New Mexico Tech Geothermal Research Update

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The Future of Geothermal in New Mexico

A Land of Geothermal Enchantment

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Chapter 2

The Geothermal Opportunity in New Mexico

Kramer Winingham, New Mexico State University
Olga Lavrova, New Mexico State University

New Mexico can position itself at the forfront of the global geothermal transition, ensuring a cleaner more secure energy future for generations to come.

As the first pages of this report make clear: New Mexico is abundant with the geothermal resources and technological expertise necessary to make the state a leader in the industry. All that geothermal potential, largely from the Rio Grande rift and the Jemez Lineament, blesses the Land of Enchantment with as much as 163.32 gigawatts of geothermal electricity potential, not to mention a vast amount of heat for heating and cooling and other direct-use applications.[1] In fact, there is sufficient heat at depth throughout nearly the *entire* state for geothermal energy use of one kind or another. (See Chapter 3, "Where is Geothermal in New Mexico?")

Also, although geothermal development has historically faced higher upfront costs than natural gas, recent advancements are narrowing the gap. Costs are already competitive with other always-on power generation sources. As the oil and gas industry continues to make improvements in drilling and other technology, costs will continue to come down.

Recognizing this potential—including a skilled oil and gas workforce—New Mexico created a $15 million Geothermal Projects Development Fund, as well as a production tax credit of 1.5 cents[2] and consumer incentives up to $9,000 for ground source heat pumps (GSHPs).[3] These incentives aim to reduce upfront costs and make geothermal projects more financially viable. This is a great start, but more can be done.

This report offers policy proposals (see Chapter 7) to accelerate geothermal in New Mexico; it dives into where to find the best heat for the best applications; it explores how to work closely with the state's strong oil and gas industry; and it examines the different people, organizations, and environmental considerations to

Chapter 4

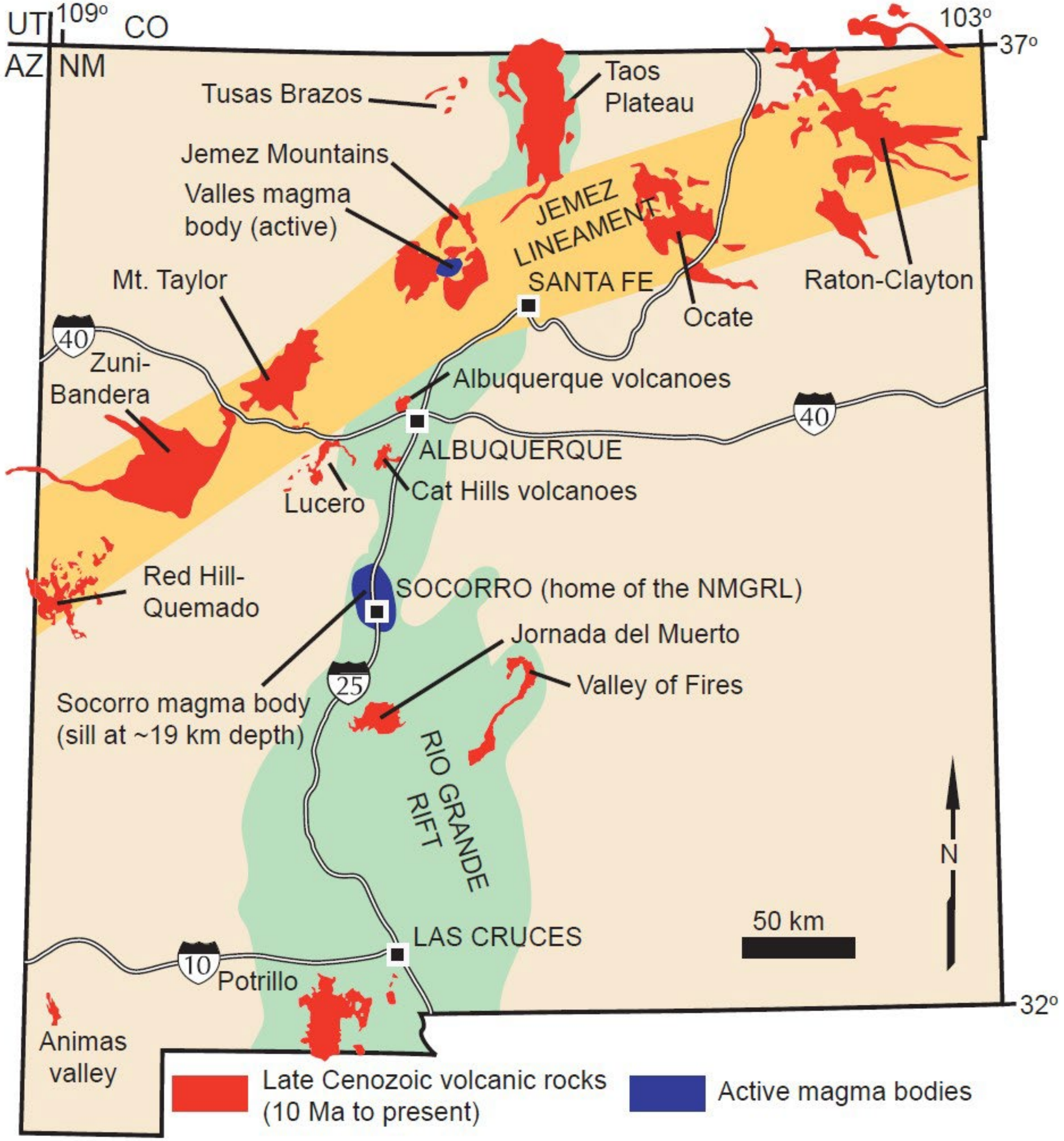
Geothermal Heating and Cooling: Applications for New Mexico's Industrial, Agricultural, Municipal, and Residential Sectors

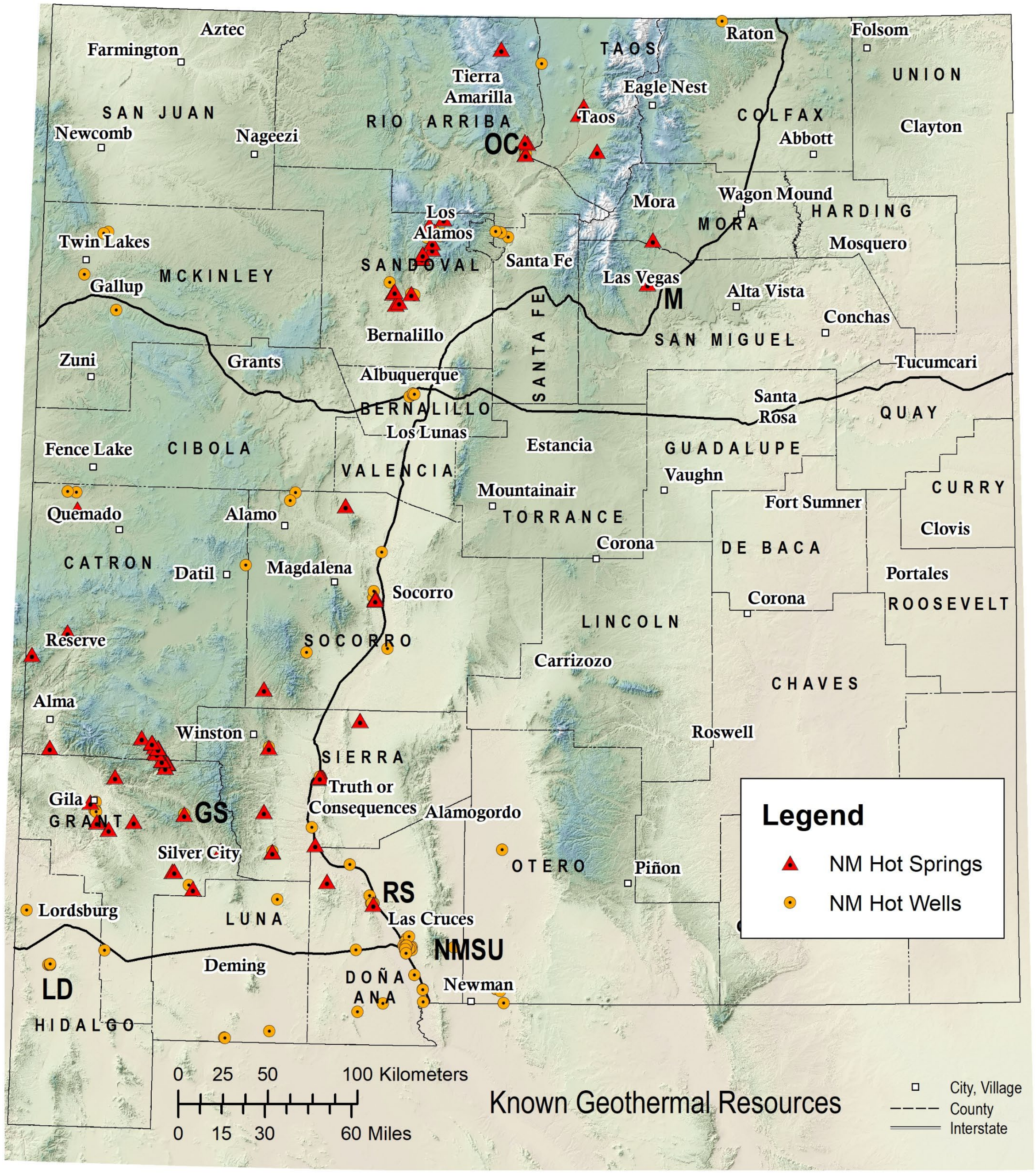
Sarada Kuravi, New Mexico State University
Kramer Winingham, New Mexico State University

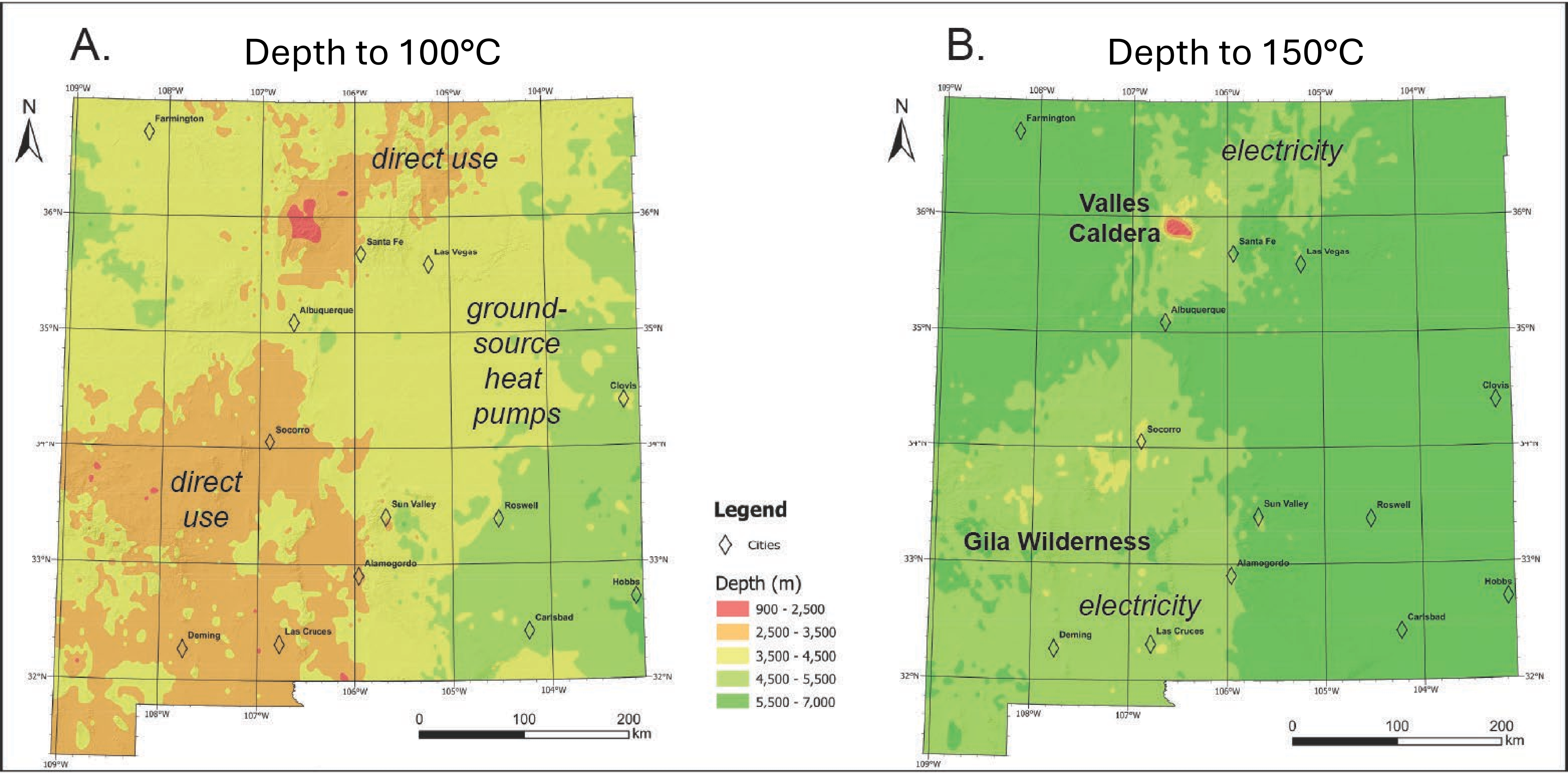
As is covered in other chapters of this report, geothermal has a long history in New Mexico, dating back centuries to Native American use of hot springs, all the way up to the state's first utility-scale geothermal electricity plant, the 15 megawatt Lightning Dock plant, in use today in the town of Animas in Hidalgo County.[1]

In part, the reason the plant is located in Animas is that in the 1960s and 1970s, research by the New Mexico Bureau of Geology and Mineral Resources,[2] prompted by rising oil prices, led to exploratory drilling and feasibility studies in various places in the state.[3] While those studies had limited success, Animas became home for a time to the nation's largest rose-growing greenhouse, powered by geothermal, and it is still home to the AmeriCulture geothermal tilapia farm.[4] The subsurface potential that prompted that early research holds true today: Directly using the Earth's heat for applications such as heating, cooling, agriculture, and industrial processes can significantly lower fuel costs and reduce emissions.

Nearly all of New Mexico has subsurface conditions capable of providing low to medium levels of heat (about 32°F-482°F, or 0°C-250°C), which could support a variety of direct use applications for industry, agriculture, and the built environment. The lower-temperature resources (32°F-212°F, or 0°C-100°C) are suitable for agricultural heating and low-temperature industrial processes. Medium-temperature resources (212°F-482°F, or 100°-250°C) can support uses in dairy processing, chemical production, and other industrial heating needs. Developing these geothermal resources in New Mexico offers a promising opportunity to tap clean, underground heat to meet growing thermal demands in these sectors.

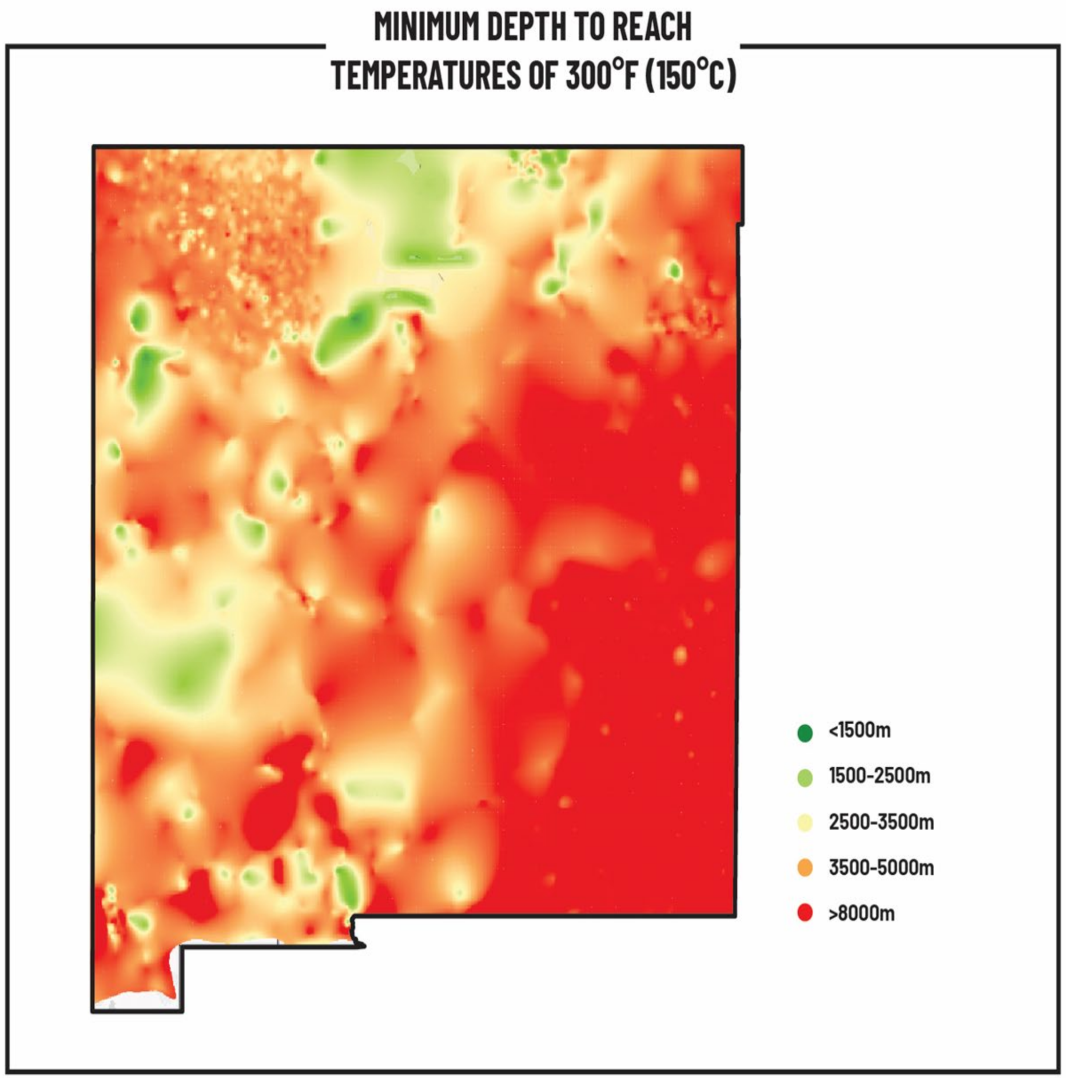

UT
109°
CO
AZ
NM
103°
37°
Tusas Brazos
Taos Plateau
Jemez Mountains
Valles magma body (active)
JEMEZ LINEAMENT
SANTA FE
Ocate
Raton-Clayton
Mt. Taylor
40
Zuni-Bandera
Albuquerque volcanoes
ALBUQUERQUE
Lucero
Cat Hills volcanoes
Red Hill-Quemado
SOCORRO (home of the NMGRL)
Jornada del Muerto
Valley of Fires
Socorro magma body (sill at ~19 km depth)
25
RIO GRANDE RIFT
N
50 km
LAS CRUCES
10
Potrillo
32°
Animas valley
Late Cenozoic volcanic rocks (10 Ma to present)
Active magma bodies


Aztec
Farmington
SAN JUAN
Newcomb
Nageezi
RIO ARRIBA
Tierra Amarilla
OC
TAOS
Taos
Raton
Folsom
UNION
Eagle Nest
COLFAX
Abbott
Clayton
Mora
Wagon Mound
HARDING
MORA
Mosquero
Twin Lakes
Gallup
MCKINLEY
Los Alamos
SANDOVAL
Santa Fe
Las Vegas
M
Alta Vista
Conchas
Bernalillo
SAN MIGUEL
SANTA FE
Zuni
Grants
Albuquerque
BERNALILLO
Tucumcari
Santa Rosa
QUAY
Los Lunas
Fence Lake
CIBOLA
Estancia
VALENCIA
GUADALUPE
Vaughn
Mountainair
TORRANCE
CURRY
Quemado
Alamo
Fort Sumner
Clovis
Corona
DE BACA
CATRON
Datil
Magdalena
Portales
Corona
ROOSEVELT
Socorro
LINCOLN
Reserve
SOCORRO
Carrizozo
CHAVES
Alma
Winston
Roswell
SIERRA
Truth or Consequences
Alamogordo
Gila
GRANT
GS
Silver City
OTERO
Piñon
RS
Las Cruces
Lordsburg
LUNA
NMSU
Deming
LD
DOÑA ANA
Newman
HIDALGO
Legend
NM Hot Springs
NM Hot Wells
0 25 50 100 Kilometers
0 15 30 60 Miles
Known Geothermal Resources
City, Village
County
Interstate

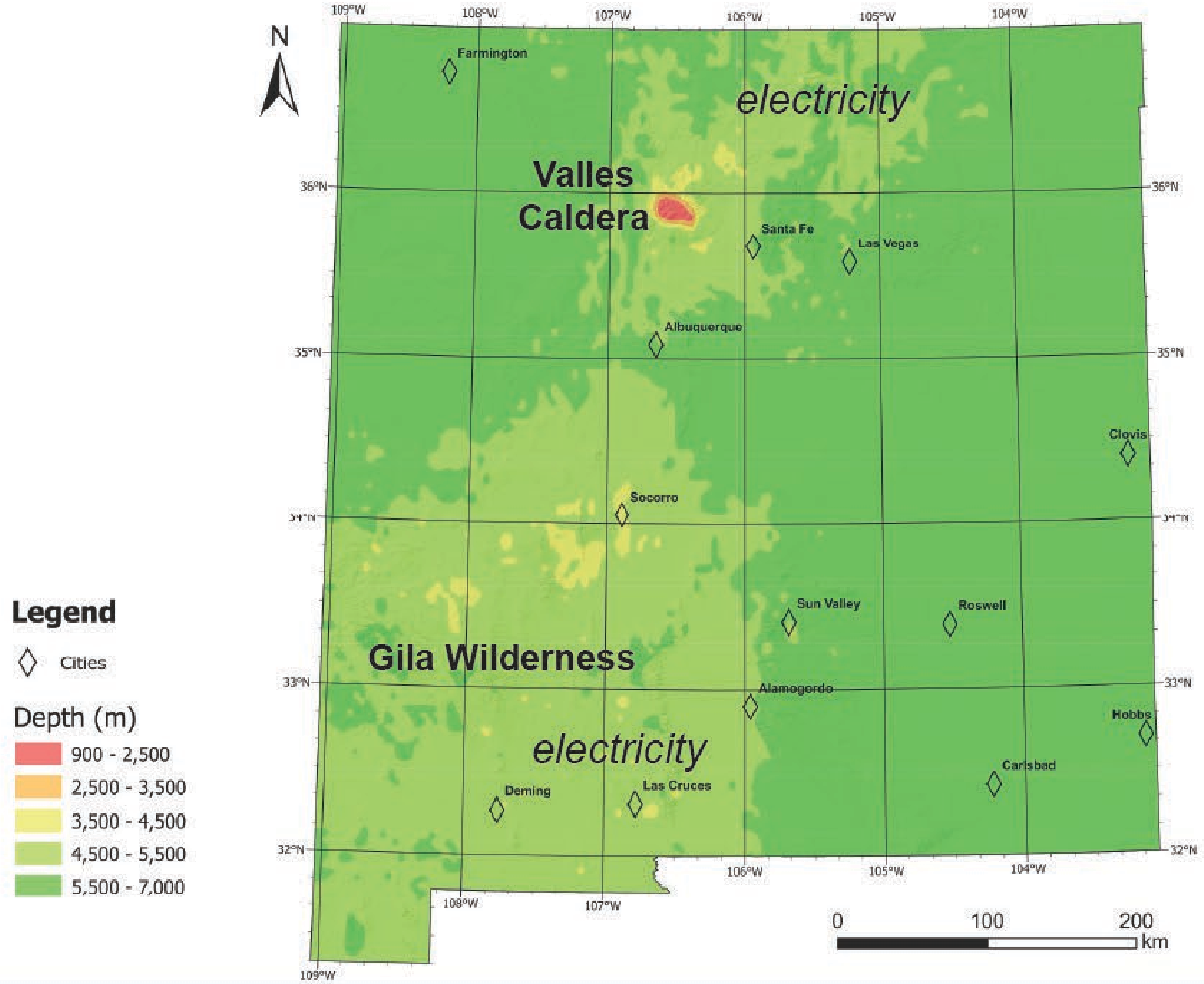


Aljubran and Horne, 2024

A.

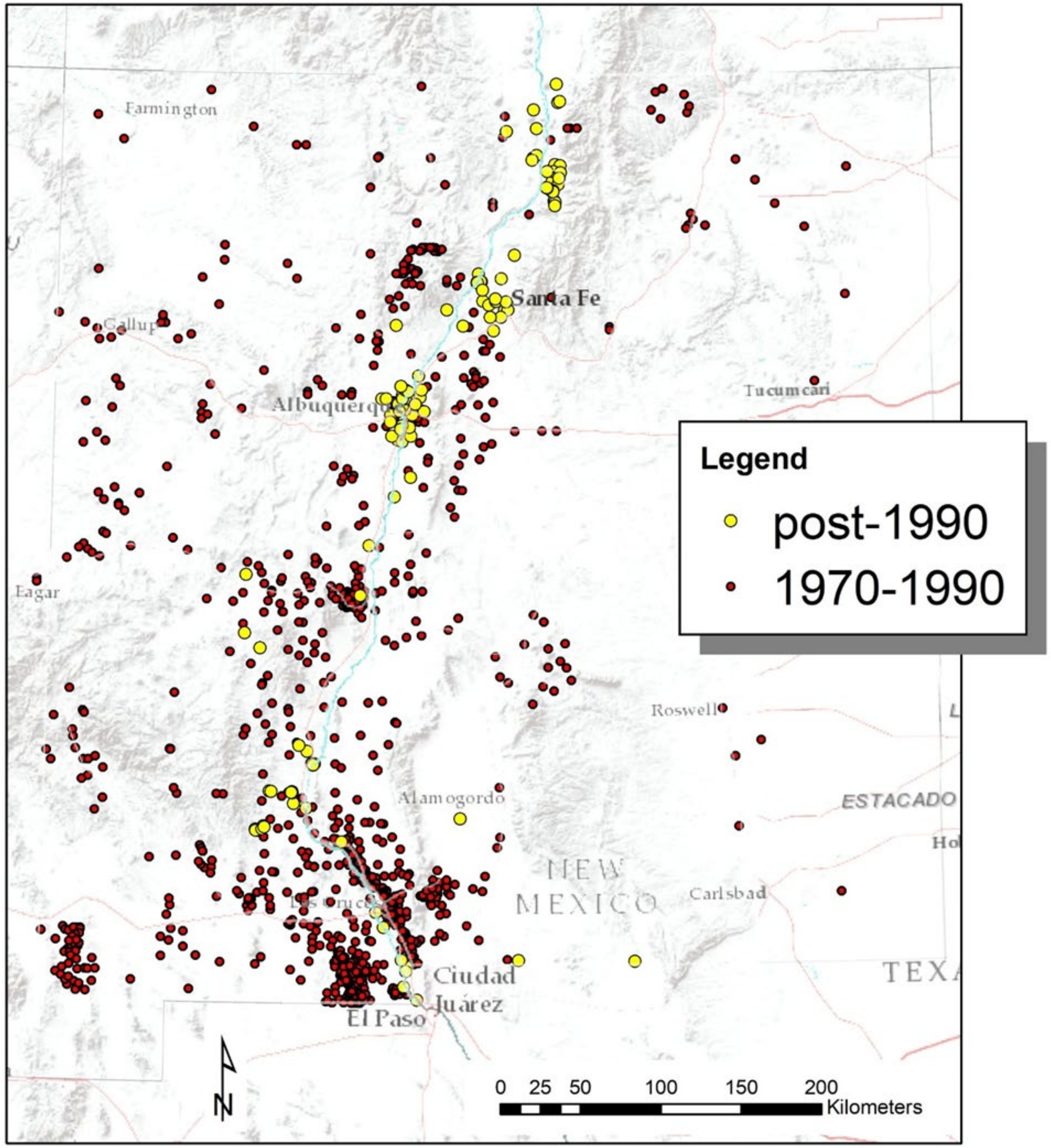


B. Aljubran and Horne, 2024

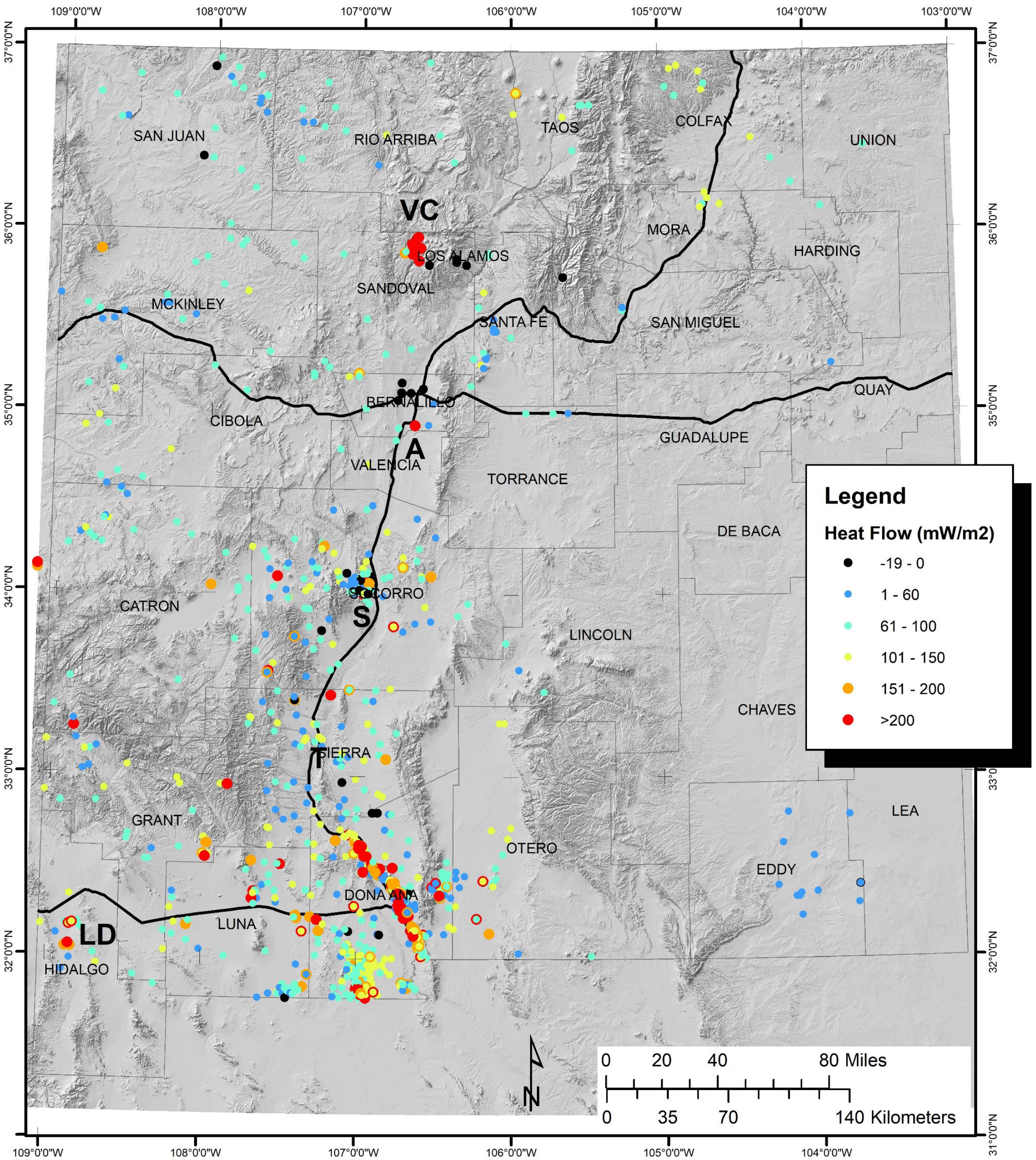


Estimated depth to at least 150°C

Temperature-Depth Data



Heat Flow



Comprehensive Energy Transition Strategy with Jean-Lucien Fonquergne (PRRC)

Critical Data Gaps & Research Needs for Geothermal Development

Deep Rift Basin Control: Drill-stem tests, down-hole pressure/temperature arrays, 2-D/3-D seismic, and magnetotelluric (MT) soundings.

Ground-Source Heat Pump (GSHP) Deployment: Create statewide GSHP registry; survey HVAC contractors to geolocate existing installs and characterize performance.

Water-Resource Accounting: Quantify water withdrawals, reinjection volumes, and produced-water compatibility for geothermal operations.

Industrial Heat-Demand Mapping: Match basin-scale heat potential with process-heat users (dairies, dehydrating food, chemical production, pulp/paper processing, mining). Industry surveys and education of heat users are needed.

Ag-Tech Applications: Geothermal heating for livestock barns, greenhouses, and crop drying facilities, and geothermal cooling to regulate temperatures in food storage and processing units (Kuravi and Winingham, 2025).

NM Tech Geothermal Energy Certificate

A 15-credit, 1-year interdisciplinary program designed for working professionals in the energy industry.

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Course Code	Course Name	Credits	Semester Offered
MENG 5075	Advanced Engineering Mathematics	3	Fall
MENG 5078	Advanced Thermodynamics	3	Fall
MENG 5079	Advanced Heat Transfer	3	Spring
HYDR 5010	Groundwater Hydrology	3	Spring
PETR 5046	Advanced Formation Evaluation	3	Fall
PETR 5065	Completion for Geothermal Wells	3	Spring
PETR 5066	Geothermal Reservoir Simulation	3	Spring
PETR 5067	Thermal Recovery	3	Spring
HYDR 5007	Hydrogeochemistry	3	Fall
HYDR 5016	Geofluids	3	Spring
HYDR 5020	Data-driven Modeling in Science and Engineering	3	Spring
HYDR 5055	Rock Fracture in Geologic Settings	3	Spring
PETR 4013	Advanced Well Design	3	Fall
PETR 5045	Advanced Production Design	3	Spring

Just in case

TYPES OF GEOTHERMAL ENERGY SYSTEMS