

Fifth Annual Conference on Carbon Capture & Sequestration

Steps Toward Deployment

Geologic Storage – Regional Assessments

Southwest Regional Partnership on Carbon Sequestration: The ‘String of Pearls’ Integrated Assessment Model

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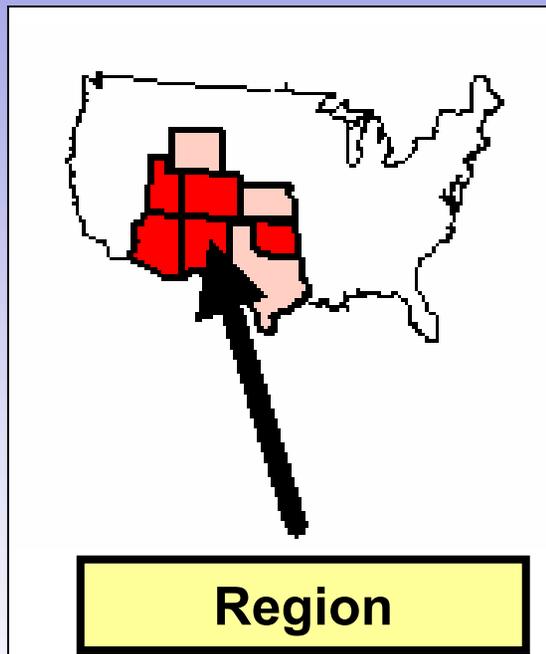
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The Integrated Assessment Model: Carbon Capture, Transportation and Storage

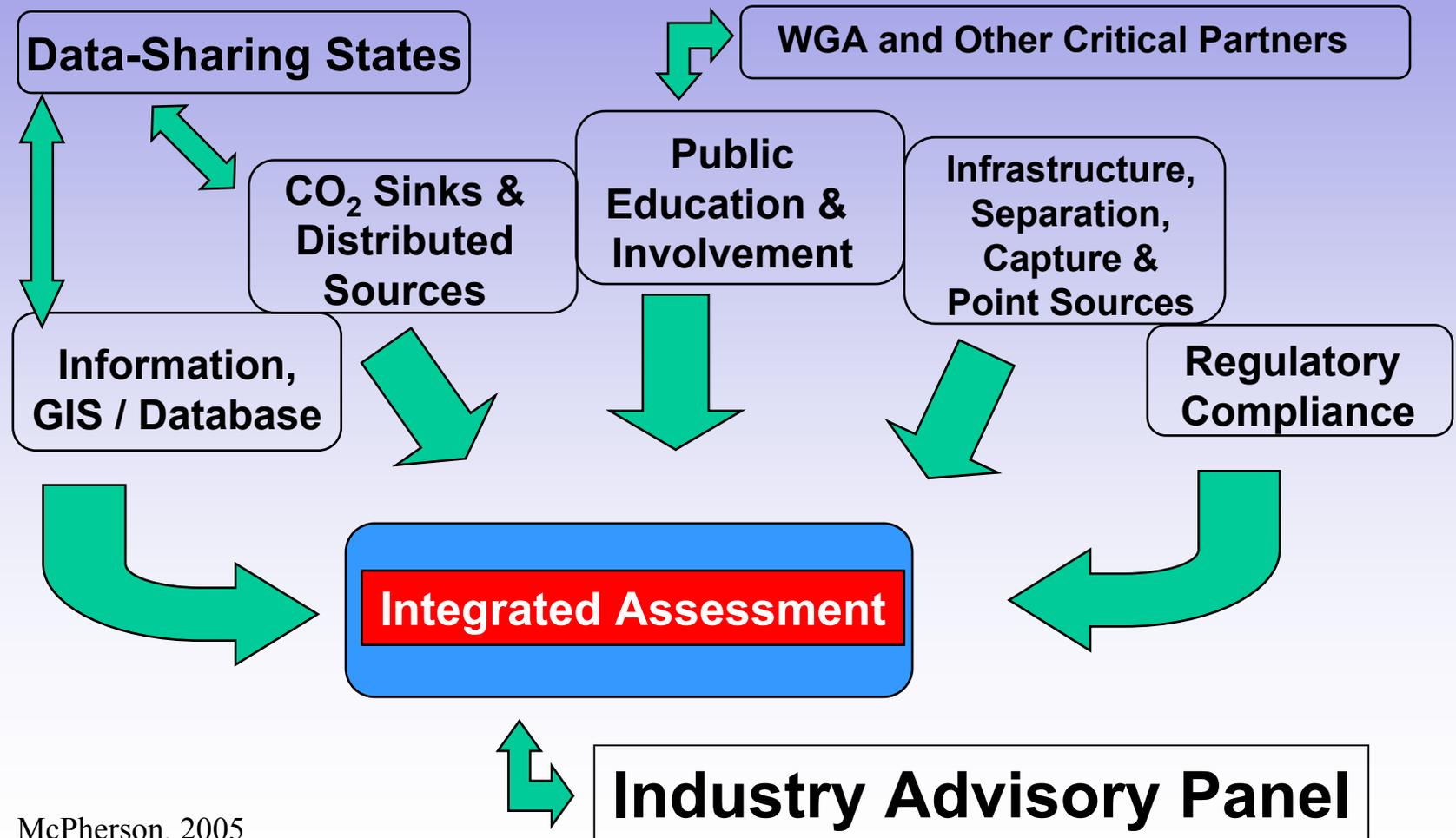
- 1. Address the physical, economic and policy requirements to characterize a carbon sequestration project**
- 2. Develop a high-level methodological framework for analysis**
- 3. Build an integrated assessment model (dynamic simulation computer model) to help interested parties understand the potential screening criteria necessary to develop such a project**
- 4. Apply the model in an illustrative test case, and beyond**

The Integrated Assessment Model: Carbon Capture, Transportation and Storage



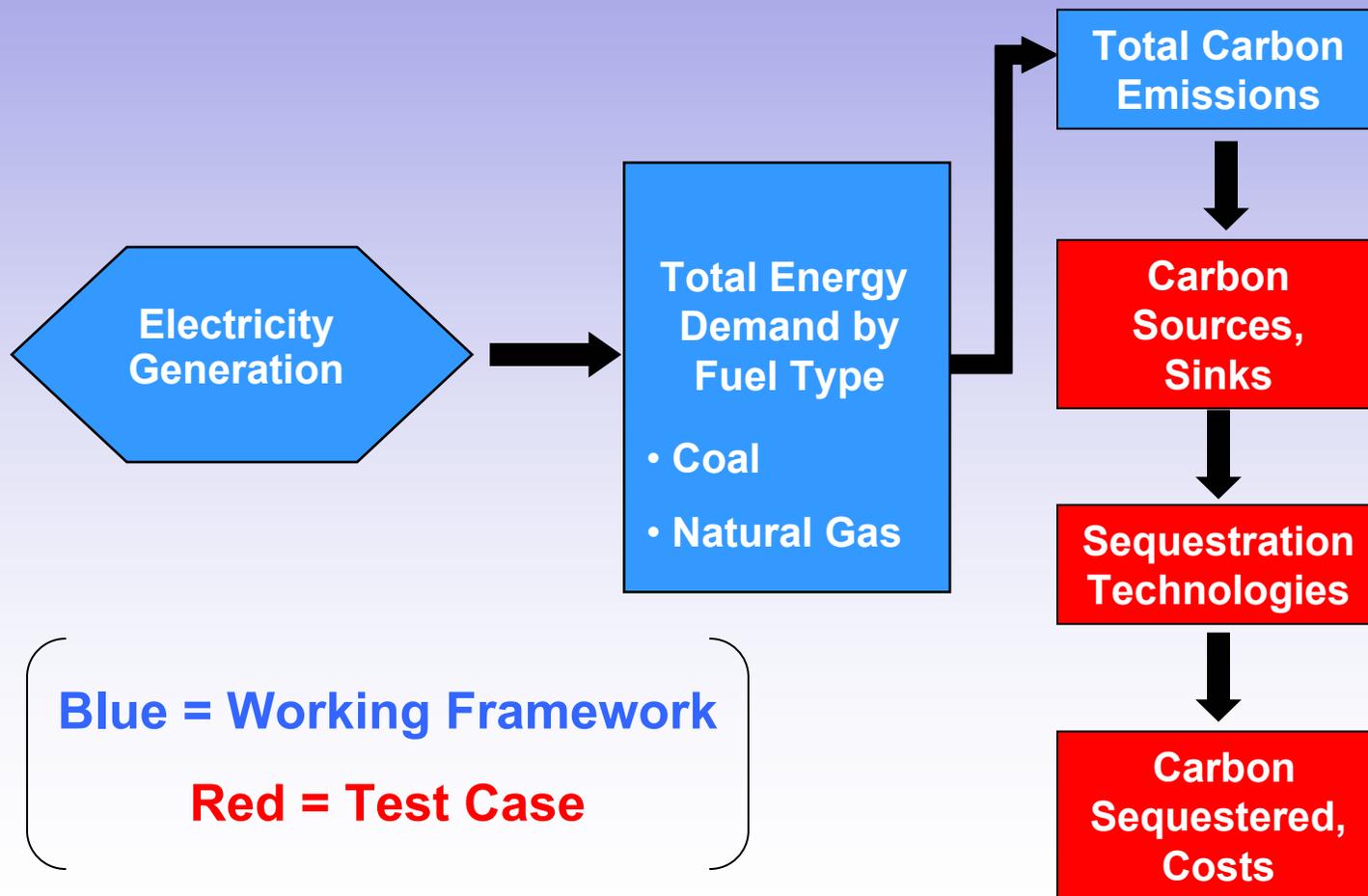
- The Integrated Assessment Team developed a dynamic simulation computer model to characterize the screening criteria:
 - underground geologic storage of carbon dioxide (CO₂)
 - the relative size of the CO₂ flow from the source to the sink
 - economics associated with this system

The Integrated Assessment Model: The SW Partnership Framework



McPherson, 2005

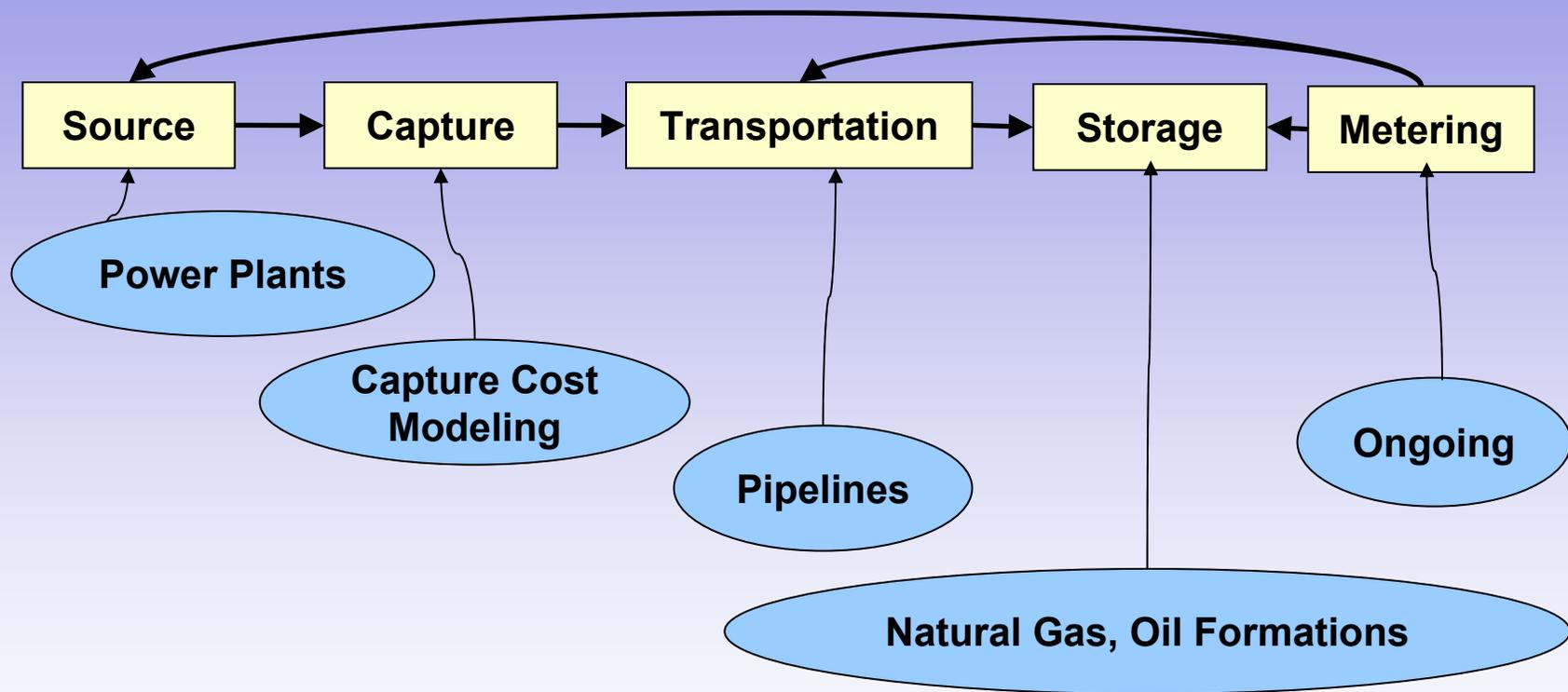
Completed: Regional Energy Model and Test Case Work



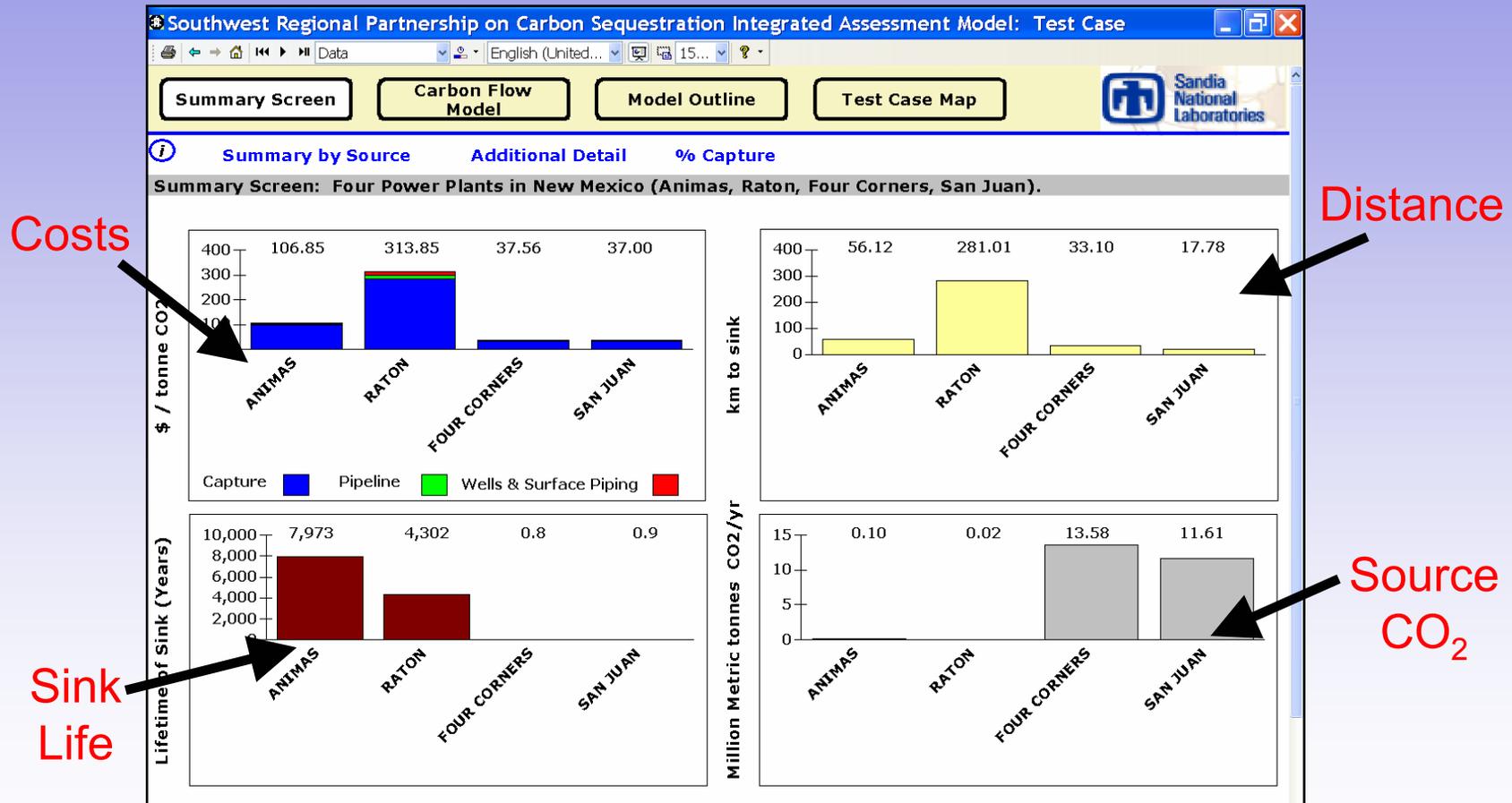
Progress of the Integrated Assessment Modeling Efforts

- Completed:
 - Collected, analyzed and consolidated SW Partnership CO₂ sources, sinks, and related economic information to develop a Test Case ‘systems view’ in the SW Regional Partnership
- Where we are:
 - Employing the String-of-Pearls methodology to develop a CO₂ sequestration network
- To be Developed:
 - Expanding the String-of-Pearls toward the full region (CO₂ sources, pipelines, sinks)
 - Including Pilot Projects in UT, NM and TX
 - Addressing MMV and Risk in the ‘systems view’

Schematic of the Integrated Assessment Model



Completed: Initial Prototype Test Case Model Results Screen

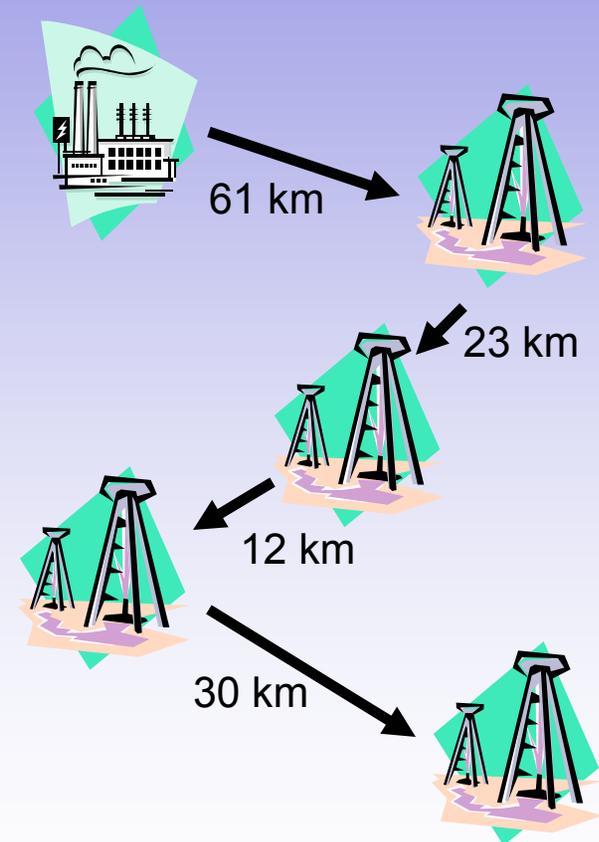


Sources: CO₂ flow (EGRID; EPA, 2005) and costs (GTI/IECM; CMU, 2004); transport flow and associated costs (Williams, 2002; Ogden, 2002); Sink sizes (SRPCS); (90% CO₂ Capture). Summer 2005.

Where we are:

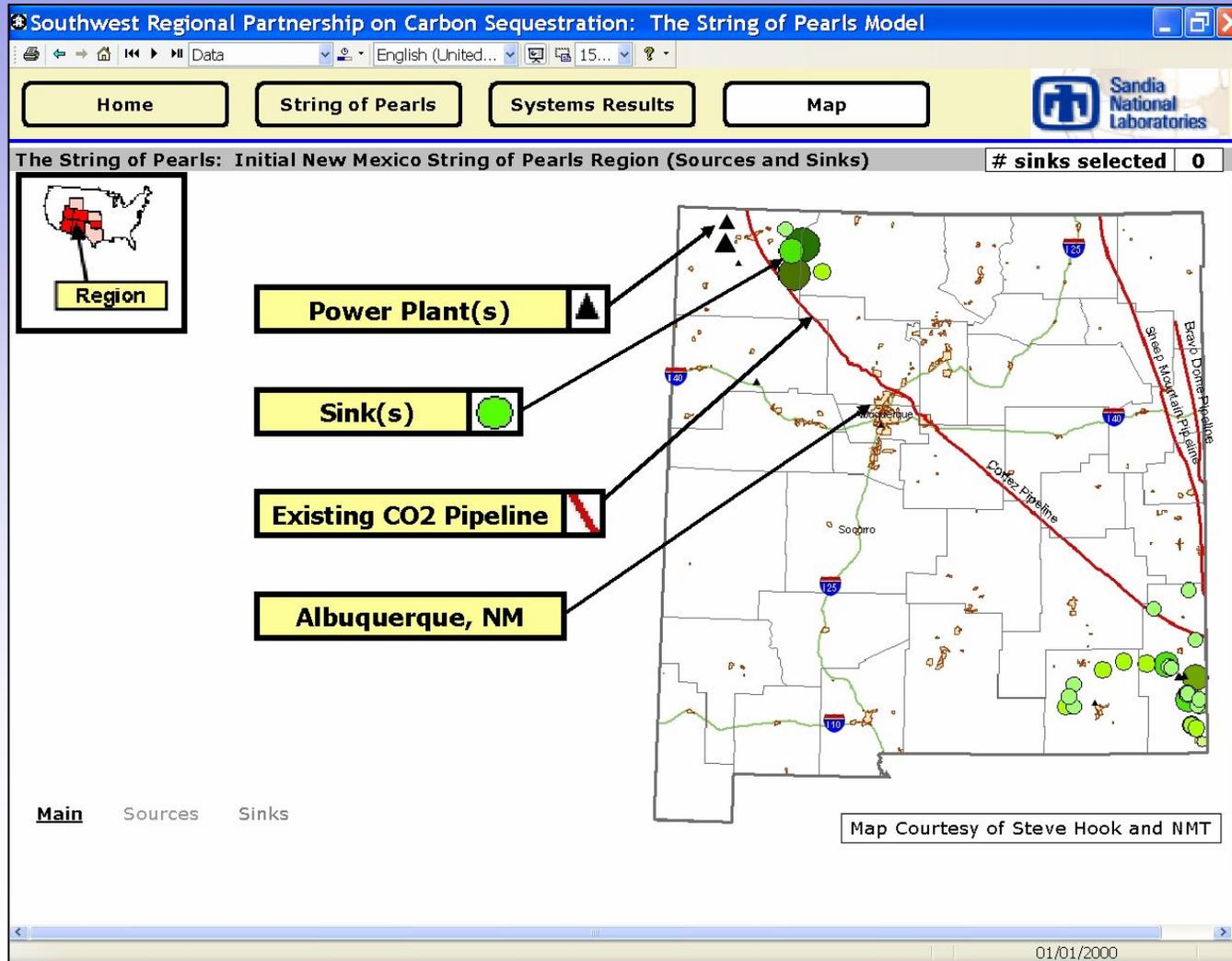
The 'String of Pearls' Model Framework

- Model calculates the distance to transport CO₂ from the source to the closest sink
- Then calculates the distance from the first sink to the next closest sink, and so on until a network of sinks are used
- Looking to address additional metrics (e.g. largest sink volume, lowest overall cost, etc.) for additional systems insight



(picture and orientation not to scale)

Where we are: The 'String of Pearls' Model Framework



Where we are: The 'String of Pearls' Model Framework

The screenshot shows the 'String of Pearls' Model Framework interface. The browser title is 'Southwest Regional Partnership on Carbon Sequestration: The String of Pearls Model'. The interface includes a navigation bar with 'Home', 'String of Pearls', 'Systems Results', and 'Map' buttons. The main content area is titled 'The String of Pearls: Choose a CO2 source (Coal, Gas, Custom), and watch or select the String of Pearls sinks.'

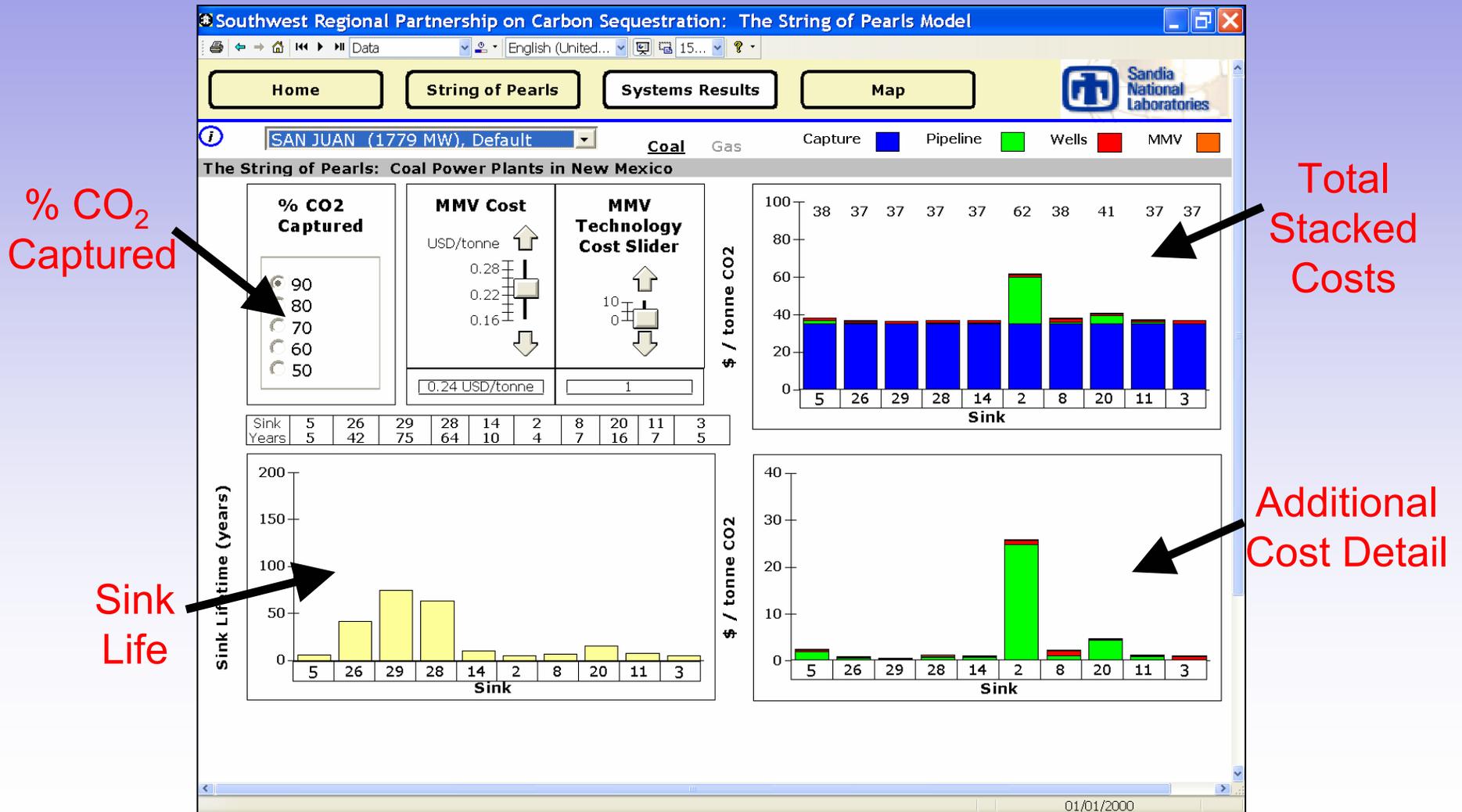
CO₂ Sources: This section allows users to select a source. It includes a radio button for 'Use selected Source (e.g., San Juan)' and another for 'Use custom Source (e.g., Lat., Long.)'. A dropdown menu shows 'SAN JUAN (1779 MW), Defa'. Below this is a 'Choose a Gas source' dropdown and a 'Select a Custom Power Plant Location' section with latitude and longitude sliders.

String of Pearls: This section is titled 'Sink(s): Automatic String of Pearls, or Custom Sink Option'. It contains a table with columns: Plant, Sink, Distance (km), and Cost (\$/tonne). The 'Power Plant' section shows 'Selected' as 5 with a distance of 61.09 km and a cost of 38.20. The 'Sinks' section shows a list of nodes and their corresponding sinks, distances, and costs.

Sink Selection Options: This section includes a 'Distance Between Source and Sinks (km)' slider set to 0, a note 'No Sinks Meet this Capacity Criteria, Default Selected', and another slider set to 1,000. A button labeled 'Click here to Select Specific NM Sinks' is also present.

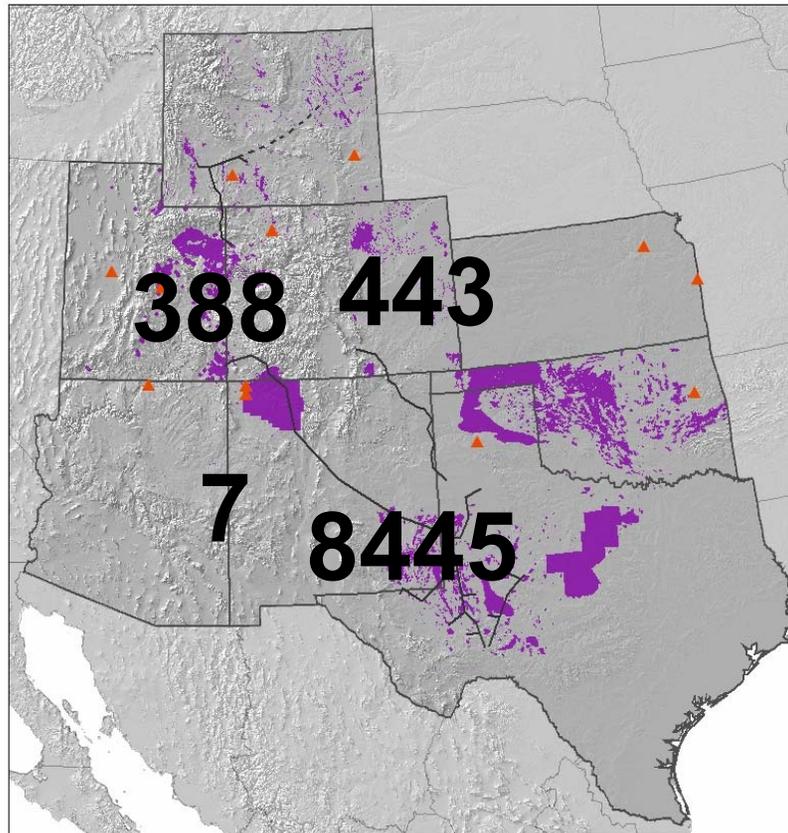
Custom Source: This annotation points to the 'Select a Custom Power Plant Location' section, which includes latitude and longitude sliders.

Where we are: The 'String of Pearls' Model Framework

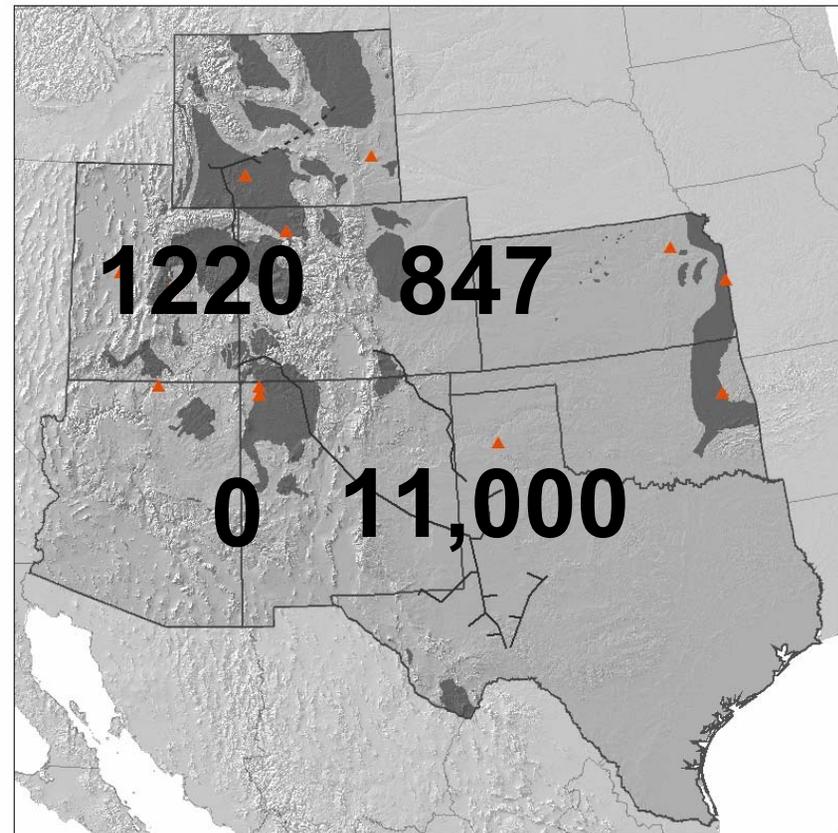


Geological Carbon Dioxide Storage:

Oil/Gas Reservoirs

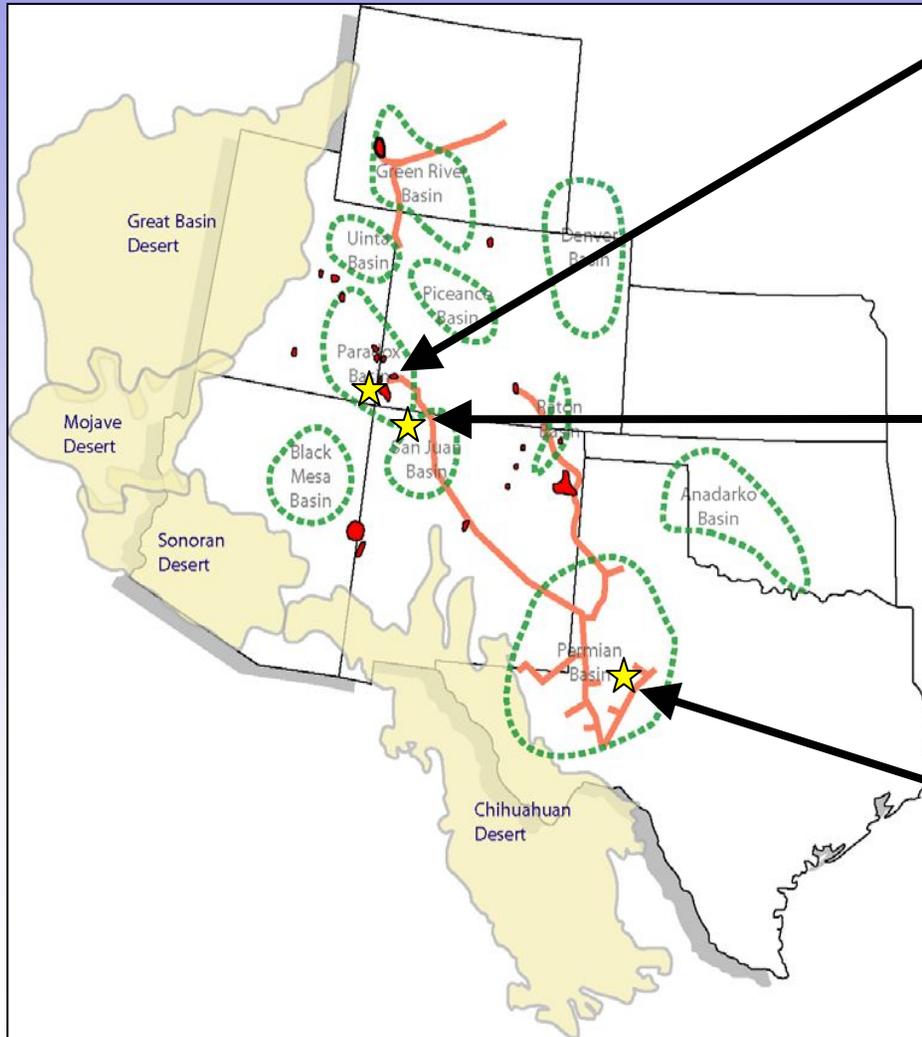


Major ECBM Options



(Million metric tons, excluding OK, TX, WY, Source: McPherson, 2005)

Phase II Demonstration Options: Geological Sequestration



- Paradox Basin, Utah:
combined EOR and deep saline aquifer sequestration pilot test
(*Jim Rutledge*)
- San Juan Basin, NM:
combined ECBM and terrestrial sequestration pilot test
(*Scott Reeves, Joel Brown*)
- Permian Basin, TX:
combined EOR and sequestration pilot test at SACROC & Claytonville
(*Mark Holz*)

Issues to Address for the ongoing Integrated Assessment

- Carbon Model Issues
 - Ongoing development for additional user options
 - Time scale, projections, costs, granularity
- Regional Allocation
 - Economic data are collected on a political boundary basis, sources and sinks are geographic
 - Regulatory issues by political boundary
- Sources of Carbon
 - Utility vs. Non-Utility, Potentially Locate New Plants
- Future Modeling Efforts
 - Focus on demonstration test cases

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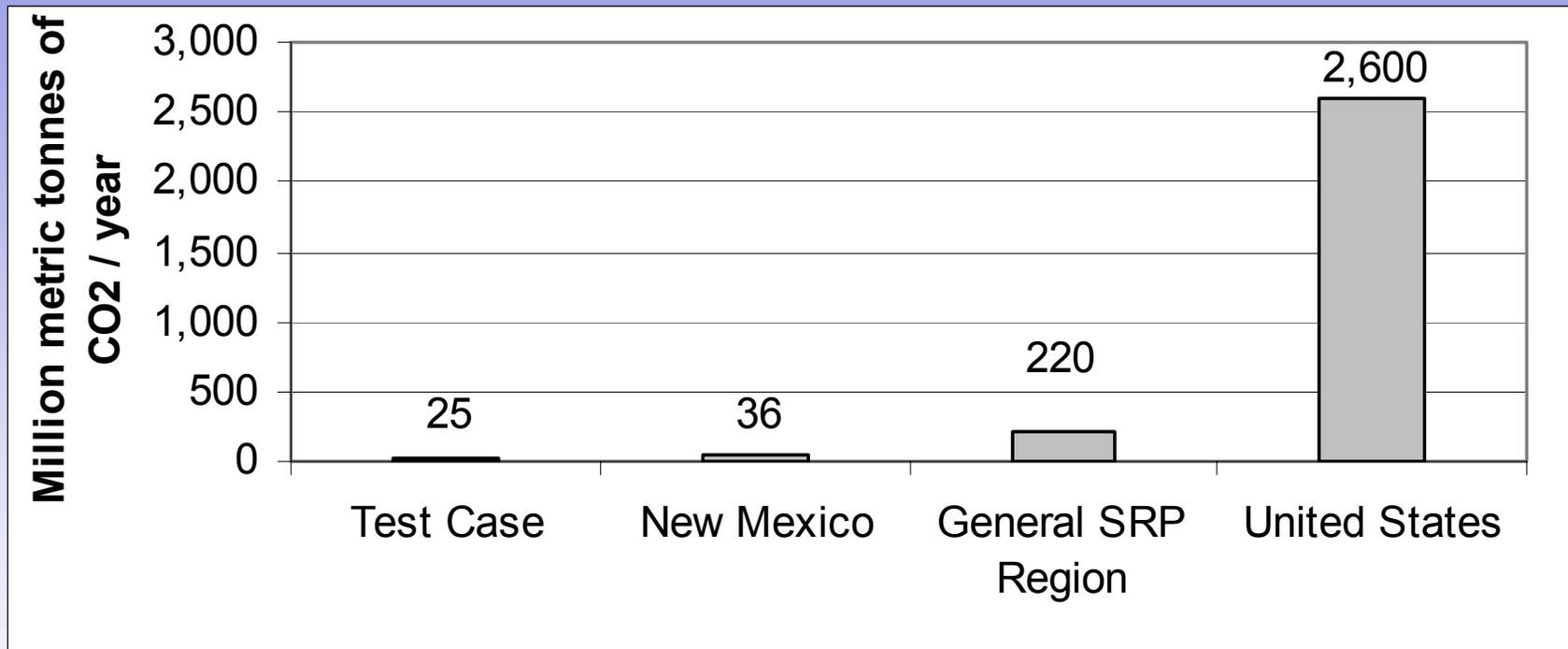
Thank You

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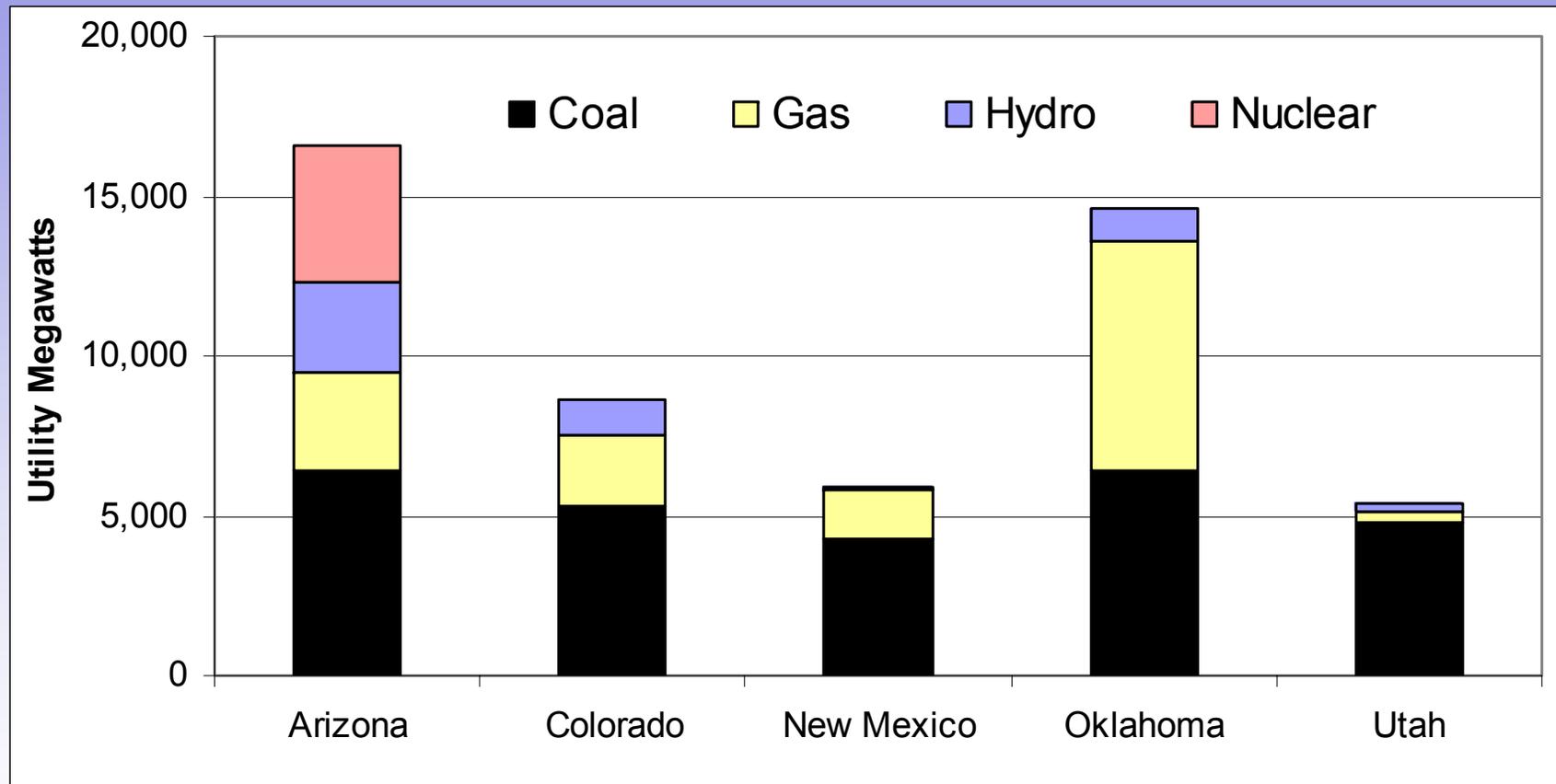
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Carbon Dioxide Emissions in 2000



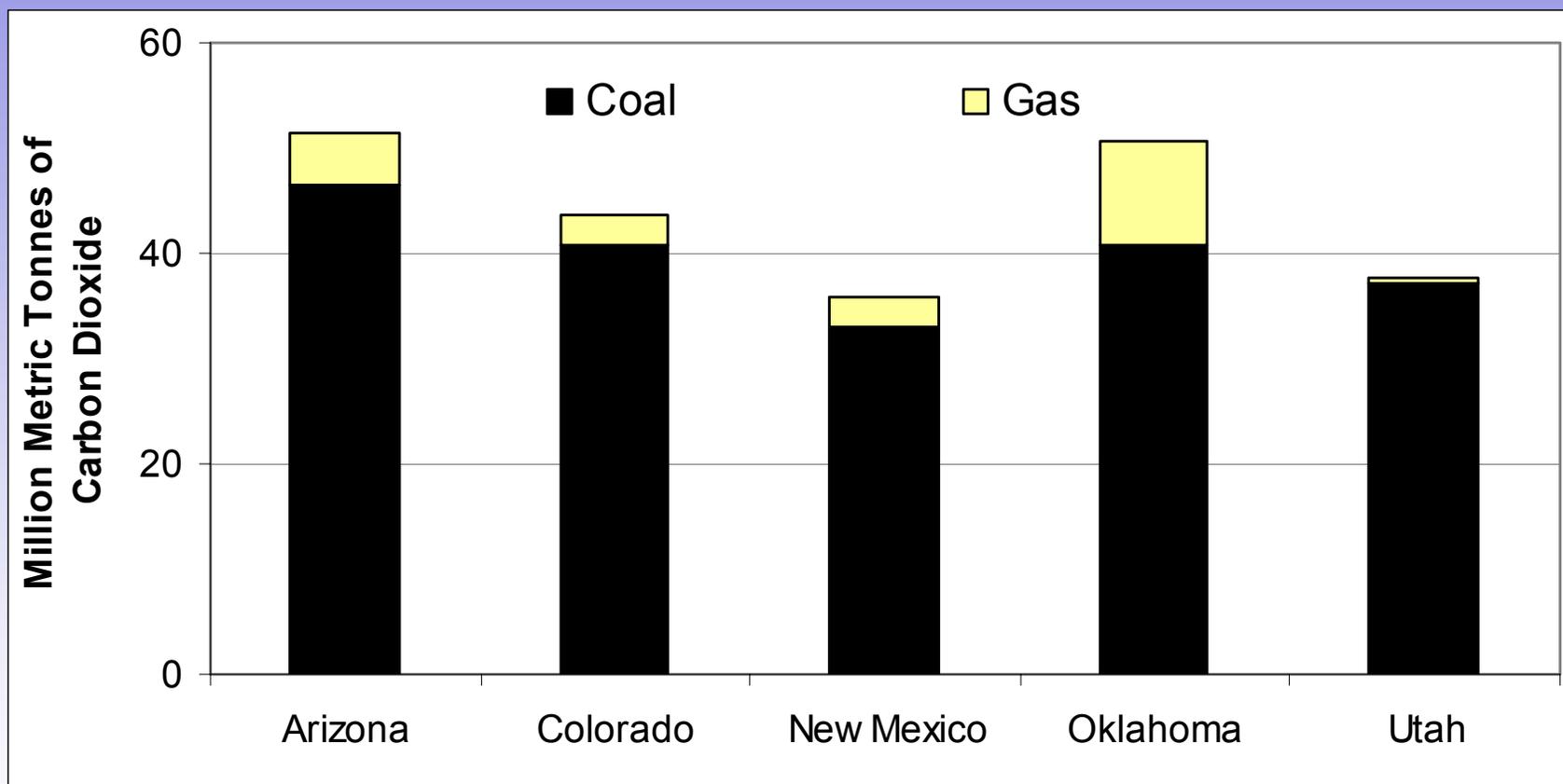
Test Case, New Mexico, the Southwest Region, and the U.S. (Note: Stationary Power Plants only, 'General SRP Region' is the sum of the emissions from Arizona, Colorado, New Mexico, Oklahoma and Utah, (EPA, 2005))

Utility-based Installed Megawatts in 2000



(EPA, 2005)

Million Tonnes of Carbon Dioxide Emissions from Utilities in 2000



(EPA, 2005)