RESOURCE PLANNING FOR ELECTRIC POWER SYSTEMS

KEY INSIGHTS

- Cost projections to 2050 are developed using endogenous learning models linking deployment to TOCC under vetted assumptions.
- Projected costs vary widely across technologies, shaped by learning assumptions and scenario inputs. Renewables and batteries show the steepest declines (up to 82% from 2025 to 2050), while gas and CCS evolve more modestly.
- Hydrogen and nuclear show the widest spreads, reflecting varied assumptions; nuclear from uncertain timing and starting costs, hydrogen from learning scope.
- Results underscore the value of scenario-based approaches over single-point estimates, especially for emerging technologies.

Cost Projection Factors for Resource Planning

by Todd Gorgian

Research Overview

Electric companies require reliable future cost information to guide sound planning and investments. Recent EPRI research develops scenario-based total overnight capital cost (TOCC) projections and annual cost factors that planners can apply directly in their analyses.

Literature-based learning rates and expert-vetted assumptions are applied to deployment outlooks from the Energy Information Administration's (EIA) 2025 Annual Energy Outlook and EPRI's REGEN Net-zero by 2050 (NZx2050) scenario. Technologies include natural gas turbines and combined cycles, solar photovoltaic (PV), onshore wind, lithium ion storage, small modular reactors, hydrogen-fired turbines and combined cycles, natural gas combined-cycles with carbon capture, and electrolyzers. Results include cost curves, annual cost factors, with an Excel tool for customization.

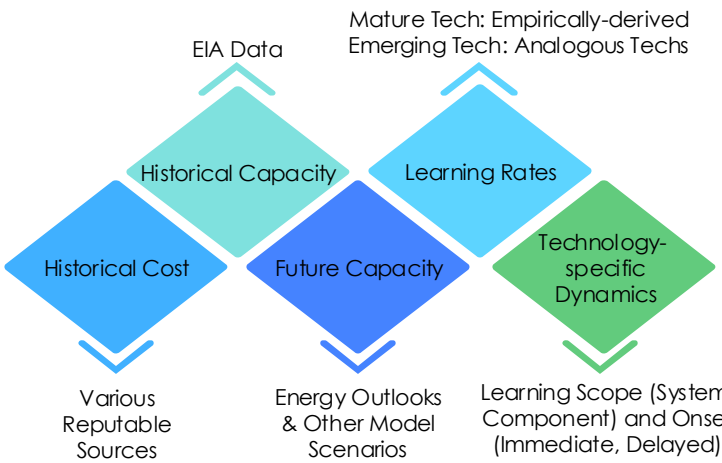

Figure 1. Model Development

As an example of one technology examined, solar PV results are shown: capacity growth across scenarios (Figure 2), resulting TOCC under all scenarios and learning rates (Figure 3), and annual cost factors relative to 2025 (Table 1).

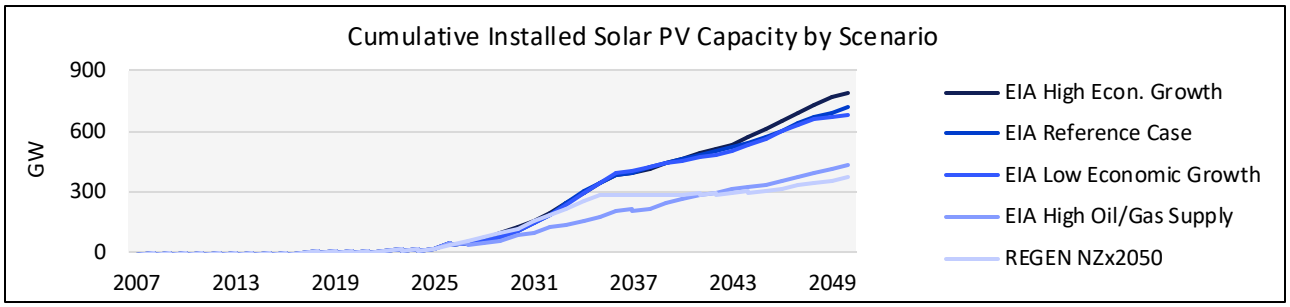

Figure 2: Cumulative Installed Solar PV Capacity (2007-2050)

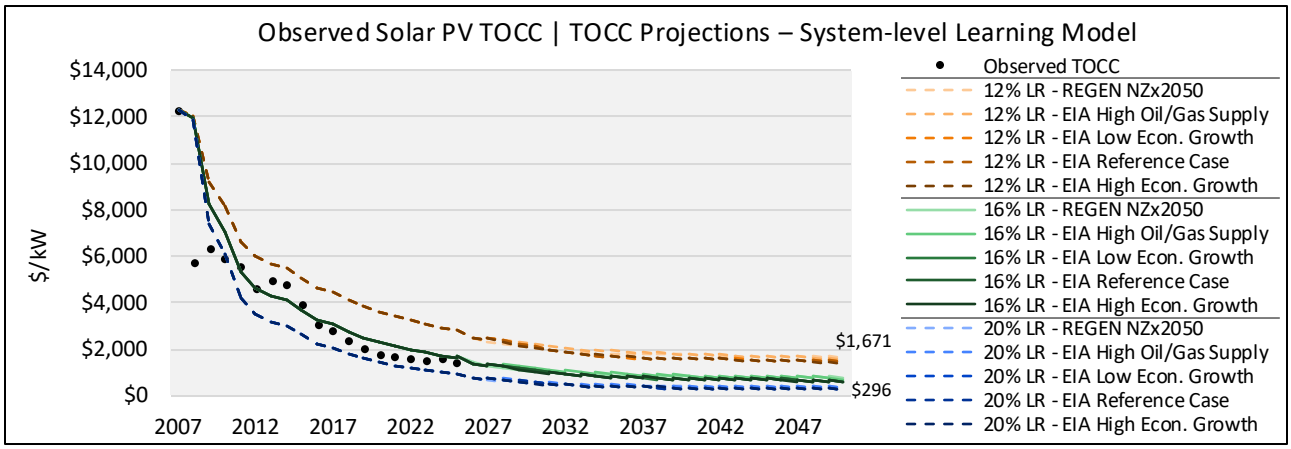

Figure 3: Observed Costs and Learning Curves for Solar PV

Year	12% LR		16% LR		20% LR	
	REGEN NZx2050	EIA High Economic Growth	REGEN NZx2050	EIA High Economic Growth	REGEN NZx2050	EIA High Economic Growth
2025	1.000	1.000	1.000	1.000	1.000	1.000
2030	0.729	0.713	0.650	0.631	0.576	0.555
2035	0.617	0.596	0.517	0.494	0.430	0.406
2040	0.617	0.565	0.517	0.459	0.430	0.369
2045	0.610	0.537	0.510	0.428	0.422	0.338
2050	0.589	0.512	0.486	0.402	0.397	0.311

Table 1: Solar PV Cost Factors in 5-yr Time Steps *(values reflect magnitude change relative to 2025)*

The cost projections and annual factors developed here help planners and analysts estimate future capital costs across scenarios. While the learning framework omits short-term supply chain effects, the scenarios provide directionally useful long-term trajectories. The structured, empirically based approach ensures transparency and consistency.

This brief is based on EPRI Report "Cost Projection Factors for Resource Planning," **Product ID 3002033150**.

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