Grid Modernization Initiative Overview

Department of Energy

Kevin Lynn

Drivers of Change

Why do we need grid modernization?

Increasing Extreme Events

Increasing Security Threats

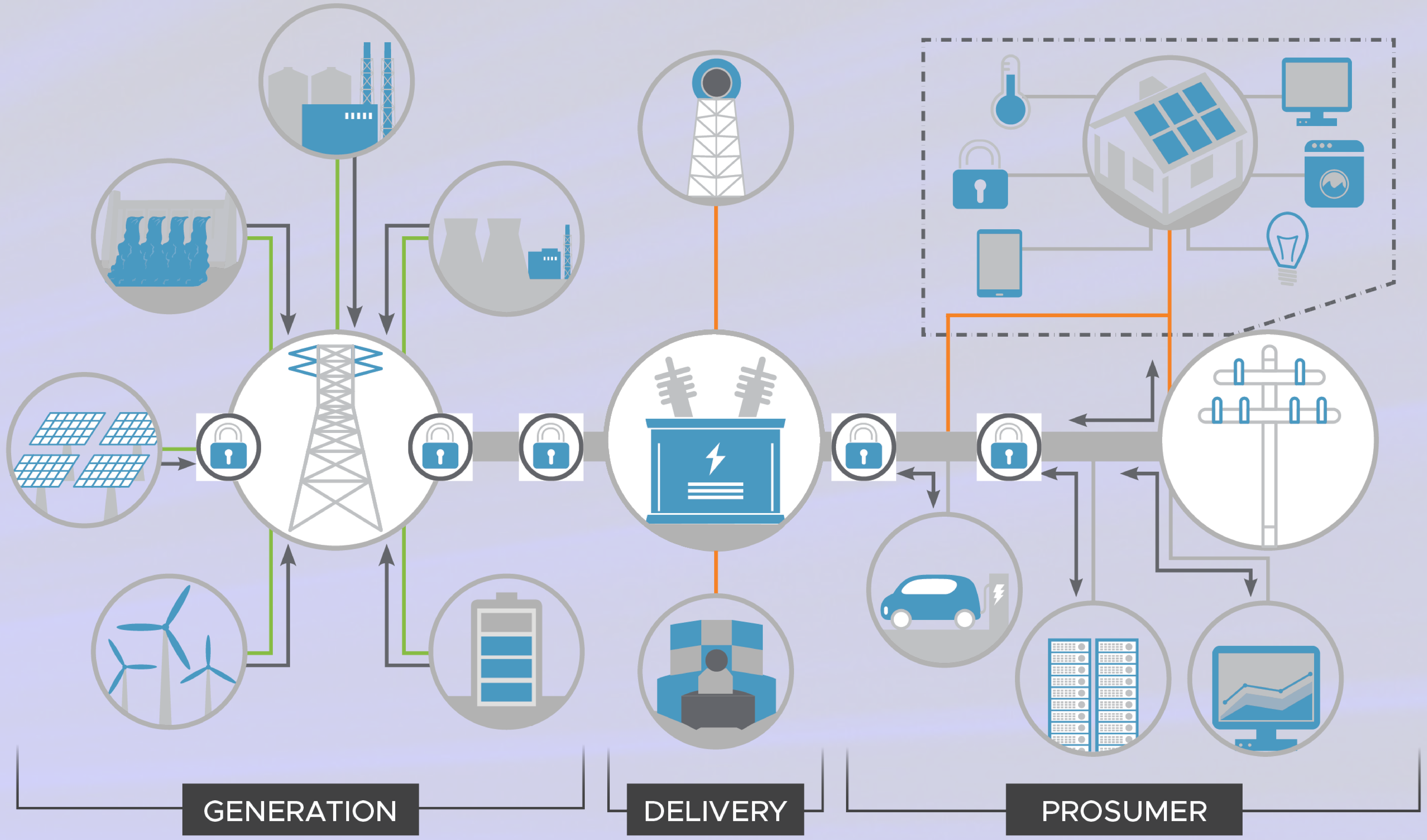
Growing Number of Prosumers

Changing Supply Mix

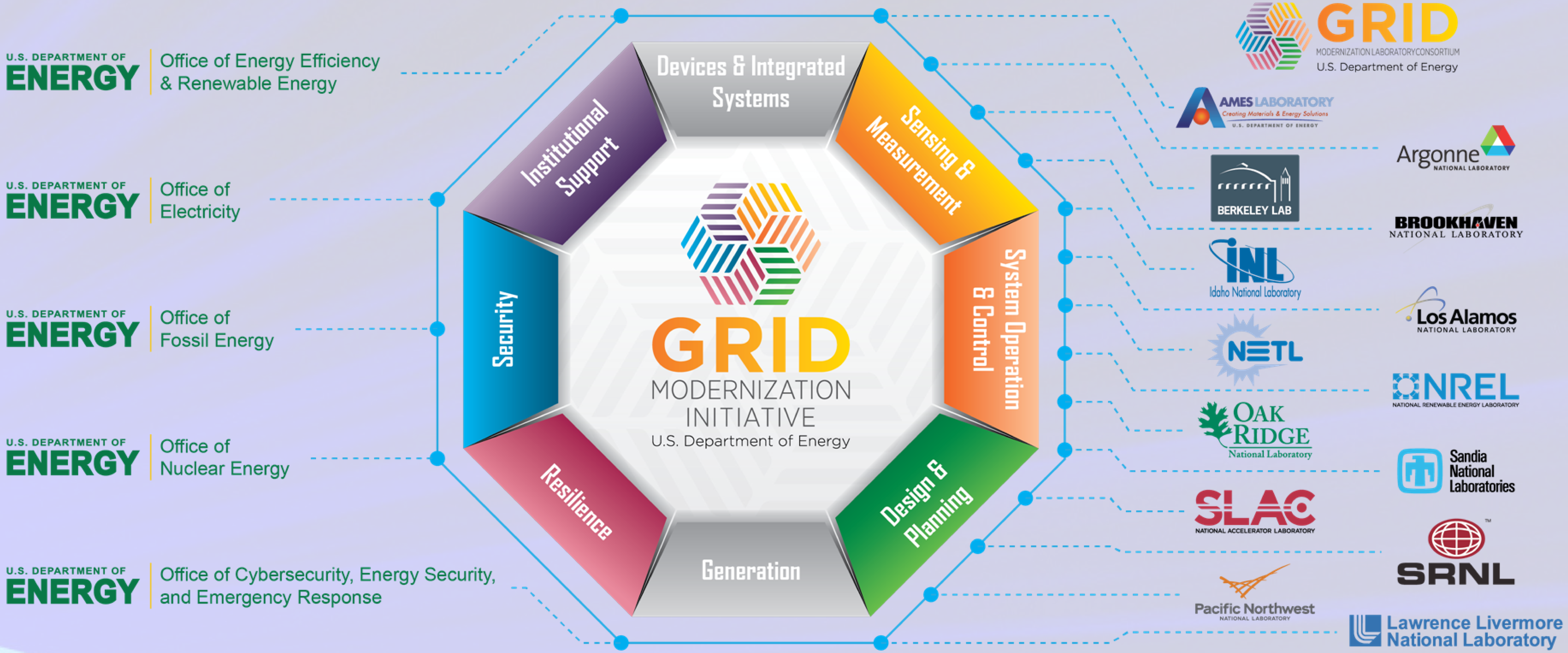
GMI History & Vision

History: Beginning in 2015, GMI has leveraged the expertise of DOE Offices, National Labs, and partners to conduct over $300M in cutting-edge R&D on grid modernization topics.

Integrated Vision: Focuses on a fully-integrated electricity system from generation to load, including independent infrastructures.



GMI and GMLC: Efficiency. Collaboration. Acceleration.



Portfolio of GMI Work

2016 Grid Modernization Lab Call
($220M)

Foundational topics including Grid Architecture, Interoperability, Frameworks, and Metrics

Resilient Distribution Systems Lab Call
($32M)

Enhancing the resilience of distribution systems, including microgrids and cybersecurity.

2019 Grid Modernization Lab Call
($80M)
Resilience Modeling, Energy Storage and System Flexibility, Advanced Sensors and Data Analytics, Institutional Support, Cybersecurity, and Generation

Other Grid Modernization Work: Program-Specific R&D Projects

A Sample of Utility Project Partners

PUGET SOUND ENERGY
ComEd An Exelon Company
AMERICAN ELECTRIC POWER
nationalgrid
AVEC ALASKA VILLAGE ELECTRIC COOPERATIVE
aps
cps ENERGY
DUKE ENERGY
Entergy
AVISTA
SOUTHERN CALIFORNIA EDISON An EDISON INTERNATIONAL Company
VERMONT ELECTRIC CO OP INC
PACIFICORP
GREEN MOUNTAIN POWER
CEC
Xcel Energy
JACKSON ELECTRIC MEMBERSHIP CORPORATION
ONCOR
Seattle City Light
WATER | ENERGY | LIFE CITY OF RIVERSIDE PUBLIC UTILITIES
Southern Company
Pedernales Electric Cooperative, Inc.
Hawaiian Electric Company
IDAHO POWER An IDACORP Company
TVA

A Sample of Vendor Project Partners

Honeywell
SIEMENS
SEL SCHWEITZER ENGINEERING LABORATORIES
ABB
IBM
Vestas
Rheem
TESLA
ECOGY ENERGY
GE Grid Solutions
HITACHI
Johnson Controls
Carrier
chargepoint
Fronius
BURNS & McDONNELL
OSIsoft
ORACLE
EATON
stem Energy Superintelligence
smarter grid solutions
Ford
BLACK & VEATCH

Foundational Metrics Analysis

Project Objective
Work directly with *strategic* stakeholders
to confirm the usefulness of *new and enhanced existing* metrics that will guide grid modernization efforts.

Grid Modernization Metrics:

- **Reliability**
- **Resilience**
- **Flexibility**
- **Sustainability**
- **Affordability**
- **Security**

Value Proposition

- ✓ Ensuring that all stakeholders understand how grid modernization investments will affect and benefit them
- ✓ Key Partners: North American Electric Reliability Corporation, National Association of Regulatory, Utility Commissioners, Energy Information Administration, American Public Power Association, Department of Homeland Security, Environmental Protection Agency, Electric Power Research Institute, Federal Energy Regulatory Commission, National Rural Electric Cooperative Association, Electric Reliability Council of Texas

Integrated Transmission, Distribution, and Communication Models

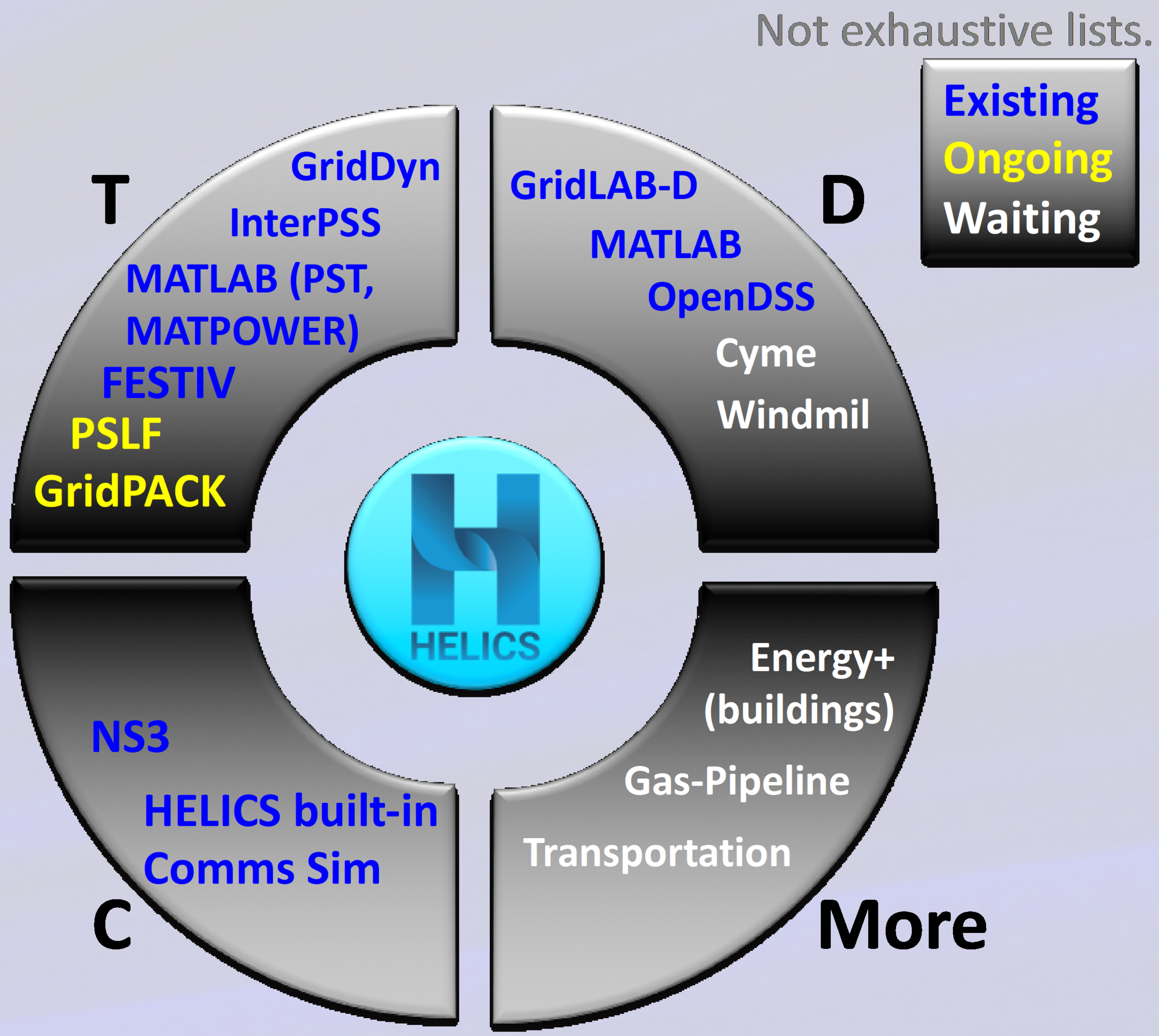
Project Description

The interdependency and interaction across transmission, distribution and communication systems can no longer be ignored, demanding integrated analysis of the end-to-end power grid.

This project developed a scalable co-simulation platform, enabling such integrated analysis to maximize flexibility and resilience of the grid.

Value Proposition

- ✓ Fill current gaps in simulation and modeling technology that inhibits integrated planning across multiple domains.
- ✓ Bring together best-in-class simulation efforts from multiple national labs.
- ✓ Create HELICS™, an **open-source co-simulation platform**, enabling interactions between leading commercial & lab-developed simulators on a wide range of computing environments.



***HELICS** (Hierarchical Engine for Large-scale Infrastructure Co-Simulation)*

Foundational Assistance to ISO/RTOs

DESCRIPTION

Share and apply advanced methods, tools, and data sets of the national labs and industry/academic partners to provide robust analytical support to address key ISO/RTO challenges.

IMPACT

Establish new best practices for ISO/RTOs to effective system operation and planning.

PARTNERS

ANL, LBNL, NREL, EPRI, Johns Hopkins University