

Geothermal Deployment Challenges Facing California Cities and Counties

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California Geothermal Annual Forum

April 7, 2011



Cal-IRES Integrated Renewable Energy Systems
for a Renewable Energy Secure California

Outline

- Regulatory and Deployment Challenges
- Geothermal Regulatory and Deployment Success Story
- California Cities and Counties
- Deployment Models
- Conclusions and Recommendations



Regulatory Challenges

- Regulation typically follows deployment. At the city and county level it needs a profitable local commercial industry to help shape it. Conflicting local regulations will drain precious industry cash flows away from development.
- Next wave of geothermal deployment in California can be helpfully informed by solar deployment experience. Is there a way to integrate with solar deployment programs?



Deployment Challenges

- Technology – what you can do
- Economics – what you should do
- Politics or (more politely) policy – what you will do

Is there an obvious, near term, well defined problem? If not, politics will be the biggest challenge in most cases.



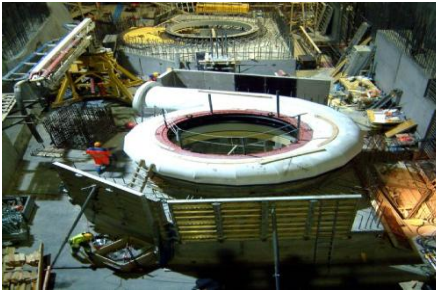
Economic Impact of Indigenous Energy

- Iceland is a volcanic island and a micro-state surrounded by the North-Atlantic Ocean (103.000 km²) with a total population of only 320.000 inhabitants (cf. California at 403,934 km²)
- During the course of the 20th Century Iceland changed from being among Europe's poorest countries, depending upon peat and imported coal for its energy, to a country with the world highest living standard (with Norway)
- A substantial part of Iceland prosperity in the latter half of the 20th century can be attributed to increased use of indigenous renewable energy sources
- Iceland is now on a mission to eliminate the use of fossil fuels over the next few decades

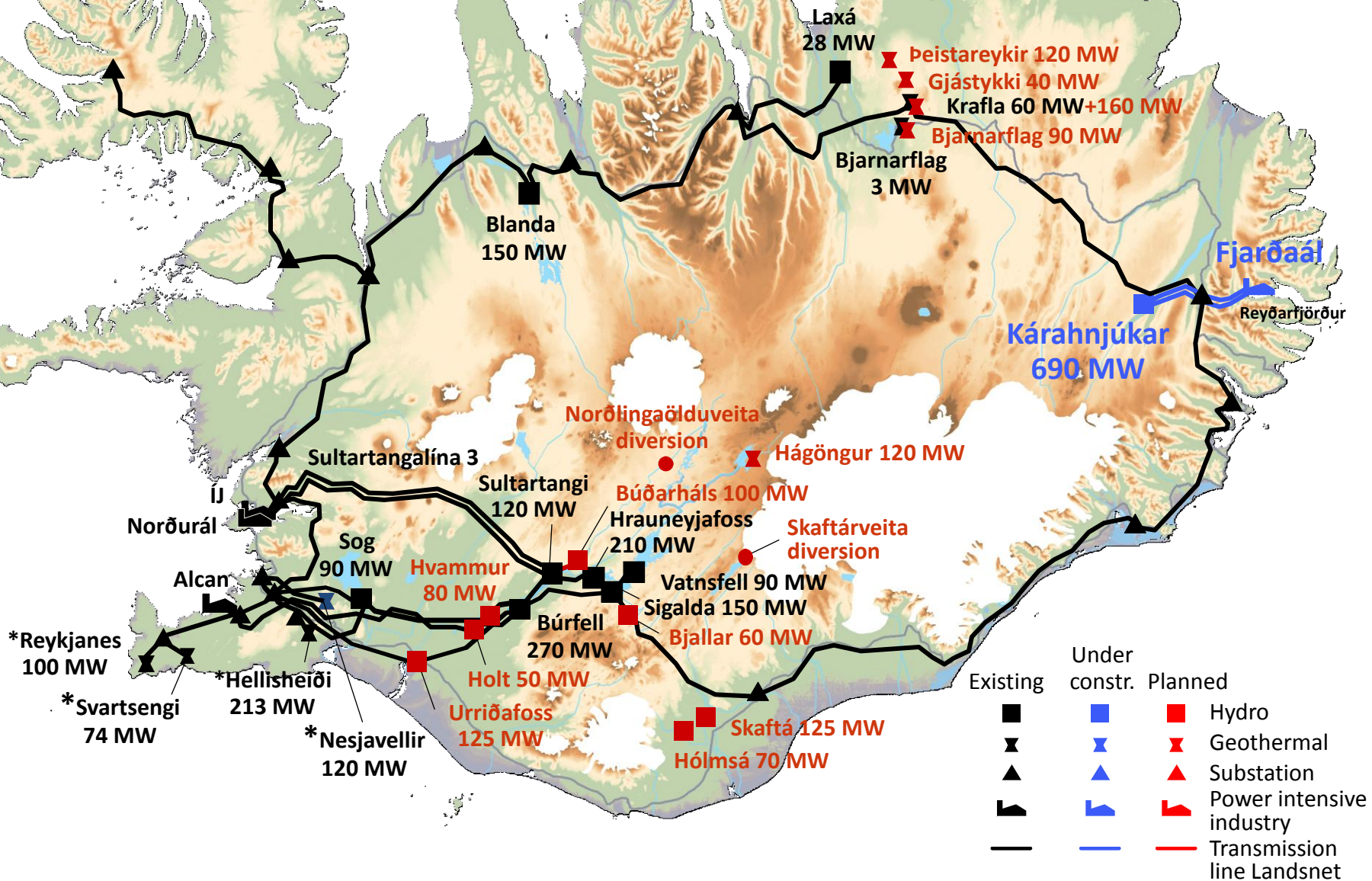


Energy Facts about Iceland

- About 90% of all buildings in Iceland are heated up by geothermal waters (10% electric heating)
- 100% of electricity generation (hydro: 71%; geo: 29%) and 82% of the primary energy (geo: 62%; hydro: 20%) comes from indigenous renewable energy sources, highest of any country
- The remaining 18% of current primary energy needs in Iceland is met by imported fossil fuel – used in transportation and fishing

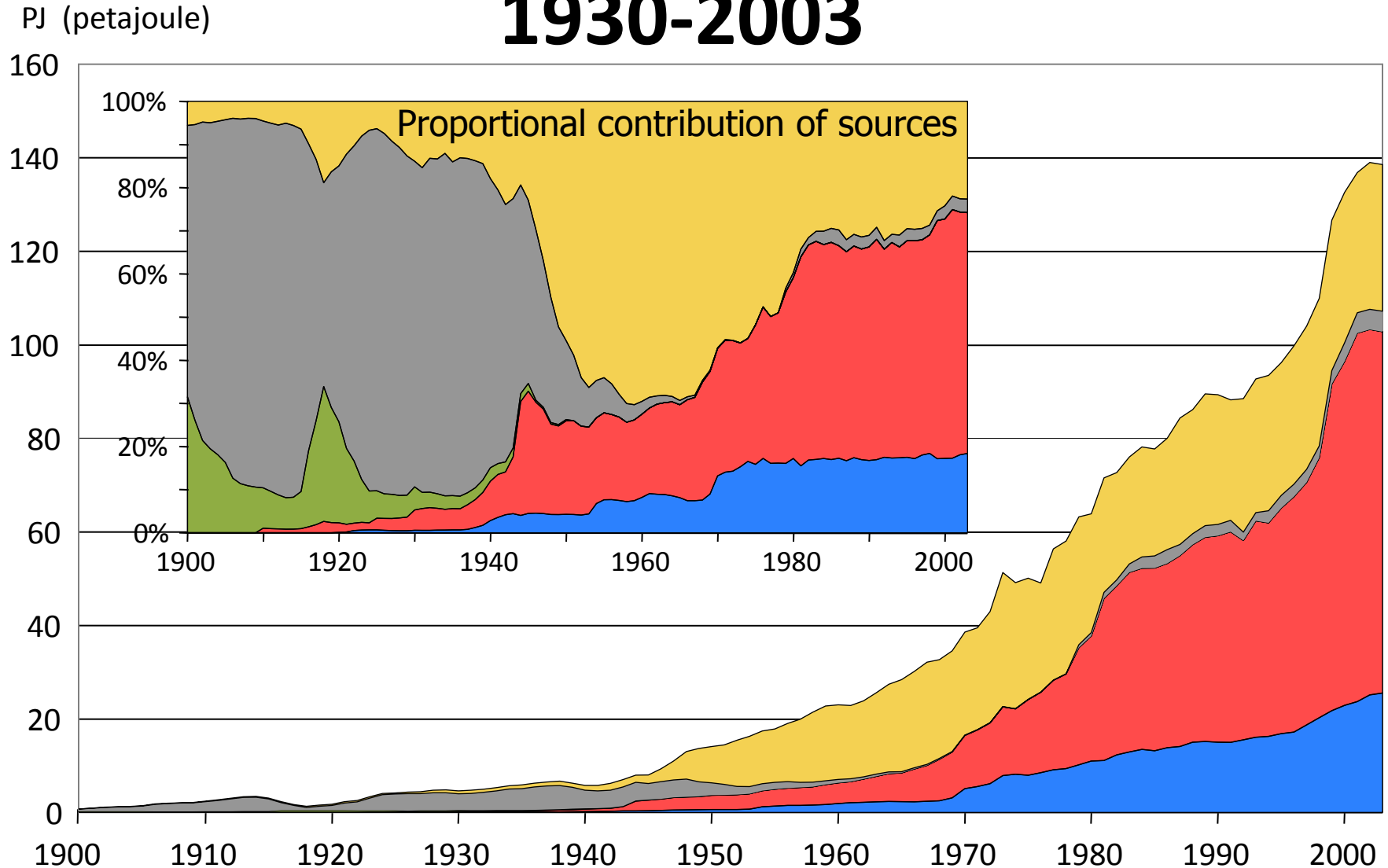


Iceland's Power System



Energy Consumption in Iceland

1930-2003



■ Hydro Power ■ Geothermal ■ Peat ■ Coal ■ Oil

Lessons Learned from the Icelandic Experience

- **Strong government support for renewable energy utilization and export of technical expertise**
- **Focus on continuous improvement and innovation in both district heating and electricity production**
- **Informed public and media understanding why utilization of renewable energy is important for the environment and the economy**
- **A matter of public pride - Icelanders are determined to complete the transition to a fully renewable energy society**



California Public Power Cities

Southern California Public Power Authority Members

City of Anaheim
City of Azusa
City of Banning
City of Burbank
City of Cerritos
City of Colton
City of Glendale
Imperial Irrigation District
LADWP
City of Pasadena
City of Riverside
City of Vernon

Northern California Power Authority Members

Alameda Municipal Power
Bay Area Rapid Transit
District City of Biggs City of
Gridley City of Healdsburg
City of Lompoc City of Palo
Alto City of Ukiah Lodi
Electric Utility Port of
Oakland Redding Electric
Utility Roseville Electric
Silicon Valley Power Truckee
Donner PUD



RESCOs and CCAs

Renewable Energy Secure Community Projects

- Canby (Modoc County)
- Humboldt County
- **Sonoma County**
- San Luis Obispo County

Active Community Choice Aggregation Efforts

- Marin Energy Authority
- San Francisco LAFCO
- San Joaquin Power
Authority
- **Sonoma County**

Sonoma County may have the best menu of geothermal opportunities among currently active counties.



California Context

Geothermal Fields Location



Geothermal Counties Per capita income rank

- Imperial – 55
- Inyo – 27
- Lake - 35
- Lassen – 58
- Mono – 16
- Sonoma – 15
- Average - 34



Local Indigenous Resource Economic Models

General

- State-wide (developed electricity resources are off the table)
- Regional (natural gas is king (for now) of California heating and cooling)

Local Strategy Options

- A. Import all locally consumed energy at high prices
- B. Export all locally produced energy at low prices
- C. Both A and B (current paradigm)
- D. Be more like Iceland



Conclusions and Recommendations

- Technology – Energy systems are more like orchestras than instruments. They need integration just as orchestras need composers and conductors.
- Economics – Energy resources are some local jurisdictions' economic future. Manage them as such.
- Politics – Be more like Iceland.

