Case Study: Stretching High Enthalpy Geothermal Fluid

You have access to high pressure, high enthalpy fluid suitable for geothermal power generation. What do you do?

Develop a traditional geothermal Rankine cycle? well yes, but the high pressure drop means that the back end of any steam turbine will have almost as much condensate as steam, so that's a problem. There are solutions to that problem, but it's more complicated and more expensive, and there is all that hot concentrated brine to deal with.

Do you develop a plant based on a binary Rankine cycle? It doesn't have that wet backend problem or major issues with non-condensable gases. Great, as long as you are happy having a gasoline like substance as your primary working fluid.

Do you have enough geothermal fluid to build a plant as big as you want? Probably not, what about boosting that cycle with thermal fuel, would that work?

Well trying to put geothermal fluid through traditional steam raising equipment would never work, but if you could find a way, the thermal energy could be used to superheat the geothermal steam stretching the amount of work that could be done with each kg of steam. This in turn would dramatically increase the MWh yield per tonne of geothermal fluid, at the expense of a significantly more complex plant and the thermal fuel to fire it on.

So would you be interested in plant that was built around a high pressure reheat Rankine cycle that is driven by geothermal fluid and fossil fuel of any kind? "Sounds too complicated", well maybe, but what if the cycle design held out the promise of:

- Clean steam in the main power cycle, no geothermal steam in your turbine;
- A highly efficient reheat steam cycle;
- Use of a high efficiency utility class steam turbine;
- No concentration of geothermal brine, so low discharge temperatures are possible without silica dropout;
- No problems with high non-condensable loads;
- The option of utilizing second-hand power station equipment with very low first cost;
- An overall plant efficiency that provides more MW of export electricity than can be created by exploiting the thermal and geothermal fuels separately.

GSL has designed such a thermal cycle, and the results were quite staggering, particularly the cycle output when compared to the separate utilization of the same amount of fuel in dedicated single fuel plant.

We make no representations about the overall commercial performance of such a plant we haven't looked at that aspect yet, but we are very proud of having come up with an innovative concept in this area and having performed enough analysis to demonstrate some very appealing benefits for fields having high pressure/high enthalpy geothermal fluid.