SMU Conference: Geothermal Energy Utilization Associated with Oil and Gas Development, June 13-15, 2011

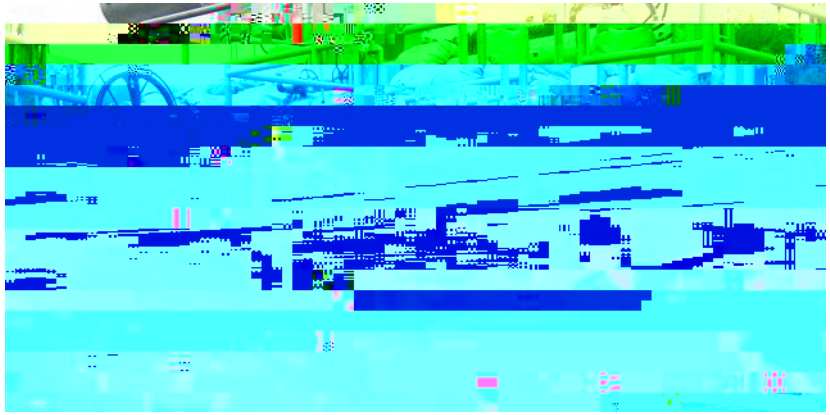
"Dinosaur and Ant Are Friends – O&G and Geothermal Can Join Forces"

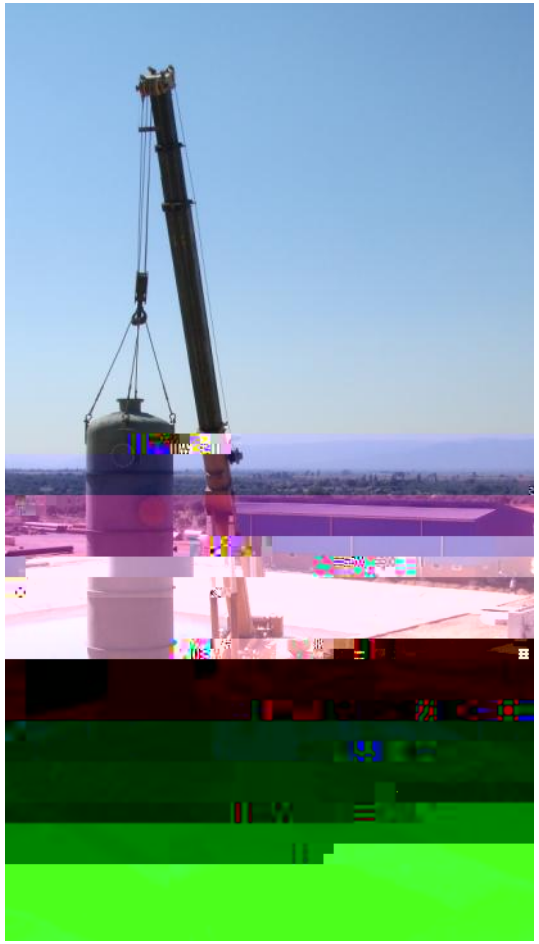
Intro to this presentation!

There’s a strong family resemblance between O&G projects

O&G and geothermal are friends?

Well, yes. Sure, O&G is a huge industry, and geothermal is small by comparison. But our two industries function in the same world of geological risk, and we have a similar accountability for what happens at the wellhead.





We stole it fair and square!

Much of the key technology of geothermal resource identification and production were borrowed from our oil and gas cousins. We in the geothermal world have been

O&G and Geo: practical similarities!

- Betting on production of stuff nobody can see
- Reliance on crusty, highly knowledgeable old-timers who are usually not presentable to bankers
- Funny smells
- Weird stuff building up in the pipes
- Chemical-process-intensive content of technology

- Risk and depletion issues for production and financing
- Similar community concerns re: environmental impacts

Specific Areas of Congruence

Obvious Resource Congruencies

- Risk: both industries bet on resources nobody can see
- Exploration techniques
- Drilling and well completion techniques
- Resource management strategies: long-term drilling program, planning for depletion, scaling/corrosion control, well-field management

Congruency in export strength

Congruency: Multiple cash streams

O&G is used to breaking down its production into various resource streams. Similarly, geothermal can deliver:

- Electricity
- Process and district heat
- Bottom-end minerals recovery (zinc, lithium, sulfur)

A Quick Look at Technical Aspects of Co-Production

Co-Production: familiar stuff

Mechanical interconnection, separation, brine handling systems = no-brainer

Cooling system selection = thought-provoking, climate- and water-dependent

Cycle selection (flash, binary) = sometimes thought-provoking, most likely flash

T-G and B.O.P. design = sometimes thought-provoking

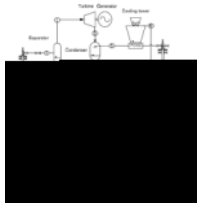
Electrical interconnection systems = sometimes thought-provoking

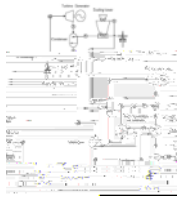
Dizzying Array of Cycle Choices

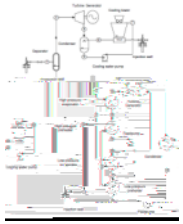
Customization is often worth it

Bigger is better, unless it isn't

Consider O&M

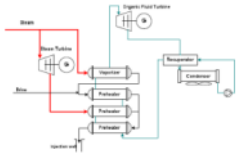


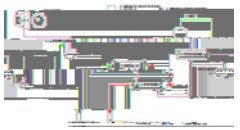




Combine standardization with flexibility

No such thing as waste





(Mlcak, 2002)
(Swandaru and Palsson, 2010)
(Kaplan, 2007)

The dynamic binary marketplace

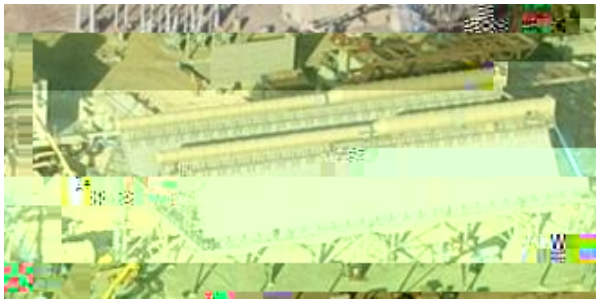
Package wrap or equipment supply

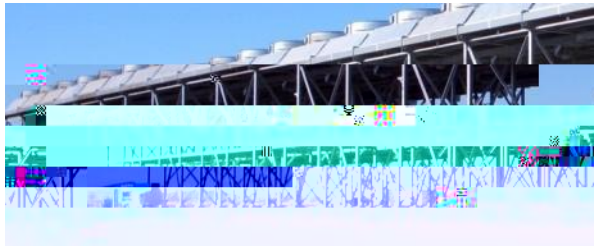
Big or small

High or low temperature

Binary solutions applicable to geothermal, co-production, industrial heat recovery, etc.

Heat rejection: very important





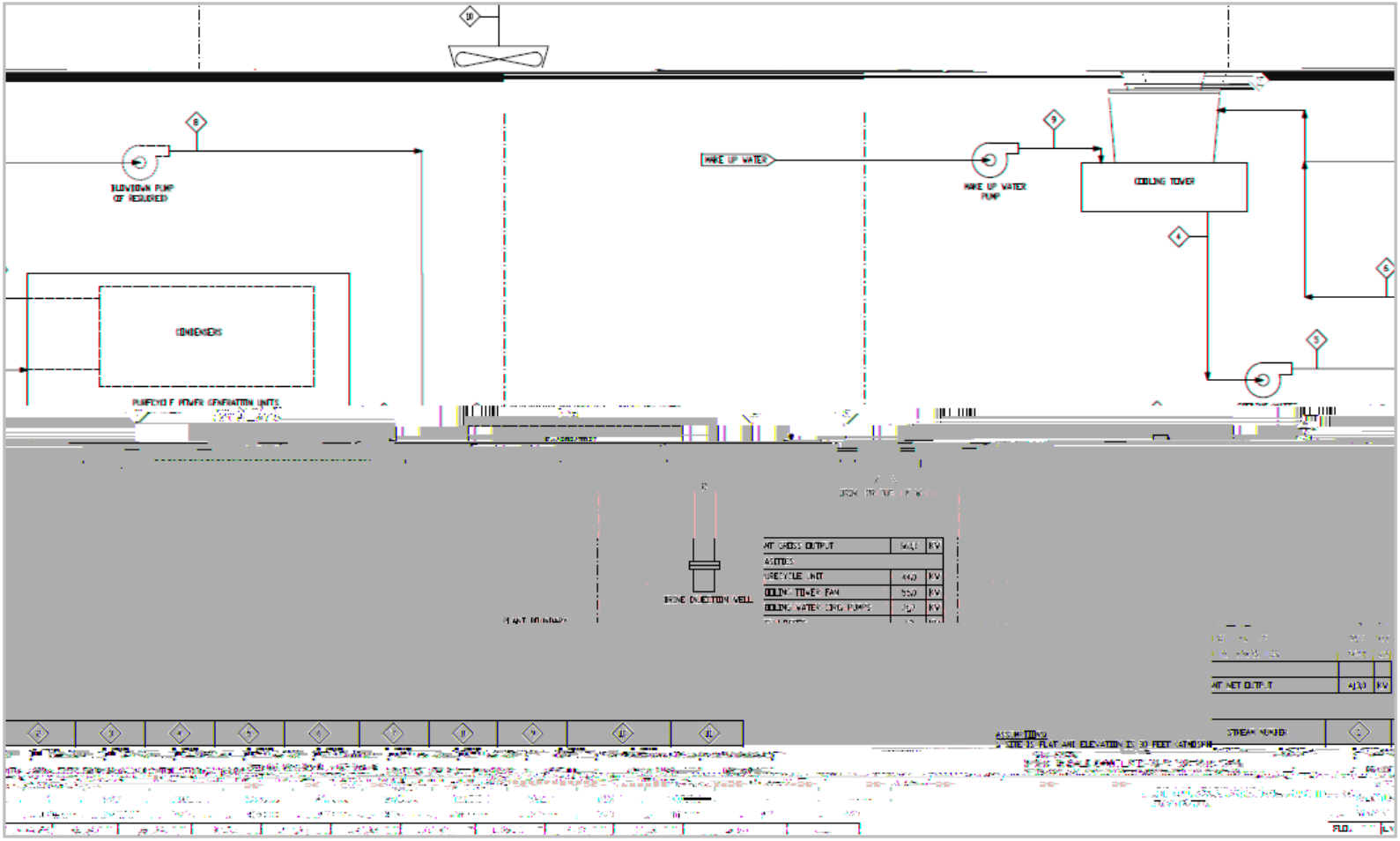
Selection of the optimal cooling system is crucial to getting the most out of the unit, since a co-production turbine-generator machine needs to take efficient advantage of a fairly narrow temperature difference between the resource and the environment.

Geothermal plant engineers pay an obsessive amount of attention to cooling system design.

Where to connect!

Commercial Considerations

An example PFD/heat balance



Indicative costs & project approaches

Cost

- Indicative Cost for 560 kW gross: $3,900/kW (1-2 wells)
- Indicative Cost for 2.5 MW gross: $3,000/kW (5-10 wells)

Approach

- EPC – full wrap with 15% markup or more due to small scale
- Design/Bid/Build with self or local financing

Summary!

In many ways, O&G people are on familiar ground when it comes to geothermal co-production.

The O&G and geothermal industries have potentially lavish export and domestic application possibilities.

Equipment economics will improve with wider and more applications!

Ant dinosaur! Open invitation to share forces and insights for heat recovery/co-production and geopressure opportunities!

Thank you for your attention!

Any questions?
Please contact:

Kevin Wallace, PE
Sr. Project Manager
kwallace@powereng.com
(208) 788-0564

William Harvey, PE, Ph.D.
Project Engineer
bharvey@powereng.com