Climate Tech Bookmarks

By Grant Faber

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Chris Burk Techno-Economics Blog
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CCS LCAs
CCS Water Footprint
LCA for Ex Situ Mineralization
ERW Geochemical and LCA Optimization
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OAE LCAs
LCA for Coastal Enhanced Weathering
Unfavorable Microalgae LCA

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Chemical Emissions Estimation Using Stoichiometry
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Bibliometric DAC Analysis
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Large-Scale CDR Expert Elicitation
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Survey of DAC Experts on Trends
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April 2026 DOE Retaining Projects Including Some DAC Hubs
April 2026 Math Behind Microsoft's Pause
April 2026 Microsoft Pausing CDR Purchases

April 2026 Cowboy and Absolute Partnership
March 2026 CTRL-S Launch
February 2026 Sweden Söderenergi BECCS Pause
February 2026 Microsoft Bought 93% of CDR in 2025
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February 2026 Terradot Acquires Eion
February 2026 WSJ on Terradot and CDR Consolidation
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September 2025 Brineworks DAC €6.8M Fundraise
September 2025 Puro €11M Series B
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August 2025 Equatic $11.6M Series A
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June 2025 Aircapture $50M Series A
May 2025 Rivan Synthetic Fuel £10M Raise
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April 2025 RepAir $15M Series A
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April 2025 Microsoft and AtmosClear 6.75M-Credit Deal
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March 2025 Spiritus $30M Series A
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December 2024 Breakthrough $40M to Deep Sky
December 2024 BCG 50,000-Ton Purchase
December 2024 Terradot–Google Deal

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November 2024 Deep Sky Credit Sales
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April 2024 MegaDAC Database Insights
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November 2025 Avnos $17M for 3,000-tpa U.S. DAC
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October 2025 Travertine 55-t Pilot Launch
September 2025 GE Vernova 1,500-tpa DAC at Deep Sky
September 2025 Ucaneo 150-tpa DAC in Germany
September 2025 Oraquel 500-tpa DAC in Poland
September 2025 Origen 2,000-tpa DAC at EERC
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December 2024 Volkswagen 600-tpa DAC in Chile
November 2024 Skytree 30-kta in Texas
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September 2024 Arbor BiCRS Credits to Microsoft
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August 2024 Deep Sky 3 kta DAC Testing Facility
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June 2024 RepAir 1 kta in Greece
May 2024 Sustaera and Deep Sky 1–5 kta
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March 2024 Infinium F–T e-Diesel Plant
March 2024 Spiritus Wyoming DAC Plant
January 2024 LanzaJet SAF Deployment

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June 2023 Project Bison Delays
April 2023 DAC Hub Apps
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October 2022 CE Up to 30 Megaton Plant
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October 2025 Global CDR Market Outlook
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Accelerating Innovation in CCUS Report
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Microsoft CDR Buying Observations
Carbon Direct and Microsoft High-Quality CDR Criteria
Business Guide to CDR Including TRLs and Ratings
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Decarbonizing Aviation Report
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Carbon Direct SAF CI and Cost Report
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Frontier Phlair Offtake
Frontier CO280 and CREW Offtakes
Frontier Terradot Offtake
Frontier CarbonRun Offtake
Frontier Exergi Offtake
Frontier Lithos Offtake

Insurance

Kita
Oka
CarbonPool
Artio
Howden
Marsh
Arbol
Aon
Canopius

Offsets

Puro VCM Market Map
Energy Impact Partners VCM Market Map
Entities Across Carbon Management Ecosystem
Carbon Market Paradoxes
Patch Framework w/ Carbon Offset Certifier Overview
Carbon Offset Buyer List
Open Standard Carbon Removal Agreement (OSCAR)
Frontier Offtake Contract Template
Sample CDR Contracts
Carbon Trading Template Contracts

Articles and Reports

Influence of SBTi BVCM on CDR
EU Greenwashing Law Files
EU Parliament Bans Greenwashing
EU Ban on Greenwashing, Carbon Neutrality, Etc.
GAO on Federal Role in VCM
How VCMs Can Support Policy Learning
December 2024 Converging Corporate Net Zero Standards
Carbon Direct on CDR SBTi Draft
Types of Additionality
Generalized Additionality Approaches
ClimeFi Commitment to Not Engage in Speculative CDR Trading
Offset Buffers and Insurance

Guidance

Oxford Net-Zero Offsetting Principles
Oxford Principles for Responsible Article 6 Engagement
Review of Core Carbon Market Challenges
Review of Offset History and Solutions
Like-for-Like to Strengthen Net-Zero Claims
Implementing Like-for-Like in the EU
Corporate Net-Zero Emissions Guidance
Double Claiming and Corresponding Adjustments
Six Questions for Better Offsets
Shift Carbon Offsetting to CDR
VCM and Novel CDR
National Claims and Additionality
Beyond Value Chain Mitigation Over Offsets
Scope 3 Workshop Findings and CDR Credit Recommendations
More Transparency Needed for SBTi
Four Ways to Fix Offsets
Reduction Offsets Possibly Still Valuable at Net Zero
Superpollutant Mitigation Overview
Horizontal and Vertical Offset Stacking
AFF Permanence Trust
Progressive (Mixed) Offsets Proposal
Pricing Carbon Offsets Considering Permanence

Carbon Market Recommendations
Building Trusted VCM
Separating Net Zero and CDR Goals
Buffer Pools and Insurance

Market Overviews

AlliedOffsets CDR Market Reports
2026 State of VCM
IETA 2025 New Carbon Order
World Bank State and Trends of Carbon Pricing Reports
2025 Allied Offsets VCM Review
2025 AlliedOffsets State of CDR Market
2025 Offset Market Projections
May 2024 VCM and Compliance Market Status
2025 State of VCM
2024 State of Carbon Credits
2024 Puro CDR Offtake Report
2024 State of VCM
2023 State of VCM
2020 Offset Analysis
CDR Market Size Potential Review
Review of Carbon Markets and CDR
Credits and Claims: State of VCM
VCM Primer

Book and Claim and EACs

RMI on Book and Claim/Insetting
RMI Book and Claim for Steel and Concrete
RMI Book and Claim Framework for Steel
RMI Book and Claim Framework for Cement and Concrete
Carbon Direct Book and Claim for Steel and Concrete
Role of EACs in Climate Strategies
Overview of Book and Claim for Transport
B&C Overview and Opportunities
EACs Growing in Popularity in 2026
Carboninsets EAC Marketplace

Offset Trackers

CDR.fyi
nbs.CDR.fyi
Known CDR Purchases
AlliedOffsets Offset Price Tracker
Article 6 Implementation Partnership Global Carbon Market Project Database
Article 6 Implementation Status Report
Carbo Alliance VCM Tracker
Carbo Alliance CDR Offset Tracker
Carbon180 Carbon Offset Registry and Project Directory
Voluntary Registry Offsets Database

CarbonPlan Offset Database
RMI Carbon Credit Types and Tracker
Open Offsets Directory

Standards Ratings Bodies, VVBs, and Corporate Accounting

ANSI Accredited GHG Validation and Verification Bodies
Verra-Certified VVBs
LCFS Accredited Verification Bodies
IETA
Integrity Council for the VCM Core Carbon Principles
Integrity Council for the VCM
VCM Integrity Initiative
VCM+ Coalition
Science-Based Targets Initiative
GHG Protocol
Task Force for Corporate Action Transparency
Carbon Measures Carbon Accounting Coalition
E-ledgers Institute Alternative GHG Accounting
Climate Liabilities and Assets Initiative
Verra
Gold Standard
Climate Action Reserve
American Carbon Registry
BeZero Credit Ratings
Sylvera Credit Ratings
Calyx Global Credit Ratings
Carbon Credit Quality Initiative
Carbon Data Open Protocol (CDOP)

Marketplaces and Platforms

2023 Carbon Removal Marketplaces
Carbonfuture
Persefoni
Thanks A Ton
Patch
CUR8 Removals Platform
Supercritical
Planboo
CEEZER
Watershed
Milkywire
Carbonplace
Carbon Removed
Xpansiv
Klimate
Wren
Senken

Zopeful
ClimeFi
CNaught
Rubicon Carbon
South Pole TechGen CDR Buyers Club
Covalent Forward Crediting Platform
Accend
Bigfoot

Criticism

Carbon Markets Insufficient for CDR Scaling
VCM Headed for a Crisis
April 2025 Lack of CDR VCM Interest
Offsets as Incompatible with Paris
Reduction Offsets as Unscalable
Need to Phase Out Non-Permanent Offsets
Issues w/ For-Profit CDR Deployment
Inherent Issues w/ Auditors/VVBs
Carbon Markets Ineffective for Net Zero
WRI E-ledgers Takedown
Improving GHG Protocol's Governance
GHG Protocol Secrecy and Bias
September 2025 SBTi Debate on NBS
Open Letter Supporting NBS for SBTi and Article 6.4
Most Forestry Protocols Lacking
Less Than 16% of Reduction Offsets Real
Low-Quality Offsets Threatening Climate Integrity
Explanations for Continued Failure of Carbon Credits
Offsets Not Offsetting
Offsetting Undermining Climate Targets
South Pole Shady Practices and Junk Offsets
South Pole Junk Offsets
South Pole Kariba Junk Offsets
Corporate Claims in Limbo After Verra Scandal
Verra Rejecting Chinese Forestry Projects
Over-Crediting of Forest Offsets
Systematic Overcrediting in CA Forest Offsets
California Should Abandon Offsets
21 Ways Forest Projects Cheat
Issues w/ Low-Quality Forest Credits
Forest Preservation Carbon Credit Harm
Hundreds of Millions of Tons of Emissions from Wildfires
Downsides of Trillion Tree Projects
Junk Offsets Rampant
Retirements from Canceled Amazonian Project
ICVCM Approving Non-Additional Credits
ICVCM Excluding RE-Based Offsets Due to Non-Additionality
EU Carbon Credit VAT Scam Story

Tracking Offsets to Demonstrate Issues
Carton and Malm Against Offsets
Offset Failures Due to Social Complexity
Carbon Offset Market Issues
Fake Offsets from Shell

The Guardian

Verra Replacing Rainforest Offset Scheme
Worthless Verra Forestry Offsets
Intractable Problems w/ Carbon Offsets
Offsets Worsening Climate Change
Top Offset Projects Worthless

MRV

Essay on Nature of Standards
Isometric MRV Principles
MMRV CDR Standards Initiative Call
Stakeholder Survey on Independent Protocol Review
Frontier CDR Clean Energy Principles
FAIR Principles for Scientific Data
Integrated U.S. GHG Monitoring Strategy
Towards Unified MMRV Frameworks
LCFS on CCS
Carbon Credit MRV Cost Calculator
DOE-Funded CDR MRV Programs

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Carbon Gap CDR Certification Principles
MRV in U.S. Federal Policy Recommendations
MRV Policy Roadmap
IEAGHG MRV Review and National Inventory Incorporation
C180 MRV Principles
C180 MRV Matrix
Frontier on MRV
Market Shaping and MRV
CDR Market Vision and MRV
Need for Redesign of CDR Market and Incentives
Mission Innovation Opportunities for International Harmonization of MRV
First-Principles Leakage Explanation
BiCRS Protocol Review and Recommendations
Milkywire ERW MRV
MRV Costs and UK Policy Recommendations
Cascade ERW MRV Cost Calculator
Cascade Climate ERW MRV Plans
ERW, Liming, and Carbonate–Silicate Swapping
Strategic Planning for mCDR MRV
mCDR Verification Challenges

Isometric OAE Quantification
OAE Data Protocol - Carbon to Sea Initiative
Carbon to Sea Review of Isometric–Planetary OAE Credits
LCA in MRV for Land-Based CDR
Carbon at Risk Framework
Conservative Embodied Emissions Accounting
Rethinking Carbon Removal Accounting
Open Questions in CDR Certification
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Carbon Gap Guide to Certifying CDR
CDR MRV Progress

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Issues w/ Different CDR Definitions
Enabling Boundaries and Policy for Net Negativity
Argument Against Ethanol CCS as CDR
Gammans Defense of Ethanol w/ CCS
Calculating CDR and Avoided Emissions for Crediting
Heatmap on CDR Definitional Issues
CRSI Carbon Flux Framework
CDR Net Removal and System Boundary Assessment
Clarifying "Removal" Definitions
System Boundaries for Pulp/Paper CDR
Pulp and Paper CCS Opportunities

MRV Landscape Mapping

CDR.fyi MRV Methodology List
TRACEcdr MRV Protocol Map
October 2025 Current State of CDR MRV
MRV for CDR Overview and Recommendations
Review of MRV Methodologies for EU CRCF
Review of Engineered GGR Standards
CDR Certification Landscape
CDR Certification Ecosystem Visualization
Carbon Direct on Navigating Registries
CRSI CDR MRV Quantification Resources

MRV Organizations

Absolute Climate
Isometric
Puro
Rainbow
OneShot Earth
Cascade Climate Open Systems CDR
Carbon Removal Standards Initiative
NIST CDR Standards Consortium
350Solutions
CCS+ Initiative

EcoEngineers
Cula
Mangrove Systems
Valorize Systems
SustainCERT
[C]Worthy
Submarine
atdepth MRV
Subtidal
Coastal Carbon
EarthXCG Digital MRV
Crystal Trade Biochar dMRV
Fix6
Chloris Geospatial
Open Forest Protocol NBS

General Methodologies

ISO/IEC Directives Part 2: Standards Drafting Principles
CarbonPlan CDR Verification Framework
ClimeFi CDR Rating Methodology
Verra Methodologies
Verra Scope 3 Standard Program
Puro MRV Standards
Isometric Protocols
Isometric General Standard
Verra DAC Module
CCS+ Initiative Carbon Management Accounting Framework
CCS+ Initiative Methodology Approach
CCS+ Initiative Methodologies
Gold Standard Engineered Removals Requirements
January 2025 Canada Draft DAC Protocol
BSI DACCS Specification
BSI BECCS Specification
Rainbow Methodologies
ERW MRV Quantification
ERW MRV Methods
ERW MRV Measurements
Methodology for Fermentation BECCS as CDR
Global Heat Reduction Initiative CO2e Credits

Biochar

European Biochar Certificate
European Biochar Certificate/CSI
CAR Biochar Protocol
Verra Biochar Protocol
Puro Biochar Methodology
Isometric Biochar Protocol
Sylvera Biochar Ratings Framework

Specific Company Methodologies

Climeworks DAC Certification Report
Climeworks and Carbfix Storage Certification Report
Planetary MRV
Planetary OAE Environmental Audit
Ebb Carbon MRV
Equatic MRV Protocol
Captura MRV Update
Captura MRV
Equatic MRV
Brilliant Planet Methodology
Rewind Marine Biomass MRV Protocol
CarbonCure Verra MRV Methodology
Drax BECCS Methodology
Charm and Bio-oil MRV Protocol
Review of Cropland ERW MRV

Storage

Functionally Stable Carbon Storage
Permanent Removal vs. Temporary
Geologic CO2 Storage Overview
Terminology for Carbon Storage
Temporary and Permanent Storage
Overview of Storage and Need for It
Geologic Storage Overview
Geologic Storage Incentives
Carbon Storage Podcast

Class VI Wells

EPA Class VI Permit Tracker
Class VI Guidance Documents
NETL CO2-Locate Well Database
Congressional Research Service on Class VI
Class VI Well Background
Class VI Wells and Incentives
Next-Gen Class VI Wells
Class VI Primacy for Louisiana
Remaining Class VI Project Risks After Primacy
Storage Obstacles

AirMiners Videos

AirMiners MRV for ERW
AirMiners MRV for DAC + Mineralization
AirMiners MRV for Soil Carbon
AirMiners MRV for CDR
AirMiners MRV for OAE
AirMiners MRV for Land-Based CDR

AirMiners MRV for Biomass Storage
AirMiners MRV for Ocean Biomass
AirMiners MRV and Environmental Justice

Policy

U.S. Government VCM Principles and Statement
Overview of CDR Regulation and Policies
Government Intervention for Carbon Credits
Public Economics of CDR
Tracing CCUS Lobbying Funds
Effect of IRA and CCUS and CDR
Grubert on DAC Hubs and CCS Policy Issues
First 100 Days of Trump 2.0 for Carbon Management
October 2025 Potential for More Hub Cuts
October 2025 10 DAC Hubs Cut
April 2025 Attempts to Save DAC Hubs
What to Expect for CDR Under Trump 2.0
CDR Predictions Under Trump 2.0
CDR Obligation as Indirect Carbon Tax
Legal Issues for Ocean CO2 Transport
2021 CCUS Policy Trends
CDR at COP24
CCS at COP24

CDR Policy Options and Recommendations

New U.S. CDR Tax Credit Considerations
CDR Policy Going Beyond Climate Policy Alone
Burns on CDR Playbook Under Trump
Policy Recommendations Based on Off-Track NDCs
BECCS Reverse Auction Design Considerations
Considerations for Combining State Support and VCM for BECCS
Climate Restoration as a Policy Goal
Fungibility of CDR Credits in Compliance Markets
Trade Policy/CBAM for CDR
CBAMs and CDR
Governing Permanence of CDR
Lessons for CDR Policy from Mining
Policy Design to Finance CCUS in Power Sector
RE Policies for CDR
Regulating Safety for CDR and CCUS
Focusing on More than Climate Benefits for CDR

General Policy Recommendations

C180 Federal Policies for Net Zero
Federal Policy Options for CDR in U.S.
Rhodium U.S. Policies to Scale CDR
CATF CDR Recommendations

CDR Policy Agenda
Policy Incentives to Scale CDR
Taxonomy of Policies to Support Durable CDR
Policy Toolkit for Scaling CDR
Effective Policies to Mobilize CDR
CRA on Catalyzing Bipartisan CDR Appeal
Carbon180 Biden Transition Handbook
Integrating CDR Into Aviation and Shipping Policies
Dimensions of CDR Policy Instruments
Criteria for Assessing CDR Policy Instruments
CCUS Policymaker Handbook
Policymaker Guidance on Carbon Credits
Principles for CDR Policies

Mitigation Deterrence

Avoiding Mitigation Deterrence/Moral Hazard of CDR
Separate Targets and Mitigation Deterrence
Call for Reduction and Removal Distinction
Open Letter on Separate CDR and Reduction Targets

Government CDR Procurement

EFI National Carbon Removal Authority Proposal
U.S. CDR Federal Procurement Ideas
2026 Canadian CDR Credit Procurement
Carbon Removal Canada Government Procurement Summary
U.S. Progress on CDR Procurement
FECM and Industry Voluntary CDR Purchasing Program
Promise of Government CDR Procurement Standards
UK GGR Business Model Documentation
Congress Should Wait on Procurement
Government CDR Financing Typology
Carbon Business Council on Demand-Side Support
Procurement Overview and Pillars
Public–Private Co-Ownership for CDR

Trackers and Specific Bills

CDR/CCUS Law Database
International CDR Laws
Carbon Gap CDR Policy Tracker
Carbon Gap EU Policy Tracker
Carbon Gap Regional CDR Policy Tracker
World Bank Carbon Pricing Dashboard
Gold Standard Carbon Market Regulation Tracker
C180 Policy Tracker
C180 Federal CDR Funding Tracker
Review of UK CDR-Relevant Laws and Challenges
CDR Policy Map
CDR Policy in U.S. States

CDR in National Climate Pledges
Data for Progress CDR Leadership Act Polling
December 2025 CO2ol Down Proposed EU CDR Regulation
October 2025 Veto of California CDR Procurement Bill
April 2025 Foreign Pollution Fee Act Introduced
February 2025 California CDR Purchase Proposal
2024 CDR Investment Act at $250/t
2024 Proposed REMOVE Act
2023 Proposed CREST Act
2022 Proposed REMOVE Act
April 2022 Federal CDR Leadership Act
2021 Proposed CREATE Act
2020 Proposed CREATE Act
FY23 CDR Federal Funding
ESIC Act for DAC Investment Tax Credit
November 2024 Massachusetts Bill Supporting CDR
SB 308 Next Steps After Defeat
SB 308 California CDR Mandate

International Policy

IPCC CDR Inventory Accounting Workshop Materials
Recommendations for CDR International Governance
Microsoft Proposal on Reconciling International CDR Trading
Proposal for Unified Global Carbon Market
International Politics and Global Governance of CDR
UK CDR ETS Integration
German Government CDR Department
Germany Negative Emissions Plan
Germany 2060 Net-Negative Target
Short-Term CDR Policy Options in Germany
Swiss Policies to Support CDR
Swiss CDR Procurement Proposal
Article 6.4 Provisional CDR Rules
CDR Stakeholder Input to Article 6.4 Meeting
Article 6 Project Pipeline
Primer on Article 6
Article 6's Role for CDR
Severe Risks to Article 6.4 Implementation
Neutralization Claims Under Article 6
Navigating Article 6 in MENA
Japan Incorporation of CDR Into GX-ETS
Governance Principles for DAC in South Korea
CDR Policy in Brazil, China, and India
G7 CDR Policy Ideas
OECD CDR Policy Case Studies

EU-Wide

Carbon Gap EU CDR Strategy Recommendations

2024 EU CDR Policy Overview
How the EU Can Regulate CDR
EU CDR Procurement Workshop Pre-Read
Recs for EU CDR Procurement Program
Options for Short-Term EU CDR Purchasing
Integrating CDR in EU Climate Policies
January 2024 EU to Require 90% Cut and 10% CDR
EU Carbon Management Strategy
CDR Policy Across Europe
EU CRCF Regulation
CRCF CDR Methodologies Draft
EU CRCF Progress
EU CRCF Analysis
EU Proposed Regulation for CDR Certification
Industry Recommendations for EU CDR Certification
Comparing CRCF with PACM
Issues with CDR in Carbon Markets and CRCF
EU Shouldn't Micromanage CDR Applicability
Corporate Interests Influencing EU NBS CDR Policy
August 2024 Sweden BECCS Reverse Auction
August 2024 Sweden BECCS Reverse Auction Review
2024 EU CDR Policies Overview
EU CDR Policy Recommendations
EU Climate Law Revision Proposals
Commentary on EU Proposal

ETS

2025 CDR–ETS Integration State of Play
EU and UK ETS and CDR Demand
Integrating CDR into EU ETS
Risks and Benefits of CDR Integration in EU ETS
Modeling Removal Compliance System in EU
Sequencing CDR into EU ETS
Sequencing Permanent CDR into ETS
Linking CDR in EU ETS
Updated Integrating CDR into ETSs
Integrating CDR into ETSs
Risks of Premature CDR ETS Integration
Path to ETS Integration for Durable CDR
Designing ETSs for Net Zero and Net Negative
Using ETS to Scale CDR
European Central Carbon Bank Proposal
EU ETS Endgame
CDR in EU ETS Simulator
CDR Reserve for EU ETS
CDR Reserves to Manage Carbon Prices

Canada

Planning Public CDR Procurement in Canada

Legal Framework for CDR in Canada
Ideas for CDR in Canadian Compliance Markets

Municipal Involvement

Role of Cities in CDR
Local Governments and CDR
Municipal CDR Projects in Minneapolis
Municipal CDR Support in Boulder and Flagstaff

45Q

NETL 45Q Guidance Toolkit
IRS 45Q Instructions
IRS 45Q Rule
45Q Text
Bad 45Q IRA Incentives
CATF 45Q Analysis
C180 45Q Recommendations
2024 45Q Congressional Letter to EPA and IRS
45Q Crediting Concerns
Insufficient MRV for 90% of 45Q Credits
Fraudulent 45Q Claims
IRS 45Q Investigation Response

DAC

C180 Strategies for DAC Hubs
Bipartisan Policy Center DAC Report
BPC 2025 DAC Recommendations
Policy Roadmap for DAC
Policy Insights for Scaling Up DAC
U.S. Policies to Advance DAC
Policy Options for DACCS
10 Policy Recommendations for DAC

ERW

ERW Policy Primer
Law of Enhanced Weathering for CDR Overview
Law of Enhanced Weathering for CDR Materials Sourcing

Marine CDR

U.S. mCDR Research Strategy - FTAC
U.S. Marine CDR Policy Overview
mCDR Governance
Legal Framework for DOC
Model U.S. Marine CDR Legislation
mCDR Policy Panel
NOAA CDR Strategy

2024 Marine CDR Policy Overview
Congressional Research Service mCDR Considerations
mCDR Governance Recommendations
Assessing mCDR Under London Protocol
Adapting London Convention and Protocol for mCDR
Next Steps on mCDR International Regulation
Directions on International Governance of mCDR
Marine CDR Policy Sequencing

Equity and FF Involvement

Overview Materials

AirMiners EJ Resource Repository
AirMiners EJ Vision Statement
JEDI for CDR Resources
Agenda for Progressive CDR
Progressive Platform for CDR
F4CR Equity Report
Carbon180 CORE Framework
AGU Ethical Framework for Climate Intervention
Iterative Model of Social Assessment
CDR Industry Commitments Pledge
Responsible Carbon Management Initiative Principles
EJ and CDR in U.S.
17 EJ Principles
Overview of Deployment Trade-Offs
CO2 Pipeline Safety Record
CO2 Pipelines Debate
CDR and Addressing Local Air Pollution

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EJ, Climate Justice, and CDR
CDR for a Just Transition
Lessons for Just DAC Deployment
Sustainable and Just CDR
Equity for Carbon Removal Quotas
Fair CDR Obligations
National Shares of GHG Reduction
Quantifying Responsibility for Climate Breakdown
Adaptation, Justice, and CDR
Avoiding Polarization of NETs
Need for Radical Transparency in CDR
CO2 Pipelines in Marginalized Communities
Navigating Stakeholder Groups in CDR
Germany CDR Stakeholder Deliberation
Holly Jean Buck Google Scholar
Simon Nicholson Google Scholar

Review of Justice-Related Implications for DAC
Ethics of CDR at Scale
Dangers of Extractivism in CDR

Polling and Perceptions

Public Engagement for Climate Intervention Governance
CDR Attention and Positive Sentiment Growing on Social Media
CCS Demand Varies w/ Information
Public Perception's Role in CDR at Scale
Public Views on CDR Methods
Demographic Effects on CDR and SRM Preferences
Perceptions of Role of Experts in Climate Intervention Governance
Climate Worry Predicting CDR Support
Indigenous Views on Climate Interventions
Emotional Responses to Climate Interventions
Driving CDR Awareness with Collective Intelligence
Communication Recommendations for CDR
CDR Messaging Guidance
Improving Online CDR Sentiment
Framing Nature-Based Solutions
Comment on Framing Nature-Based Solutions
Cross-Border CO_2 Transport Decreases CCS Acceptance

DAC

U.S. Community DAC Support Surveys
Perceptions of DAC and OAE Across Sociotechnical Scenarios
DAC Polling and Moral Hazard Framing
Exploring Public DAC Acceptability
Psychological Drivers of DAC Acceptance
Data for Progress DAC Polling
Data for Progress DAC Hub Focus Groups
DAC Hub Opinion Polling
DAC Media Coverage Analysis

Regional Focus

Global North vs. South CDR/SRM Polling
Global CDR Perceptions
Public Support Drivers for CDR in 30 Countries
CDR Perceptions in Three Asian Regions
European Views on CDR and SRM
Data for Progress U.S. CDR Polling
Perceptions of CDR and Decarbonization Across States
U.S. and UK CDR Acceptance Polling
CDR Public Perceptions in U.S. and UK
UK Public CDR Policy Preferences
UK Survey on Worth of Biological CDR
German CCU Perceptions
Denmark BECCS Perceptions and WTP

Stakeholder CDR Perceptions and Ideas in Norway
Canadian CDR and Policy Approval
Data for Progress Californians Want FFs to Pay for CDR
Data for Progress California Climate Infrastructure and CDR Polling

Community Ownership and Engagement

Community Engagement for CDR Slides
Community Benefits from CDR Slides
Overview of Public Engagement and CDR
Advances and Issues in Public Engagement
Need for Independent Public Engagement
Best Public Engagement Practices for OAE
Engagement Needed Before Methane Removal Testing
California DAC Hub Community Ownership and Refusal Right
Improving Comm. Engagement for CDR
Policymaker Lessons for CDR Community Engagement
Airhive Community Engagement
IRCR mCDR Washington Engagement
DOE Workshops Omitting Naysayers
Tensions Between DOE and White House EJ Council
Community Control of CDR
Issues with Community Engagement
Chinese Influence Campaign Stoking Environmental Protests
Engaging Stakeholders for CDR Research

Specific Projects

Early Resistance to Louisiana DAC Hub
Project Cypress CBPs
November 2025 Resident Questions for Deep Sky
December 2024 Climeworks Engagement in Louisiana
August 2024 Deep Sky DAC Opposition
Planetary Cancels Cornwall Project
April 2026 Carboniferous mCDR Controversy
Carbon Gap on Learning from Planetary Engagement
Planetary Protest
Community Pushback to CarbonCapture
July 2024 North Dakota DAC Moratorium in Response to Retract and Airhive
Retract and Airhive Materials for North Dakota DAC Facility
STRATOS Class VI Resistance
ADM Pausing Class VI Injection After Leak
April 2024 Louisiana Pipeline Leak
CO2 Pipeline Explosion in Mississippi
NPR on Satartia Incident
Lake Maurepas Blue Hydrogen Resistance
Illinois County Considering CCS Ban
May 2023 Fears About Carbon Permitting
Lake Nyos CO2 Disaster

Skepticism About Carbon Management Job Creation
Navigator CO2 Pipeline Canceled
May 2024 Pipeline Concerns and Issues
March 2024 Biochar Opposition
June 2023 Resistance to CCS in Louisiana

Leftism and CDR

Carbon Capture and EJ
XPRIZE and C180 EJ Report
Carbon Removal and Climate Justice
Left Should Focus on CCS Implementation
2023 EJ CCUS Platform
Wallace-Wells on Climate Reparations
Global North Paying for CDR, Reparations
Táíwò on CDR
African Case for CDR
CO2 Pipeline Moratorium Letter
Opposition to Carbon Capture
May 2023 EJ Opposition to CCUS/CDR
Socialist Argument for CDR
Leftist View of CDR as Public Good

Fossil Fuel Involvement

DAC as License for O&G
DAC as License for Coal and NG
Defense of EOR
O&G Intended Use of CCS/DAC for EOR
EOR Nuance Podcast
CATF on EOR Emissions Reductions
Keith on Why CDR Can't Save Big Oil
Oxy CE Acquisition Strategy
Buck and Burns on Oxy CE Purchase
Oil Major Responsibility to Fund DAC
Overview of O&G CDR Strategies
O&G Skillsets for Carbon Management and Net Zero
Issues w/ Fossil Embrace of DAC
Concerns About FF DAC Hub Involvement
DAC Reconsidering Oil Under Trump
Oil Company DAC Involvement
Oxy Foresees Trump DAC Support
Oxy CEO Lobbying Trump for DAC
Occidental and Stratos
AtmosClear and Exxon Storage Deal
Exxon Abandoning GT and Doing In-House DAC
Aramco and Siemens DAC Pilot
Aramco Backing Ucaneo
Aramco Investment in Homeostasis

Spiritus Aramco Funding
8 Rivers/Calcite JX Nippon O&G Investment
RepAir Taking Oil Money
Idemitsu Investment in Carbonfuture
Aramco Carbon-Neutral Oil Sales
Aramco "Carbon-Neutral" Oil Shipment
Oxy and SK Net-Zero Oil
Eneos Japan Net-Zero Oil
Carbon-Negative Oil?

Criticism

CDR Controversy Discussion
Techno-Optimism in IPCC
February 2024 Growing CDR Sustainability Concerns
Too Much CDR Hype
CIEL Geoengineering and CDR Risk Report
Lag and Soil Issues w/ ERW
Puro and Lithos ERW Credit Questions
Skepticism of Net-Zero Pledges
Issues w/ Net-Zero Pledges
Flowcarbon Shutting Down

DAC

Romm DAC Critique
Reddit Response to Heirloom Plant
Overly Optimistic DAC Assumptions
Unrealistic DAC Energy and Material Needs
Thermodynamic Issues with DAC
Misguided DAC Critique
Wind, Water, and Solar vs. DAC
High-Level DAC Issues
February 2024 Not Enough DAC for Industrial CO2
DAC as a Distraction
Stratos and Oxy Critique
Deep Sky Hype Criticism
Prometheus Fuels Skepticism
CIEL DAC and Oil Critique
Data for Progress DAC Hubs Letter
Issues w/ Oil-Funded DAC
Backlash to Climeworks Backlash
Climeworks Mammoth Skepticism
Climeworks Low Capture Levels
Global Thermostat Dysfunction
CO2Rail and Mobile DAC Criticism

Marine CDR

Biotic mCDR Not Feasible Due to Oxygen
Issues w/ Ocean CDR
OAE Additionality Problems
Marine Ecosystem Impacts of Climate Interventions
Neglected Aspects in Marine CDR
Running Tide History and Failure
Running Tide Premise Responsible for Failure
Running Tide Post Mortem and Lessons
Running Tide Shuts Down
Issues w/ Seaweed Sinking and Running Tide

BiCRS

Biochar Business Issues
Biochar Scaling Issues
Biochar May Have No Ag Benefit
PM Emissions from Biochar-Amended Soil
Biochar May Not Be CDR
Biochar Random Reflectance Method Issues
Mantria Biochar $54.5M Ponzi Scheme
Accounting Issues in BECCS and CDR Broadly
Increased Emissions from Forest-Fueled BECCS
UK BECCS Criticism
Bio-Oil Acidic, Unstable, and Corrosive
Synbio CDR Shortcomings

Soil Carbon Sequestration

Issues w/ Soil Carbon as CDR
Soil Carbon Critique
Soil Carbon Critique Continued
Issues w/ Carbon-Storing Farms

CCS

Impossibility of CCS and Green H2 to Scale in Time
Parody Ad Mocking CCS
CCS Criticism
CCS and 45Q Criticism
Oil Change International on CCS
ENGOs Urging EPA to Stop CO2 Injection
Letter to Govt. Criticizing Carbon Capture
Why Carbon Capture isn't a Climate Solution
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Carbon Dioxide Removal
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DAC People List
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Frontier CDR Resource List
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CDR Overview
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Carbon Gap CDR Research Gaps
Homeworld Collective Problem Repository
Research and Innovation for EU Neutrality Ideas

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Azarabadi on DAC Scaling
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Tuning Petroleum Refining Away from Combustion
IEAGHG CO2 Conditioning Workshop
Issues Impeding CCS Deployment
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COP26 Reimagining CDR
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Hausfather CDR Overview
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8 Rivers/Calcite DAC Overview
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Role of CDR in Achieving Net Zero
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Höglund 2023 CDR Overview
Ocean CDR Explanation
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AirMiners Carbon Storage Event
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CarbonStorage.io Carbon Management Map

CO2 Storage Permit Tracker
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Carbfix Storage Map
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DOE Carbon Matchmaker Map
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NETL CONNECT Carbon Management Project Map
NETL Carbon Utilization Map
NETL CCS Map
NETL Carbon Storage Atlas
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Road to 10 Gigatons of CDR Game
CDR.AI LLM
Calculator for Allocated Corporate CDR Responsibility
EU CDR Contribution Calculator
CarbonPlan DAC Cost Calculator
OAE Efficiency Mapping Tool
DOR Efficiency Mapping Tool

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Mark1 Climate Tech Developer-as-a-Service
NewClimate Institute
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Startup Studio Analysis
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Signal NFX Investor Lists
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Limited Accountability for Missed Corporate Targets

Rhodium

Rhodium Climate Outlook
2025 U.S. GHG Estimates
Mid-2025 U.S. GHG Outlook
2024 U.S. GHG Emissions
Mid-2024 U.S. GHG Outlook
2023 U.S. GHG Estimates
Mid-2023 U.S. GHG Outlook
2022 U.S. GHG Estimates
Mid-2022 U.S. GHG Outlook
2021 U.S. GHG Estimates
2020 U.S. GHG Estimates

Our World in Data

Global CO2 Emissions
GHG Emissions by Sector Graphic
Emissions by Sector
Historical CO2 Contributors
Cumulative CO2 Emissions by Fuel Type

Calculators and Tools

Ember Climate Tracking Tools
En-ROADS Climate Simulator
Carbon Price Calculator
Carbon Pricing CO2 Reduction Calculator
CRANE Emissions Reduction Modeling
CO2 Visualization Game
Emissions Reduction Simulator

IPCC

IPCC Models Close to Actual Observations
U.S. Updated 2035 NDC
IPCC AR7 Chapter Plans
IPCC AR6
IPCC AR6 Synthesis Report
IPCC AR6 Explanation
Misalignment Between IPCC Temp Mentions and Probability
IPCC AR5
IPCC AR5 Synthesis Summary for Policymakers
IPCC AR5 Synthesis Report
IPCC 1.5°C Warming Report
IPCC Land Report

IRA

IRA Explainer
IRA Text
IRA Potential Implications
Projected IRA Impacts
Assessing IRA Impacts
July 2023 Modeled IIJA/IRA Impacts
Jenkins IRA Summary
Carbon Direct Summary of IRA Credits
CTVC IRA Tracker
IRA-Enabled Progress

Geoengineering

Lockley Solar Geoengineering Updates
Overview of SRM Actors
SRM Resources and Overview
SRM Overview
Alliance for Just Deliberation on SRM
Degrees Initiative SRM Capacity Building
Reflective SRM Research
Stardust SRM Company
Stardust Story
Geoengineering vs. CDR and Impacts
Adaptation vs. Geoengineering Ambiguity
New Policy in Solar Geoengineering
Geoengineering Podcast
Geoengineering Discussion
Controlling Private-Sector SRM Influence
November 2025 Increasing SRM Interest
July 2025 SRM Public Engagement Issues
2023 Call for Geoengineering

Academic Articles

Geoengineering Book: Methods, Risks, and Governance
Proposal for Responsible SRM Research Plan
CDR, SRM, and Remaining Research
Global South More in Favor of Geoengineering
Public Perceptions of Geoengineering
American Public Perceptions of SRM
Addressing SRM's Transparency Problem
Governance and Deployment of Earth System Interventions
Governance for Small Geoengineering Experiments
Profit-Seeking SRM and Risks of Market-Based Climate Solutions
Critiques of Polar Geoengineering Tactics
Arctic Security and Geopolitics of Solar Geoengineering
Security Expertise and Solar Geoengineering
SRM Sky Color Change Modeling
Why Albedo Modification Won't Work

Energy Geopolitics

CGEP YouTube Videos
Climate Work to Overcome Geopolitical Discord
Geopolitics of Energy Transition
Geopolitics Shaping Clean Energy Transition
New Joule Order
JPMorgan on New Map of Energy Geopolitics
Podcast on Climate Action and Great Power Competition
Yergin on 50th Anniversary of Embargo
February 2024 Yergin on NG and Energy Security
Energy Flatness and Geopolitics

A Primer on the Geopolitics of Oil
2023 Global Energy Market Turbulence
Series of Articles on the End of Oil
New Energy Industrial Strategy Substack
U.S. Energy Superpower Status
Oil Markets Introduction
Long-Run Harm of Shale Revolution

Tech Modeling

Performance Curve Database
Visual Patent Search for DOE-Funded R&D
PatentsView Patent Data and Visualizations
DOE Patents
Tech Forecasting Company
Precision Bias

Scholars

Jessika Trancik
François Lafond
J. Doyne Farmer
Rupert Way
Gregory Nemet
Edward Rubin
James McNerney
James M. Utterback
W. Brian Arthur
Jason Crawford

Academic Articles

Stat Basis for Predicting Tech Progress
Designing for Manufacturing Scalability
Testing Experience Curves on 51 Technologies
Doyne Farmer on Learning Curve Article
Stat Test of Experience Curves
Unit Size and LBD
Tech Improvement Rate Predictions from Patent Data
Tech Improvement from Mining Patent Data
Empirical Trends in Technical Performance
Systematic Historical Analogue Research
LBR Rapid Improvements w/ No Commercial Production
Comparing Expert Surveys and Model-Based Forecasts
Role of Design Complexity in Technology Improvement
Mathematical Progress on Innovation and Obsolescence
Tech Performance Modeling w/ Design Theory
Testing and Improving Technology Forecasts
Perils of Learning Models
Combining Wright's and Goddard's Laws
Learning Curve Lit Review
Political Aspects of Experience Curves
Growth, Innovation, Scaling - Bettencourt
Superexponential Trends in IT
Review of Experience Curves and Associated Uncertainties

Review of Learning Effects in Prospective Tech Assessment
Arthur on Invention
Quantitative Base for Combinatorial Innovation
Factors Affecting the Cost of Airplanes (Wright)
1899 Telegraphy LBD Article
Moore's and Wright's w/ WWII Innovation
Progress Functions as a Managerial Opportunity
Cybernetic Perspective on Tech Learning
Percolation Model of Innovation
Evidence for Organizational LBD
Technological Forecasting for Decision Making Book
Technology Evolution and Parasitism
Universal Technological Evolution
Uneven Evolution of Human Know-How

Climate Tech

Review of Cost Reduction Drivers and RE Case Studies
Statistical Technology Cost Forecasting and PV Case
Tech Forecasts and the Energy Transition
Review of Learning in Energy Systems
Learning Curves and Energy Tech Policy
Clean Tech Pathways
Granular Climate Technologies
Book: Tech Learning in Low Carbon Transition
Duration of Formative Phases of New Energy Tech
Tech Decline Modeling and Energy Tech
Book: Energy Technology Innovation History
Costs as Biggest Solar and Wind Drivers
Lithium-Ion Battery Cost Decline
Evaluating Causes of Li-Ion Battery Cost Reductions
Energy Storage Experience Curves and Projections
Trancik on Accelerating Climate Innovation
Evaluating Causes of PV Cost Reductions
Factors Influencing PV Cost Reductions
Linking Hard and Soft Costs of PV
Experience Curves for Carbon Capture at Power Plants
Utility-Scale Wind and Solar Learning
Extensive Review of LRs for Electricity Supply Tech
Learning Rates for Energy Technologies
Experience Curves for Energy Demand Technologies
Image Summarizing Learning Sources (From Energy Demand Article)
Importance of Customization and Design Complexity for Cleantech Policies
Podcast on Customization and Design Complexity Article
Sensitive Intervention Points in Carbon Transition
Using Research to Inform Energy R&D Investments
Life Cycle Sustainability Assessment and Emerging Tech
Approaches to Learning for Low-Carbon Tech
Tech Progress and Spillovers for LEDs

Hydrogen Learning Curves
Experience Curves for 150 Technologies Including CDR and AI
Experience Curves for Emissions Control Tech

TRLs, MRLs, and ARLs

Original TRL Report
DOE Technology Readiness Assessment Guide
Commercial Adoption Readiness Assessment Tool
Combining TRLs and Risk Assessments
Role of TRLs and MRLs
MRL Reference
Aligning Sociotechnical Systems and ARLs

Articles and Podcasts

Trancik Podcast on Tech vs. Climate Change
W. Brian Arthur Podcast on Nature of Tech
Technology Red Flags
Busting Popular Myths About Innovation
Long Nose of Innovation
Critique of (Nikola) Tesla Syndrome
Importance of Learning By Doing and R&D for Cleantech
Academic vs. Practical Plants
Communicating with Process Flowsheets
Chemical Plant Layout Textbook
Experience Curve Effects: Wright's Law

TEA and Cost Resources

Technology Scaling for Renewables
Review of Learning Curve Usefulness
Cost Reduction Approach for Climate Tech Companies
CDR Cost Reduction for XPRIZE Finalists
Applying Scaling Laws in Process Engineering
Founder's Guide to TEAs
Guide to TEA

Futures Studies, Progress, and Science

Works in Progress
Cold Takes Karnofsky Blog
Statecraft Substack
Institute for Progress
Speculative Technologies Innovation Nonprofit
Good Science Project
Abundance and Growth Fund
Futures Studies

Futures Studies Topics
Emerging Technologies
List of Emerging Technologies
Progress Studies Trends
Case for Innovation and Optimism
(Positive) Moral Consequences of Economic Growth
Scarcity Mindsets and American Stagnation
Science, Capitol Hill, and the Need to Build Relationships
Techno-Industrial Policy Playbook
Life Cycle of Uncomfortable Tech
Jason Crawford Interview with Vox
Techno-Optimism for 2022
Starting an Advance Market Commitment
Small Experiments

Metascience

Matt Clancy Full Metascience Lit Review and Resources
Knowledge Spillover Analysis
Science is Getting Harder
Science Funding Lessons from mRNA Vaccines
Journey from Lab to Scale for Materials
Ideas to Improve Science
Dark Matter (Informal IP) in Deep Tech
Changing IP and R&D for Public Good
Ongoing Replication Crisis and How to Fix It
Why Most Published Research Findings Are False
How Bad Data Becomes Research
Issues with Peer Review
Research Leaders' Playbook
Program Manager Curriculum

DOE and Federal Government

Lessons Learned from DOE on Federal Energy Programs
EFI on Modernizing DOE
FAS DOE 4.0 Proposals
ClearPath DOE Modernization Proposal
Fast Track Proposal for DOE
DOE Program Design and Strategy Action Plan
Overview of DOE Funding Mechanisms
DOE Funding Overview
DOE Prize Authority
Wicked Learning Environments and Program Eval at DOE
Innovation Waypoints Substack on Federal Energy Programs
Keith Boyea's Substack on DOE Funding
FAQ about U.S. Public R&D Funding
SBIR Return Analysis
Reforming SBIR

Ending SBIR Mills
ARPA Model Reading List
Importance of Agency in ARPA Model
Promises and Challenges of ARPA Model
DARPA Origin and Operation
Prediction at IARPA
OSTP Mottos and Maxims
OT Discussion
OT Overview and Recommendations
Articles from Ex-USG on Government Experiences
What Grant Reviewers Actually Look For

Superforecasting and Prediction

Metaculus Superforecasting
Interactive Brokers Forecast Betting
Long Bets
February 2024 Updates on Superforecasting
Why Prediction Markets Aren't Popular