Project: ACT Acorn Feasibility Study

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Acorn

D09 Eclipse Model Files
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The ACT Acorn consortium is led by Pale Blue Dot Energy and includes Bellona Foundation, Heriot-Watt University, Radboud University, Scottish Carbon Capture and Storage (SCCS), University of Aberdeen, University of Edinburgh and University of Liverpool.

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1.0 Scope

1.1 Purpose

The purpose of the ACT Acorn Deliverable 09 Eclipse Model Files (D09) is to form a repository for the geological information that would be suitable for publication or future use in due course.

1.2 Scope

The Deliverable Scope covers the following aspects:

- Confirmation of the Petrel and Eclipse Model files used for the Acorn Storage Site Storage Development Plan (SDP).
- The storage of relevant Petrel and Eclipse Model files for the East Mey Storage Development Plan (SDP) within a digital repository.
- Confirmation that the geological models for East Mey have been through a quality control process to ensure that no information confidential to the project is available within the repository.

1.3 Geological Models

The model files have been divided into two categories based on the works carried out for the ACT Acorn Deliverable 07 Acorn Storage Site Storage Development Plan and Budget (D07) and ACT Acorn Deliverable 08 East Mey Storage Site Storage Development Plan and Budget (D08) reports. For the D07 report, only Eclipse files have been supplied as the dynamic model was already constructed under the Energy Technologies Institute (ETI) Strategic Storage Appraisal Project, (Pale Blue Dot Energy, Axis Well Technology, Costain; 2015; Captain X CO_2 Storage Development Plan and Budget), and no access was available to the initial Petrel files. The Eclipse files cover the simulation scenarios undertaken for the “Strategies for Increasing Storage Efficiency” (Output OP313a) and “Dynamic Modelling” (Output OP322a) sections of the D07 Report. The D07 simulation files share a common data section that are shared across all the simulation scenarios and have been stored separately under the “*includes*” folder.

For the D08 East Mey site, the full Petrel model has been stored on a digital hard drive along with the Eclipse files. For the East Mey Petrel model, the following data were removed in accordance with the CDA license agreement:

- All raw well logs
- All well tops
- All deviation surveys
- All seismic and check-shot data
- All fields boundaries located within the East Mey storage site
- All RFT data collected from CDA inventory
- All field production data collected from the OGA portal
- Only wellheads remained in the Petrel model

The interpreted Balder, Mey and Ekofisk surfaces are, however, left within the Petrel model. Static and dynamic models are also available in the model. The list of simulation scenarios constructed as per the “Strategies for Increasing Storage Efficiency” (Output OP313b) and “Dynamic Modelling” (Output OP322b) sections of the D08 Report are also available in the Petrel model, (Figure 1-1).

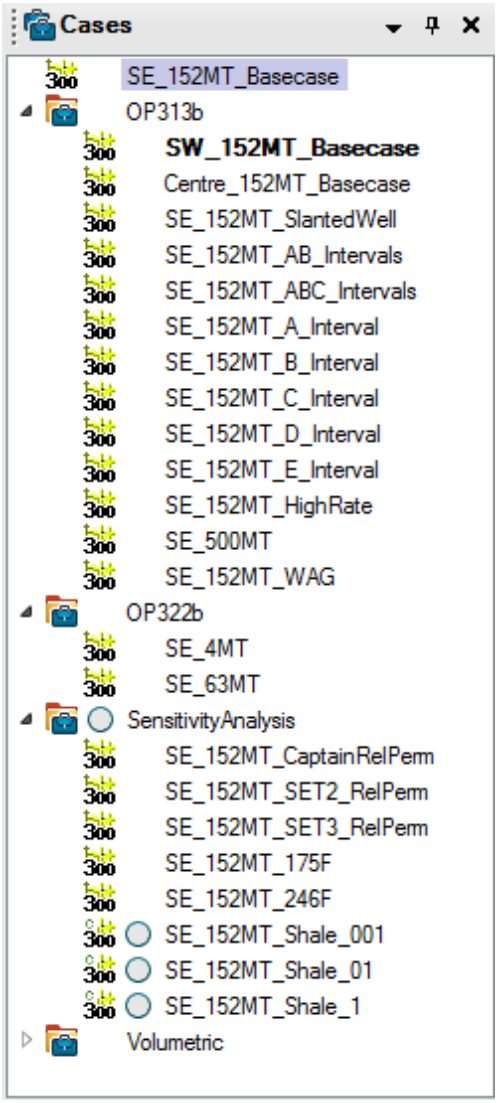

Figure 1-1: The D08 simulation scenarios constructed in the Petrel model

2.0 Eclipse Models used in the Acorn Storage Site SDP Assessment

Table 2-1 summarises the Petrel and Eclipse data files used for analysis presented within the "Strategies for Increasing Storage Efficiency" (Output OP313a) and "Dynamic Modelling" (Output OP322a) sections of the D07 Report.

Simulation Data file	folder	Description	Format
Basecase_60MT	D07\OP313a\	Base case scenario for OP313a	.DATA
BrineProductionDowndip1	D07\OP313a\	Brine production downdip at 50,000bpd/day brine production	.DATA
BrineProductionDowndip2	D07\OP313a\	Brine production downdip at 50,000bpd/day brine production	.DATA
BrineProductionDowndip3	D07\OP313a\	Brine production downdip at 25,000bpd/day brine production	.DATA
BrineProductionDowndip4	D07\OP313a\	Brine production downdip at 10,000bpd/day brine production	.DATA
BrineProductionUpdip	D07\OP313a\	Brine production updip at 50,000bpd/day brine production	.DATA
Completion_LowerHalf	D07\OP313a\	Injectors are completed at lower third	.DATA
CompletionUpperHalf	D07\OP313a\	Injectors are completed at top third	.DATA
DepletingA&C	D07\OP313a\	Depleting A&C fields to provide more pore volume for CO_2 storage	.DATA
Horizontalwell	D07\OP313a\	Horizontal injectors instead of vertical injectors	.DATA
InjectionRateHigher	D07\OP313a\	Injecting at 2x higher rate than the base case scenario	.DATA
InjectionRateLower	D07\OP313a\	Injecting at 4x lower rate than the base case scenario	.DATA
WAG	D07\OP313a\	Water alternating CO_2 injection instead of continuous CO_2 injection	.DATA
Zerosalinity	D07\OP313a\	Zero salinity model instead of base case model	.DATA

1and6	D07\OP313a\wellplacement\	Alternate well locations (locations 1&6)	.DATA
1and7	D07\OP313a\wellplacement\	Alternate well locations (locations 1&7)	.DATA
1and11	D07\OP313a\wellplacement\	Alternate well locations (locations 1&11)	.DATA
6and7	D07\OP313a\wellplacement\	Alternate well locations (locations 6&7)	.DATA
6and10	D07\OP313a\wellplacement\	Alternate well locations (locations 6&10)	.DATA
7and10	D07\OP313a\wellplacement\	Alternate well locations (locations 7&10)	.DATA
10and1	D07\OP313a\wellplacement\	Alternate well locations (locations 10&1)	.DATA
10and11	D07\OP313a\wellplacement\	Alternate well locations (locations 10&11)	.DATA
11and6	D07\OP313a\wellplacement\	Alternate well locations (locations 11&6)	.DATA
11and7	D07\OP313a\wellplacement\	Alternate well locations (locations 11&7)	.DATA
4MT	D07\OP322a\	CO_2 storage under first supply scenario (4MT)	.DATA
31MT	D07\OP322a\	CO_2 storage under second supply scenario (31MT)	.DATA
63MT	D07\OP322a\	CO_2 storage under third supply scenario (63MT)	.DATA
152MT	D07\OP322a\	CO_2 storage under fourth supply scenario (152MT)	.DATA
152MT_goldeneye_offset_3	D07\OP322a\	CO_2 storage under fourth scenario (152MT) – boundaries are expanded to include South East Goldeneye structure – Final OP322a Goldeneye scenario	.DATA

Table 2-1: Eclipse data files used for analysis presented in the Acorn Storage Site SDP report

3.0 Petrel and Eclipse Models used in the East Mey SDP Assessments

Table 3-1: summarises the Petrel and Eclipse data files used for analysis presented within the “Strategies for Increasing Storage Efficiency” (Output OP313b) and “Dynamic Modelling” (Output OP322b) sections of the D08 Report.

Simulation/Model Data file	folder	Description	Format
EastMey_Petrel_Model.pet	D08\	East Mey Petrel model	.PET
SE_152MT_Basecase.	D08\SE_152MT_BASECASE	Base case scenario for OP313b/OP322b simulations (152.4MT).	.DATA
SW_152MT_Basecase	D08\SW_152MT_BASECASE	OP313b. Impact of injection site location. Injecting at the south West of the model.	.DATA
Centre_152MT_Basecase	D08\CENTRE_152MT_BASECASE	OP313b. Impact of injection site location. Injecting at the centre of the model.	.DATA
SE_152MT_SlantedWell	D08\SE_152MT_SLANTEDWELL	OP313b. Impact of deviated well against vertical injection wells	.DATA
SE_152MT_AB_Intervals	D08\SE_152MT_AB_INTERVALS	OP313b. Impact of zonal injection (into A&B intervals)	.DATA
SE_152MT_ABC_Intervals	D08\SE_152MT_ABC_INTERVALS	OP313b. Impact of zonal injection (into A&B&C intervals)	.DATA
SE_152MT_A_Intervals	D08\SE_152MT_A_INTERVAL	OP313b. Impact of zonal injection (into A intervals)	.DATA
SE_152MT_B_Intervals	D08\SE_152MT_B_INTERVAL	OP313b. Impact of zonal injection (into B intervals)	.DATA
SE_152MT_C_Intervals	D08\SE_152MT_C_INTERVAL	OP313b. Impact of zonal injection (into C intervals)	.DATA
SE_152MT_D_Intervals	D08\SE_152MT_D_INTERVAL	OP313b. Impact of zonal injection (into D intervals)	.DATA
SE_152MT_E_Intervals	D08\SE_152MT_E_INTERVAL	OP313b. Impact of zonal injection (into E intervals)	.DATA

SE_152MT_HighRate	D08\SE_152MT_HIGHRATE	OP313b. Impact of high rate (2X) CO_2 injection	.DATA
SE_500MT	D08\SE_500MT	OP313b. High volume CO_2 injection (500MT against 152.4MT)	.DATA
SE_152MT_WAG	D08\SE_152MT_WAG	OP313b. Impact of WAG against continuous CO_2 injection	.DATA
SE_4MT	D08\SE_4MT	OP322b. The 4MT CO_2 injection scenario.	.DATA
SE_63MT	D08\SE_63MT	OP322b. The 63MT CO_2 injection scenario.	.DATA
SE_152MT_CaptainRelPerm	D08\SE_152MT_CAPTAINRELPERM	Sensitivity analysis for OP322b. Impact of relative permeability curves. Captain X relative permeability has been used.	.DATA
SE_152MT_SET2_RelPerm	D08\SE_152MT_SET2_RELPERM	Sensitivity analysis for OP322b. Impact of relative permeability curves. Second set of relative permeability data has been used.	.DATA
SE_152MT_SET3_RelPerm	D08\SE_152MT_SET3_RELPERM	Sensitivity analysis for OP322b. Impact of relative permeability curves. Third set of relative permeability data has been used.	.DATA
SE_152MT_175F	D08\SE_152MT_175F	Sensitivity analysis for OP322b. Impact of injection site temperature	.DATA
SE_152MT_246F	D08\SE_152MT_246F	Sensitivity analysis for OP322b. Impact of injection site temperature.	.DATA
SE_152MT_Shale_001	D08\SE_152MT_SHALE_001	Sensitivity analysis for OP322b. Impact of transmissibility through the shale layers ($k_{h\ shale}$=0.01mD).	.DATA
SE_152MT_Shale_01	D08\SE_152MT_SHALE_01	Sensitivity analysis for OP322b. Impact of transmissibility through the shale layers ($k_{h\ shale}$=0.1mD).	.DATA
SE_152MT_Shale_1	D08\SE_152MT_SHALE_1	Sensitivity analysis for OP322b. Impact of transmissibility through the shale layers ($k_{h\ shale}$=1mD).	.DATA

Table 3-1: Petrel model and Eclipse data files used for analysis presented in the East Mey SDP report