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# Best Practices In Integrated Resource Planning

Overcoming Challenges of the new Paradigm in Integrated Resource Planning

September 2015

# Executive Summary

- Structural trends in the electricity industry are quickly changing the industry landscape
  - Abundant supplies of natural gas from shale deposits
  - Shifting supply and demand fundamentals
  - Technological advancement and lower costs of alternative generation resources such as distributed generation (DG), demand response (DR), and energy efficiency (EE) programs and storage
  - Changing state regulatory paradigms and more stringent federal environmental regulations
  - Increasing pressure on maintaining competitive rates
  - In response, utilities and their regulators are seeking to refresh their integrated resource plans (IRPs)
- Traditional planning approaches are not well suited to the risks and opportunities caused by the interplay of these structural trends and the attendant uncertainty now faced by utilities
- In this document, we discuss several best practices industry leaders are employing to adapt IRP development to these risks, opportunities, and uncertainties:
  - Using Least-Regret Planning
  - Integrating New Types of Resources
  - Increasing Stakeholder Involvement
- This is the first of two documents that ScottMadden will issue about new approaches for IRP development. The next is:
  - Energy Efficiency: The Benefit of Treatment as a Resource in IRPs




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# Least-Cost Planning vs. Least Regret Planning

**With today's complexity and uncertainty, traditional planning approaches can act as a straitjacket for strategic thinking; significant business risks and opportunities could be ignored. A way to resolve this challenge is utilizing a "least-regrets" planning methodology**

### *Least-Cost Planning*

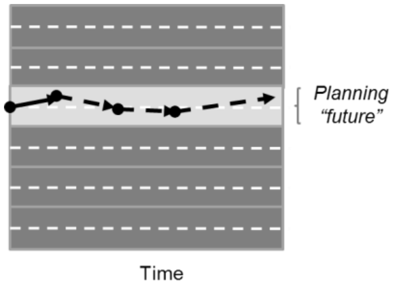
**In the traditional "Least Cost Planning" approach, the analysis tends to gravitate around the path that seems the most likely**

**Key Aspects**

- Uses forecasts of critical business variables (i.e., load forecast, fuel prices, etc.) in order to define a single planning "future"
- A few assumptions are varied somewhat to analyse sensitivities
- Candidate resource options are defined

**Planning Outcome**

- The portfolio of resources that will produce the least cost



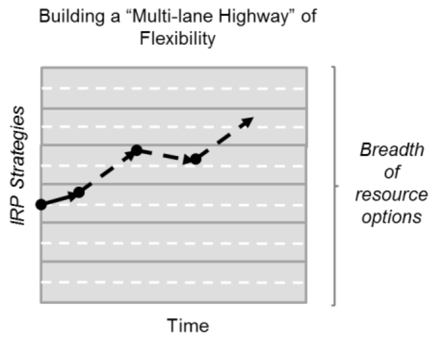

### *Least-Regret Planning*

**Key Aspects**

- Key business "unknowns" (i.e., economic growth, game-changing technology, etc.) are identified and used to develop multiple possible future scenarios of the external business environment
- Critical variables (i.e., load forecast, fuel prices, etc. are forecasted within each future business environment scenario
- Candidate resources are identified
- Most assumptions and variables are subjected to stochastic analysis

**Planning Outcome**

- A portfolio with a range of resources values that will perform well under different possible futures







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# Scenario Planning

**One of the most widely used methodologies for least-regret planning is scenario planning. With this methodology, there are two main tasks—devising scenarios and developing planning strategies.**

## Devising Scenarios

- Develop pictures of futures states of the external business environment that
  - Describe potential outcomes of factors (uncertainties) outside of the utility's control " (i.e., economic growth, game-changing technology, etc.)
  - Represent plausible, possible conditions (not predictions of the future) that stretch planner's thinking
  - Include uncertainties that are volatile and could significantly impact operations such as:
    - Commodity prices
    - Environmental regulations

## Developing Planning Strategies

- Test various business options within the utility's control to respond to scenarios
- Create options that take multiple shapes, for example:
  - Minimize capital investment
  - Promote the use of a particular technology (i.e.. renewables)
  - Enter new lines of business (i.e. installation of roof-solar on retail customers)
- Define and model a set of rules for each strategy as to how the utility will approach capacity needs during the planning process

- For the planning exercise be successful, it is important to define a wide set of scenarios and strategies that stretches the utility's traditional thinking
- A well-designed strategy will perform well in many possible scenarios




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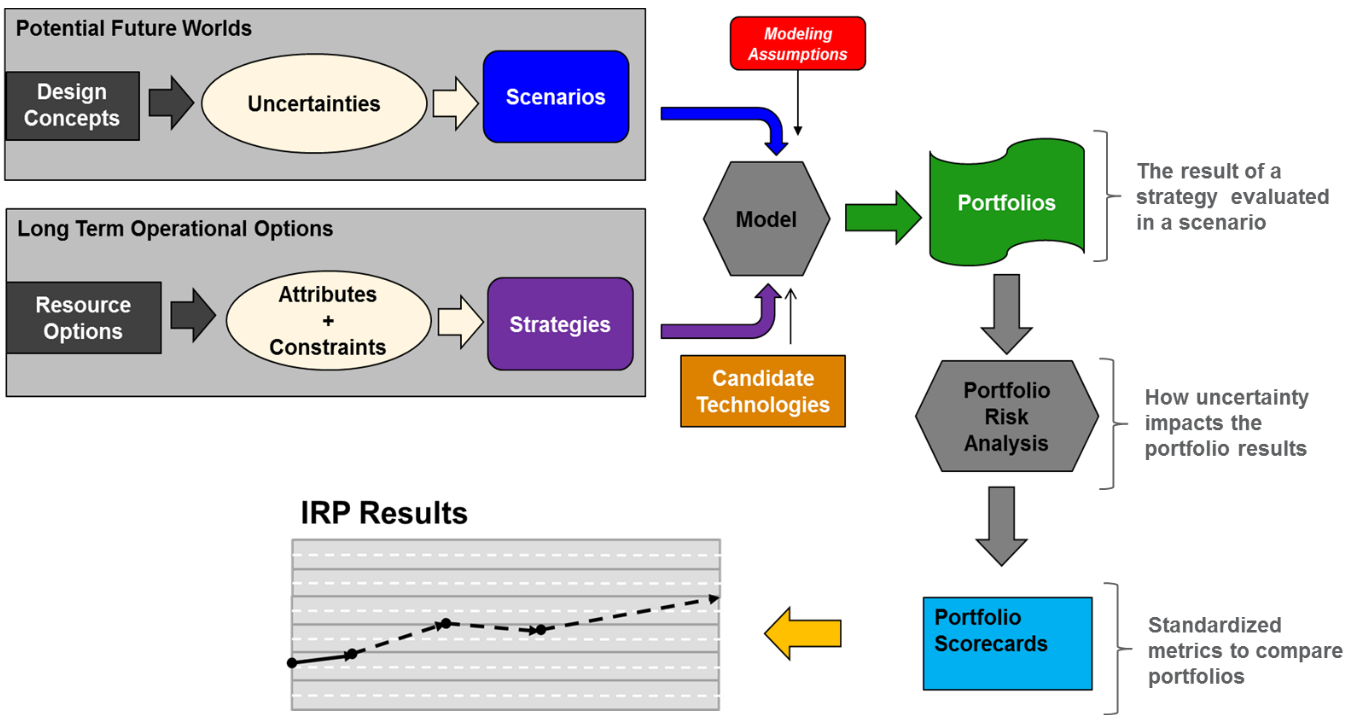
# Modeling

**The graphic below outlines how modeling is used to support strategy development under scenario planning**

- Business scenarios and strategies are defined
- Each strategy/scenario combination is then "run" through the model producing an optimized "least cost" generation portfolio
- The portfolios are analyzed and "scored" according to defined evaluation criteria

**Scenario Planning Modeling Methodology**

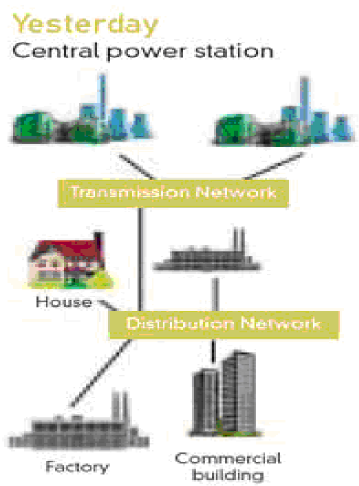


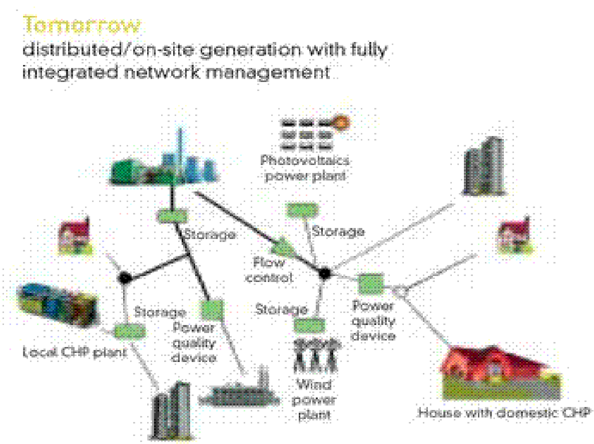

**In order to define the final IRP results, both model results and other factors should be considered, e.g., internal and external stakeholders' input and the enterprise strategy, etc.**

# New Types of Resources

**The IRP process should fully incorporate in the analysis new types of resources like DG, EE, DR, storage, etc. that are testing the traditional utility business model of central station generation**

- Today, there is not a standardized method or “best practice” on how to model these new resource types
- Traditionally, utilities under RPS or EE targets introduced these resources as fixed requirements in the portfolios
- Other utilities simply ignore them in their planning
- Best practice is to integrate them fully as resource options in the analysis



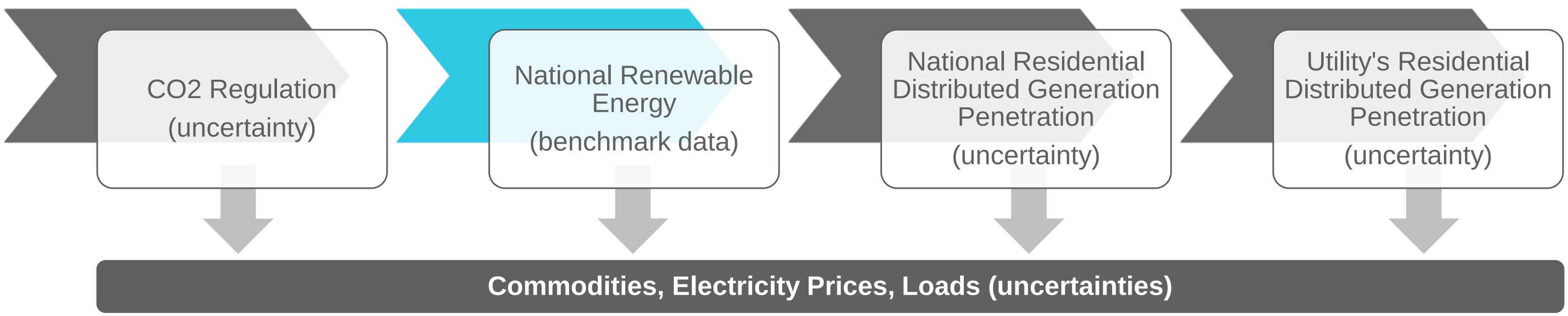

**A few utilities are making the effort to fully integrate these resources in their IRPs (examples of these are: TVA, Puget Sound, or NYSGE). In the following pages are examples on how TVA integrated DG and EE in their 2015 IRP**

# Example: Distributed Generation in TVA's 2015 IRP

- TVA is a wholesaler of electricity and does not own distribution; therefore, DG was defined as demand-side renewable generation that is customer driven (outside of utility involvement) resulting in a reduction of utility loads
- DG penetration was considered to have different market dynamics in the industrial and residential segments and therefore required different assumptions. For example:
  - Industrial customers were more likely to adopt DG; therefore, the degree of penetration and the adoption curve should be more accelerated than in the residential segment
  - DG penetration in the industrial segment was assumed to be gas-fueled; therefore, the main drivers will be gas and electrical prices
  - DG penetration in the residential segment was considered to be solar and therefore was modeled as a percentage of the growth of renewable energy in the utility's territory

***Example of Sequential Flow of Drivers for Modeling Residential Distributed Generation***

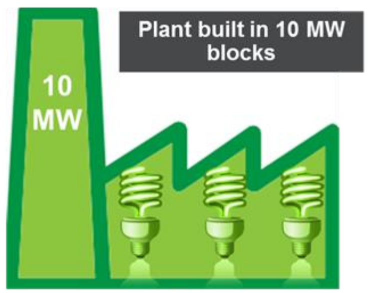
*(uncertainties – grey, supporting data – blue)*




Source: TVA

# Example: Energy Efficiency in TVA's 2015 IRP

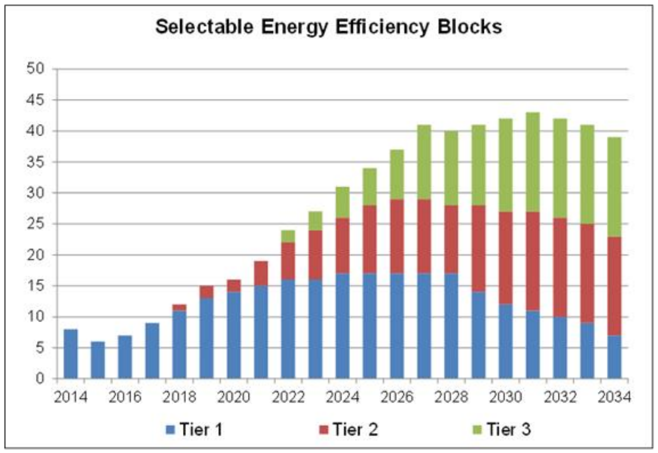
- EE was modeled in 10MW blocks, equivalent to 10 MW plants, and selectable by the model
- Three primary sectors were considered: residential, commercial, industrial
- The number of blocks available at any given time was predicated on TVA's market studies and experience




**Modeled like any other resource**

**Block Characteristics:**
- Capacity factor equivalent
- Load shape
- Cost to build program
- Time to implement
- Lifetime of program
- Installed cost/kWh

| Block Parameters | Residential | Commercial | Industrial |
|---|---|---|---|
| MW per Block | 10 | 10 | 10 |
| GWh per Block | 50 | 59 | 72 |
| Ramp Rate (Yr 1 - 5) | 25% | 25% | 25% |
| Ramp Rate (Yr 6 -15) | 20% | 20% | 20% |
| Ramp Rate (Yr ≥ 16) | 15% | 15% | 15% |
| Max Blocks per Year | 23 | 12 | 8 |
| Lifespan Tier 1 | 17 | 15 | 12 |
| Lifespan Tier 2 | 13 | 13 | 10 |
| Lifespan Tier 3 | 13 | 13 | 10 |
| Initial Cost Ranges (Millions) | $20.7 to 38.0 | $11.6 to 33.4 | $11.5 to 33.0 |



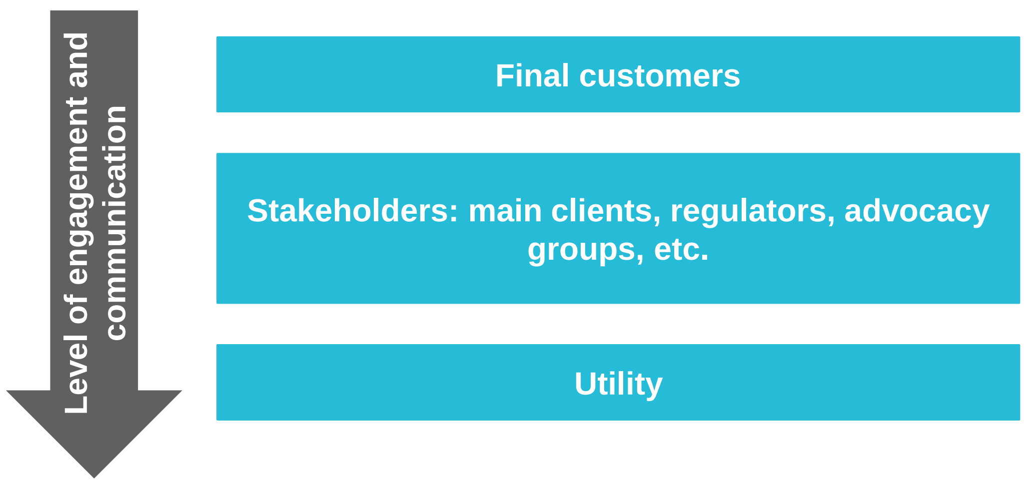

Source: TVA

**In a subsequent paper to be released by ScottMadden, we will discuss different methodologies on how utility's are integrating EE and DR as resources in their IRPs**

# Stakeholder Involvement in the IRP

**Industry trends will demand more openness from utilities**

- All IRP processes are subject to public oversight, although the degree of public disclosure and engagement varies across the industry
- Emerging trends will require utilities to implement more sophisticated processes in stakeholder engagement and communication
  - More players are impacted by the process and in different ways – they are demanding a “seat at the table”
  - IRPs are subjected to increasing levels of public scrutiny – interveners are becoming more sophisticated and challenging every aspect of the IRPs
  - The “optimum outcome for the system” is less obvious – the IRP process becomes a sounding board and the result a balancing act of different agendas
- Utilities need to define their stakeholders’ engagement strategy
  - The level of involvement and communication would probably happen in layers of increasing engagement and communication



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# Example: Stakeholder Involvement in TVA's 2015 IRP

- TVA created multiple venues in order to provide information and get input and feedback from stakeholders
- An IRP working group was created that included a wide variety of stakeholders
  - Members included main clients, regulators, advocacy groups, and academia
  - The group met monthly with TVA's IRP team
  - Comments and recommendations from the group were incorporated along the whole IRP process
- Additional stakeholders groups were formed in order to incorporate external input and expertise on specific subjects
  - The objective was to provide a forum in which critical aspects could be discussed in detail
  - The output from this group was incorporated by TVA into the IRP process

***Example: External Stakeholder's Involvement during TVA's 2015 IRP***

| Forum for Public Input |
|---|
| Public Scoping Meetings |
| IRP Working Group (and other stakeholder groups) |
| Quarterly Public Briefings |
| Draft IRP Public Comment Period |
| External Web Page |

| Team | Description / Interaction with IRP |
|---|---|
| *Regional Energy Resource Council (RERC)* | ▪ Provides high-level stakeholder input to TVA on strategic and environmental issues<br>▪ Will likely require regular briefings on the IRP |
| *Tennessee Valley Renewable Information Exchange (TVRIX)* | ▪ Discusses and provides TVA input on renewable options in the Valley<br>▪ Will develop data options for renewables by early 2014 and provide to the IRP team to include in modeling |
| *Energy Efficiency Information Exchange (EEIX)* | ▪ Helps TVA identify "best practices" in energy efficiency<br>▪ EEDR staff will take the best practices and create program blocks (load shapes, market penetration studies, etc.) to be used in IRP modeling |
| *IRP Working Group (IRPWG)* | ▪ Stakeholder group format similar to that used during 2011 IRP<br>▪ Consists of diverse stakeholders representing balanced interests<br>▪ Will meet regularly and serve as the working group for stakeholder input |

Source: TVA

# Closing Thoughts

- The multitude and nature of the challenges currently faced by the utility industry call for new approaches to IRP development
- In this document, we have discussed some of these new approaches and highlighted three best practices from our best practices library
  - Using Least-Regrets Planning
  - Integrating New Types of Resources
  - Increasing Stakeholder Involvement
- This is the first of two documents dedicated to discuss issues around long-term planning
  - In the second document, we will analyze the drivers behind the development of energy efficiency and how this resource has been incorporated in the long-term plans of utilities in the Southeast
- ScottMadden has extensive experience assisting several of its utility clients in the development of their IRPs and incorporating best practices




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