

**Nevada Governor's  
Office of Energy**



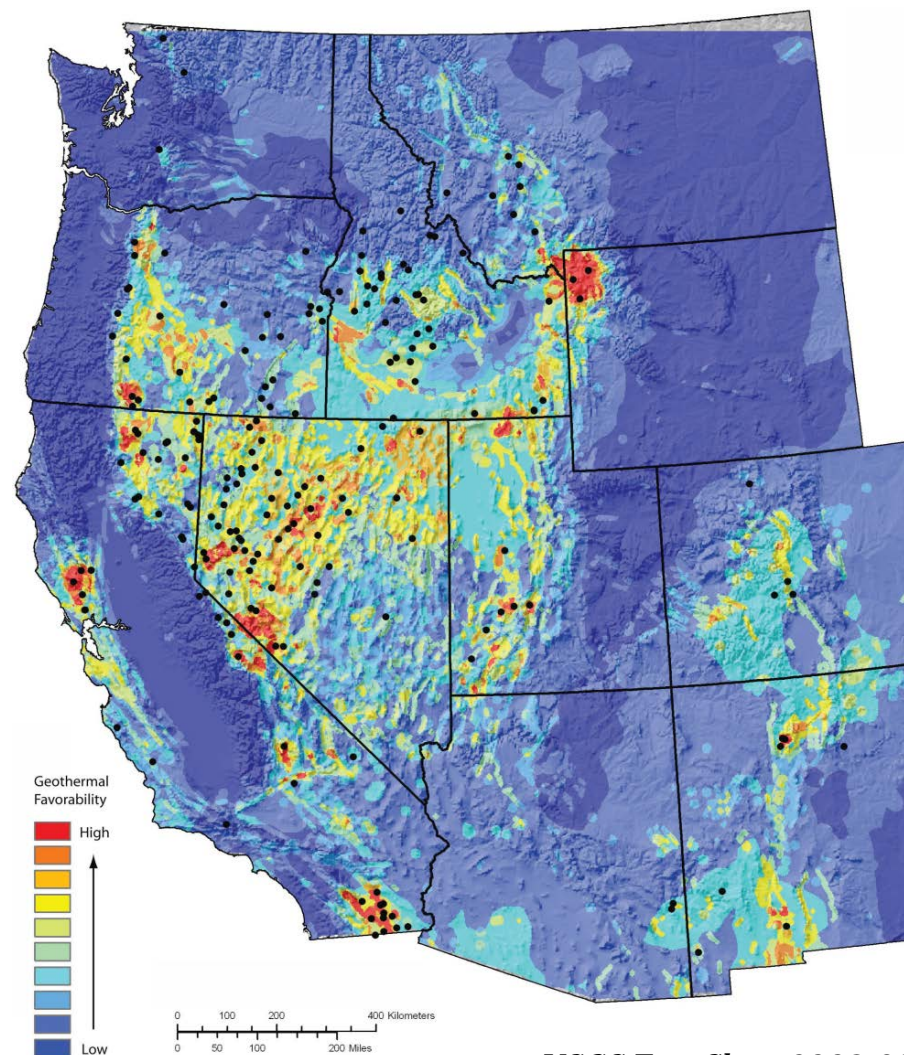
# Nevada Geothermal

**Division of Minerals (*minerals.nv.gov*)**

**Governor's Office of Energy (*energy.nv.gov*)**

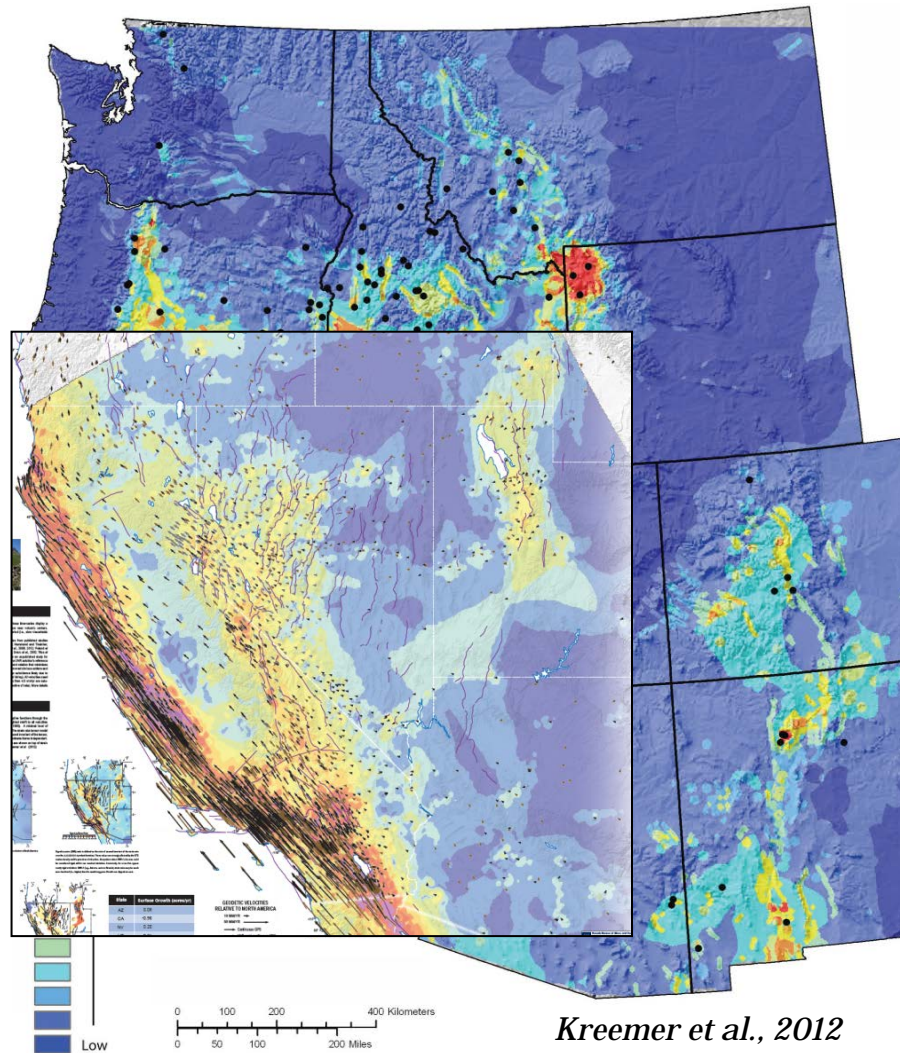
**Bureau of Mines and Geology (*nbmg.unr.edu*)**

# Geothermal... Why Nevada?



- 2nd Largest Geothermal Producer in US
- Largest Area of Geothermal Potential in US
- Largest number of hot springs in the US

# Geothermal Favorability



*Kreemer et al., 2012*

- Geologically favorable because earth is being strained (faulted) in this region
- Dispersed zone of extension – heat relatively close to Earth's surface



# Geothermal In Nevada

*Dixie Valley Plant, Churchill County, NV 2018*



## **Electricity**

- 26 Plants
- 17 locations

## **Heating**

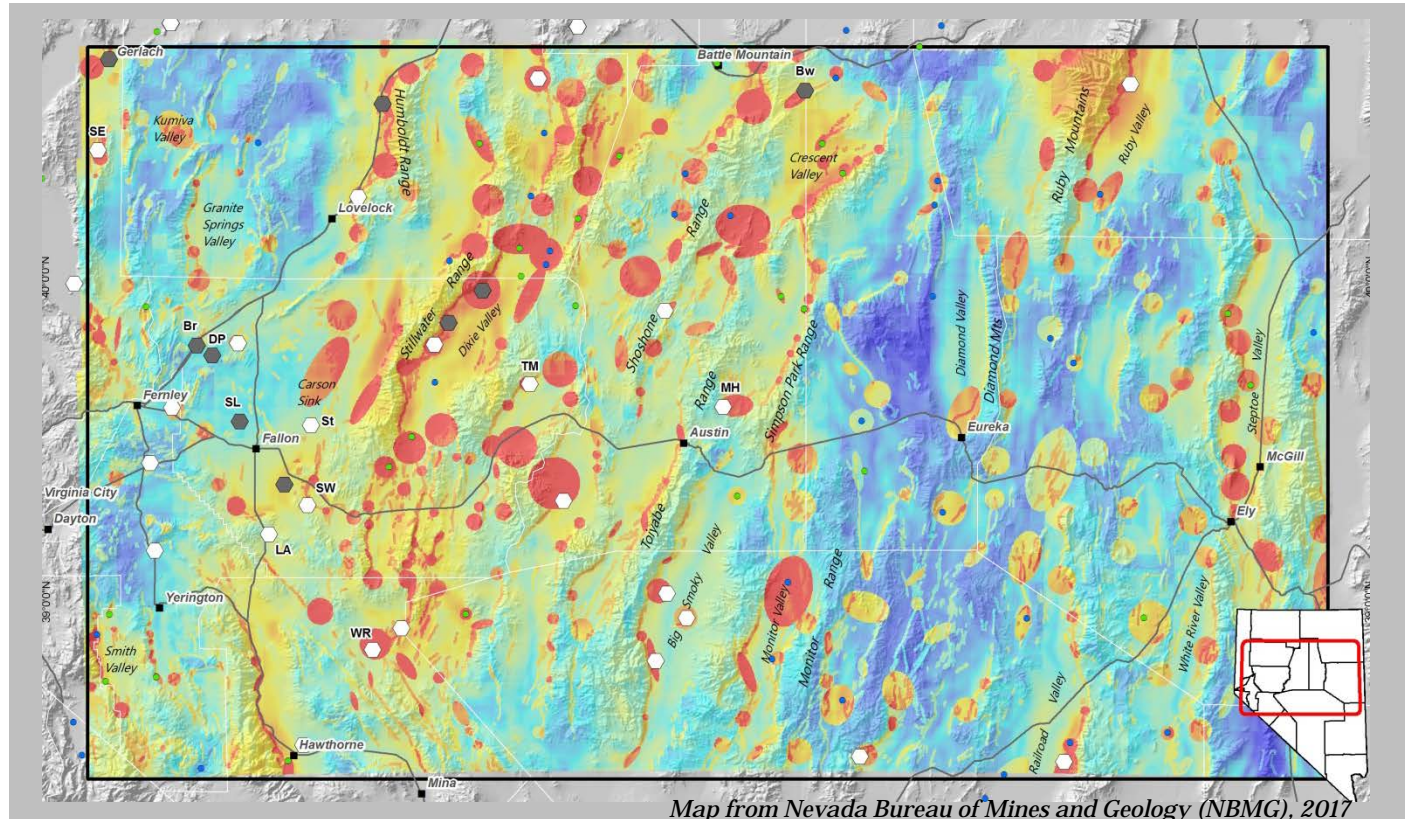
- Utility districts
- Residential homes and ranches\*
- Casino/Resort

## **Commercial**

- Agriculture or mining operations
- Dehydration or separating processes

\*Note: in Nevada geothermal is defined as anomalous heat, so would not include heat pump or heating and cooling systems that use water that is of normal ground water temperature

# State Initiatives for Geothermal

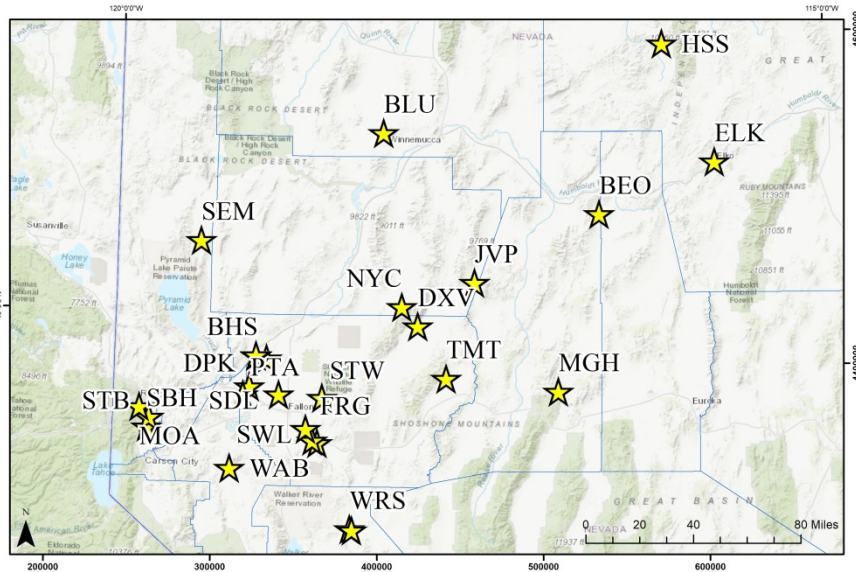


- Successful results from NBMG's Play Fairway Model facilitating exploration targeting
- >80% federal lands, with majority managed by the BLM
  - Geothermal fields often developed on federal leases
- Nevada Renewable Portfolio Standard (RPS) is slated to increase from 22% (2020) to 50% by 2030
  - California renewable incentives also increase demand for Nevada-based geothermal energy

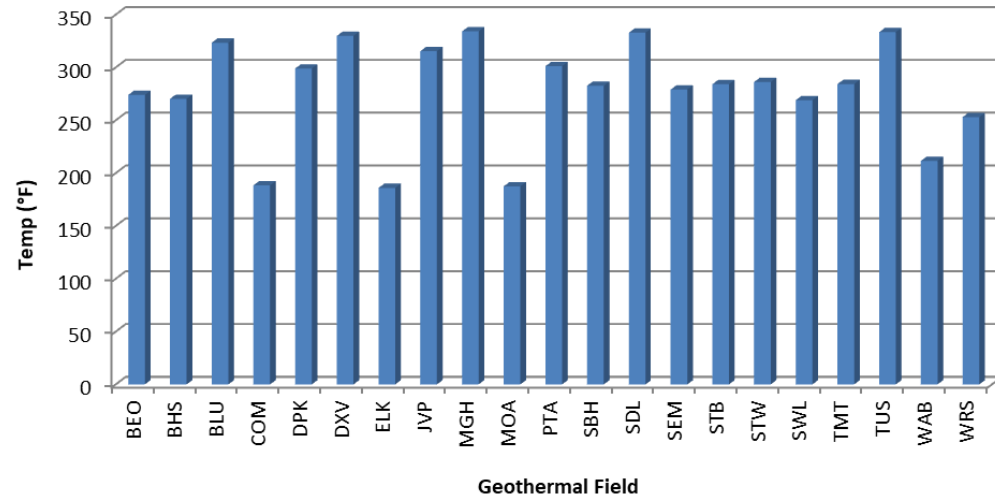


# Binary Systems - Drone Video

# Nevada Geothermal



Average Production Temperatures

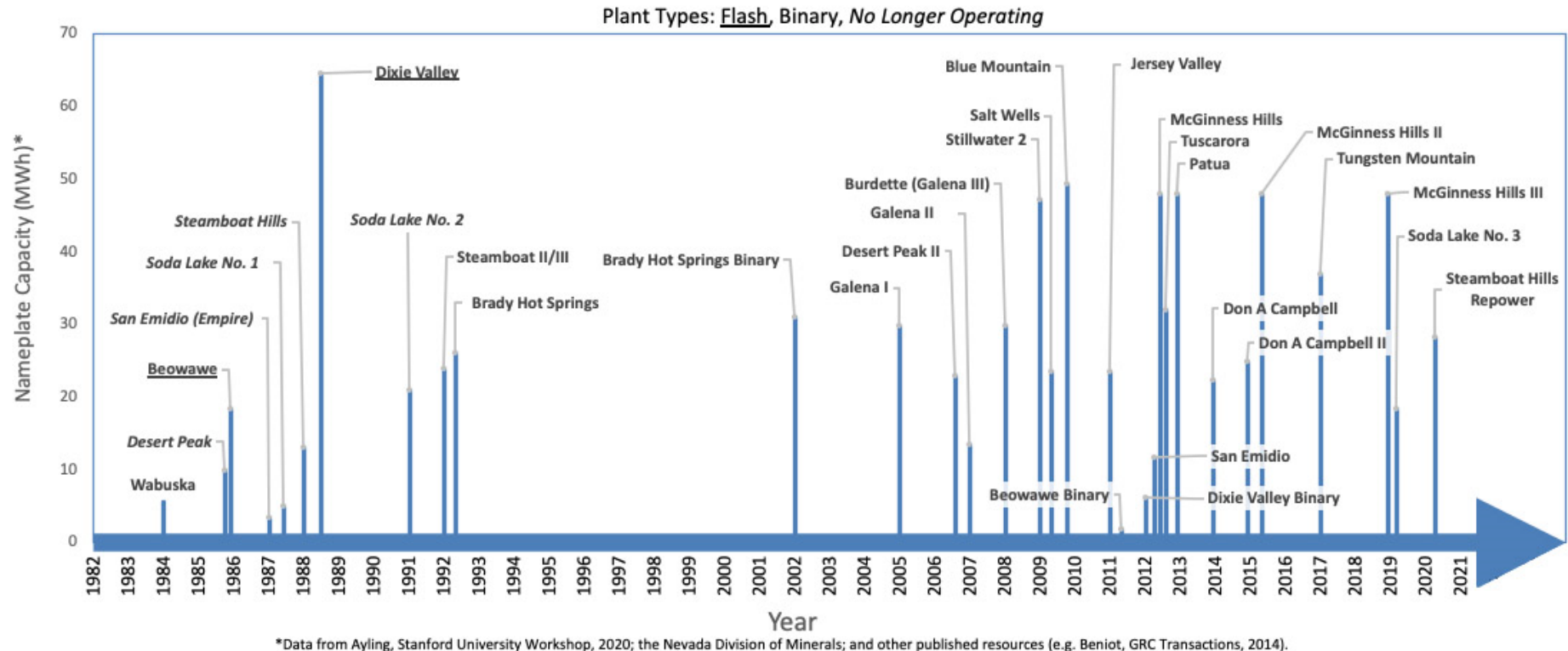


- Binary systems are key to efficient production of resources in Nevada
- Average temperature of a NV geothermal field  $\sim 277^{\circ}\text{F}$

*Beowawe (BEO), Brady Hot Springs (BHS), Blue Mountain (BLU), Desert Peak (DPK), Dixie Valley (DXV), Elko Heat Co. (ELK), FORGE (FRG), Hot Sulphur Springs (HSS), Jersey Valley (JVP), McGinness Hills (MGH), Moana (MOA), New York Canyon (NYC), Patua (PTA), Salt Wells (SW), San Emidio (SEM), Soda Lake (SDL), Steamboat Hills (STB), Stillwater (STW), Tungsten Mountain (TMT), Wabuska (WAB), Wild Rose (WRS)*



## Geothermal Electrical Generation Plants - Timeline & Nameplate Capacity (MWh)

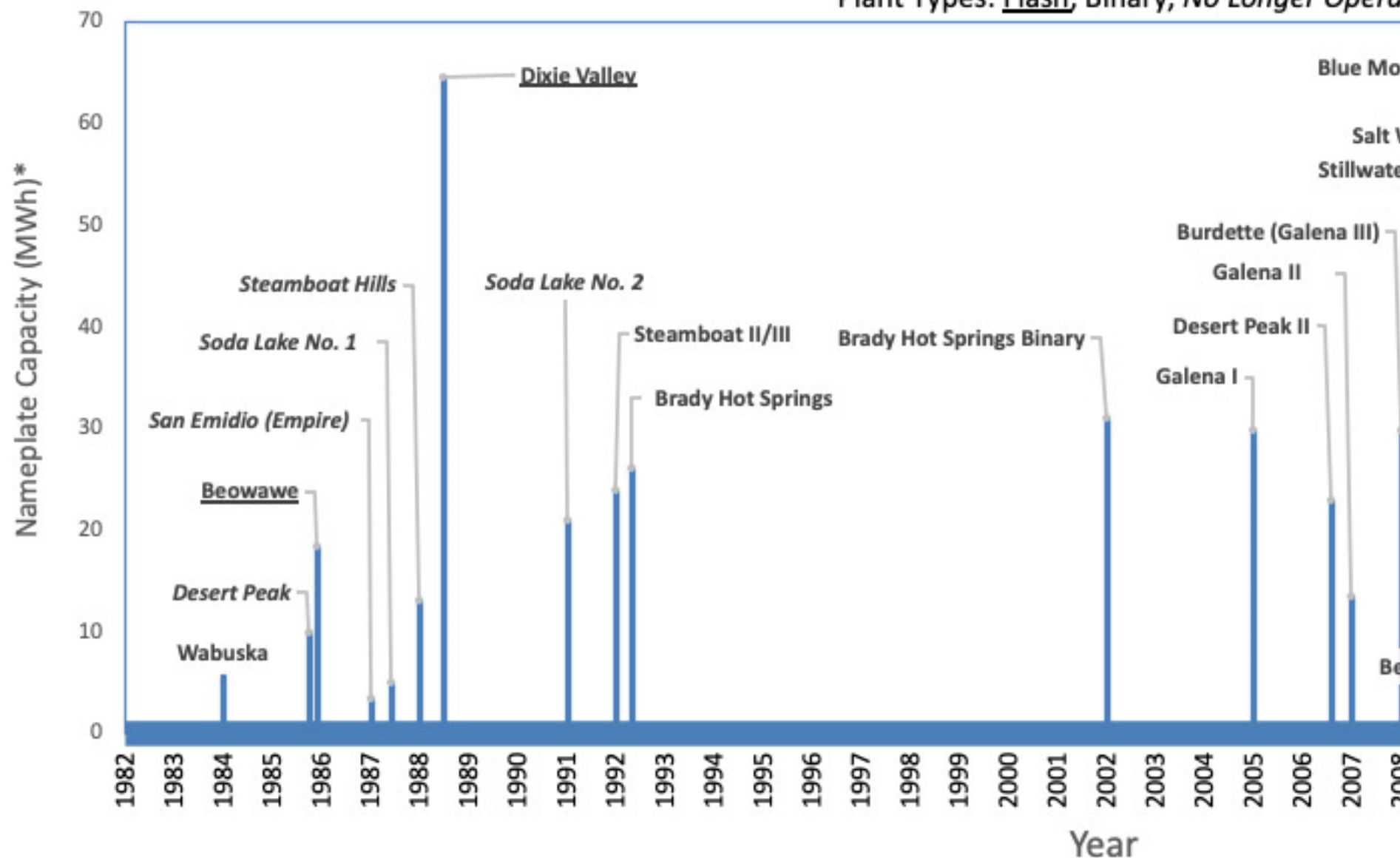


- Geothermal exploration started in late 1970s
- Binary introduced to the US in 1981 by Ormat (DOE grant)
- Commercial/Domestic plants not shown on timeline, include:
  - Elko Heating Company 1982; Moana Utility District, Reno 1983; Peppermill Casino, Reno 2010



# Geothermal Electrical Generation Plants - Timeline & Nameplate Capacity

Plant Types: Flash, Binary, No Longer Operating

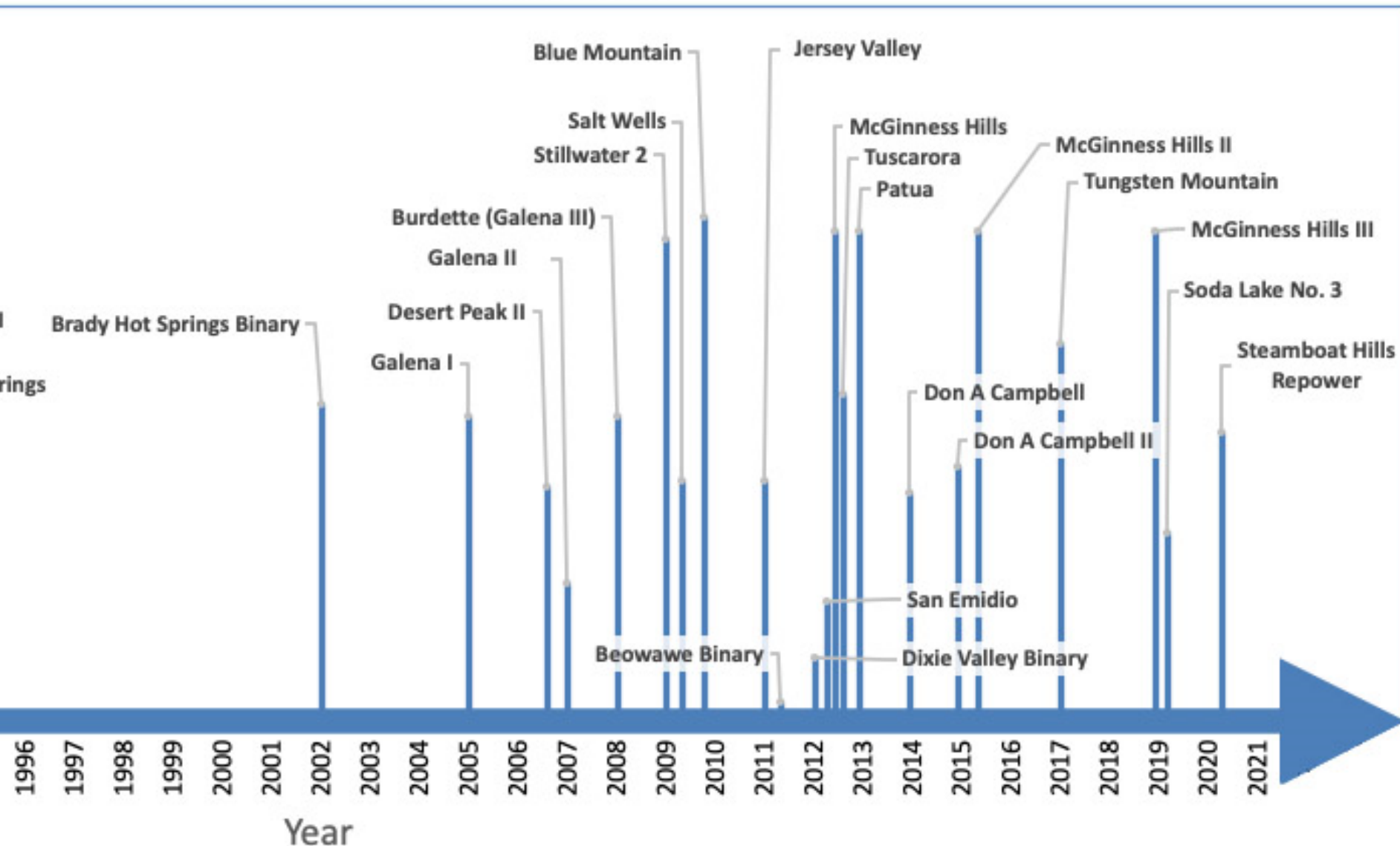


\*Data from Ayling, Stanford University Workshop, 2020; the Nevada Division of Minerals; and other published resources



# Generation Plants - Timeline & Nameplate Capacity (MWh)

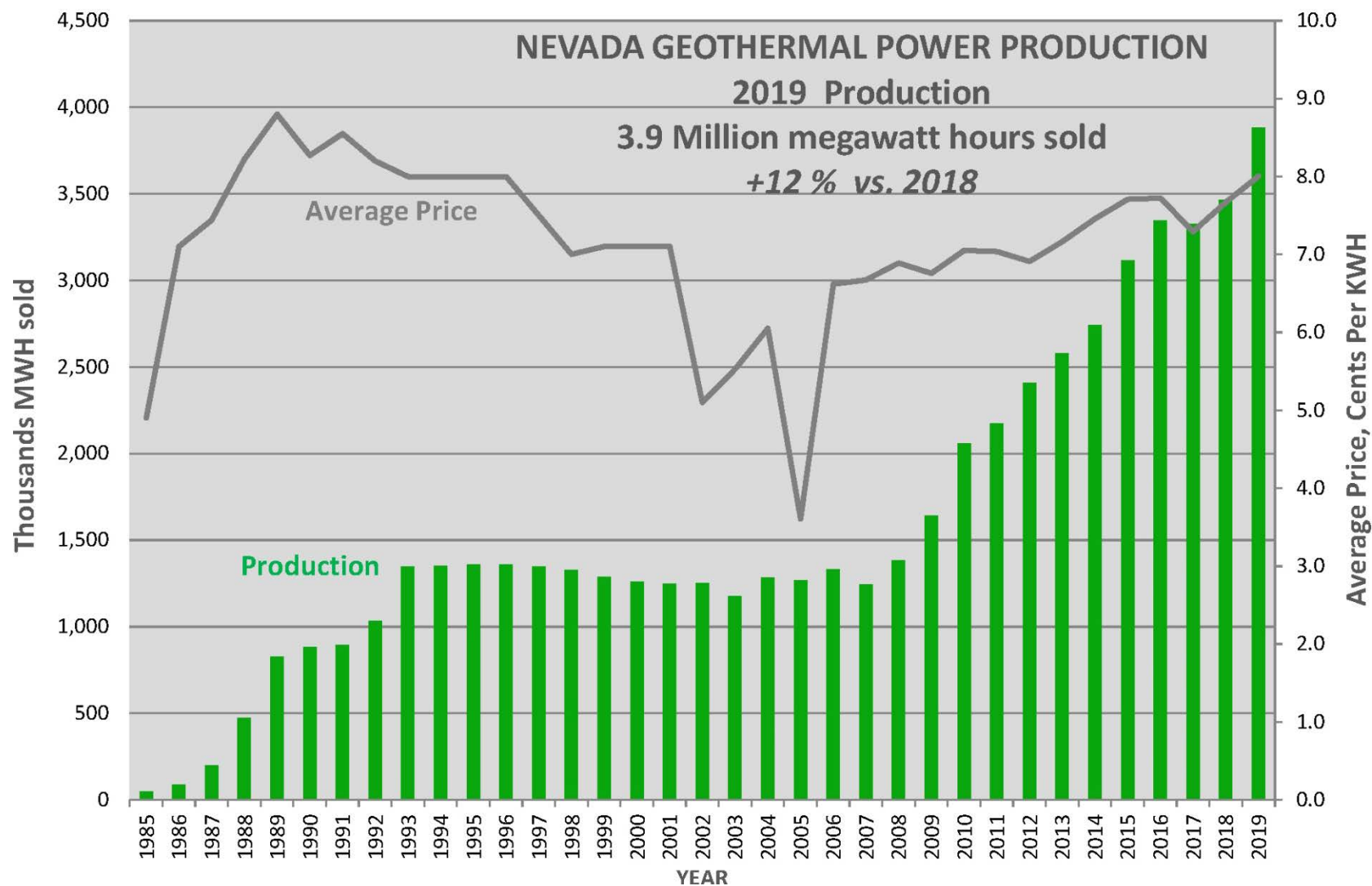
Plant Types: Flash, Binary, *No Longer Operating*



hop, 2020; the Nevada Division of Minerals; and other published resources (e.g. Beniot, GRC Transactions, 2014).



# Geothermal Production







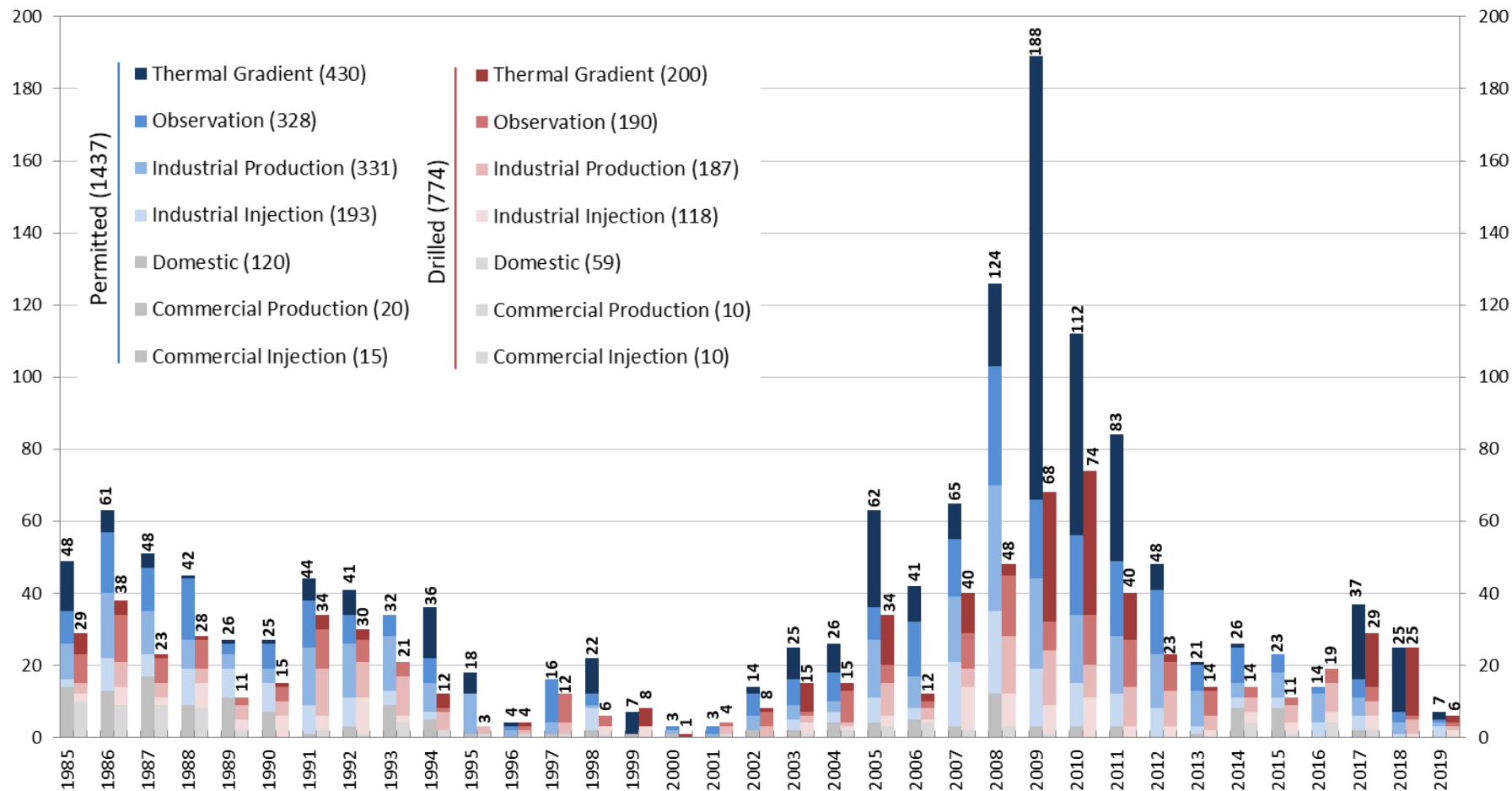
# Division of Minerals



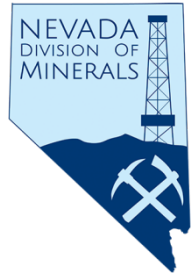
- State Regulatory Agency for the drilling, completion, and maintenance of all geothermal wells drilled in Nevada, also conducts well inspections.
  - BLM is lead agency for wells drilled on federal leases.
- Collects and disseminates information concerning geothermal, oil/gas, and mineral production and topics



# Nevada Geothermal Wells



# For more information



The screenshot shows the official website of the Nevada Division of Minerals. The header includes the State of Nevada seal, the text 'State of Nevada Commission on Mineral Resources Division of Minerals', and the NV.gov logo. Navigation links for 'Agencies' and 'Jobs' are present. A search bar with 'ENHANCED BY Google' and a 'PRINT' button are also visible. The main navigation menu includes 'HOME', 'ABOUT US', 'COMMISSION', 'PROGRAMS', 'NEWS', 'FAQS', and 'CONTACT US'. The main content area features a large photo of a mining conference and a 'Current Information' section with three bullet points: '2020 Excellence in Mining Reclamation Awards Presentation', 'Distance Learning - Educational Videos', and 'Opportunities for Precious Metals Toll Processing and Copper Concentrate Processing in Nevada, NBMG Report No 57'. Below this is an 'Important Links' section with links to 'Open Data Site-GIS files, NDOM', 'State and Federal Permits Required Before Mining or Milling Can Begin - February 2015', and 'YouTube Channel, NDOM'. An 'Other Important Links' section includes 'Comparison of Federal and State Small Exploration and Small Mining Project Authorities', 'Nevada Bureau of Mines and Geology', and 'Governor's Office of Energy'. The footer section is titled 'Programs'.

State of Nevada  
Commission on Mineral Resources  
**Division of Minerals**

NV.gov Agencies Jobs

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**Current Information**

- 2020 Excellence in Mining Reclamation Awards Presentation
- Distance Learning - Educational Videos
- Opportunities for Precious Metals Toll Processing and Copper Concentrate Processing in Nevada, NBMG Report No 57

**Important Links, Nevada Division of Minerals**

- Open Data Site-GIS files, NDOM
- State and Federal Permits Required Before Mining or Milling Can Begin - February 2015
- YouTube Channel, NDOM

**Other Important Links**

- Comparison of Federal and State Small Exploration and Small Mining Project Authorities
- Nevada Bureau of Mines and Geology
- Governor's Office of Energy

**Programs**

***Division of Minerals Website: [Minerals.nv.gov](https://minerals.nv.gov)***





# For more information



State of Nevada  
Commission on Mineral Resources  
**Division of Minerals**



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**Programs**

[Abandoned Mine Lands \(AML\)](#)

[Bond Pool \(Reclamation\)](#)

[Dissolved Mineral Resource Exploration \(DMRE\)](#)

[Education and Outreach](#)

**Geothermal**

- Forms and Reports
- Permits
- Geo FAQ

 **GEO THERMAL**

The Nevada Division of Minerals is the state's regulatory authority for all geothermal wells drilled in Nevada. Geothermal wells drilled within Nevada, on either private or federally managed lands, must be permitted by the Nevada Division of Minerals. The associated drilling and completion programs must be approved by the Division before either program is implemented. The Division oversees the drilling and subsequent completion operations through daily reporting to the Division by the operator, as well as inspect the wells after they are completed. The Division must also approve all maintenance and work-over operations during the life of the well, as well as the final plugging and abandonment of a well at the end of its useful life. Geothermal production and injection information is submitted to the Division on a monthly basis, where the information is tabulated both monthly and annually.

- [Nevada Geothermal Power Plants 2019](#) &
- [Nevada Active Mines and Energy Producers 2019](#) &

**Geothermal Contact**

Lowell Price  
Fluid Minerals Program Manager  
[lprice@minerals.nv.gov](mailto:lprice@minerals.nv.gov)

**Statute & Regulations**

[NRS 534 A](#)

[NAC 534 A](#)

**Geothermal Links**

[LR 2000](#)

[BLM Geothermal Information](#)

[Geothermal Frequently Asked Questions \(FAQ\)](#)

## ***Geothermal Program Page***

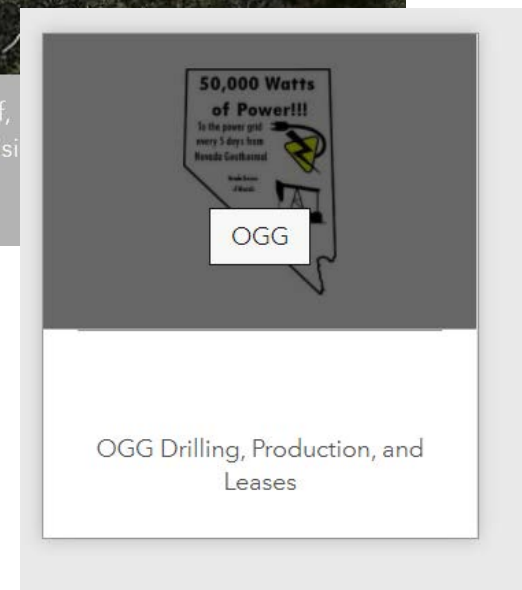
*Including updated Regulations (NAC), approved 2019, codified 2020*



# For more information



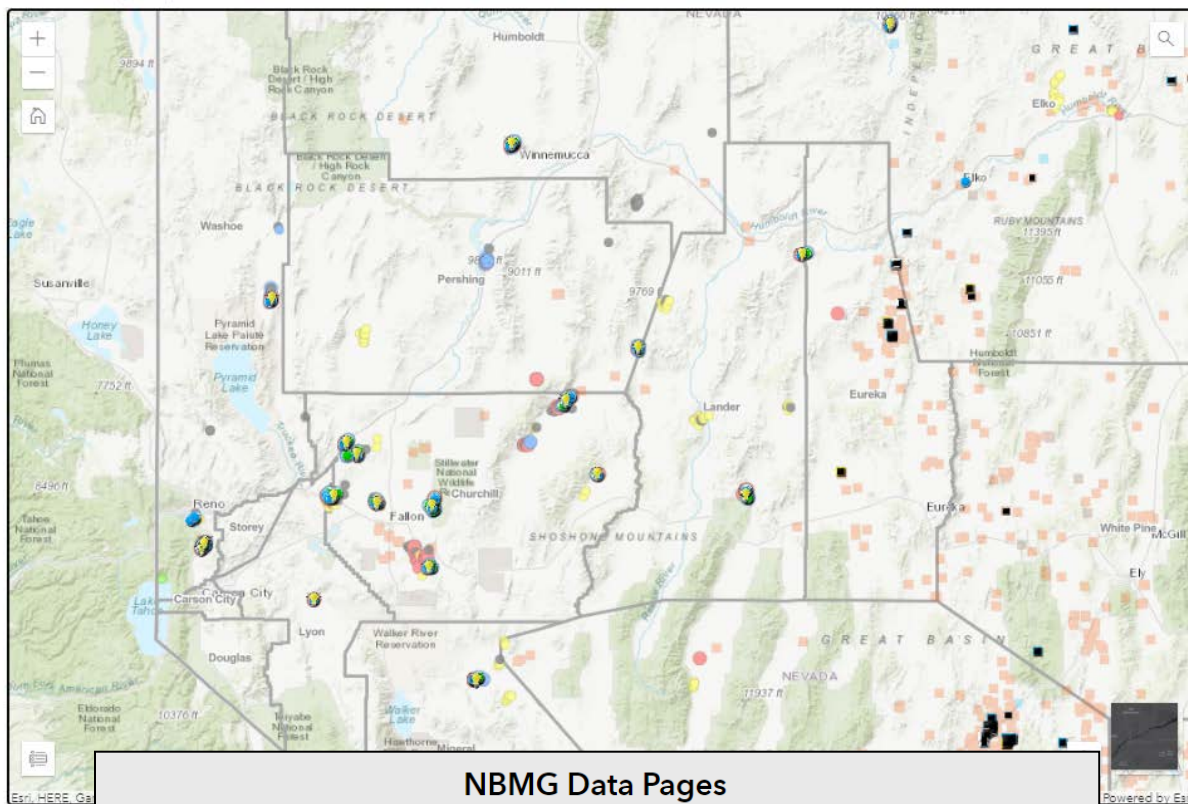
- Open Data Site – Oil/Gas/Geothermal
- <https://data-ndom.opendata.arcgis.com/>
- See booth video (second monitor) for a how-to video





# For more information

Historic Oil, Gas, and Geothermal Production in Nevada

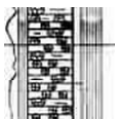


## NBMG Data Pages

API numbers found on this map can be used in conjunction with the Nevada Bureau of Mines and Geology (NBMG) website to obtain further information about each well. All well records from the Division go to the NBMG for storage and scanning for public access after confidentiality time periods have lapsed, and are searchable using the links below.



Oil & Gas Information



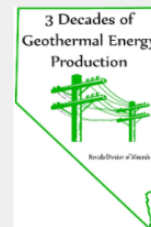
Oil & Gas Well Log File Search



Geothermal Information



Geothermal Well Log Search



## Nevada Geothermal Plants - Production Data

To spatially display geothermal drill and production data.

[Download the Data](#)



## Geothermal Production and Well Data

To spatially display geothermal drill and production data.

[Download the Data](#)



# Governor's Office of Energy



Nevada Governor's  
**Office of Energy**

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WELCOME TO THE OFFICE OF ENERGY



## Current Information

- [2019 Status of Energy Report](#)
- [Electrifying Nevada's 21st Century Transportation System](#)
- [The Economic Potential for Energy Storage in Nevada](#)
- [Nevada Electric Highway](#)
- [Clean Energy Projects Through C-PACE Financing](#)
- [Stay Connected](#)
- [Renewable Portfolio Standard Reporting](#)

# Governor's Office of Energy



- The Renewable Energy Tax Abatement (RETA) Program awards partial sales and use tax partial property tax abatements to renewable energy facilities.
- The RETA program is a crucial tool in attracting developers to Nevada because it provides an incentive for the construction on commercial power plants.
- These projects increase Nevada's tax revenue and lead to job creation in a growing industry.



# Governor's Office of Energy



- The projects that have received a partial abatement have created over 10,000 jobs.
- These projects have attracted over \$8.3 billion in capital investments, payroll and taxes paid.



# For more information



The logo for the Nevada Governor's Office of Energy, featuring the state seal and the text "Nevada Governor's Office of Energy".

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## Programs

- [Building Energy Codes](#)
- [Direct Energy Assistance Loan](#)
- [Green Building Tax Abatements](#)
- [Home Energy Retrofit Opportunities for Seniors](#)
- [Lower Income Solar Energy Program \(LISEP\)](#)
- [Nevada Electric Highway](#)
- [Performance Contracting](#)

## RENEWABLE ENERGY TAX ABATEMENTS

The Renewable Energy Tax Abatement program came under the Governor's Office of Energy's jurisdiction in July 2009. The program awards partial sales and use tax and partial property-tax abatements to eligible renewable energy facilities. The Governor's Office of Energy staff reviews the abatement applications, conducts public hearings to determine eligibility, and reviews annual compliance audits after abatements have been granted.

### Progress

Regulations for the program were adopted in 2010. The state has approved 35 tax abatement applications, which include large scale solar PV, solar thermal, biomass, geothermal, and wind projects throughout the state.

### Renewable Energy Tax Abatement Application

- [Application Process](#)
- [Process Timeline](#)
- [Requirements](#)

## Contact

Laura Wickham  
Program Manager  
775-434-4046  
[lwickham@energy.nv.gov](mailto:lwickham@energy.nv.gov)

## Resources

[Renewable Energy Tax Abatement Fact Sheet](#)

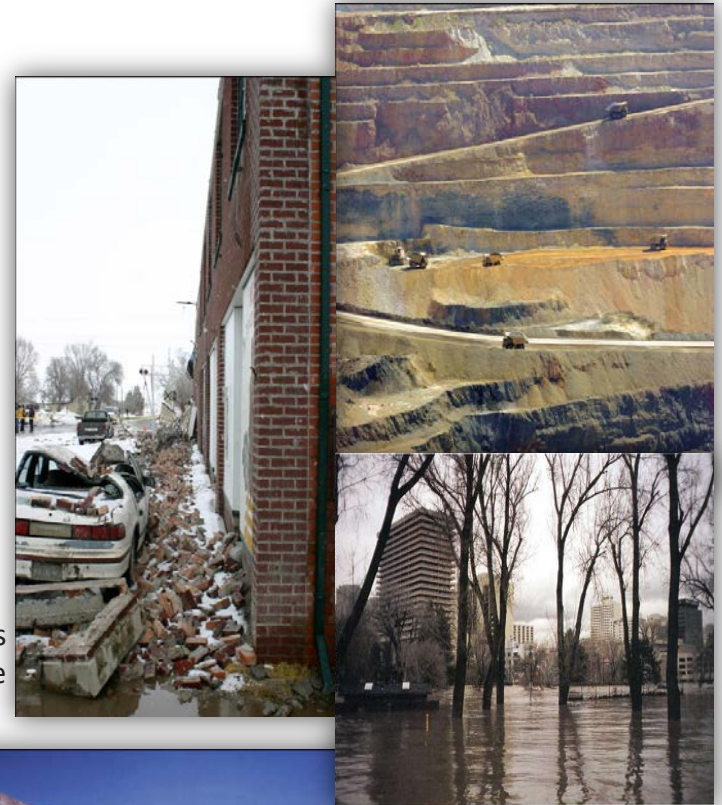
***Energy.nv.gov***

# NBMG MISSION: NEVADA'S GEOLOGICAL SURVEY

**Nevada Bureau of Mines and Geology** – Mission defined by state statutes: **Bureau of analysis, information, and exchange on Nevada geology and natural resources** (APPLIED GEOLOGY for the public good)

- Archive and disseminate geologic data
- Elucidating NV's geologic framework
  - **Geologic hazards**
  - **Natural resources**
- Enhance public safety
- Facilitate economic development

<https://thenevadaindependent.com/podcast/indymatters-episode-69-state-geologist-jim-faulds-talks-geothermal-and-the-chaotic-origin-story-of-minerals-in-nevada>



2008 Wells  
Earthquake

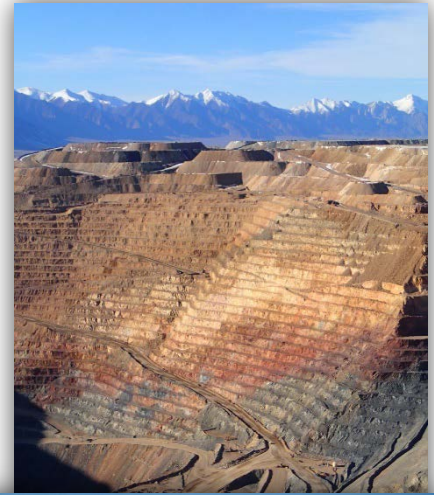
1997 New Year's Flood -  
Reno



1954 Dixie Valley Earthquake

# NBMG STRUCTURE/OUTCOMES

- Components:
  - Research/teaching faculty
  - Cartographic/GIS/Pub support staff
  - Great Basin Science Sample and Records Library
  - Administrative
- ~27 full-time employees
- Outcomes:
  - Natural resource assessments – Minerals, geothermal, oil and gas
  - Geologic hazard assessments – Earthquakes, floods, landslides
  - Geologic framework studies – Geologic mapping, regional databases
  - 2019 production – >50 papers; >\$4 M in active grants; \$3.2M in new grants
  - Teach many courses; advise ~20 grad students







## ORGANIZATIONAL CHART

# NEVADA BUREAU OF MINES & GEOLOGY

COLLEGE OF SCIENCE, UNIVERSITY OF NEVADA, RENO

● no state funding  
● fully state funded  
● partially state funded & the fraction of state funding

F: faculty / S: staff



**JAMES FAULDS**  
DIRECTOR, STATE GEOLOGIST + PROFESSOR F



**LORA ROBB**  
BUSINESS MANAGER F



**CANDICE VIVIEN**  
ADMIN ASSISTANT II S

### RESEARCH FACULTY



**MICHAEL DARIN**  
ASSISTANT PROFESSOR F



**ANDREW ZUZA**  
ASSISTANT PROFESSOR F



**RICHARD KOEHLER**  
NEOTECTONICS  
ASSISTANT PROFESSOR F



**SETH DEE**  
ADMINISTRATIVE  
FACULTY .75 F

**VACANT**  
ADMINISTRATIVE  
FACULTY .5 F

### ECONOMIC GEOLOGY PROGRAM/RESEARCH FACULTY



**JOHN MUNTEAN**  
ASSOCIATE PROFESSOR  
CREG DIRECTOR  
BRANT CHAIR F



**MATTHIEU HARLAUX**  
ASSISTANT PROFESSOR F

### CARTOGRAPHY/GIS



**JENNIFER VLCAN**  
BUSINESS PROC  
ANALYST III .8 S



**RACHEL MICANDER**  
CARTOGRAPHIC/  
GRAPHICS III .40 F



**VACANT**  
CARTOGRAPHIC/  
GRAPHICS III S



**CHRISTINA CLACK**  
GRAPHIC DESIGNER II  
.20 S



**IRENE EDGERTON**  
CARTOGRAPHIC/  
GRAPHICS IV .22 S

### GREAT BASIN SCIENCE SAMPLE + RECORDS LIBRARY



**EMILY O'DEAN**  
DATA MANAGER F



**CRAIG DEPOLO**  
PROFESSOR F



**DAVID DAVIS**  
GEOLOGICAL INFO  
SPECIALIST S



**CHARLOTTE STOCK**  
ADMIN ASSISTANT III .50 S



**BRET PECORARO**  
DEVELOPMENT  
TECHNICIAN II S

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**GEOFF BLEWITT**  
PROFESSOR F



**BILL HAMMOND**  
PROFESSOR F



**CORNÉ KREEMER**  
PROFESSOR F

### GREAT BASIN CENTER FOR GEOTHERMAL ENERGY



**BRIDGET AYLING**  
GEOTHERMAL SPECIALIST  
ASSOCIATE PROFESSOR  
DIRECTOR GEOTHERMAL CENTER F



**ROZENA BRECKE**  
ADMIN ASSISTANT III .47 S



**CARY LINDSEY**  
GEOTHERMAL CENTER  
POST-DOCTORAL SCHOLAR S



**ELI MLAWSKY**  
GEOTHERMAL CENTER  
DATA MANAGER F



# Thank you!



**Nevada Governor's  
Office of Energy**



- Check out our booth:
  - Engage in chat sessions, ask questions, and more!
- Mini-educational session on Thursday at 12:30pm (PT)
  - Dr. Ayling from NBMG will be presenting an update of geothermal activities in the state (2019/2020)