

Geothermal Energy's Role in Nevada's Water Future

February 6, 2014



McGinness Hills, Lander County, Nevada



Green energy you can rely on

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Overview of Ormat

Market leader with proven track record:

- Over four decades of experience
- Established renewable energy pure-play
- Technology leader with over 82 U.S. patents
- 1600 MW of constructed capacity
- Own and operate 595 MW of installed capacity
- Vertically integrated
- 500 employees in the U.S. + 600 overseas

NYSE	ORA
Share Price:	\$26.70
52wk Range:	\$16.67 - \$28.23
Avg. Vol. (3m):	63,600 shares
Market Cap:	\$1.21 B
FY12 Rev.:	\$514.4 M
HQ:	Reno, Nevada

HQ: Reno, Nevada
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Introduction

- Changes to electric generation mix in Nevada
- Challenges and opportunities
- Overcoming challenges and capitalizing on opportunities
- Why an all-of-the-above energy strategy should include geothermal generation.





What do these plants have in common?



Senate Bill 123

- Directs NV Energy to eliminate 800 megawatts of coal-fired generation from its portfolio
- Authorizes utility ownership of a 550 megawatt power plant
- Mandates 350 megawatts of renewable energy development

Challenges and Opportunities

- Valmy and Gardner are base-load, dispatchable plants; valuable characteristics to grid operators
 - Able to run around the clock, unlike solar or wind plants 
 - Can be quickly turned down or up to match demand 
 - They provide grid stability with inertia; voltage regulation
- They have significant environmental impacts which can be offset by newer technologies and renewables
 - Large carbon footprint and emissions 
 - Consume large amounts of fresh water for cooling 
 - Valmy has permits for over 16,000 acre-feet
 - Gardner has permits for over 6,900 acre-feet

How Can We Overcome the Challenges?

- SB 123 authorizes NV Energy to build a new 550 megawatt power plant
 - If it is like other recent plants, it will be a high efficiency state-of-the-art, natural gas, combined cycle plant
 - It will be base-load
 - It will be dispatchable
 - However, it exposes NVE's non-renewable fleet to price volatility; gas prices will increase.
- The renewable resourced mandated by SB 123 are likely to be a mix of solar, wind, and geothermal. Of these, only geothermal is base load and dispatchable; solar and wind are intermittent resources.

How Can We Capitalize on the Opportunities?

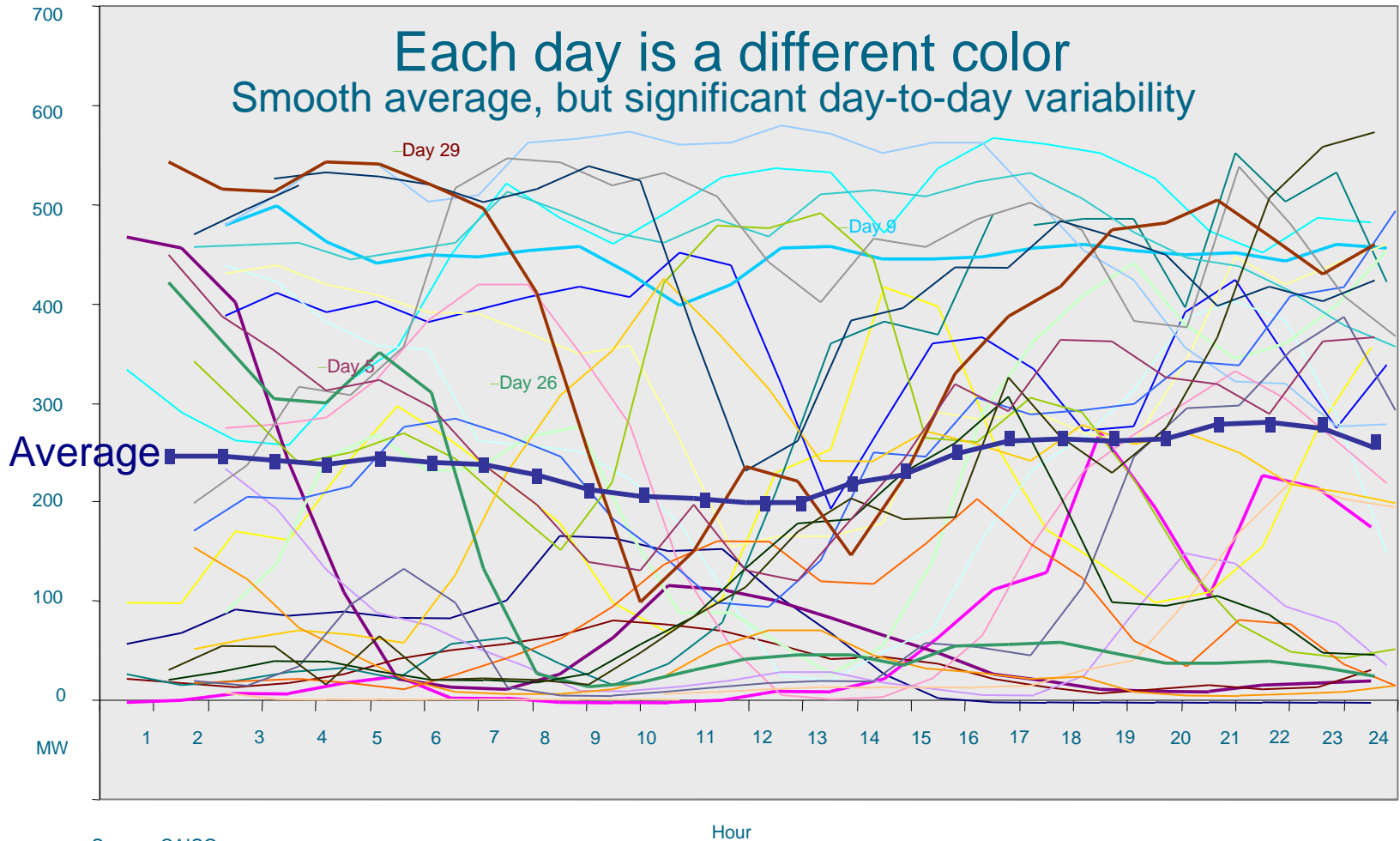
- The new gas-fired plant and the renewable resources authorized by SB 123 will have smaller carbon footprints than the soon-to-be retired coal plants.
- NV Energy's recent gas fired plants have been air-cooled, saving significant amounts of scarce water.
- The three main renewable technologies; solar, wind, and geothermal, can all provide energy with little to no cooling water demand.

What's the big deal about "Base load?"

What does "Dispatchable" mean to me?

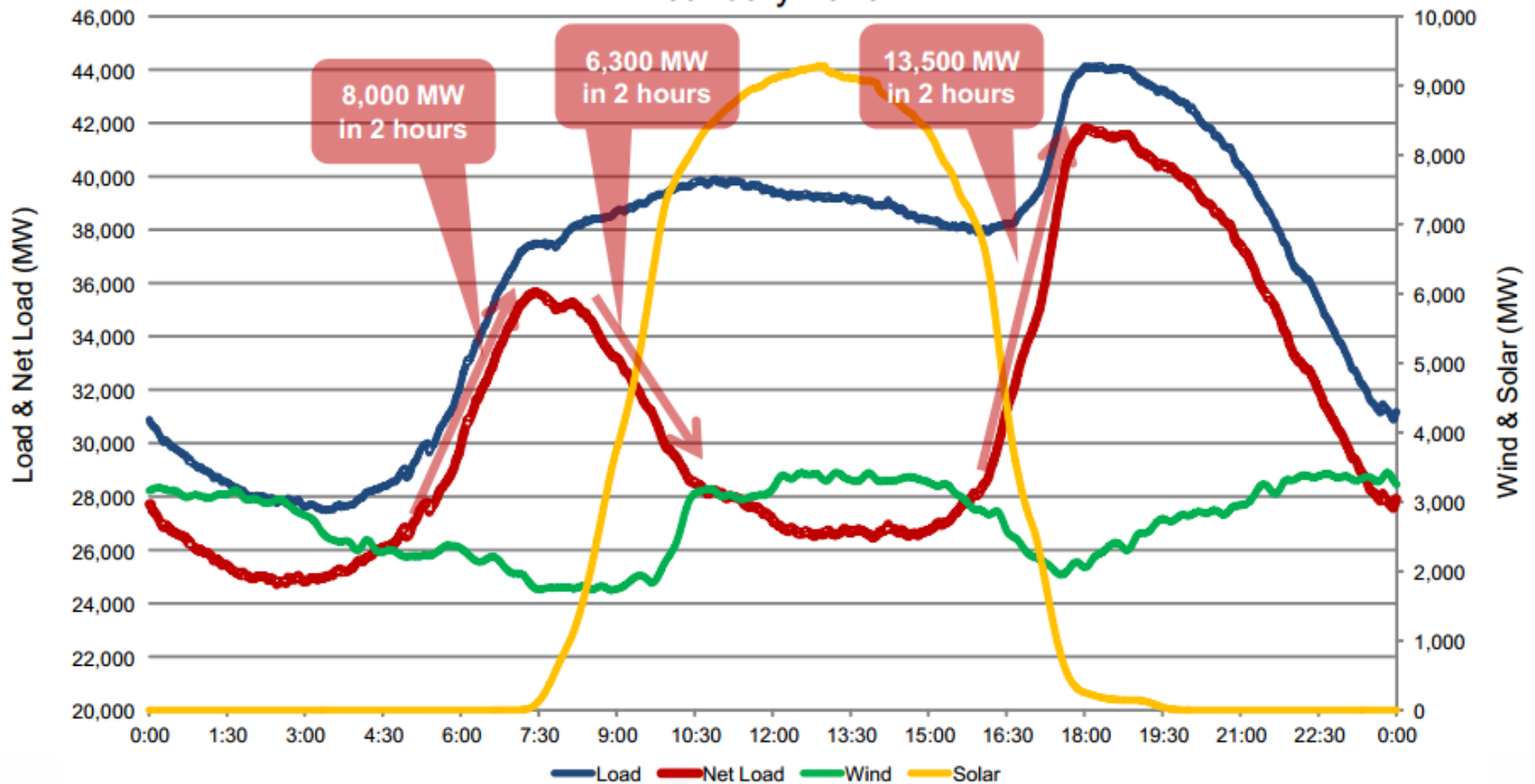
- Base load generation means power that can be reliably scheduled, hour-by-hour, throughout the day or the year.
- Why it matters:

Renewable Intermittency Challenge

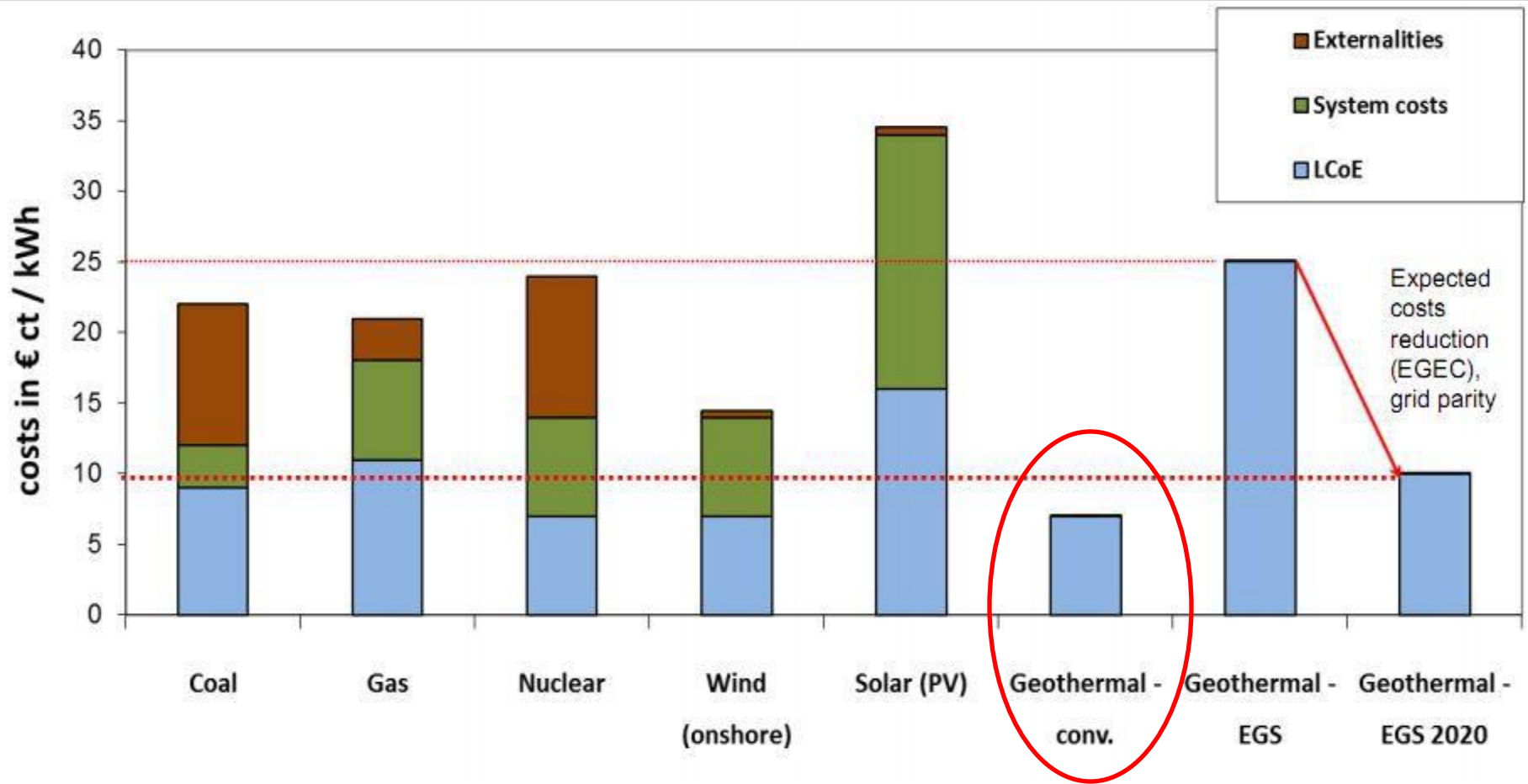


Solar PV can create huge load swings

CAISO Load, Wind & Solar Profiles – High Load Case
January 2020



Integration costs cannot be ignored



- Geothermal: Competing with Other Renewable and Non-renewable Technologies, European Geothermal Energy Council Reporting, November 19, 2013

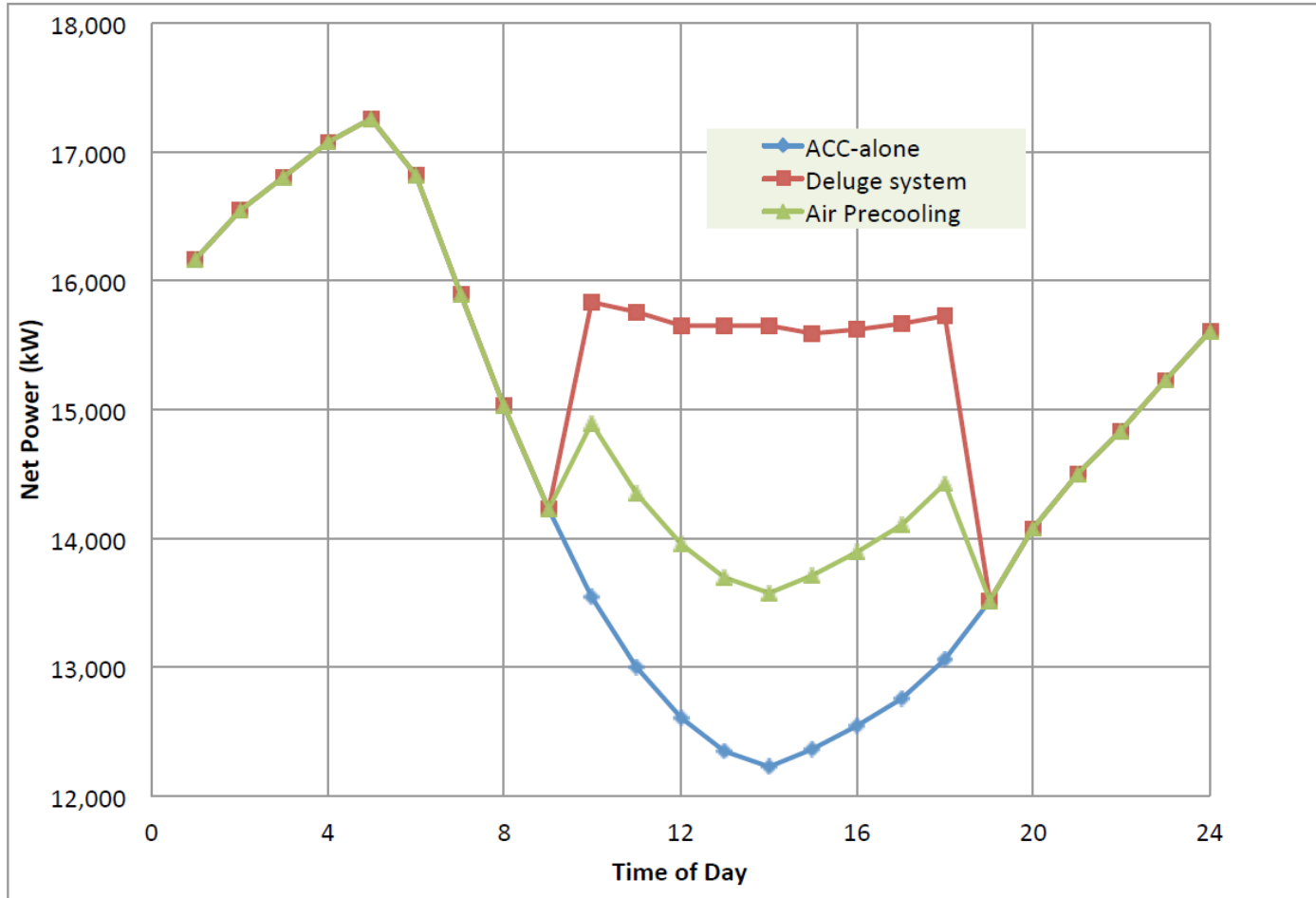
NV Energy's Current Renewable Mix:

- Geothermal – 385 MW Capacity
- Solar – 160 MW Capacity
- Wind – 151 MW Capacity
- 350 MW additional capacity on the way, Nevada's RPS calls for 25% renewables by 2025

So how does geothermal help and where does water come into the equation?

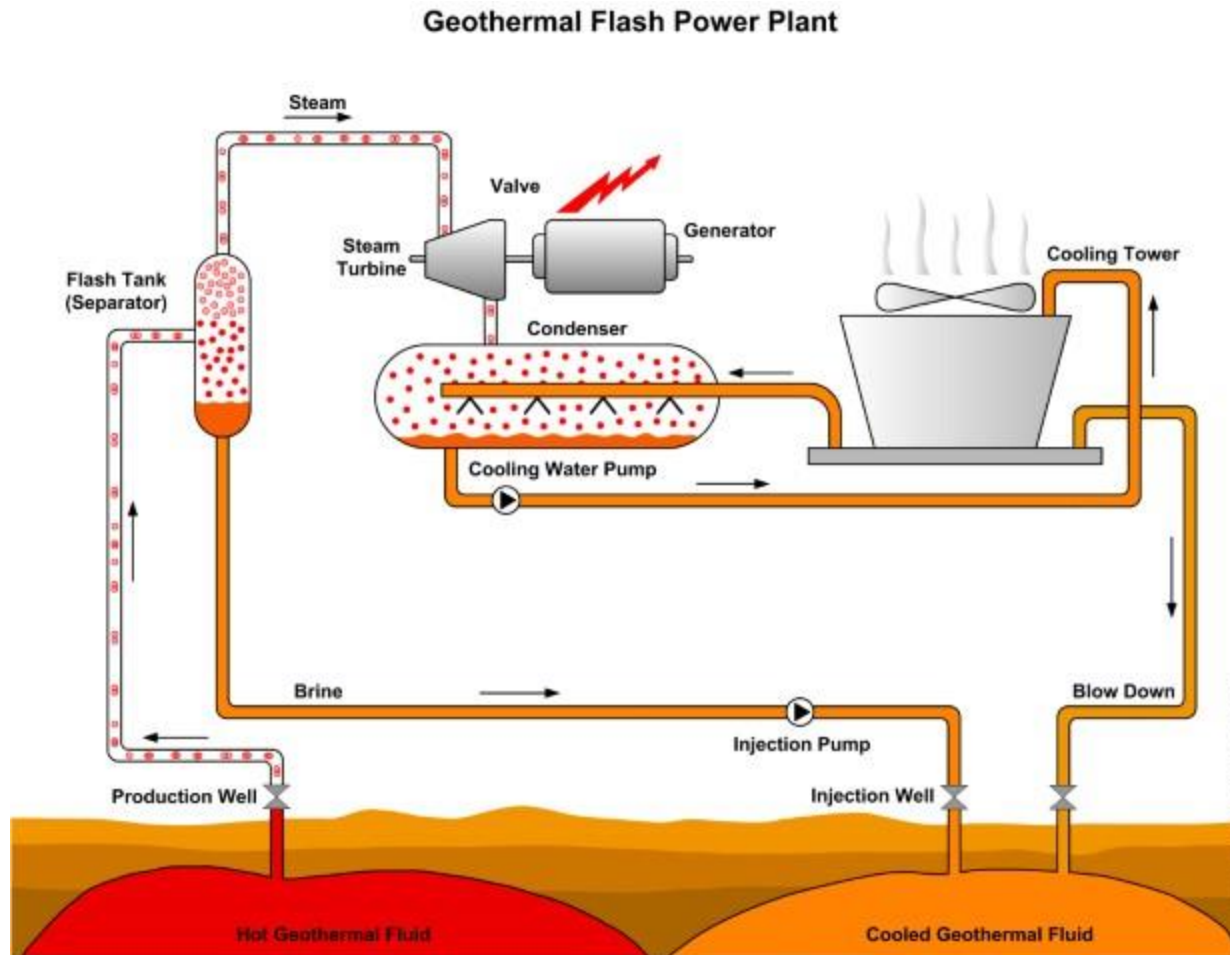
- Behind California, Nevada has the highest geothermal potential in the U.S.
- As we mentioned previously, geothermal is considered base load; it has a very predictable generation profile.
- Most of the geothermal generation in Nevada is air-cooled, meaning it consumes no water.

Complementary generation profile

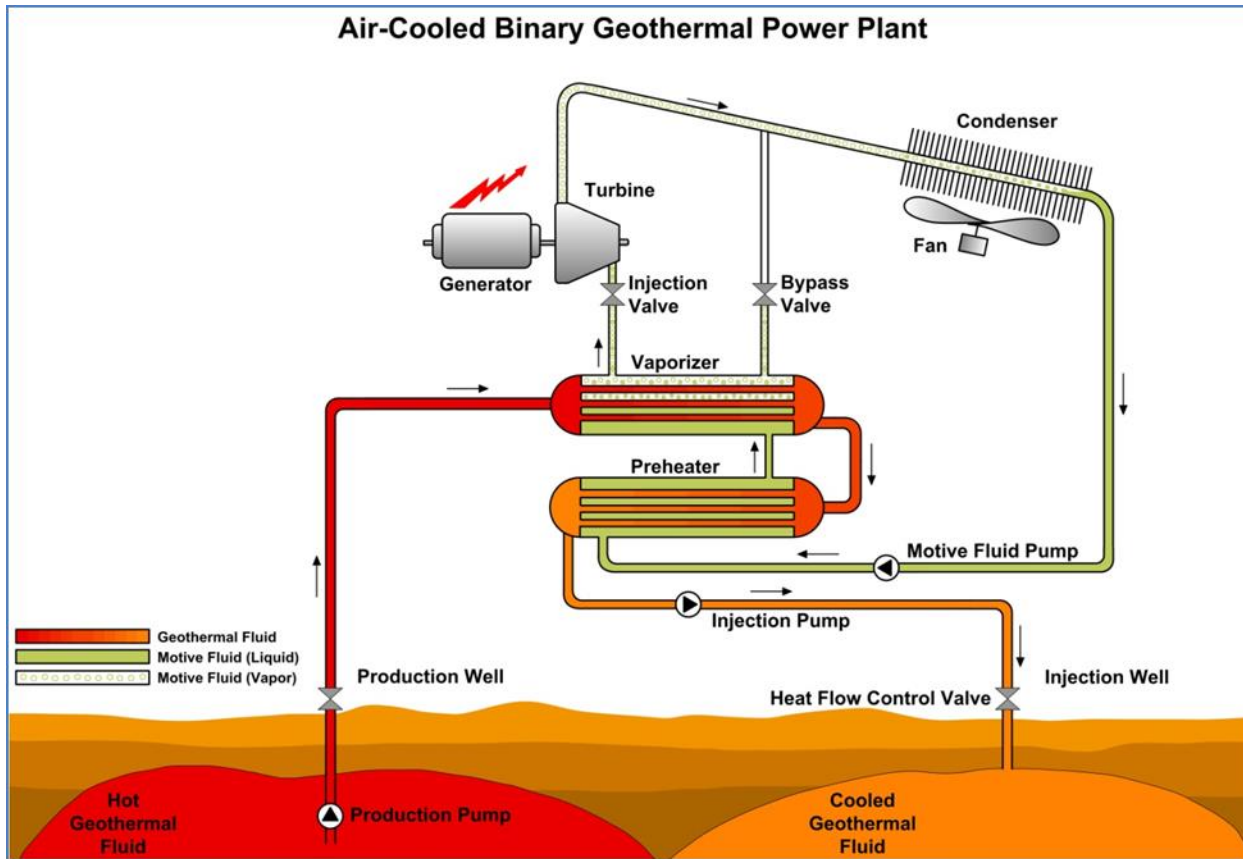


Source: Ashwood, Bharathan: Hybrid Cooling Systems for Low-Temperature Geothermal Power Production. 2011

How it works: Geothermal Flash



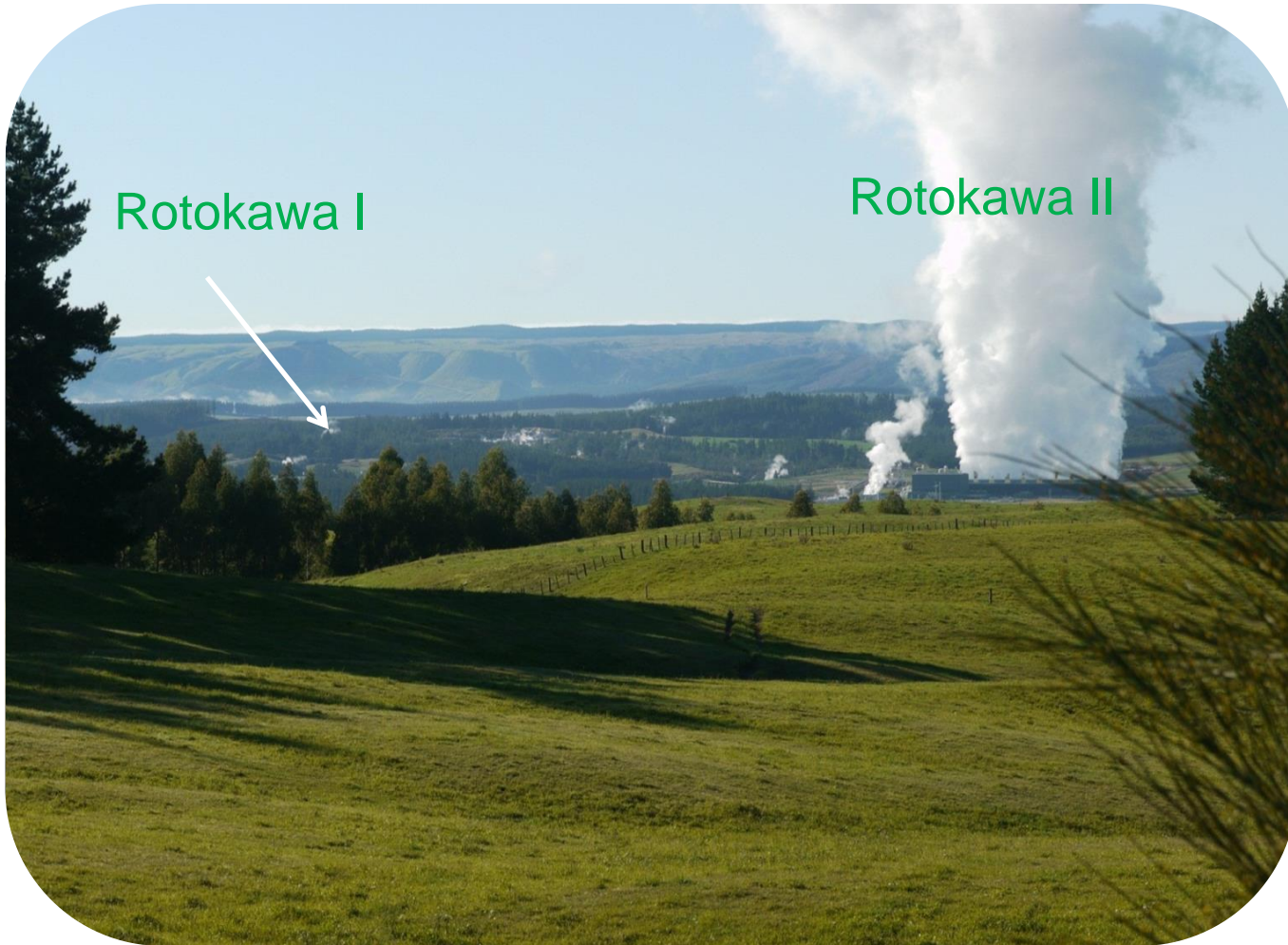
How it works



How Cooling Affects Efficiency

- Power plant turbines are extremely sensitive to changes in exhaust (condensing) pressure.
- If we can reduce exhaust pressure, we can increase efficiency and output.
- The cooler the condenser, the lower the pressure.
- Wet cooling produces consistently cool condenser temperature, but not without environmental impact.

The impact of wet cooling



Hybrid cooling systems

- Air-cooled technology with evaporative assist during hottest hours of day.
- Much lower water consumption than conventional wet cooling.
- Can be retrofitted to existing air-cooled power plants.
- Can be switched on and off quickly to help balance grid

Fogging system at work



Summary

- Changes are coming to Nevada's generation portfolio
- We can learn from others
- Intermittency presents challenges and has a cost
- Base load, dispatchable is essential to offset the cost and impacts of intermittency
- Geothermal is Nevada's best base load, dispatchable renewable energy source
- Has a large, positive impact to local economies
- Geothermal consumes little or no water
- How should this unique attribute be valued in the marketplace?