CO2 Utilization Portfolio Review

BETO Peer Review

11 March 2021

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U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

CO2 Utilization Review Panel

Name	Affiliation
Phil de Luna (Lead Reviewer)	National Research Council Canada
Matthew Kanan	Stanford University
Charles McCrory	University of Michigan
Alissa Park	Columbia University
Shawn Jones	Arkion Life Sciences





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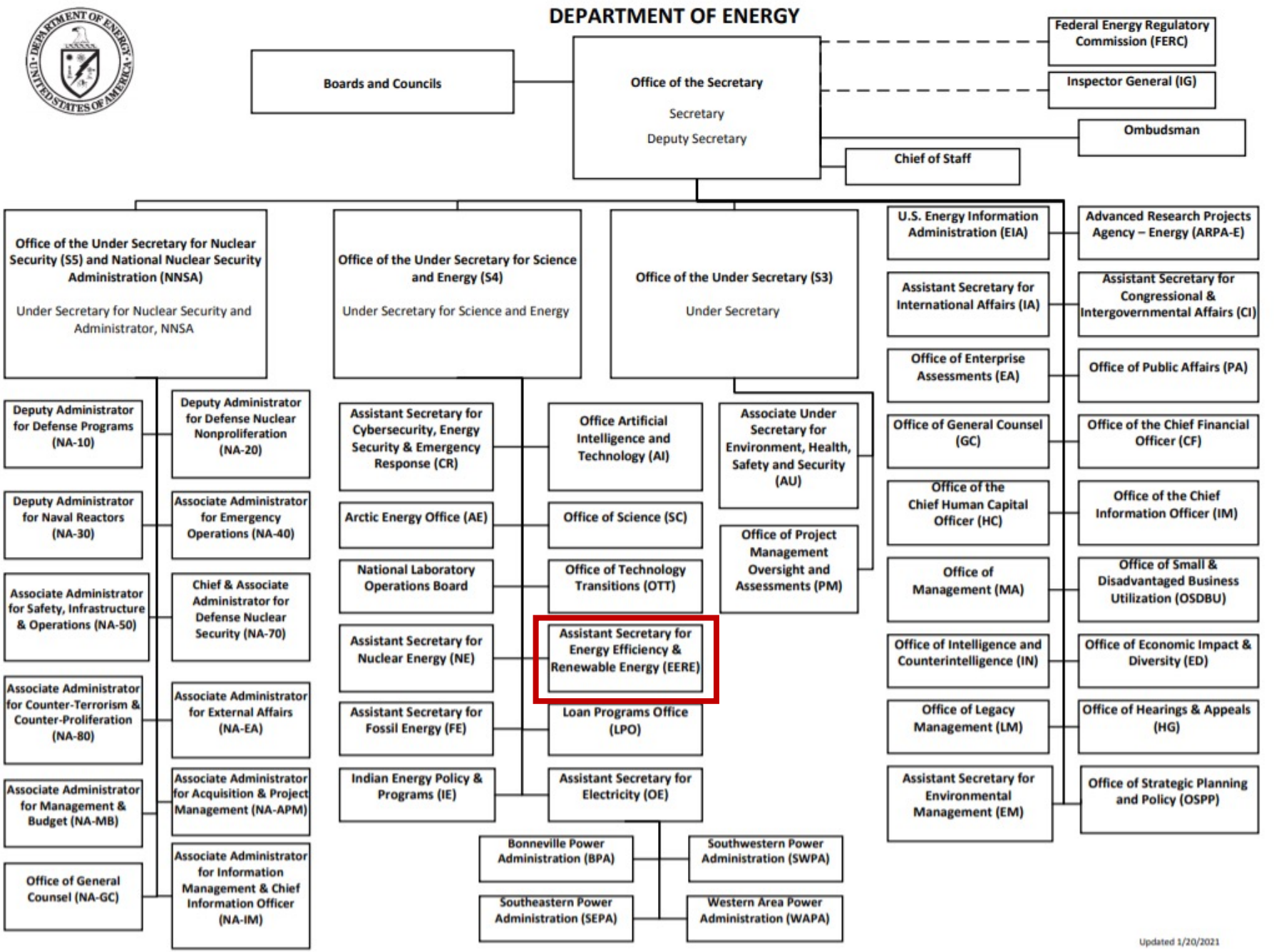
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Chief & Associate Administrator for Defense Nuclear Security (NA-70)
Associate Administrator for Counter-Terrorism & Counter-Proliferation (NA-80)
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Associate Administrator for Management & Budget (NA-MB)
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Bonneville Power Administration (BPA)
Southwestern Power Administration (SWPA)
Southeastern Power Administration (SEPA)
Western Area Power Administration (WAPA)
Associate Under Secretary for Environment, Health, Safety and Security (AU)
Office of Project Management Oversight and Assessments (PM)
Updated 1/20/2021

BETO at a Glance

FY21 Budget Breakdown

US Department of Energy: $35B

Office of Energy Efficiency and Renewable Energy: $2.86B

Bioenergy Technologies Office: $255M

BETO at a Glance

Production & Harvesting

Feedstock Supply & Logistics
Works to reduce the cost, improve the quality, and increase the volume of sustainable feedstocks available for delivery to a conversion process.

Advanced Algal Systems
Focuses on improving the productivity of algal biomass and enhancing the efficiency of cultivation and harvesting.

Conversion & Refining

Conversion
Develops technologies to convert non-food feedstocks into biofuels, bioproducts, and biopower.

Conducts feedstock blend testing, separations, materials compatibility evaluations, and techno-economic analyses to focus research on highest impacts.

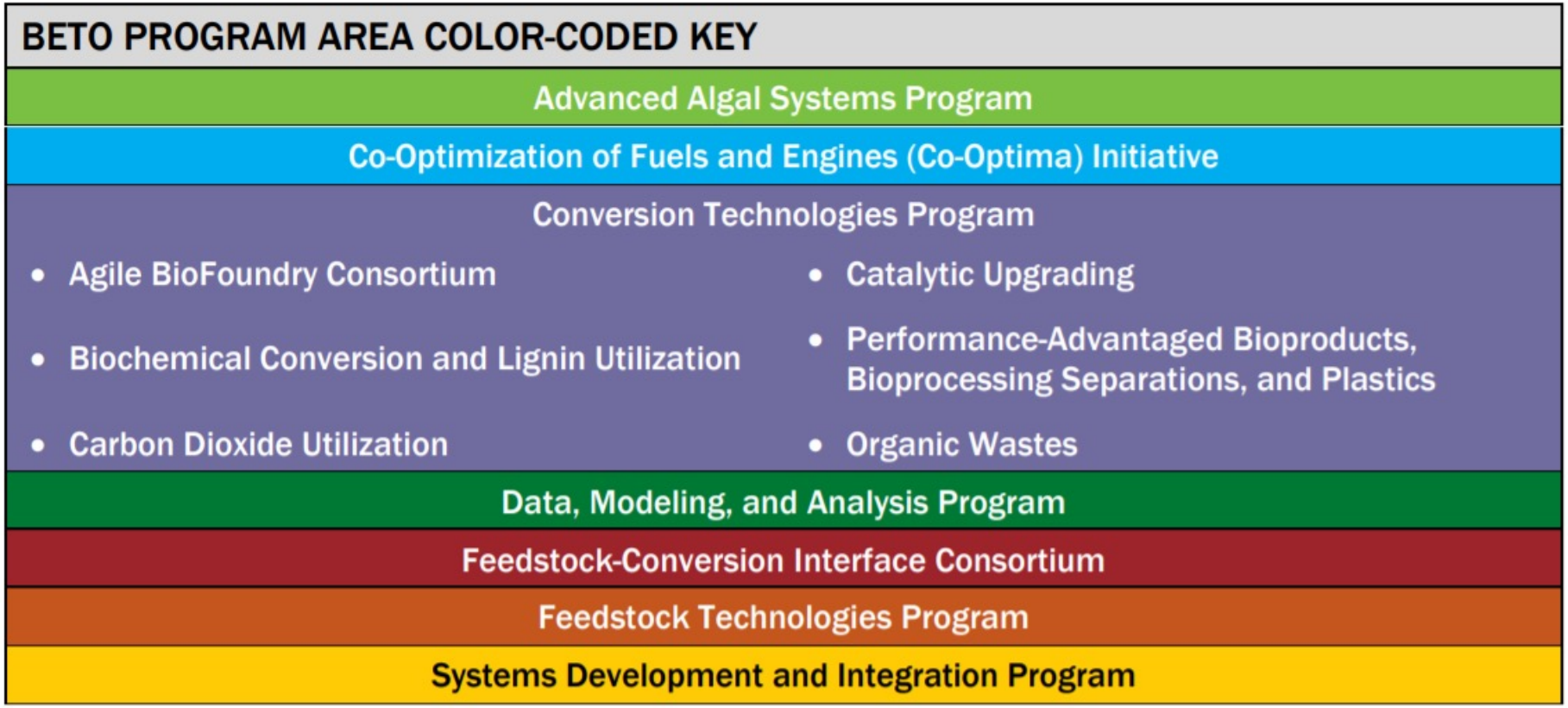
Distribution & End Use

Advanced Development and Optimization
Aims to reduce technology uncertainty in bioenergy by integrating individual technologies into a system/process and provides vital knowledge fed back to research programs.

Crosscutting

Sustainability and Strategic Analysis
Supports program decision-making and develops science-based strategies to understand and enhance the economic and environmental benefits of advanced bioenergy.

BETO at a Glance



Conversion FY21 Budget: ~$110M

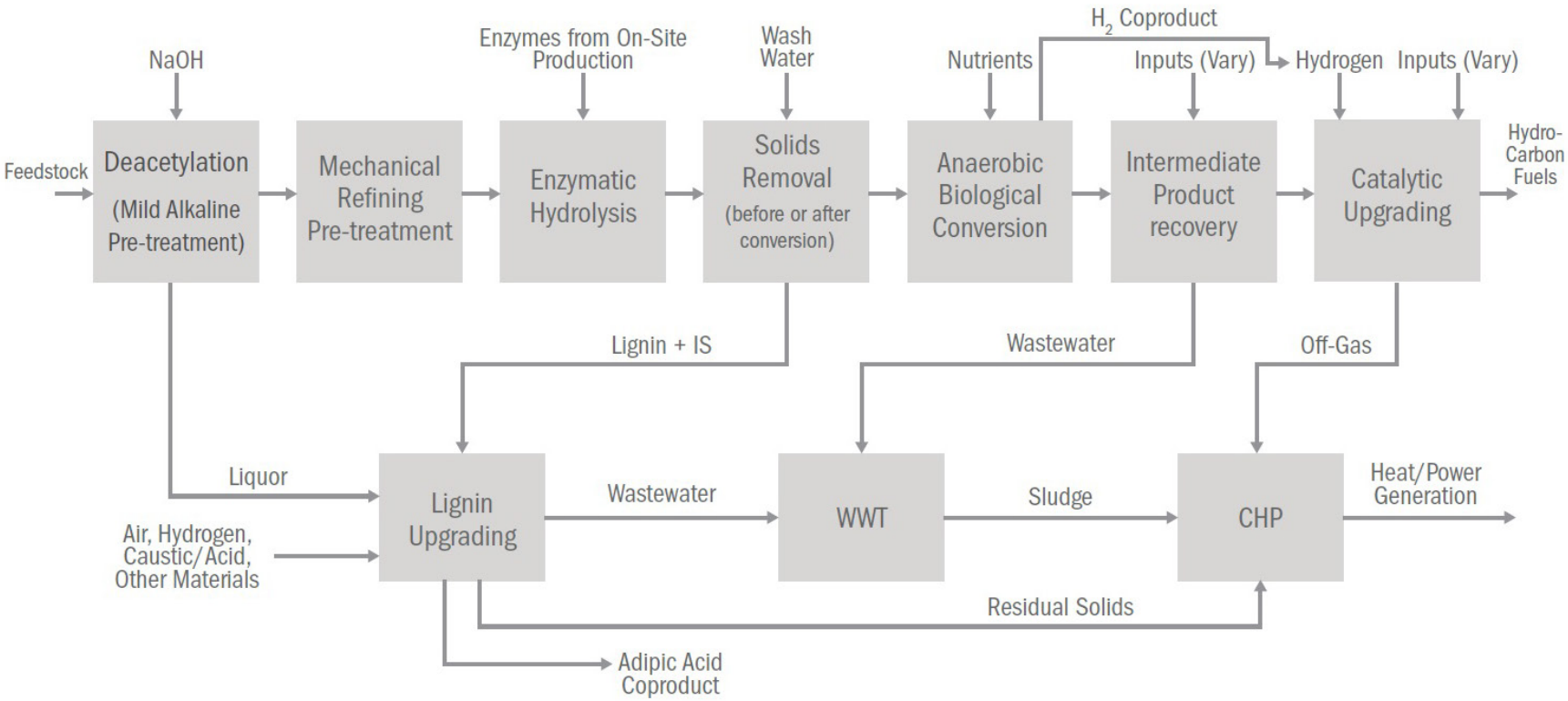
How CO2 Utilization fits into BETO

In general, the projects within the portfolio can be thought of as either:

- Pathway Specific: aimed priority unit operations or key processing components (identified by BETO) that form the technology building blocks that may contribute the most significant improvements to our modeled design cases.

- Enabling Research: projects that more generally reduce the time and cost required to develop new and improved catalysts and organisms while driving conversion efficiency and develops more efficient and less expensive separations.

BETO Pathway example



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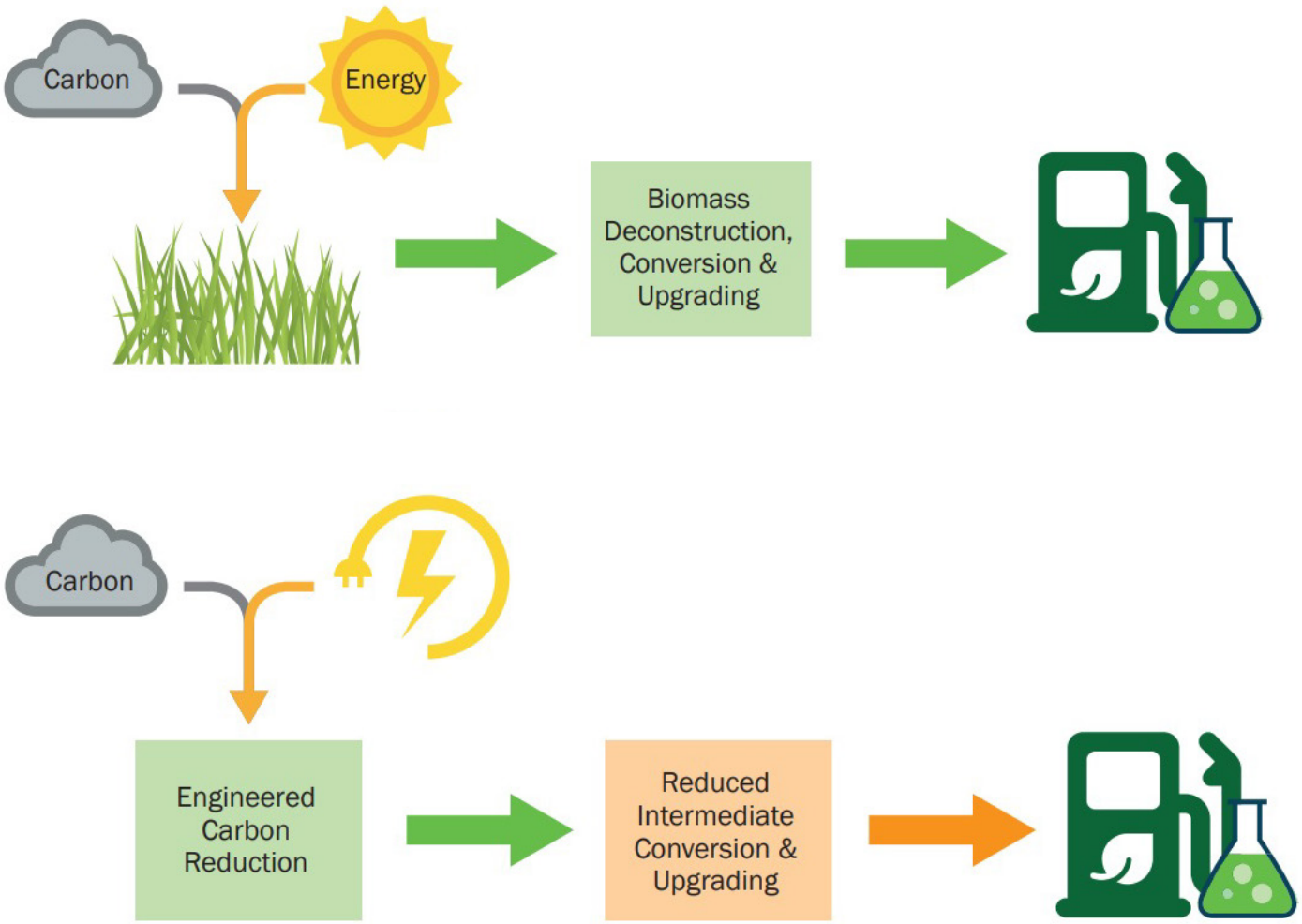
Types of Projects

The portfolio is generally split between two categories of projects:

- Annual Operating Plans (AOPs): agreements between DOE and the national labs, generally three years in length

- External projects via Funding Opportunity Announcements (FOAs): projects which are competitively awarded via publically announcements. Generally 2-3 years in length

CO2 Utilization portfolio within BETO



Agenda

Day 4 – Thursday, March 11, 2021

Start Time EST	End Time EST	CO_2 UTILIZATION		
		Presentation	**Organization**	**Presenter**
10:00 AM	10:30 AM	GATHER, TECH CHECK, NETWORKING QUESTIONS - 30 MIN AHEAD OF EACH SESSION		
10:30 AM	5:35 PM	**CO_2 Utilization**	***Conversion Program***	***Ian Rowe***
10:30 AM	10:40 AM	Intro to CO_2 portfolio	*BETO*	*Ian Rowe*
10:40 AM	11:10 AM	Feasibility Study of Utilizing Electricity to Produce Intermediates from CO_2 and Biomass	*NREL*	*Josh Schaidle*
11:10 AM	11:40 AM	Electrocatalytic CO_2 Utilization	*NREL*	*Jack Ferrell*
11:40 AM	12:10 PM	Hybrid electro- and thermo-catalytic upgrading of CO_2 to fuels and C_2+ chemicals	*ORNL*	*Zhenglong Li*
12:10 PM	12:20 PM	BREAK		
12:20 PM	12:50 PM	Waste Carbon Gas Upgrading via Acetogens	*NREL*	*Jonathan Lo*
12:50 PM	1:20 PM	Integration of CO_2 Electrolysis with Microbial Syngas Upgrading to Rewire the Carbon Economy	*NREL*	*Michael Resch*
1:20 PM	1:50 PM	Novel Cell-Free Enzymatic Systems for CO_2 Capture	*NREL*	*Min Zhang*
1:50 PM	2:25 PM	BREAK		
2:25 PM	2:55 PM	Improving formate upgrading by Cupriavidus necator	*NREL*	*Christopher Johnson*
2:55 PM	3:25 PM	Enhancing Acetogen Formate Utilization to Value-Added Products	*NREL*	*Jonathan Lo*
3:25 PM	3:55 PM	Synthetic C_1 Condensation Cycle for Formate-Mediated ElectroSynthesis	*NREL*	*Wei Xiong*
3:55 PM	4:05 PM	BREAK		
4:05 PM	4:35 PM	Development of a scalable, robust electrocatalytic technology for conversion of CO_2 to formic acid via microstructured materials	*Montana State University*	*Lee Spangler*
4:35 PM	5:05 PM	Production of bioproducts from electrochemically-generated C_1 intermediates	*LanzaTech, Inc.*	*Justin Bromley*
5:05 PM	5:35 PM	Integrating Chemical Catalysis and Biological Conversion of Carbon Intermediates for Deriving Value Added Products from Carbon Dioxide	*Johns Hopkins University*	*Michael J. Betenbaugh*
5:35 PM	6:05 PM	**Reviewer Wrap Up and Debrief**	***Reviewers***	

9 AOPs

3 FOA Awards

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