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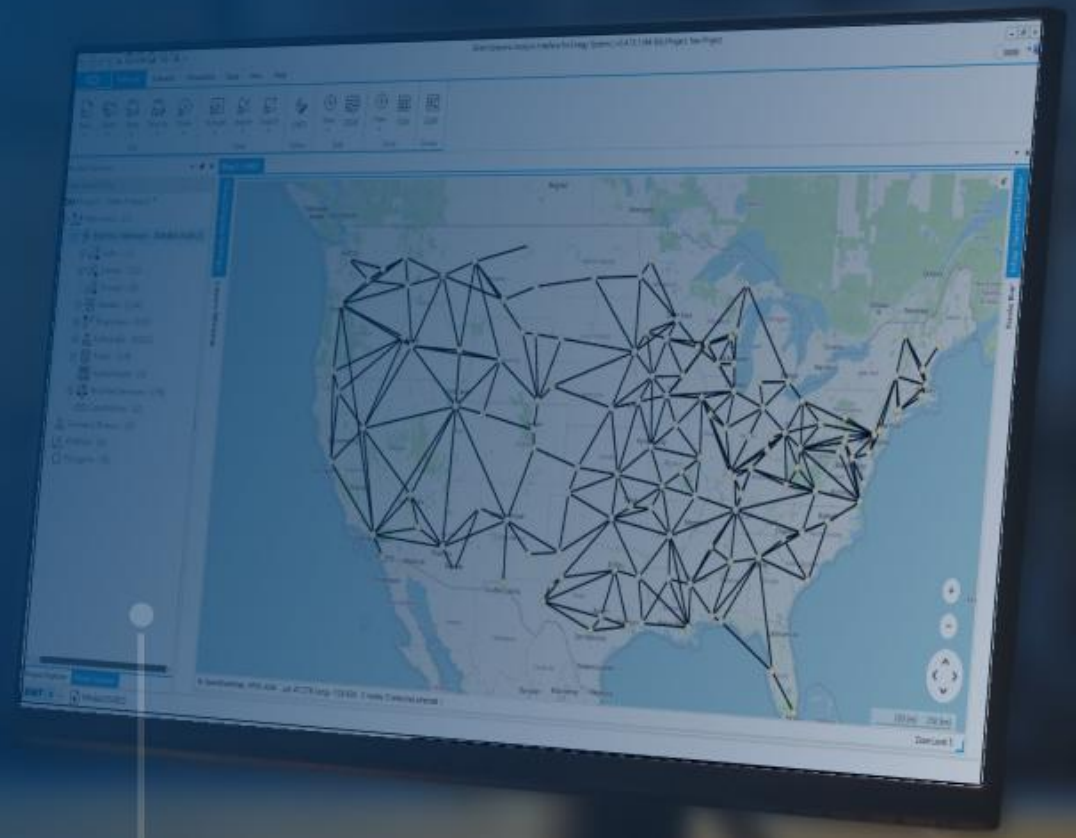
Plan the Energy Future

Integrated Planning Guidebook



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What does it mean to *do* integrated planning, in practice?

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Introducing: Integrated Planning Guidebook

- Practical entry point for any planner, in any planning area, at any stage of integration.
- Single reference for integration.
- Industry-wide task force of planning experts from utilities, system operators, national labs, software vendors, and consulting shops.

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Overview of Power System Planning: Dimensions

Scope | Objectives/boundaries

Scale | Detail

Horizon | Duration

Action | Decisions

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Applying Dimensions to Planning Areas

Scope

Scale

Horizon

Action

GENERATION	TRANSMISSION	DISTRIBUTION	CUSTOMER
Supply	Reliability of high voltage system	Reliabilty of low voltage system	Behavior of end user
Local-National	Regional-interconnection	Local	Residential-commercial
10-30 years	5-15 years	3-10 years	2-5 years
Generation Investment	New lines and substation upgrades	Substation and service device upgrades	Program development

Trend from larger to smaller scales

Trend from longer to shorter horizons

Intention: Allow planners to understand other planning areas.

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Applying Dimensions to Modeling Domains

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

- 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.

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New Challenges with Current Processes

 GENERATION

 TRANSMISSION

 DISTRIBUTION

 CUSTOMER

- 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

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Stages of Integration: Example Generation/Transmission

Walk: Communication and understanding

- What G needs to understand about T and vice versa
- Teams to discuss model abstractions, physical realities, etc.

Jog: Aligning data inputs

- Mapping G assets to T assets
- Time-series approach for transmission studies

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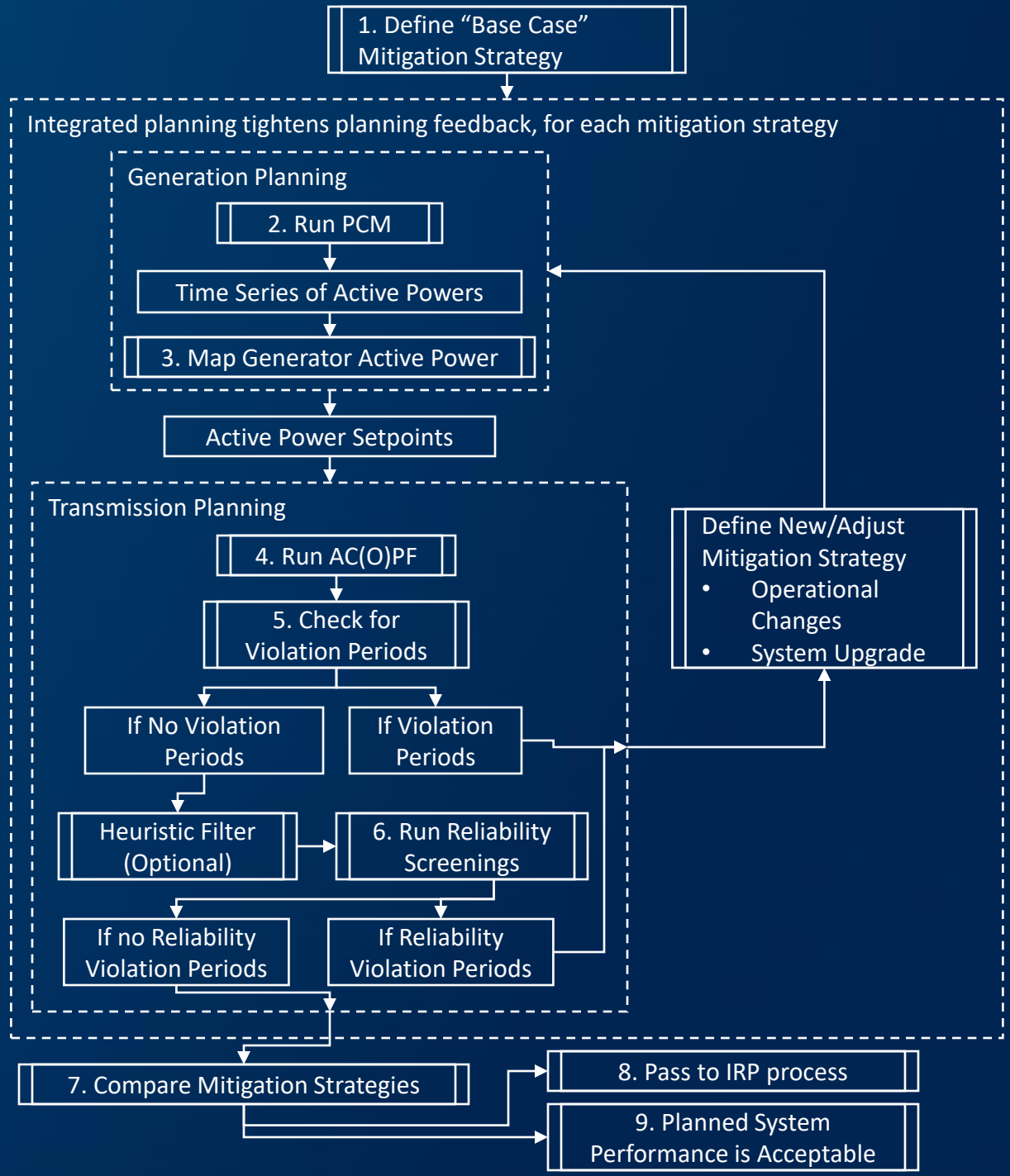
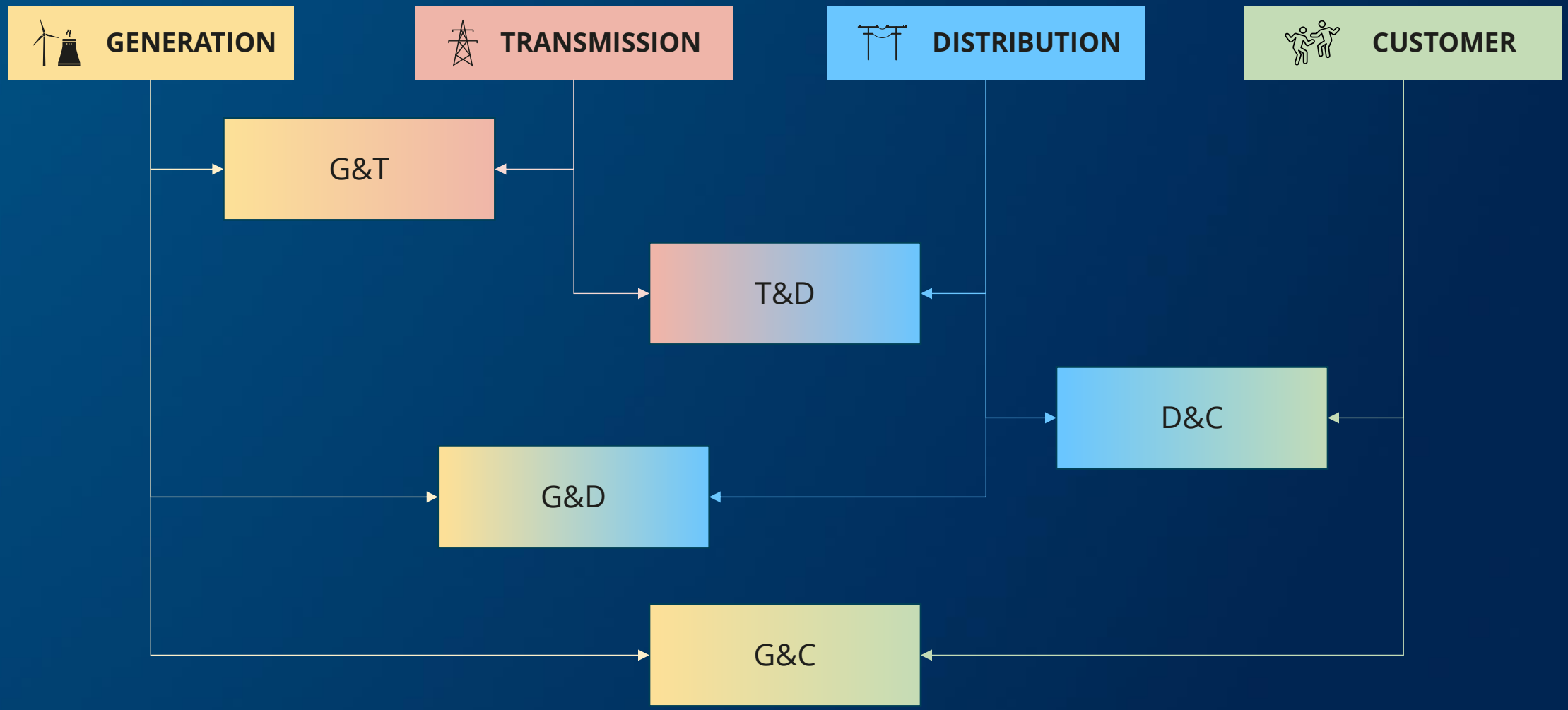
Run Stage Example: Generation & Transmission

- Step 1: Define “Base Case” strategy
- At a high-level run stage means tighter traditional feedback loops
- Steps 2-3: Mapping PCM results to active power setpoints
- Steps 4-6: Checking for periods that violate physics, if these exist adjust mitigation strategies!
- Step 7: Compare strategies
- Step 8: If strategies require significant changes, may need to inform IRP process
- Step 9: Planned system performance is acceptable



Walk/jog/run stages of integration applied to:



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The Value of Integrated Planning

Lower costs

Increased system resilience

Streamlined processes

Data integrity

Synergistic outcomes

Balancing competing objectives

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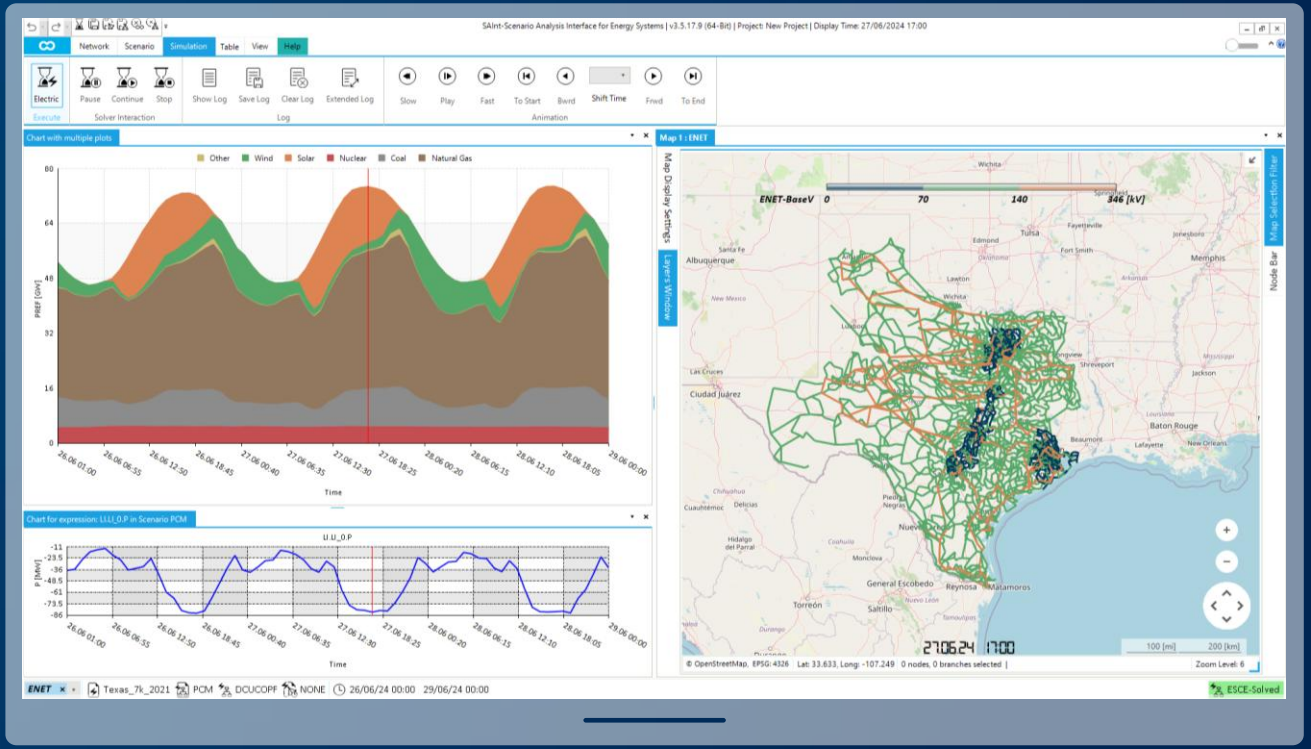
Technologies to Facilitate Integrated Planning

- **Spatially Referenced Data**
- **Interoperability Across Modeling Domains**
- **High Dimension Data Processing**
- **Computational Performance**
- **Single Point of Interaction User Experience**



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

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ESIG Integrated Planning Guidebook Coming Summer 2025!

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