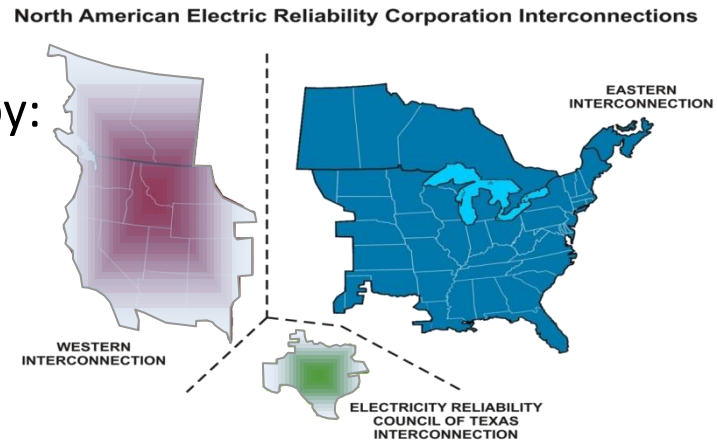
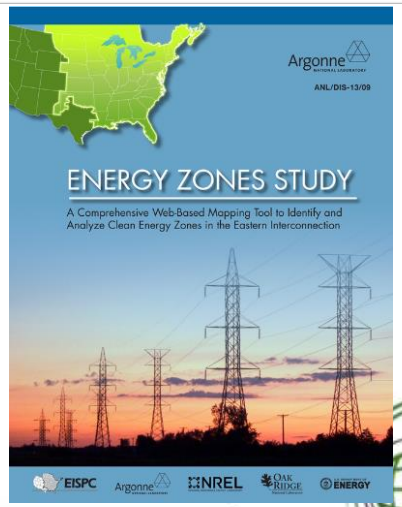
Energy Zones Mapping Tool for Eastern Interconnection

Vladimir Koritarov
Program Manager
Argonne National Laboratory
9700 S. Cass Avenue, ES-202
Lemont, IL 60439
Email: koritarov@ANL.gov
Phone: 630-252-6711

EISPC Energy Zones Mapping Tool

- EZ Mapping Tool was developed for Eastern Interconnection States' Planning Council (EISPC) by:
  - Argonne National Laboratory (Project Lead)
  - Oak Ridge National Laboratory, and
  - National Renewable Energy Laboratory
- EISPC represents 39 states, District of Columbia, City of New Orleans and 6 Canadian Provinces located within the Eastern Interconnect (EI)
- EISPC is comprised of public utility commissions, Governor's offices, state energy offices, and other key government agencies and representatives
- Funding was provided by the U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability under the American Recovery and Reinvestment Act





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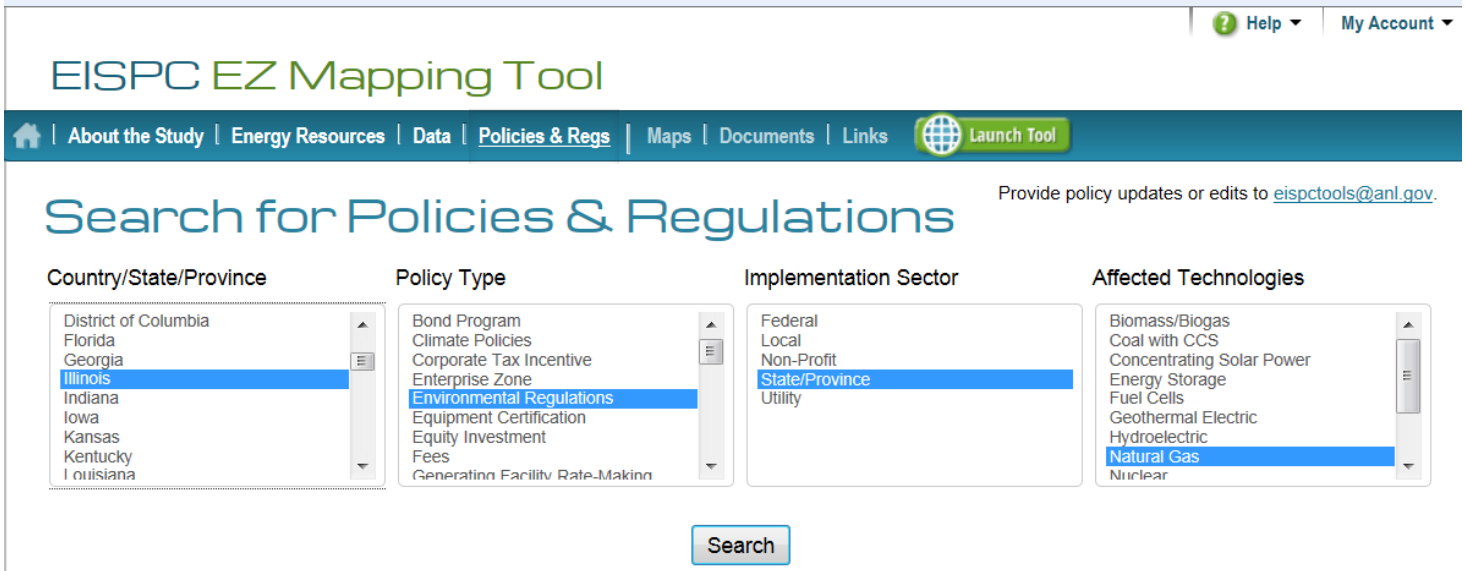
EISPC EZ Mapping Tool Is Publicly Available

- The EZ Mapping Tool provides data, models, reports, and policy information for nine clean (low/no carbon) energy resource categories in the Eastern Interconnection
- The tool is intended for:
  - EISPC members (state energy and environmental offices, public utility commissions, etc.)
  - Electric utilities and grid operators
  - NGOs
  - Energy industry
  - Regulators,
  - Energy researchers, etc.
- Over 1,000 registered users since April 2013

http://eispctools.anl.gov

EZ Mapping Tool Includes Searchable Policy Database

- Laws, regulations, incentives, and other polices in the EI states (including Canadian provinces) related to clean energy generation
- Over 2,300 policies (compiled by Clean Energy States Alliance – CESA)



EZ Mapping Tool Supports Suitability Modeling of Nine Clean Energy Resource Categories

Wind

Biomass

Clean Coal (with carbon capture and storage)

Water

Clean Energy Resource Categories

Geothermal

Storage

Solar

Nuclear

Natural Gas

Suitability Models and/or Reports are Available for 29 Clean Energy Technologies

Biomass

- New biomass-fired plant with traditional combustion
- Biomass co-fired with existing coal plant
- Landfill gas extraction and plant inventory
- Methane extraction from wastewater treatment
- Methane extraction 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 system
- Geopressured geothermal

Natural Gas

- Combined cycle
- Underground natural gas storage
- Above-ground natural gas storage

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

- Added output from existing hydropower dam
- New output from existing non-powered dam
- In-stream hydrokinetic energy
- Tidal hydrokinetic energy
- Wave energy

Wind

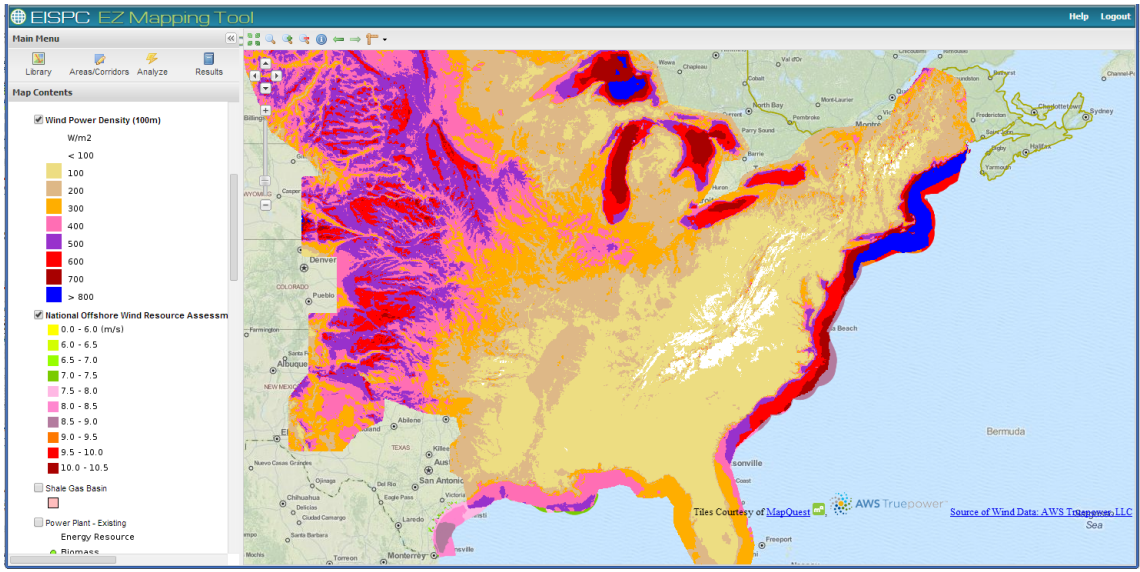
- Land-based wind turbine
- Offshore wind turbine

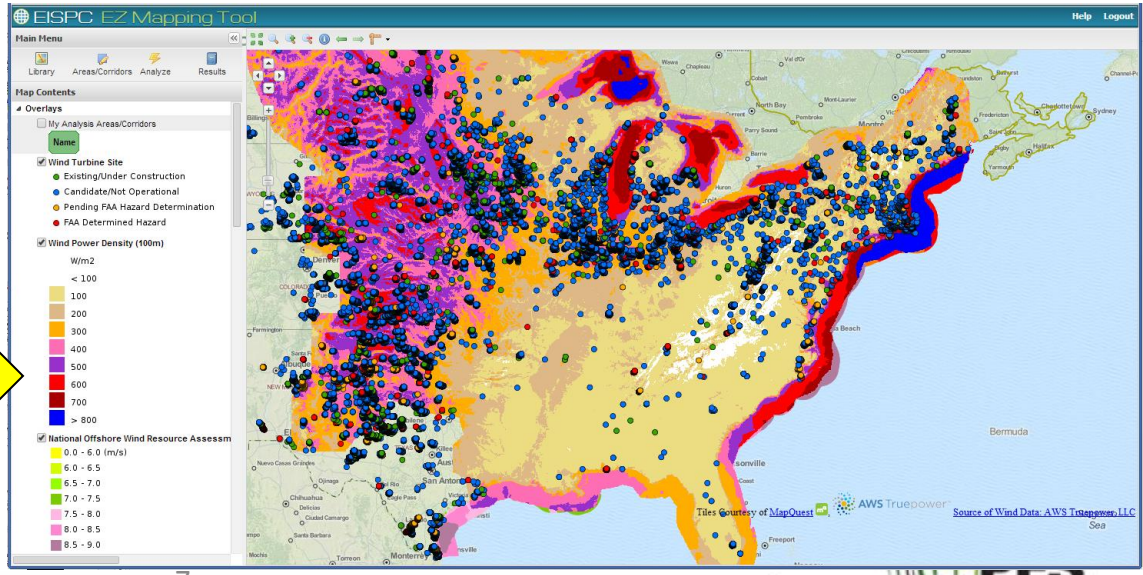
Suitability model

Report based on inventory or energy resource availability

EZ Mapping Tool Has an Extensive GIS Data Library

- About 250 GIS mapping layers:
  - Energy resources (wind, solar, biomass, etc.)
  - Energy infrastructure
  - Siting factors
  - Reference layers
  - Environmental
- Detailed metadata for all layers
- Downloadable GIS data for most layers
- Searchable energy policy database (2,360 policies)
- Actively maintained and updated

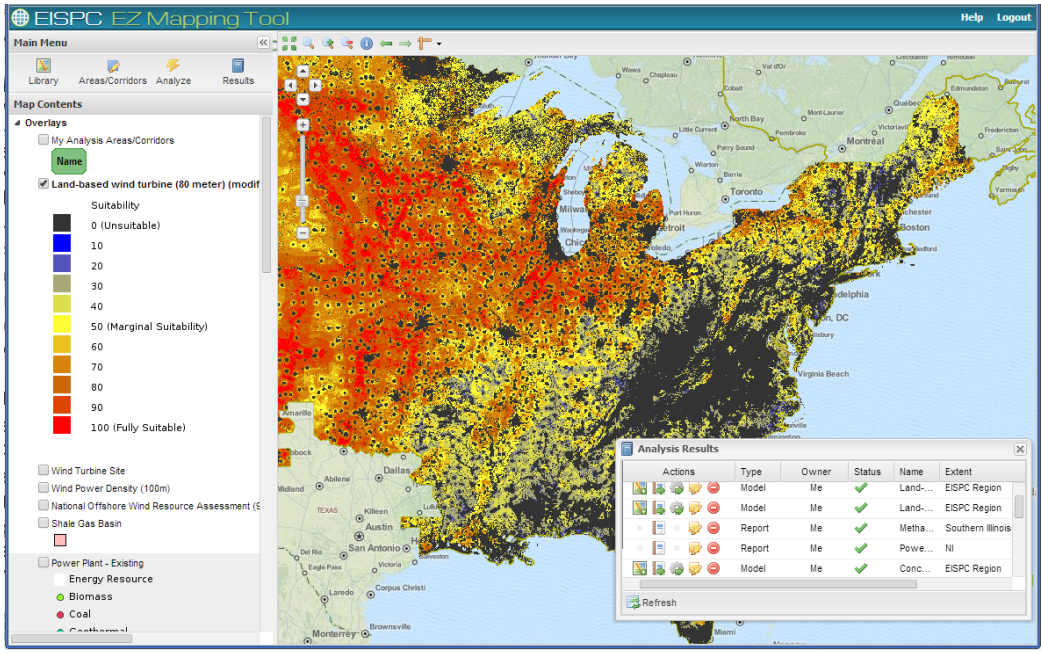


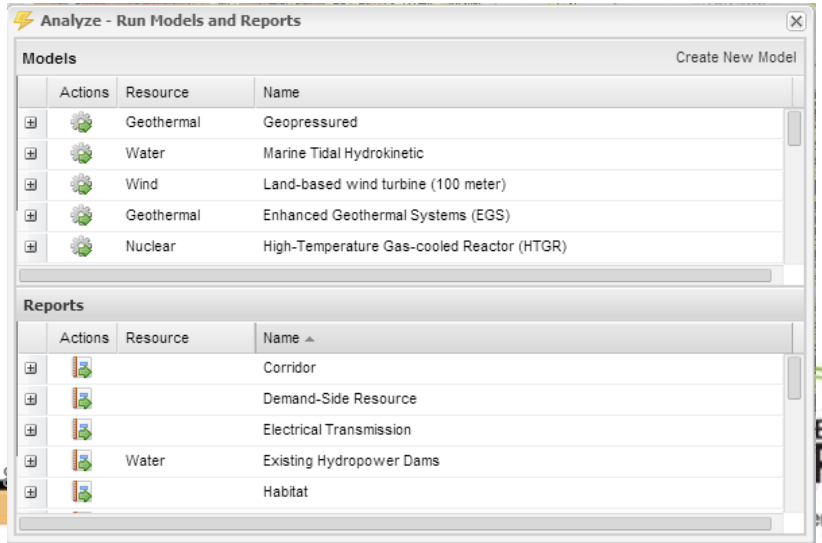


Existing/planned wind turbine sites shown over wind energy potential data

EZ Mapping Tool Allows Users to Perform Customized Suitability Modeling of Energy Resources

- Models generate “heat maps” showing suitability of areas for developing any clean energy resources
- Inputs include:
  - Energy resource data
  - Land cover/landforms
  - Environmental factors
  - Population density
  - Existing infrastructure
  - Other suitability factors
- Models are user-configurable and fully customizable
- Users can design new models using any of 60 input model layers
- Composite “synergy” models map areas suitable for multiple technologies





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EZ Mapping Tool Suitability Modeling Approach

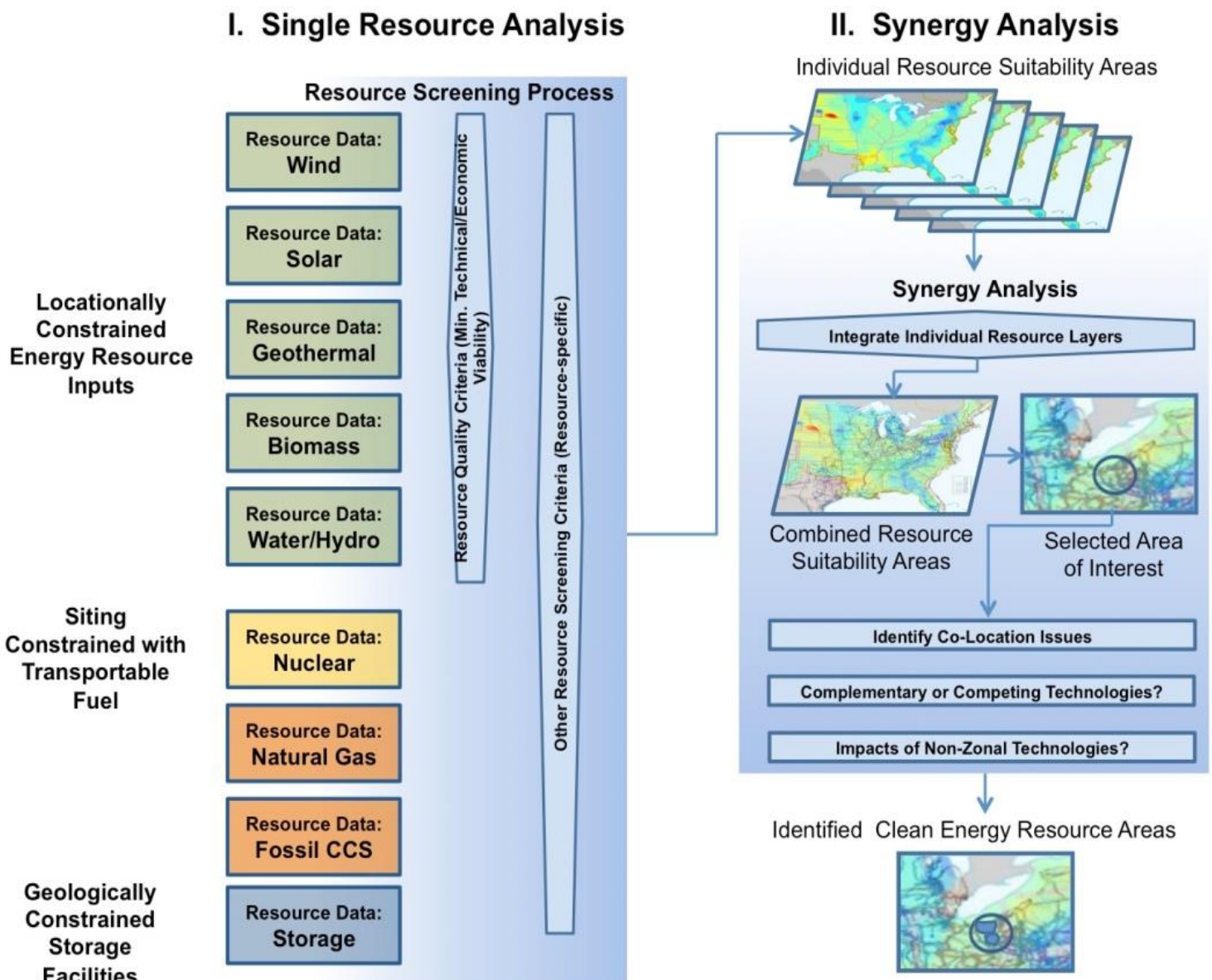
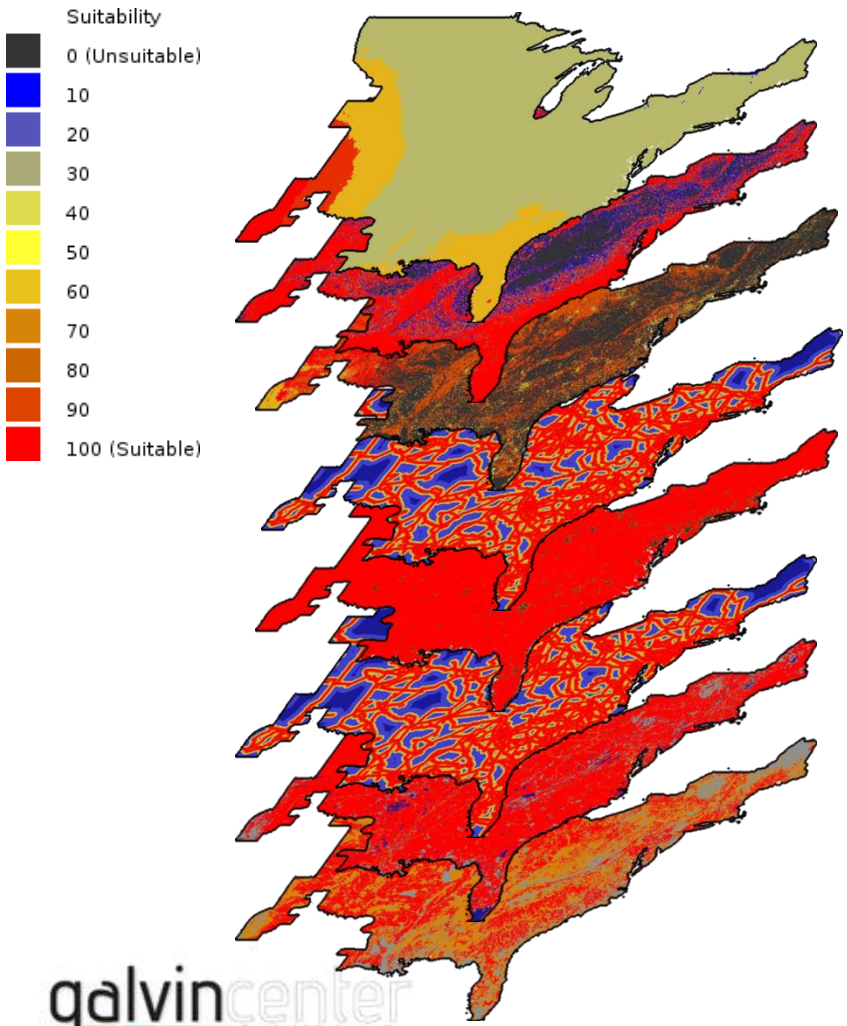


Illustration of Suitability Modeling Approach

Example for Concentrating Solar Power



Input Modeling Layers

Energy Potential: Solar CSP

Slope

Land Cover Area

Distance to Rivers ≥ 64,500 gpm

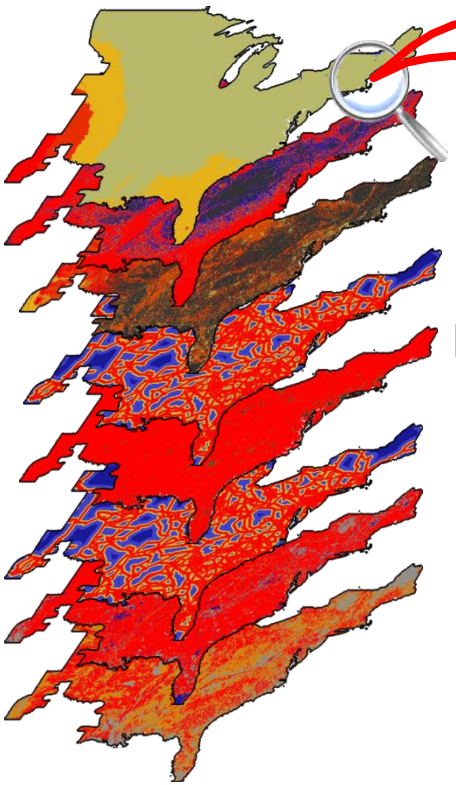
Population Density

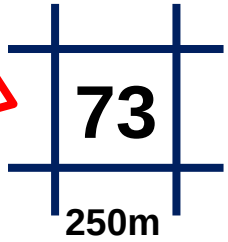
Distance to Transmission ≥ 345kV

Protected Lands (Composite of many sources)

Habitat (Composite of many sources)

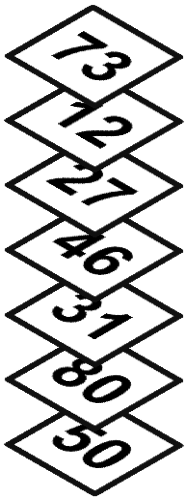
Calculating Composite Suitability Score for Each Cell



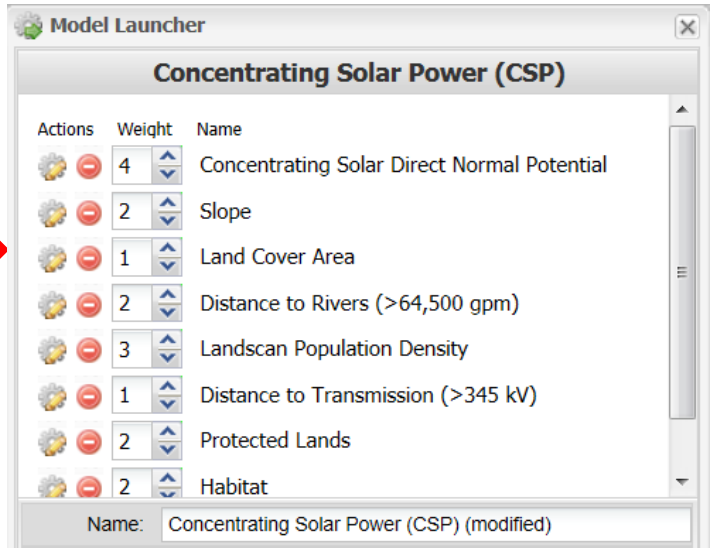


Each 250m x 250m cell, in each layer, is coded with a suitability value from 0 (unsuitable) to 100 (highest suitability)

Input data



Model Parameters



Composite Score

Geometric Mean Computation

Potential Studies and Applications

- Mapping and characterizing offshore wind resources in Great Lakes region
- Identifying areas in Great Plains with highest wind energy potential and least environmental impact
- Identifying biomass areas in the Southeast and New England
- Measuring and mapping reduction in wind potential when assuming stringent rather than moderate habitat avoidance criteria
- Mapping location of flexible resources (e.g., energy storage) relative to variable renewable resources, etc.