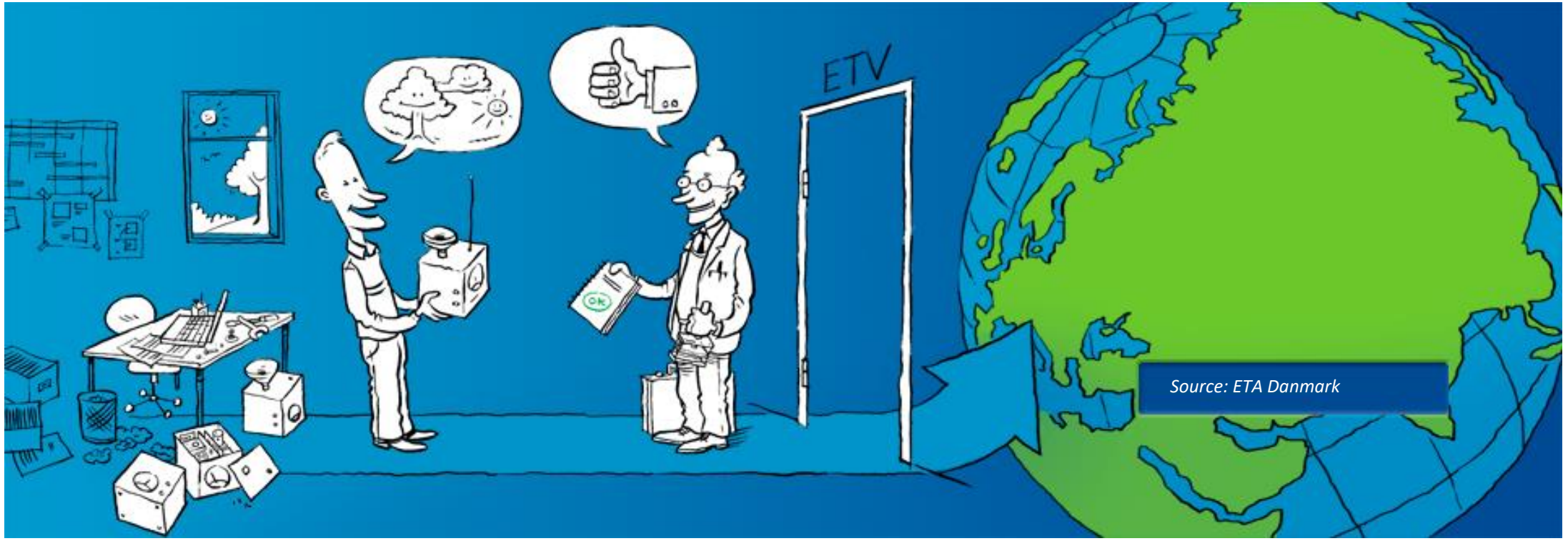
Environmental Technology Verification in Carbon Utilization & Removal

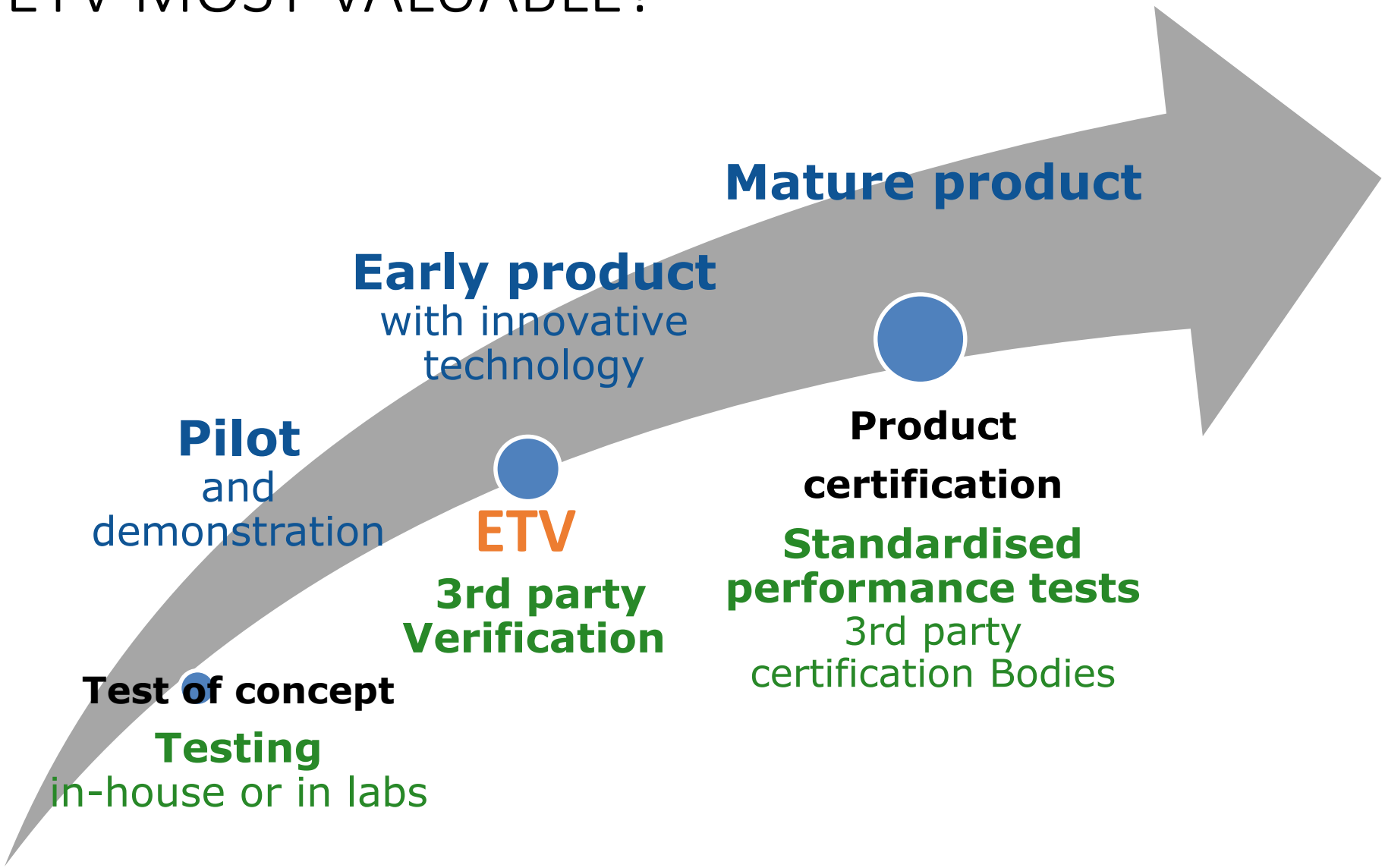
Existing Roles and New Pathways for ETV to Support a Low Carbon Future

WHAT IS INDEPENDENT ENVIRONMENTAL TECHNOLOGY VERIFICATION (ETV)?



Source: ETA Danmark

WHEN IS ETV MOST VALUABLE?

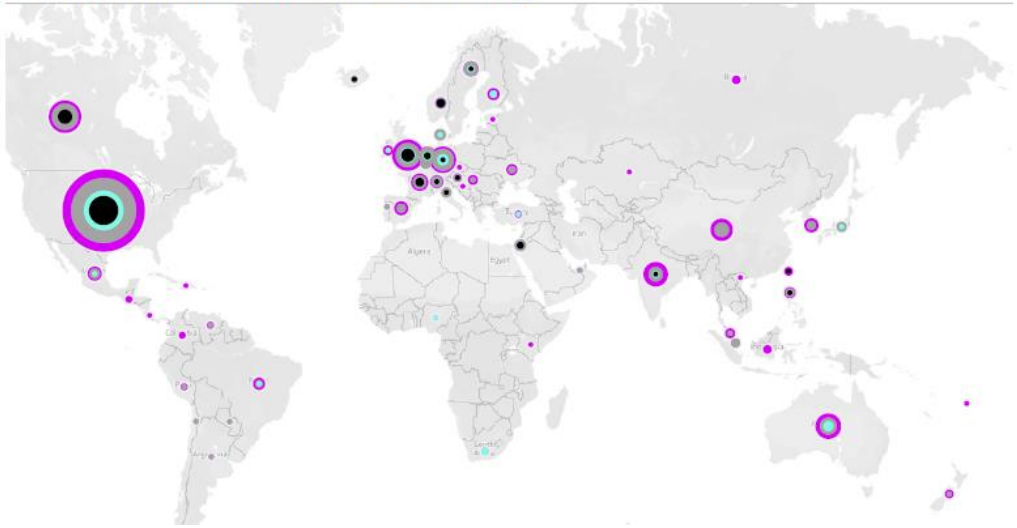


Carbon Utilization (CCU) & Removal (CDR): New Environmental Technology Markets

Number of Companies	Countries Represented	Reported Capital Raised to Date
997	55	$25.4B

https://circularcarbon.org/wp-content/uploads/2024/02/CCN-2023-MarketReport.pdf

Location of All Innovators In the Index by Solution Type



https://www.xprize.org/prizes/carbonremoval/articles/cdr-innovation-landscape-and-2024-outlook

Barriers to CCU and CDR Market Growth

- Lack of trust in supplier data (aka – too much hype!)
- Novel unproven technologies
- Novel / inconsistent / lacking test and evaluation protocols
- No product performance standards

Carbon Utilization &Removal Market Verification Needs

Voluntary Carbon Market & CDR Credits

- High Quality, Transparent Data
- Different from Past Offset Markets
- Technical Experts Focused on Innovative CDR Tech

Technical Due Diligence

- Funders – Public & Private
- Investors
- Technology Developers

The Current CDR Certification System & ISO 14034 ETV

- New CDR-specific registries have developed

puro·earth

ISOMETRIC

- Registries have included ISO 14034 accreditation as an acceptable certification for auditors / verifiers
- Some have included ISO 14034 derived specifications in standards (i.e. ISO 17025 laboratory accreditation)
- ISO 14034 accredited entities have:
  - technical focus
  - deep measurement & testing expertise
  - experience with unproven technologies

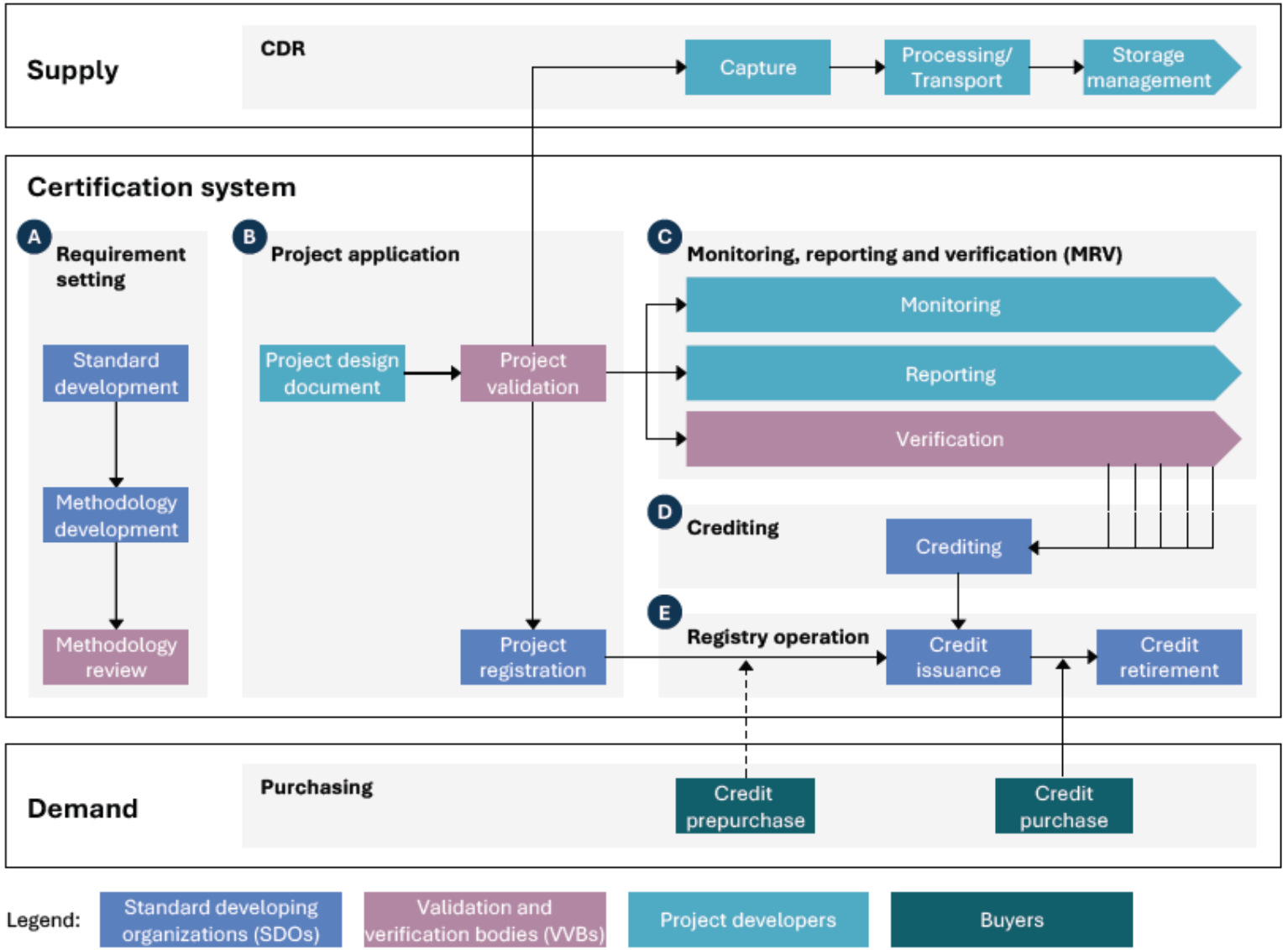


Figure 2: A simplified representation of the current CDR certification system in the VCM, based on own research findings and inputs from interviewees. Multiple certification programs are active within the system. Multiple actors might undertake activities that are assigned here to a single actor, or actors may outsource specific activities to other entities.

https://www.suslab.ch/projects-1/cdr-certification-governance

Carbon Utilization Technology Verifications

- Carbon XPRIZE utilized an ISO 14034 framework for evaluation of 10 finalist teams for $20 Million USD competition
- Four CO2 utilization technology companies opted to complete and have published full ISO 14034 ETV reports

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VERIFICATION STATEMENT

In accordance with ISO 14034:2016
Environmental Technology Verification

Technology & Company Information		
Technology Name	**Company**	**Technology Type & Application**
CarbonBuilt Reversa!™	CarbonBuilt™ https://carbonbuilt.com	Direct utilization/conversion of carbon dioxide (CO_2) borne in a CO_2-dilute flue gas stream to produce concrete components

Verification Parameter	Verified Performance
Operational Scale	0.34 tonne CO_2/carbonation period (24 hours)
CO_2 Utilization	0.26 tonne CO_2/carbonation period (24 hours)
CO_2 Embedded in Product	19.5 kg CO_2/tonne concrete
CO_2 Conversion Efficiency	75.6 %
Energy Usage	3,704 MJ/batch, 282 MJ/tonne concrete
Water Usage	0.28 m³/batch, 0.02 m³/tonne concrete
CMU 28-day Compressive Strength	22.43 MPa

Verifier Information			
Verification Body	**Lead Verifier**	**Verification Body Accreditation**	**Verification ID**
350Solutions, Inc. https://350solutions.com	Bill Chatterton	ANAB Cert. AI-2618 for ISO:IEC 17020-2012 / ISO 14034-2016	VS- CKP-A-01

350 VERIFIED ISO 14034

Disclaimer: 350Solutions Name and/or Logo does not imply approval or certification of this product, nor does it make any explicit or implied warranties or guarantees as to product performance. Information on the performance characteristics of the CarbonBuilt Reversa!™ Technology can be found at https://350solutions.com. Contact 350Solutions or CarbonBuilt to obtain a copy of this ETV verification statement.

CarbonBuilt™

Issue Date: April 15, 2021

ANAB ACCREDITED

VERIFICATION STATEMENT

In accordance with ISO 14034:2016
Environmental Technology Verification

Technology & Company Information		
Technology Name	**Company**	**Technology Type & Application**
Thermochemical Methanol Synthesis	Breathe Applied Sciences PVT LTD https://breatheasciences.com	Thermochemical conversion of concentrated CO_2 for the production of methanol and CO.

Verification Parameter	Verified Performance
Operational Scale	31.59 ± 0.072 kg CO_2/day
CO_2 Capture in the Product	1.375kg CO_2 / kg methanol
CO_2 Conversion	39.06% ± 5.67%
Methanol Produced	6.46 ± 0.67 kg methanol/day
CO Produced	2.18 ± 0.22 kg CO/day
H_2 Usage	0.67 ± 0.07 kg / kg methanol product
Energy Usage	7.76 ± 1.27 kWh / kg methanol product

Verifier Information			
Verification Body	**Lead Verifier**	**Verification Body Accreditation**	**Verification ID**
350Solutions, Inc. https://350solutions.com	Kevin McCabe	ANAB Cert. AI-2618 for ISO:IEC 17020-2012/ISO 14034-2016	VS-XP2003

350 VERIFIED ISO 14034

BREATHE

Issue Date: June 22, 2021

ANAB ACCREDITED

Other Integration Opportunities for ETV in CDR

Other CDR crediting registries

- Opportunities to improve outcomes via high quality technical verification vs. prior accounting-based verifications
- Utilize ISO 14034 ETV as a platform for portion of technical project validation
- Allow ISO 14034 accreditation – provides an additional market for verifiers to work in adjacent to ETV

CDR offtake agreement buyers

- Buyers asking for technical diligence and validation
- Not fully aligned with ISO 14034 at this time, but could fit well

Government Funding Programs

- RD&D programs proving technology performance
- US DOE Funding & Prize Programs
- EU Innovation Fund

Investors

- Also asking for technical diligence on novel CDR technology
- ISO 14034 ETV could provide a standard to

Suppliers

- Providing market relevance in a multi-billion-dollar market

Summary

- Carbon Removal is a novel < 5 yr old market
- New technologies are being developed constantly
- Investment levels and tech deployment in the billions
- Uncertainty regarding if the technologies work as claimed
- Success in integrating ISO 14034 in some CDR validation / verification frameworks
- Significant alignment of ETV with market needs
- Need to push for broader and consistent market acceptance of ETV in CDR

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