The 9th IEEJ/APERC International Energy Symposium
19 April 2024
Grand Prince Hotel Takanawa, Tokyo Japan

Session2:
Build-up of an ecosystem
for carbon circularity

Road to CCS/DAC commercialization
- Economics by carbon market -

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CCS and Carbon Market
- IETA CCS HLC -

Various standard for carbon credits, accounting, and safety operation

Alberta Government

JOGMEC

CO2 EOR Guideline)

ISO

ISO27914(Geological Storage),
ISO27916 (CCS/EOR)

American Carbon Registry
AT WINROCK INTERNATIONAL

BRITISH COLUMBIA

United Nations
Framework Convention on
Climate Change

puro.earth

Gold Standard
Climate Security & Sustainable Development

CCS+ initiative

GLOBAL CARBON COUNCIL

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Negative comments and concerns about CCS

◆ Effectiveness of CCS

- ✓ What is CCS? - insufficient information
- ✓ Is CCS mature technology? - maturity of technology
- ✓ Is CCS commercially effectiveness? - comparing to alternative technologies
- ✓ Does CCS consume huge energy? - energy loss
- ✓ Does Japan have sufficient storage potential? - storage potential

◆ Emission Reduction Effects (quantification)

- ✓ Should assure safe and long term containment
- ✓ Should have robust MRV
- ✓ Should have measure for assuring permanence
- ✓ Should evaluation of total reduction effects (considering value chain emission)

◆ Environment impacts (pollution, natural environment and social environment)

- ✓ Marine environment
- ✓ Ground water and air pollution
- ✓ Hazard waste
- ✓ Social impacts, such as accident and disaster

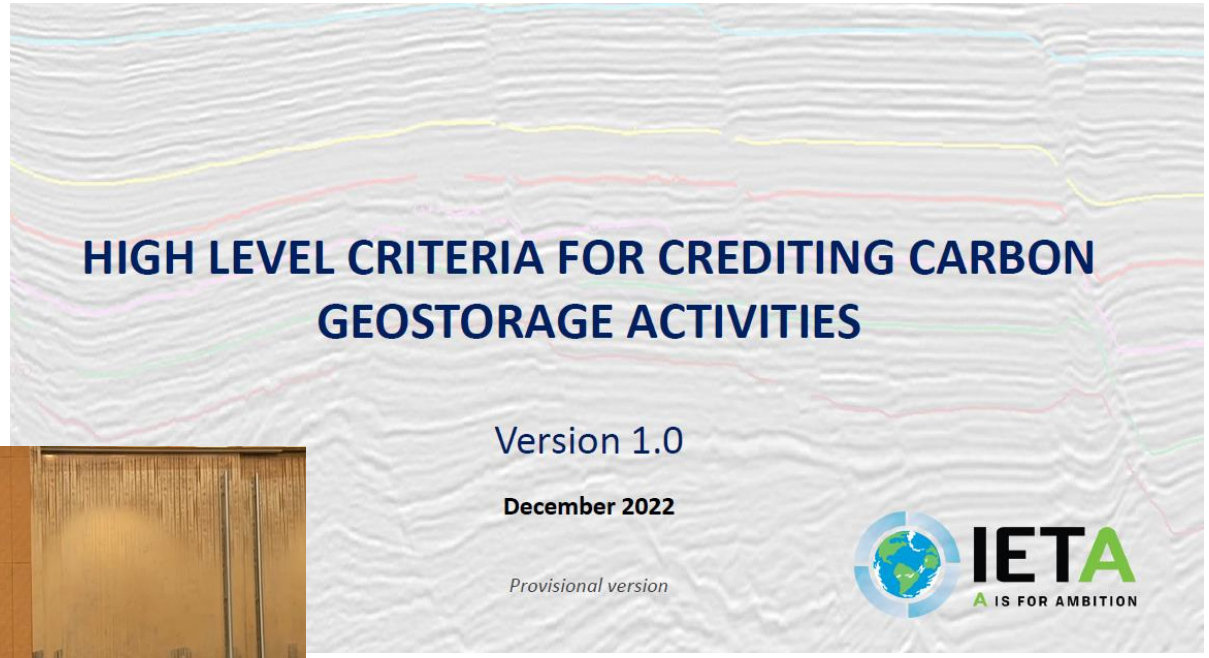
◆ Others

- ✓ Policy change risk
- ✓ Impact on local economy (benefit)
- ✓ Large scale accident and its compensation

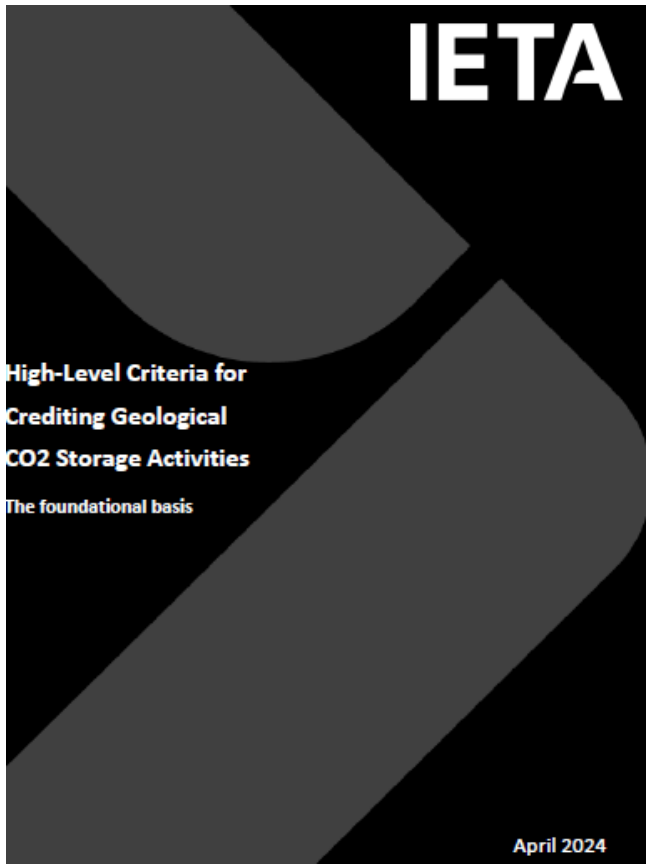
source
Collecting information based experience of 30 CCS experts in Japan. August 2021

CCS High Level Criteria

- Basic element to be reviewed for credits generation – detail methodologies and requirements are by each standard, ISO, regulation.
- Expected use: Support programs for CCS credits, checklist for stakeholders and information for regulation settings



Launch event at Asia Climate Summit in Singapore
Dec. 2023



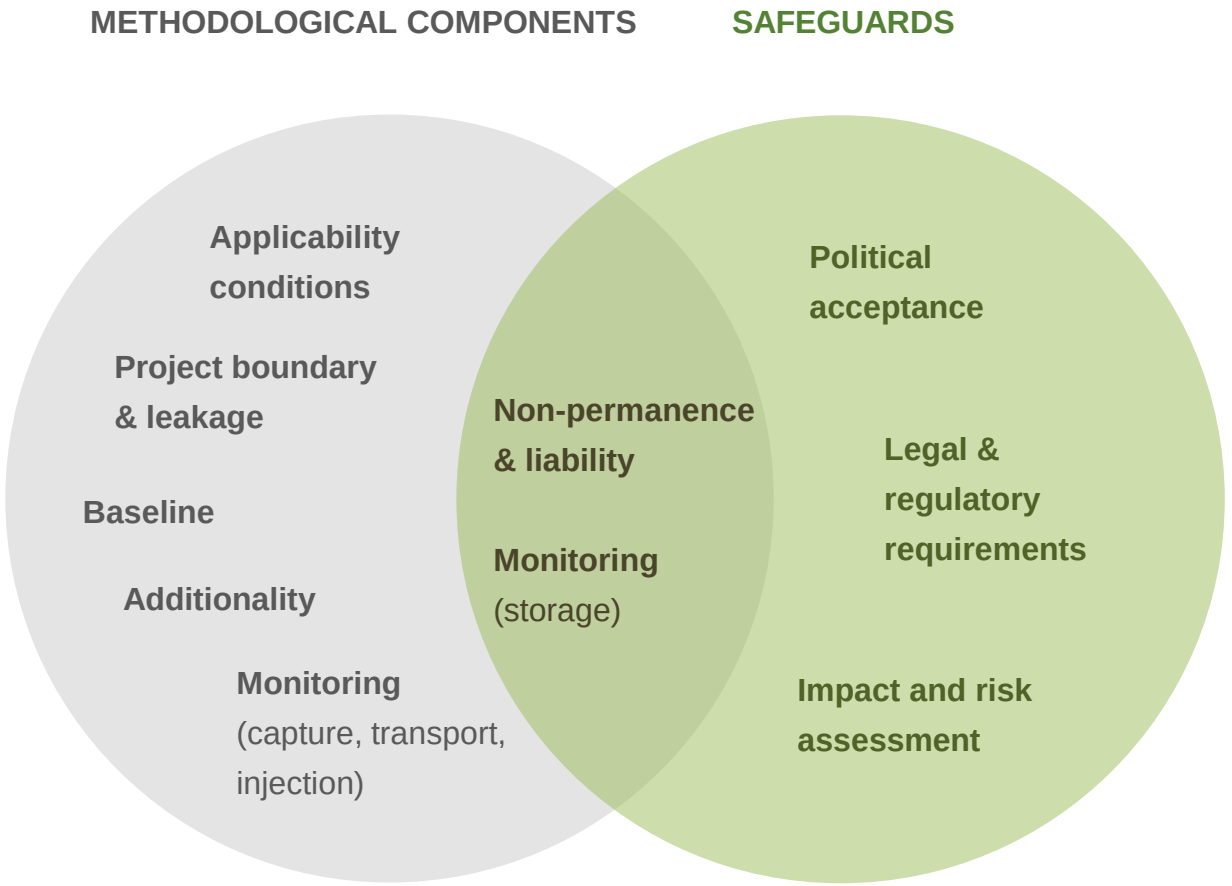
Revised version
April 2024

Basic Structure of IETA HLC

Based on existing methodologies, expert consultation and global reporting standards*, IETA proposes the following criteria to underpin and guide the crediting of carbon geostorage activities in carbon markets:

- **methodological components** describing the rules and procedures for quantifying emission reductions and removals arising from creditable geostorage activities. Six key core methodological components are provided; and
- **safeguards** that identify and manage the specific impacts and potential risks associated with carbon geostorage (including carbon reversal). Ten high-level criteria and supporting 'checkpoints' for safe deployment are provided.

The handling of non-permanence and liability relates to both methodological design and the safeguards for safe carbon geostorage (see right). As such, quantification methodologies must be underpinned by the safeguards described



* Including the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, and CCS CDM Modalities and Procedures

High Level Criteria for Crediting Carbon Geostorage Activities

METHODOLOGICAL COMPONENT	
01.	APPLICABILITY CONDITIONS
02.	PROJECT BOUNDARY & LEAKAGE
03.	BASELINE
04.	ADDITIONALITY
05.	NON-PERMANENCE & LIABILITY
06.	MONITORING

SAFEGUARD AREA	HIGH LEVEL CRITERIA	
POLITICAL ACCEPTABILITY	01.	SIGNIFICANT AND COST-EFFECTIVE FOR NATIONAL CLIMATE MITIGATION
	02.	ALIGNED WITH NATIONAL DEVELOPMENT PRIORITIES AND POLICY AIMS
	03.	PUBLIC ACCEPTANCE
LEGAL AND REGULATORY FRAMEWORK FOR SAFE STORAGE	04.	LEGAL BASIS FOR INJECTION AND STORAGE
	05.	EFFECTIVE SITE SELECTION AND DEVELOPMENT
	06.	ROBUST OVERSIGHT OF SITE OPERATION AND CLOSURE
	07.	LIABILITY FOR CARBON REVERSAL
ENVIRONMENTAL AND SOCIAL SAFEGUARDS	08.	RISK AND SAFETY ASSESSMENT
	09.	ENVIRONMENTAL AND SOCIAL IMPACTS
	10.	SUSTAINABILITY

Source IETA
https://www.ieta.org/resources/IETA%20Initiatives/CCS%20Criteria/High%20Level%20Criteria%20for%20crediting%20geostorage%20activities%20v1.0.pdf

Demand for CCS/DAC

Demand from GX ETS

◆ GX ETS: voluntary participation by corporates
✓ 1st Phase: April 2024 -
✓ 2nd Phase: April 2026 -

◆ Eligible Credit
✓ J Credit
✓ JCM
✓ Additional credits (draft): 5% limit of total emission.

PM Kishida's Policy Speech
(31 Jan. 2024)

We will promote the legalization of the carbon pricing system toward its full-scale introduction in FY2026, with a view to making participation mandatory for large companies and establishing a certification system for individual companies' reduction targets.

National Assembly
31 Jan. 2024

Draft policy of additional eligible credits

	Japan	International
Project proponent	Any	Projects which GX League participant companies have been involved in from the beginning of project development * Involvement: 20% or more equity share
Project place	In Japan	Out of JCM partnership country
Methodology	1 Expected to contribute NDC of Japan; CCU, Blue Carbon (coast line), BECCS, DACCS 2 Satisfy certain quality standard, or involvement of Japanese government in the operation of the program 3 Priority on the domestic project if there are same type of projects	

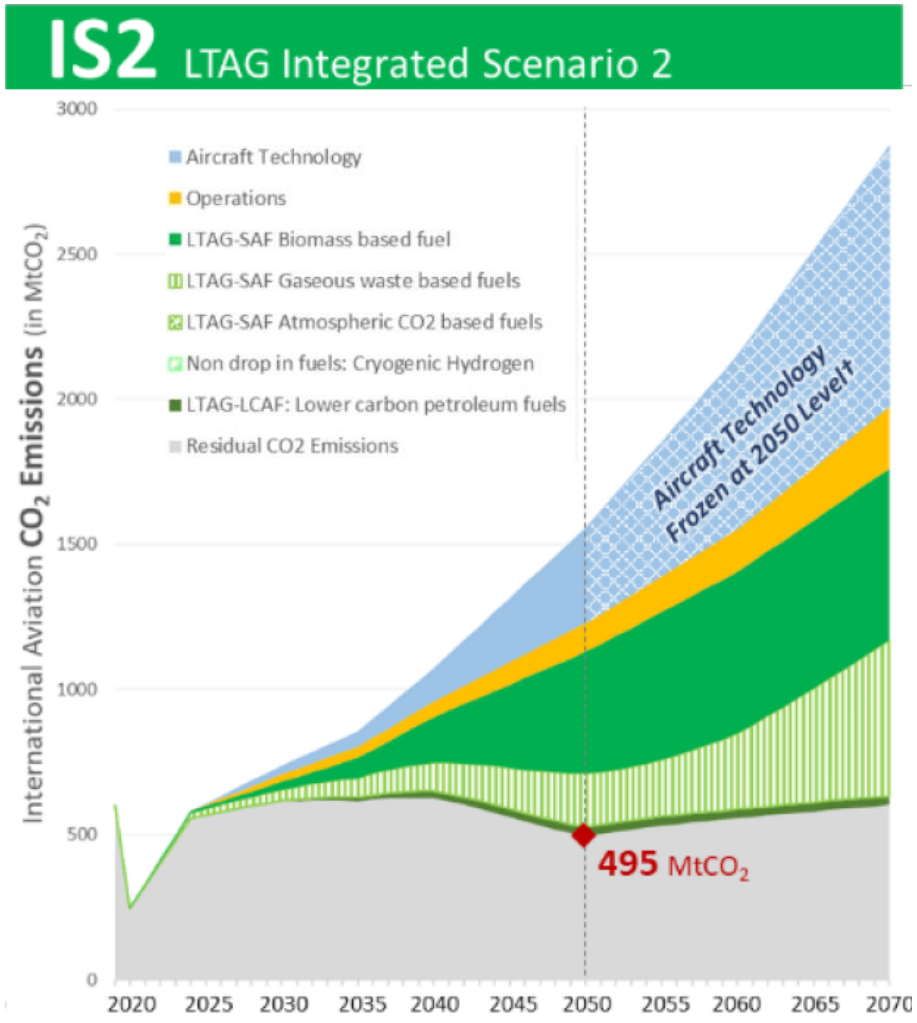
Potential - Long term demand for CCS/DAC

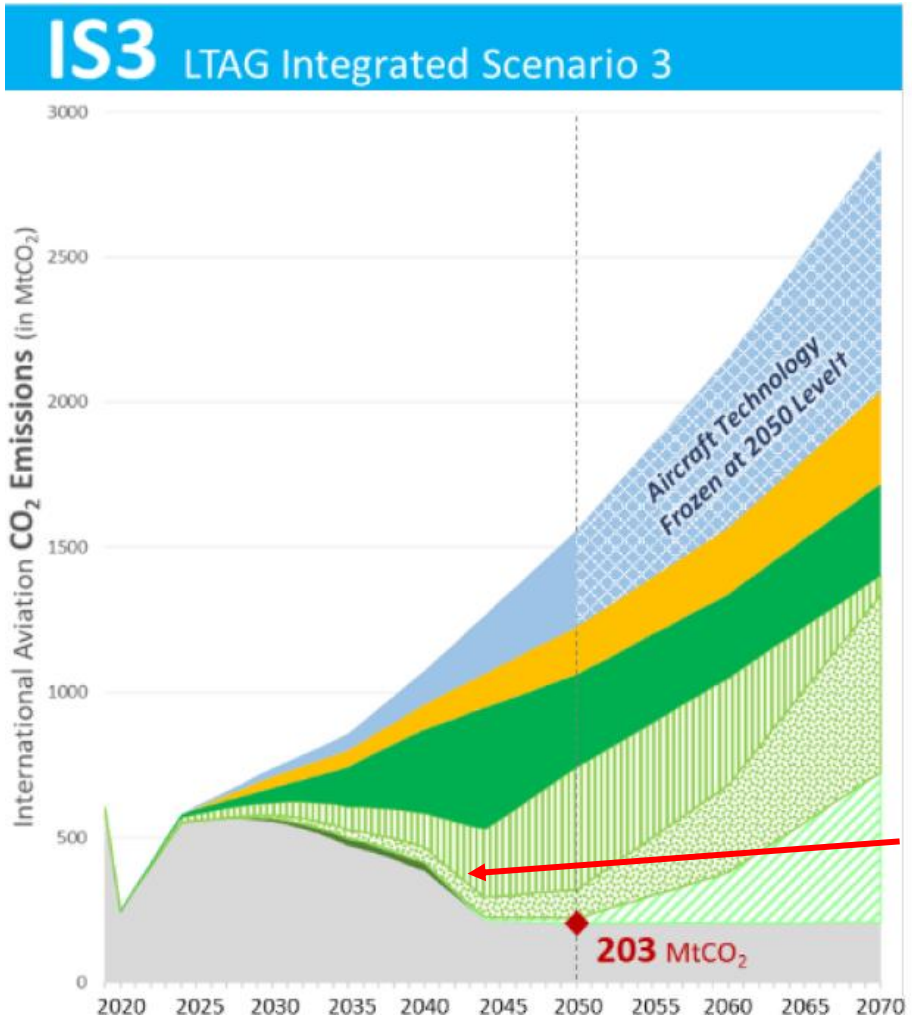
- CCS will become increasingly important as a decarbonization technology when fossil fuel use. In the long term, however, the role of CCS will change as fossil fuel use decreases. DACCS/BECCS as a negative emission technology will be important.
- Demand for CCS/DAC varies by sector – depending on the availability of alternatives technologies.

Sector	Role of CCS/DAC
Power Generation	• Significant portion of generation will be replaced by renewable energy sources. Role of CO2 for power sector will be limited, such as for thermal power as stabilizing fluctuations in renewable electricity.
Low fuel production	• CCS is an option for producing low carbon fuel
Industry	• Electrification is a mainstream measure in general. Some industry, such as steel, cement and chemical, will use CCS and hydrogen as their option.
Ground transportation	• FCV is an option, particularly for long-haul trucking
Aviation (ICAO)	• LCAF(Lower Carbon Aviation Fuel) and E-Fuel are option of decarbonized fuel. • As out of sector measures DACCS and BECCS will be considered.
Maritime	• Ammonia is an important option.

Case – International Aviation

- Zero or lower emission fuel plays important role. SAF＋CCS and LCAF are recognized as option.
- It is considered offset by credits from DACCS and BECCS will be used.





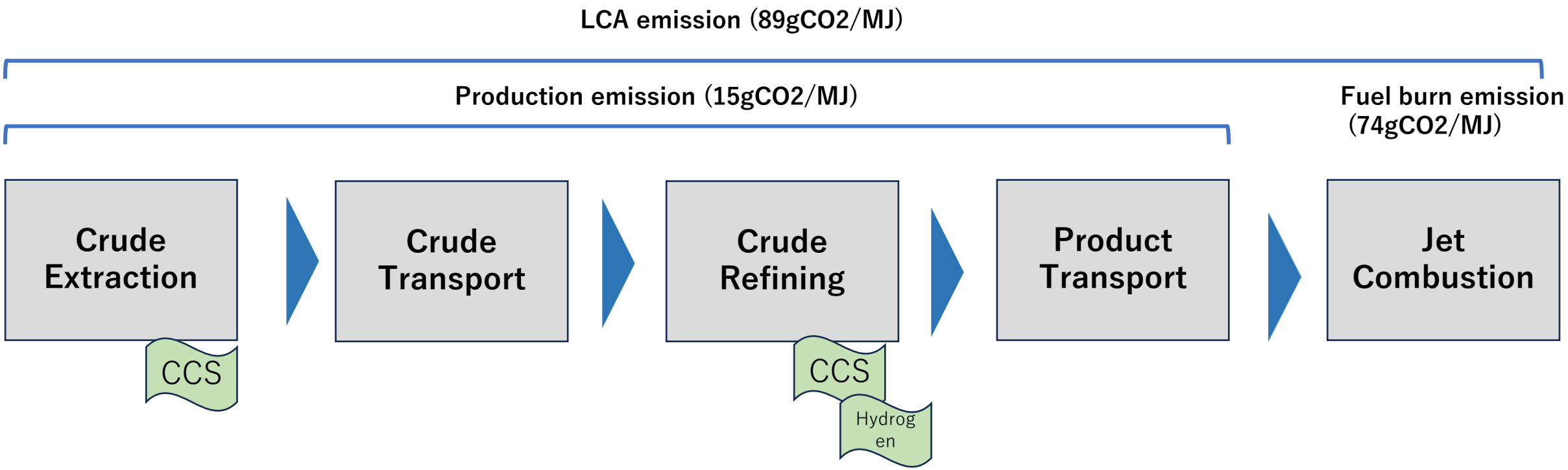
SAF
(SAF + CCS(ethanol production))

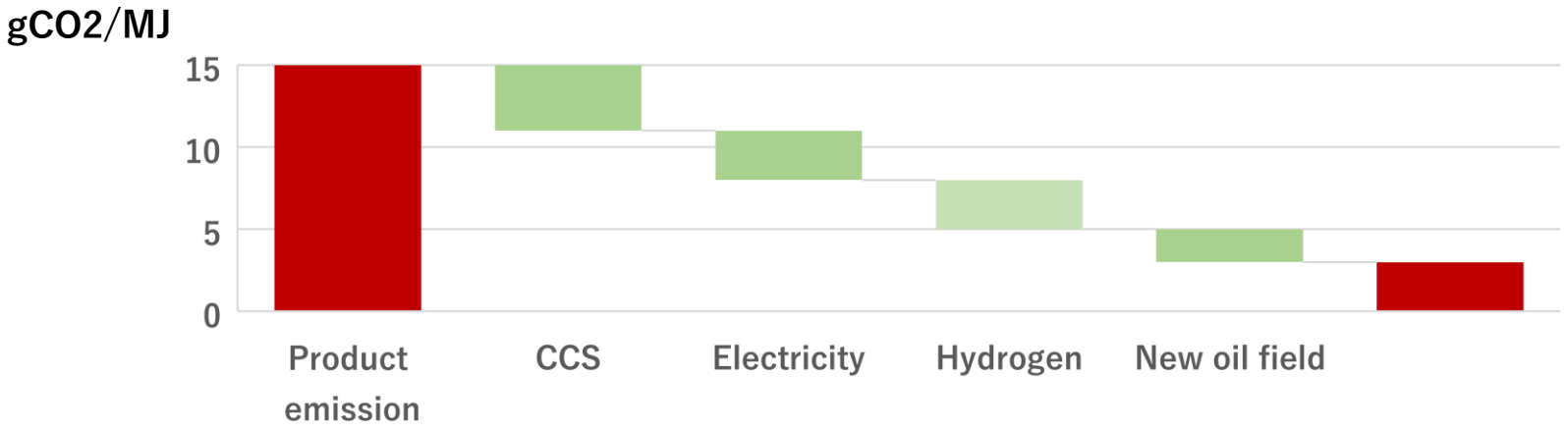
E-Fuel
(DAC + Hydrogen)

LCAF (Jet Fuel CCS)

Offset by negative emission credits (DACCS, BECCS)

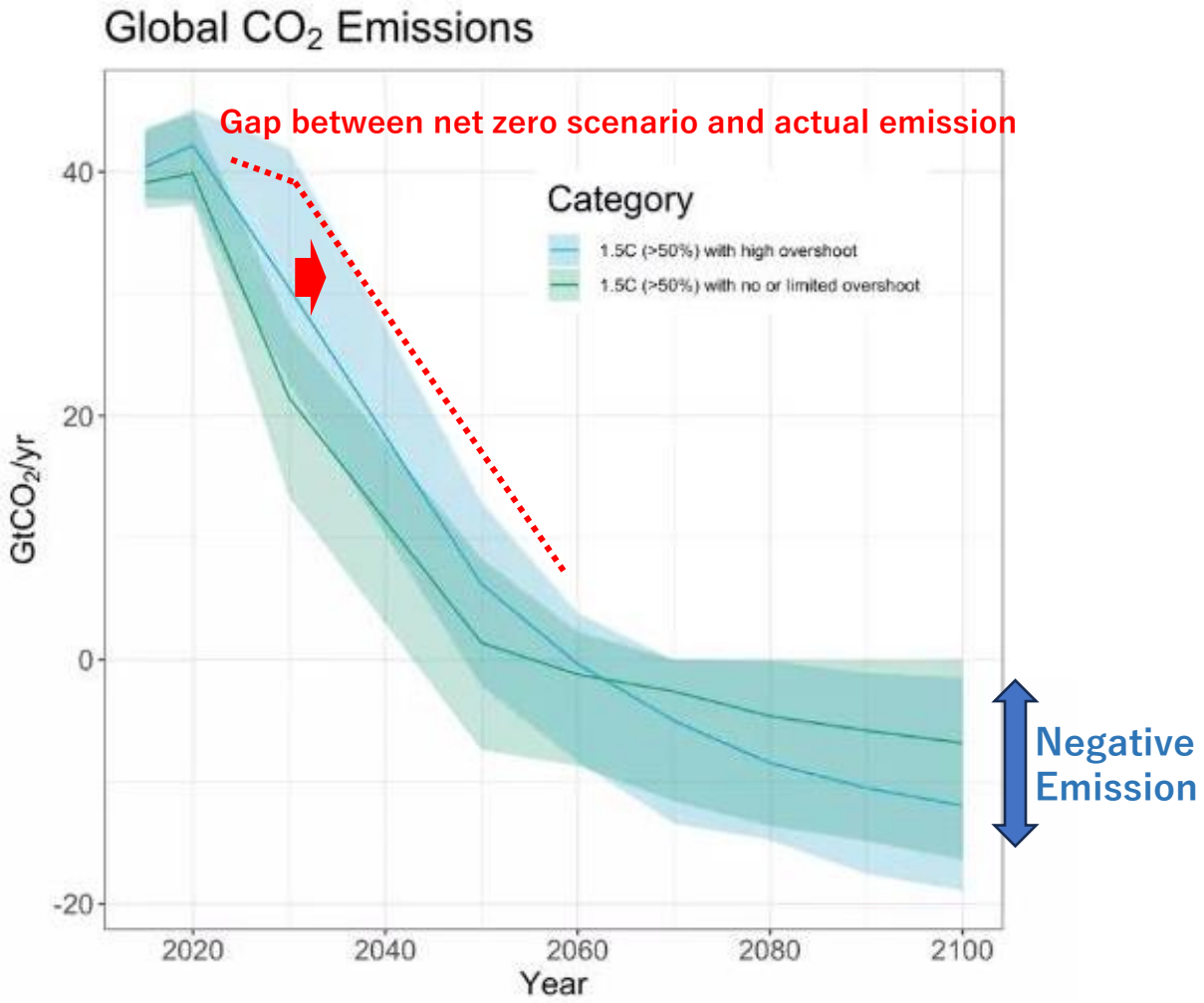
LCAF (Lower Carbon Aviation Fuel) and CCS



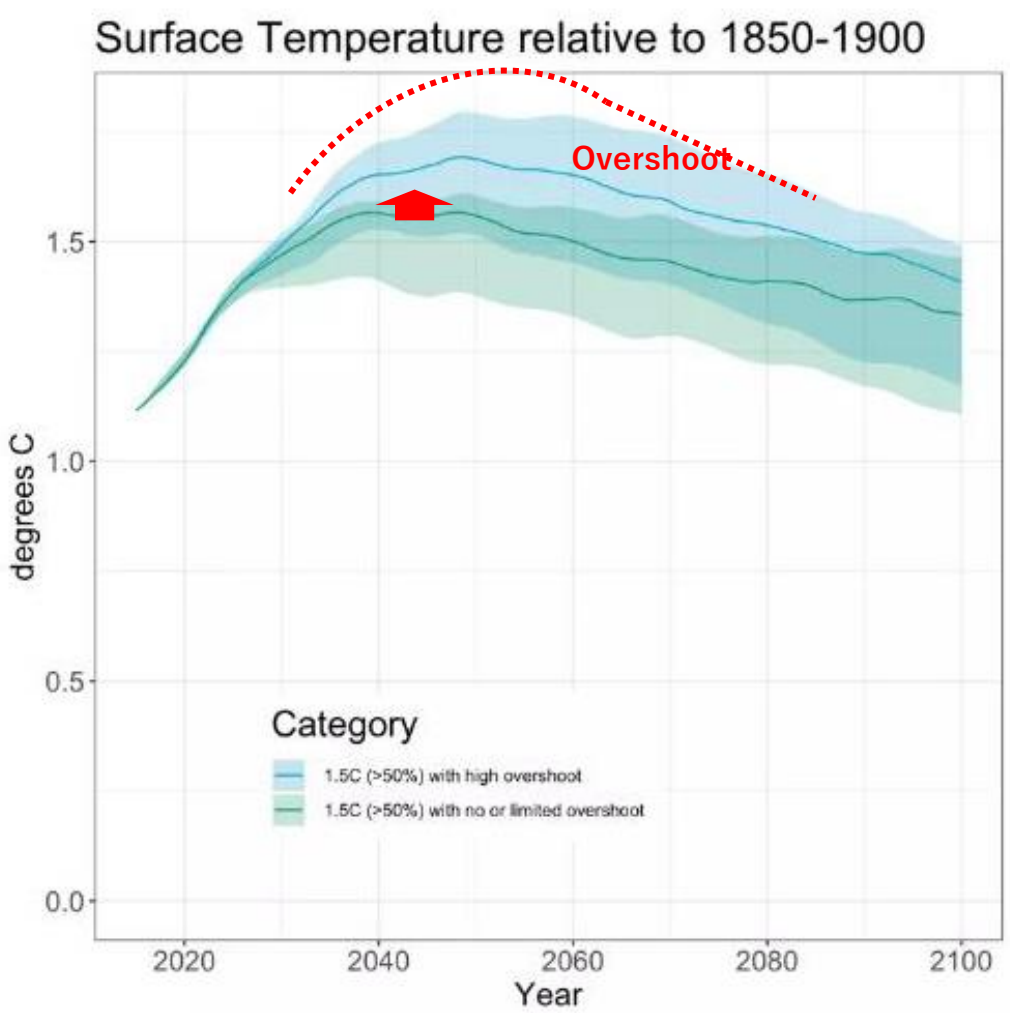


Scenario analysis – overshoot scenario

- Overshoot scenario: Emissions exceeding carbon budget for 1.5 degree target but subsequent negative emissions will decrease the temperature below 1.5 degree.
- Not a major scenario analysis in the IPCC 6th Report



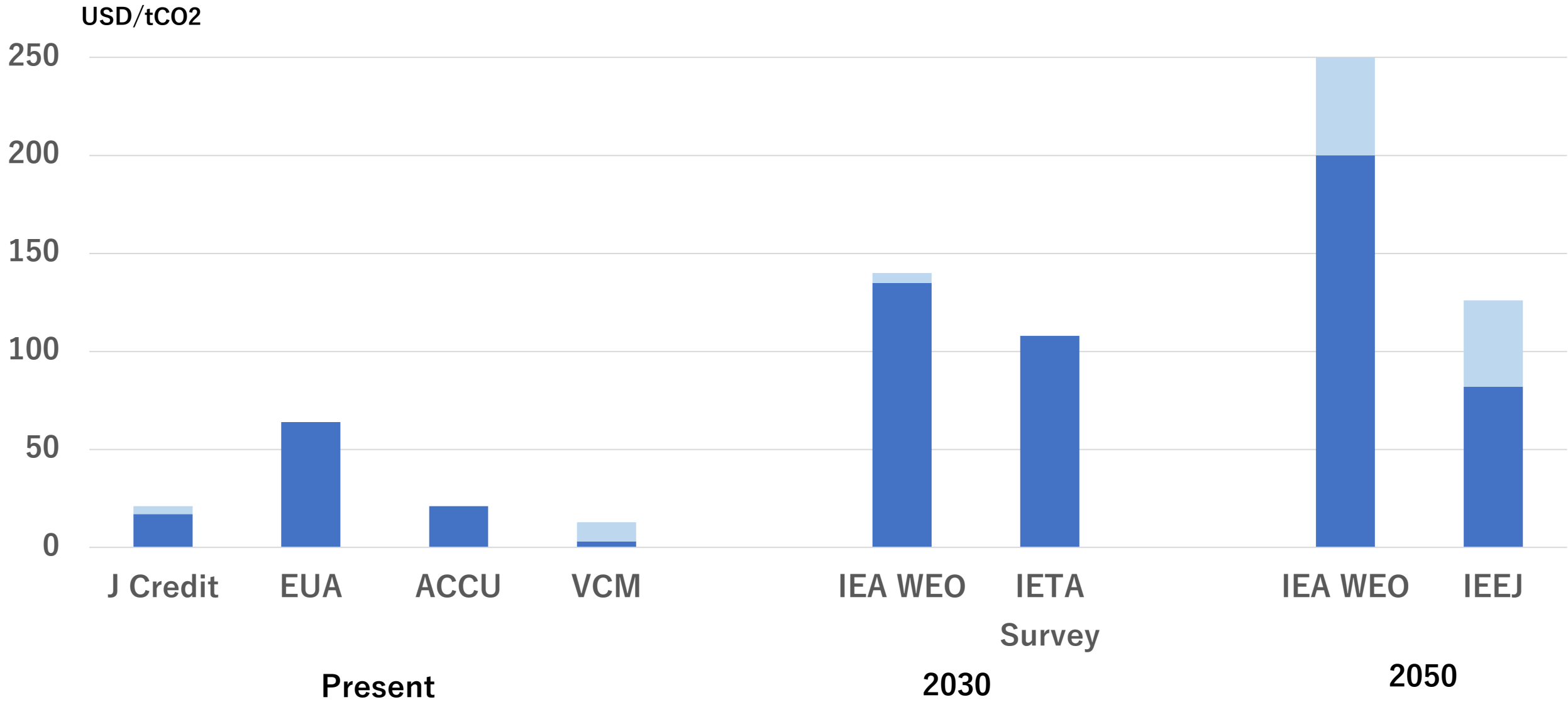
Data from WGIII Figure 3.10



Data from WGIII Box SPM.1 Figure 1

Economics – carbon price

Commercia benefit of CCS/DAC – carbon price



Note:
J Credit: RE=high, EE=low, VCM: Removal=high, Nature base=low, IEA: NZE=high, APS=low, IEEJ: power sector: zero emission :high, 70% reduction=low

Conclusion

- ◆ Economics
  - ✓ Carbon price is increasing but not enough now
  - ✓ Additional revenue is necessary

- ◆ Indispensable option
  - ✓ Hard to abate sector – international aviation/maritime

- ◆ Public Acceptance
  - ✓ Communication is crucial – IETA CCS HLC

Reference - applicability of CCS High Level Criteria in Japan

Methodological Component

METHODOLOGICAL COMPONENT		DESCRIPTION	Applicability
01.	APPLICABILITY CONDITIONS	Defines the specific circumstances, attributes and other conditions that apply to eligible geological CO_2 storage activities. These can include the eligible sources of captured CO_2 (e.g. which types of CO_2 and from which sectors, both of which have implications for baseline selection; see below), the modes of transport, and the allowable storage media. Geographical and technical restrictions can also be applied (e.g. only countries with CCS laws; conditions on geostorage development/operations).	Japan plan to have Geological CCS. For CCS/EOR, emission from increased production is took into account
02.	PROJECT BOUNDARY & LEAKAGE	Defines the emissions by sources and removals by sinks that must be measured and accounted for across the capture>transport>storage chain (project boundary). Includes emissions occurring *outside* of the immediate control of the project operator (e.g. upstream emissions), but which are measurable and attributable to the project activity (i.e. 'leakage').	Emission from capture and transportation shall be considered. Hub and Spoke model is planned
03.	BASELINE	Describes procedures and options to establish the *baseline scenario* and a methodology for calculating *baseline emissions.* The emissions from the project activity must be compared to the baseline to quantify the net emission reductions or carbon removals. Options include projection-based approaches (e.g. historical emissions, or estimated future emissions, without CO_2 capture) or standards-based approaches (e.g. using benchmark emissions of a comparable activity without CO_2 capture).	Before CCS, all emission is to atmosphere.
04.	ADDITIONALITY	Demonstration that the activity delivers emissions reductions/removals that would not have occurred absent of the incentive created by carbon credit revenues. Different approaches and tests exist for demonstrating additionality (e.g. first-of-a-kind (FOAK); regulatory surplus; financial additionality). The primary purpose of CO_2 capture is climate mitigation, which generally means that most projects will be additional. Novelty also means that FOAK or technology penetration rates can be used to rapidly demonstrate project additionality. Financial additionality testing may also be used to discern the value of crediting where other incentives (e.g. tax breaks) or benefits also exist (e.g. commercial CO_2 utilization).	CCS has additional because no revenue without credits (by UNFCCC)
05.	NON-PERMANENCE & LIABILITY	Methodologies should ensure that geological storage sites are appropriately characterized, selected, developed, managed and closed level to mitigate against the risk of carbon reversals (*quality assurance*). Liability to remedy the impacts of any carbon reversals must also be allocated *(liability allocation*). These safeguards can be implemented *either* by applying geographical applicability conditions (i.e. relying on local laws and regulations) and/or through other effective safeguards **(see safeguard criteria 05, 06, 07)**.	Site selection, closure plan. monitoring – ISO27914 & 27916
06.	MONITORING	Robust monitoring is needed to measure flows and emissions related to aboveground features of the activity and to check for CO_2 leaks in around the storage site. Results of monitoring are used to (i) quantify creditable reductions or removals and (ii) protect natural ecosystems and human health. The latter safeguard can be implemented *either* by applying geographical applicability conditions (i.e. relying on safety monitoring under local laws and regulations) and/or through other effective safeguards **(see safeguard criteria 08, 09)**.	Post closure monitoring is determined by regulation (ISO). CCS Operation law is under consideration in Japan

Safeguards/Sustainability

SAFEGUARD AREA	HIGH LEVEL CRITERIA	DESCRIPTION	EXAMPLES OF EVIDENCE / CHECKPOINTS	Applicability
POLITICAL ACCEPTABILITY	01. SIGNIFICANT AND COST-EFFECTIVE FOR NATIONAL CLIMATE MITIGATION	Technologies involving geostorage should be part of a host country's cost-optimized and Paris-aligned national mitigation pathway. The host country mitigation scenarios must have been developed cognizant of the UN Sustainable Development Goals (SDGs).	• Nationally Determined Contributions (i.e. inclusion of geostorage within mitigation scenarios and plans) • Long-term Low Emissions Development Strategies (i.e. inclusion of geostorage) • Techno-economic mitigation studies etc	A measure at Japanese NDC
	02. ALIGNED WITH NATIONAL DEVELOPMENT PRIORITIES AND POLICY AIMS	Technologies involving geostorage should be well aligned with the host country's national development plans, policies and sectoral programmes (e.g. economic development plans, energy sector development, industrial development strategy).	• Nationally Determined Contributions (i.e. demonstration of alignment with broader aims) • National development plans and strategies (e.g. economic development plans, energy sector development, industrial development strategy)	A measure at Japanese NDC Government support CCS Pilot projects in and out of Japan
	03. PUBLIC ACCEPTANCE	Activities should only be credited where the host country government and political stakeholders accept the need for geostorage (e.g. undertaking of robust stakeholder consultation as part of national climate policy development).	• Nationally Determined Contributions (i.e. developed with broad public input) • Normal host country public consultation processes and procedures • *OECD Best Practice Principles on Stakeholder Engagement in Regulatory Policy*	Consultation is needed EIA is critical

Safeguards/Sustainability

SAFEGUARD AREA	HIGH LEVEL CRITERIA		DESCRIPTION	EXAMPLES OF EVIDENCE / CHECKPOINTS	Applicability
LEGAL AND REGULATORY FRAMEWORK FOR SAFE STORAGE	04.	LEGAL BASIS FOR INJECTION AND STORAGE	Activities credited under international standards should be compliant with host country laws and regulations. The responsibility for governing the geological pore space into which CO_2 is injected and stored is typically vested into government (but sometimes the surface property owner). In some situations, protection of sub-surface resources may also trigger government permitting and oversight (e.g. groundwater protection). Appropriate permission must therefore be obtained to access and use geologic pore space for the purpose of storing CO_2.	• National laws (e.g. constitution; mineral laws etc that indicate ownership of geological pore space and procedure(s) by which access is conferred to economic operators/private entities). • *CDM CCS Modalities and Procedures* (requirements outlined in Appendix B)	CCS promotion law is under consideration
	05.	EFFECTIVE SITE SELECTION AND DEVELOPMENT	In permitting the use of geological pore space for CO_2 storage, the pore space owner should ensure protection of natural resources and public health and safety. The safety and security of storage in a proposed geological storage site must be appropriately demonstrated prior to the granting of access and use permission (through e.g. robust site characterisation and selection reports and development, operation and closure plans).	• National laws and regulations (e.g. mineral or petroleum development laws; environmental protection laws; dedicated geological storage law) • *2006 IPCC Guidelines Volume 2, Chapter 5: Carbon Dioxide Transport, Injection and Geological Storage* (Requirements in Section 5.10 include reporting of site characterisation and selection, modelling, monitoring plan design, monitoring etc.) • *CDM CCS Modalities and Procedures* (Appendix B) • *ISO Standard 27914:2017 - Geological Storage*	Site selection shall be an important condition at the law
	06.	ROBUST OVERSIGHT OF SITE OPERATION AND CLOSURE	Geological storage activities must be operated respecting the conditions specified in storage site permits with appropriate oversight of a competent body (i.e. modes of development, operation and closure).	• National laws and regulations (clarifying the competent authority and their regulatory powers)	Closure and post closure monitoring will be a condition at the law
	07.	LIABILITY FOR CARBON REVERSAL	Responsibility for CO_2 stored in geological formations must be appropriately allocated to ensure that remedial measures are implemented in the event of a leak/carbon reversal from a geological storage site.	• Liability arrangements (e.g. national laws on environmental liability; mineral/petroleum laws; geological CO_2 storage law) • Liability transfer arrangements (e.g. aligned with the cessation of monitoring described in the *2006 IPCC Guidelines Volume 2, Chapter 5*) • Non-permanence risk tool (NPRT) applied by registry operator	The law will cover this too.

Safeguards/Sustainability

Contact: report@tky.ieej.or.jp

SAFEGUARD AREA	HIGH LEVEL CRITERIA	DESCRIPTION	EXAMPLES OF EVIDENCE / CHECKPOINTS	Applicability
ENVIRONMENTAL AND SOCIAL SAFEGUARDS	08. RISK AND SAFETY ASSESSMENT	Geological domains are inherently heterogenous, each having unique characteristics that influence the safety, durability and non-permanence risk of storage. Risks from CO_2 leaks therefore need to be suitably assessed and managed on the basis of site-specific characteristics within a proposed geological storage site, its surrounding domains and the proposed modes of development and operation. Inherent uncertainty in geological analysis means that this must be based on scenarios of specific features and potential events and processes that could occur at the specific site in order to understand the scale and magnitude of potential impacts (i.e. risks).	• National laws and regulations • *ISO Standard 27914:2017 - Geological Storage* (Section 6: Risk Assessment) • *CDM CCS Modalities and Procedures* (Appendix B)	A condition of project approval
	09. ENVIRONMENTAL AND SOCIAL IMPACTS	The nature of the impacts of leaking CO_2 of an individual project needs to be understood in the context of the scenarios identified in the risk and safety assessment (e.g. communities, natural ecosystems). Measures must be taken to mitigate and mange such risks and impacts.	• National laws and regulations • *ISO Standard 27914:2017 - Geological Storage* (Section 6: Risk Assessment) • *IFC Performance Standards on Environmental and Social Sustainability (Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts*)	A condition of project approval. EIA is needed.
	10. SUSTAINABILITY	Sustainability impacts and benefits of an individual project must be appropriately demonstrated (e.g. tangible co-benefits and/or contributing towards multiple United Nations SDGs). Corporate social responsibility should be part of project deployment (as appropriate to the project setting). For example, implementation could be accompanied by community support programmes and knowledge sharing, education and engagement actions relating to climate change and its mitigation through geologic CO_2 storage.	• *CDM Sustainable Development co-Benefits Tool* • *ISO Standard 37101:2016 - Sustainable development in communities* • Project-level standard requirements for sustainability (e.g. The Gold Standard requirement to deliver on at least 3 SDGs, including climate action (SDG 13))	Consultation with stakeholders, particularly people near to project sites, is critical