CASE-1

1 Description

CASE-1 is an optimization model that was developed to maximize the plateau duration. In this optimization model, there are three main decision variables, i.e., fluid flow rates, drilling schedule, and recovery mechanism. In addition, the optimization model includes some constraints, such as production constraints, injection constraints, and drilling constraints. The summary of the objective function and decision variables is given in Table 1.

Table 1: Summary of objective function and decision variables for CASE-1

Objective Function	Max: Plateau Duration (t_p)	
Variables	Fluid Flow Rates	Oil Production Rate (q_o)
		Gas Production Rate (q_g)
		Water Production Rate (q_w)
		Gas Injection Rate (q_{gi})
		Water Injection Rate (q_{wi})
	Drilling Schedule	Oil Producer (N_{op})
		Gas Injector (N_{gi})
		Water Injector (N_{wi})
	Recovery Mechanism	Recovery Mechanism (RM)

2 AMPL Implementation

The optimization model CASE-1 was implemented in AMPL (A Mathematical Programming Language), which is a programming language designed to solve a wide range of optimization problems. AMPL implementation for CASE-1 was divided into four modules/files, i.e., model file, data file, PWL table file, and run file. The relationship between these files can be seen in Figure 1.

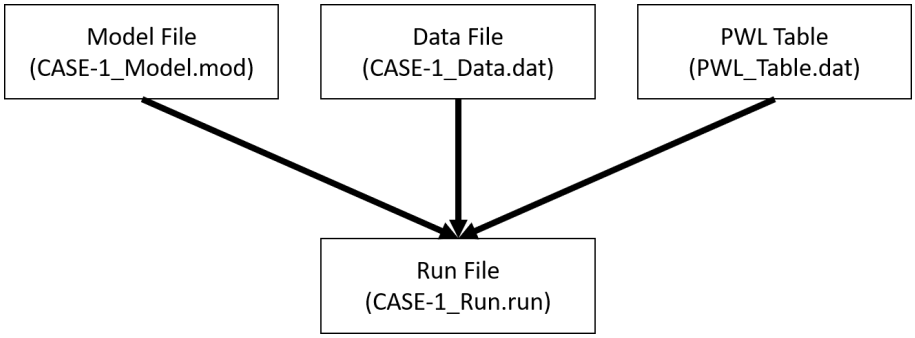

Figure 1: AMPL implementation for CASE-1

A brief explanation of each file is provided as follows:

- Model file ("CASE-1_Model.mod" file):
  The optimization model is formulated in the model file. In this file, all components of optimization are clearly stated, such as the parameters (optimization inputs), the sets, the variables, the objective function, and the constraints.

- Data file ("CASE-1_Data.dat" file):
  In the data file, the input values for most parameters are specified (except the PWL table to carry out 3D PWL approximations).

- PWL table ("PWL_Table.dat" file):
  PWL table is input to any software that performs PWL approximation. The PWL table file contains a PWL table to carry out 3D PWL approximations. This file also includes the number of breakpoints in the 3D PWL approximations.

- Run file ("CASE-1_Run.run" file):
  The run file can be considered as the main file in the AMPL implementation. Once this file is executed, it will command AMPL to read the model, data, and PWL table files. After that, the run file selects a solver to be used and customizes the selected solver. The run file then defines SOS2/SOS1 conditions associated with PWL approximations. Subsequently, the run file commands to solve the optimization problem. Finally, the optimization results are extracted to an output file ("CASE-1_Results.out" file).