# Meeting 13/05/2020

Chris, Stuart, Gus, Mylene

Online

* Keep length of confirmation report
* Add executive summary with 3 research questions and hypothesis to test: identify what is though from previous studies and define testable hypothesis to prove/refute the main ideas/research questions.
* Date for panel – ask Wyn for availability on the 11th June
* AFH, MR and CMCD to define the scope of the first paper and what figures to use = how to illustrate the main points and conclusions, will enable to focus on the paper direction and make writing easier.
* Chris to work on inkscape file reading

Case study:

* Midlothian Coalfield
* Dawdon-Horden
* UKGEOSC site

Research questions

1. Heat sources and recharge: First paper – to be published in near future:

* Hypothesis:
  + GSHPs are heat mining – storage is required
  + Is **heat mining** inevitable (i.e. cooling of ground in near surface)?
  + Is **solar/surface heat flux**/**recharge** negligible compared to geothermal gradient?
  + Does surface temperature contribute to the mine-water thermal recharge?
* Message: Coupled GSHP-storage (i.e. recharge from waste heat) is a more complete system to avoid heat mining (balanced production/recharge)
* Conclusion: storage requirement for the sustainability of heat extraction from the GSHP.
* Notes:
  + Focus on BHE for single house (domestic heating)
  + Justification of line source extraction model: we focus on the geological response to the heat extraction (i.e. contribution from subsurface geology), which is not a function of the heat exchanger behaviour: no need to model BHE-ground heat transfers (engineering problem)
  + Don’t need to derive top BC flux from local climate data
  + Make 3D model work for pre-empting reviewer questions but maybe not necessary.
  + Focus on diffusive heat transport/heat mining first - Include advective flow in a second stage paper (groundwater flow is another problem – suggestion to create hydro map for the UK as groundwater flow might enhance heat recharge while no porosity in basement) 🡪 could assess what technology is most suitable for geothermal applications depending on the depth + recharge mechanisms
  + Gus: recharge through solar panel (April to September) for hot water heating, includes a geographical aspect (i.e. orientation of the panels)

1. Impact of past mine working practices on heat in flooded mines
   * Gus: look at results from radioactive waste disposal literature (effects of humidity/ventilation)
   * Chris: possibility to use UKGEOS temperature data? (Watson and Westaway 2020; Scottish Journal of Geology):
     + Paper based on deep seismic borehole that did not intersect mine workings.
     + Data up-dip available + BGS do have pump test data and temperature logging. Pump test data (20 l/s for 5 hours / 1-2 m drawdown) being prepared for public release + loads of other publications (Stuart)
     + Could use data to model the 2D heat transfer at the site
     + What is the contribution of the of flow toward the Clyde (Stuart)
     + Data is available but need to understand what the past recent history affect has been on the temperature profile. Need to show the effect of water abstraction on subduing the geothermal gradient = explain long-term and overprint on the temperature gradient by history of dewatering (how impact zone of influence + temperature distribution) 🡪 HT model (Chris)
     + Would be good to get a publication out in the area soon (Stuart)
   * Possibility to use data from Dawdon (includes temperature profile before pumping too so could be used for benchmarking)
   * Chris: create generic model of zones (stratigraphic succession appear in every location but with different thicknesses: i.e. 50m soil, Carbo sequence, coal mine material).
     + Compare the three locations and see how they differ.
     + How geology reacts to heat extraction = heat content vs heat required
2. What are the most important data to extract from mine plans to build useful models to assess sustainable heat

Other work in progress (CMCD)

* Jesus looking at the value of the void
* Chris developing code in OGS 2019
* Fiona: thermos-mechanical aspects