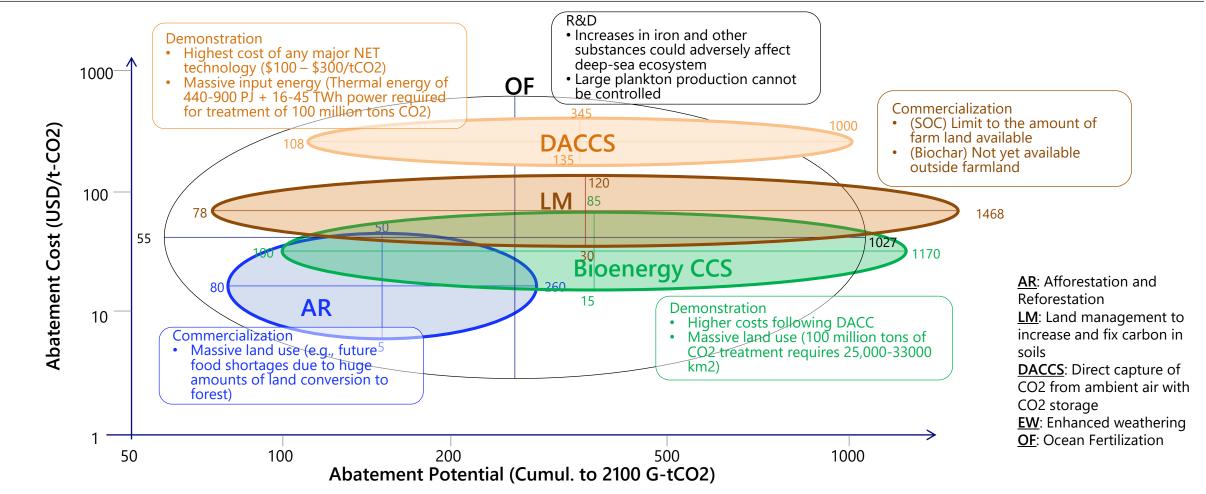


Technology trends

• Currently, demonstrated DACCS and Bioenergy CCS could potentially reduce cost.

Abatement Potential and Cost of Key Negative Emission Technologies



Source: EASAC (2018) "Negative emission technologies: What role in meeting Paris Agreement targets?"

IEA "Special Report on Carbon Capture Utilization and Storage CCUS in clean energy transitions" .

Technology trends

- Innovations to solve the challenges of DACCS and Bioenergy CCS.
- Development of a new system in business and resource recycling is required.

Key challenges and solutions in Negative Emission Technologies

Challenge				Solution	
Separation Storage and Utilization	1	 Highly-efficient Absorption Process To reduce costs Cost reduction for promotion is necessary 	→ A	Economies of Scale Involving Different Industries E.g. 1: Collaboration with the oil and aviation industry E.g. 2: Collaboration with the electric power / IT industry	
	2	 Energy Consumption During the Process = CO2 Emission Reduction DACCS requires a large amount of heat in the absorption process and the CO2 emission reduction effect is offset Use of energy to transport bio-resources and CO2 will defeat the purpose. 	В	New Process of Carbon Dioxide Separation E.g. 3: Low temperature process E.g. 4: Membrane separation process	
	3	 Developments on CO2-Utilization An advantage of Bioenergy CCS/DAC is that it "can be implemented anywhere." However, the use of CO2 is not able to take advantage of its strengths in EOR. Development of applications other than EOR is required. 	с	Combined use of Net Zero/Negative E.g. 5: Combined use of Geothermal (Heat utilization: DACCS) E.g. 6: Utilize Waste-to-energy (WtE) (Reduce competition for food: BiCRS) E.g. 7: Development of a hydrogen-containing surface (used as a CO2	
	4	 Additional Value CCS/CCUS certification/methodology has not been established even within the scope of voluntary credit 	D	utilization medium) Utilization of CO2 from Chemicals and Cement etc.	
	5	 Social Acceptability There are concerns about the safety of CO2 storage Overcoming is necessary to promote the location of the facilities 	× E	Establishment of Evaluation Methods and Methodologies	
			→ F	Safety Verification	
			G	Awareness Program	

