**GEOPHIRES Output File Header Descriptions**

**Input File:**The input file is a \*.csv file with the same name as the folder it is in.

Column Descriptions:

Index: matches the index in the file GEOPHIRES\_InputParameterDescriptions.xlsx

Group: matches the group name in the file GEOPHIRES\_InputParameterDescriptions.xlsx

dist: the probability distribution, as described in MonteCarloGEOPHIRESinParallel\_ForGeophiresv2.docx

arg1, arg2, arg3, arg4: the arguments to the probability distributions, as described in MonteCarloGEOPHIRESinParallel\_ForGeophiresv2.docx

**Output File: Run##\_SingleItemsSummary.xls**

Column Descriptions:

RowTemplate: Numeric values are quantiles of the output variable in the following columns. The mean and standard deviation are also reported.

InitHeatProducedMWth: The initial heat production from the production well, MWth.

AvgMWthProduced: The average heat production from the production well over the simulated lifetime of the system, MWth. Note: if the production essentially stops before the simulated lifetime, this value will not be representative of the reservoir’s heat produced during its useful life.

AvgkWh\_th\_Extracted: The average heat extracted from the reservoir over the simulated lifetime of the system. Note: if the production essentially stops before the simulated lifetime, this value will not be representative of the reservoir’s heat extraction during its useful life.

AvgkWh\_th\_Produced: Same as AvgkWh\_th\_Extracted, but accounts for wellbore heat transfer. So, this is the heat at ground surface, kWth.

LCOH\_$MMBTU: Levelized cost of heat, $/million BTU. 2016 USD are reported. Note: if the production essentially stops before the simulated lifetime, this value will not be representative of the LCOH during its useful life.

AvgProdTempDrop\_C: The average temperature drop in the production well over the simulated lifetime. Note: if the production essentially stops before the simulated lifetime, this value will not be representative of the production well temperature drop during its useful life.

NumRedrill: Number of times that new wells were drilled in the simulated lifetime.

Cwell\_M$: capital cost for wells, million USD.

Cstim\_M$: capital cost for production well stimulation, million USD.

Cplant\_M$: capital cost for the surface facilities, million USD.

Cdistr\_M$: capital cost for the distribution system, million USD.

Cpiping\_M$: capital cost for piping, million USD.

Cexpl\_M$: capital cost for exploration, million USD.

Ccap\_M$: total capital cost, million USD.

Coamwell\_M$: operation and maintenance cost for the wellfield, million USD.

Coamplant\_M$: operation and maintenance cost for the surface facilities, million USD.

Coamwater\_M$: operation and maintenance cost for the makeup water, million USD.

Coam\_M$: total operation and maintenance cost, million USD.

InitResHeat\_PJ: the total thermal energy contained within the specified reservoir rock volume, PJ.

AvgGeofluidPdrop\_kPa: average pressure drop.

AvgInjWellPdrop\_kPa: average pressure drop at the injection well, kPa.

AvgResPdrop\_kPa: average pressure drop in the reservoir, kPa.

AvgProdWellPdrop\_kPa: average pressure drop in the production well, kPa.

AvgBuoyancyCorr\_kPa: average correction to the pressure due to buoyancy, kPa .

RockTemp\_C: Initial reservoir rock temperature, °C.

FracWidth\_m: Takes a different interpretation depending on the reservoir model used. For plug flow, the width of the reservoir. For multiple parallel fractures, the width of the fracture. Both in m.

FracHeight\_m: Takes a different interpretation depending on the reservoir model used. For plug flow, the length of the reservoir (longest dimension in 2D space). For multiple parallel fractures, the height of the fracture. Both in m.

FracSep\_m: Takes a different interpretation depending on the reservoir model used. For plug flow, the height of the reservoir (thickness). For multiple parallel fractures, the separation between parallel fractures along the length of the reservoir. Both in m.

FracArea\_m2: Heat transfer area for the fracture in contact with the rock, m2.

numFrac: Number of fractures in multiple parallel fractures model.

ResVol\_m3: Reservoir volume, m3.

AvgAnnPumpCost\_M$: Average annual pumping costs, million USD. Note: if the production essentially stops before the simulated lifetime, this value will not be representative of the pumping costs during its useful life.

**Output File: Run##\_YearlySummaryData.xls**

Rows: Numeric values are quantiles of the output variable in the following columns. The mean and standard deviation are also reported.

Columns: The time (years) of the simulation.

Tabs:

RemainingResHeat\_PJ: The amount of thermal energy that can still be extracted, PJ.

kWh\_th\_Extracted: The amount of heat that has been extracted from the reservoir, kWhth.

kWh\_th\_Produced: The amount of heat that has been produced from the production well, kWhth.

ReservoirDrawdownPct: The percentage of the initial reservoir heat that has been extracted. This number can be greater than 1 with the multiple parallel fractures model when vertical flow is used.

**Output File: Run##\_TimestepSummaryData.xls**

Rows: Numeric values are quantiles of the output variable in the following columns. The mean and standard deviation are also reported.

Columns: The time (years) of the simulation

Tabs:

HeatExtractedMWth: heat extracted from the reservoir, MWth.

HeatProducedMWth: heat produced from the production well (ground surface), MWth.

ProdTempC: production temperature (ground surface), °C.

OrigProdTempPct: percentage of original production temperature, °C

VolInj\_m3ps: flow rate of injected water, m3/s

VolProd\_m3ps: flow rate of produced water, m3/s

TotPressDropkPa: total pressure drop, kPa.

InjPressDropkPa: pressure drop at the injection well, kPa.

ResPressDropkPa: pressure drop in the reservoir, kPa.

ProdPressDropkPa: pressure drop in the production well, kPa.

BuoyPressDropkPa: pressure drop due to buoyancy of the fluid, kPa.

PumpPower\_MWe: Pumping power requirements, MWe.

ResTempC: Temperature of the reservoir at point of contact with the top of the production well (temperature at depth), °C.

**Output File: Run##\_ProbTempHeat.xls**

Columns: The time (years) of the simulation.

Rows:

Prob3MW: Probability that the heat produced is greater than 3 MWth.

Prob4MW: Probability that the heat produced is greater than 4 MWth.

Prob5MW: Probability that the heat produced is greater than 5 MWth.

Prob50C: Probability that the produced fluid temperature is greater than 50 °C.

Prob60C: Probability that the produced fluid temperature is greater than 60 °C.

Prob70C: Probability that the produced fluid temperature is greater than 70 °C.

Prob3M50C: Joint probability that the produced fluid temperature is greater than 50 °C and the heat produced is greater than 3 MWth­.

Prob3M60C: Joint probability that the produced fluid temperature is greater than 60 °C and the heat produced is greater than 3 MWth­.

Prob3M70C: Joint probability that the produced fluid temperature is greater than 70 °C and the heat produced is greater than 3 MWth­.

Prob4M50C: Joint probability that the produced fluid temperature is greater than 50 °C and the heat produced is greater than 4 MWth­.

Prob4M60C: Joint probability that the produced fluid temperature is greater than 60 °C and the heat produced is greater than 4 MWth­.

Prob4M70C: Joint probability that the produced fluid temperature is greater than 70 °C and the heat produced is greater than 4 MWth­.

Prob5M50C: Joint probability that the produced fluid temperature is greater than 50 °C and the heat produced is greater than 5 MWth­.

Prob5M60C: Joint probability that the produced fluid temperature is greater than 60 °C and the heat produced is greater than 5 MWth­.

Prob5M70C: Joint probability that the produced fluid temperature is greater than 70 °C and the heat produced is greater than 5 MWth­.

**Output File: Run##\_ProbTempHeat\_Yearp95.xls**

Rows: probability variable names for the rows listed in Run##\_ProbTempHeat.xls.

Column: year at which the probability becomes < 95%.

**Output Plots and Output Summary data:**

1. **Run##\_ProbOverTime\_ProbXMTC.png**

Plots of the probability over time of producing > X MWth heat (XM), > T °C water (TC), or jointly providing > XM and > TC.
Plotted values are provided in the xls file: Run##\_ProbTempHeat.xls .

1. **Run11\_ScalarVariable.png, Run11\_YearlyVariable.png, and Run11\_TimestepVariable.png**Summary results for scalar values (Run##\_SingleItemsSummary.xls) are plotted as histograms. The file names are labeled with the above format for scalar variables.

Yearly computed data (Run##\_YearlySummary.xls), and data computed for each timestep (Run##\_TimestepSummary.xls) are plotted as timeseries figures. The file names are labeled with the above formats for yearly and timestep variables.
2. **Run##\_Data.RData**An R data file that contains all of the workspace data found in the R computing environment at the end of running the R script “PlottingFunctions.R” within this folder.
3. **Run##\_Results.csv**Contains the input parameter values and the scalar output variable results for each of the 1000 replicates of GEOPHIRES. The first column provides the replicate ID number from 0 – 999. Columns 2 – 120 provide the GEOPHIRES input parameters, as described in GEOPHIRES\_InputParameterDescriptions.xlsx, and an additional column called “Replicate” that repeats the replicate ID number. The remaining columns provide the GEOPHIRES scalar variable output (column names are as described above for Run##\_SingleItemsSummary).