# Advances, Challenges, and Opportunities with Comprehensive Electricity Planning

NARUC Annual Meeting and Education Conference
LEADING THE WAY
EXPLORING OPPORTUNITIES

Session C3

NARUC
National Association of
Regulatory Utility Commissioners

# NARUC-NASEO TASK FORCE ON COMPREHENSIVE ELECTRICITY PLANNING

NASEO
National Association of
State Energy Officials

## Advances Challenges, and Opportunities with Comprehensive Electricity Planning

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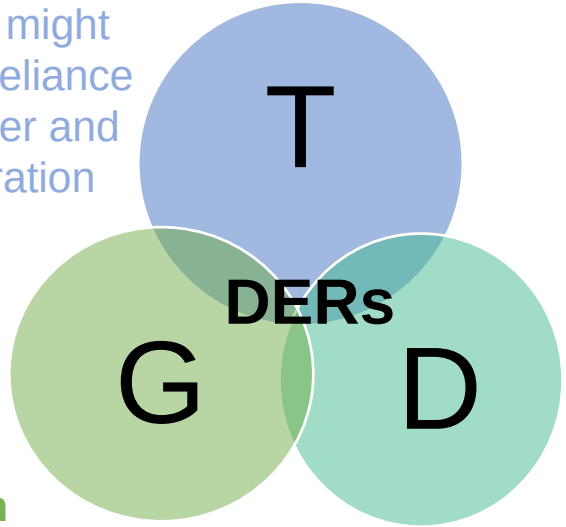
Chairman Jeffrey Ackermann, Colorado

*November 20, 2019*
*NARUC Annual Meeting and Education Conference 2019*

# Planning and Investment Decisions Could Optimize Supply and Demand

**Transmission needs** might be reduced with less reliance on central station power and increased DER penetration




With growth of DER, the amount and type of **central station generation** needed to balance supply and demand is evolving

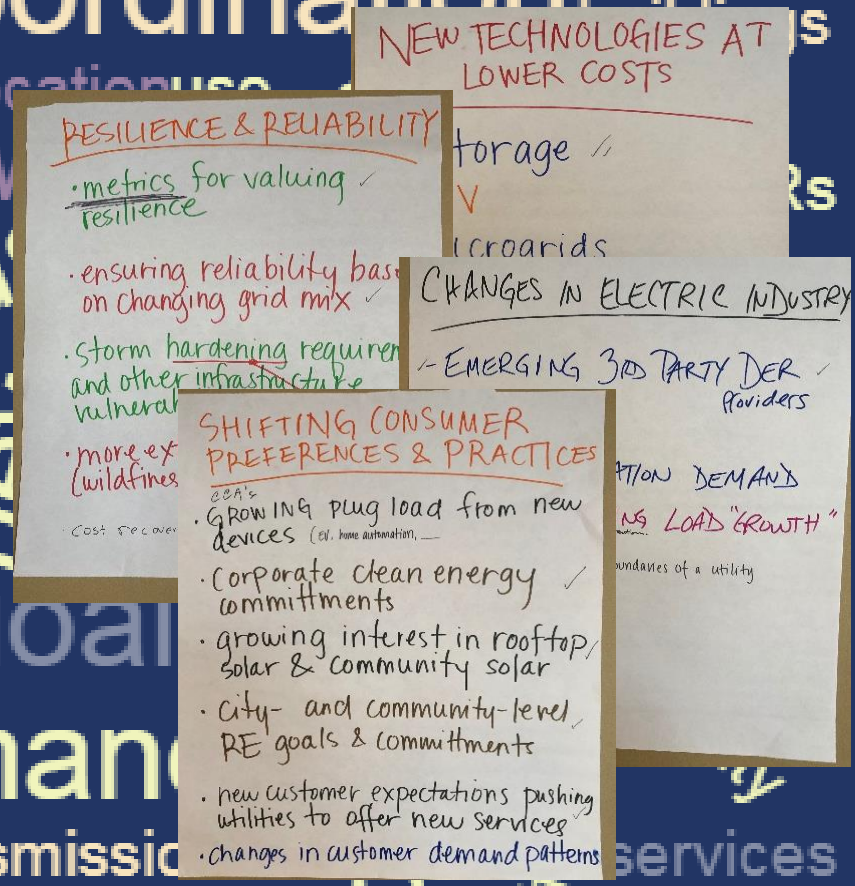
**Distribution system** investment decisions now need to account for the quantity, location, capabilities, and load shapes of resources added to the distribution system

With greater alignment of resource and distribution planning, states & utilities could:

- Improve grid reliability and resilience
- Optimize use of distributed and existing energy resources
- Avoid unnecessary costs to ratepayers
- Support state policy priorities
- Increase the transparency of grid-related investments decisions

# Key Trends Driving Need for Change

1. Resilience and reliability
2. Regulatory trends
3. Coordination needs and benefits
4. Policy/legislative interests
5. Fuel price and other cost uncertainties
6. Shifting consumer preferences / practices
7. Changes in electric industry
8. New technologies at lower costs



# NARUC-NASEO Task Force on Comprehensive Electricity Planning

Announced Nov. 2018

**Purpose: Develop new pathways for aligned electricity planning**

1. **Innovation**: Pioneer new tools and roadmaps for aligning planning to meet state needs
   - Participants are convening in multi-state cohorts with others operating in similar market, regulatory, and policy environments
2. **Action**: Apply insights to directly benefit state action
   - Each state will develop concrete steps / an action plan at the end of the initiative
3. **Replication**: NARUC and NASEO will publish templates and resources to support all members

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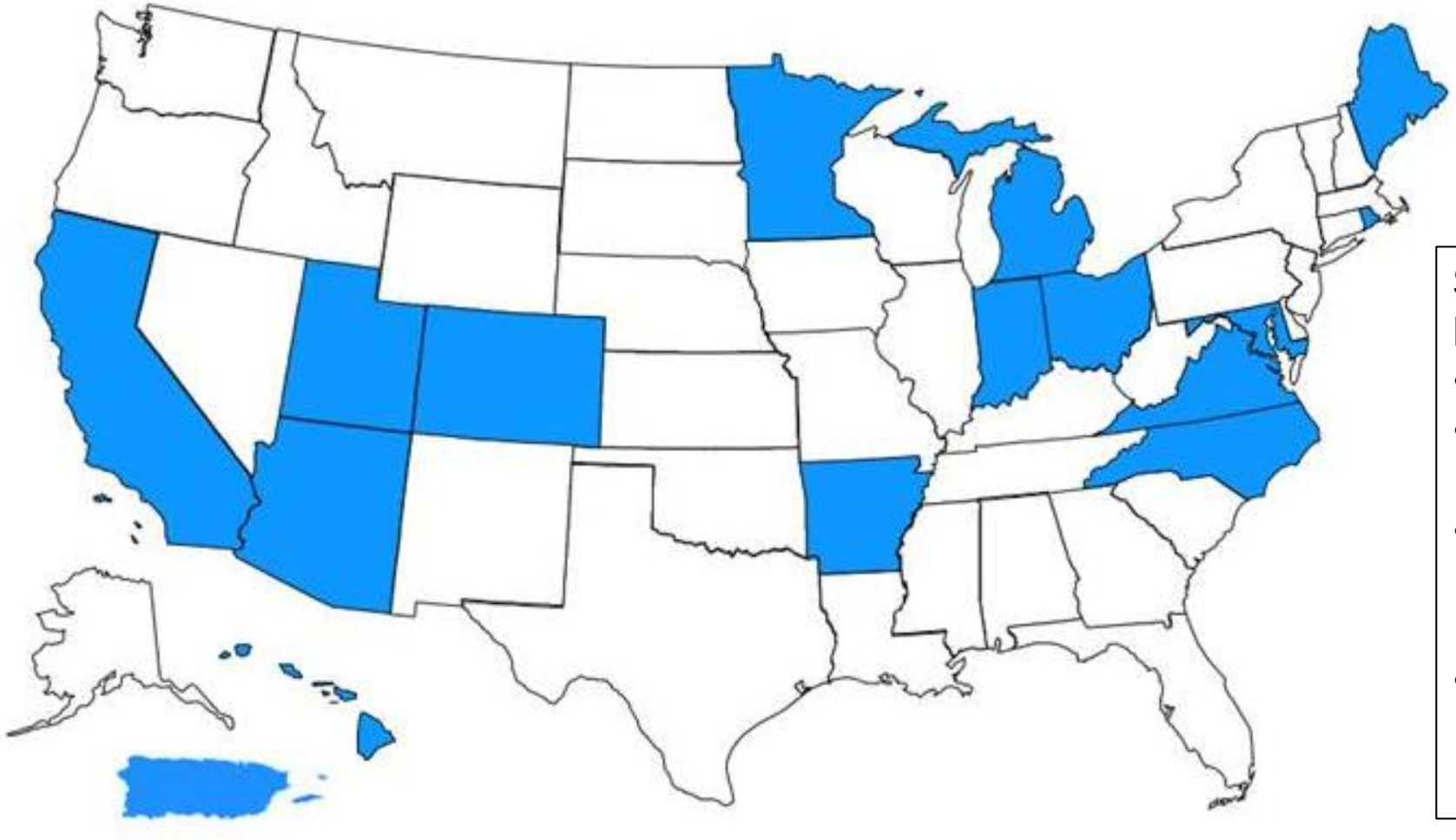
# 16 States represent NARUC & NASEO members



**States are Diverse and Representative:**

- Geography
- Market models (e.g., retail competition, wholesale market)
- Planning approaches (e.g., state energy office roles, distribution system planning)
- State goals (e.g., grid mod, resilience, climate, clean energy, economic development)

# Five State Teams ("Cohorts")

**16 states | 5 cohorts**

| Vertically Integrated | | | | Restructured |
|---|---|---|---|---|
| **Coral** | **Turquoise** | **Silver** | **Amber** | **Jade** |
| • Within organized markets | • Outside organized markets | • Within organized markets | • Outside organized markets | • Within organized markets |
| Tackling alignment of distribution, resource, and transmission planning | | Tackling alignment of distribution and resource planning | | Focused on integrated distribution planning (combined with other state / utility energy planning and programs) |
| • *Pragmatic state; works collaboratively in region; operates in 2 RTOs* | • *Anticipates range of energy policies; juggles urban vs. rural needs: long distances between load centers; transmission challenges* | • *Coastal state vulnerable to weather-related natural disasters; experiencing flat to declining load* | • *State is facing increasing weather-related damages and costs; new transmission and generation siting requests coming in* | • *Retail competition in state; dynamic policy environment; impacted by cold-weather events* |

# Task Force Process

**2 years | 4 workshops**

*We are here*

# Examples of Guiding Principles:
## *What the Cohorts Want to Accomplish*


*Guiding Principles for* ***Planning Processes***

*Guiding Principles for* ***Outcomes***

| | | | | |
|---|---|---|---|---|
| Let Public Interest Guide Approaches | Facilitate Meaningful Stakeholder Engagement | Preserve Safety, Reliability, & Affordability Foundation | Promote Utility Financial Health | Meet Evolving Public Policy Goals |
| Use Consistent Assumptions Across Analytical Activities to Promote Data-Driven Results | Holistically Identify & Consider Investment Options | Maximize Customer Value and Opportunity | Increase System Efficiency | Ensure Resilient Critical Energy Infrastructure |
| | | Balance System Needs with Other Objectives | Be Responsive to Changing Generation Mix | |

# Standard Building Blocks of Electricity System Planning

Establish Planning Assumptions

Develop Load Forecasts

Describe the Future Trajectory

Identify System Needs

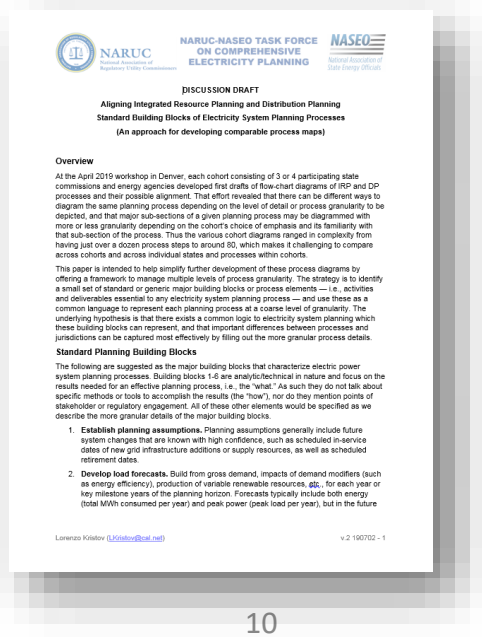
Explore Solutions to Address Gaps

Evaluate and Apply Criteria to Determine Preferred Solutions

Finalize Solutions and Publish Plan

Implement Solutions

- Represent fundamental steps in system planning
- Use common language across cohorts while preserving diversity in approach
- Focus on analytic/technical steps: results (“what”) not methods/tools (“how”)
- See discussion draft and description of the building blocks in the online resource library at: www.naruc.org/taskforce/resources/


NARUC-NASEO TASK FORCE ON COMPREHENSIVE ELECTRICITY PLANNING

DISCUSSION DRAFT

Aligning Integrated Resource Planning and Distribution Planning

Standard Building Blocks of Electricity System Planning Processes

(An approach for developing comparable process maps)

Overview

At the April 2019 workshop in Denver, each cohort consisting of 3 or 4 participating state commissions and energy agencies developed first drafts of flow-chart diagrams of IRP and DP processes and their possible alignment. That effort revealed that there can be different ways to diagram the same planning process depending on the level of detail or process granularity to be depicted, and that major sub-sections of a given planning process may be diagrammed with more or less granularity depending on the cohort’s choice of emphasis and its familiarity with that sub-section of the process. Thus the various cohort diagrams ranged in complexity from having just over a dozen process steps to around 80, which makes it challenging to compare across cohorts and across individual states and processes within cohorts.

This paper is intended to help simplify further development of these process diagrams by offering a framework to manage multiple levels of process granularity. The strategy is to identify a small set of standard or generic major building blocks or process elements — i.e., activities and deliverables essential to any electricity system planning process — and use these as a common language to represent each planning process at a coarse level of granularity. The underlying hypothesis is that there exists a common logic to electricity system planning which these building blocks can represent, and that important differences between processes and jurisdictions can be captured most effectively by filling out the more granular process details.

Standard Planning Building Blocks

The following are suggested as the major building blocks that characterize electric power system planning processes. Building blocks 1-6 are analytic/technical in nature and focus on the results needed for an effective planning process, i.e., the “what.” As such they do not talk about specific methods or tools to accomplish the results (the “how”), nor do they mention points of stakeholder or regulatory engagement. All of these other elements would be specified as we describe the more granular details of the major building blocks.

1. **Establish planning assumptions.** Planning assumptions generally include future system changes that are known with high confidence, such as scheduled in-service dates of new grid infrastructure additions or supply resources, as well as scheduled retirement dates.
2. **Develop load forecasts.** Build from gross demand, impacts of demand modifiers (such as energy efficiency), production of variable renewable resources, etc., for each year or key milestone years of the planning horizon. Forecasts typically include both energy (total MWh consumed per year) and peak power (peak load per year), but in the future

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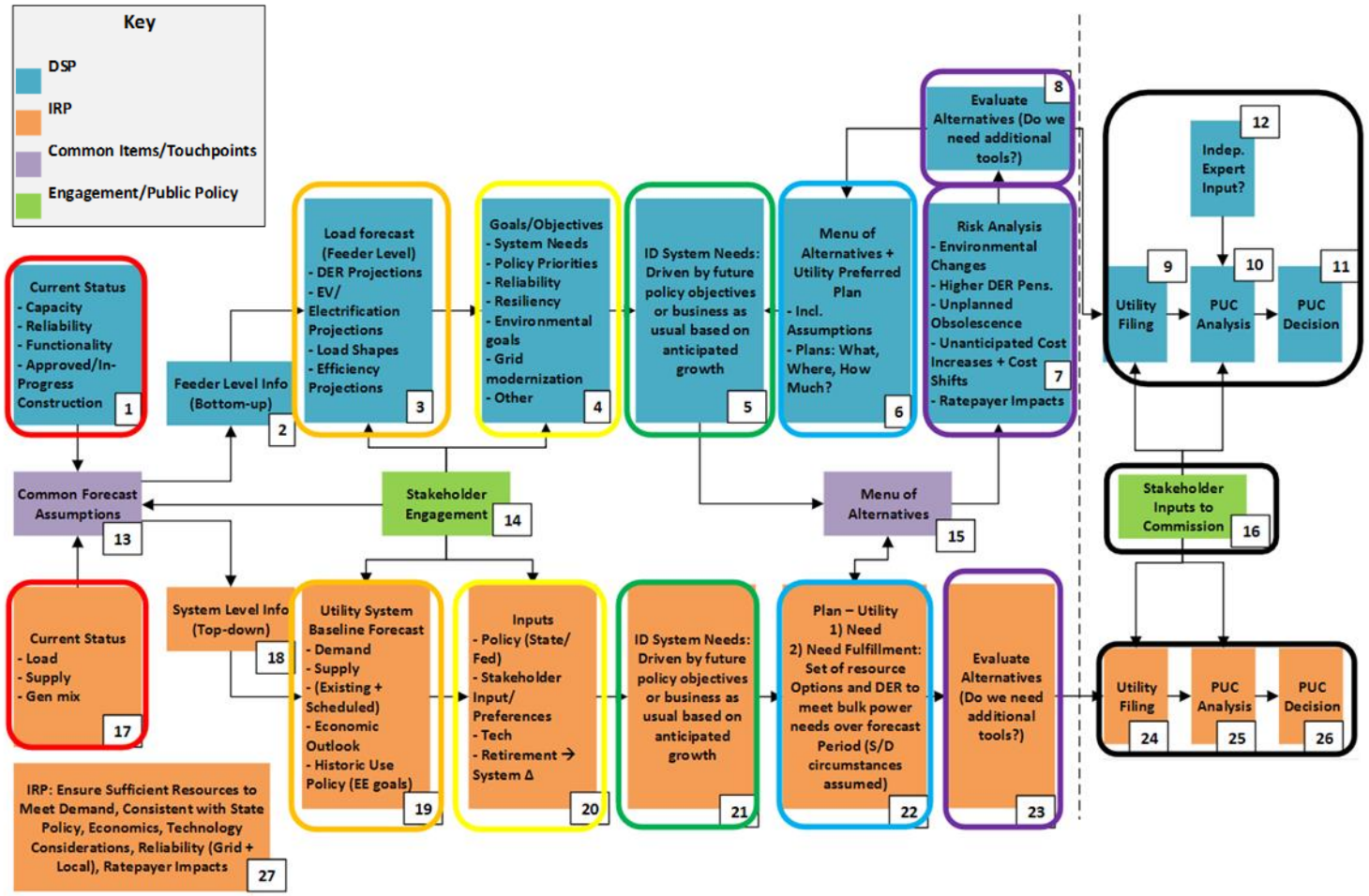
# Illustrative Example of a Cohort Process Map




## Building Blocks of Planning

- Establish Planning Assumptions
- Develop Load Forecasts
- Describe the Future Trajectory
- Identify System Needs
- Explore Solutions to Address Gaps
- Evaluate and Apply Criteria to Determine Preferred Solutions
- Finalize Solutions and Publish Plan
- Implement Solutions

# Key Issues Being Addressed by Cohorts in Process Mapping Exercises

- Desire to **clearly set expectations** at outset for utilities, PUCs, SEOs, stakeholders about the process and what it is trying to accomplish.
- Identification of improved approaches for **stakeholder engagement** at critical steps in the planning process.
- Expanding on the **fundamentals of distribution system planning** to incorporate emerging methods (e.g., multi-scenario forecasting, hosting capacity analysis, non-wires alternatives, locational value).
- Encouraging cost-effective **integration of DER** by evaluating a **range of solutions and procurement strategies** to optimize grid investments and maximize value for customers.
- Coordination and **syncing of data, assumptions and modeling scenarios** to **holistically** consider grid needs and solutions across the entire system (generation, transmission, distribution).
- Acknowledging the contributions of **energy efficiency as a resource,** including impact of EE in forecast assumptions and solution identification.

# Additional Issues Identified by Cohorts (*not visible in process maps)*

- How does **rate design** fit into aligned planning?
  - To what extent can innovations in rate design offer solutions for meeting grid needs, and how can that be reflected in aligned planning processes?
- What metrics should be used to factor **resilience** into aligned planning?
  - How is resilience best defined within the context of planning and what technical criteria or metrics should be applied to measure potential resilience benefits of investment options in an aligned planning process?
- How do we ensure **equity and affordability** in the transition being envisioned and articulated by new planning approaches?
- When will **tools and models** exist that can enable the types of holistic analysis that would allow for optimization of possible solutions across G, T, and D?
- Where should a state/utility draw the line between transparency and security when considering **data access / data sharing**?
- What kind of **utility business models** will support optimized investments in distribution, generation, and transmission assets?

# Next Steps and New Resources


## February 2021

- Release system planning process maps, roadmaps, and state action plans

| New Resources |
| --- |
| Online Resource Library |
| Task Force webinar slides and recordings |
| Profiles of Task Force participating states |
| Task Force press releases & articles |

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**www.naruc.org/taskforce/**


Task Force Home
Background
Leadership
Participating States
Resources
Media

### Task Force on Comprehensive Electricity Planning

The National Association of Regulatory Utility Commissioners (NARUC) and the National Association of State Energy Officials (NASEO) will provide a forum for the development of state-led pathways toward a more resilient, efficient, and affordable grid.

### Electricity Planning for a 21st Century Power Grid

Emerging technologies, decreasing costs, consumer preferences, new energy service providers, and state and local efforts are driving significant growth in distributed energy resources (DERs) such as solar, storage, energy efficiency, demand management, and microgrids. These investments increasingly require regulatory and policy innovation and a greater emphasis on planning to overcome system complexities and avoid unnecessary costs associated with operating the grid.

With greater alignment of resource and distribution system planning, states and utilities could:

- Improve grid reliability and resilience
- Optimize use of distributed and existing energy resources
- Avoid unnecessary costs to ratepayers

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# From Energy Optimization to Aligned Outcomes

## NARUC Annual Meeting, San Antonio, Texas

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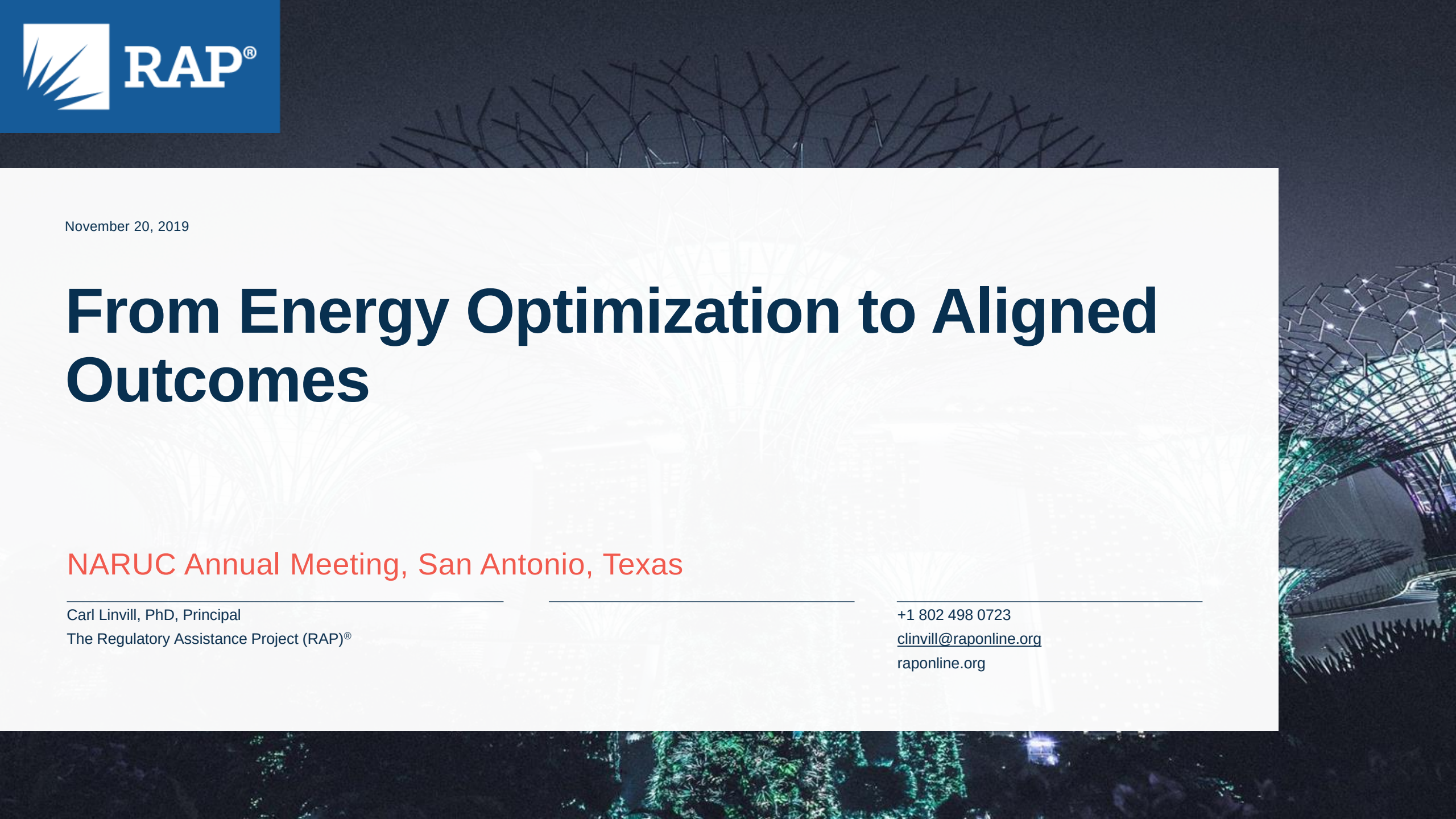
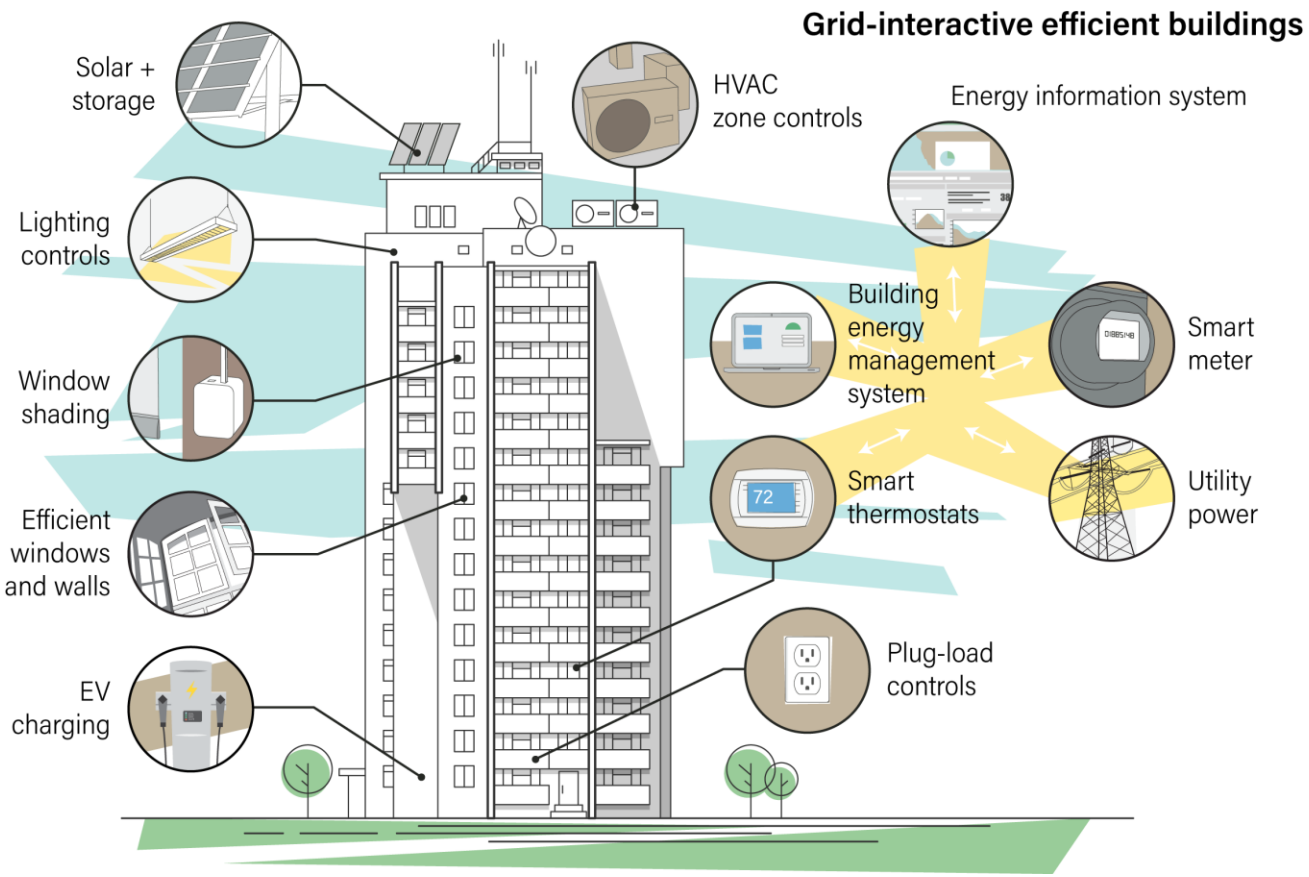


# Advanced Technologies Enable Decentralized Energy Optimization

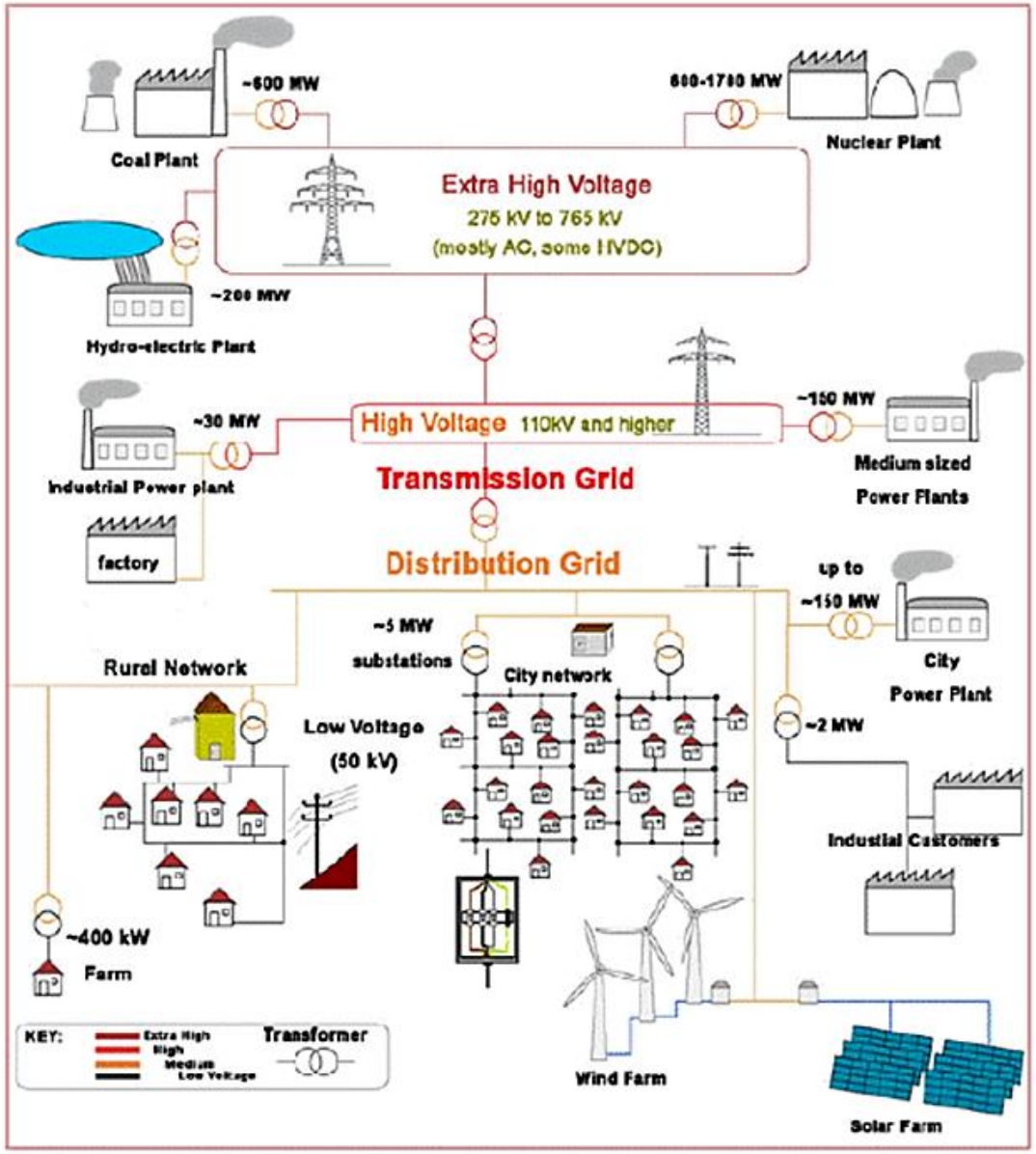
# From Grid-Integrated Buildings …

Source: RAP




Source: ACEEE

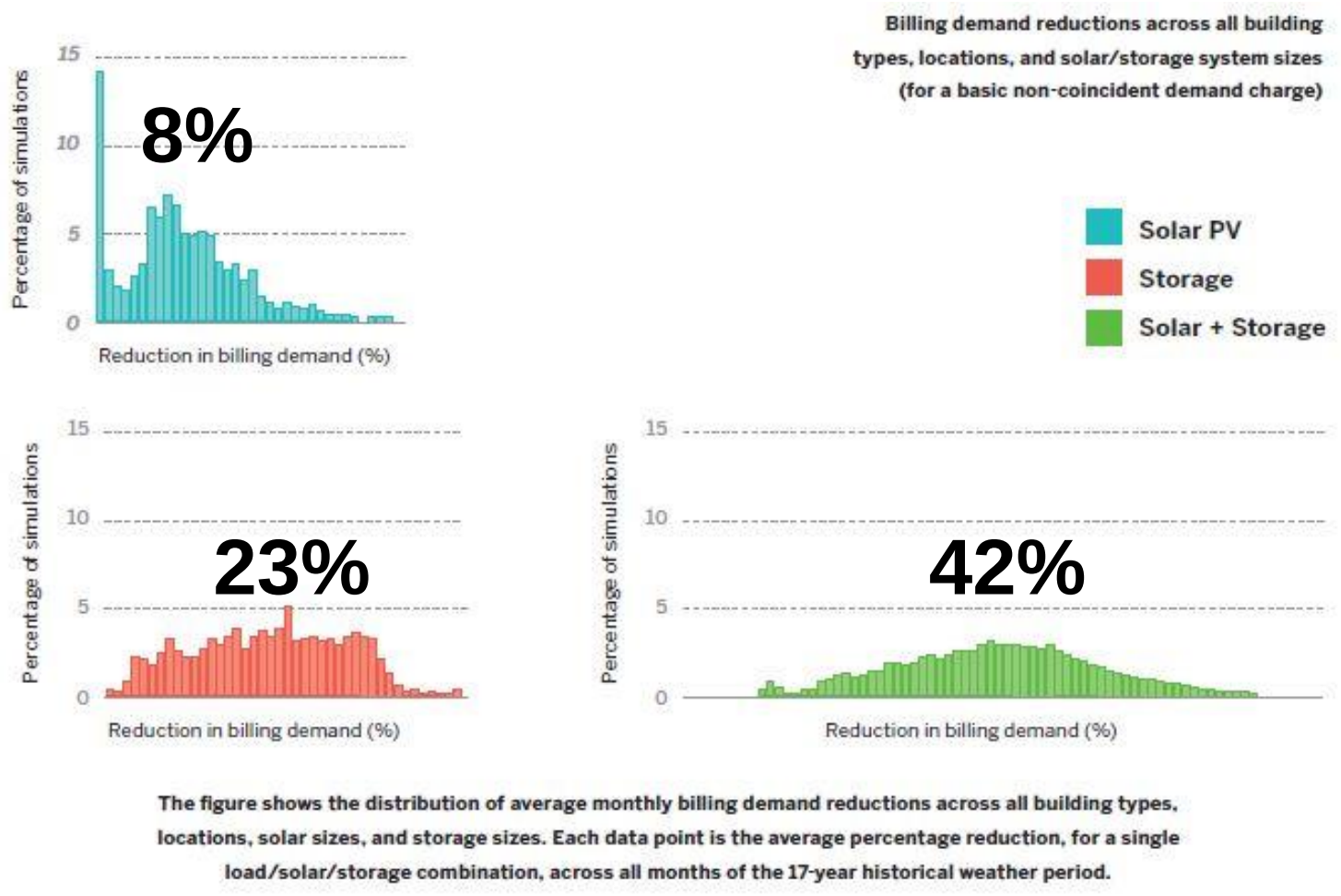
# … To Distribution and Bulk System Operations




Source: National Renewable Energy Laboratory

# The Energy Optimization Problem is Framed in the Eye of the Beholder

# From Optimizing Solar Plus Storage …

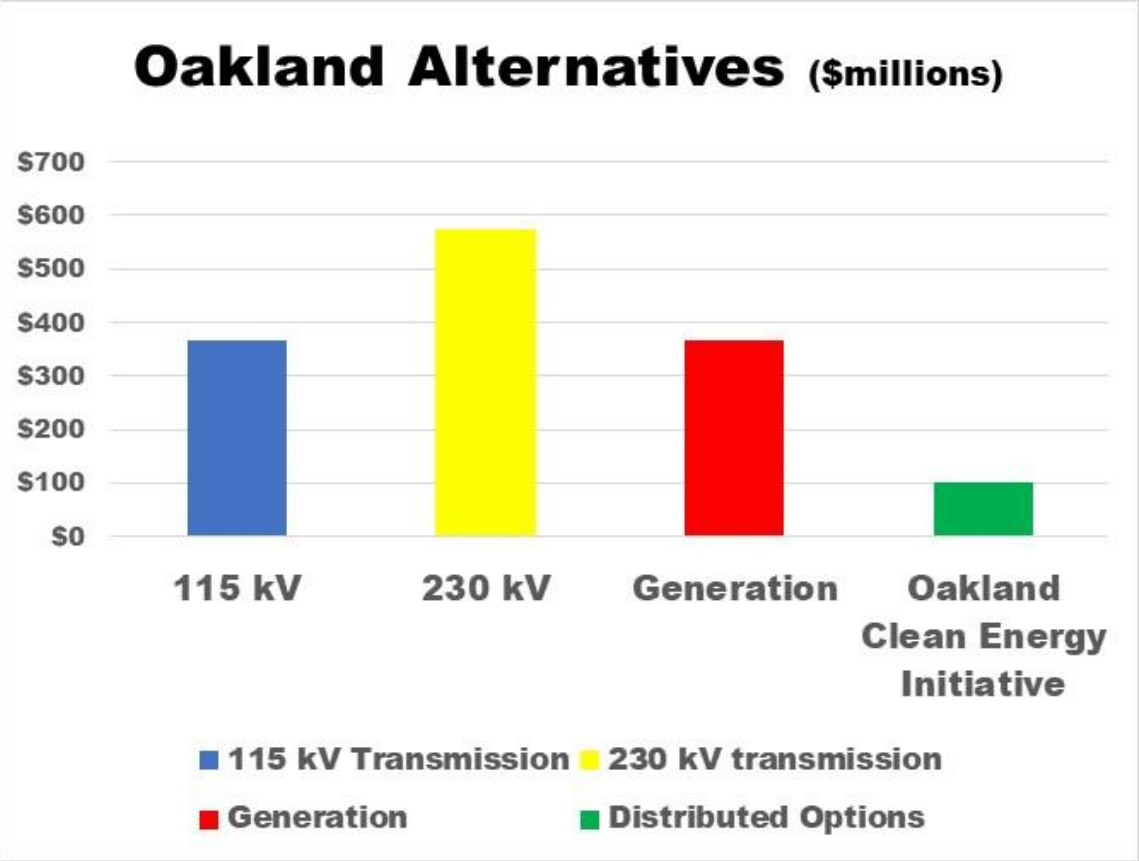



Source: Gagnon et al. (2017). *Solar + Storage Synergies for Managing Commercial-Customer Demand Charges*. Lawrence Berkeley National Laboratory.

# To Optimizing Community Choices …

## *The Oakland Clean Energy Project*

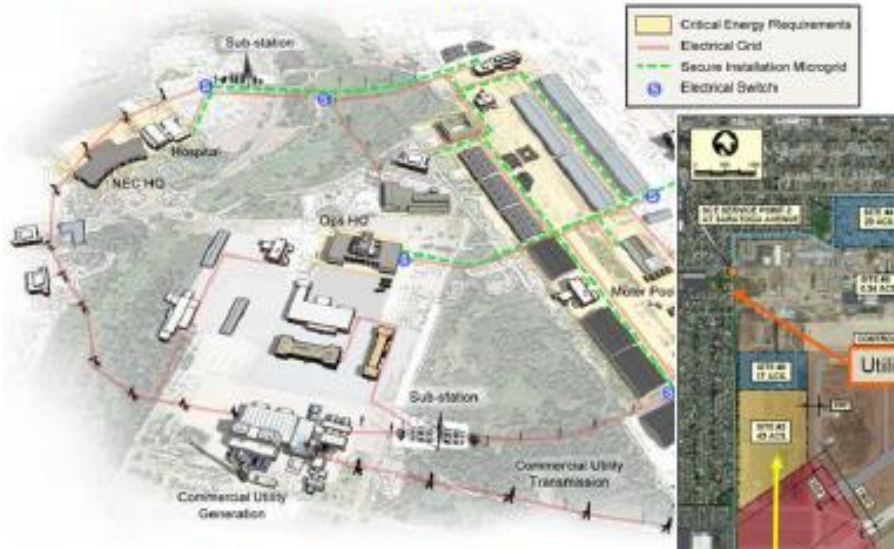

Source: East Bay Community Energy



# … To Optimizing for Resilience

**Army proposed outgrant of 115 acres at JFTB Los Alamitos**

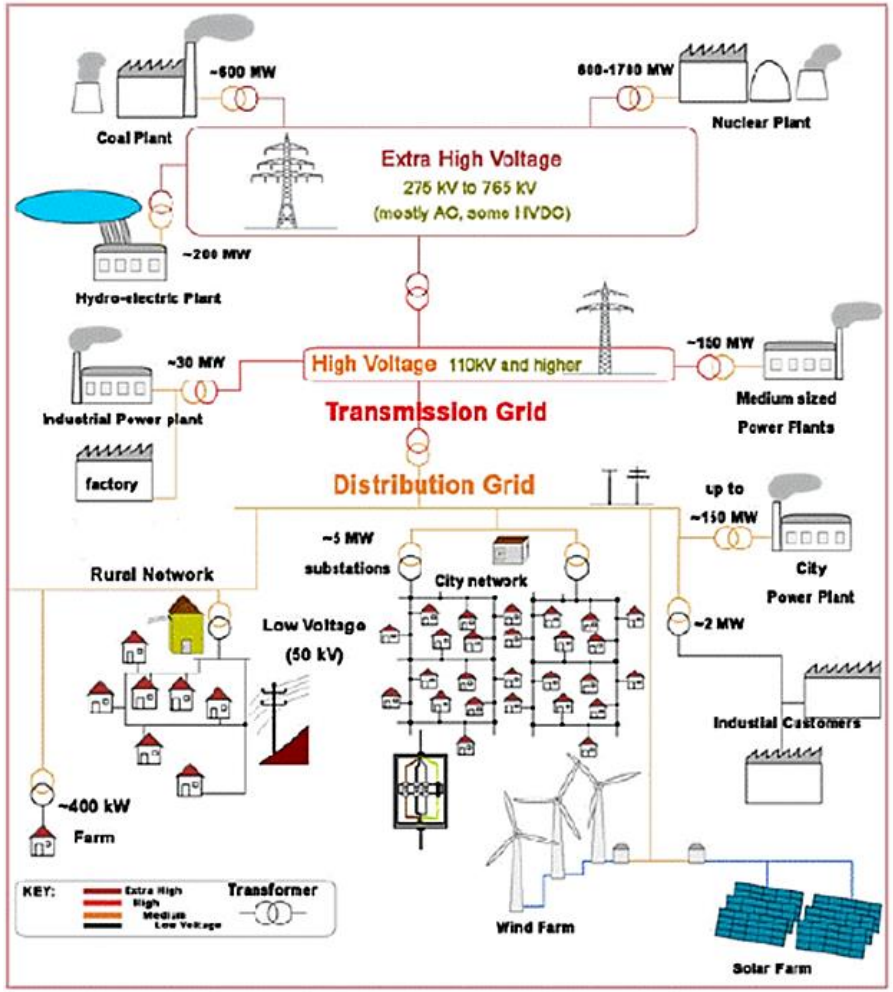
- Developer would construct, own, operate and maintain 16 MWs of solar power, energy storage, and microgrid components
- During normal ops, the developer sells power to the grid
- During contingency ops, the developer would provide islandable power for critical loads for min 7 – max 30 days




Notional Army Microgrid

Project Development Concept

# … To Optimizing Across Domains




Bulk System Guidelines
NERC, FERC
IEEE, ANSI, IEC
NESC

Technical and
jurisdictional overlap

Distribution System Guidelines
IEEE 1547, PUC/PRC
IEEE, ANSI, IEC
NEC

Source: National Renewable Energy Laboratory

# Effective Planning Establishes the Context for Aligning Decentralized Optimization

Effective planning creates a context where decentralized energy optimization choices can be consistent with grid-optimized outcomes.

# About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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# PLANNING TOOLS

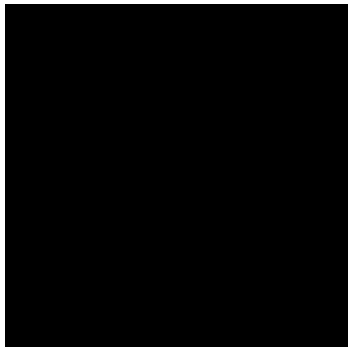
## 2019 NARUC Annual Meeting and Education Conference

*Advances, Challenges, and Opportunities with Comprehensive Electricity Planning*

**Samir Succar**

20 November 2019

# What's the value of transparency in distribution planning?



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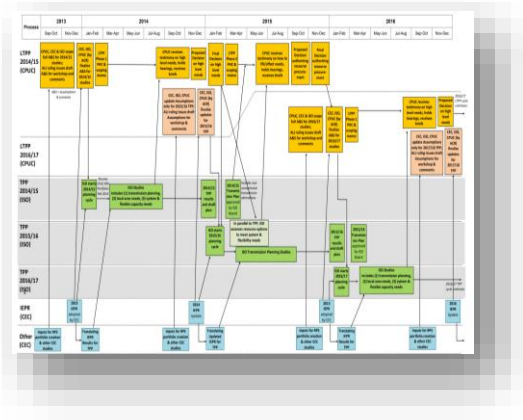
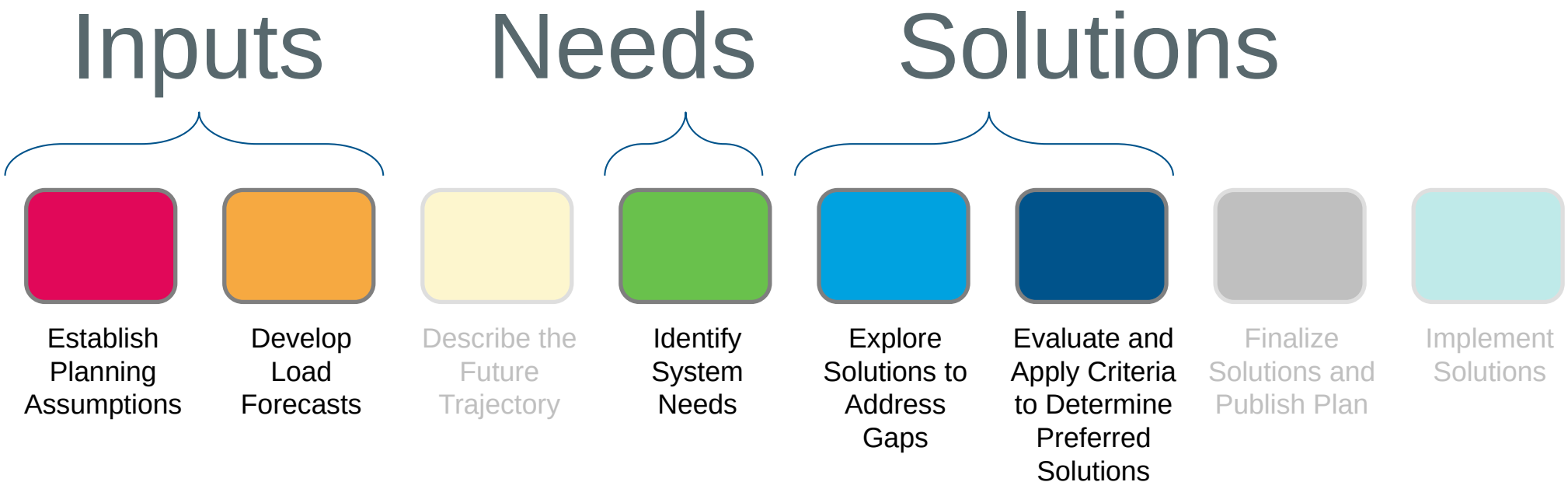
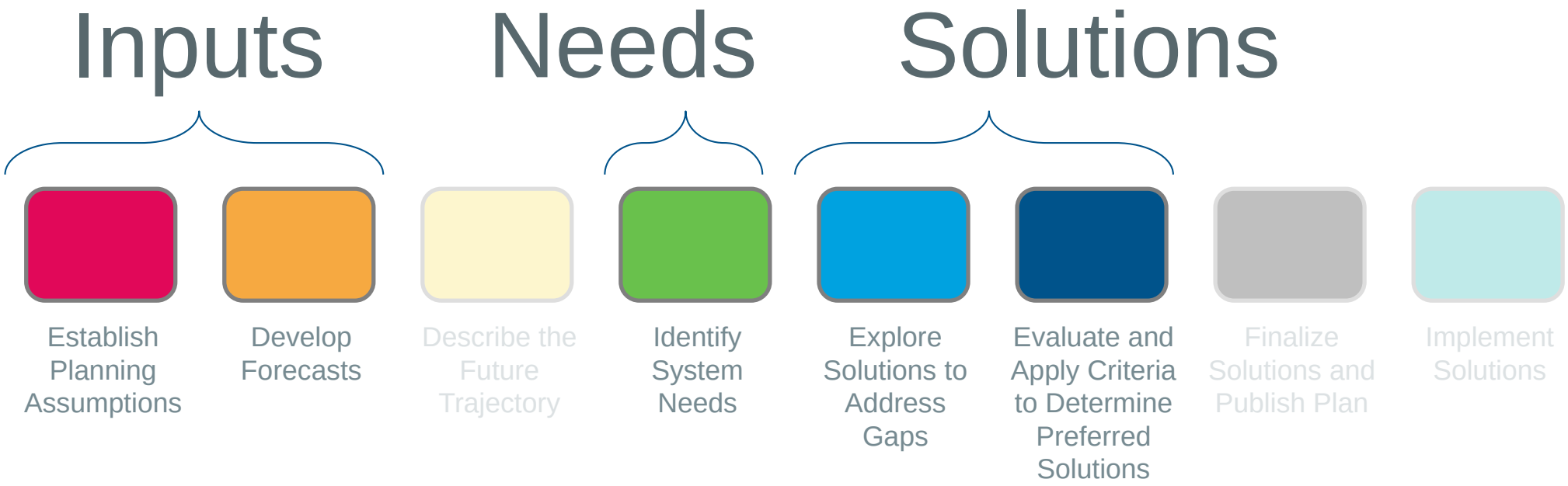


# In the Context of Planning **Analysis**, We're Talking About **Three Things**

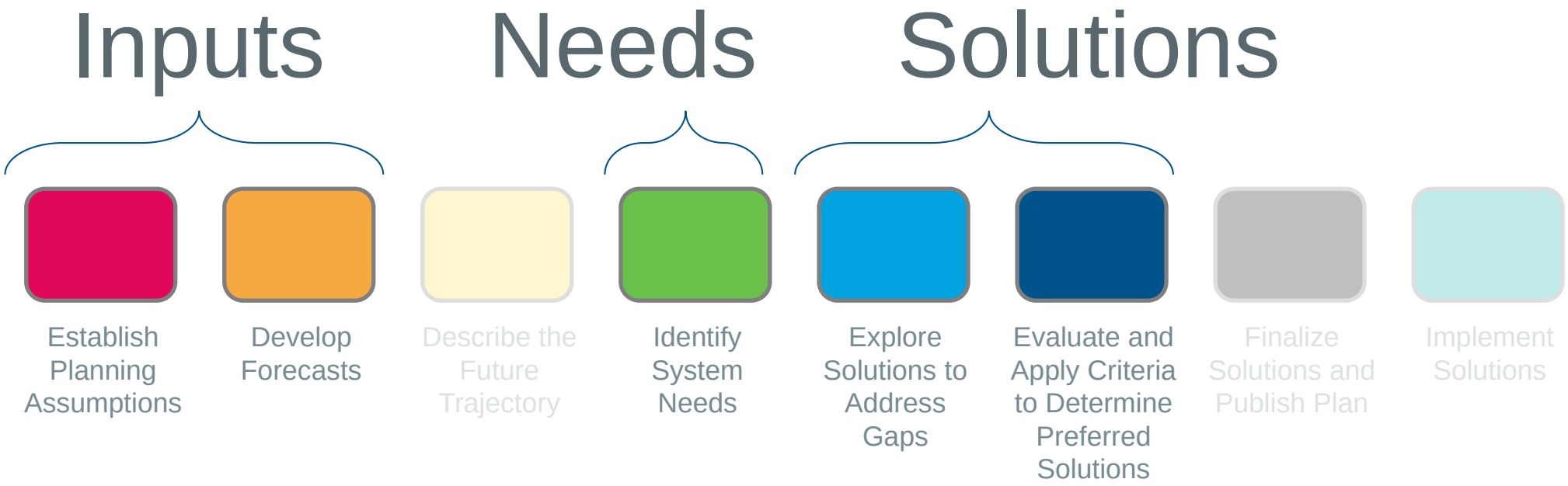


# Each addresses a different set of questions



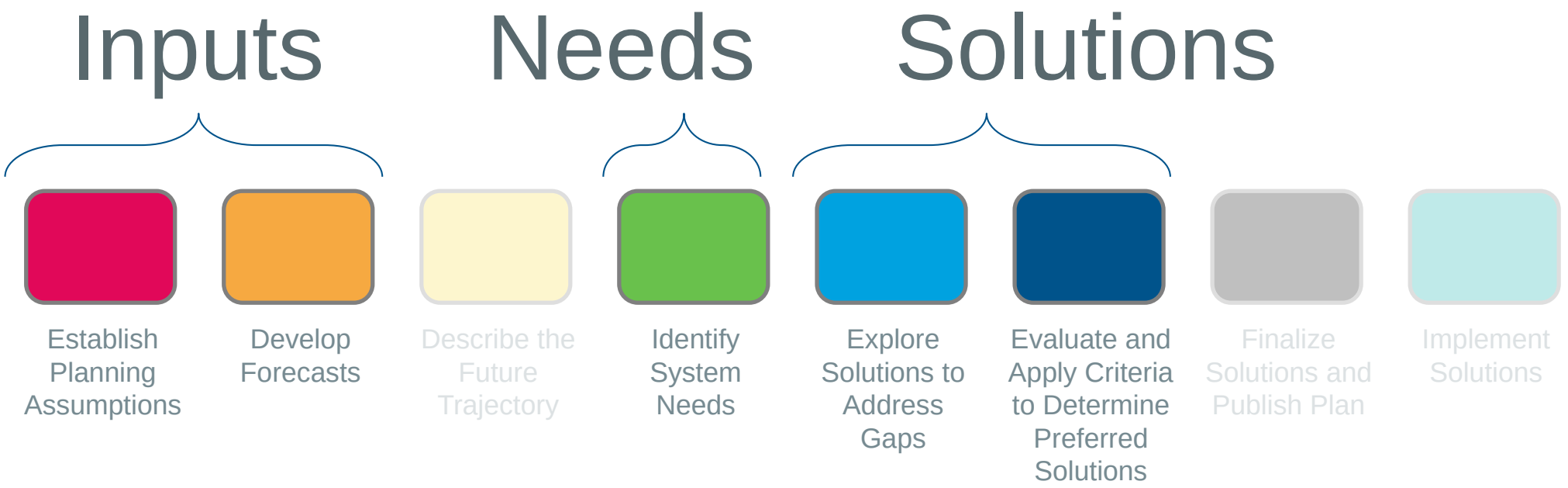

- What is the current state?
- How will load and resources evolve?

# Each addresses a different set of questions




- What is the current state?
- How will load and resources evolve?
- Where do we have gaps?

# Each addresses a different set of questions




- What is the current state?
- How will load and resources evolve?

- Where do we have gaps?

- What solutions can meet these needs?
- Which solutions deliver the most value at the least cost?

| We are talking about… | We're not focusing on… |
|---|---|
| Software tools | Data availability, etc. |
| Utility tools | Other use cases |
| Distribution system analysis | Transmission, resource |
| Planning | Interconnection, protection, etc. |

# Today's Focus

# What tools exist to answer these questions?

## Distribution / DER Analysis

EPRI StorageVET, NREL SAM, HOMER, NREL ReOPT, LBNL DER-CAM E3 DERAC, NREL PVWatts, PVSyst, NREL BLAST, IA LoadSEER, CPR WattPlan, NREL dGen, ICF Sightline, ESRI Network Analyst, Prosumer Grid, Kevala Network Assessor / Grid Assessor, Nexant Grid 360, CYME , Synergi, Milsoft Windmil, EDD DEW, GridLabD, EPRI OpenDSS, PowerFactory, EPRI DRIVE, Siemens PSS SINCAL,OpusOne GridOS

# What tools exist to answer these questions?

## Distribution / DER Analysis

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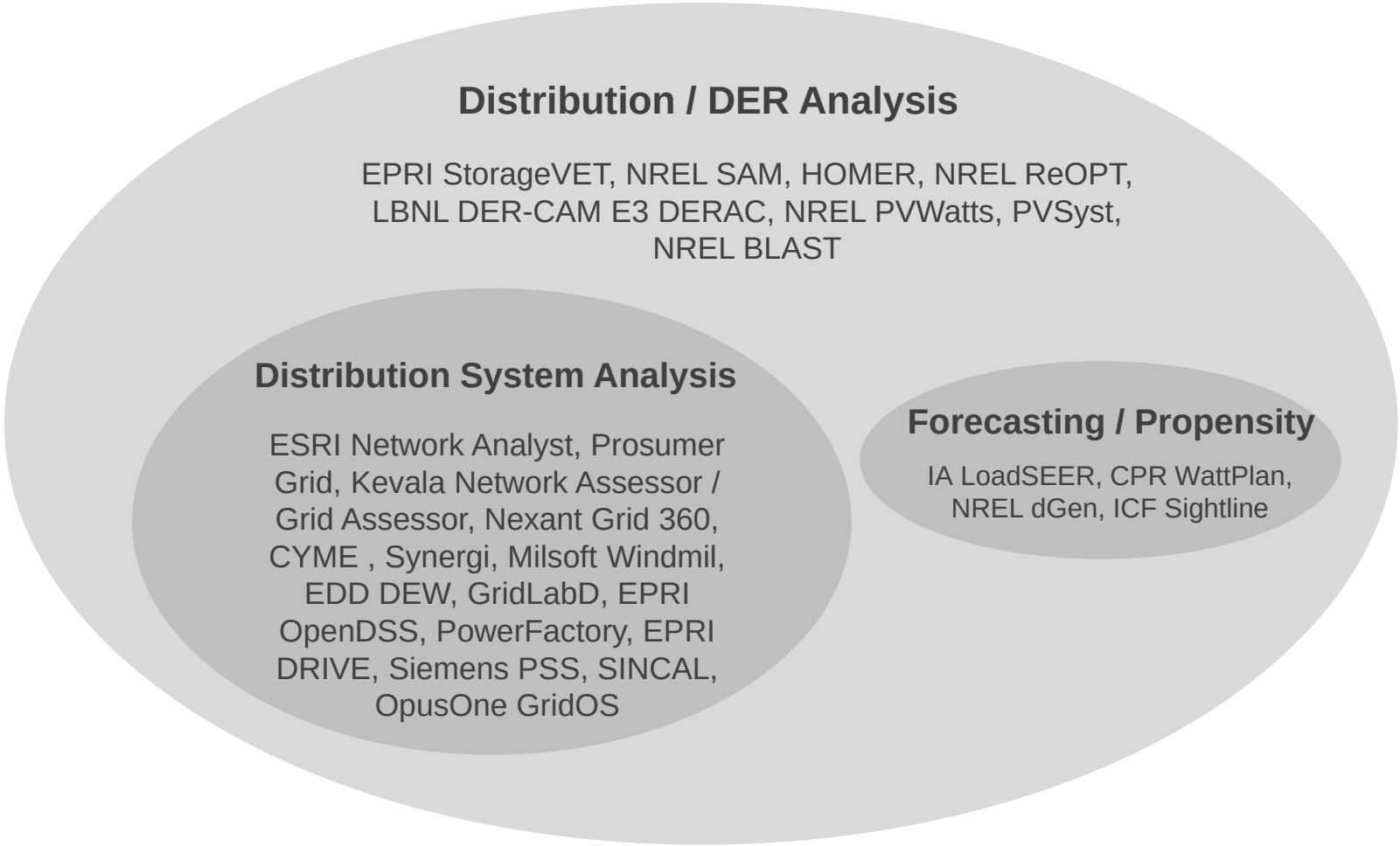
### Forecasting / Propensity

IA LoadSEER, CPR WattPlan, NREL dGen, ICF Sightline

# What tools exist to answer these questions?



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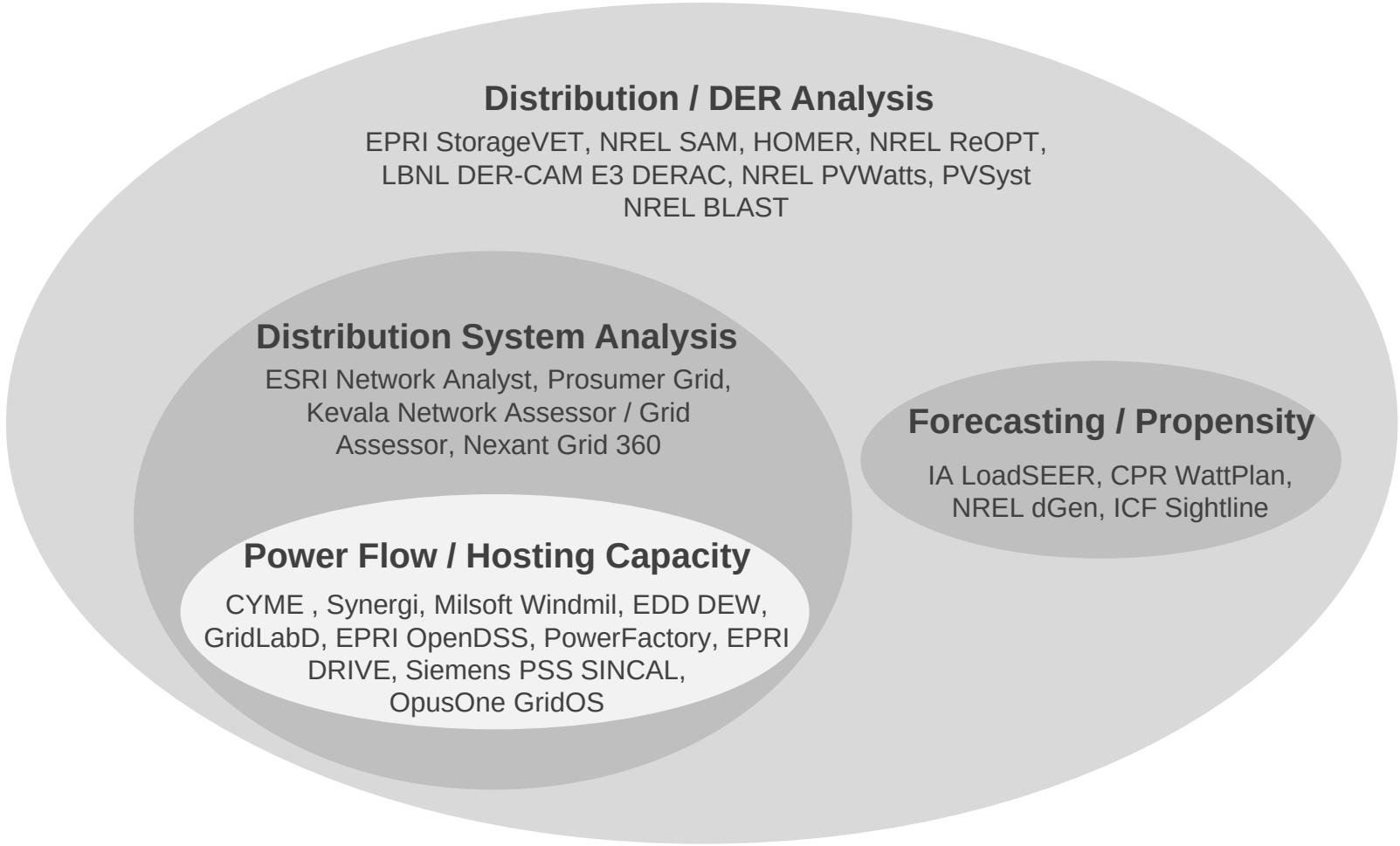
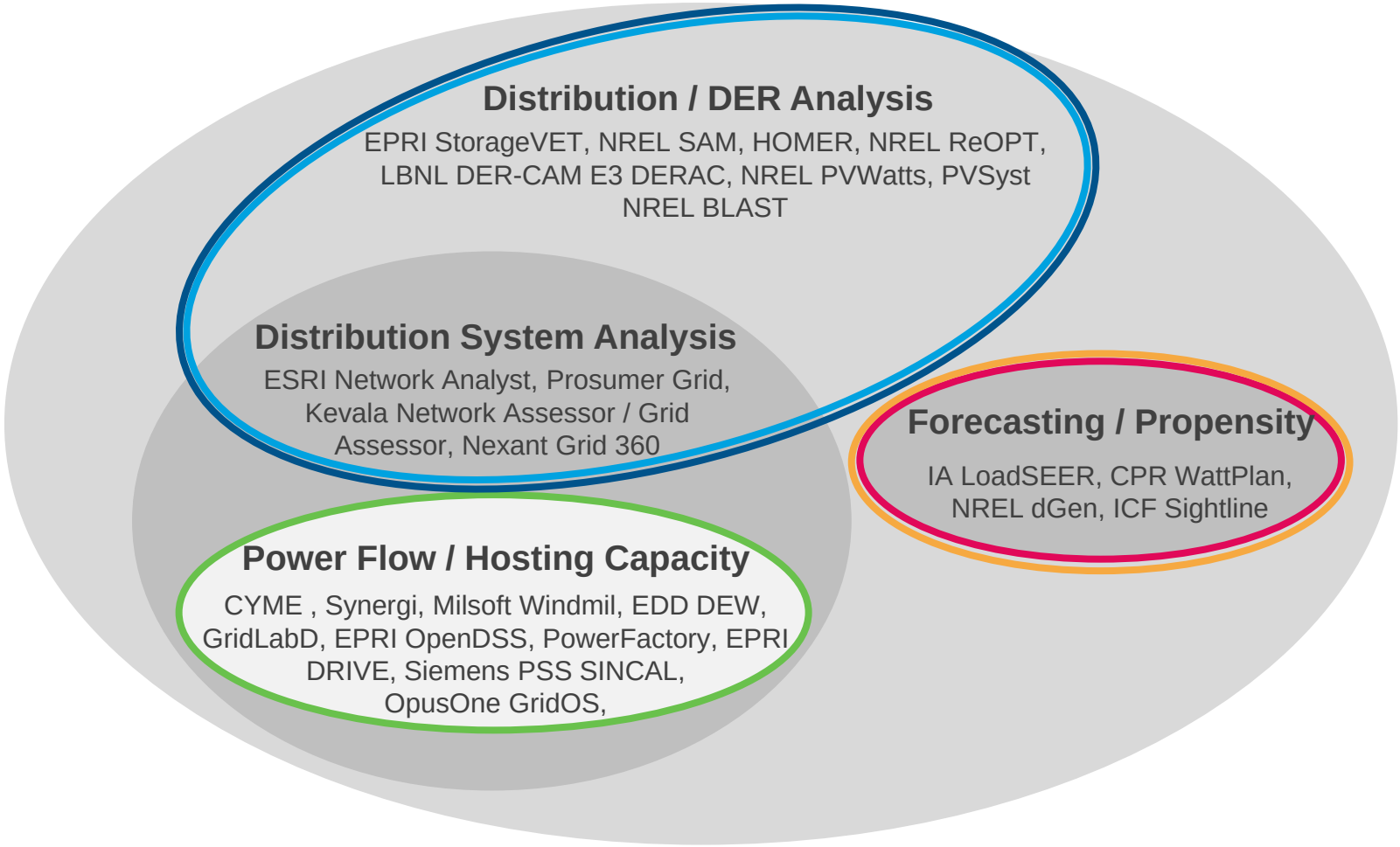
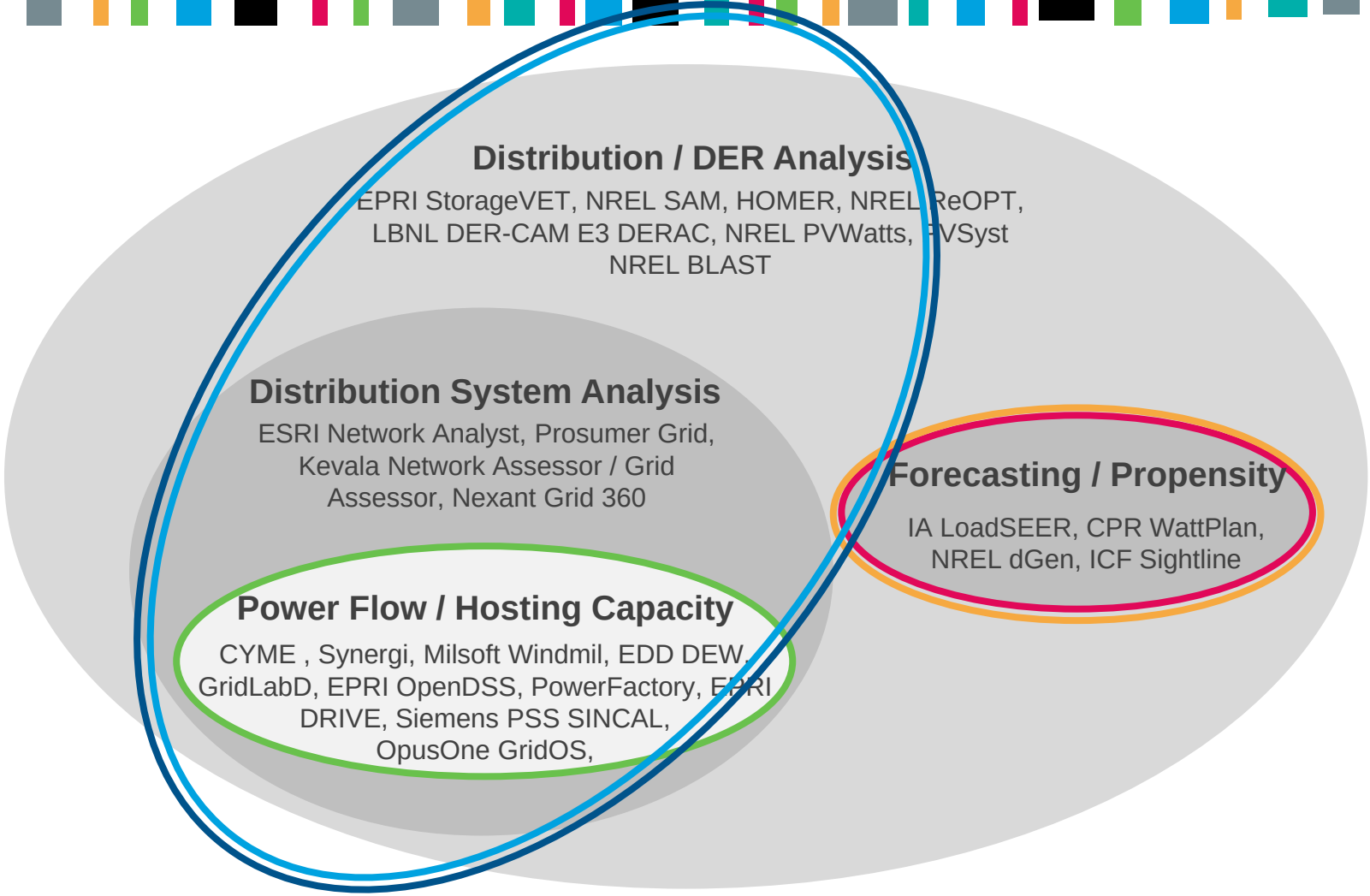


# How do these map to the building blocks?




| Establish Planning Assumptions | Develop Forecasts | Describe the Future Trajectory | Identify System Needs | Explore Solutions to Address Gaps | Evaluate and Apply Criteria to Determine Preferred Solutions | Finalize Solutions and Publish Plan | Implement Solutions |
|---|---|---|---|---|---|---|---|

# How is the picture evolving?

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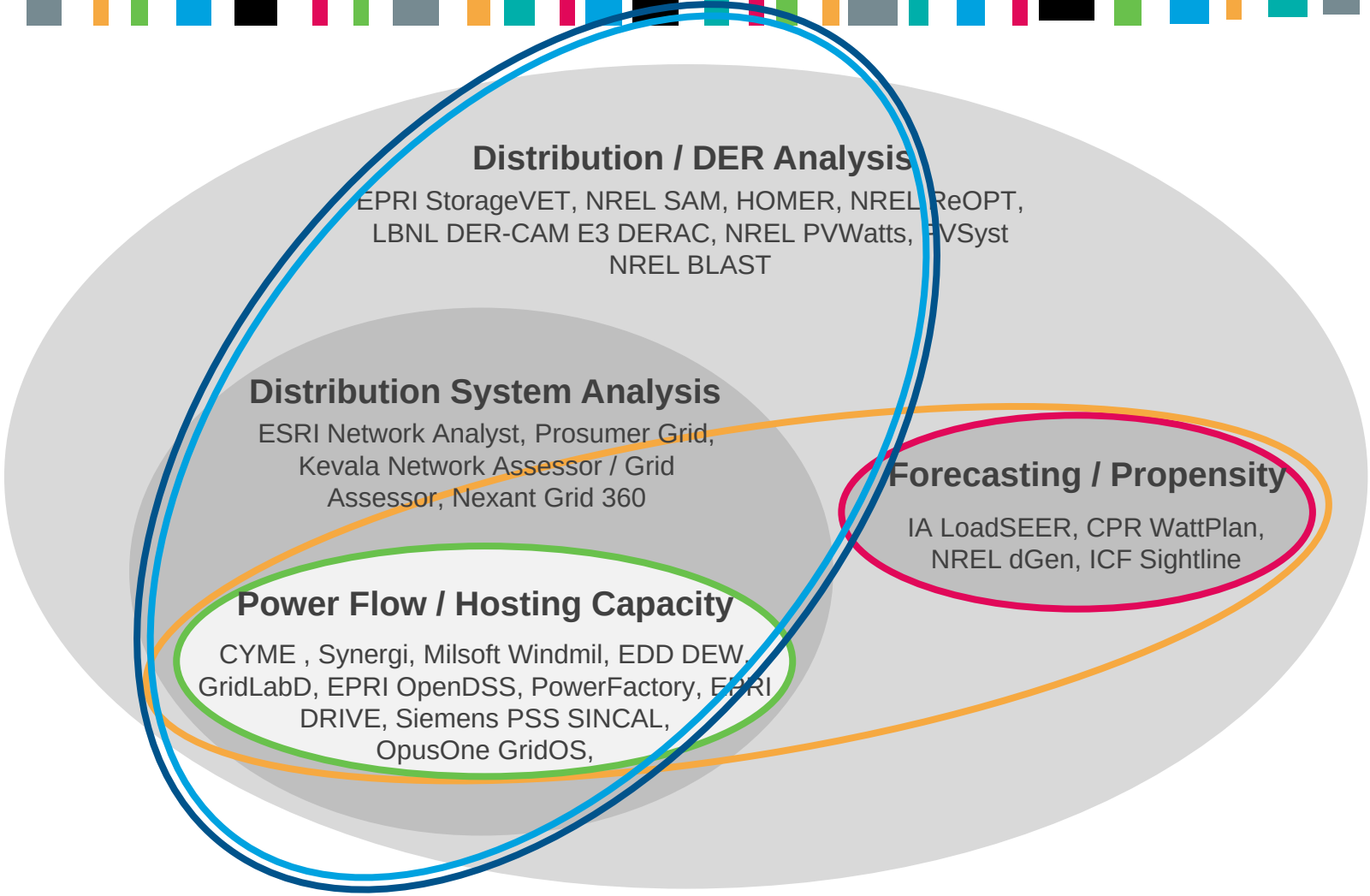


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|---|---|---|---|---|---|---|---|

# A Few Observations Thus Far

- Transparency promotes better dialog
- Tools can support planners, developers, state energy offices and regulators
- Complexity does not always produce value
- Criteria should reflect objectives
- Evolving objectives require new approaches
  - Planning alignment
  - DER integration/utilization
  - Resilience
  - Capital efficiency

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