U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

2021 PROJECT PEER REVIEW

U.S. DEPARTMENT OF ENERGY
BIOENERGY TECHNOLOGIES OFFICE

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INTRODUCTORY LETTER

Dear Colleagues,

In the spring of 2021, the U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Bioenergy Technologies Office (BETO) continued its long-standing commitment to transparency by implementing the tenth biennial external review since 2005 of its research, development, and demonstration portfolio. Conducted in accordance with EERE Peer Review guidelines, the review was designed to provide an external assessment of the projects in BETO's portfolio and collect external stakeholder recommendations on BETO's overall scope, focus, and strategic direction. Results of the Project Peer Review may help inform programmatic decision making and impact future budget and funding opportunity decisions.

This review is critical to the success of BETO's mission, which focuses on high-impact, broadly applicable applied research, development, and analysis. Activities funded by BETO strategically address technology challenges and uncertainties to accelerate the scale-up and commercialization of bioenergy technologies, which are an important component of decarbonizing the transportation sector and the U.S. economy. At BETO, we are committed to accountability in project management and in our role as stewards of taxpayer dollars. BETO actively manages projects toward high-impact results. The Peer Review is an invaluable opportunity for independent reviewers to rigorously evaluate the management, technical approach, impact, and progress and/or outcomes of projects in the BETO portfolio as well as the program strategies that guide technology area development. Further, it is a unique opportunity for external stakeholders to hear, in a compact and consistent format, about progress from every corner of the portfolio.

The 2021 Peer Review comprised two levels of review: (1) individual projects were scored on the basis of management, technical approach, impact, and progress and outcomes; and (2) each technology area portfolio was evaluated for overall strategy and progress. This report contains the results of both levels of review and the inputs of approximately 400 participants in the Peer Review process, including principal investigators, reviewers, and BETO's staff and contractors.

BETO thanks all the reviewers who participated in this review as well as the more than 1,000 attendees of the Project Peer Review event. Our reviewers include some of the most experienced and knowledgeable experts in the bioenergy community, and we appreciate their insights and recommendations. Achieving the objectives of BETO depends on the effective management of all projects in BETO's existing portfolio and on the appropriate focus and structure of future initiatives. BETO values the input of all stakeholders in the bioenergy sector and looks forward to working with them in the years ahead to continue progress on the path toward building a successful bioenergy industry and a sustainable bioeconomy.

Sincerely,

Valerie Reed

Valerie Reed
Director, Bioenergy Technologies Office
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Bioenergy Technologies Office (BETO) manages a diverse portfolio of technologies covering the full spectrum of bioenergy production, from the feedstock source to the end use, as illustrated in Figure 1. BETO systematically prioritizes research, development, and demonstration (RD&D) into technology opportunities across a range of emerging scientific breakthroughs and technology readiness levels. This approach supports a diverse RD&D portfolio while developing the most promising and widely applicable technologies, testing technologies as integrated processes, and demonstrating integrated processes to support scale-up. These technologies will use a broad variety of currently underused domestic biomass and waste resources to produce increasing volumes of biofuels and bioproducts.

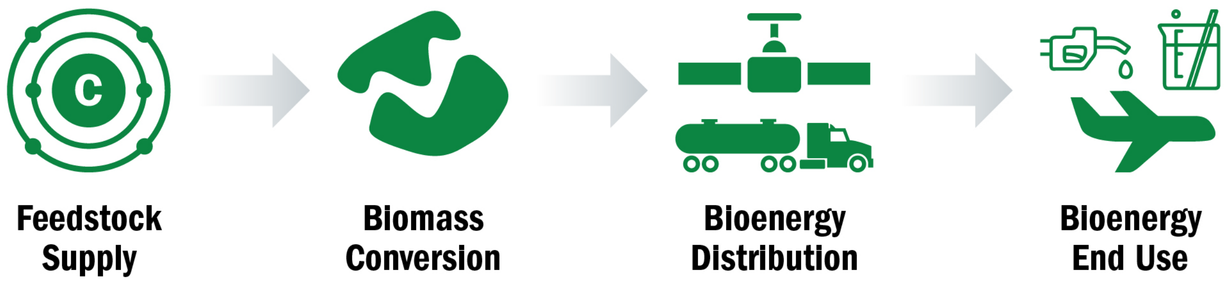

Figure 1. Biomass-to-bioenergy supply chain

The biennial Peer Review process enables external stakeholders to provide feedback on the responsible use of taxpayer funding and develop recommendations for the most efficient and effective ways to accelerate the development of a bioenergy industry. This report includes the results of the Project Peer Review meeting held in March 2021.

ACRONYMS AND ABBREVIATIONS

2HMS	2-hydroxymuconate semialdehyde
3HB	3-hydroxybutyrate
3-HPA	3-hydroxypropionaldehyde
AAS	Advanced Algal Systems
ABF	Agile BioFoundry
ABPDU	Advanced Biofuels and Bioproducts Process Development Unit
ACI	advanced compression ignition
ACSC	Advanced Catalyst Synthesis and Characterization
AD	anaerobic digestion
ADAM	anaerobic digestion with arrested methanogenesis
ADOPT	Automotive Deployment Options Projection Tool
AEM	anion exchange membrane
AFDW	ash-free dry weight
AI	artificial intelligence
ALD	atomic layer deposition
ALPHA	Aqueous Lignin Purification with Hot Agents
AM	arrested methanogenesis
ANL	Argonne National Laboratory
AnMBR	anaerobic membrane bioreactor
ANN	artificial neural network
AOP	annual operating plan
API	application programming interface
ASABE	American Society of Agricultural and Biological Engineers
ASSERT	Analysis of Sustainability, Scale, Economics, Risk and Trade
ATD	alcohol to diesel
ATEC	Algae Technology Educational Consortium
ATJ	alcohol to jet
ATP	adenosine triphosphate
ATP3	Algae Test Bed Public-Private Partnership
AVAP	American Value-Added Pulping
AWOEx	advanced wet oxidation/steam explosion
AzCATI	Arizona Center for Algae Technology and Innovation
BAT	Biomass Assessment Tool
BBG&T	bio-blendstock generation and testing
BDO	butanediol
BEH	batch enzymatic hydrolysis
BETO	Bioenergy Technologies Office
BFD	block flow diagram
BFNUF	Biomass Feedstock National User Facility
BGTL	biogas to liquid
bio-ACN	bio-acrylonitrile
bio-BDO	bio-based 1,4-butanediol
bioLEADS	bioenergy Landscape Environmental Assessment and Design System
BioMADE	Bio-Industrial Manufacturing and Design Ecosystem

BioSep	Bioprocessing Separations Consortium
BioSTAR	Bioenergy Sustainability Tradeoffs Assessment Resource
BKDL	ß-keto-d-lactone
BLV	Biological Lignin Valorization
BOTTLE	Bio-Optimized Technologies to keep Thermoplastics out of Landfills and the Environment
BSCRS	Biomass Supply Chain Risk Standards
BSM	Biomass Scenario Model
BTS	biomass to syngas
C1U	C1 Upgrading
C2U	C2 Upgrading
CAP	combined algal processing
CapEx	capital expenditures
Cas	CRISPR-associated
CCC	countercurrent chromatography
CCE	carbon conversion efficiency
CCLUB	Carbon Calculator for Land Use Change from Biofuels
CCPC	Consortium for Computational Physics and Chemistry
CCUS	carbon capture, utilization, and storage
CDI	capacitive deionization
CDM	Catalyst Deactivation Mitigation for Biomass Conversion
CEH	continuous enzymatic hydrolysis
CFD	computational fluid dynamics
CFEP	carbon fiber reinforced epoxy composite
CFP	catalytic fast pyrolysis
CFPP	cold filter plugging point
CFRP	carbon fiber reinforced epoxy composite
CH_4	methane
ChemCatBio	Chemical Catalysis for Bioenergy Consortium
CMA	critical material attribute
CNS	carbon nanospike
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CoA	coenzyme A
COD	chemical oxygen demand
Co-Optima	Co-Optimization of Fuels & Engines
CORSIA	Carbon Offsetting and Reduction Scheme of International Aviation
CPD	Catalyst Property Database
CPFD	computational particle fluid dynamics
CPP	critical processing parameter
CQA	critical quality attribute
CRADA	cooperative research and development agreement
CRISPR	clustered regularly interspaced short palindromic repeats
CSTR	continuous stirred-tank reactor
CTT	cubical triaxial tester

Cu	copper
CUBI	Catalytic Upgrading of Biochemical Intermediates
DAC	direct air capture
DBTL	design-build-test-learn
DDGS	dried distillers' grains with solubles
DEM	discrete element method
DFA	directed funding award
DFI	ducted fuel injection
DFO	directed funding opportunity
DIC	dissolved inorganic carbon
DISCOVR	Development of Integrated Screening, Cultivar Optimization, and Verification Research
DIVA	Design Implementation Verification Automation
D-LEWT	distributed low-energy wastewater treatment
DMA	data, modeling, and analysis
DME	dimethyl ether
DMR	deacetylation and mechanical refining
DOE	U.S. Department of Energy
DSS	decision support system
EAB	external advisory board
EASy	Evolution by Amplification and Synthetic Biology
ECO2R	electrochemical reduction of CO_2
EDD	Experiment Data Depot
EDI	electrodeionization
EERE	Office of Energy Efficiency and Renewable Energy
EIS	Electrochemical Impedance Spectroscopy
EPA	U.S. Environmental Protection Agency
EPC	engineering, procurement, and construction
ETJ	ethanol to jet
ETO	ethanol to C3+ olefins
EtOH	ethanol
FAIR	Findability, Accessibility, Interoperability, and Reusability
FAME	fatty acid methyl ester
FCC	fluid catalytic cracking
FCIC	Feedstock-Conversion Interface Consortium
FE	Faradaic efficiency
FEI	fuel economy improvement
FEL	front-end loading
FEM	finite element method
FICFB	fast internal circulating fluidized bed
Fire MAPS	Fire Monitoring, Alerts, and Performance System
FMEA	failure mode and effects analysis
FOA	funding opportunity announcement
FOG	fats, oils, and greases
FPEAM	Feedstock Production Emissions to Air Model
FT	Feedstock Technologies

FTS	Fischer-Tropsch synthesis
FY	fiscal year
GAI	Global Algae Innovations
GCAM	Global Change Analysis Model
GC-MS	gas chromatography–mass spectrometry
GDE	gas diffusion electrode
GGE	gallon gasoline equivalent
GHG	greenhouse gas
GMO	genetically modified organism
GREET	Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies
GTAP-Bio	Global Trade Analysis Project-Bio
GVL	gamma-valerolactone
H_2	hydrogen
H_2S	hydrogen sulfide
HACL	2-hydroxacyl-CoA lyase
HDCJ	hydrotreated depolymerized cellulosic jet
HDO	hydrodeoxygenation
HDV	heavy-duty vehicle
HEFA	hydroprocessed esters and fatty acids
HFO	heavy fuel oil
HMF	hydroxymethylfurfural
HObT	Host Onboarding Tool
HOD	host onboarding and development
HPC	high-performance computing
HTL	hydrothermal liquefaction
HTP	hydrothermal processing
HTS	high-throughput screening
HYPOWERS	Hydrothermal Processing of Wastewater Solids
IAB	industry advisory board
IBR	integrated biorefinery
IBSAL	Integrated Biomass Supply Analysis and Logistics
IDAES	Institute for the Design of Advanced Energy Systems
IDL	indirect liquefaction
IEA	International Energy Agency
IEO	industry, engagement, and outreach
IH2	integrated hydropyrolysis and hydroconversion
INL	Idaho National Laboratory
IP	intellectual property
ISO	International Organization for Standardization
ISU	Iowa State University
JEDI	justice, equity, diversity, and inclusion
KCl	potassium chloride
KDF	Knowledge Discovery Framework
k_La	volumetric mass transfer coefficient
KPI	key performance indicator
LANL	Los Alamos National Laboratory

LAP	laboratory analytical procedure
LAS	linear alkylbenzene sulfonate
LBNL	Lawrence Berkeley National Laboratory
LCA	life cycle assessment
LCFS	low-carbon fuel standard
LDV	light-duty vehicle
LEAF	Leveraging Algae Traits for Fuels
LHV	lower heating value
LMW	low molecular weight
LTAD	low-temperature advanced deconstruction
LUC	land use change
MALDI	matrix-assisted laser desorption/ionization
MBL	alpha-methylene butyrolactone
MC	membrane carbonation
MCCI	mixing-controlled compression ignition
MDV	medium-duty vehicle
MEA	membrane electrode assembly
MEK	methyl ethyl ketone
MES	microbial electrosynthesis
MESP	minimum ethanol selling price
MFI	materials flows through industry
MFSP	minimum fuel selling price
MMA	methylmethacrylate
MNE	MicroNiche Engineering
MOC	mechanism of corrosion
MOGD	mobil olefin to gasoline and distillate
MON	motor octane number
MOVES	Motor Vehicle Emission Simulator
MPa	megapascal
MS	mass spectrometry
MSSP	minimum sugar selling price
MSU	Montana State University
MSW	municipal solid waste
MYPP	Multi-Year Program Plan
NaOH	sodium hydroxide
NCSU	North Carolina State University
NETL	National Energy Technology Laboratory
NGO	nongovernmental organization
Ni	nickel
NIH	National Institutes of Health
NIPU	non-isocyanate polyurethane
NIR	near-infrared
NIST	National Institute of Standards and Technology
NMR	nuclear magnetic resonance
NO_x	nitrogen oxide
NPV	net present value

NREL	National Renewable Energy Laboratory
OEM	original equipment manufacturer
OFS	oleo-furan surfactants
OLADE	Latin American Energy Organization
OpEx	operating expenditures
ORNL	Oak Ridge National Laboratory
OSU	The Ohio State University
PABP	performance-advantaged bioproduct
PBR	photobioreactor
Pd	palladium
PDK	poly(diketoenamine)
PDU	process development unit
PEAK	Productivity Enhanced Algae and Tool-Kits
PEM	polymer electrolyte membrane
PET	polyethylene terephthalate
PFAS	per- and polyfluoroalkyl substances
PG	performance grade
PHA	polyhydroxyalkanoate
PHB	polyhydroxybutyrate
PHU	polyhydroxyurethane
PI	principal investigator
PIMS	photoionization mass spectrometry
PKS	polyketide synthase
PM	particulate matter
pMMA	polymethacrylic acid
PNNL	Pacific Northwest National Laboratory
POC	point of contact
POLYSYS	Policy Analysis System Model
POM-DME	polyoxymethylene dimethyl ether
POME	polyoxymethylene ether
PRELIM	Petroleum Refinery Life Cycle Inventory Model
PSA	pressure swing adsorption
PSD	particle size distribution
Pt	platinum
PTU	polythiourethane
PU	polyurethanes
Q&A	question and answer
QbD	quality by design
QTOF	quadrupole time-of-flight
R&D	research and development
RACER	Rewiring Algal Carbon Energetics for Renewables
r-BOX	reverse β-oxidation
RCD	rotary ceramic disk
RCF	reductive catalytic fractionation
RCFP	reactive catalytic fast pyrolysis
RECS	redox-based electrochemical separation

ResIn	Responsible Innovation for Highly Recyclable Plastics
RFI	request for information
RFID	radio frequency identification
RHE	reversible hydrogen electrode
RIN	renewable identification number
RIPE	Responsible Innovation for bioPlastics in the Environment
RNA	ribonucleic acid
RNG	renewable natural gas
ROI	record of invention
RON	research octane number
RRB	Red Rock Biofuels
SAF	sustainable aviation fuel
SCME	single-cylinder metal engine
SCP	single-cell protein
SDI	Systems Development and Integration
SEQHTL	sequential hydrothermal liquefaction
SFA	strategic focus area
SMART	specific, measurable, attainable, realistic, and time-related
SMB	simulated moving bed
SMR	steam methane reforming
SNL	Sandia National Laboratories
SOA	state of the art
SOP	standard operating procedure
SOPO	statement of project objectives
SOT	state of technology
SPERLU	Selective Process for Efficient Removal of Lignin and Upgrading
SPP	Strategic Partnership Project
SPPR	structure-property-processing relationship
SPR	structure-property relationship
SUNY	State University of New York
SWIFT	Single-Pass, Weather-Independent Fractionation Technology for Improved Property Control of Corn Stover Feedstock
TCA	tricarboxylic acid
TCF	Technology Commercialization Fund
TCPDU	Thermal and Catalytic Process Development Unit
TEA	techno-economic analysis
TERA	Toxic Substance Control Act (TSCA) Environmental Release Application
TFF	tangential flow filtration
THF	tetrahydrofuran
TiO_2	titanium dioxide
TOS	time on stream
TPA	terephthalic acid
TRI	ThermoChem Recovery International, Inc.
TRL	technology readiness level
TRY	titer, rate, and yield
TSA	temperature swing adsorption

UCSD	University of California San Diego
UHS	unhydrolyzed solids
ULSD	ultra-low-sulfur diesel
USDA	U.S. Department of Agriculture
USF	University of South Florida
UTSA	University of Texas at San Antonio
VFA	volatile fatty acid
VLSFO	very-low-sulfur fuel oil
VTO	Vehicle Technologies Office
WBS	work breakdown structure
WGS	water-gas shift
WRRF	water resource recovery facility
WTE	waste to energy
YSI	yield sooting index
Zr	zirconium

CONTENTS

INTRODUCTION

The Project Peer Review meeting took place virtually on March 8–12, 15–16, and 22–26, 2021. The Peer Review brought together reviewers, BETO staff, project performers, and other stakeholders along the entire bioenergy supply chain. Projects were systematically reviewed by 67 external subject matter experts from industry, academia, nonprofit, and government. BETO's funding portfolio was presented in 12 technology areas:

- Advanced Algal Systems
- Agile BioFoundry
- Biochemical Conversion and Lignin Utilization
- Carbon Dioxide Utilization
- Catalytic Upgrading
- Co-Optimization of Fuels and Engines
- Data, Modeling and Analysis
- Feedstock Technologies
- Feedstock-Conversion Interface Consortium
- Performance-Advantaged Bioproducts, Bioprocessing Separations, and Plastics
- Organic Wastes
- Systems Development and Integration.

Each review session was structured with a technology area overview that linked the projects in the portfolio to the technology area challenges and the program strategy for measuring progress and managing deliverables toward outcomes. Each review session had a panel of independent reviewers that reviewed and scored each individual project as well as provided overall recommendations regarding the strategy and progress of the technology area. The 271 project presentations reviewed represent a total DOE investment of $662 million and cover activities that incurred costs from fiscal years (FY) 2019–2021. Because some activities were initiated prior to FY 2019, and because some FY 2020 and FY 2021 appropriations have not yet been invested in projects, the fiscal year appropriations to BETO during the same time period do not neatly correspond to the total investment in the activities that were reviewed. Figures 2 and 3 depict the number of presentations reviewed by technology area session and the associated funding allocation. Results of the 2021 BETO Peer Review may be used to help inform programmatic decision making, modify or discontinue existing projects, guide future funding opportunities, and support other budget and strategic planning objectives.

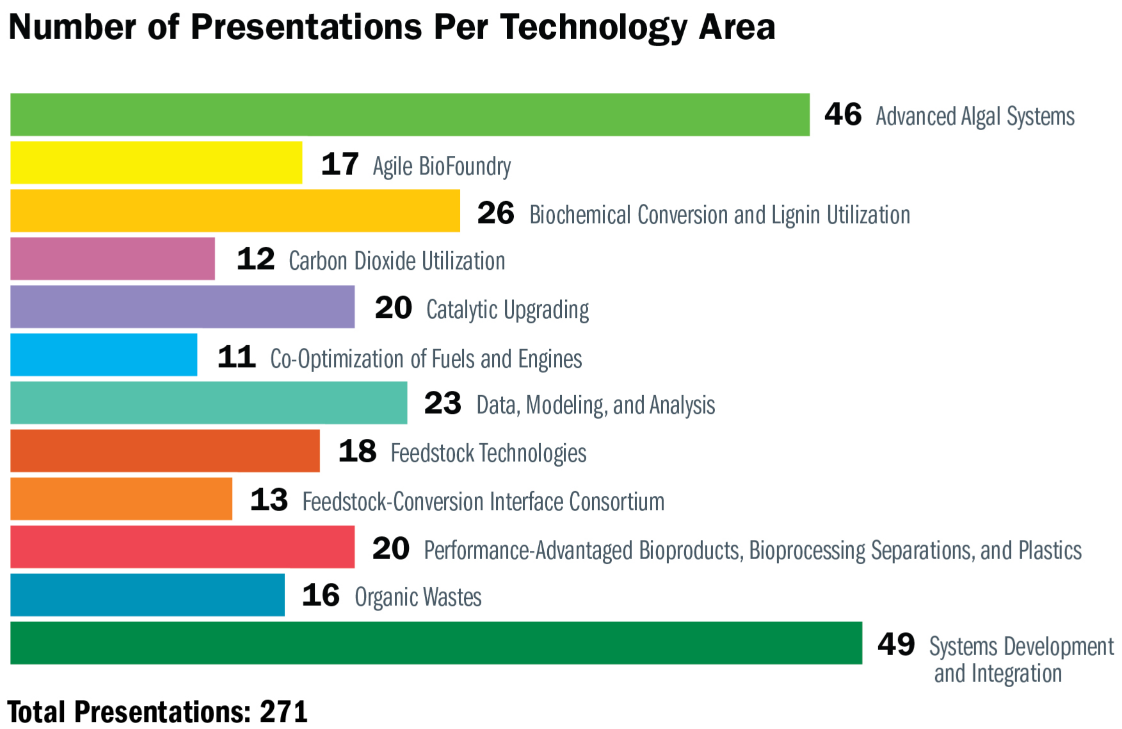

Figure 2. Number of presentations by technology area session

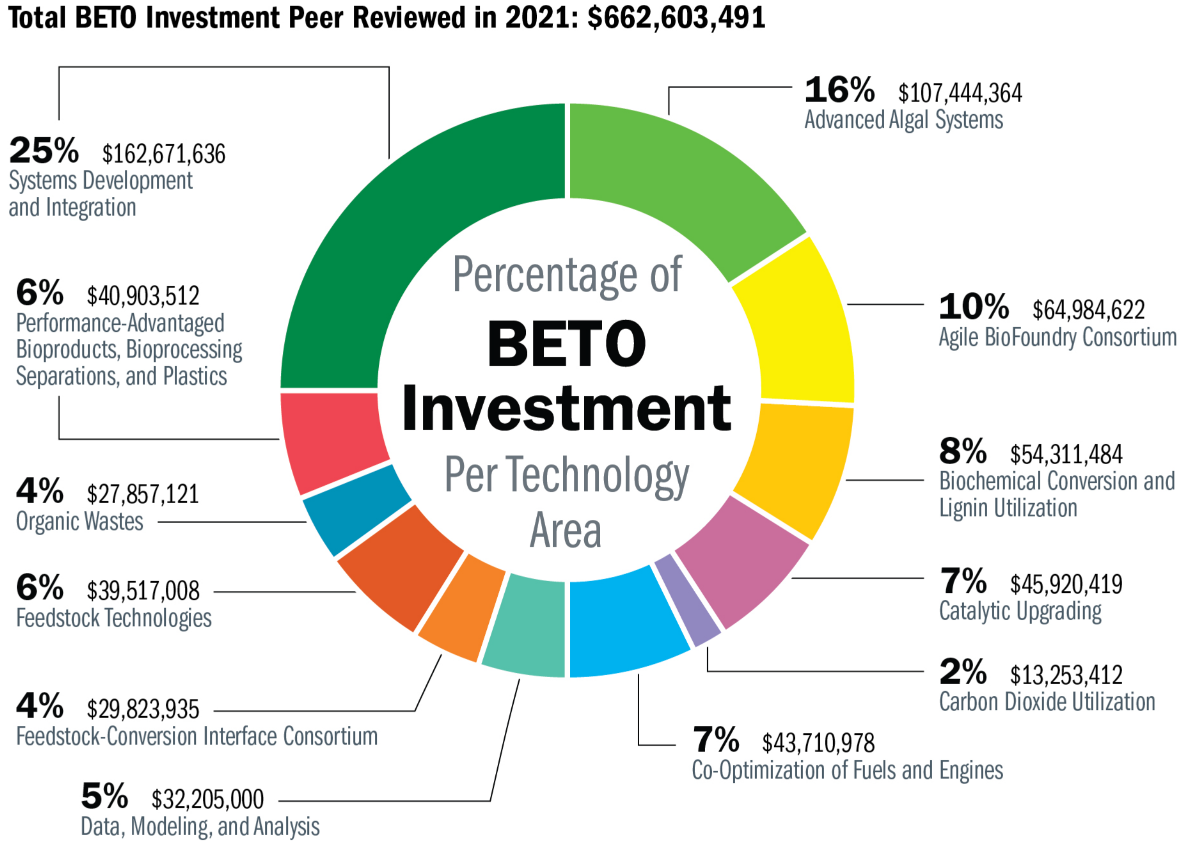

Figure 3. Total BETO funding of reviewed activities by technology area session

ROLES AND RESPONSIBILITIES

The BETO 2021 Peer Review was planned by an internal planning committee. The reviews were conducted by external individuals with expertise in their fields and organized into Review Panels, one panel of individuals for each of the 12 review sessions. The internal planning committee comprised BETO federal and contractor staff and was designated with the responsibility for developing and coordinating all aspects of the review process, from initiation through completion, in compliance with EERE standards for conducting Project Peer Reviews. This committee included a federal lead and a contractor support person for each of the 12 technology areas as well as a federal Peer Review chair and assistant review chair responsible for all aspects of the overall process, with support of a coordination and execution support team. Support contractors from Boston Government Solutions, Allegheny Science & Technology, BCS LLC, Redhorse Corporation, and The Building People LLC provided planning support and meeting logistics for each session and for the overall Peer Review.

The Review Panels for each technology area consisted of five to seven external individuals who were selected based on technical expertise and professional qualifications in their designated technology area. Efforts were made to ensure experiential, institutional, and geographic diversity within each Review Panel by including a mix of reviewers from industry, academia, and federal agencies, with a range of expertise in the many focus areas within each technology area. Reviewers were required to sign legal agreements confirming an absence of a conflict of interest with the projects they reviewed. Final decisions on reviewer selection were made by the internal planning committee, with final approval by BETO's director. In addition, one reviewer on each panel was designated as the lead reviewer. In most cases, lead reviewers had previous experience participating as a reviewer in a prior BETO Project Peer Review. The extra responsibilities of the lead reviewer included gathering the individual reviewer comments and scores and synthesizing them into a summary report for inclusion in this document.

Table 1 list the members and affiliations of the lead reviewers of each panel. Members of each technology area Review Panel are listed within each technology area session summary.

Table 1. Lead Reviewers

Name	Affiliation
Jesse Bond	Syracuse University
Jeanette Brown	Manhattan College
Phil De Luna	National Research Council Canada
Glenn Farris	Lee Enterprises Consulting, Inc.
Kevin Fingerman	Humboldt State University
Daniel Lane	Saille Consulting
Jaime Moreno	The GWP Group
Mark Penshorn	Penshorn Analysis
Pamela Peralta-Yahya	Georgia Institute of Technology
Cory Phillips	Phillips 66
Christopher Rao	University of Illinois at Urbana-Champaign
Matt Tobin	Independent consultant

PROJECT EVALUATION CRITERIA

Reviewers evaluated each project on specific criteria, including management, approach, impact, and progress and outcomes. These evaluation criteria served as the template for the scores and comments provided to each project:

- **Management**—Projects were evaluated on the degree to which:
    - The project performers have a clear management plan and successful implementation strategy, which includes risk identification and mitigation strategies.
    - The project provides routes for communication and collaboration with related projects and/or advisory boards, if appropriate.
- **Approach—**Projects were evaluated on the degree to which:
    - The project performers have developed an approach with substantial merit to advance the state of the art, as relevant to the defined BETO program and technology area goals.
    - The project performers have developed an approach with significant potential for innovation in its application.
- **Impact**—Projects were evaluated on the degree to which:
    - The project demonstrated a clear connection of project approach to the potential for significant impact and outcomes.

    - The project has clear commercialization potential or has used or plans to use industry engagement to guide project deliverables, as relevant.

- **Progress and outcomes**—Projects were evaluated on the degree to which:
    - The project has made appropriate progress toward addressing the project goal(s).
    - The accomplishments have been achieved on schedule with the planned approach, and, if relevant, the risk mitigation strategies have been employed to maintain project progress.

Scores ranged from 5 (outstanding) to 1 (unsatisfactory) per the rubric in Table 2.

Table 2. 2021 BETO Project Peer Review Scoring Rubric

Outstanding	Good	Satisfactory	Marginal	Unsatisfactory
5	4	3	2	1
All aspects of the criterion are comprehensively addressed. There are significant strengths and no more than a few—easily correctable—weaknesses.	All aspects of the criterion are adequately addressed. There are significant strengths and some weaknesses. The significance of the strengths outweighs most aspects of the weaknesses.	Most aspects of the criterion are adequately addressed. There are strengths and weaknesses. The significance of the strengths slightly outweighs aspects of the weaknesses.	Some aspects of the criterion are not adequately addressed. There are strengths and significant weaknesses. The significance of the weaknesses outweighs most aspects of the strengths.	Most aspects of the criterion are not adequately addressed. There may be strengths, but there are significant weaknesses. The significance of the weaknesses outweighs the strengths.

FORMAT OF THE REPORT

Information in this report has been compiled as follows and is based on the following sources:

1. **BETO overview:** This section provides an overview of BETO's mission, vision, and goals, as well as descriptions of BETO's approach to achieving technical goals and the challenges in doing so.

2. **Peer review report introduction:** This section contains overview information on the Peer Review process, roles and responsibilities, and project evaluation criteria.

3. **Technology area summaries:** This section contains 12 chapters that represent the comprehensive evaluation for each technology area reviewed. Each chapter includes:

    A. **Introduction:** An overview of the technology area's project portfolio, including total funding of the projects reviewed and percentage of total BETO project portfolio.

    B. **Review Panel members:** A list of names and affiliations for each individual who provided project evaluations and contributed to the Review Panel summary report.

    C. **Review Panel summary report:** This summary of project evaluations provides insight regarding the technology area's overall strategy and progress. This chapter was drafted by the lead reviewer for each technology area in consultation with the full Review Panel. Consensus among the reviewers was not sought, and reviewers were asked to include differences of opinion and dissenting views within the report.

    D. **Technology area programmatic response:** Represents the program's official response to the recommendations provided in the Review Panel summary report.

    E. **Project evaluations:** The project reports summarize the results of each project evaluated during the review process, including the following elements:

        i. **Project name and the lead project performer organization:** The full project name is listed as the heading, followed by the lead project performer's organization.

        ii. **Average project score per review criterion:** A bar chart depicts the average scores for each evaluation criterion, the range of scores per criterion given to the project by the individuals within the Review Panel, the average project score, and the average of all the projects in the technology area per criterion.

        iii. **Summary table:** Reference information about the project, which includes the recipient organization, principal investigator (PI), project dates, and total DOE funding.

        iv. **Project descriptions:** Compiled from the abstracts submitted by the project performer.

        v. **Reviewer comments:** Verbatim comments made by the Review Panel, edited only for grammar and clarity. Each bulleted response represents the opinion of one reviewer. Reviewers were not asked to develop consensus remarks, and in most cases the reviewers did not discuss their overall comments on each project with one another. In a limited number of cases, reviewer remarks deemed inappropriate or irrelevant were excluded from the final report.

        vi. **PI response to reviewer comments:** The response to the reviewer comments provided by the project performers. Responding to reviewer comments was optional.