

# Foundations of Integrated Planning: Defining a Framework for Comprehensive Energy System Planning

## EXECUTIVE SUMMARY



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**T**raditional electricity planning practices have often been siloed. Generation, transmission, distribution, and customer program/distributed energy resource (DER) planners all have their own planning teams, models, data inputs, and vocabularies. This siloed approach was sufficient when one-way power flow from a limited set of dispatchable generators allowed for either separate or sequential planning processes with limited feedback between them. However, that is not the power system of today. Ongoing transformations—including accelerating load growth, technology development, the growth of inverter-based resources, evolving extreme weather events, and the emerging need to consider integrations between coupled energy systems—are pushing planning processes toward a new integrated planning paradigm.

**Integrated planning is a comprehensive energy system planning approach that coordinates across systems to develop affordable, reliable, and robust investment plans.** Integrated planning coordinates across electricity generation, transmission, and distribution, and customer loads and DERs, and may also consider interactions between the electricity system and other energy systems. This type of planning can ensure the right investments, in the right places, at the right times, and has the potential to lead to a lower-total-cost set of solutions to meet planning needs.

A four-part integrated planning framework is presented in this report (Figure ES-1, p.2). The **integration of inputs** focuses on aligning inputs, modeling assumptions, scenarios, and data formats and structures across planning

All three integrated planning reports can be found at <https://www.esig.energy/integrated-planning/>.

**FIGURE ES-1**  
**The Integrated Planning Framework Presented in This Report**

Integration of Inputs	Integration of Analysis	Integration of Actions	Integration with Decision-Making
Aligning inputs, modeling assumptions, scenarios, and data formats and structures across planning processes to set a common foundation across all planning processes	Determining the key data flows between both economic and physical planning analyses needed to reach a comprehensive solution	Leveraging integrated planning analyses to determine a coordinated set of near-term proposed investments across all planning domains	Ensuring that these proposed near-term action plans fit within existing infrastructure decision-making structures or that those decision-making structures evolve to support regulatory approval and implementation of comprehensive planning solutions

Source: Energy Systems Integration Group.

processes to set a common foundation. The **integration of analysis** emphasizes determining the key data flows between both economic and physical planning analyses needed to reach a comprehensive solution. Data flows are mapped within electricity generation, transmission, and distribution and customer program/DER planning, as well as between electricity planning, natural gas system planning, and economy-wide decarbonization analyses. Integrated analysis can be achieved through co-optimization across planning domains (such as capacity expansion that considers generation, transmission, and storage investments) or iterative processes focused on two flows of information between models. The **integration of actions** involves leveraging integrated planning analyses to determine a coordinated set of near-term proposed investments across all planning domains. The **integration with decision-making** ensures that these proposed near-term action plans fit within existing infrastructure decision-making structures or that those decision-making structures evolve to support regulatory approval and implementation of comprehensive planning solutions.

In addition to substantial technical changes to analytical processes, integrated planning involves change management and can benefit from an incremental approach. While the journey will be unique within each planning process, most can benefit from the following generalized set of steps:

- Determine integrated planning objectives
- Perform a gap assessment for existing planning processes
- Align key inputs and develop integrated scenarios

**In addition to substantial technical changes to analytical processes, integrated planning involves change management and can benefit from an incremental approach.**

- Develop deeper connections between existing analytical processes
- Create or adapt stakeholder engagement plans to support an integrated planning process
- Consider organizational re-alignment and/or formalized agreements between planning organizations
- Advance new analytical methods and tools to facilitate planning integrations
- Consider opportunities for co-optimization or co-simulation methods across planning domains

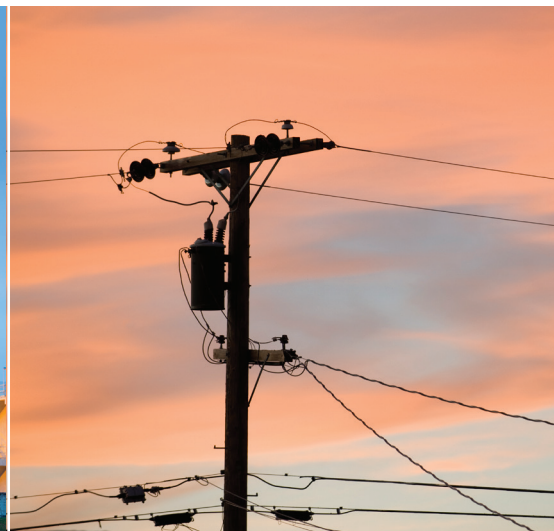
Technology and policy drivers are pushing planners toward a more integrated approach. The framework presented in this report forms a foundation upon which planners can build to reap the benefits of new comprehensive planning methods. While each integrated planning process presents its unique opportunities and challenges, all processes can improve by strengthening their technical and procedural connections across planning domains.



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*Foundations of Integrated Planning: Defining a Framework for Comprehensive Energy System Planning*, by the Energy Systems Integration Group's Integrated Planning Task Force, is available at <https://www.esig.energy/integrated-planning/>.

To learn more about the topics discussed here, please send an email to [info@esig.energy](mailto:info@esig.energy).

The Energy Systems Integration Group is a nonprofit organization that marshals the expertise of the electricity industry's technical community to support grid transformation and energy systems integration and operation. <https://www.esig.energy>.

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