# Integrated Planning Guidebook

## A Practical Coordination Framework for Electricity Planners

ESIG
ENERGY SYSTEMS INTEGRATION GROUP

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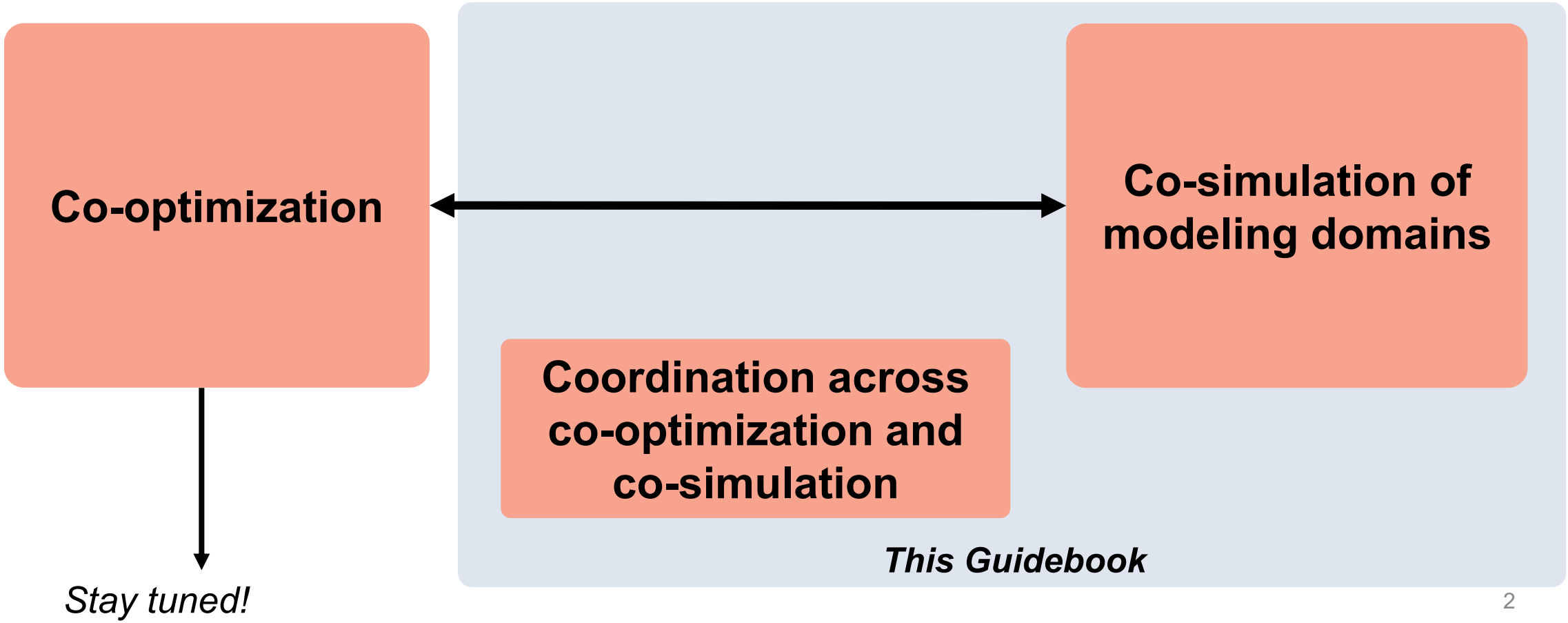
# Building on the Foundation

**Integrated analysis may use:**



# Guidebook Chapters

- New Challenges with Current Processes
- Defining Integrated Planning
- Overview of Electric Power System Planning: Structured Across Consistent Dimensions
- The Integrated Planning Framework
- The Value of Integrated Planning
- Key Concepts for Integrated Planning Software
- A Leadership Perspective on Integrated Planning

**Industry Spotlights Throughout: Insights from expert planner interviews and literature**

# New Challenges

GENERATION | TRANSMISSION | DISTRIBUTION | CUSTOMER LOADS AND RESOURCES

- Rapidly Changing Policies
- Managing IBRs and Grid Stability
- Large/Uncertain Load Growth
- Rapid Technological Improvement at Grid Edge
- Complexity of Value Stacking
- Infrastructure Resilience Under Uncertain Climate
- Aging Infrastructure

**These challenges manifest differently for different planning areas**

***Practically*** **incorporate short-term operational details into long-term planning (where feasible)**

# Applying Dimensions to *Planning Areas*

| | GENERATION | TRANSMISSION | DISTRIBUTION | CUSTOMER LOADS AND RESOURCES |
|---|---|---|---|---|
| **Scope** | Supply | Reliability of high voltage system | Reliability of low voltage system | Behavior of end user |
| **Scale** | Local-national | Regional-interconnection | Local | Residential-commercial |
| **Horizon** | 10-30 years | 5-15 years | 3-10 years | 2-5 years |
| **Action** | Generation Investment | New lines and substation upgrades | Substation and service device upgrades | Program development |

**Intention: Allow planners to understand other planning areas.**

# Applying Dimensions to *Modeling Domains*

Scope

Scale

Horizon

Action

## GENERATION

- Capacity Expansion Modeling
- Probabilistic Resource Adequacy Assessment
- Production Cost Modeling

## TRANSMISSION

- Balanced AC Power Flow Simulations
- Short-Circuit/Fault Modeling
- Phasor Domain Transient Simulations
- Electromagnetic Transient Simulations

## DISTRIBUTION

- Unbalanced AC Power Flow Simulations
- Short-Circuit/Fault Modeling

## CUSTOMER LOADS AND RESOURCES

- Load Forecasting Modeling
- Rate Design and Tariff Models
- Demand Response and Demand-Side Management Planning Models
- Cost-Effectiveness Tests
- Customer Behavior and Adoption Models

**Intention: Allow planners to understand the models run by other planners.**

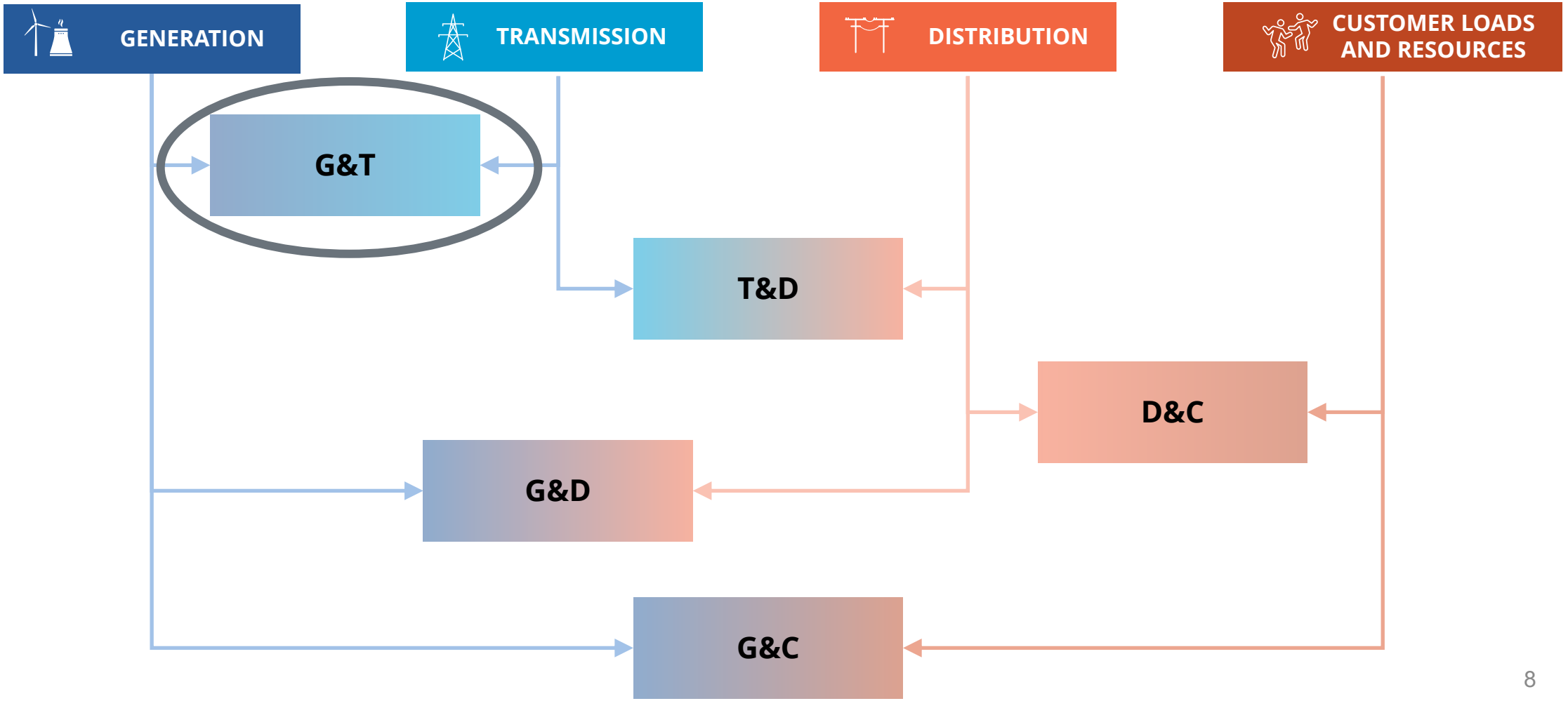
# Stage of Integration

**Walk:** Communication and understanding

**Jog:** Aligning data inputs

**Run:** Integrated modeling processes

# Applying Walk/Jog/Run to Planning Interfaces



# Stages of Integration: Example G&T

## Walk: What G needs to understand about T and vice versa

- **Terminology:** A G "scenario" may mean model runs with a specific set of input assumptions and constraints but a T "scenario" may a period of stress
- **Abstractions:** How are line losses represented (or ignored)

## Jog:

- **Spatial mapping:** Link **G** assets to **T** assets
- **Time-series mapping:** Easy handoff of 8760 data across planning areas

# Run

## Integrated Generation/ Transmission Planning Workflow

**1:** Base case

**2–3:** Economic

**4–7:** Reliability

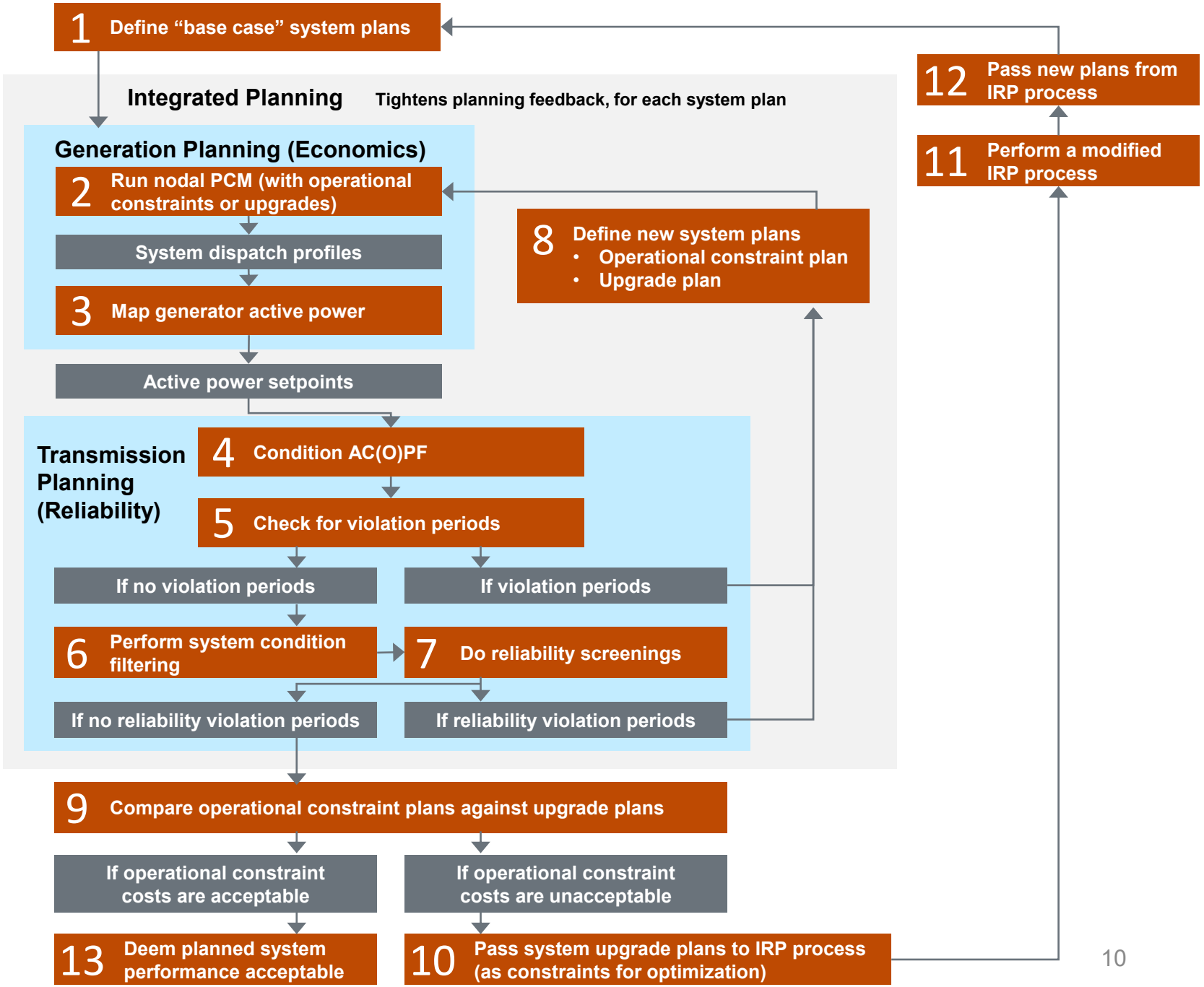
**8:** Iterate

**9:** Compare plans

**Outcomes:**

**10–12:** Pass to IRP

**13:** Performance is acceptable

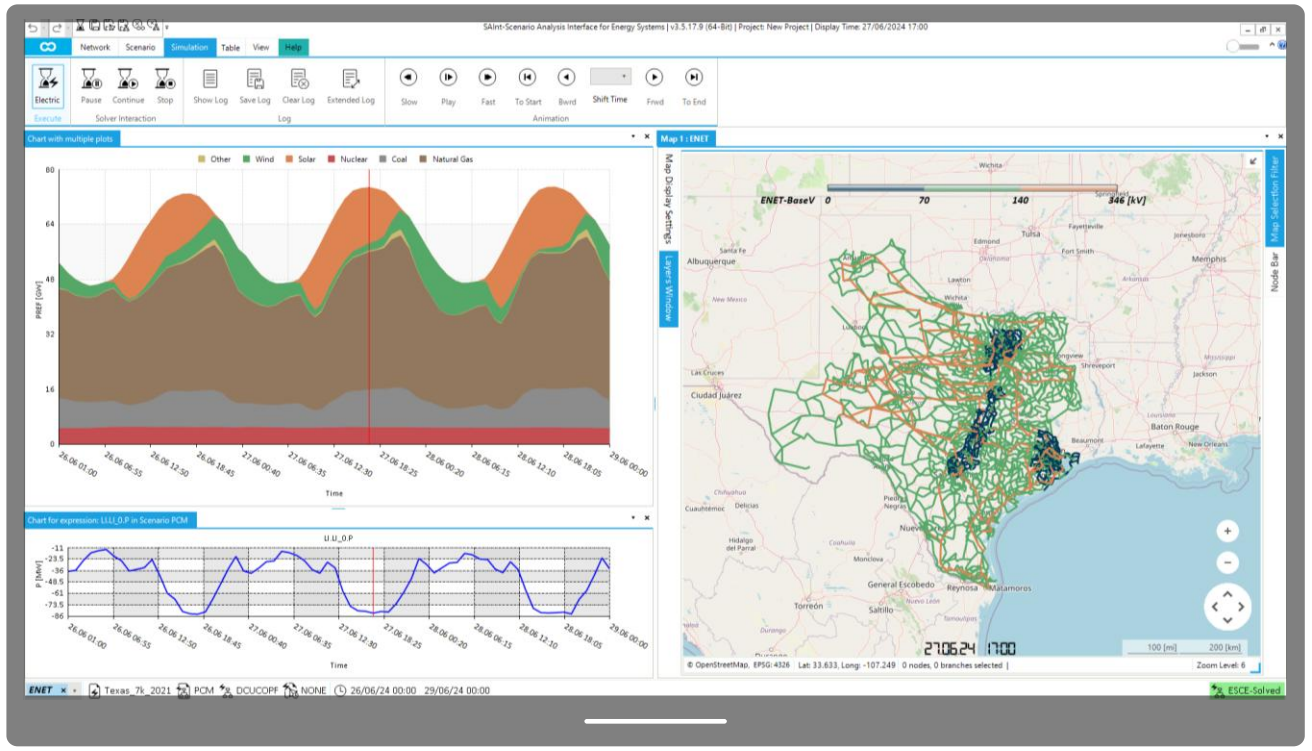


# The Value of Integrated Planning

- **Lower costs**
- **Increased system resilience**
- **Streamlined processes**
- **Data integrity**
- **Accurate benefit accounting**
- **Ability to balance competing objectives**

# Technologies to Facilitate Integrated Planning

- Spatially referenced data
- Interoperability across modeling domains
- High dimension data processing
- Computational performance
- Streamlined multi-model interactions



Example: **SAInt** – encoord's integrated planning solution

# Implementation Considerations

Need for thoughtful change management and strong executive leadership

Use “walk/jog/run” framework to guide integration efforts

Start with a specific, achievable *case study*

- *Solves a real challenge the utility is facing*
- *Sufficient scope to solve an important problem but not so large that it requires an entire planning team to perform the work*
- *Can be performed concurrently with existing planning activities*
- *May be driven by a regulatory mandate*

# Next Step: Read and Share the Guidebook!

## A special thank you to:

- **ESIG staff:** Thoughtful consideration, collaboration, and guidance
- **Task force members:** Many hours of thoughtful discussions and feedback on guidebook!
- **Interviewees:** Dozens of experts interviewed to share their experience integrated planning
- **Guidebook reviewers:** Over 500 comments from reviewers

## This guidebook was an integrated planning effort!

## Read and share the guidebook!