



Modelling Geothermal Resource Utilization By Incorporating Resource Dynamics, Capacity Expansion, and Development Costs

Nathalie Spittler, PhD student

nas14@hi.is





Research question

How does the consideration of geothermal resource dynamics for electricity production influence certain variables of the energy system (e.g. electricity cost, resource availability)?

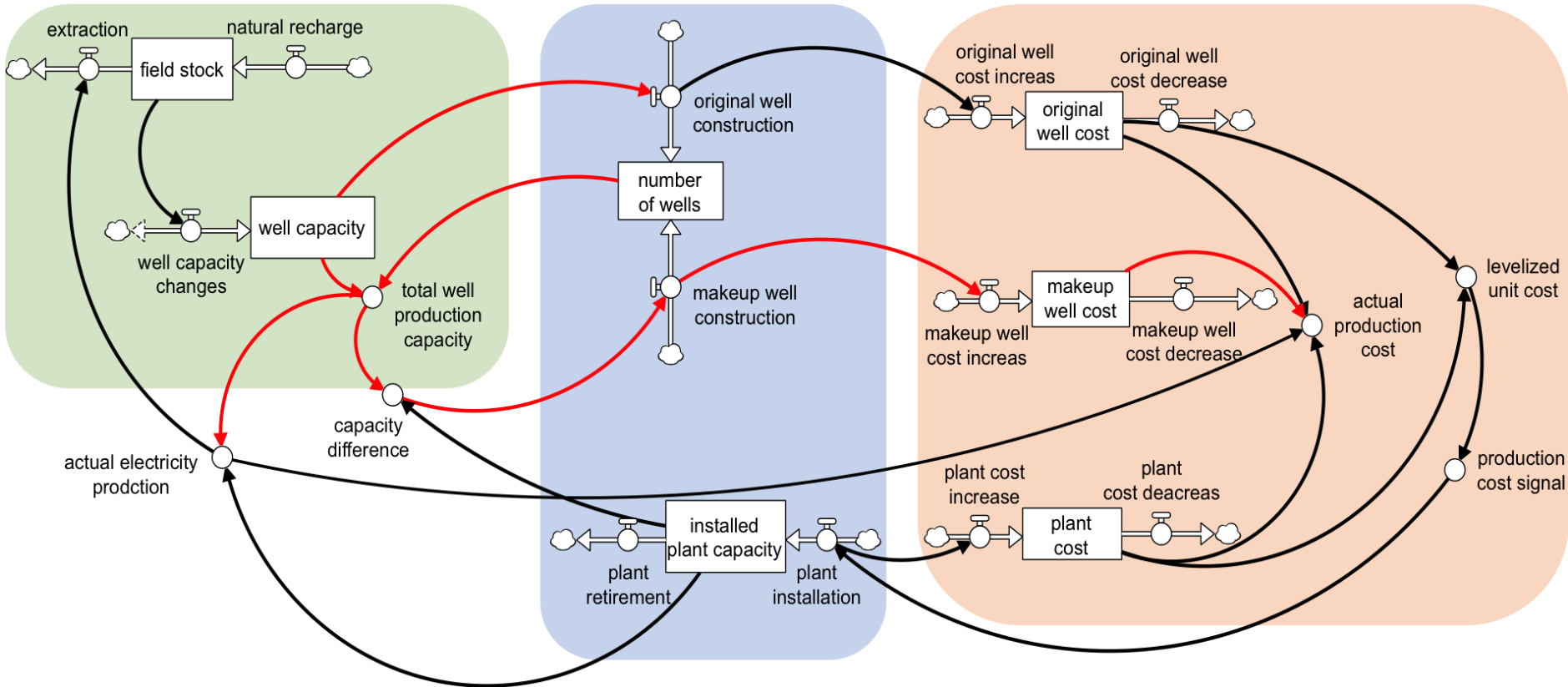


Geothermal resource dynamics model

Geothermal resource dynamics

Plant construction

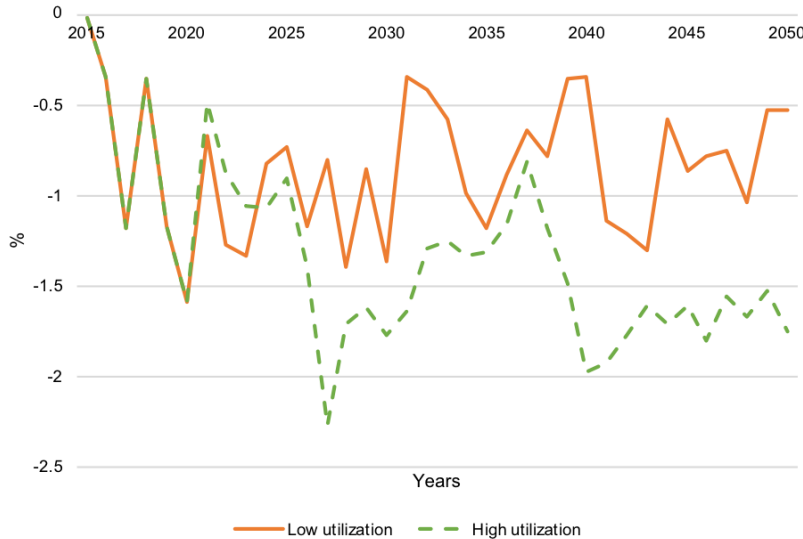
Economics



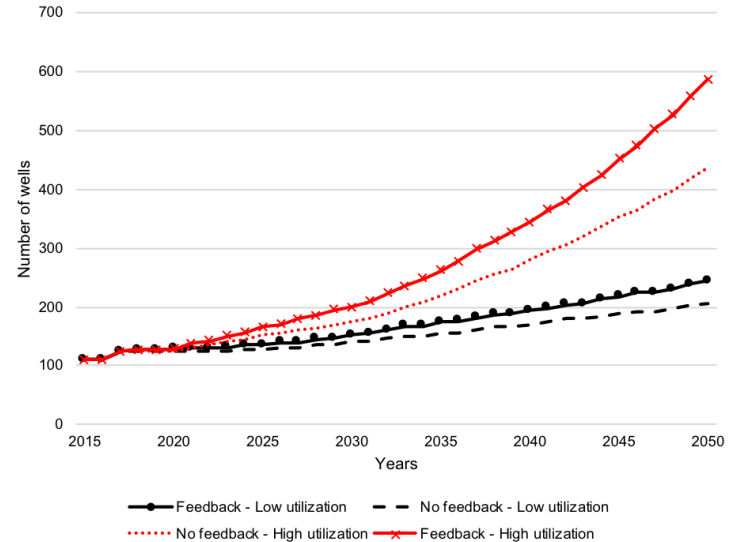


Geothermal resource dynamics results (i)

If geothermal resources are considered...



...forecasted **electricity production** is lower due to declining well capacities and delays in makeup well construction.

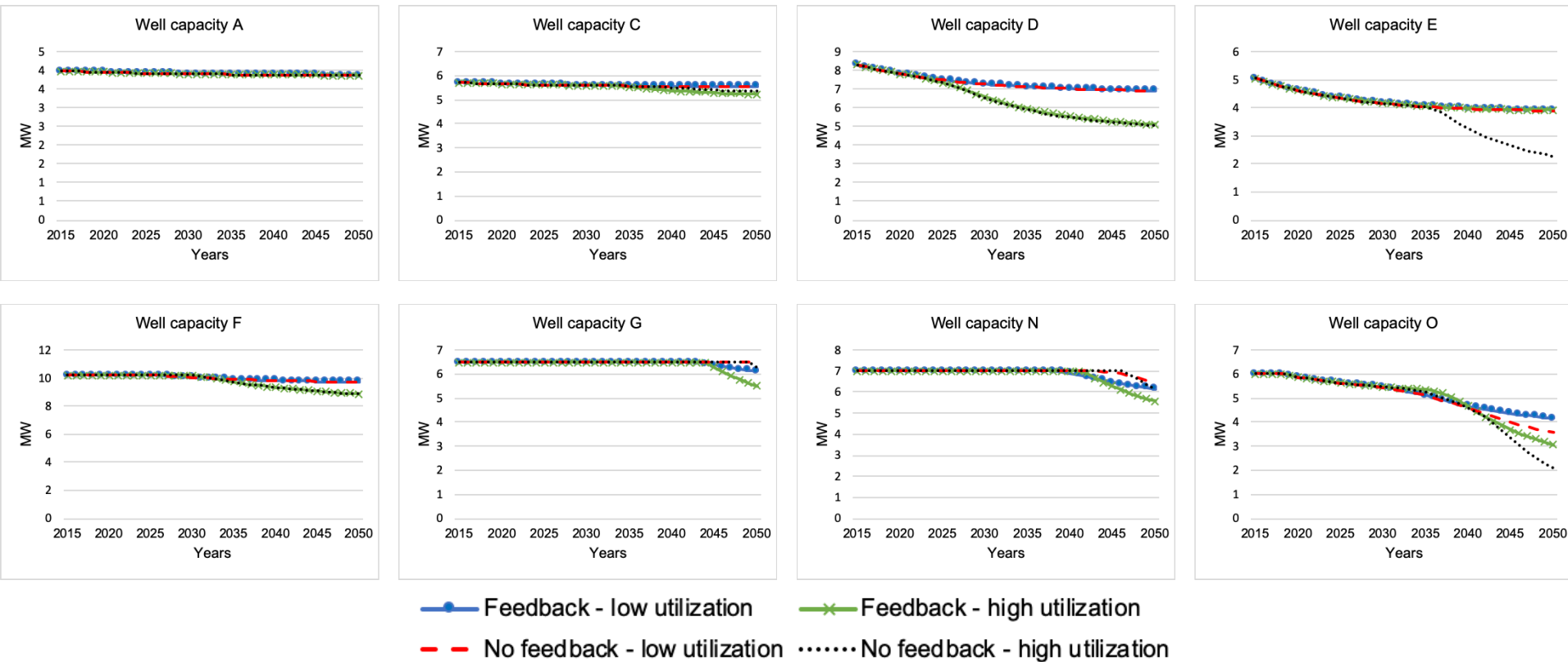


...**total number** of estimated **wells** is higher.



Geothermal resource dynamics results (i)

If geothermal resources are considered...

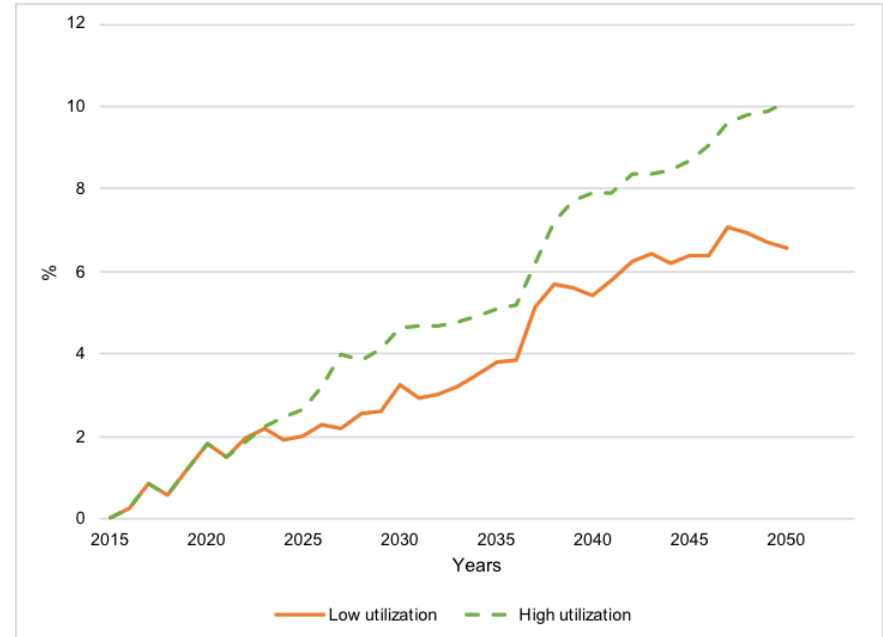
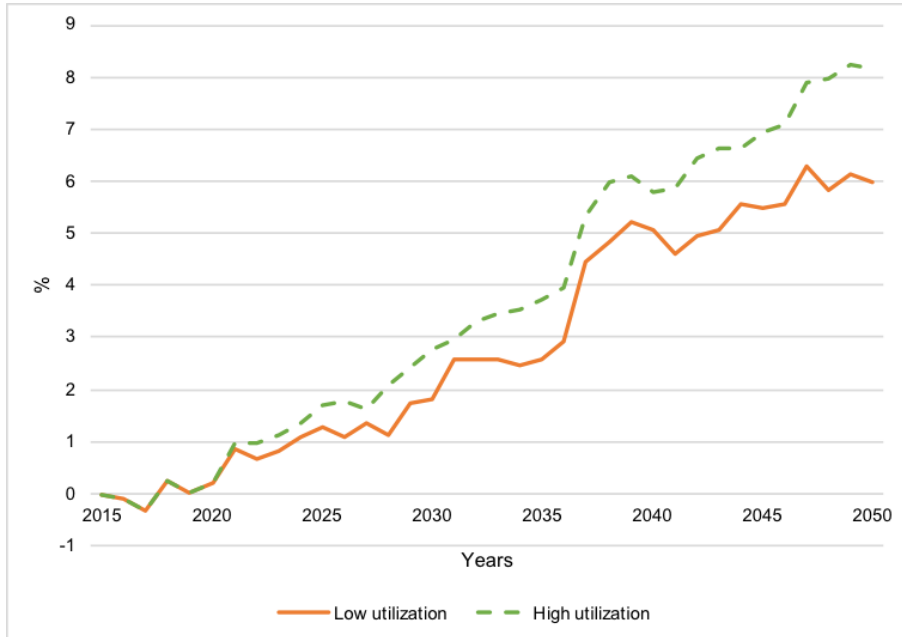


Well capacity (corresponding to field stock) of some plants is significantly lower/higher.



Geothermal resource dynamics results (iii)

If geothermal resources are considered...



...total annualized cost differ and differences in average production cost per unit are even higher because production is lower.



Conclusion

- System dynamics is well suited to capture the dynamics of the geothermal resource and the feedback between various system components
- The geothermal resource dynamics' effect on electricity production, cost and resource availability is captured
- Including a more realistic representation of the renewable resource dynamic led to more accurate estimations of future development of some variables



Take-home message

Excluding dynamics of renewable resources, such as geothermal, can lead to suboptimal planning of energy systems



For more information contact nas14@hi.is

