Gas-Electric Interdependence

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DOE Electricity Advisory Committee

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National Energy Technology Laboratory (NETL): America's First Energy Research Lab

About Us

Founded in **1910**

Designated a national laboratory in **1999**

3 campuses and **2** field offices

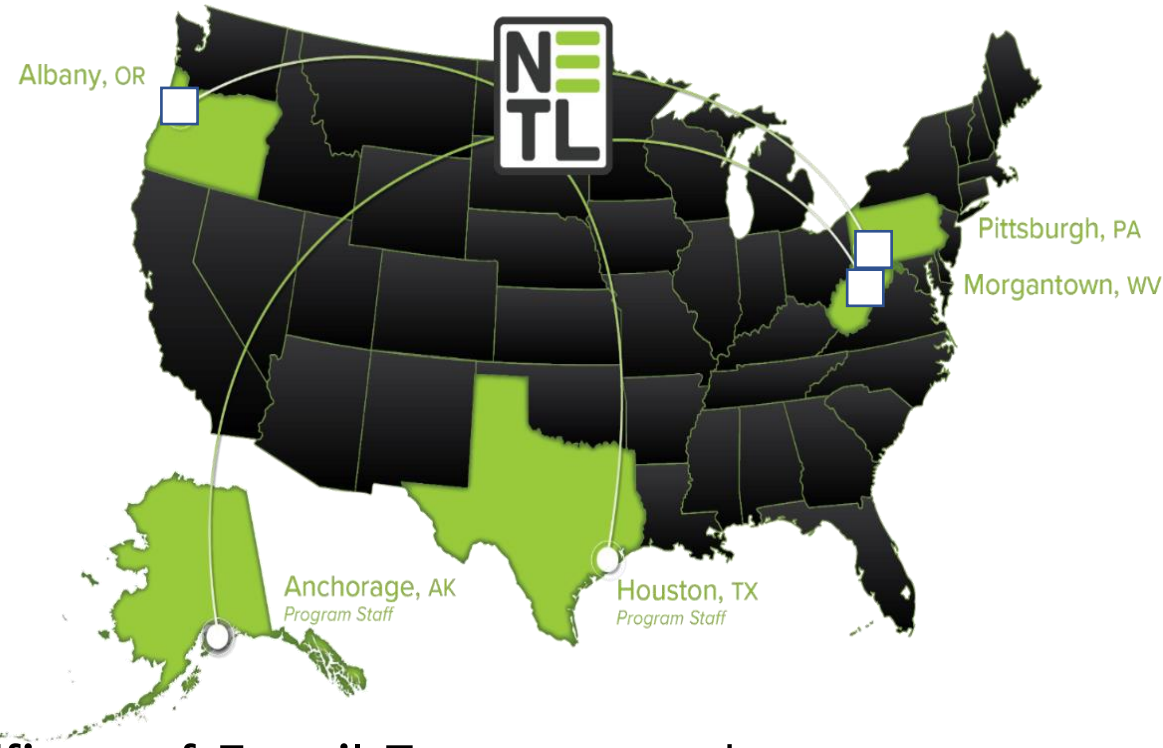
1,800+ employees

Only **Government owned & operated** lab

One of three applied research national labs

900+ R&D projects overseen in **50** states

$6.3B under management, primarily from Office of Fossil Energy and Carbon Management



Only National Lab dedicated to carbon research

Gas-electric coordination

- Lots of words, inconsistent action
- Past performance is no guarantee of future results
  - Most studies to date are either post-mortem or assume historical system performance
  - No or limited inter-market feedback modeling is performed
  - Studies are limited to period around peak electricity demand, which may not coincide with peak gas demand
- NAESB Gas-Electric Harmonization Forum and FERC/NERC Joint Inquiry into Winter Storm Elliott recommend performance of interdependence studies to examine whether additional infrastructure is needed to support future gas-fired power generation usage patterns needed to support grid reliability

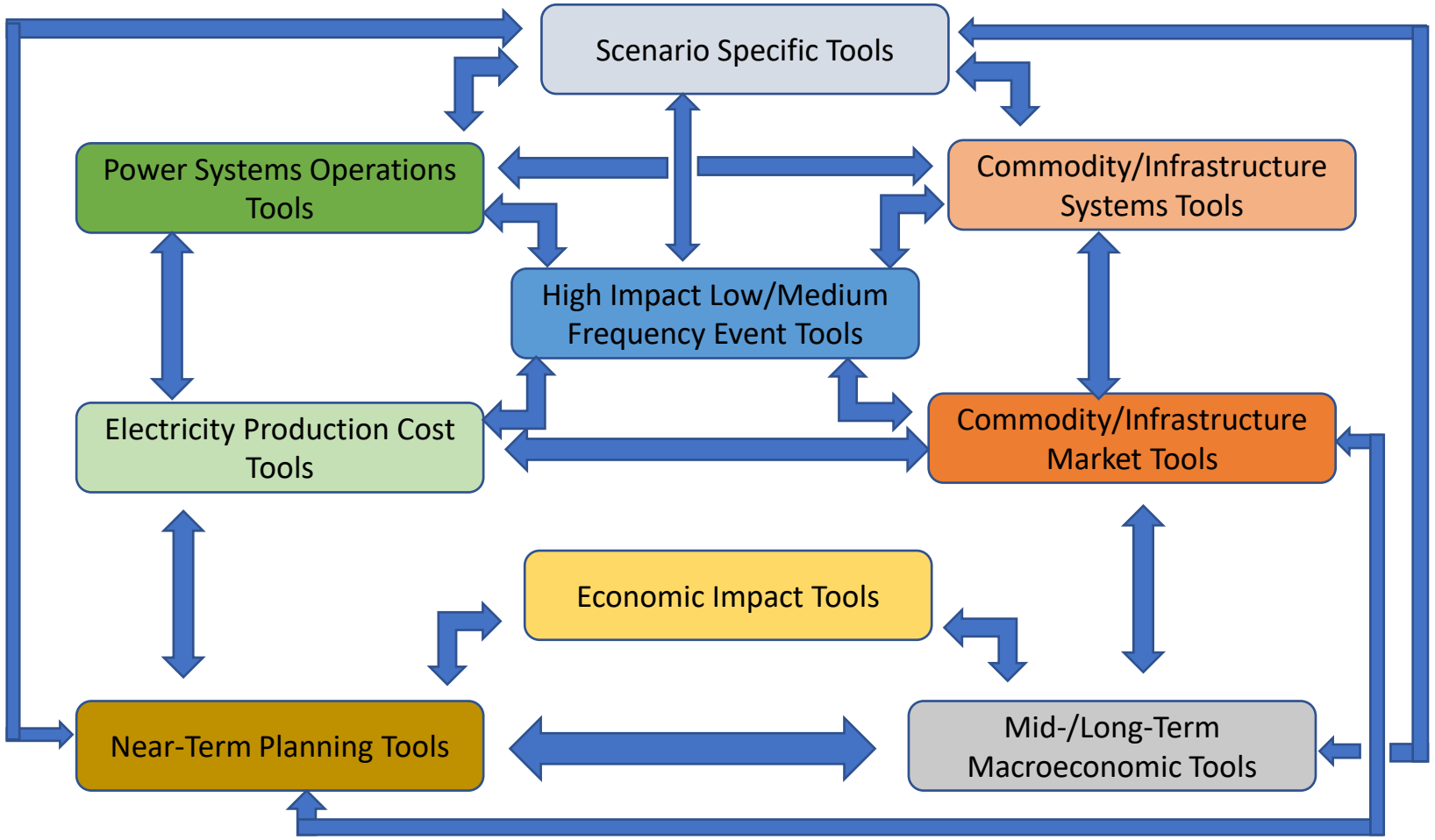
How can NETL help?

Under the auspices of DOE's Offices of Fossil Energy and Carbon Management and International Affairs, NETL has developed an integrated analysis capability, **Markets and Grid Infrastructure Interdependence Collaborative (MAGIIC),** which,

- Integrates common industry utilized market planning and operations tools and data with cross-infrastructure, econometric, and purpose-built tools
- Can evaluate complex interplay between interconnected markets and infrastructure systems in North America and globally to produce:
  - Informed R&D pathways
  - Improved operational processes
  - Detailed reliability and resource adequacy evaluations
  - Informed infrastructure utilization and planning considering interdependencies and physics
  - Interdependency assessments
  - Economic impacts and jobs estimates

How can MAGIIC be used for gas-electric questions?

- Based on most recently available critical energy infrastructure information and market models
- Integrated cross-sectoral analysis capability
- Avoids blinders of single function model, providing a robust depiction that better matches the real world



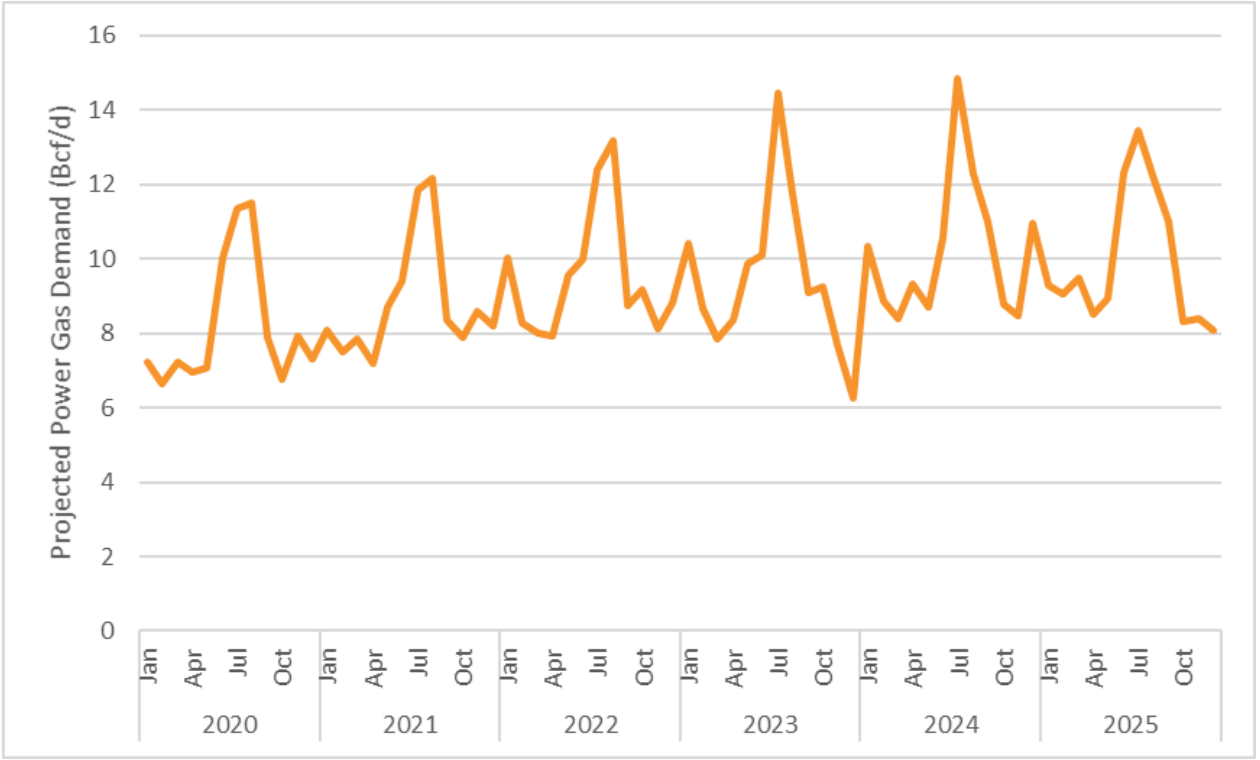
Currently Integrated Tools[1]

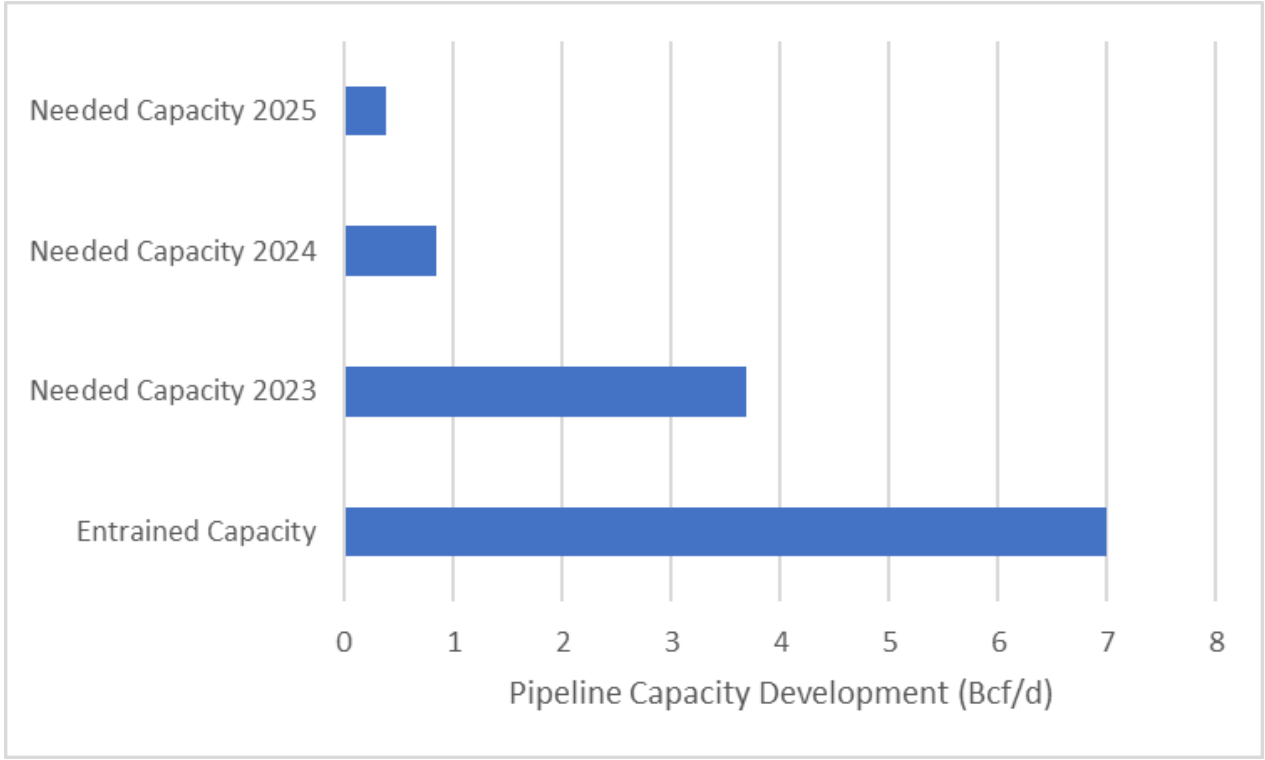
The current menu of tools available within **MAGIIC** is extensive. Framework is extensible to incorporate additional tools and models as needed

Scenario Specific Tools	Engineering Process Design (ASPEN Plus), Life Cycle Assessment (GaBi, SimaPro), NETL Developed Open-Source Tools (IDEAS, FE/NETL Onshore CO2 EOR Cost Model, FE/NETL CO2 Prophet Model, SCoRE), Transportation and Supply Chain models
Power Systems Operations Tools	PSS/E, PSLF
High-Impact Low/Medium Frequency Events Tools	@Risk
Commodity/Infrastructure Systems Operations Tools	MarketBuilder (North American and World Gas and Oil Models)[2], NGfast[3], NGTransient[3], FE/NETL CO2 Transport Cost Model
Electricity Production Cost Models	PROMOD, PLEXOS
Near-Term Planning Models	Hitachi Capacity Expansion, EPRI EGEAS
Mid-/Long-Term Macroeconomic Models	EIA NEMS, IEA MARKAL-TIMES
Economic Impact/Econometric Models	IMPLAN, WVU ECIO
Commodity/Infrastructure Market Models	MarketBuilder[2], SimCCS, IHS Markit tools

1 List is not meant to be all encompassing. Not all listed tools are maintained under constant license by NETL.
2 MarketBuilder is a commercial model owned and operated by Deloitte which covers near-term natural gas market operations and long-term endogenous expansion.
3 NGFast and NGTransient are owned and operated by Argonne National Laboratory.

Examples of MAGIIC Applied for Gas-Electric Interdependencies





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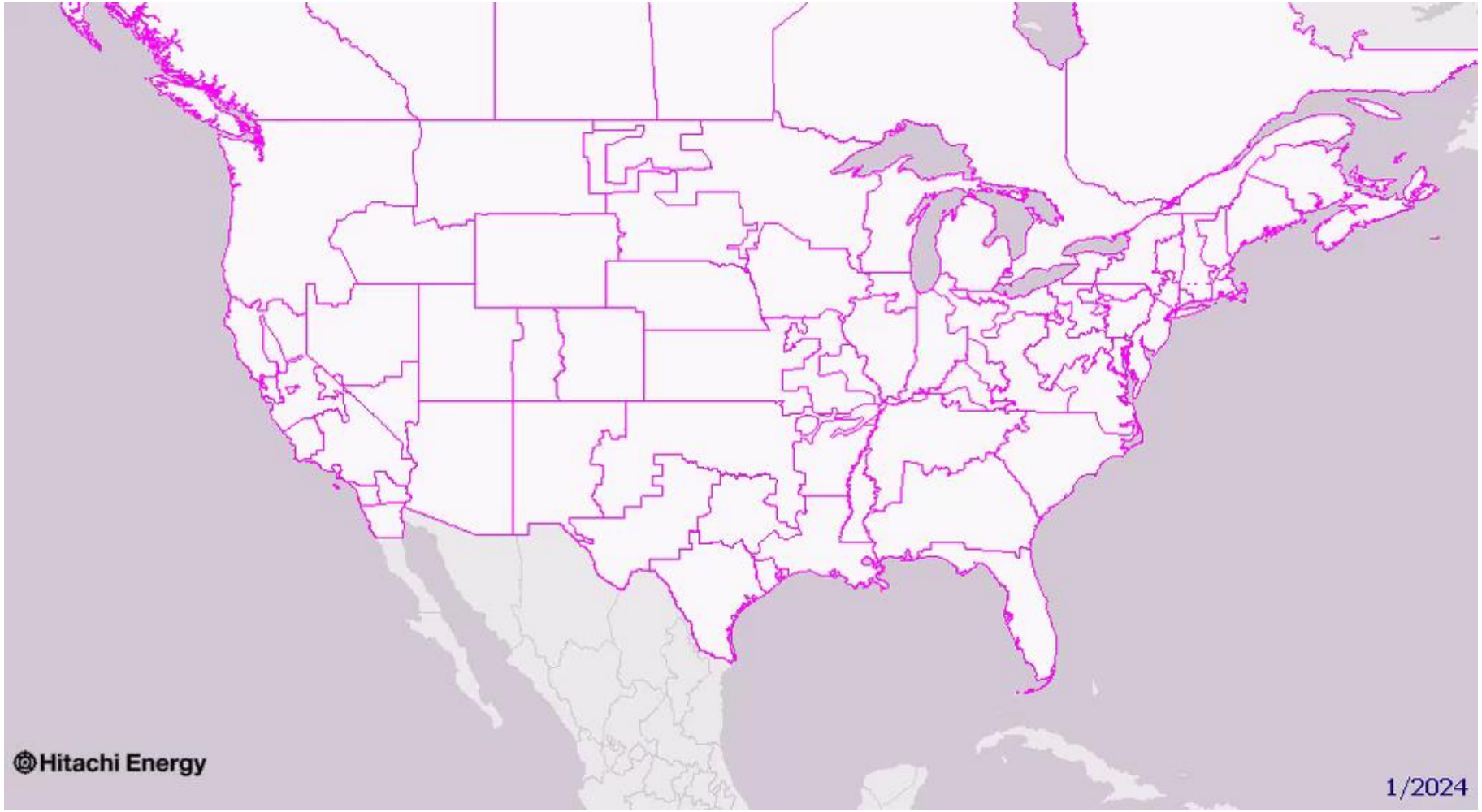

* 28 second video covering every operating hour from 1/2024 through 12/2030; Results visualized using Hitachi Velocity Suite

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