Planning Energy Zones for the Eastern Interconnection

James Kuiper, Andy Ayers, Kevin Hlava, Vladimir Koritarov, Andrew Orr, and Jianhui Wang

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Session: Using GIS for Energy Analytics
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1:30 – 2:45 p.m., Room 28A
Overview

The American Recovery and Reinvestment Act provided funding and directive to DOE to:

- Provide technical assistance to the North American Electric Reliability Corporation, the regional reliability entities, the States, and other transmission owners and operators for the formation of interconnection-based transmission plans for the Eastern and Western Interconnections and ERCOT.

- Such assistance may include modeling, support to regions and States for the development of coordinated State electricity policies, programs, laws, and regulations.
Overview

DOE Funded Three Initiatives:

North American Electric Reliability Corporation Interconnections

Our Focus (U.S. Portion)
Overview

Two Teams formed for Planning:

*States*

Eastern Interconnection States’ Planning Council (EISPC)

pronounced “ice-pic”

*Planning Authorities*

Eastern Interconnection Planning Collaborative (EIPC)
Overview

Two Teams: Collaborative Roles

**States**

EISPC

- Commissioners, Governors’ Reps, State Energy Offices, Environmental Agencies

- Lead studies and whitepapers

- Identify clean energy zones

- Provide inputs to Engineering Team via Stakeholder Steering Committee

**Planning Authorities**

EIPC

- Planning Authorities:
  - RTOs
  - Transmission Owners

- Run power system models, prepare transmission plans

- Stakeholder Steering Committee provides strategic guidance
Energy Zones Study

Background:

• EISPC Energy Zones Working Group (EZWG) Guides the Energy Zones Study

• Energy Zones Study carried out by three National Labs:
  - Argonne National Laboratory
  - Nat’l Renewable Energy Laboratory
  - Oak Ridge National Laboratory
Energy Zones Study

Goals and Objectives:

• Inventory clean (low- or no-carbon) energy resource development opportunities (in map form)

• Develop methodologies for identifying clean energy resource areas

• Enable States to inform and collaborate in stakeholder system planning, using modeling timeframes to 2030

• Provide information about circumstances that inhibit or encourage potential resource development

• Focus analysis on concentrated energy resource areas
Energy Zones Study

What Makes This Study Unique:

Unprecedented collaboration among Eastern Interconnection States

Unparalleled in its…

• Scope (jurisdiction and geographic extent)
• Interconnection-wide collaborative application of industry-recognized planning tools
• Long-term public policy ramifications
Energy Zones Study

Eight Clean Energy Resources/Technologies

- Biomass
- Nuclear
- Storage
- Water
- Solar
- Wind
- Clean Coal (with carbon capture/sequestration and storage)
- Geothermal

Energy Zones Study

27 Clean Energy Sub-Technologies:

**Biomass**
- Forest biomass and wood waste
- Agricultural biomass and waste resources
- Dedicated energy crops
- Methane from landfills
- Methane from wastewater treatment
- Methane from animal manure processing

**Clean Coal**
- New clean pulverized coal technology
- New integrated gasification combined cycle
- New coal fluidized bed
- Retrofitted pulverized coal

**Geothermal**
- Enhanced geothermal systems
- Geopressured geothermal

**Nuclear**
- Large light-water reactor
- Small modular reactor, integral pressurized-water reactor
- High-temperature gas cooled reactor/
  Very high temperature gas-cooled reactor

**Solar**
- Concentrating solar power
- Utility-scale photovoltaic
- Rooftop photovoltaic solar

**Storage**
- Hydroelectric pumped storage
- Compressed air energy storage

**Water**
- Additional output from existing hydropower dams
- New output from existing non-powered dams
- In-stream hydrokinetic energy
- Tidal hydrokinetic energy
- Wave energy

**Wind**
- Onshore wind turbines
- Offshore wind turbines
Energy Zones Study

Each sub-technology has resource data, and a suitability model

Example:
Utility-scale Photovoltaic Solar

Resource data: 10-km resolution direct normal solar irradiance, annual average over 1998-2005
Energy Zones Study

Example: Utility-scale Photovoltaic Solar

Modeling layers (DRAFT)

Resource Data
- Annual average direct normal solar radiation (Source: NREL direct normal solar irradiance)

Screening Factors
- Population density (Landscan and U.S. Census bureau population data)
- Protected lands (Compiled from multiple sources)
- Topographic slope (National Elevation Data, 10-m resolution)
- Habitat (Compiled from multiple sources)

Informational Layers
- Proximity to electric transmission lines (Platts/Bentek Energy)
Energy Zones Study

Example: Utility-scale Photovoltaic Solar
Energy Zones Study

Major Milestones:

- Preliminary GIS Viewer
  - Beta version: Map viewer of GIS database
  - Mar 2012

- Draft “EISPC EZ Mapping Tool”
  - Aug 2012

- Final Tool and Report
  - 1st qtr 2013
General Features of Final Tool:

- Available to U.S. public
  - Web-based tool, free, secure, must register
  - Ability to save analysis runs, print results
  - Many user-adjustable screening factors
  - Restricted access to some core data sets

- Collaborative regional-scale decision making
  - Not suitable for project siting studies
  - Higher-level resource/technology information only
EISPC EZ Mapping Tool

General Features of Final Tool:

• **Viewing options for area-of-interest**
  - Eastern Interconnection-wide view
  - State or multiple State views
  - Transmission planning areas, NERC regions
  - User-defined views

• **Analysis options**
  - One resource/technology at a time
  - Multiple resource/technology scenarios
  - Reports and analysis for user-defined zones
EISPC EZ Mapping Tool

General Features of Final Tool:

• Additional info available in tool
  - Informational layers that aid context
  - Policies etc. that inhibit/encourage selection
  - Metadata with more detail for each map layer

• Important Note

Labs will not identify actual energy zones, but provide the methodology and tools for stakeholders to identify clean energy resource areas.
**EISPC EZ Mapping Tool**

**Sample View: Home Page**

- Background information
- Launch tool
- Resource/Technology descriptions
- Links to Lab partners
- Includes on-line help guides

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EISPC EZ Mapping Tool

Sample View: Data and Controls

Map navigation controls:
- Pan, Zoom, etc.

Catalog of available map layers
EISPC EZ Mapping Tool: Adding Layers

Add Layers from EISPC Catalog

Includes:
- Layer title, category, data source, technology
- Sort on any column
- Filter list by category, data source, technology
- >100 layers at launch. Additional layers will be available.
EISPC EZ Mapping Tool

Sample View: Screening Factors

Screening factors will have user-adjustable settings.

Examples:
- Wind power class
- Population density
- Carbon storage proximity
- Solar intensity
- Topographic slope
Click on Get Feature Info tool, then on a location or feature of interest on the map. Results appear in Feature Info dialog.
Conclusions

• Energy future requires options
• Public web-based tool
• Scope includes 27 energy technologies
• Identifies clean energy resource areas
• Built to aid collaboration
• Planned completion: 1st quarter 2013
Questions?

Authors:

– Jim Kuiper  jkuiper@anl.gov
– Andy Ayers  aayers@anl.gov
– Kevin Hlava  khlava@anl.gov
– Vladimir Koritarov  koritarov@anl.gov
– Andrew Orr  aorr@anl.gov
– Jianhui Wang  Jianhui.Wang@anl.gov

Questions?