

Adaptive Planning: Building Flexible Resource Plans under Uncertainty

by Rachel Moglen and Nidhi Santen

KEY INSIGHTS

- Traditional planning finds the best portfolio for a single assumed future but can miss strategic near-term decisions that become valuable when conditions change. Adaptive planning finds these decisions.
- Adaptive planning shows which decisions to lock in now, and which can be deferred until uncertainty resolves, preserving optionality.
- Adaptive planning can identify portfolios that are higher reliability and lower cost than traditional planning.
- Adaptive portfolios identify a strategic near-term hedge, which is not necessarily the average portfolio but a deliberate mix of options.
- Adaptive planning is possible with existing planning tools, and adoption is growing among electric companies.

Electric companies make resource decisions today that will endure for decades, without knowing what the future holds. The stakes are high. Building too little risks reliability. Building too much threatens affordability and risks stranded assets. Banking on a technology that falls short can hurt both reliability and affordability.

Resource planning has long focused on managing uncertainty, including load growth, policy, renewable output, fuel prices, and generation outages. However, today's growing uncertainty puts electric companies in a difficult position where established risk mitigation techniques may fall short.

Adaptive resource planning, an emerging risk management technique, identifies flexible planning decisions that strategically hedge against a wide range of plausible futures.

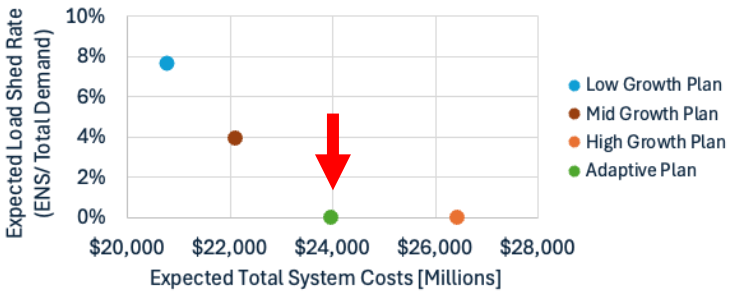


Figure 1. Compared to traditional planning methods, adaptive plans can achieve high reliability at lower cost.

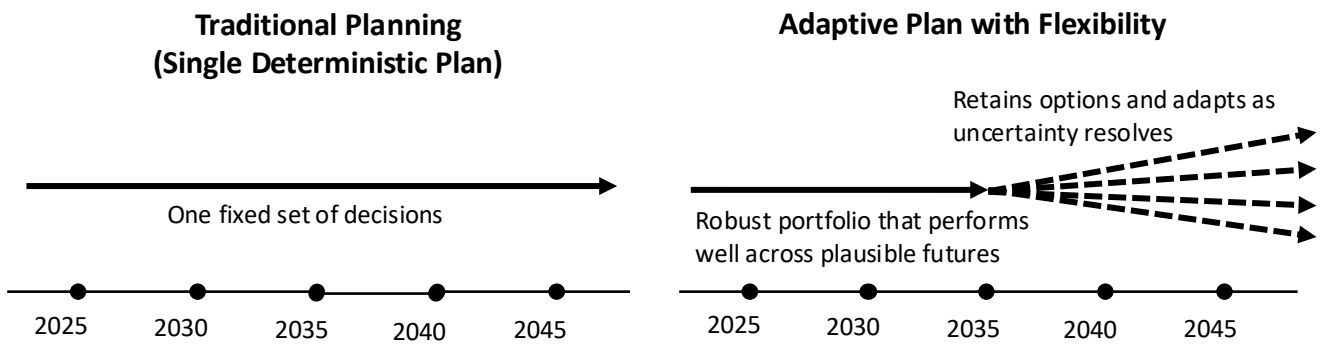


Figure 2. The deterministic plan follows a fixed path, even as uncertainty grows over time. The adaptive plan instead lays out a roadmap of flexible future adaptations. In the near term, it also provides a robust action plan that strategically hedges against uncertain futures.

Limitations of Traditional Planning

Traditional planning asks what the resource portfolio should look like over the next 20 to 30 years, but what planners really need to know is which decisions to make *today*. Resource plans are re-filed every two to five years so that companies can adjust as new information emerges; rarely do companies *need* to lock in decisions 15 to 20 years out. However, traditional scenario-based planning evaluates one future at a time. When different futures call for meaningfully different portfolios, it is unclear what portfolio to commit to, and near-term strategic decisions can be missed.

Adaptive Planning Provides Clarity

Adaptive planning separates the planning horizon into near-term decisions—what to commit to now, and future decisions—what to defer. It weighs multiple plausible futures at once to find a robust near- term strategy that hedges against uncertainty while preserving the ability to adapt later.

The result is a single near-term action plan that best positions the company for a range of futures, plus a longer-term roadmap tailored to each plausible future. This two-stage structure fits the resource planning cycle remarkably well: lock in near-term choices now, and make longer-term decisions in later cycles as uncertainty resolves.

A New Approach to Planning

For planners, adopting adaptive planning means more model runs or longer model solves. This additional computational burden may not be trivial, but emerging computational advances can provide relief. For stakeholders, a shift to adaptive planning means accepting conditional portfolios rather than a single fixed portfolio. Even so, the trade-off may be worth it: in an uncertain future, adaptive planning gives electric companies a practical way to make confident decisions today.

This research highlight is based on the following EPRI Reports

"Uncertainty Management, Stochastics, and Hedging Techniques for Resource Planning"
Product ID 3002036184

"Quantifying the Impact of Large Load Uncertainty: Insights from Adaptive and Deterministic Planning Models"
Product ID 3002031457

RESEARCH CONTACTS

Rachel Moglen, Ph.D.
rmoglen@epri.com

Nidhi Santen, Ph.D.
nsanten@epri.com

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