

Transmission Development Zones for Renewable Energy Resources



**Michigan Wind Energy
Resource Zone Board**

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Policy objectives

- Identify the highest concentrations of the least-cost renewable resources, in sufficient quantity to sustain competition among potential developers
- Identify in advance the environmental and other land use issues that may limit development
- Establish an open and transparent process, so that findings will carry great weight in subsequent docketed proceedings

Renewable energy zone efforts

Texas: Competitive Renewable Energy Zones (CREZ)

California: Renewable Energy Transmission Initiative (RETI)

Colorado: renewable resource mapping, expedited transmission planning

Nevada: Renewable Energy Transmission Access Advisory Committee (RETAAC)

Western Governors' Association: Western Renewable Energy Zone Initiative (WREZ)

Midwest ISO: Regional Generation Outlet Study

Arizona, New Mexico, Utah: Efforts starting

Models

- Texas
 - Legal status of CREZs came first, then PUC designated CREZs
 - Formal stakeholder participation in rulemakings and contested case -- more contentious, but decisions are legally binding
- Everybody else
 - Zones are identified first, based on technical potential
 - No legal status imputed to zones
 - Informal stakeholder participation

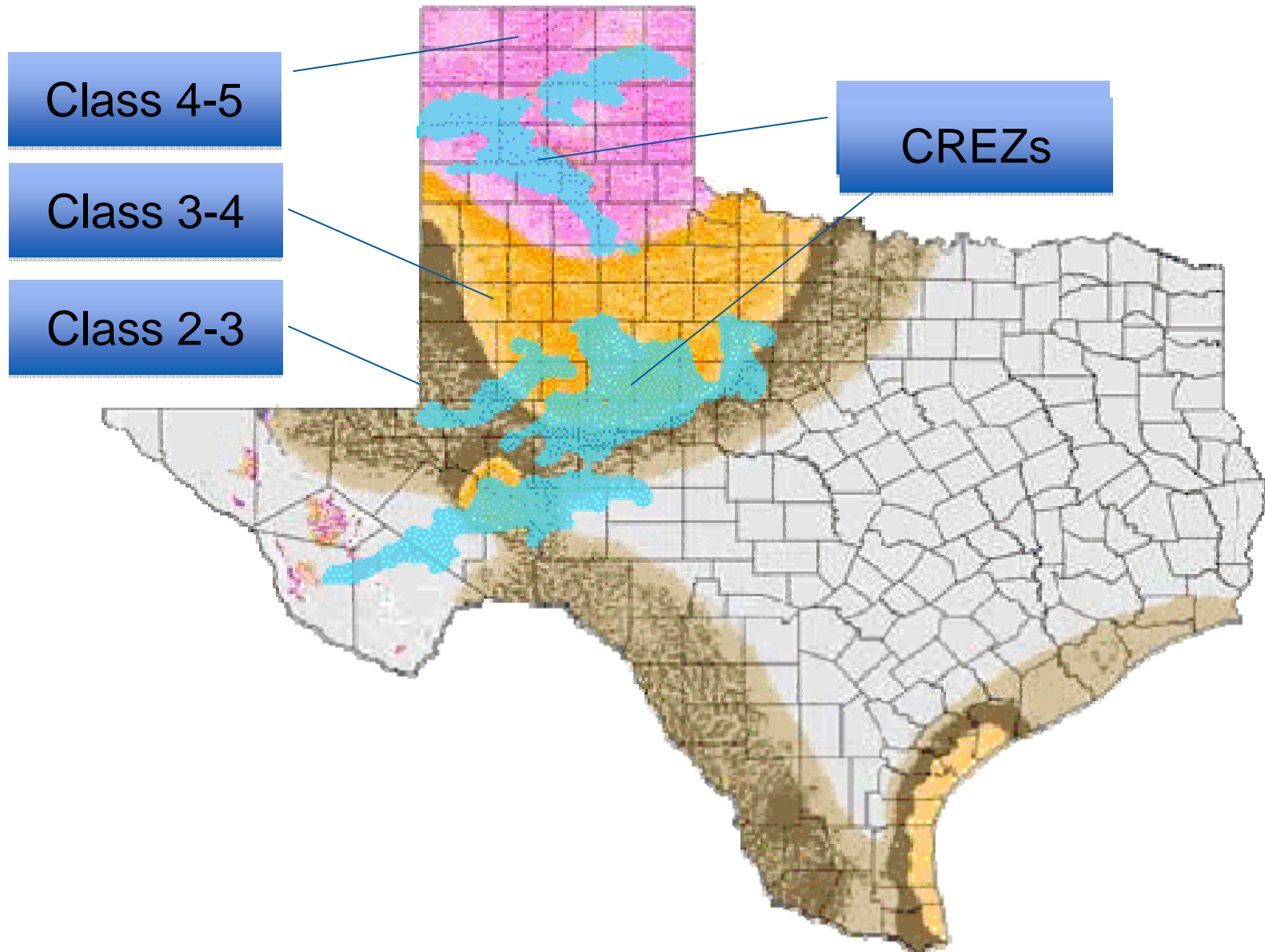
Texas CREZ model

- Texas RPS, REC trading program began in 2002, the same time retail competition began in ERCOT
- All new wind development took place in the same area
 - Followed available transmission capability, not the best wind
 - 759 MW added from mid 2001 to early 2002
 - ~400 MW of export capability
 - ERCOT issued standing curtailment orders every day during windy season
 - Curtailments degraded effective capacity factor from a potential of around 40% (Class 4 wind) to 27% (Class 2 wind)

Texas CREZ model

- In 2005, Texas Legislature increased the RPS goal from 2 GW to 5 GW, directed PUC to designate CREZs
 - Directed PUC, ISOs to study alternatives
- CREZ status meant:
 - Transmission deemed to be used and useful
 - Transmission costs were deemed be prudent and recoverable in rates
- Information taken into account
 - Mesoscale modeling by AWS Truewind
 - Demonstrations of financial commitment by developers
 - Public intervenors

Texas wind classes and CREZs



Texas CREZ by the numbers

Technical potential for wind power within designated CREZs	More than 32 GW
Capacity to be accommodated in CREZ transmission plan	11.5 GW
Wind power already on ERCOT system (pre-CREZ capacity)	8 GW
Docket opened	January 4, 2007
Final order on rehearing	October 6, 2008

Alternative model

- Not necessarily driven by transmission constraints limiting existing wind power
- Generally intended to facilitate RPS demand (Texas CREZ will facilitate post-RPS wind expansion)
- Largely an assessment of technical potential
 - No statutory authority needed
 - Work is often coordinated with transmission planning at the ISO or utility level
 - Estimates levelized cost of energy (LCOE) for resource zones, to identify least-cost resources
 - Cost recovery is not addressed

Alternative model: California

- Concern that California will miss its RPS goal without significant new transmission.
- Renewable Energy Transmission Initiative
 - Collaborative effort by California PUC, California Energy Commission
 - Identify resources and transmission needs for the purposes of meeting California RPS
- Identify existing and potential projects for wind, solar, geothermal and biomass
- Identify and exclude environmentally sensitive areas
- Quantify clusters of projects based on LCOE
- CPUC will decide later how to treat in docketed cases

Alternative model: Colorado

- Two companion bills passed by Colorado Assembly
 - Task force to map state's best renewable resources
 - Directive to utilities to develop transmission proposals for renewable energy zones
 - Not well-coordinated; utilities had to file proposals before task force finished its final report
- Mapping task force decided to treat small hydro, biomass, geothermal and PV as local resources
- Identified utility-scale generation development areas for wind and concentrating solar only
 - Calculated supply curves to compare relative busbar costs
- Insufficient time to collect habitat data

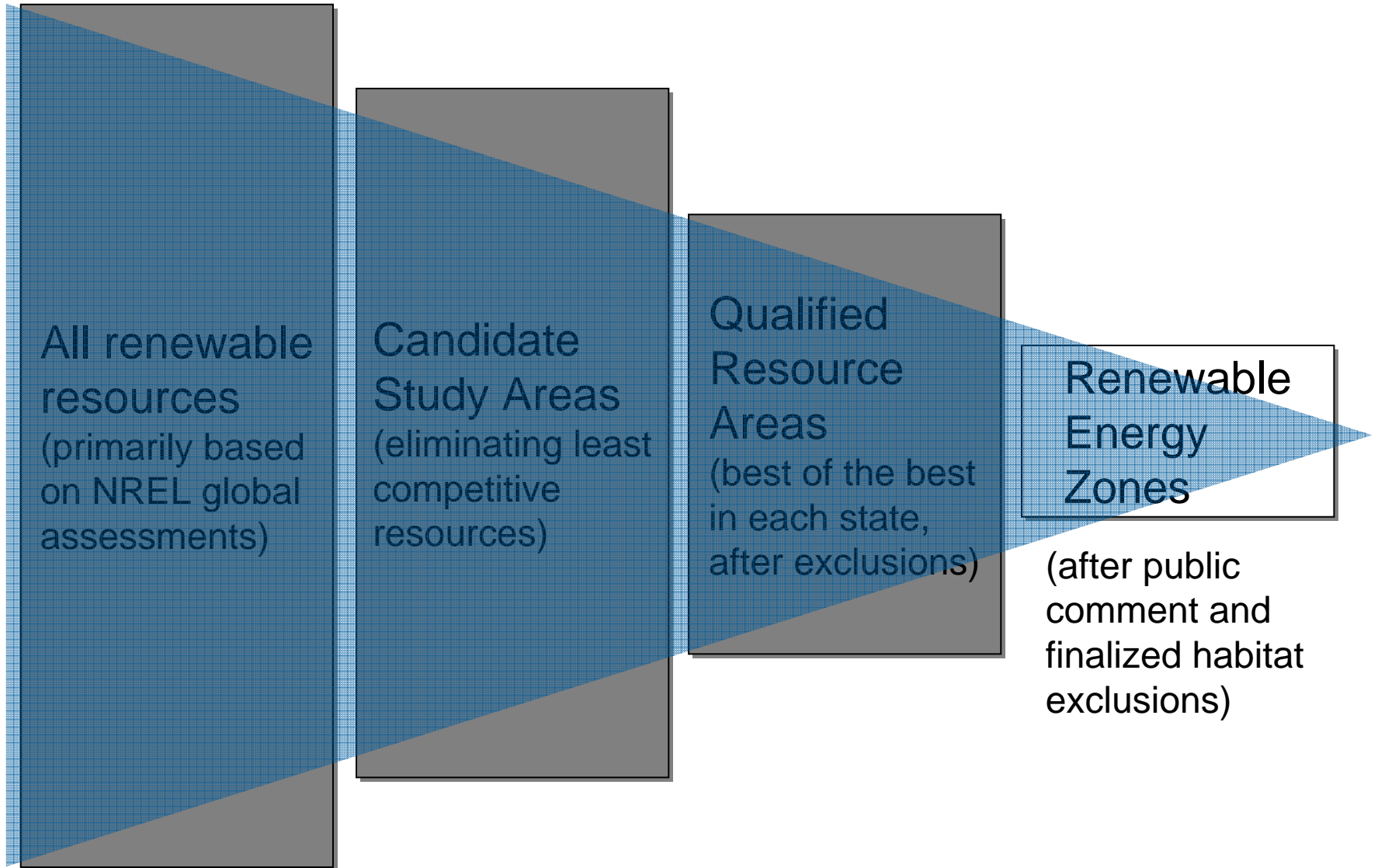
Alternative model: Key issues

- Scope of analysis: regional, or in-state only?
 - Possible export benefits: greater local development
 - Possible import benefits: access to renewable power at lower cost
 - What's the objective, and what's the authority?
 - Sensitive areas
 - Implied outcomes
 - What about renewable resource potential that doesn't end up in a zone?
 - Pressure from developers (and possibly local leaders) to get individual "pet" projects in a zone, regardless of macro analysis and criteria
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Western Renewable Energy Zones

QuickTime™ and a
decompressor
are needed to see this picture.

Progression



Filtering Qualified Resource Areas

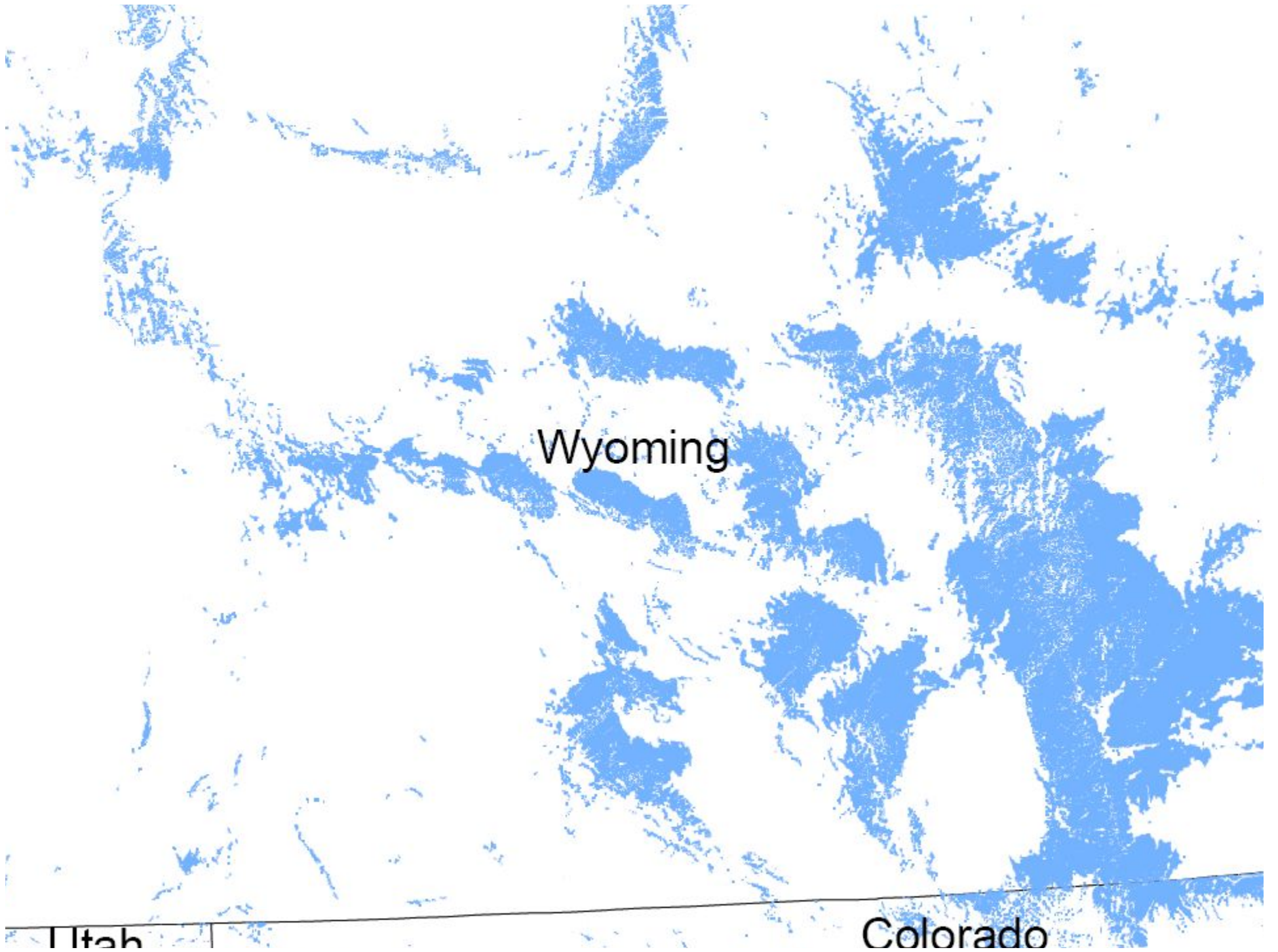
- Develop and apply technical exclusions
 - No development in urban areas, near airports, on wetlands
 - Lands off limits by statute or policy (national parks, wildlife refuges, wilderness areas, etc.)
 - For wind,
 - Exclude slopes greater than 20%
 - For solar thermal (CSP),
 - Exclude slopes greater than 2%
 - Minimum square contiguous area of 640 acres

Filtering Qualified Resource Areas

- State-specific resource thresholds
 - For wind,
 - Class 5 and better: Montana, Wyoming
 - Class 4 and better: Baja California, Colorado, New Mexico, Texas
 - Class 3 and better: all other states/provinces
 - For solar thermal (CSP),
 - 7.25 kWh/m²/day: Arizona
 - 7 kWh/m²/day: Baja California, California, Colorado, Nevada, New Mexico
 - 6.5 kWh/m²/day: Utah, Texas

Filtering Qualified Resource Areas

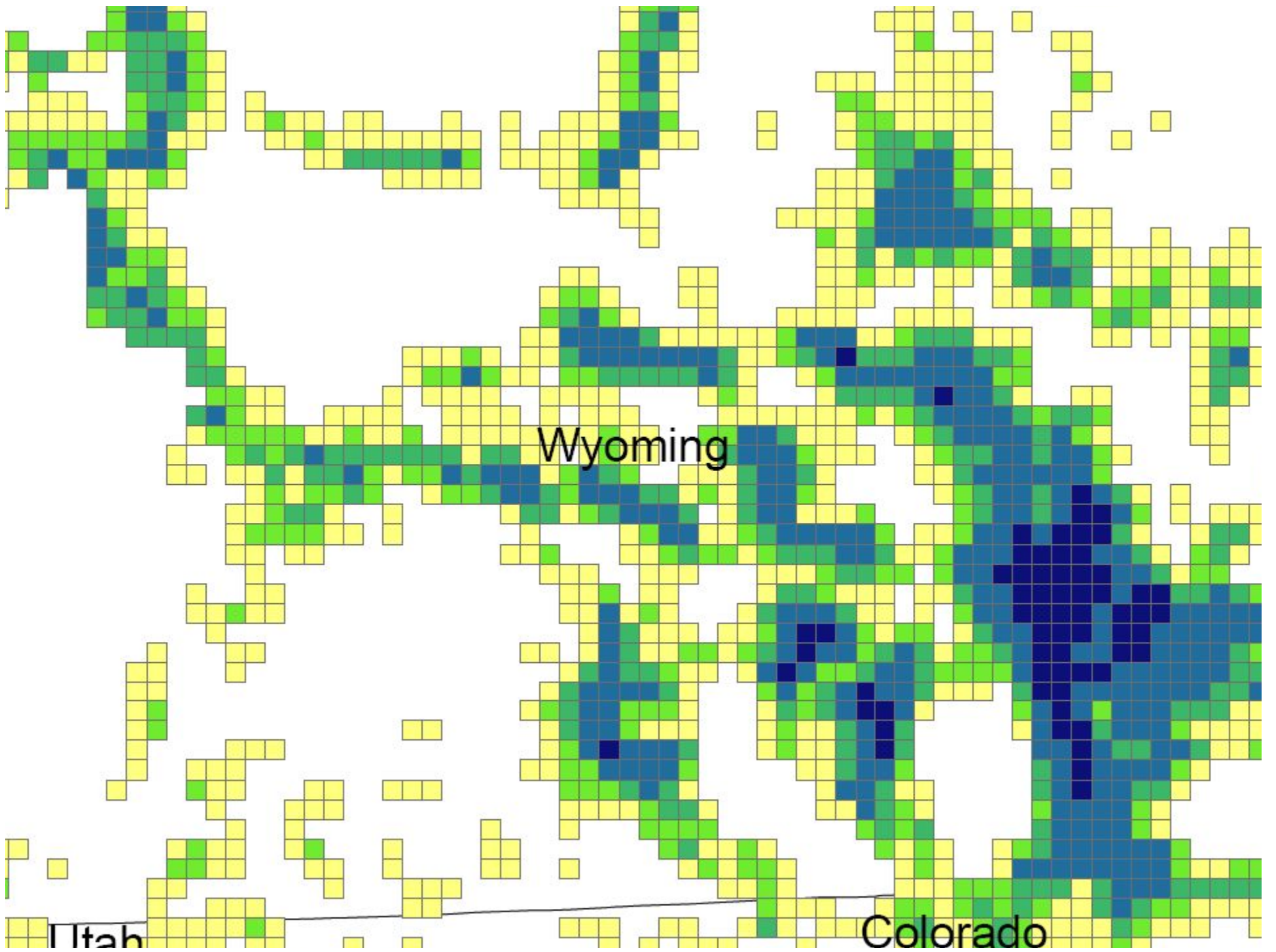
- Apply reduction factors to estimate developability
 - For wind, 25% of qualifying technical potential
 - For solar, 3.5% of qualifying technical potential
 - Applied density screen to remaining qualified resources
 - Uniform grid overlay over entire Western Interconnection, each grid cell 50 km²
 - Calculate the total MW of qualifying potential in each grid
 - Eliminate isolated grid cells
 - Eliminate cells with relatively low MW
 - Eliminate clusters with aggregate qualifying potential less than 1,500 MW
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Wyoming

Utah

Colorado



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Next steps

- Finalize habitat exclusions
 - Calculate supply curves for each QRA
 - Eliminate, consolidate QRAs into renewable energy zones
 - REZs and supply curves will go into a high-level conceptual transmission model linking REZs to major load centers via existing transmission paths (but assuming major upgrades along the paths)
 - REZs and model (Excel-based) will be available to load-serving entities and regulators to test scenarios
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Western Renewable Energy Zones

WREZ web site--

<http://www.westgov.org/wga/initiatives/wrez/>

WREZ GIS portal--

<http://mercator.nrel.gov/wrez/>

Login “wrez”

Password “guest”

Hourly wind power variation

