

4-year research programme

Objective: Improve efficiency, safety and public understanding in geothermal

Output : Data & insights to support policy development and regulatory frameworks

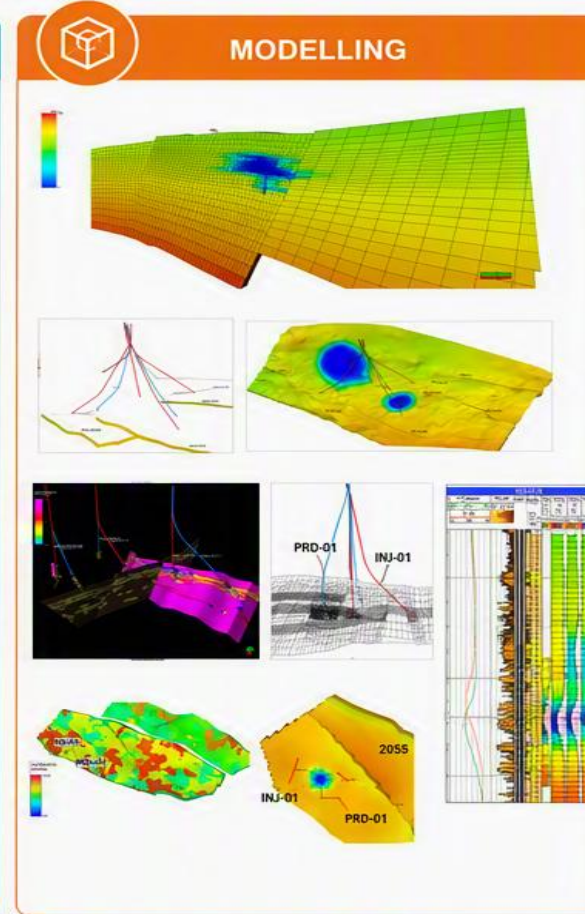
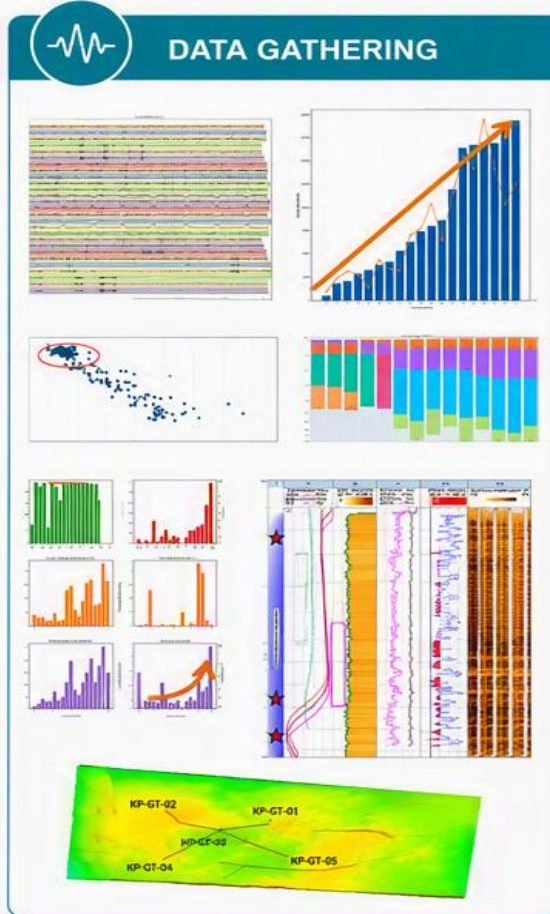


-  WP1 – shallow geothermal
-  WP2 – marginal reservoirs
-  WP3 – closed loop systems
-  WP4 – coldfront & induced seismicity
-  WP5 – geothermal production data



Programme highlights in last year

FIELD CAMPAIGNS



OUTREACH

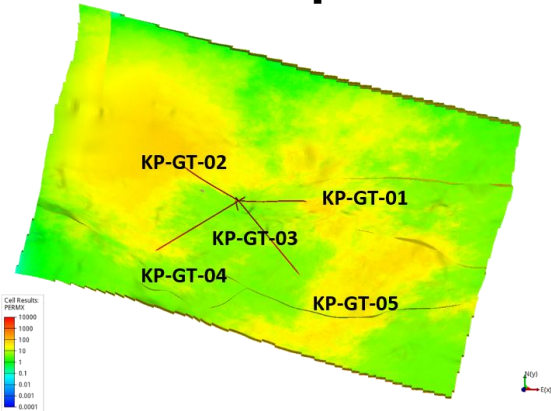




Op deze plek in Middenmeer onderzoekt
het Geo4all project...

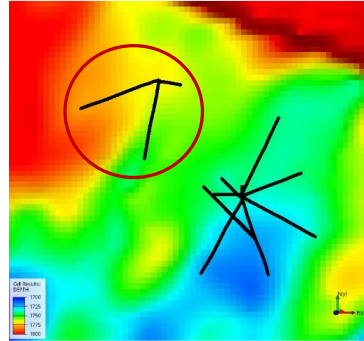
Case studies

Koekoekspolder



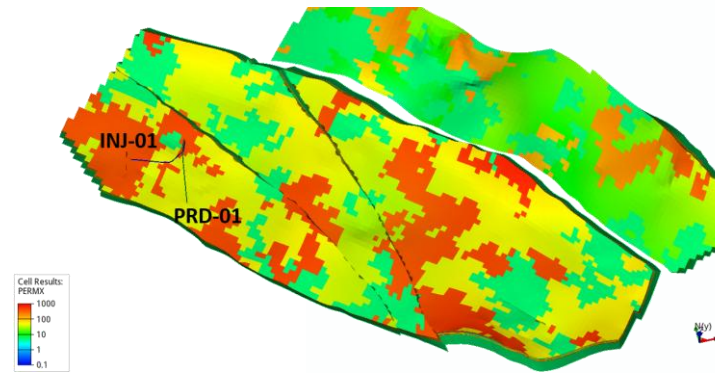
- Existing triplet (12-year production)
- New doublet planned
- What is the best placement for KKP-GT-04 and KKP-GT-05?

Luttelgeest



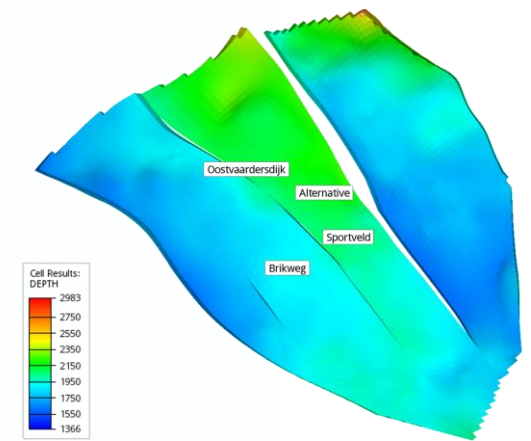
- Existing triplet in operation
- Problematic injection well LTG-GT-06
- What are the most cost-effective intervention to boost production?

Amsterdam



- Green field development
- First doublet planned for a selected surface drilling location
- Limited available data: fair degree of uncertainty (reservoir structure, facies assumptions, compartmentalization)
- What is the best well placement?

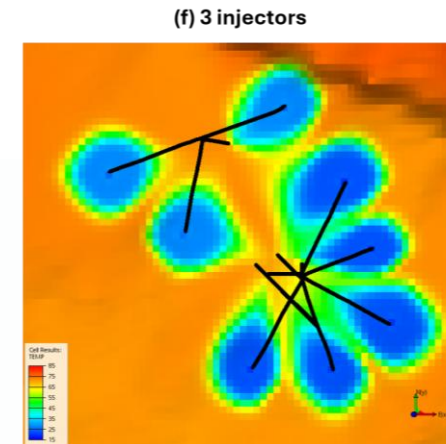
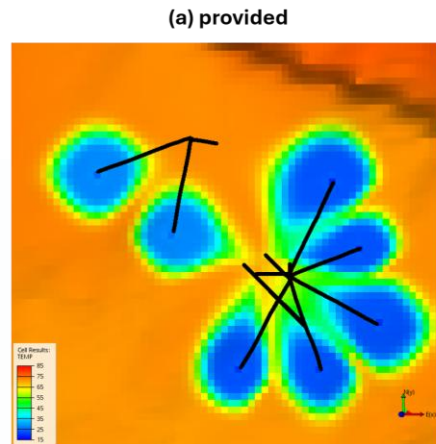
Almere



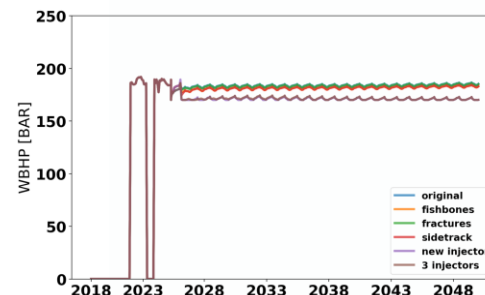
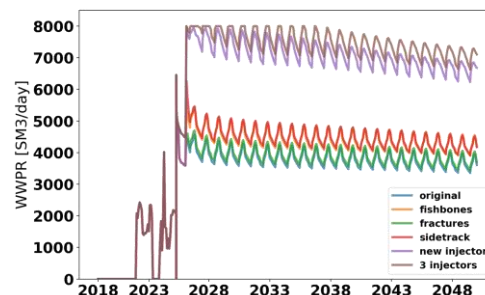
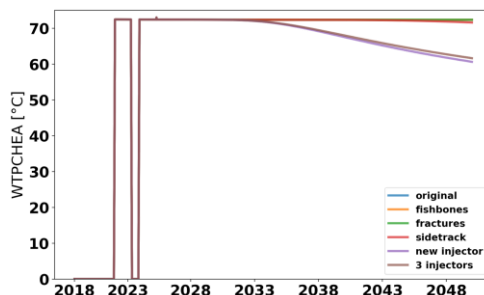
- Truly green field development
- Early stage: all decisions are open
- Limited available data: mostly conceptual model scenarios available
- What is the best well placement, surface drilling location, number of wells, play opener doublet?

Results: Luttelgeest

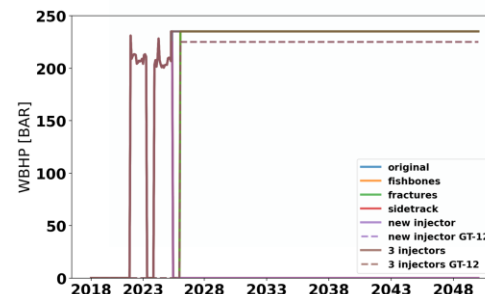
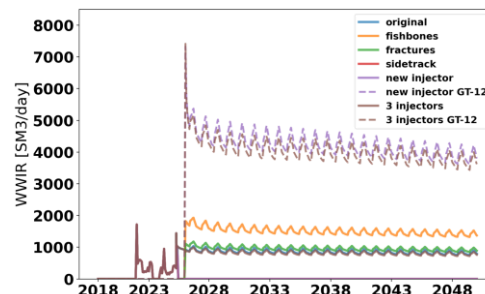
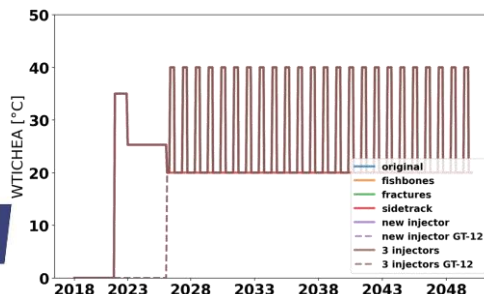
- 6 scenarios considered:
 - Original scenario, interventions in LTG-GT-06 (fishbones, fractures, side-track) and new injector (LTG-GT-12 replacing LTG-GT-6 and using 3 injectors)
- Fishbones and side-track expected to help (+17.5% in production rates), but main benefit is in adding a new injector (+85% in production rates)
- Cost-effectiveness analysis requires cost information (not available for all scenarios)
- Re-evaluated scenarios with revised well pressures: same conclusions
 - Increased drawdown in LTG-GT-04 (+10 bar), increased injection pressures (+5 and +10 bar for GT-05 and GT-06)



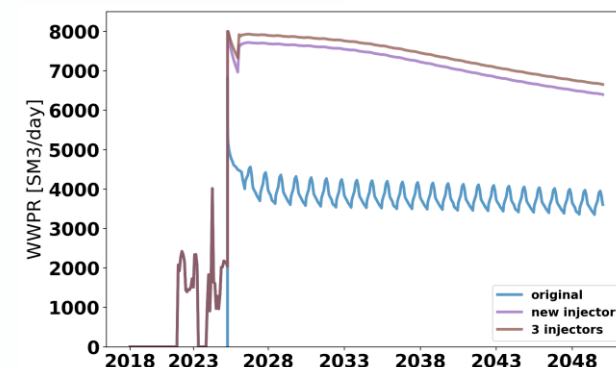
LTG-GT-04
(producer)



LTG-GT-06
(injector)

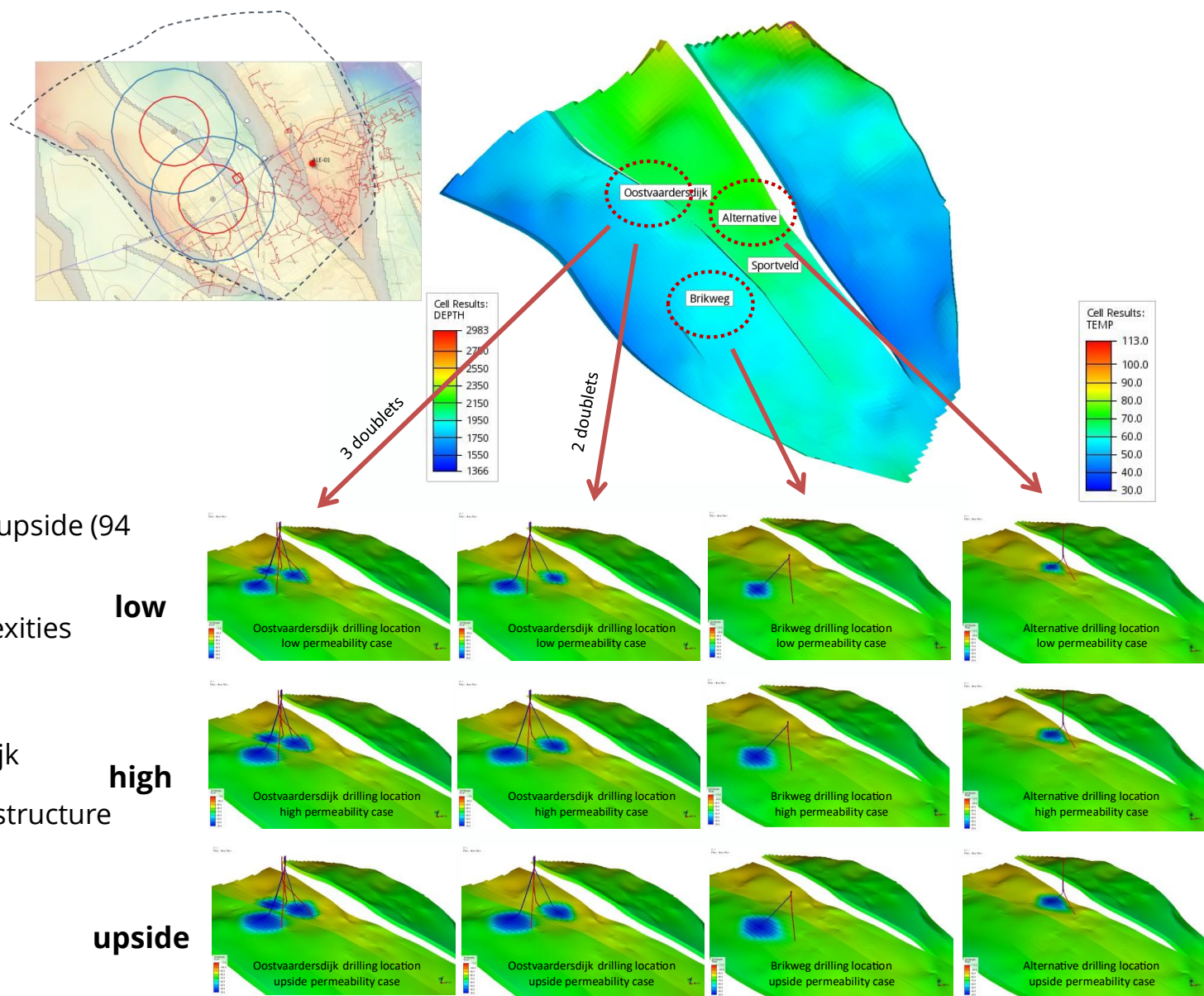


Production flow rates at LTG-GT-04
(scenario with revised pressures)



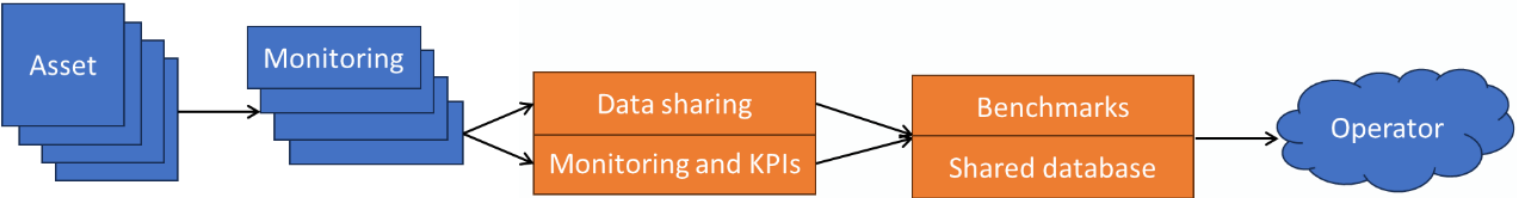
Results: Almere

- 2 fault block compartments:
 - Deep and shallow
 - Higher temperatures in deep compartment
- Little information available (distant analog wells):
 - High uncertainty on flow properties (permeability)
 - 3 scenarios considered: low (43 mD), high (75 mD), upside (94 mD)
 - Mostly conceptual models, without detailed complexities
- 4 surface drilling locations considered:
 - Brikweg, Sportveld, Alternative and Oostvaardersdijk
 - Different costs associated with heat transport infrastructure
- **Which surface drilling location?**
How many doublets?



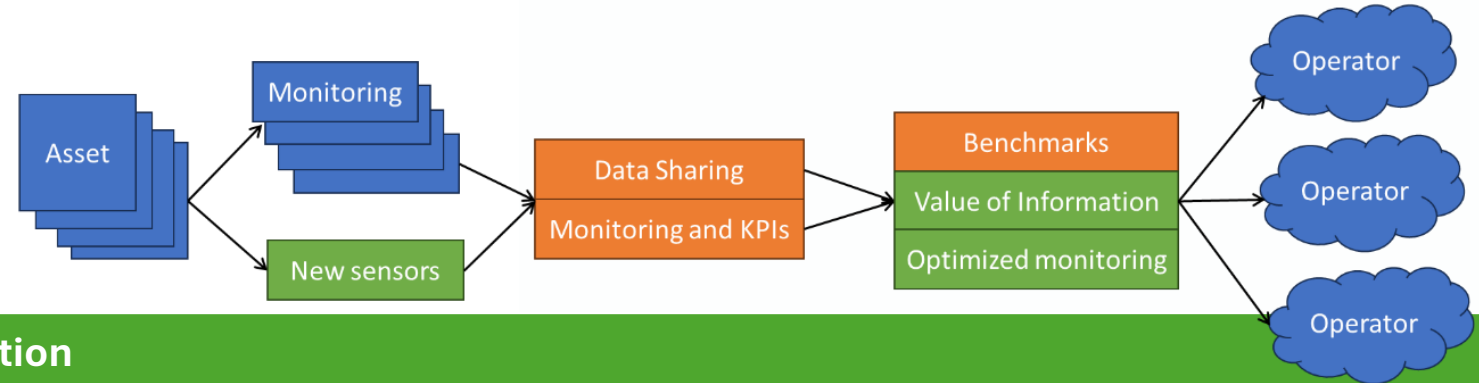
WP 5: Activities

WP5.1: Existing data



Activity	Description
5.1.1 Standards for KPI's	What are the essential data to be collected Can we derive KPIs from existing data in a standardized way? How can we make predictions and recommendations for operational settings or design improvement?
5.1.2 Data sharing and Benchmarking	What is gained by sharing data from multiple assets and what is the added value?

WP5.2: New data



Activity	Description
5.2.1 Data acquisition option evaluation	What options are available and how can we predict/evaluate their added value?
5.2.2 Data acquisition field evaluation	Is the predicted added value in line with field observations?

Bezoek onze
website



Geo **L4** all

innovatieprogramma