

Cougar IV

A Joint Industry Project

Characterization of uncertainty in geoscience and reservoir modeling

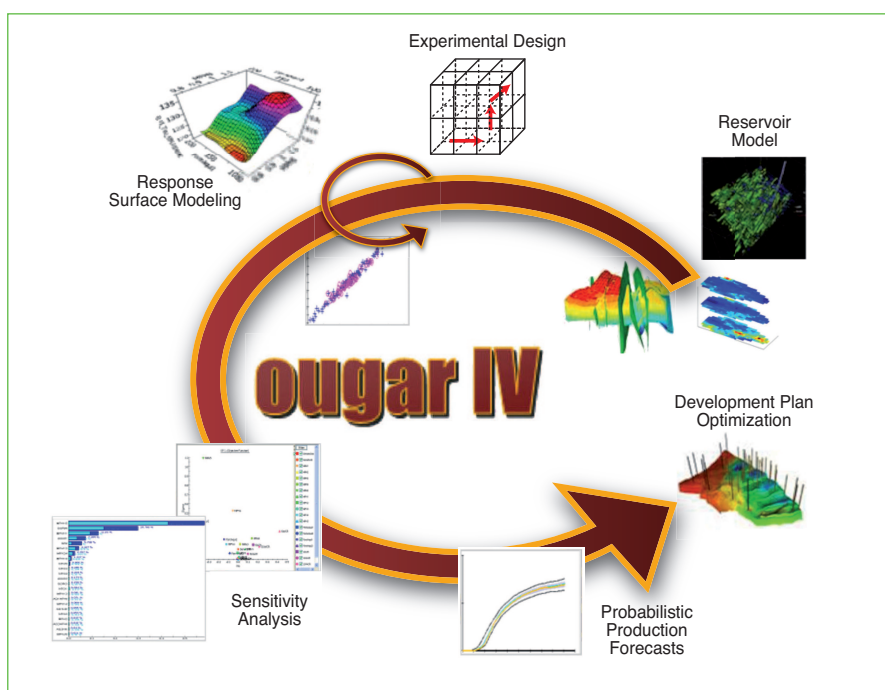
Objectives

The general objective of the Cougar Joint Industry Projects is to develop methodologies and to propose prototype software solutions for managing uncertainty and taking more effective field development decisions.

The Cougar IV project is a logical follow-up of Cougar I, II, and III in which additional methods will be investigated and prototype tools will be improved and developed for:

- taking better field development decisions while improving the management of uncertainty in the entire workflow of a field evaluation;
- performance assessment of CO₂ geological storage.

The industrial partners of Cougar IV JIP will benefit from a technological advance and act as technical advisors who provide regular feedback during the project. The Cougar IV JIP is open to new partners.



Successful examples of prototype functions developed during past JIPs are: the joint modeling method (Cougar I), decision trees and multi-response objects (Cougar II), and non-parametric and adaptive design methods (Cougar III). More details of the achievements of previous JIPs can be provided on request.

Program

The Cougar IV JIP is a three-year program covering new and advanced topics identified during the previous JIPs by industrial partners and by the Cougar R&D group.

The technical program is organized into the following four work packages.

WP1 - Simplified and integrated uncertainty management workflows

The WP objectives are to:

- provide reservoir engineers with easy-to-use job-oriented workflows to manage uncertainty. Experimental design and response surface selection will be automatic, enabling inexperienced users to perform general uncertainty management tasks;
- extend the uncertainty definition by adequate parameterization throughout the entire reservoir engineering workflow, from geological modeling to fluid flow simulation. This will be possible using the link with IFP Energies nouvelles' OpenFlow™ software platform, which manages complex reservoir workflows by integrating different activities, such as FracaFlow™ (fracture characterization), GeostatFlow™ (property modeling), UpscalingFlow™, and PumaFlow™ (fluid flow simulator), as well as third-party software such as geomodelers and other fluid flow simulators.

WP2 - Production scheme planning and optimization under uncertainty

A special effort will be made to supply reservoir engineers with solutions that make it possible to optimize a development scheme

under uncertainty. Particular tasks will be aimed at:

- making it easier to compare and choose between various possible production schemes, starting either from one or more history-matched models or from a probabilistic history matching result;
- optimizing controllable production scheme parameters, taking into account the remaining uncertainty, based on an adaptive design of experiments and Non Parametric Response Surface methods.

WP3 - Performance assessment for CO₂ storage

The objective is to use and adapt the available uncertainty management techniques to provide an effective solution for CO₂ storage performance assessment. To achieve this goal, various reliability techniques (from the mechanical engineering and nuclear fields) will be analyzed and combined with adaptive design of experiments and Non Parametric Response Surface methods, developed in past Cougar JIPs, in order to investigate dedicated algorithms.

WP4 - Improved sensitivity and uncertainty analyses

The goal is to continuously improve and extend uncertainty management methods and techniques to provide reservoir engineers with the most advanced engineering solutions.

Particular tasks will deal with:

- improved management of production profiles;
- screening methods with a large number of parameters;
- sensitivity and uncertainty analysis on grid responses.

The Cougar group will perform validation studies on synthetic or real field data provided by partners. Support will also be provided to partners for testing the deliverables on their field studies.

Deliverables

At the end of each year's program, the following project deliverables are provided during the annual meeting:

- presentation of research methodology and validation studies;
- software prototype modules;
- training on the software prototype modules;
- reports on methodology and validation studies;
- user manuals and tutorials for software prototype modules.

The software prototype modules will be compatible with the commercial Cougar™ software.

JIP Leader

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