Potential Role of Digital Twins in the Geological Disposal Facility Project

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Overview

Academic background and research interests

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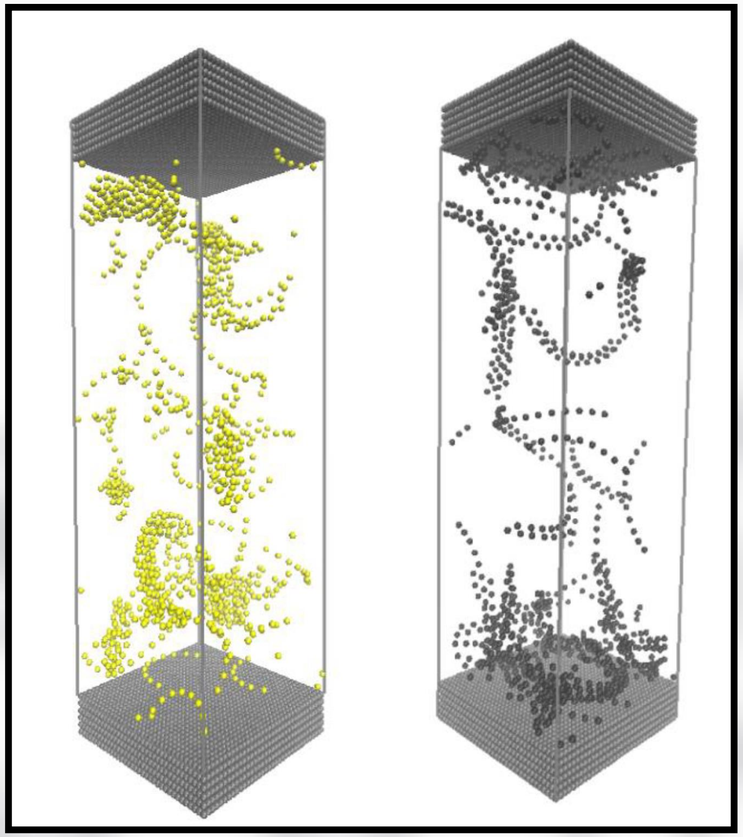
Summary of first year research

Outcomes and deliverables

Academic background and research interests

- MEng Chemical Engineering - University of Manchester
- MEng Dissertation: Molecular Dynamics Simulations of Banana-Shaped Plasticisers and Polyisoprene in Contact with Graphite
- Research interests:

  -Multi-scale modelling and simulation
  -Nuclear fuel cycle



Credits: MEng Dissertation - Kristof Bartha

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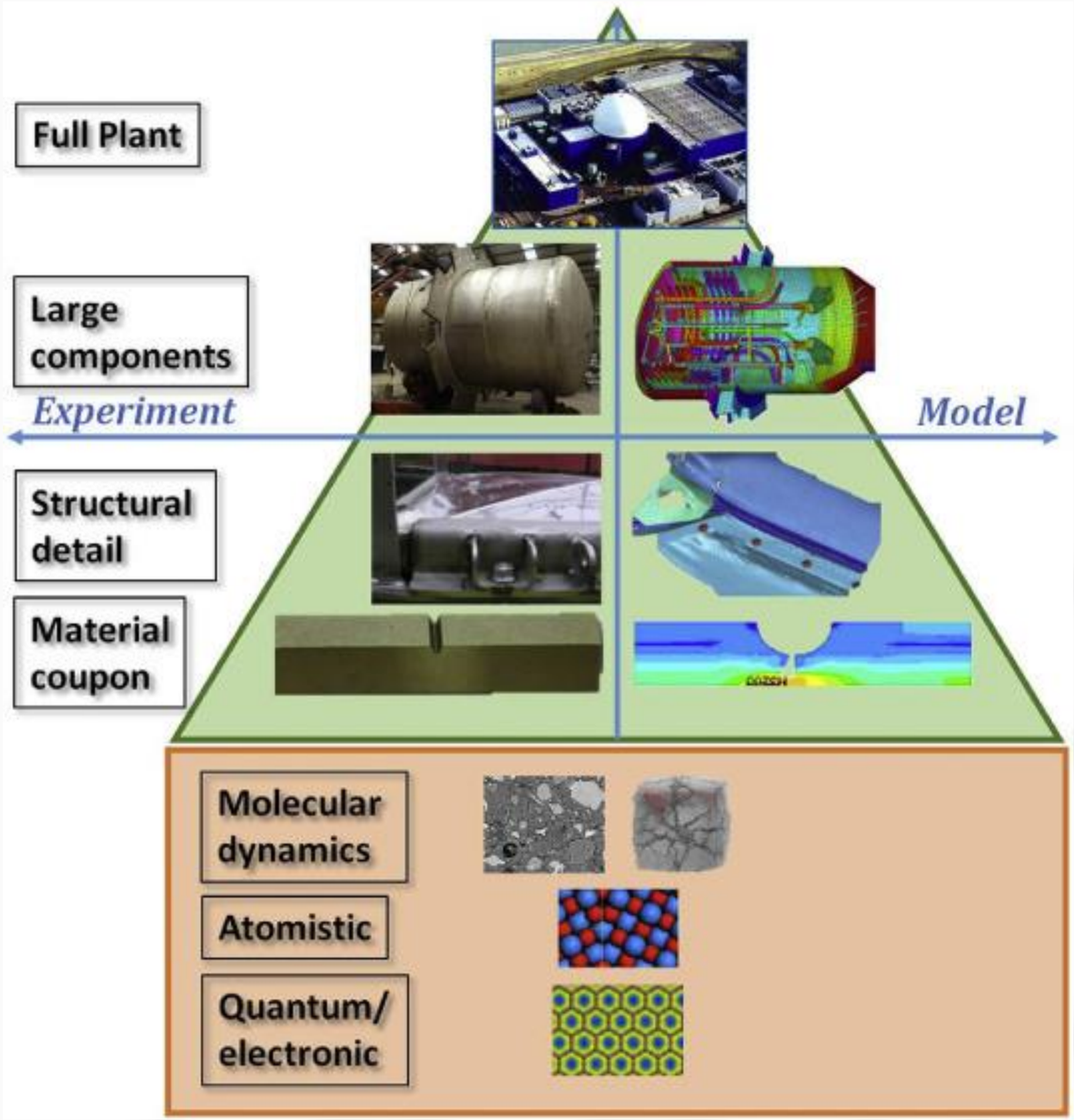
Project background and motivation

- “A digital twin is an integrated multi-physics, multi-scale, probabilistic simulation of an as built vehicle or system that uses the best available physical models, sensor updates, fleet history, etc., to mirror the life of its corresponding flying twin.”
- INDE - Integrated Nuclear Digital Environment
- Implementing Geological Disposal: Working with Communities
- How can a digital twin help with implementing geological disposal?



Credits: A framework for an integrated nuclear digital environment
Eann Patterson & Richard Taylor

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Summary of first year research

Public engagement applications of digital twins

The systematic literature review identified a gap in knowledge.

Currently, public engagement is done by digital models.

Engagement tools are visualisation, communication and co-design. Often the applications are in the domain of urban planning.

The prototype digital twins found are smart city systems.

A Geological Disposal Facility Digital Twin could help the host community create a community vision through visualisation, collaboration and consultation.

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Summary of first year research

Potential functionality of a geological disposal facility digital twin

11 Internal stakeholder expectation interviews were conducted, analysed and a preliminary list of potential functionalities was formulated.

Key features found:

-Platform for collaboration
-Standardised flow of information and single source of truth (digital thread)
-Dynamic interaction and optimisation between models

Summary of first year research

Potential functionality of a geological disposal facility digital twin 2

Proposed structure:

-The digital twin would consist of three digital entities (built environment, geological environment and waste packages) which would output an optimised design of the geological disposal facility when connected.

Potential benefits are the elimination of design freeze, selective waste package emplacement, reduced development, licensing and construction times.

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Outcomes and deliverables

A manuscript will be prepared and submitted for publication with the title: Potential Functionality of a Geological Disposal Facility Digital Twin.

A report will be prepared to formulate recommendation on the deployment of the digital twin with an emphasis on public engagement features.

A study will be created outlining the scope, usage, governance, validation and verification of the digital twin.

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