



International Review Workshop on JAEA's URL projects

**Outline of the Second Mid-term Research
Phase (FY2010-FY2014) Reporting in JAEA**

**- CoolRep H26: focusing JAEA's URL Programme
on National Programme Requirements -**

18th June 2014

Toshihiro SEO

Japan Atomic Energy Agency

**Sector of Decommissioning and Radioactive Wastes Management
Geological Disposal Research and Development Department
Geosynthesis Section**

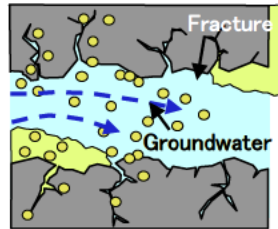
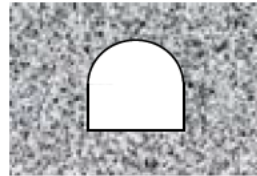
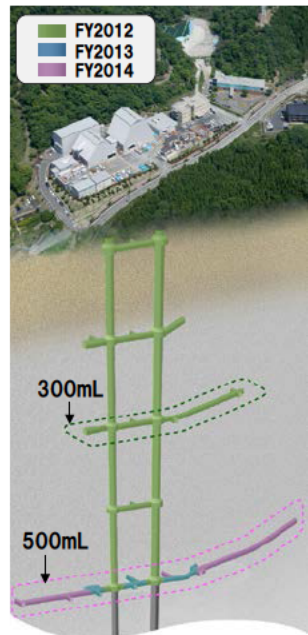
Presentation Outline

- **National programme and our research activities.**
- **URL reporting in CoolRep H26**

JAEA's URL Projects

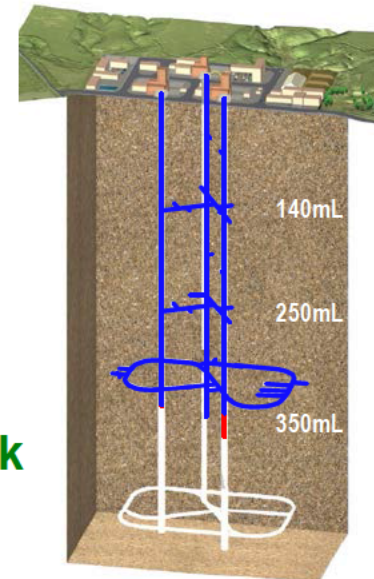
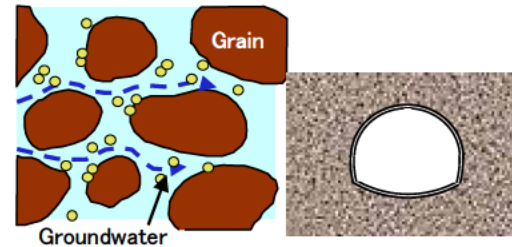
- **Confirm the applicability of geological disposal technologies**
 - Site investigation methods (Mizunami & Horonobe)
 - Engineering technologies / Safety assessment methods (only Horonobe)
- **Understand the deep geological environment**
- **Provide training area for staff from both Japanese domestic and international disposal programme**
- **Promote public's understanding of deep underground**

Mizunami URL Project (Mizunami City, Gifu Pref.)



- ✓ **Granite**
(Crystalline rock)
- ✓ **Mechanically hard rock**
- ✓ **Fractured media**
- ✓ **Fresh water**

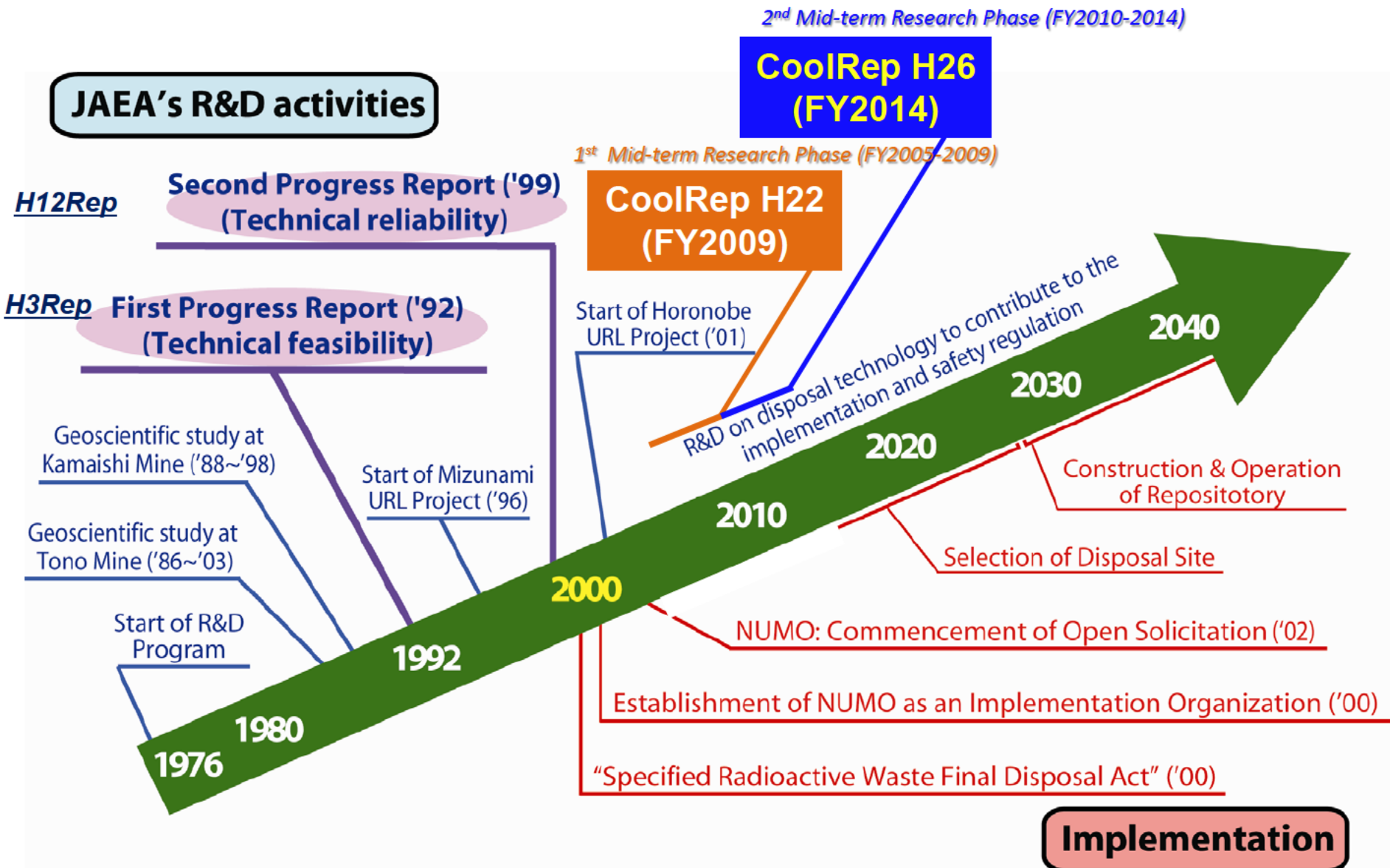
Horonobe URL Project (Horonobe Town, Hokkaido Pref.)



- ✓ **Mudstone**
(Sedimentary rock)
- ✓ **Mechanically soft rock**
- ✓ **Porous media**
- ✓ **Saline water**

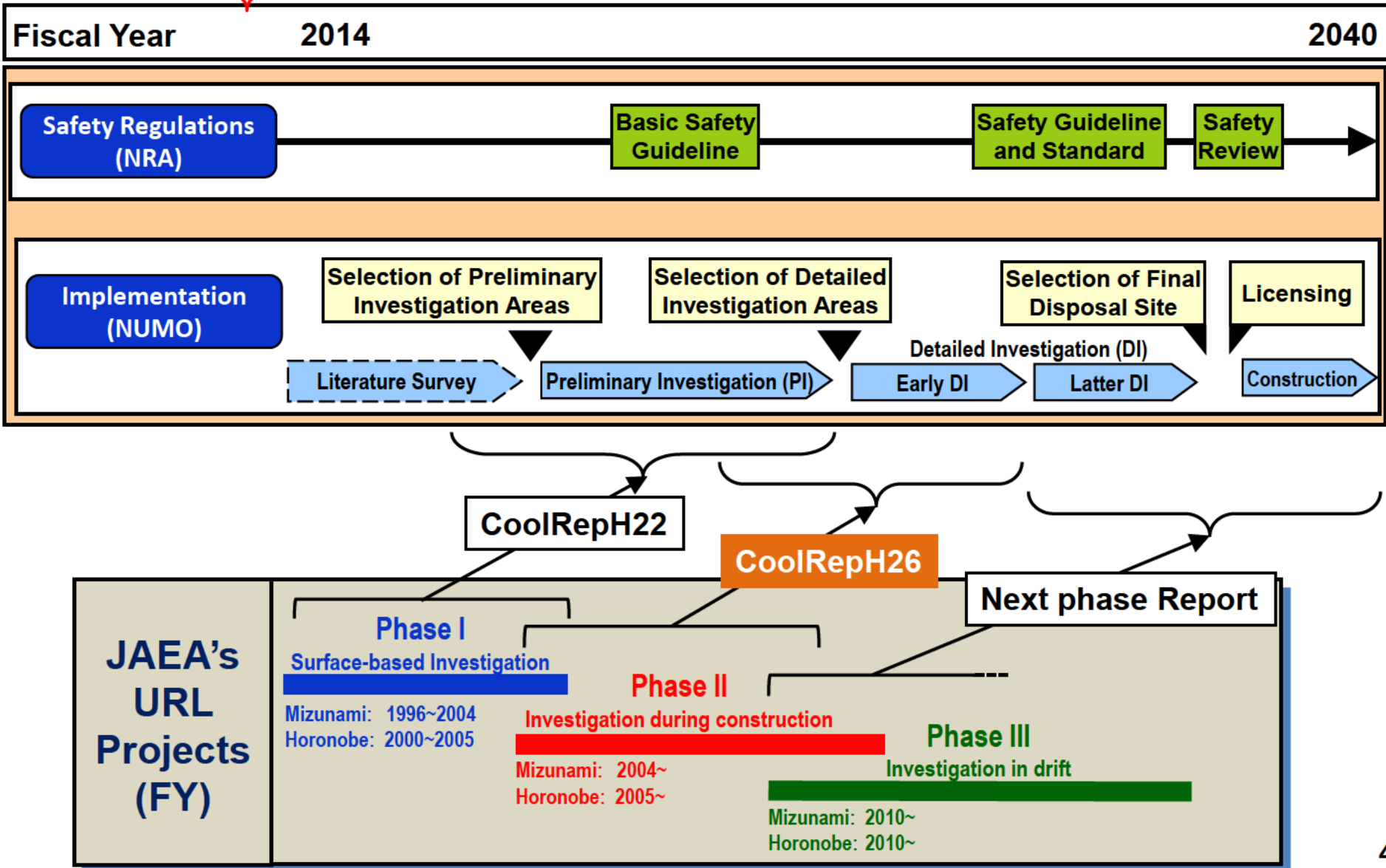
— FY2013
— FY2014

Historical Overview of JAEA's R&D Activities



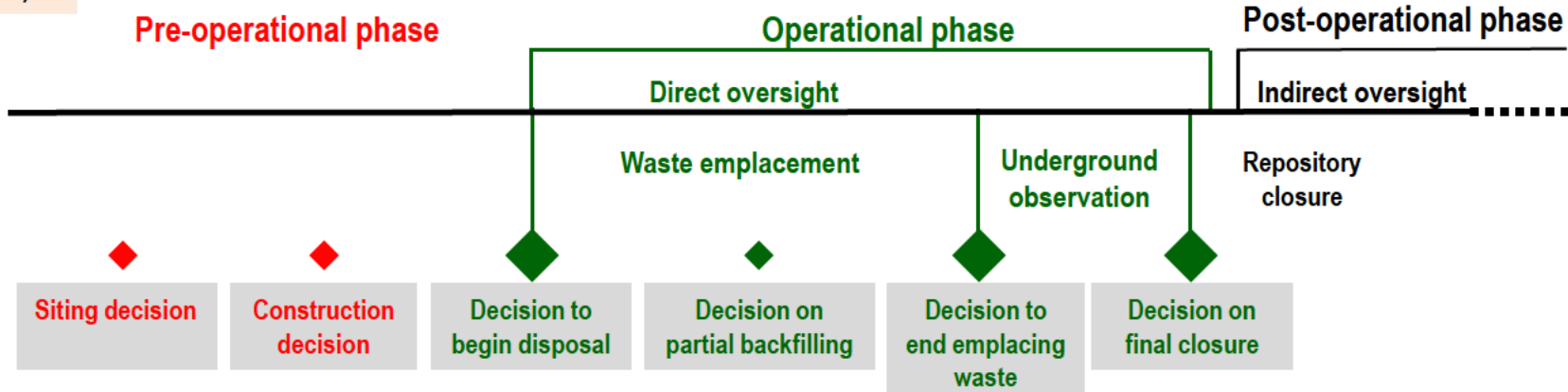
R&D Activities to Support National Programme

Currently no volunteered site



Feedback Process of URL Research

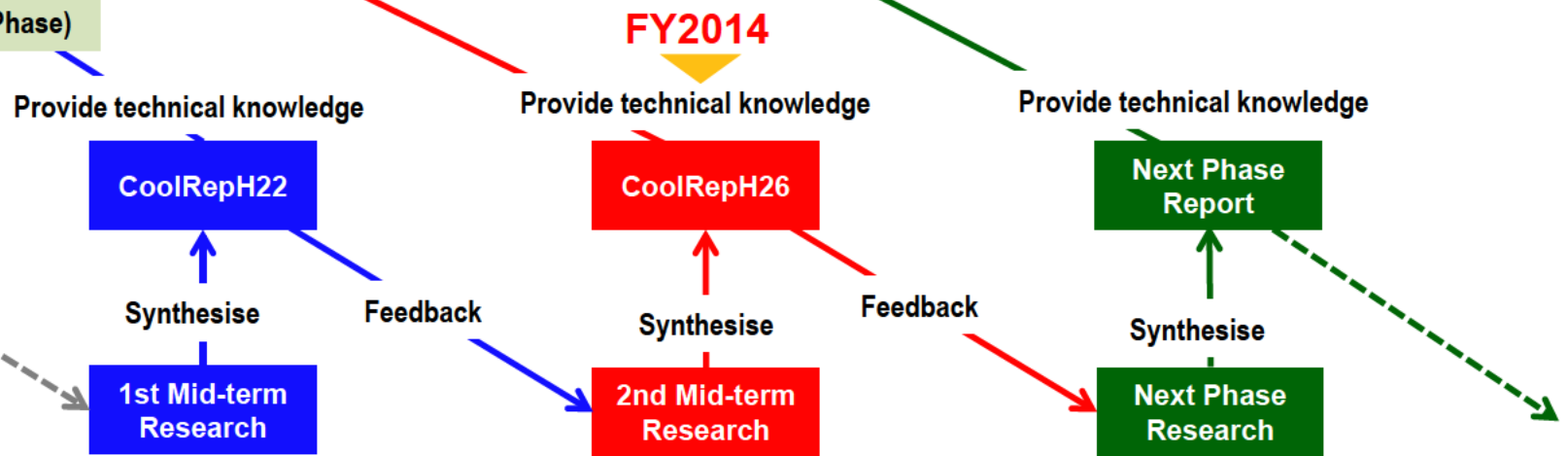
General Activity Phase
OECD/NEA (2013)



(NUMO's Activity Phase)



(JAEA's Activity Phase)



CoolRep

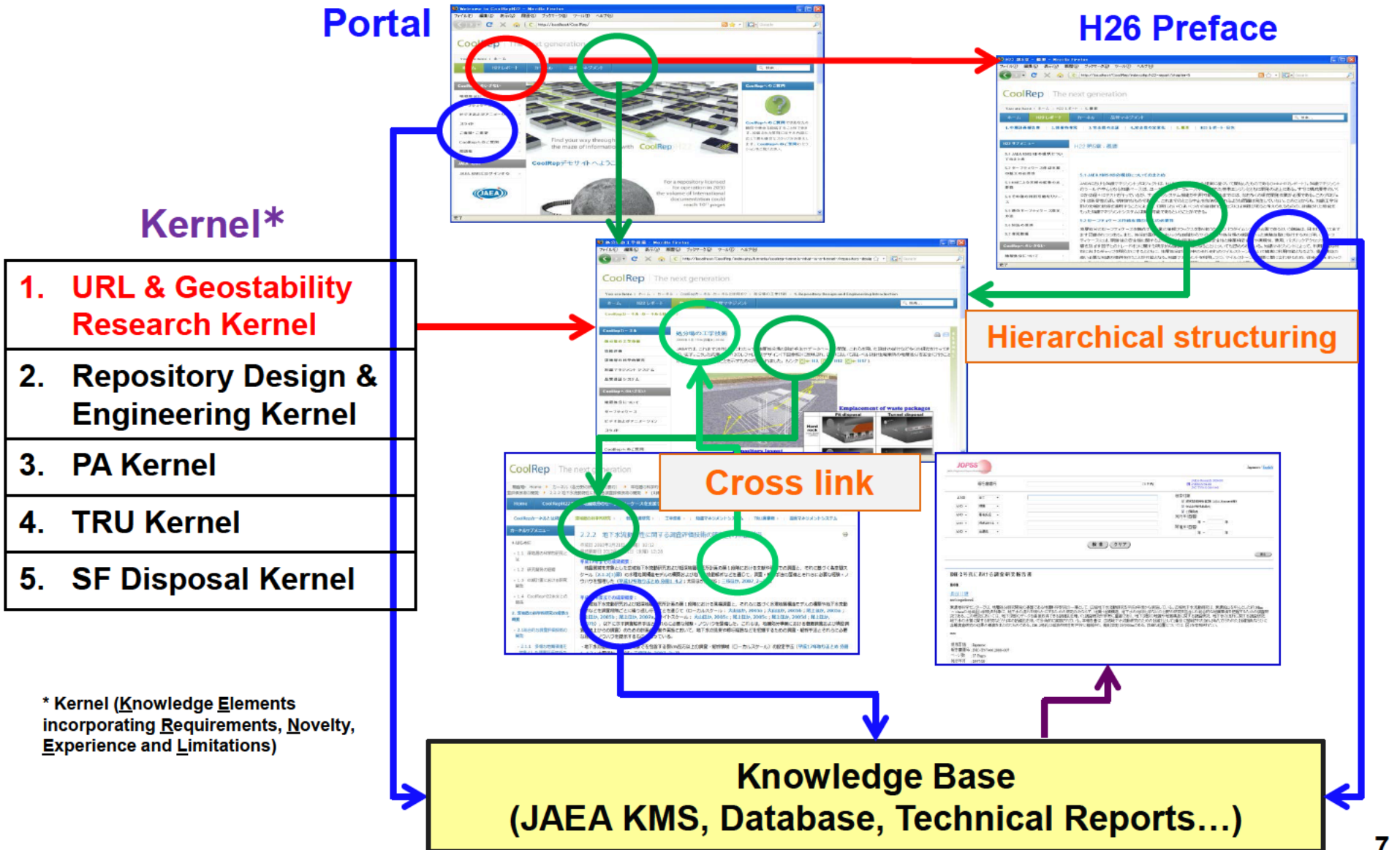
- **CoolRep** developed as the interface to H22 – providing easy access to all supporting documentation
- **CoolRep** specifically designed to communicate with a wide range of stakeholders...

COOLREP | The next generation

The screenshot displays the CoolRep website interface. At the top, a navigation bar includes links for Home, H22 Report, Kernels, Quality Management, KMS, and Background, along with a search bar. Below the navigation bar, the main content area is divided into several sections. On the left, a sidebar titled 'Interact with Coolrep' contains links for 'Ask Coolrep', 'CoolRep asks you', 'Have Your Say', and 'Videos & Animations'. Below this sidebar is a 'Kernels' section with the text 'Explore CoolRep's Kernels : Concise technical information' and the JAEA logo. The central part of the page features a large image of a maze of information with a green arrow pointing through it, accompanied by the text 'Find your way through the maze of information with CoolRep'. To the right of this image is an 'Ask Coolrep' section with a question mark icon and the text 'ASK Coolrep gives you the chance to submit your own questions or concerns to be answered by the Coolrep international research team. The answers will be given in video replies. View the Ask Coolrep section.' Below this is a 'Coastal Repository Study' section with a question 'What might a Japanese coastal repository look like?'. At the bottom, there are two boxes: 'Why deep geological disposal?' with the text 'Radioactive wastes are presently stored safely in surface facilities. Why spend so much money to create a deep geological repository for radioactive waste?' and 'Why volunteer for a repository?' with the text 'Japan needs to find a volunteer site where we can build a safe repository why should a community volunteer to host a repository?'.

[CoolRepH22](http://if.quintessa.co.jp/CoolRepEN/)
<http://if.quintessa.co.jp/CoolRepEN/>

Structure of CoolRep H26



Key Points of CoolRep H26

URL & Geostability Research Kernel

Focused on...

- The technical requirements of the implementer (NUMO), regulator (NRA) and relevant research organisations

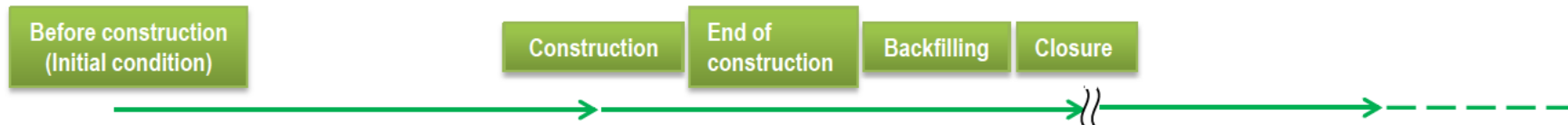
Clarifying JAEA's goals by...




- New contents structure based on chronological order in repository life phases
- Extraction of core messages and response to national programme requirements from each research digest

Integrated by...

- Advanced web technologies with JAEA's in-house developed KMS (Knowledge Management Systems)

General Framework of Research Outcome



	A1) Understanding initial geo-environmental conditions	A2) Understanding impact of construction in geo-environmental conditions	A3) Understanding long-term changing/recovering behaviour of geo-environmental conditions
Core messages	(A1 Core Message)	(A2 Core Message)	(A3 Core Message)
Research digests (Example)	<p style="text-align: center;"> Synthesizing</p> <ul style="list-style-type: none"> • Demonstrate confidences and limitations of site descriptive models made by surface-based investigations etc 	<p style="text-align: center;"> Synthesizing</p> <ul style="list-style-type: none"> • Confirm methods to design and construct URL/repository using conventional technology etc 	<p style="text-align: center;"> Synthesizing</p> <ul style="list-style-type: none"> • Develop and test computer modelling and simulation tools for constructing site evolution models etc



B) Tools development for integration of knowledge from each research result

Develop JAEA KMS including ISIS (Information Synthesis and Interpretation System)

Integration of Research Results (1)

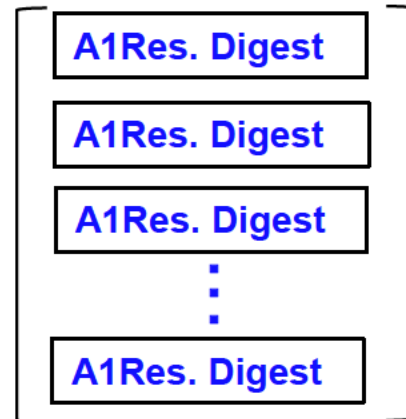
Derivation of core message and response to National Programme Requirements

A1) Understanding initial geo-environmental conditions

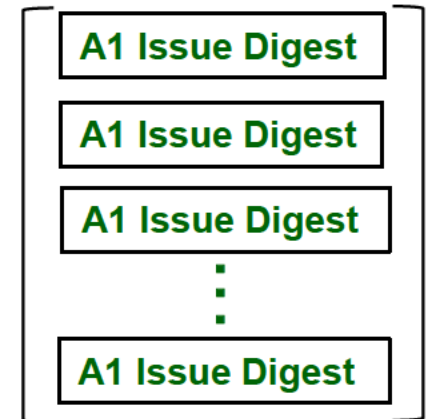
National Programme Requirements

1. NUMO (2010): R&D Needs for Geological Disposal Project - for the Selection of Detailed Investigation Areas
2. NUMO (2013): R&D plan on geological disposal project - R&D for Preliminary and detailed Investigation stages
3. Radioactive Waste Safety Subcommittee (2003): In preparation for making basement of safety regulation of HLW disposal
4. Science Council of Japan (2012): Report presented recommendations that went beyond the AEC's request, including a fundamental revision of policies concerning HLW disposal
5. Gov. of Japan (2014): Basic Energy Plan
... etc

A1 Core Message



A1 Response to National Programme Requirements



—

=

A2) Understanding impact of construction in geo-environmental conditions

••••

A3) Understanding long-term changing/recovering behaviour of geo-environmental conditions

••••

Integration of Research Results (2)

Visualising technological relevance and traceability of research results

Core message

- ✓ Develop and test methods to evaluate the impact of URL construction and any potential impact on long-term safety performance
- ✓ Acquire new insights into engineering technologies for reducing excavation effects around shafts and drifts

Research digest

Geology

Hydrogeology

Volume of inflow into underground tunnels

- ✓ Pilot borehole investigations are capable of improvement prediction accuracy.
- ✓ ...

Impact on groundwater table and pressure

- ✓ Assignment of hydraulic monitoring intervals taking into account hydrogeological heterogeneity including hydrogeological compartment is useful for estimation of hydraulic characteristics.
- ✓

Hydrochemistry

Issue digest

Investigation, modeling and simulation techniques for prediction the change of hydrogeological condition related to closure

- ✓ Applicability checking of techniques of investigation, analysis and assessment for evaluation of influences of heterogeneous inflow into underground on performance of material for back-filling by groundwater recovery experiment and tunnel back-filling experiment.
- ✓ ...

Response to National Programme Requirements

Development of drift backfilling technology

Development of long-term monitoring technology

(Example of A2)

Integration of Research Results (3)

National Programme Requirements to focus URL research

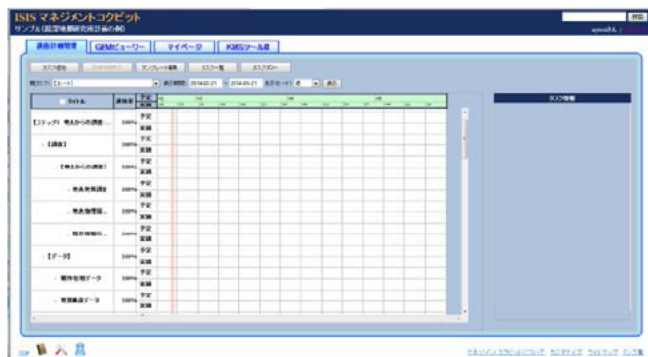
- **Use Information Synthesis and Interpretation System (ISIS)**
 - ✓ A component of the comprehensive JAEA Knowledge Management System
 - ✓ Active application during site investigation, rather than simply recording what has been done by a conventional “static” methodology – e.g. “geosynthesis”

- **Support planning, implementation and integration of a site descriptive model with associated site characterization data-set, based on past experience and know-how obtained in JAEA’s URL and elsewhere**

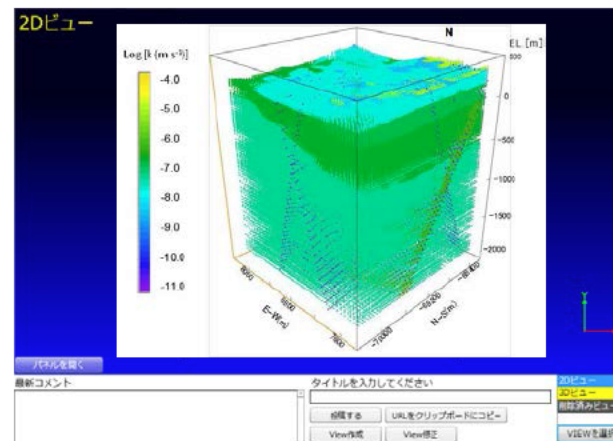
- **Provide flexible restructuring of information for performance assessment and design teams (and, potentially, communication with other stakeholders)**

Integration of Research Results (4)

Tools of ISIS (Information Synthesis and Interpretation System)



Research programme management tab



GEM (Geological Environment Model) viewer tab



My page tab
(Groupware)



KMS tool group tab
(link to ISIS tools)

ISIS management cockpit

Integration of Research Results (5)

Cross-checking with NUMO's requirements and others

- **Technical implications for NUMO's requirements (NUMO (2010), NUMO (2013)) has been examined, especially from a practical application perspective to a potential site.**
- **Compare research items with what has been done in the preceding geological disposal projects in foreign countries (e.g. Finland, Sweden) for ensuring sufficiency in the report.**

Core Messages of URL/Geostability Research Kenel

Core Message of A1

- ✓ **Synthesise overall investigation methodologies to construct site descriptive models under limited investigations**
- ✓ **Can evaluate/reduce uncertainty of geo-environmental models by using multiple lines of evidence**

Core Message of A2

- ✓ **Develop and test methods to evaluate the impact of URL construction and any potential impact on long-term safety performance**
- ✓ **Acquire new insights into engineering technologies for reducing excavation effects around shafts and drifts**

Core Message of A3

- ✓ **Develop and test methods to evaluate long-term geological evolution and its impact on deep underground**

Statement of CoolRep H26 (Tentative)

URL & Geostability Research Kernel

- **We have synthesised the research results from MIU/HOR URLs and geo-stability projects in the second-mid term research phase as CoolRepH26. It could be used as technical bases for NUMO/Regulator in each decision point from sitting to beginning of disposal (PI to DI Phase).**
- **High quality construction techniques and field investigation methods have been developed and implemented and these will be directly applicable to the National Disposal Programme (along with general assessments of hazardous natural events and processes)**
- **It will be crucial to acquire technical knowledge on decisions of partial backfilling and final closure by actual field experiments in MIU/HOR URLs as main themes for the next phases.**