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GIS-based Strategic Analysis Approach for Combined Heat & Power (CHP) Applications

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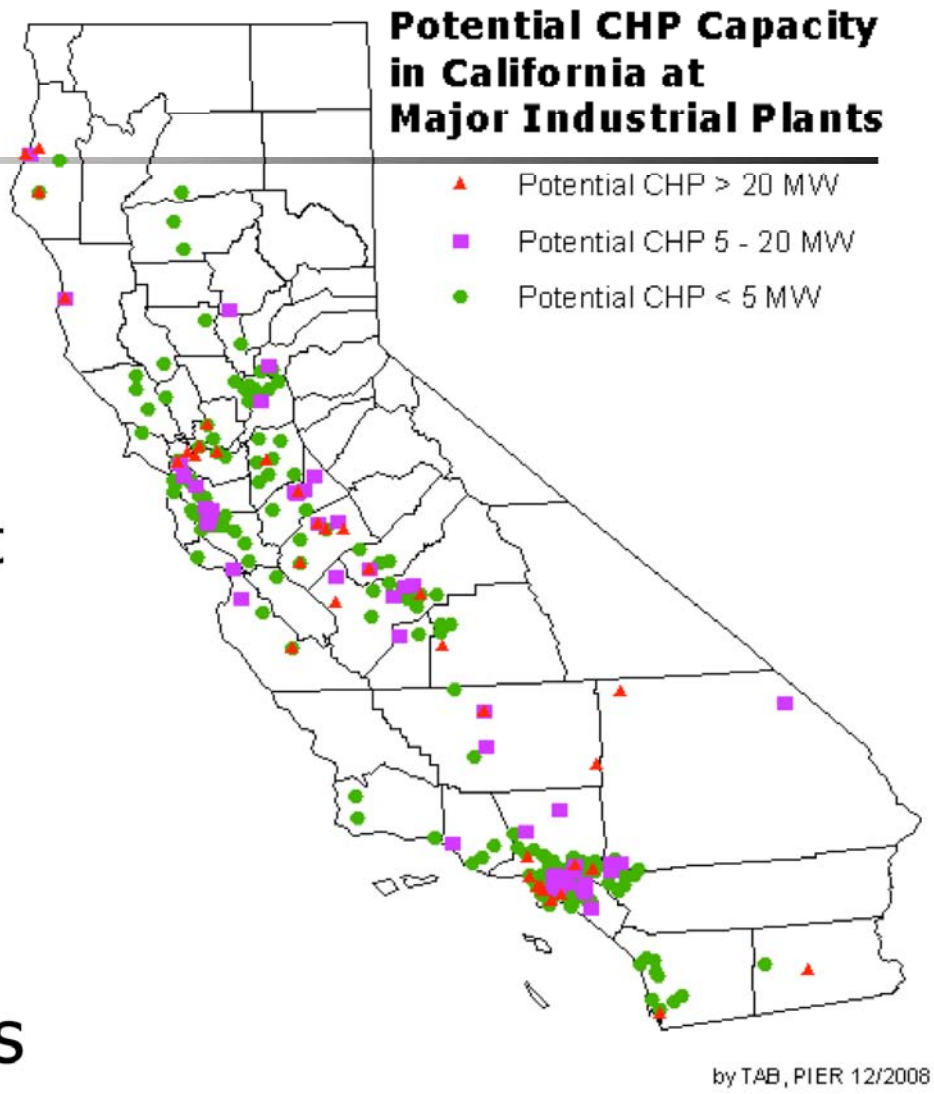
Overview

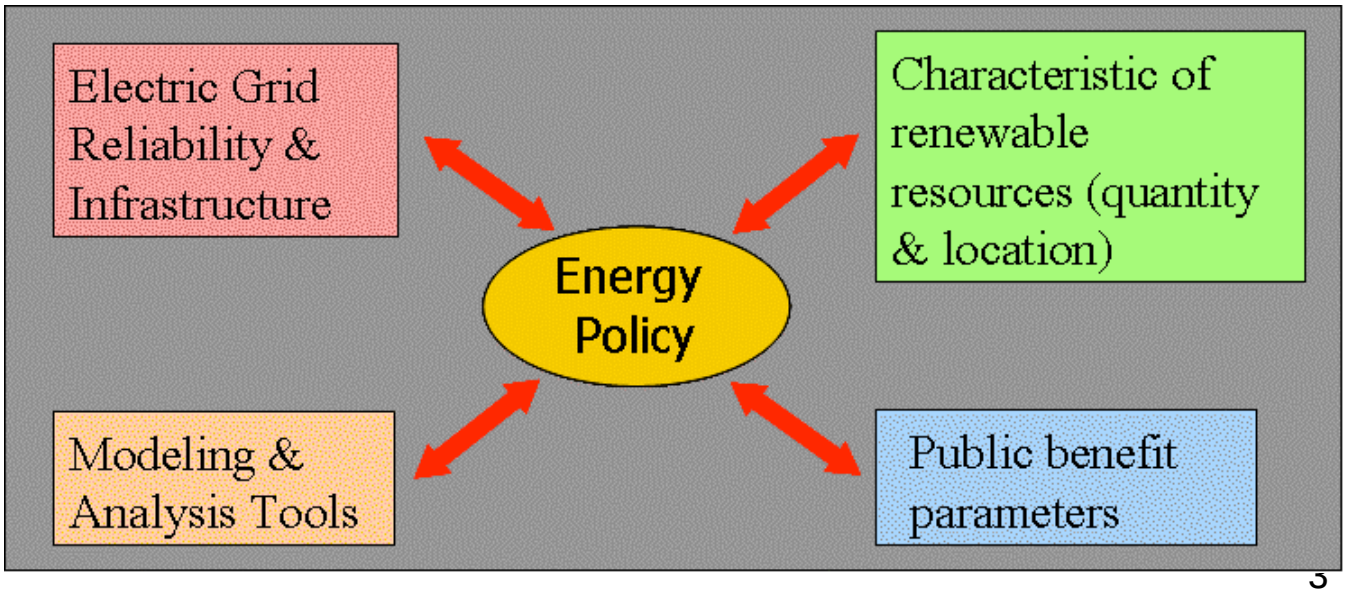
- CHP Analysis Objectives
- Background
  - Strategic Assessment Approach for Renewables
  - Renewable Portal
- Suggested CHP Methodology
- Comments/Questions



CA Energy Drivers

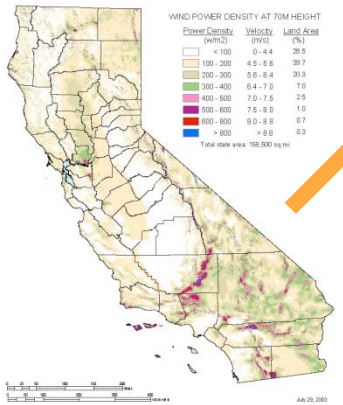
- State and National Energy Policies (AB32, AB1613)
- Environmental & Transmission Impacts
- Public Benefit and Fuel Diversity
- Advanced, Clean Technology Options
- Economically Viable & Reliable Solutions

Unique combination of key elements to meet policy



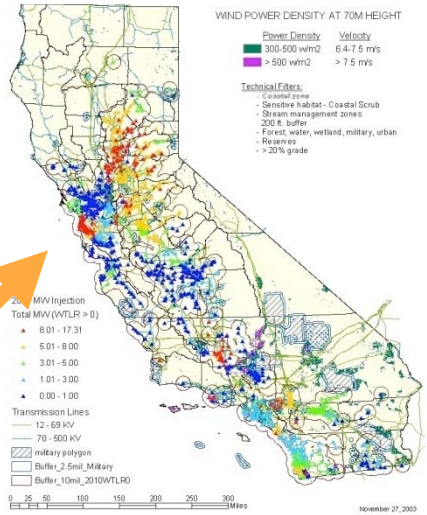
CHP Analysis Objectives

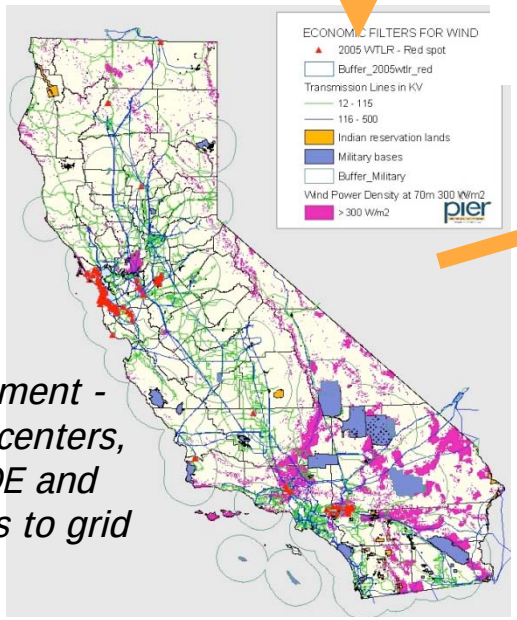
- Combine resource potential, economic information and policy targets into geospatial data layers to inform siting of CHP resource opportunities
  - Incorporate appropriate location and economic filtering criteria
  - Enable consistent visuals & analysis via web-based portal
- Determine the transmission and distribution (T&D) benefits of increasing CHP levels to:
  - Improve system reliability considering portfolio of DG resource (i.e. renewables, PV)
  - Reduce gas usage and carbon emissions
  - Optimize CHP development in strategic areas to reduce transmission congestion and consider MRTU location-based pricing



1. Statewide Renewable Resource Assessment

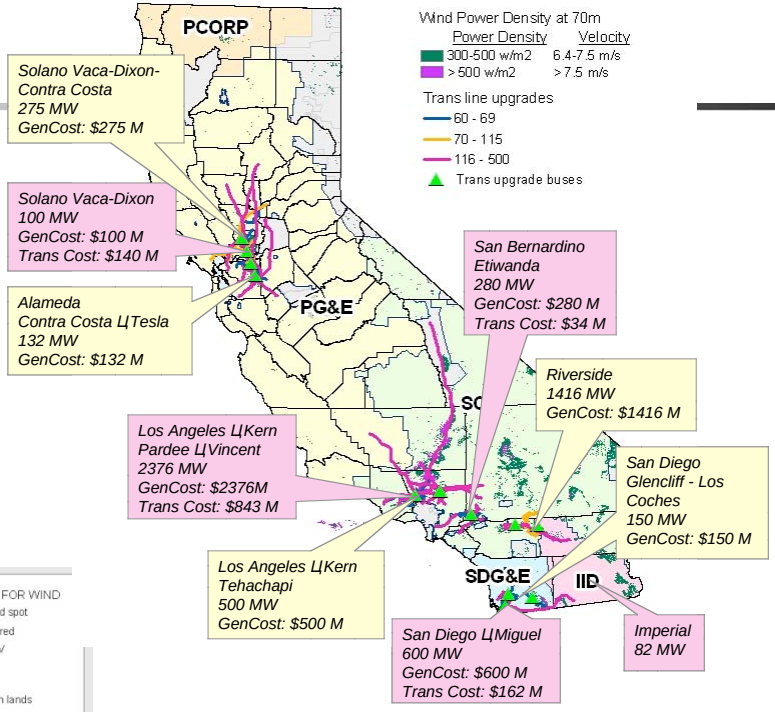
2. Prioritized Transmission based on reliability & operation





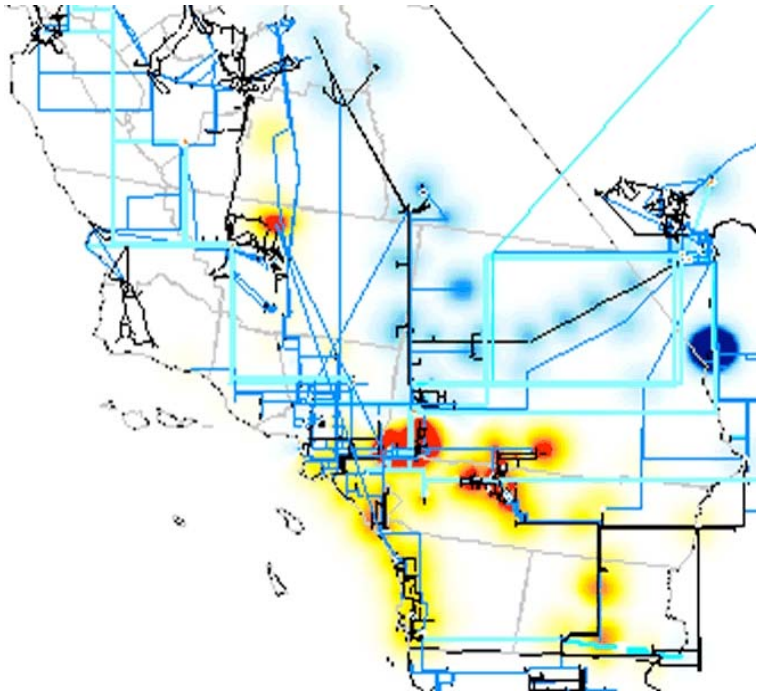
3. Economic alignment - proximity to load centers, transmission, LCOE and maximum benefits to grid

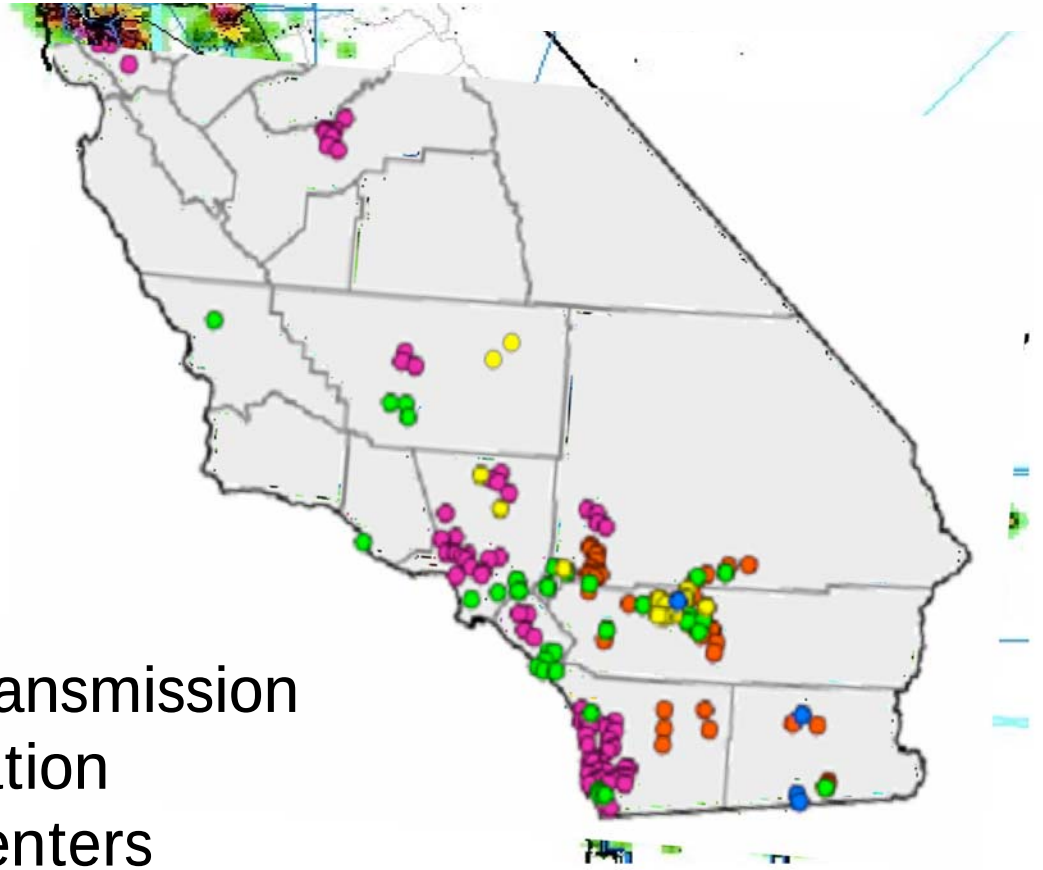
4. Resource options in future scenarios



Integrated Resource Plan

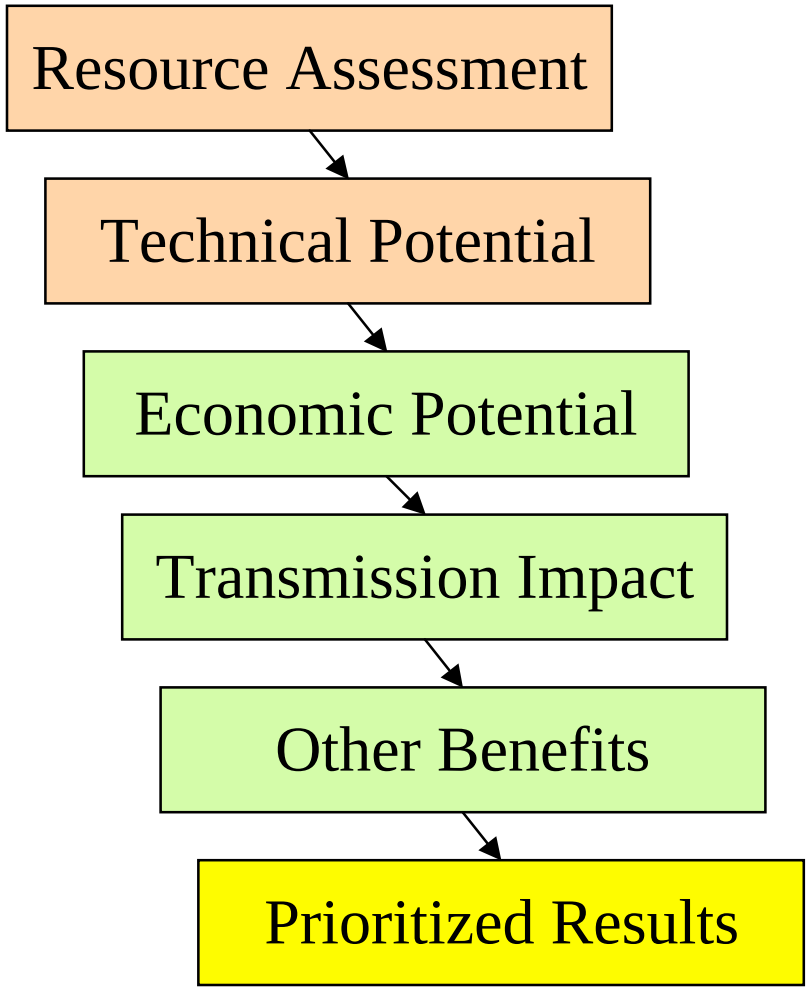
Strategic Assessment Applied for Renewables





Need to connect transmission congestion, generation solutions to load centers

Strategic Assessment Approach



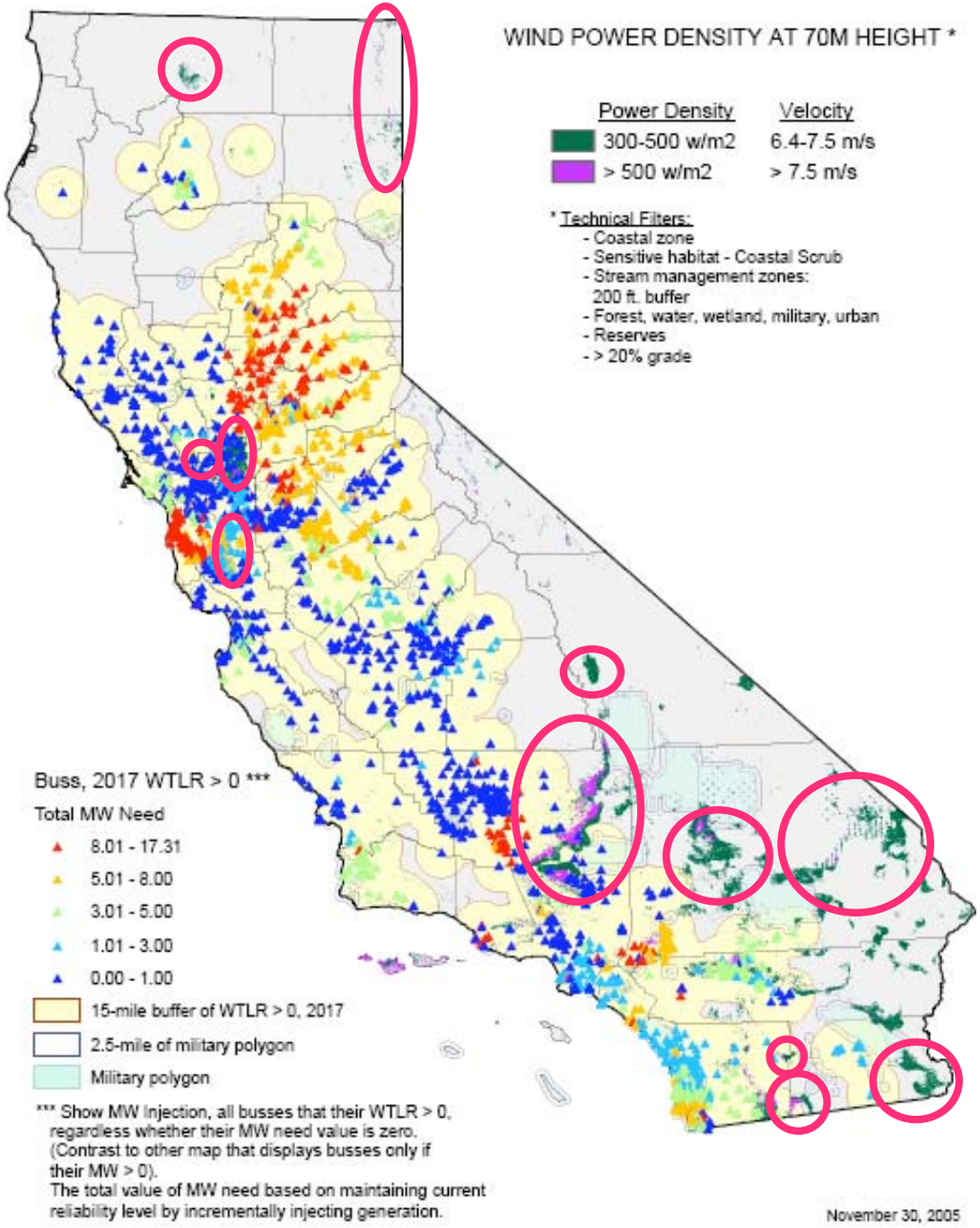
- Identifies key focus locations for development
- Considers development timeframe and economics for maximum public benefits
  - Transmission
  - Environmental
  - Other non-energy benefits
- Prioritizes resources with transmission impact/build-out
- Graphically integrate solutions for policy and planning needs based on a transmission reliability metric

Basic Models/Tools Needed

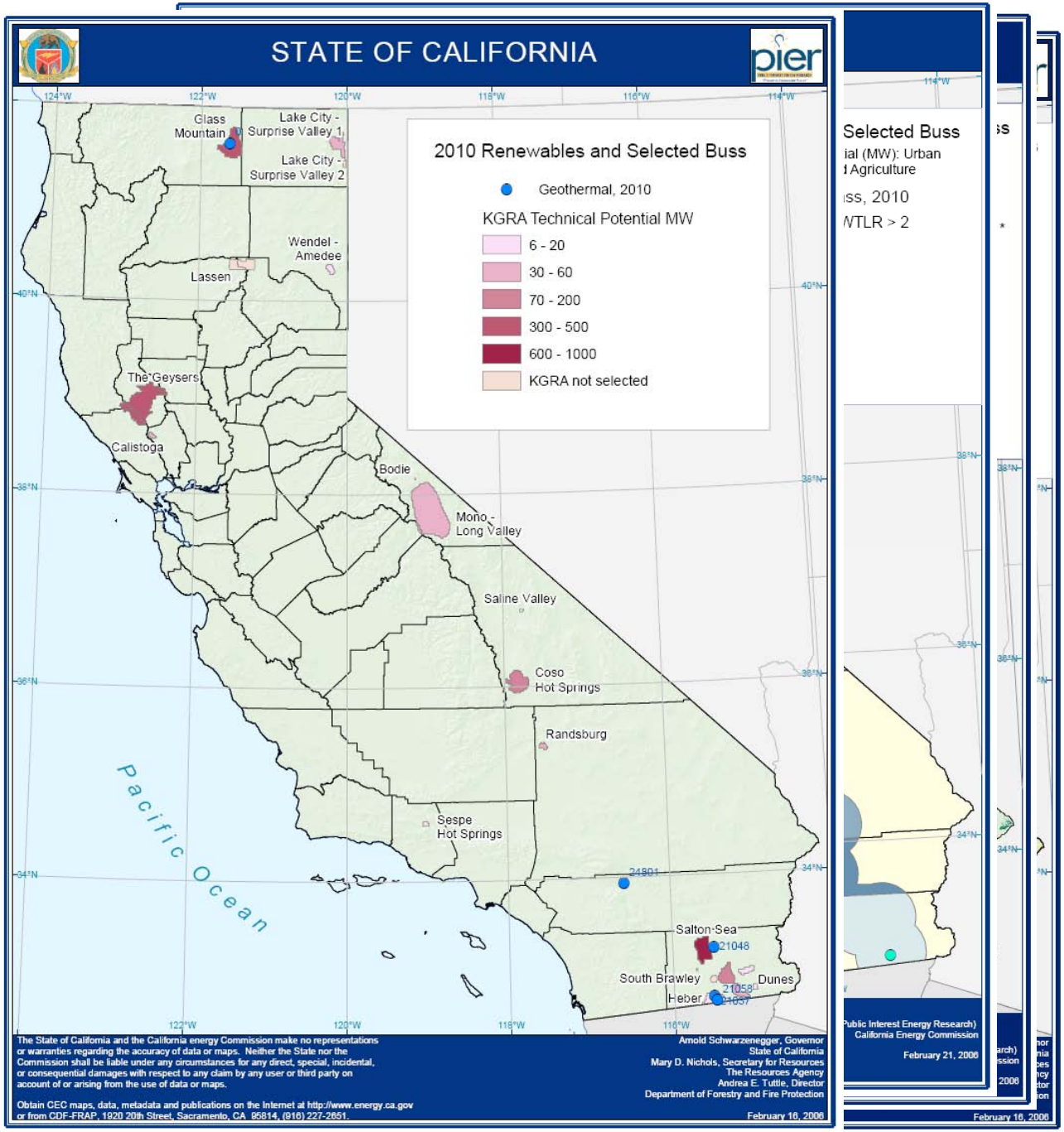
- Technical
  - Renewable resource assessments – locations and performance potential
  - Transmission power flow modeling – current and planned (scenarios)
  - Transmission pathways and updated database
  - Transmission production cost modeling – baseline and future resources
- Economic
  - Cash flow analysis
  - Economic criteria (energy & non-energy)
- GIS visualization & mapping capability
- GIS analysis capability
- Inform & communicate via web-based portal

Exploring New Renewable Development Locations

* forecasting
* performance profiles

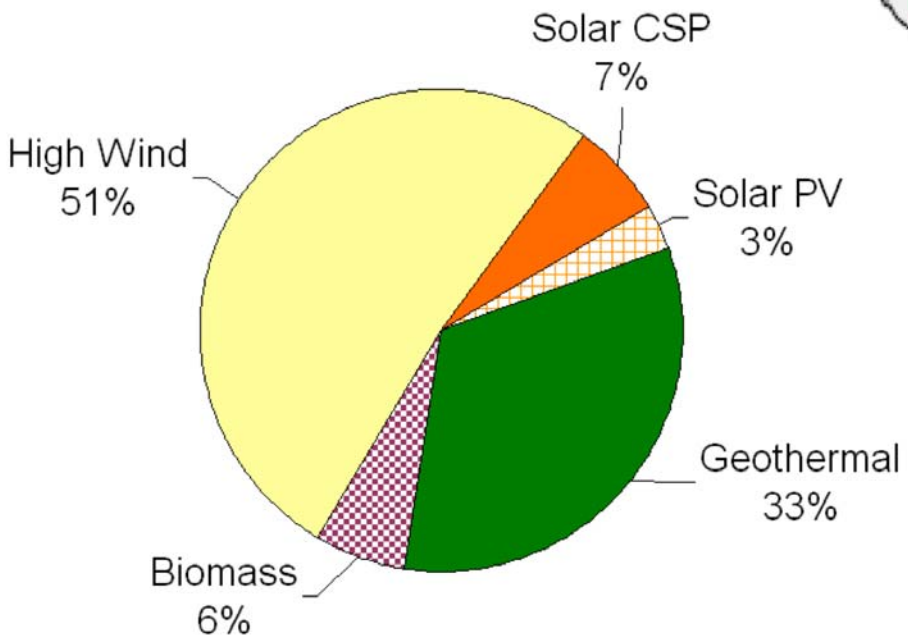


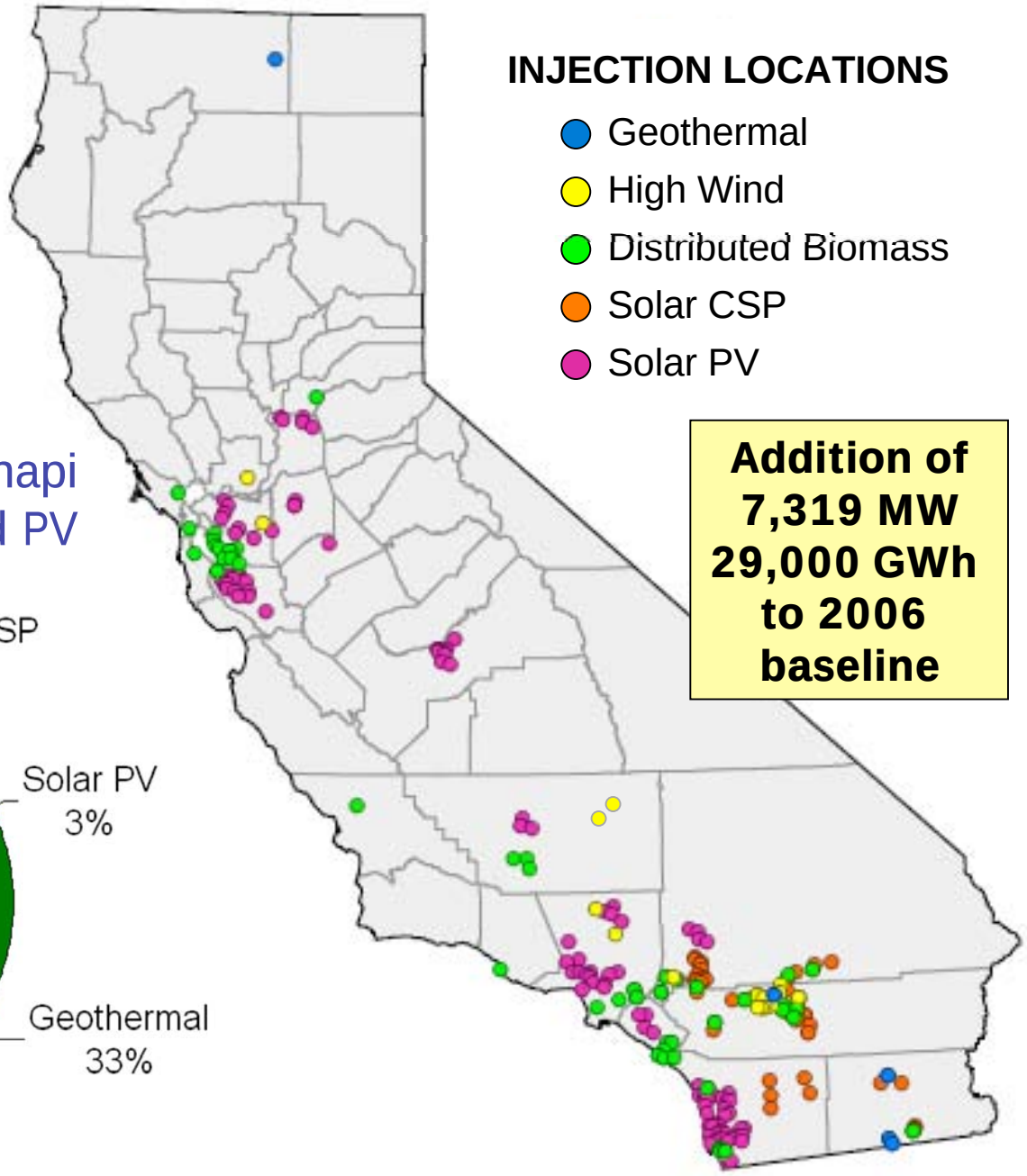
Portfolio of Resources



2010 Scenario

- 20% renewable generation
- Portfolio mix of resources
- 3000 MW of wind at Tehachapi and 3000 MW of distributed PV





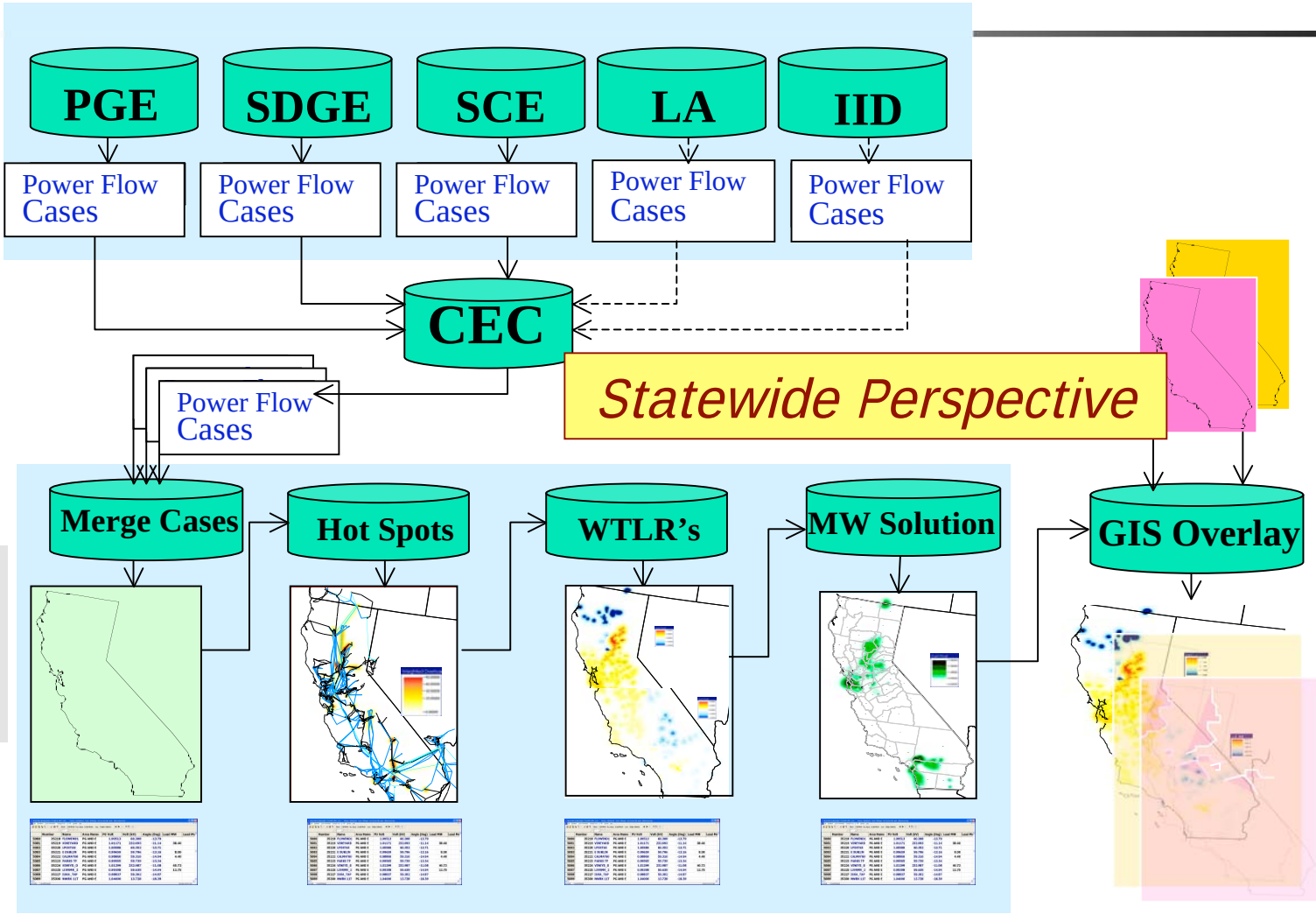
Addition of 7,319 MW 29,000 GWh to 2006 baseline

Transmission Modeling Overview

Utilities

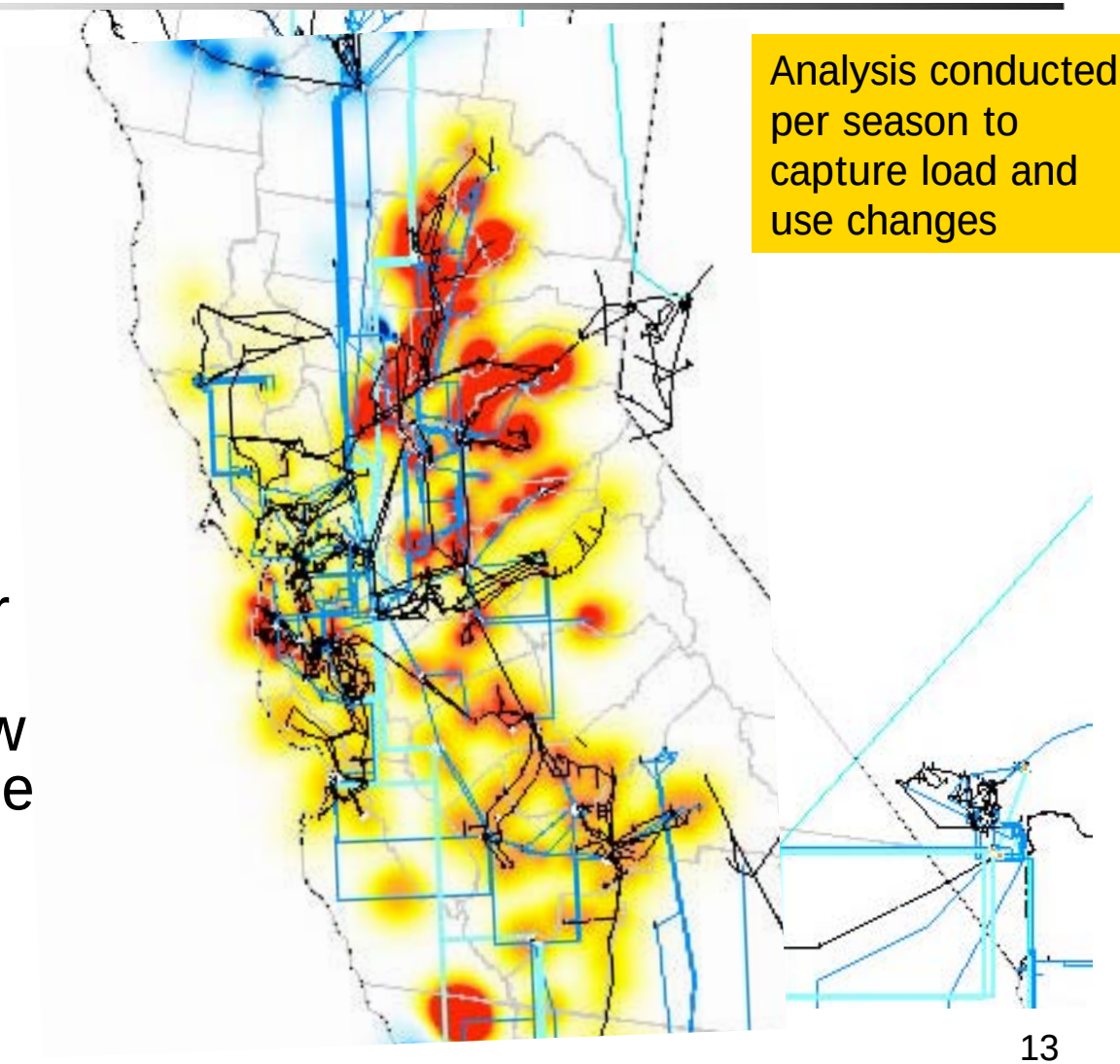
CEC

Trans. Planners



Transmission Analysis

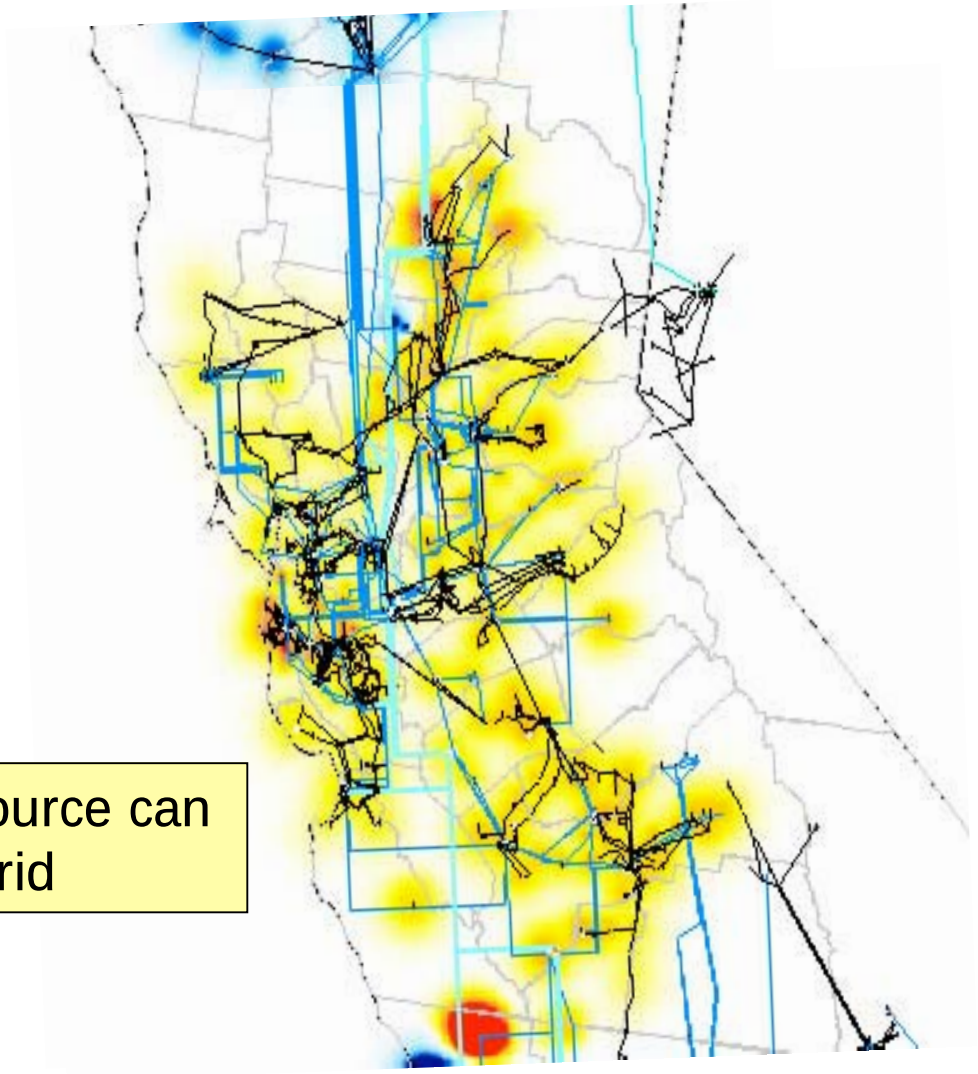
- Link resource to injection location
- Compute Transmission Loading Relief Sensitivities to find high impact buses
- Transmission congestion areas or "hot spots" ranked by areas where new generation would be beneficial
  - Red area best
  - Yellow area good
  - Blue area worst



Analysis conducted per season to capture load and use changes

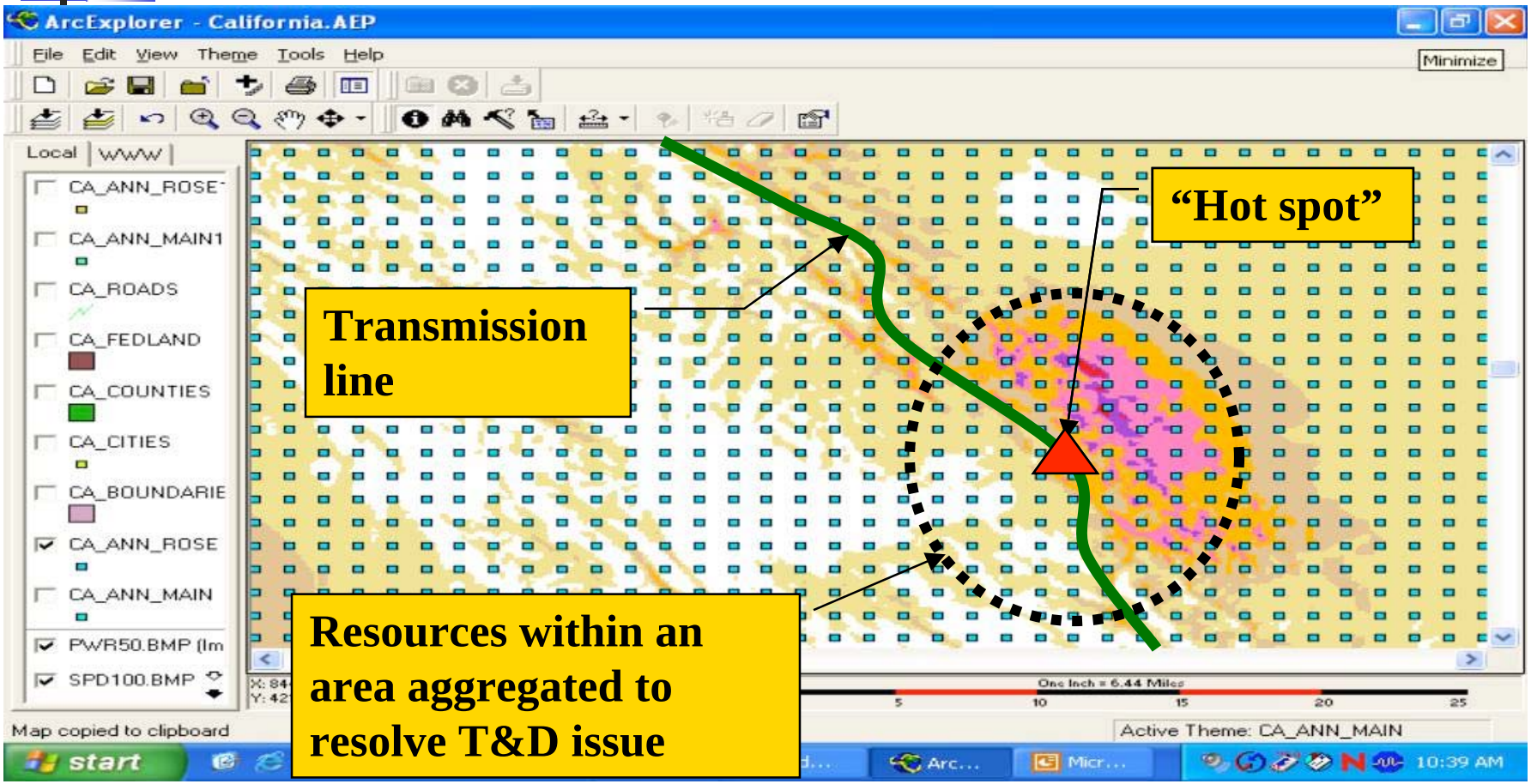
After Renewable Injection

- Strategically located resources reduces “hot spots” significantly
- Overall system benefit by injecting resources at location



Ability to inform were resource can be placed to benefit the grid

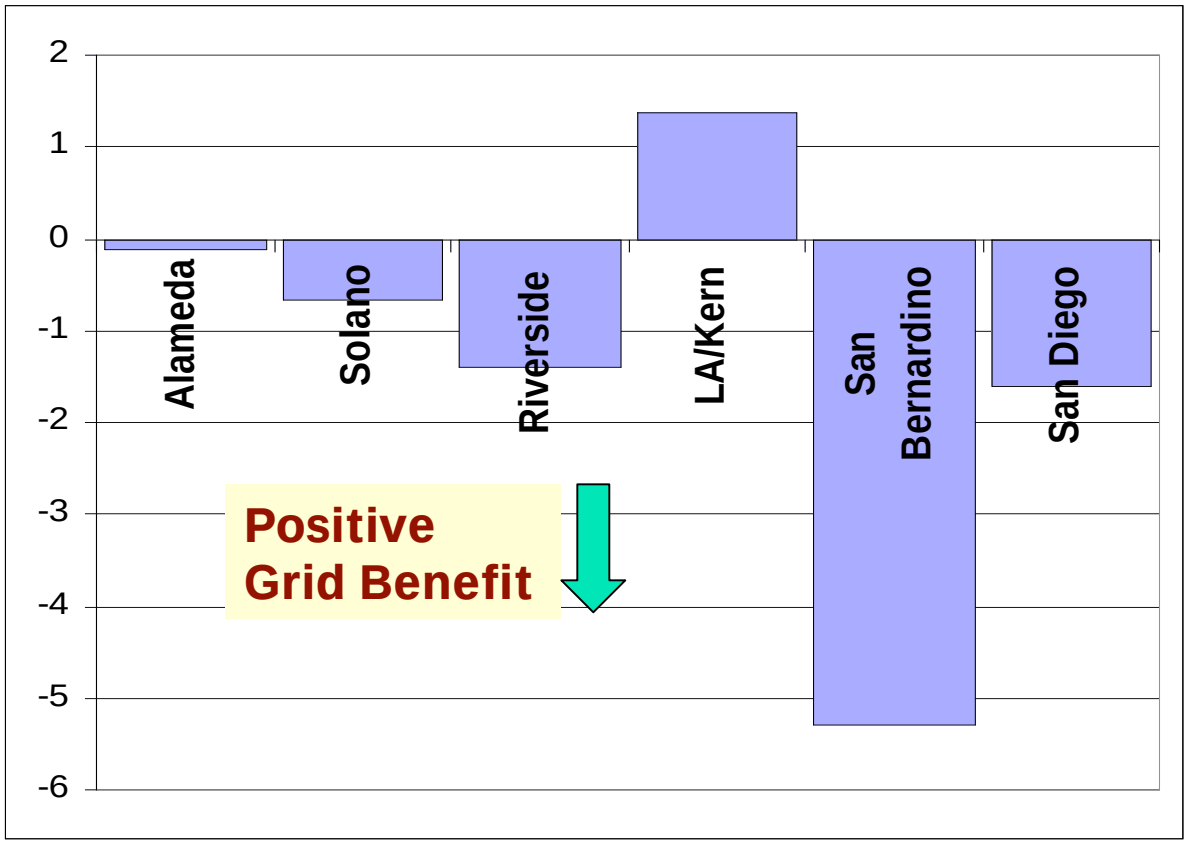
Resolving “Hot Spots” by aggregating resources



Illustrative Example

Locational Evaluation:
Ranking by Transmission Benefit

- Sites located based on wind resource availability, proximity to hotspots, available transmission
- Locations ranked by transmission system metric – *an indicator of transmission benefit*



Illustrative example for new wind potential

Economic Valuation

Generation LCOE

- Standardized cost accounting for technology and year available

+

Transmission LCOE

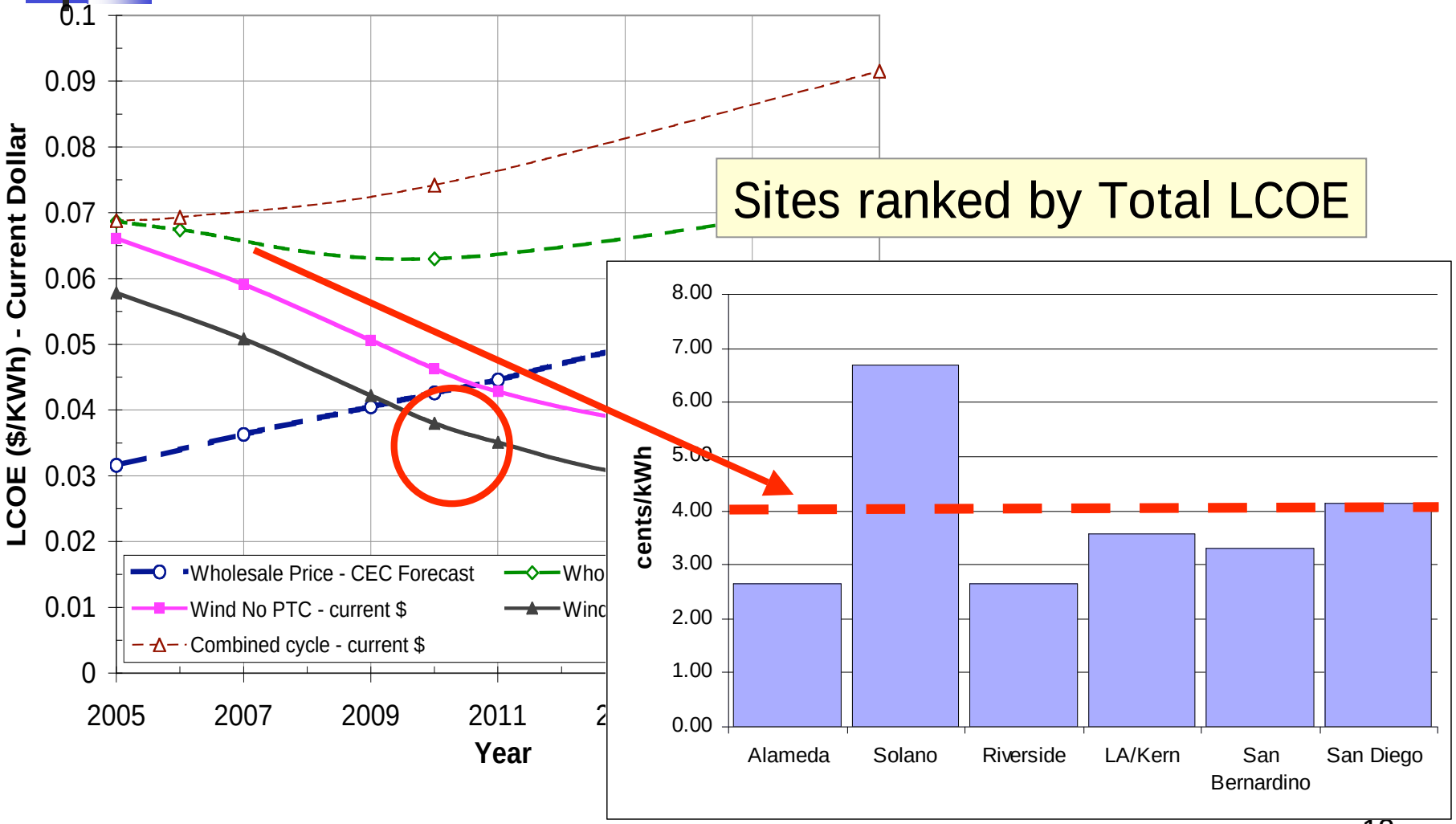
- Estimated integration impacts/ requirements (with contingencies)
- Financial parameters consistent with those applied to the generator

=

Total LCOE

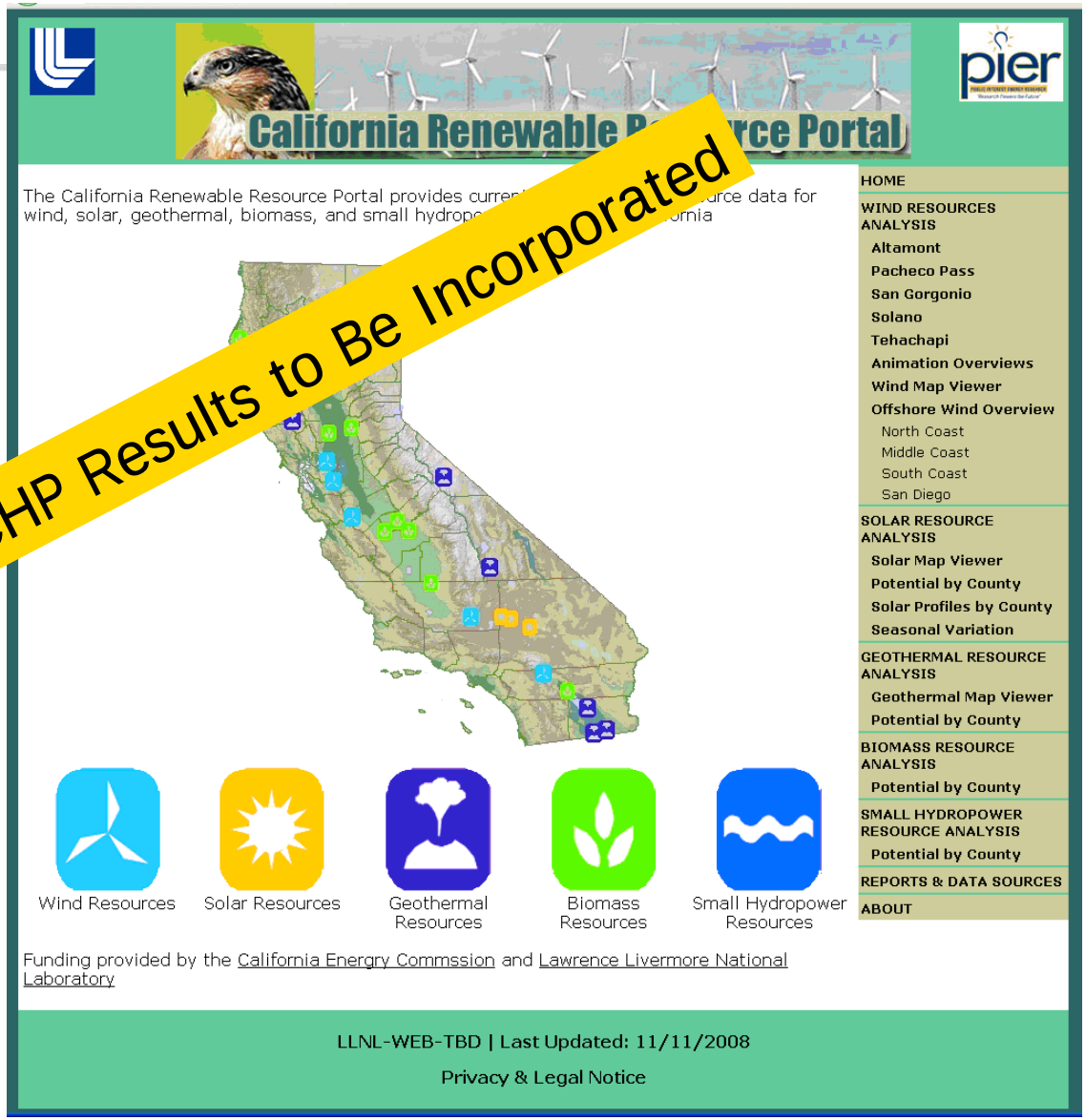
Temporal Evaluation:

Ranking by Economic Benefit

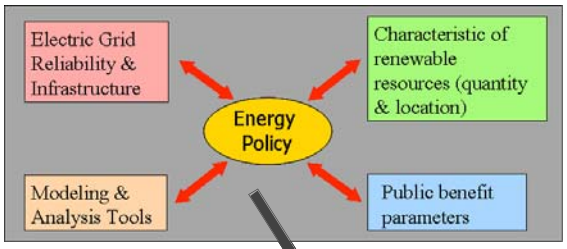


Renewable Resource Portal

- Consolidates and provides access to most recent resource information
- Makes available public research datasets and other databases
  - All renewables
  - Integrated analysis
  - High resolution geospatial information
  - Support planning & research

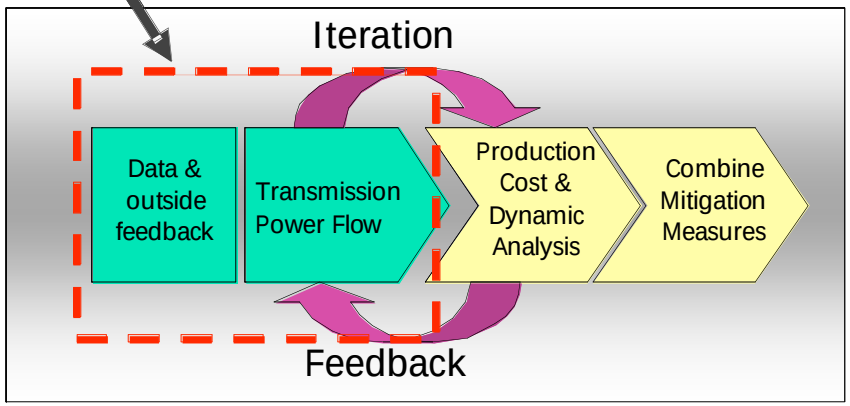


Value of Consistent Data



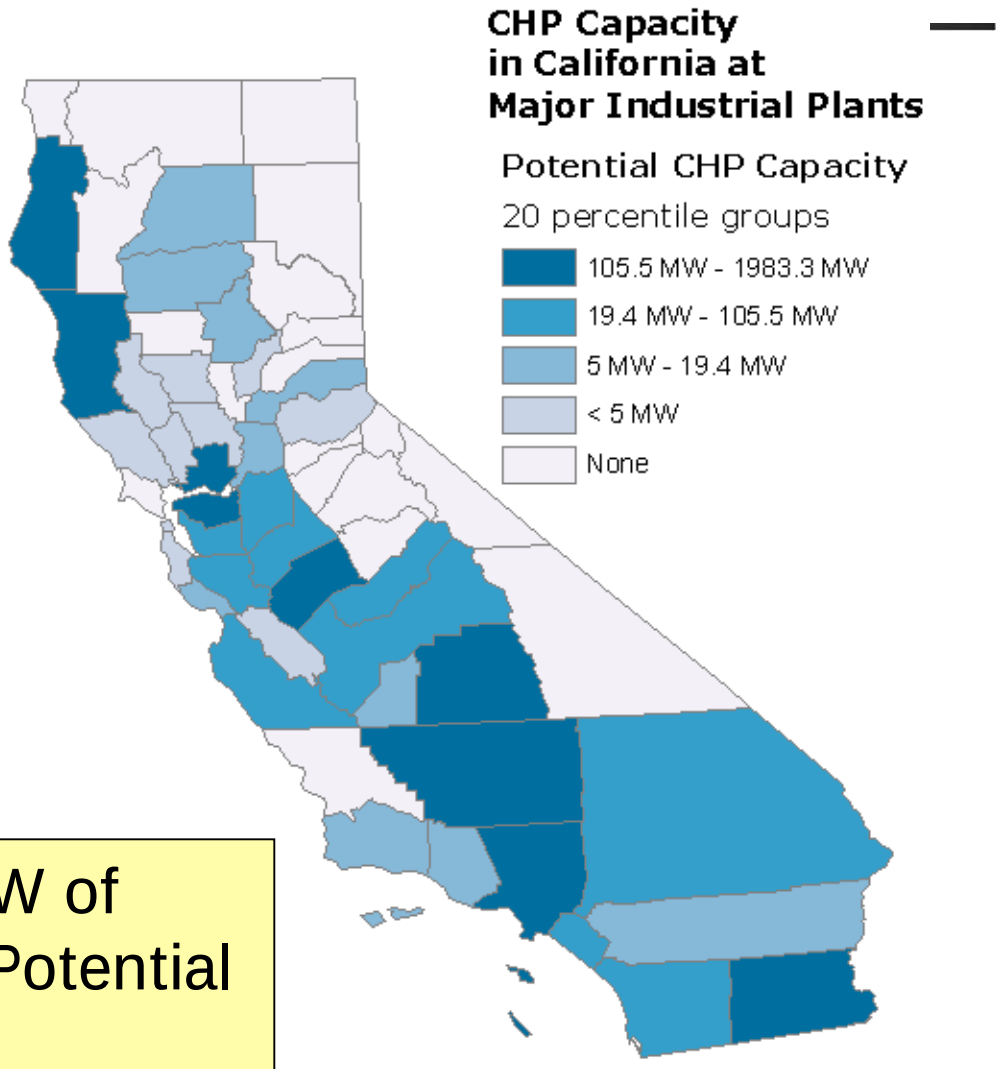
Transmission & Resource Planning

Operational Response & Grid Reliability Management



- 2005 Strategic Value Assessment for Renewables (SVA)
- 2007 Intermittency Analysis Project for Renewable Integration (IAP)
- 2007 Northern California Regional Integration of Renewables (RIR)
- Meta data supporting other Commission study efforts (i.e. AB32 Scenarios Study, RETI)

Potential Industrial Sector CHP by County



Approx 6000 MW of New Technical Potential (947 total sites)

CHP Assessment Deliverables

- Strategic CHP opportunities linked with statewide T&D benefits
- Strategic CHP locations that maximize public benefits and minimize T&D impacts/constraints
- Common assessment framework to compare, combine and co-develop CHP and distributed renewables (i.e. PV, DG resources)
- Public and consistent data sets and metadata
- Common web-based interface for CHP resource analysis linkable with renewable resources

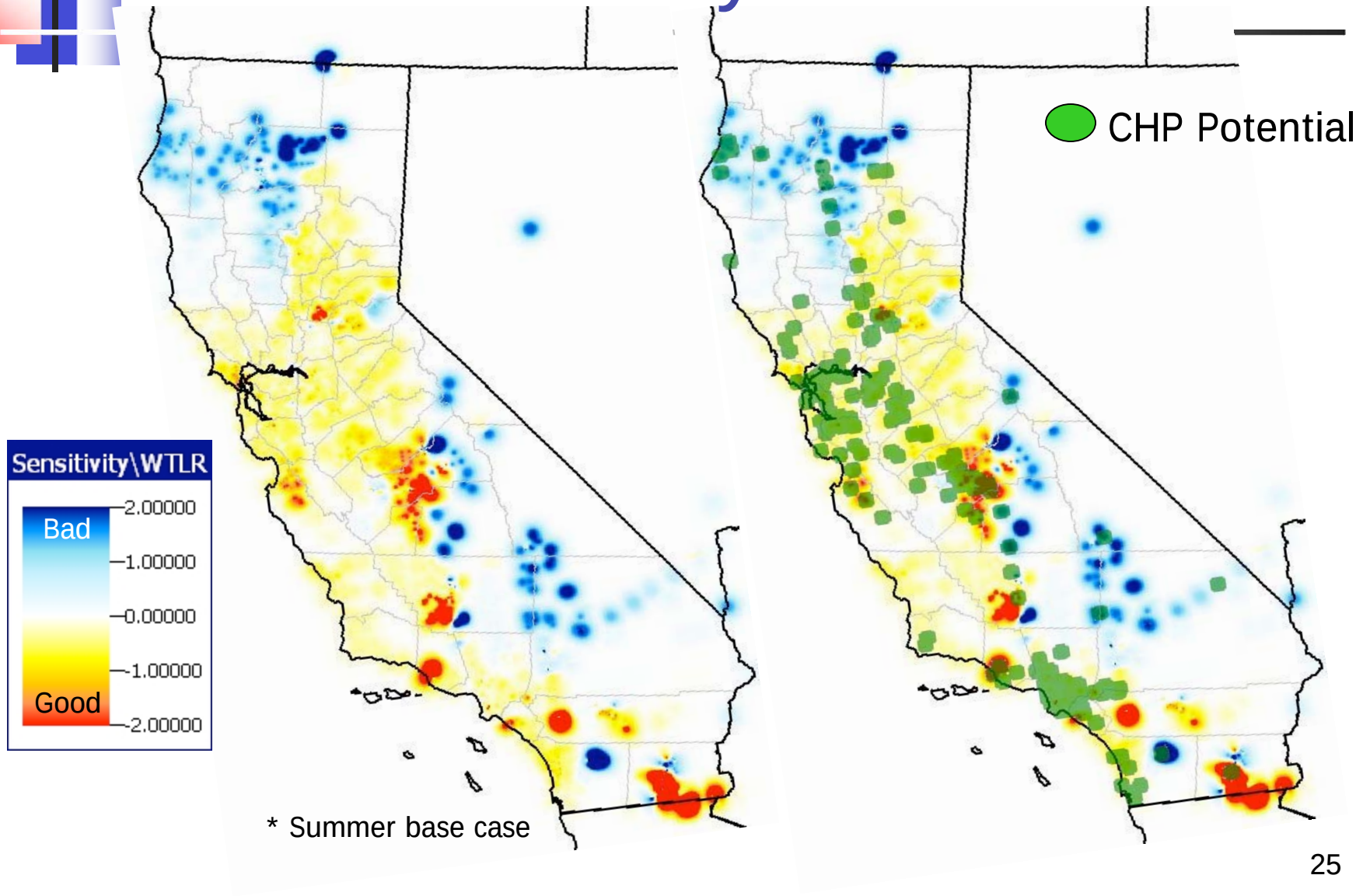
Proposed CHP Assessment Steps

- Identify potential CHP locations by size category (<5 MW, 5-20MW, >20MW)
- Identify areas that have congestion and link with CHP resources
- Correlate CHP locations to injection substation locations aggregated by zip code, counties or other categories
- Conduct transmission simulations for 2020 summer, spring and fall base cases to find CHP injection benefit for alleviating transmission “hot spots”
- Study and resolve summer “hot spots” first

Proposed CHP Assessment Steps (Cont'd)

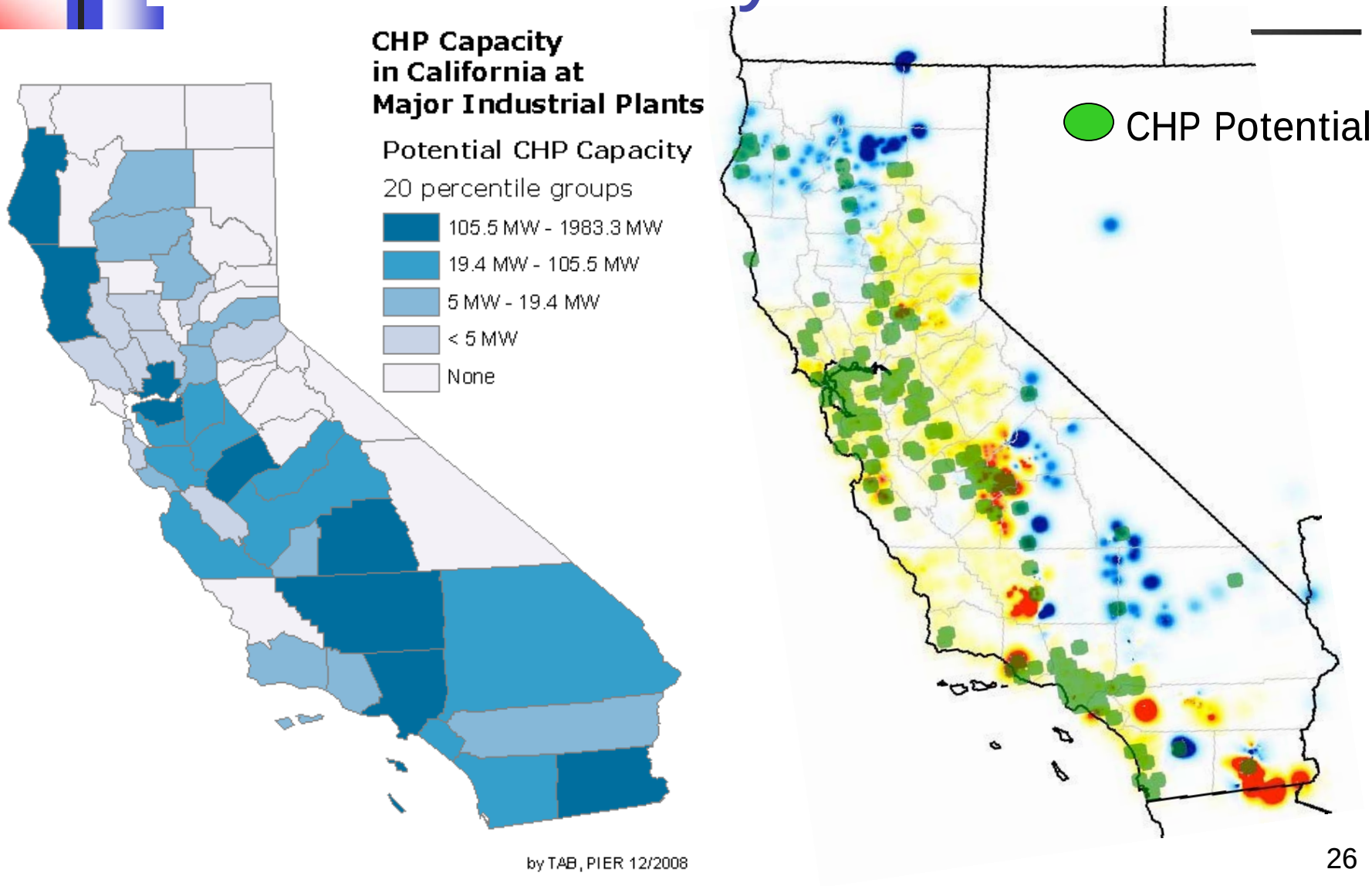
- Determine value of CHP to reduce congestion (locational & temporal)
- Select other locations for study
- Repeat power flow studies
- Repeat studies for spring and fall periods

Transmission Hot Spots with CHP Potential Overlay



* Summer base case

Transmission Hot Spots with CHP Potential Overlay



Summary of Benefits

- Focus on statewide portfolio & T&D planning options
- Focus on locations requiring transmission reliability improvements while supporting distributed renewables and CHP technology development
- Develop tools and analysis which evaluate distributed resources along with conventional generation and quantify system benefits
- Allow for a *common perspective* for evaluating different technologies competing for limited system resources
- Provide a common forum to examine the location and timing of new resources and T&D needs

CHP Assessment

- Categorization?
  - Focus on industrial and commercial potential (any initial insight/input on priority technology, size, locations?
  - Maintain consistent categories as ITRON study (Traditional CHP, Cooling, CHP export market)
- Transmission Assessment Level?
  - Track larges sites individually and aggregate smaller sites for preliminary work with potential to refine details in the future
  - 69kV, 115kV cut-off for distribution to transmission
- Policy, Scenario Targets & Timing?
  - Assess distribution to transmission impact of new capacity at 2020 levels to complementarily achieve clean energy targets (AB32, AB1613 & RPS)
  - Priority regions, markets
- Visualization & Portal Display Capability?
- Overlays to be added?

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