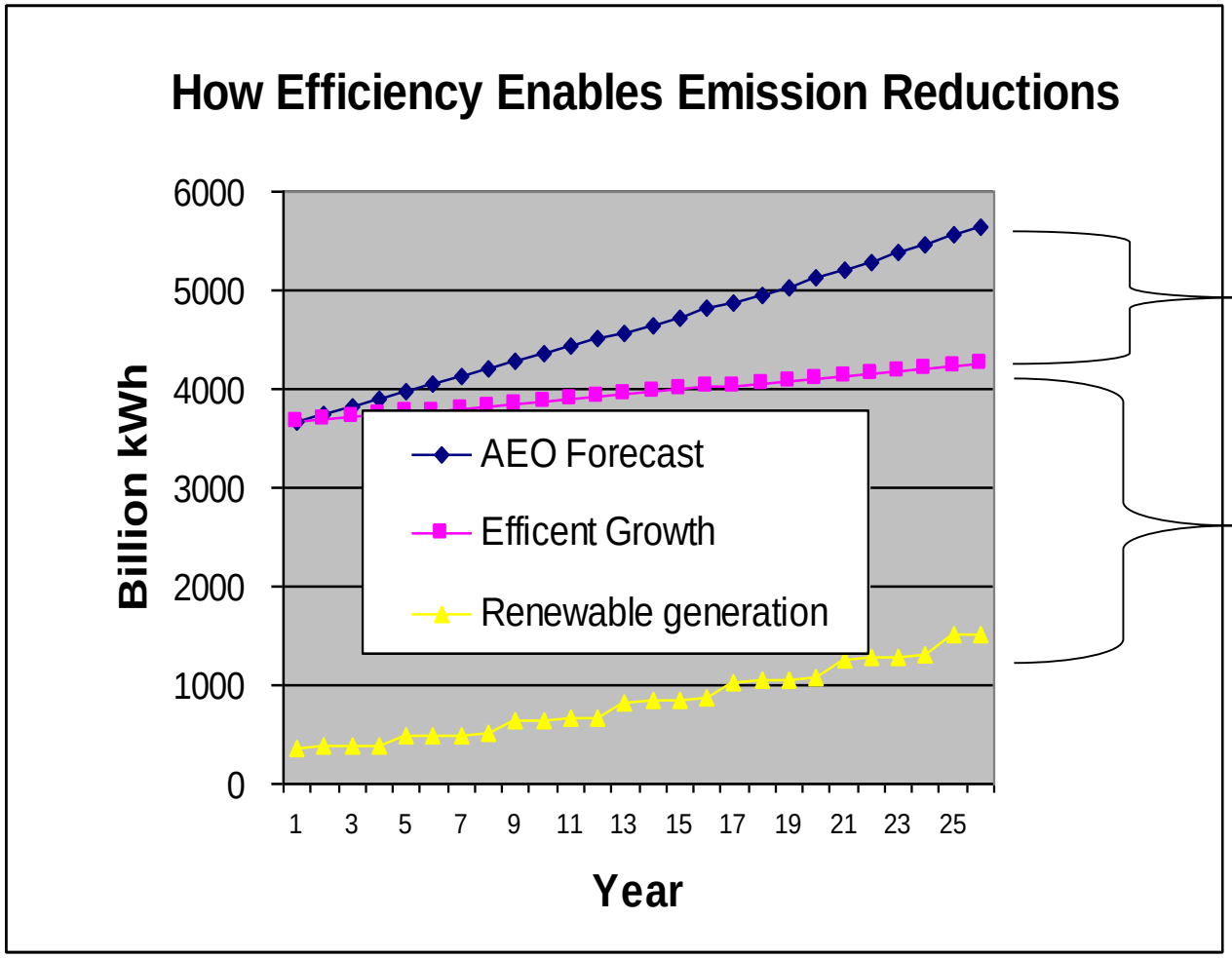
# EE as a Low-Cost System Resource

Efficiency costs less than conventional power generation technologies




Source: ACEEE

# EE Enables Low-Emission Development



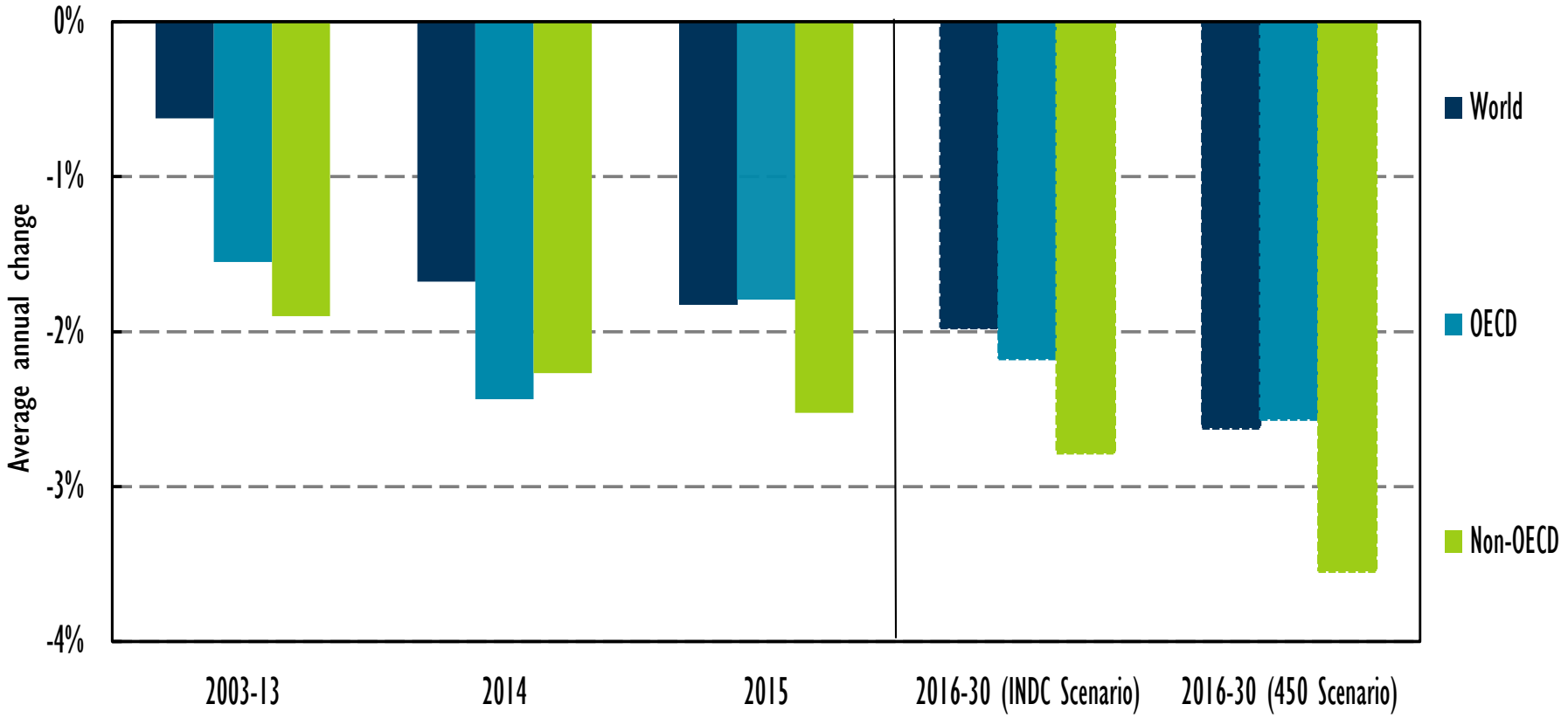

Reducing Demand growth via EE…

Enables emission reductions as clean energy supply catches up to lower demand

**Allows time for better planning**

# EE Enables Decoupling of Energy and GDP

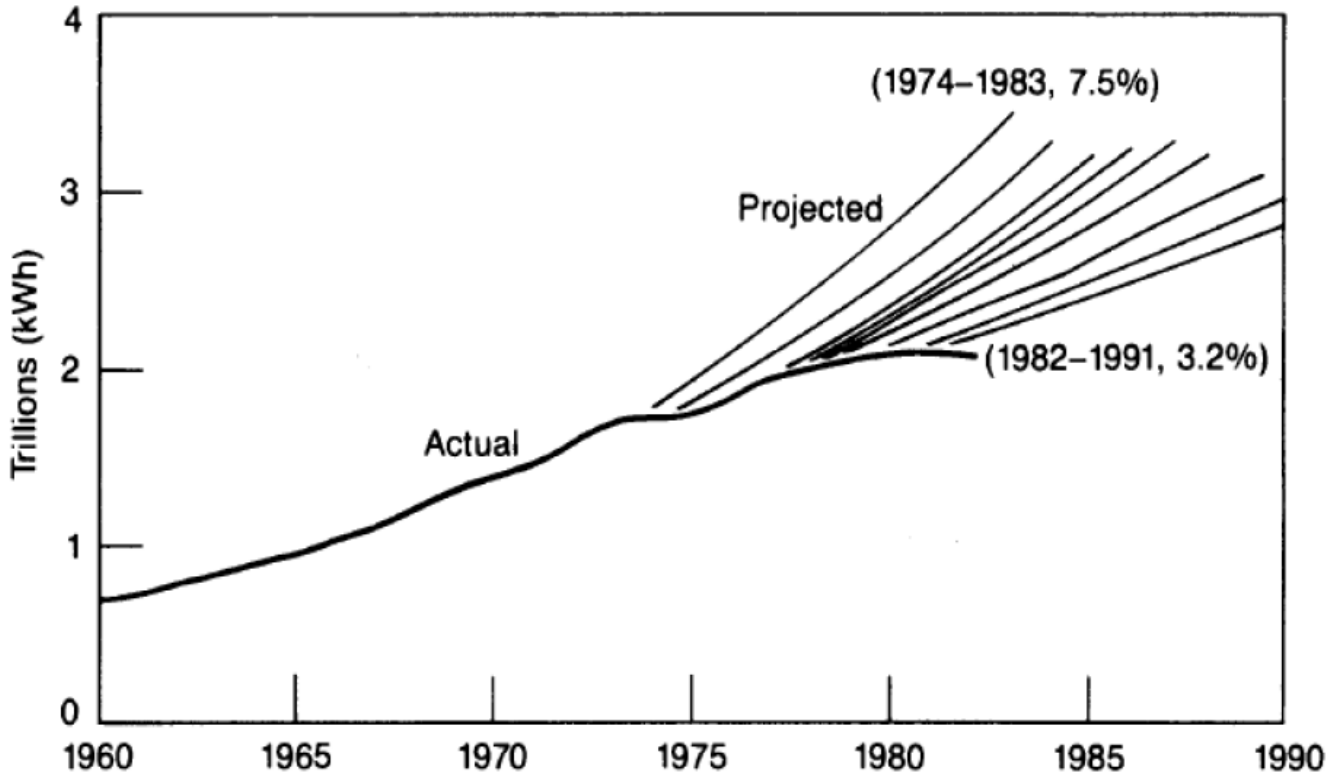
## EE reduces energy intensity: energy use per unit of GDP




*Source: IEA 2016 Energy Efficiency Market Report.*

# Decoupling Energy and GDP Reduces Demand Growth

- U.S. electricity demand growth fell by more than half in one decade




*Source: National Electric Reliability Council forecast vs. actual data*

# DSM Regulatory Enabling Policies

- Funding/cost recovery—timely and practical mechanisms for funding or recovering DSM program costs.
  - General rate case—tends to be slow and complex
  - Specific rate rider—faster and simpler
  - Grants or other public funding
- Revenue stability—removing the EE disincentive
  - Reform of “volumetric” rate designs, i.e. costs spread over a volume of energy sales
  - If DSM reduces sales, costs and margins are not fully recovered
  - “Decoupling” energy sales and revenues can stabilize revenues, using a simple rate adjustment annually to “true up” rates

# Other DSM Regulatory Issues

- Are resource acquisition approvals linked to the IRRP?
  - E.g., can a power plant receive approval for construction without being included in the IRRP?
  - E.g., if a DSM resource costs less than another resource, would the other resource be approved without first implementing DSM?
- Does the regulatory authority apply any “loading order” or other criteria to resource acquisition decisions?
  - E.g., the California PUC requires all cost-effective DSM to be acquired before a utility applies for other resource approvals

# DSM in Procurement Processes

- DSM in an IRRP does not ensure DSM implementation
- Procurement methods are needed to ensure DSM benefits are realized
- DSM procurement options include:
  - DSM auctions, with private parties bringing impacts at agreed prices
  - Utility DSM program implementation via rate-based funding
  - Third-party program implementation with rate-based funding
- Loading-order procurement policies can prioritize DSM over more costly resources

# Who Utilizes IRP Type Analysis and Why?

*Presenter: Maria Scheller*

USAID FROM THE AMERICAN PEOPLE

ICF

# Examples of IRP

- The 2016 **South Africa** IRP was used to identify its new generation projects for the period through 2030 with consideration of carbon scenarios through 2050. It is considered to be a “living plan” with regular updates
- In 2015, **Tennessee Valley Authority** in the U.S. developed their Energy Vision 2020 using an IRP process
- In 2013, ICF supported the development of an IRP for the **Malawi** Power System that has been instrumental in identifying new power projects that are being supported by the MCC

# IRPs in Developed Countries

- **Regulated utilities** have an obligation to their ratepayers to minimize system costs
  - Evaluate and balance the expected cost, risk of candidate portfolios, and long-run public policy goals to choose the portfolio with the best cost-risk combination
- **Unregulated utilities** have similar obligations to ratepayers
  - Utilize IRP analysis to assess market risk and drive procurement for supply and demand resources
- **Regulators** require that IRPs are filed and reviewed to ensure prudence in utility decision making
  - IRPs guide procurement and certification processes
- **ISOs** perform system based studies, similar to IRP, to assess the potential impact of resource development or policy implications on their systems (e.g. NYISO CARIS)
- **Market participants** utilize IRPs to assess potential market opportunities
- **Stakeholders** consider IRPs in planning and financing decisions

# Traditional Benefits of IRP

- A long-term, system view (vs. short-term, project-based view)
- Consideration of all resources and evaluations done on a level-playing field
- Explicit recognition of a broader range of potential risks, including climate change
- Broad stakeholder engagement
- Robust plan to support investment and other decision-making

# Added Benefits of Resiliency Planning

## Expanding to IRRP Yields Greater Consumer Benefit and Sustainability

- Fuel Price and Investment Risks: Singular focus on gas-based capacity expansion in the U.S. in 1990s resulted in price risks and volatility in early 2000s
  - IRRP can increase fuel diversity
- Climate Risks: Frequent drought in Tanzania and Ghana has reduced hydro-electricity generation and increased cost of service
  - IRRP can help optimize the hydro contribution to the portfolio
- Demand-side risks: Rapid demand growth and poor load factor increases load shedding, resulting in customer dissatisfaction
  - IRRP can manage demand growth, improve load factor, increase revenue and improve customer satisfaction

# IRPs Lead to Better Outcomes

- IRP analysis provides critical information for utilities and regulators to plan toward and measure against.
  - IRPs help generate lower expected costs of electricity, lower risk from price volatility, lower social and environmental impact.
- Lack of information from planning
  - Results in limited investor interest and less than optimal investment strategies
  - Slows electric access and impacts climate/sustainability
  - Results in lack of accountability for decisions
- Adding *resiliency* aspects to traditional resource planning further extends the likely longevity of said plan, as well as the ability to withstand potential catastrophic events (e.g. factoring in flood potential for localities when building transmission lines or power plants)

# Lack of Coordinated Planning can lead to Energy Crisis and Unchecked Prices

- Several states returned to IRP like processes post deregulation due to unforeseen energy crisis (California 2000) and lack of consumer confidence due to increasing retail prices (e.g. Delaware 2006)
  - California (2005) and Delaware (2006) have mandated a return to deliberate resource planning for procurement of standard offer service (SOS) supply
  - New Mexico (2007) and Montana reintroduced IRP requirements
  - Connecticut (2007) legislated IRP requirements
  - Missouri returned to IRP after several years of allowing utilities to file a waiver from existing IRP rules (late 2000s)
  - Louisiana's Public Utilities Commission instituted an integrated planning process (2012)

# Lack of Coordinated Planning resulted in Uninformed Decisions

| Area | Historical examples of development failures related to lack of IRP information availability and planning structure |
|---|---|
| Brazil | Lack of integrated resource planning pitted base-load thermal against hydro, plants not economic for private partners to operate and government carried fuel, offtake risks at a loss (1990s to early 2000s) |
| India | Non-transparent, non-competitive procurement of IPP led to poor planning and operation of overly complex PPA. Government nationalized plant after Enron bankruptcy. |
| Indonesia | Non-transparent, non-competitive, corrupt procurement led to oversized asset development. After currency crisis and regime change, new government renegotiated and cancelled contracts at investor expense. |

# NA Model – Utility led with Regulatory Oversight

- Regulatory approval takes many forms:
  - Commonly, regulators presume the action plans (in particular, the short-term plans) are intend to be followed once accepted. However, specific decisions, such as approval of PPA agreements, DSM program investments, or CPCN (certificate of public need and convenience) are reviewed in separate proceedings. To the extent those specific cases vary from the approved IRP, the utility/load serving entity must provide context as to why
  - To a limited extent, approval of the IRP makes the IRP proposal actionable and indicates permission to proceed with planned investment and other decisions

**Generally, IRRPs are considered a useful tool or guide, not a doctrine**

# Actionable IRP – Georgia


Commission approval of the Georgia Power 2016 IRP allowed Georgia power to move forward with several direct and immediate actions:

- Distributed Generation RFP for 100 MW – Georgia Power will issue an RFP in 2017, with a commercial operations date in 2018 or 2019
- 200 MW of "self-build renewable capacity“ at costs up to Georgia Power’s avoided cost
- 1 MW for a pilot solar demonstration project by 2019
- Approval of a wind study with reporting on a quarterly basis
- Closure of several existing power plants
- Increase in reserve requirements (increase of planning reserve margin)
- Closure of an ash pond facility

# Informative IRP – Virginia

Virginia utilities file an integrated resource plan to their state regulatory commission on a biannual basis.

- IRPs present a preferred portfolio plan
- IRPs present short-term, mid-term and long-term action plans

Short-term plans often name specific projects, investment activities or DSM programs. Longer term plans may identify generic projects and activities to move toward such projects (e.g. identification of a new combined cycle addition in 2025)

For specific project construction plans, utilities must seek the commission approval through certificate of public need and convenience hearings. Likewise, DSM programs require a DSM filing, etc.

- IRPs set the stage for future hearings, while investments need not match the IRP exactly, a company is expected to be able to justify deviations

# South African IRP Process

- Only country to legally require national level IRPs for the power sector.
  - Led by the SA Department of Energy
  - IRP first recommended in 1998 but least-cost supply schedules were constructed (rather than integrated supply and efficiency plans) by and for the main utility (Eskom).
- IRP is updated and reviewed periodically and is considered indicative rather than “cast in concrete”
- Impact criteria include cost, GHG emissions, technology risk, local development, water use, and regional development
- Participation process before promulgation
- Only plants that are included in the IRP can be licensed, unless the Minster decides to include other generators
- Serves as an input to other departments that focus on job creation, energy security, climate change, and financing considerations
- Beginning to focus on an the IEP: Integrated Energy Plan