

# Practical Guidance for Geological CO<sub>2</sub> Storage

## - A guide for CCS operators -

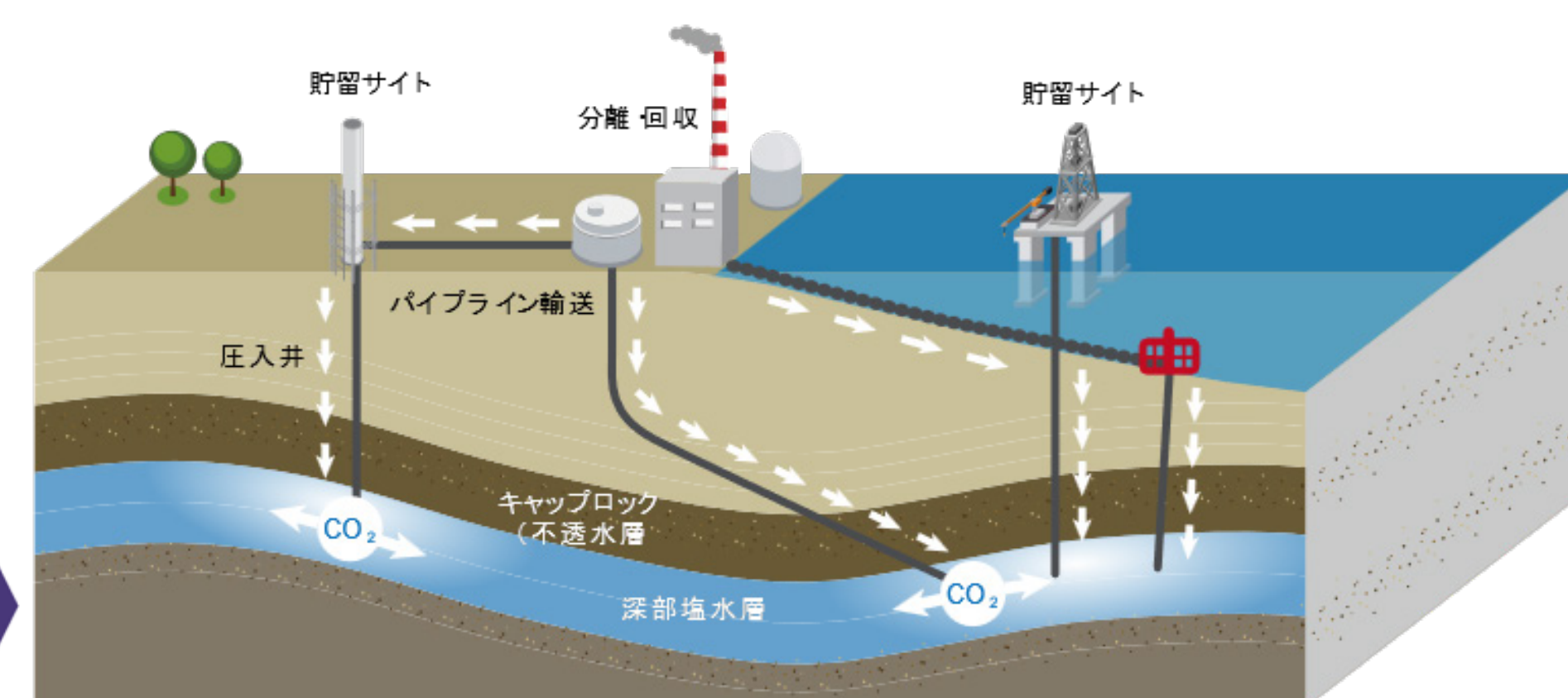
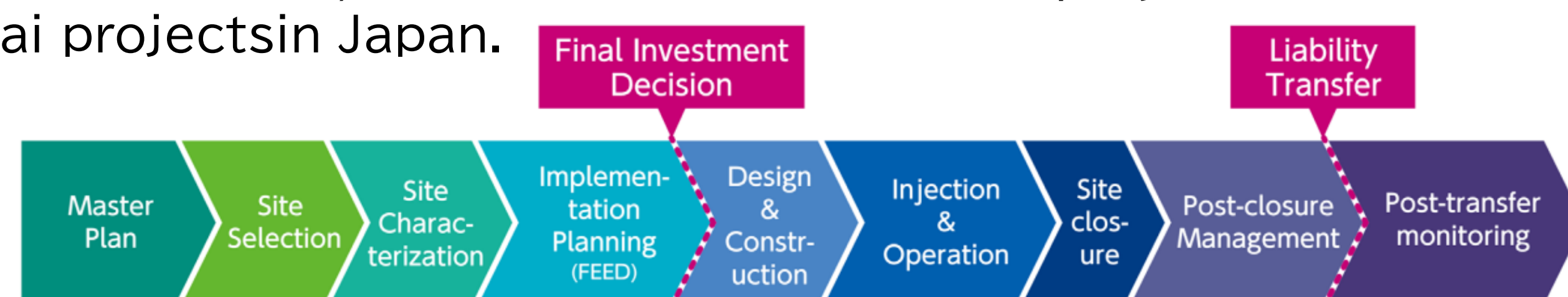
RITE, we are working on a broad range of technology development for the commercialization of CO<sub>2</sub> geological storage, which includes CO<sub>2</sub> monitoring technology using optical fibers and microbubble injection technology, through verification test projects both in Japan and the world. We are also compiling a “Practical Guidance for Geological CO<sub>2</sub> Storage”, including case studies all over the world, to assist CCS operators to plan geological storage. The guidance will be released sequentially through websites of the Geological Carbon Dioxide Storage Technology Research Association (the main organization for geological storage) and NEDO.

### Outline of the “Practical Guidance”

Made up of eight chapters, following a standard process of geological storage project from master planning to post-site closure management.

The source of information and data includes large-scale CCS projects, such as Quest in Canada and Decatur in US, as well as demonstration projects of Nagaoka and Tomakomai projects in Japan.

Contents covered is set forth below :



### Chapter 1 Overview / Master Plan

- Overview of the project
- Master and implementation plan
- Relevant legislation
- Economics
- Uncertainty of the project and Risk management
- Views on PO/PA (Public Outreach/ Acceptance)

\* PA in early stage is recommended.

### Chapter 2 Site Selection

- Regional geological evaluation
- Sites/"area" evaluation (geological and non-geological)
- Potential area/sites ranking
- Pore-space ownership and site exploration permit

\* To select multiple candidate sites is recommended, and uncertainties resulting from insufficient geological information must be kept in mind. Anyway, for a commercial success, think first of “Injectivity”.

### Chapter 3 Site Characterization

- Data acquisition for detailed evaluation (appraisal well, 3D-seismic)
  - Modelling of the storage system (static & dynamic)
  - Flow simulation to confirm storage capacity and assess risks
  - Conceptual design of the facilities, rough economic FS
- ⇒ Final selection of the storage site

\* Described based on the Nagaoka project with pilot scale and the Tomakomai project with semi-industrial scale

### Chapter 4 Implementation Plan

- Preliminary design for FEED and construction plan
  - Injection operation and monitoring plan
  - Post-injection management plan
  - Risk management and social engagement(PO/PA) plan
- \* After final economic evaluation, FID will be carried out. Contingency plan is essential, however.

### Towards CCS commercialization

Last May, the Bill on CCS Business Act was promulgated in Japan, and “Advanced CCS Projects” are now ongoing, which is strongly promoted by METI, aiming to embark on commercialization of CCS by 2030.

### Chapter 5 Design and Construction

- Detailed design and construction of ground facilities for transportation and injection.
  - Construction of injection and observation wells
  - Case studies of the Nagaoka and Tomakomai projects
- \* legal regulations is main concern on this stage.

### Chapter 6 Operation and Management

- Injection operation
  - Monitoring for well integrity, surface, subsurface and reservoir
  - Periodical history matching and model revision for long-term prediction
  - Public engagement and emergency plan
- \* Focus on well integrity and reservoir in monitoring, and pay much attention to PA for steady operation.

### Chapter 7 Site Closure

- Injection well plugging
  - Removal of associated surface facilities
- \* A perfect well abandonment is essential for smooth transfer as below.

### Chapter 8 Post-closure Management

After the site is closed, monitoring will continue, just to be safe.

\* The plan and period of monitoring for “liability transfer” will be determined by laws, which is getting an emerging issue.



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