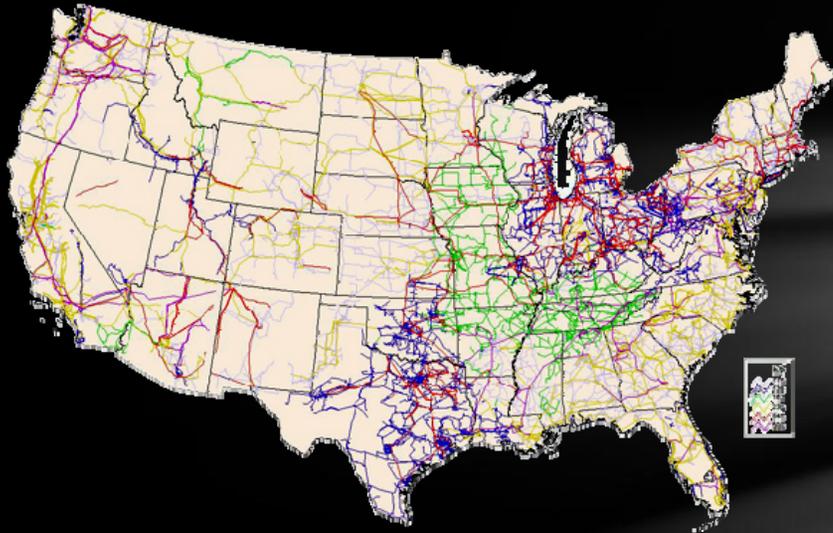


FERC Modeling Workshop



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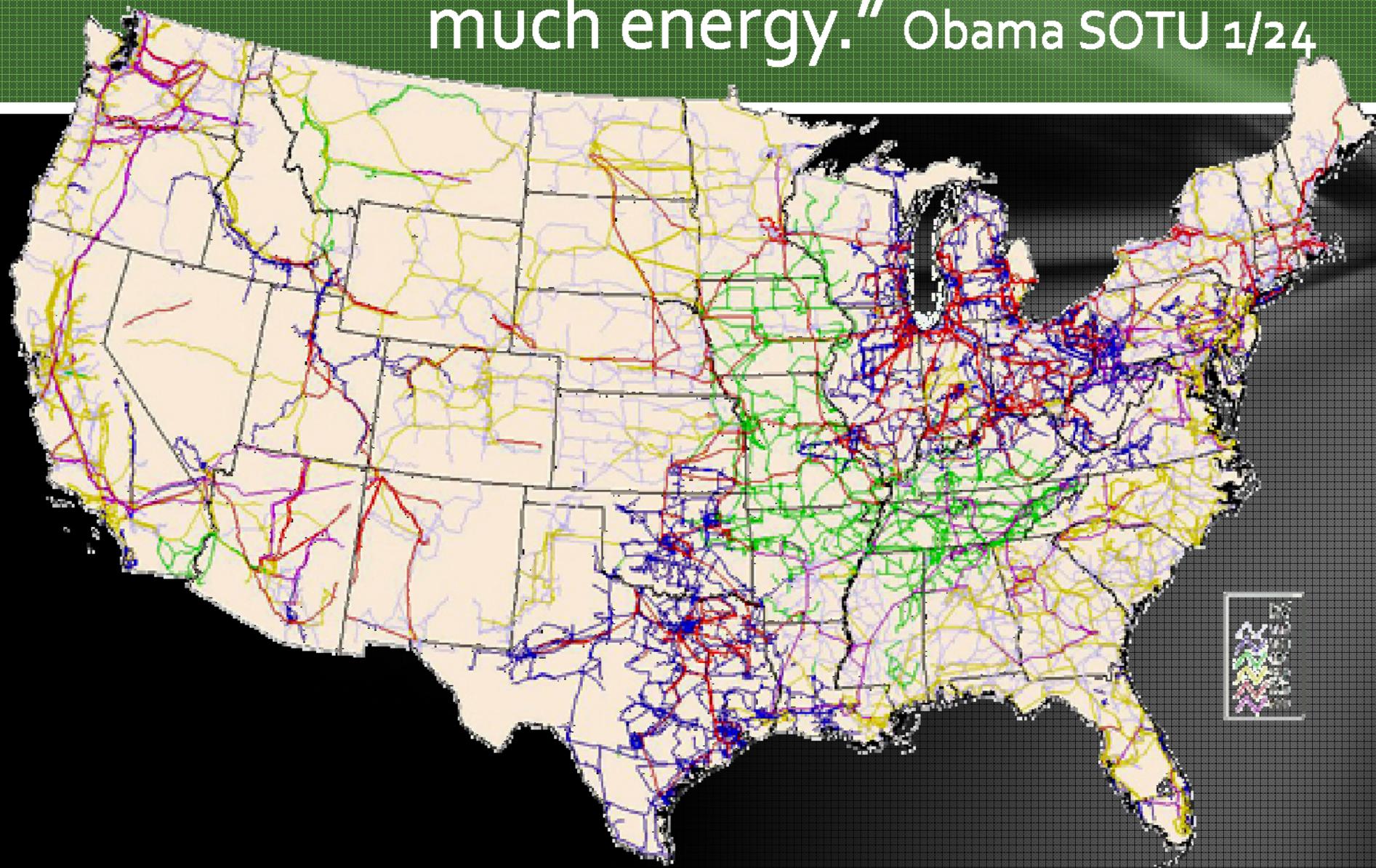
Grid Modeling is Top Priority

- *One of OE's priority projects is "Grid Modeling - Develop and implement an advanced energy infrastructure and modeling program focused on contingency analysis and analysis related to environmental regulations."*
- *A draft white paper on grid analytics, frames DOE's strengths/weaknesses, addresses gaps and makes recommendations on DOE efforts regarding tools/skills, leveraging capabilities of national labs, other agencies, e.g., FERC, DOD, etc. to provide long term value in support of national needs*

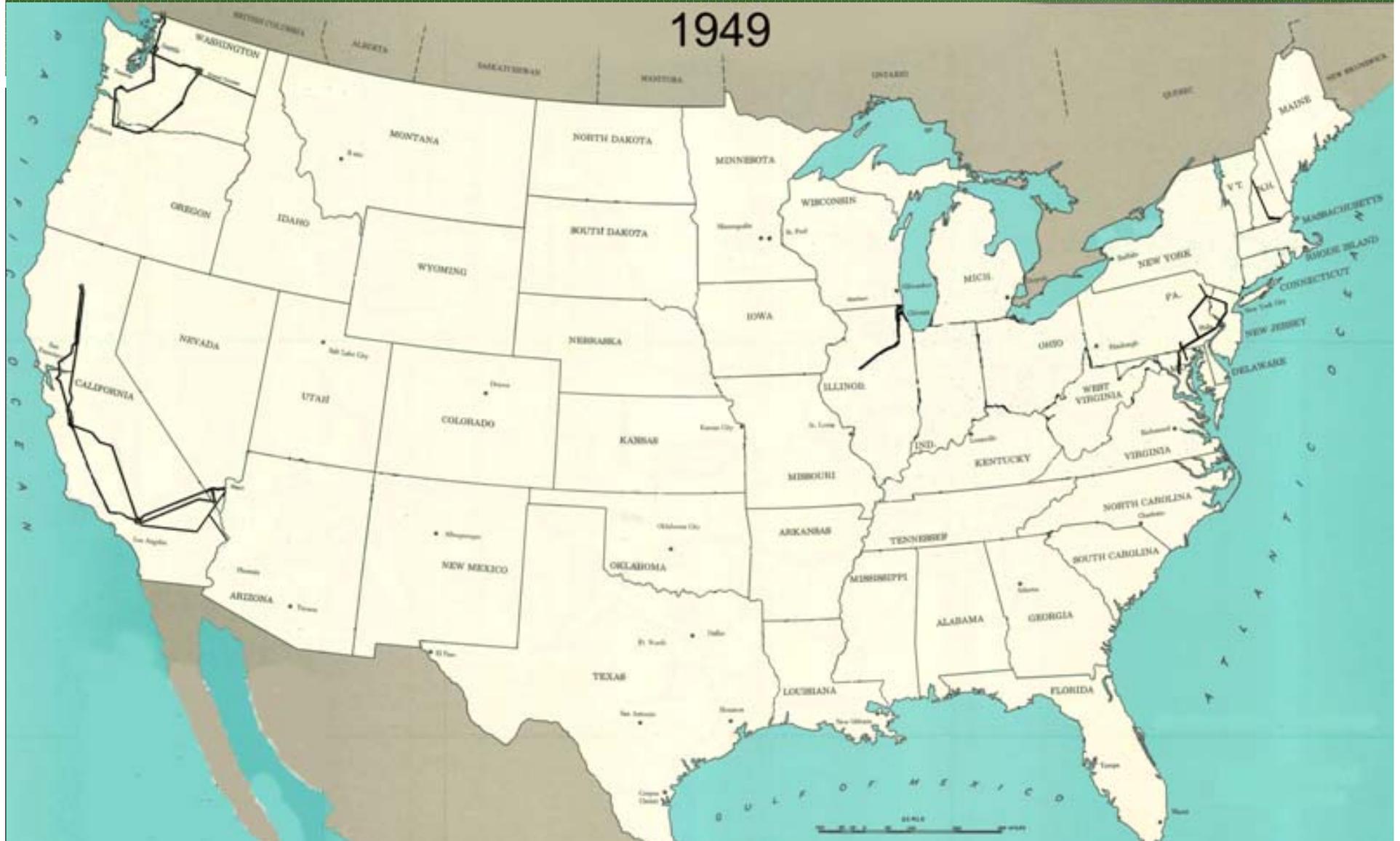
FY13 Advanced Modeling Grid Research \$10M Request

- *Advanced Modeling Grid Research develops sophisticated algorithms, models and capabilities to better analyze and predict grid behavior*
- *The program applies this understanding using real-time electric system data to improve grid planning and operations*
- *Specifically, the research focuses on:*
 - Accelerating performance – improving grid resilience by developing dynamic state estimation and contingency analysis at a sub-second level
 - Enabling predictive capability – relying on real-time measurements and improved models to more accurately represent the electric system and better predict system behavior, thus reducing margins and equipment redundancies needed to cover uncertainties

“We have a power grid that wastes too much energy.” Obama SOTU 1/24

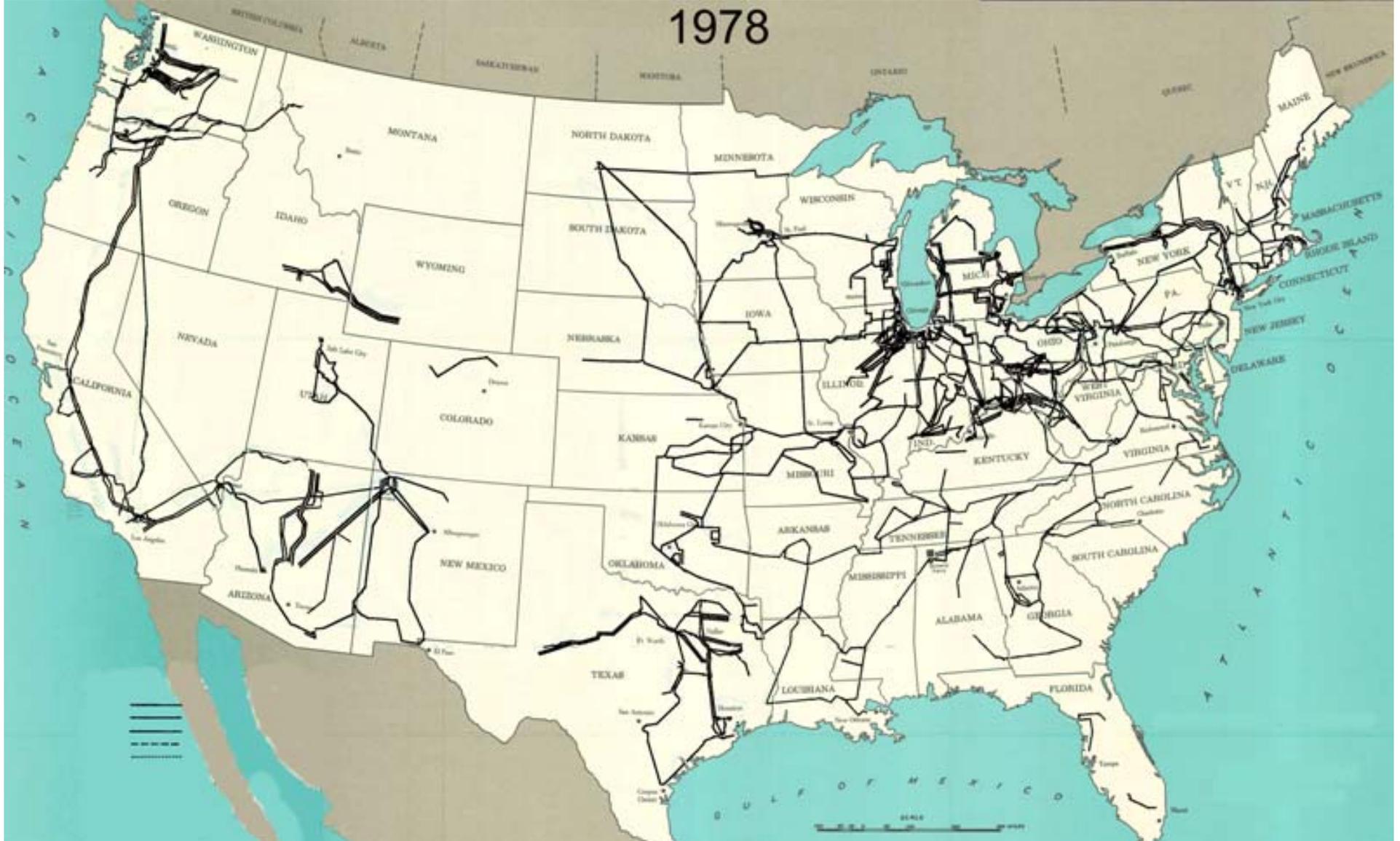


EHV Transmission Growth at a Glance



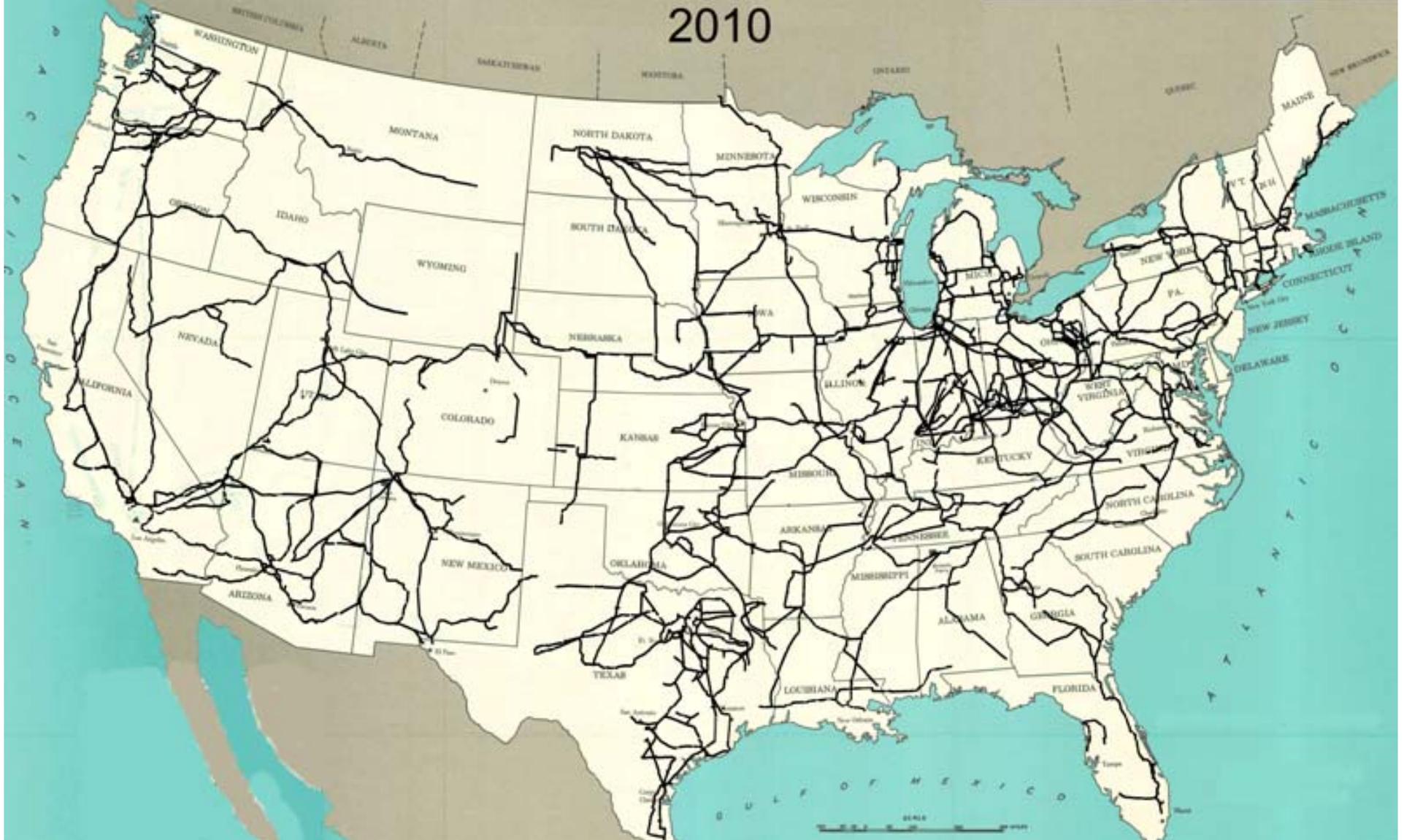
EHV Transmission Growth at a Glance

1978



EHV Transmission Growth at a Glance

2010



Observations

Most EHV grid buildout to date in the US concluded in mid-1980s with little if any consideration of regional needs, let alone interconnection-wide or national needs

Several key facilities like LaCygne-Stilwell 345 kV have already been rebuilt and rightsized within a fraction of their projected original useful lives

More rebuilds of critical facilities like Mt Storm – Doubs 500 kV are in process now

Majority of facilities in existing EHV corridors will approach economic lives in current planning horizons

Research Results

Funding for planning tools/capabilities within DOE, federal agencies and national labs diminished significantly in 1980s

ENTSO-E and others seems to be taking leadership role with respect to Common Information Model (CIM)

Probabilistic planning is needed more than ever, but seems to be lacking resources and commitment to move forward

Research efforts regarding tools and techniques are promising, warranting more engagement and support by industry, but implementation needs to be encouraged

Gaps between operations and planning, as well as transmission and distribution must be addressed

Research Results (cont)

Better data, as well as collaborative, coordinated planning which is open and transparent, is essential to success

Data collection/reporting and standardization efforts within the bulk power industry need attention as noted by MIT "The Future of the Electric Grid" report which concluded that:

"DOE should work to ensure that comprehensive data from its Smart Grid projects are widely shared",

"State regulators and others...should require utilities to compile and publish standardized metrics of utility cost, reliability, and other dimensions of performance " and

"FERC should require that detailed data on the US bulk power system be compiled and made appropriately available"

Electricity System for Hubs being proposed by DOE could be critical assets into future efforts at national/regional levels

Better Data is Essential

Accurate input data is critical success factor for future grid modeling efforts not only for DOE, but throughout the bulk power industry

The lack of understanding and transparency regarding existing assets are impediments to collaborative, coordinated and cost effective grid planning and operations

Getting consensus on data and metrics are paramount with aging infrastructure and the challenges of building new facilities to enable future markets

Interregional Planning Works

In the 1960s, 11 South Central Electric Companies (SCEC) built first 500 kV network in US with 345 kV extensions to facilitate 1,500 MW seasonal diversity interchange with TVA using common design standards

The benefits of this expansion were grossly underestimated, e.g., planners and transmission / substation design engineers assumed only a fraction of 500 kV line thermal capacity would be needed and utilized in operations. Difficult to comprehend any line ever loading over 1,000 MVA

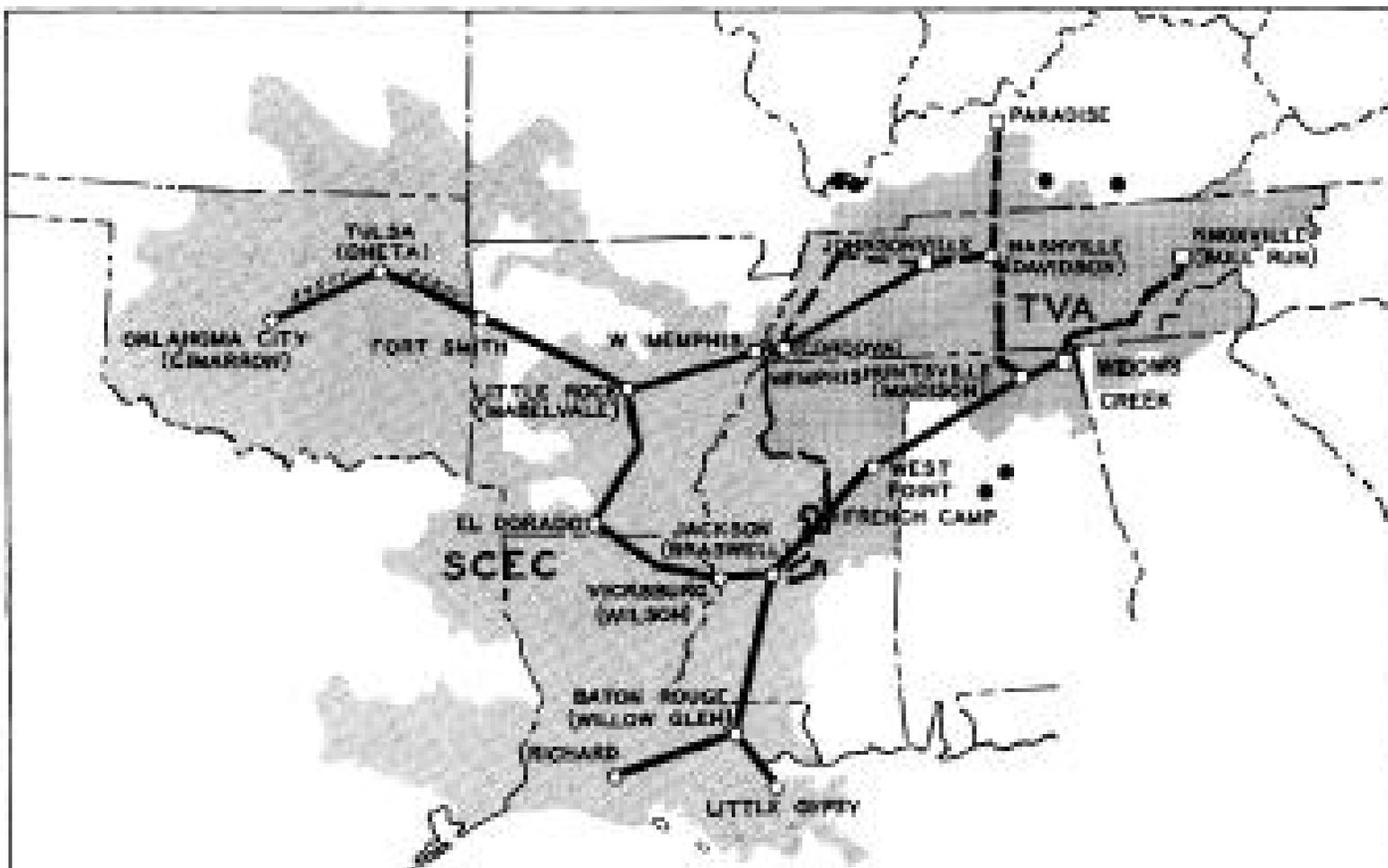


Fig. 1. TVA-SCEC transmission lines.

Concluding Remarks

Interconnection wide planning efforts like EIPC funded by DOE are great starts, but now is the time for real collaborative and coordinated planning, to identify key corridors and coordinate rightsizing of key facilities in critical corridors as assets reach their useful lives

Replacement in kind of existing infrastructure will perpetuate the existing patchwork quilt for another 50 years with each project that is not rightsized

If we start now, it will take 40 years to create a more efficient grid and now is the time to start since every decision, even inaction, has a cost that is ultimately born by consumers in the bulk power industry

“The world will not evolve past its current state of crisis by using the same thinking that created the situation.”

Einstein