

***The Industrial Energy Transition and Decarbonization (IETD)  
Consortium Techno-economic Reports***

**2024**

**Alternative Feedstocks for Lower Carbon Intensity**

AUTHORS: Miguel Mendonça Reis Brandão, Wojciech Budzianowski

PEER REVIEWERS: Johann Gorgens, Matteo Prussi

**Advances in Electrolyzer Technologies and the Scale-up for Green Hydrogen**

AUTHORS: Yasser Mahmoudi Larimi, Vincenzo Spallina

PEER REVIEWERS: Prodromos Daoutidis, Matthew Palys

**Techno-economic Analysis for Hydrogen Production, Transportation, and Storage**

AUTHORS: Pierre Millet, Bruno Pollet, Aliaksei Patonia

PEER REVIEWERS: Dmitri Bessarabov

**2023**

**Analysis of CO<sub>2</sub> Sources and Demand for CO<sub>2</sub>-Derived Products**

AUTHORS: Prof. Gabrielle Centi, Ranjit Prasad, Roger Green

PEER REVIEWERS: Ali Nabavi, Dawid Hanak

**Techno-economic Analysis (TEA) Case Study Series – Vol 1: Biomass to Renewable Fuel, CO<sub>2</sub> to Methanol, and Refinery Carbon Capture**

AUTHORS: Dr. Michelle Lynch, Zulay Hankamer

PEER REVIEWERS: Ari Minkkinen, Karen Wilson

**Lessons Learned: Case Studies of Failed CCUS Projects and Technologies**

AUTHOR: Ahmed Abdulla

PEER REVIEWERS: Jonathan Forsyth, Karl Gerdes

**2022**

**State of the Art and Future Prospects for Catalytic and Electrochemical Routes to CO<sub>2</sub> Conversion**

AUTHORS: Prof. Michelle Aresta, Dr. Angela Dibenedetto, Dr. Deepak Pant, Prof. Onofrio Scialdone

PEER REVIEWERS: Dr. Niklas Jakobsson and Prof. Siglinda Perathoner

**Advanced Materials for CO<sub>2</sub> Capture and Separation**

AUTHORS: Prof. Chunfei Wu, Dr. Olajide Otitoju, Dr. Yang Han, and Prof. W.S. Winston Ho

PEER REVIEWERS: Prof. Dawid Hanak and Prof. Niall Mac Dowell

**CO<sub>2</sub> Reduction via Biomass Conversion in Energy and Chemicals**

AUTHORS: Prof. Leda Van Doren and Prof. Qingshi Tu

PEER REVIEWERS: Prof. Miguel Brandão and Prof. Johann Gorgens

## 2021

### **Progress Towards Operating a Viable Business in CO<sub>2</sub>**

AUTHORS: Prof. Peter Psarras

PEER REVIEWERS: Charles McConnell, Olivier Messenger

### **Catalogue of Most Important Scientific Advances in CCUS**

#### **Over the Past 3 Years**

AUTHORS: Dr. Niall Mac Dowell, Prof. Paul S Fennell, Nadine Moustafa, Paola Saenz Cavazos, Michael D High

PEER REVIEWERS: Danielle Ballivet-Tkatchenko, Mr. Phillip Armstrong

### **Permanent Sequestration of CO<sub>2</sub> in Industrial Wastes/Byproducts**

AUTHORS: Prof. Muftah H. El-Naas

PEER REVIEWERS: Profs. Phil Renforth and Shu-Yuan Pan

## 2020

### **Life Cycle Assessment (LCA) for Sustainable Chemical and Polymer Production**

AUTHORS: Dr. Michelle Lynch, Dr. Nuno Batalha and Martha Neugarten

PEER REVIEWERS: Eric Johnson and Chris Foster

### **Energy Efficiency/CO<sub>2</sub> Mitigation Case Study Series – Vol. 3: Allied Industries**

AUTHORS: Prof. Paul Fennell, Dr. Justin Driver and Dr. Gbemi Oluleye

PEER REVIEWERS: James Kumana and Ari Minkkinen

### **The Role of CO<sub>2</sub> Emissions Reduction in Overall Corporate Sustainability Initiatives**

AUTHORS: Charles McConnell, Aparajita Datta, Aneecia Vernessa Payne

PEER REVIEWERS: Jonathan Forsyth

## 2019

### **Technical and Commercial Progress Towards Viable CO<sub>2</sub> Storage**

AUTHORS: Mr. Kevin Doran, J.D., Dr. Mehdi Azadi, Dr. Sebastian Fischer

PEER REVIEWERS: Lars Eide, Volker Sick

### **Compact Light-Weight CO<sub>2</sub> Capture Technologies for Small- to Medium-scale CO<sub>2</sub> Emitters**

AUTHORS: Dr. Niall Mac Dowell, Dr. David Danaci, and Caroline Ganzer

PEER REVIEWERS: Ari Minkkinen and Prof. Sankar Bhattacharya

### **Advances in Direct Air Capture of CO<sub>2</sub>**

AUTHORS: Prof. Jennifer Wilcox, Noah McQueen, Alexander Jensen-Fellows, and Dr. Simona Liguori

PEER REVIEWERS: Jonathan Forsyth, Prof. Eloy Sanz-Pérez, and Prof. Colin McCormick

## 2018

### **Advances in Mineral Carbonation of CO<sub>2</sub>**

AUTHOR: Prof. Jennifer Wilcox

PEER REVIEWERS: Mr. Hal Gunardson and Prof. Mercedes Maroto-Valer

### **CO<sub>2</sub> Utilization Beyond EOR**

AUTHORS: Profs. Cyrus Kian, Kevin Doran and Elizabeth Lokey

PEER REVIEWERS: Profs. Mojdeh Delshad and Robert Enick

### **State of the Art and Future Prospects for Electrochemical CO<sub>2</sub> Conversion Routes**

AUTHORS: Profs. Joannis Spanos, Niklas Kinzel, Christophe Werle and Walter Leitner

PEER REVIEWERS: Profs. Feng Jiao and Seglinda Perathoner

## 2017

### **CO<sub>2</sub> Conversion Startups for Venture Capital**

AUTHORS: Michelle Lynch

PEER REVIEWERS: Issam Dairanieh and Olivier Messenger

### **Progress Towards Cost-Effective and Sustainable H<sub>2</sub> Production**

AUTHORS: Prof. Javier Dufour Andía, Dr. Shankar Nataraj, and Prof. Adel Ismail

PEER REVIEWERS: Dan Kubek

### **CO<sub>2</sub> Utilization in Reforming**

AUTHORS: Danielle Ballivet-Tkatchenko

PEER REVIEWERS: Gabrielle Centi

## 2016

### **Benchmarking CO<sub>2</sub> Capture Technology (Vol. 3): Update on Selected Pre-/Oxy-Combustion and Post-Combustion Capture Routes**

AUTHORS: Drs. Shankar Nataraj and Mr. Phillip Armstrong

PEER REVIEWERS: Mr. James Sorensen and Dan Kubek

### **Integration of Renewable Energy in CO<sub>2</sub> Capture and Conversion Processes**

AUTHORS: Karl Gerdes and John Wind

PEER REVIEWERS: Messrs. Hal Gunardson and Ari Minkkinen

### **System Perspectives/Net GHG Benefit of CO<sub>2</sub> Conversion Technologies**

AUTHORS: Prof. Walter Leitner and Prof. Thomas Müller

PEER REVIEWERS: Prof. Frank Behrendt and Prof. Jennifer Wilcox

## 2015

### **Energy Efficiency/CO<sub>2</sub> Mitigation Case Study Series – Vol. 2: Petrochemicals and Chemicals**

AUTHOR: Mr. James Kumana

PEER REVIEWERS: Drs. Frank Zhu and Eric Patela

### **Integrated CO<sub>2</sub> Capture and Conversion from Flue Gases**

AUTHORS: Drs. Niall Mac Dowell and Paul Fennell

PEER REVIEWERS: Dr. Karl Gerdes and Mr. Hal Gunardson

### **Progress Towards Technologically and Commercially Viable CO<sub>2</sub> Conversion to Olefins, Acids and Esters**

AUTHORS: Drs. Gabriele Centi and Siglinda Perathoner

PEER REVIEWERS: Prof. Walter Leitner and Mr. Dennis Leppin

## 2014

### **Advances in Energy Efficiency via Separations Technology**

AUTHORS: Drs. Peter Goodrich, Ah-Hyung (Alissa) Park and Jennifer Wilcox

PEER REVIEWERS: Drs. William Koros and Pushpinder Puri

### **Process/Energy Integration in CO<sub>2</sub> Capture: Opportunities and Challenges**

AUTHORS: Messrs. Hal Gunardson and Dr. Niall Mac Dowell

PEER REVIEWERS: Mr. James Sorensen and Dr. John Tao

### **Energy Efficiency/CO<sub>2</sub> Mitigation Case Study Series – Vol. 1: Refining and Fuels**

AUTHOR: Mr. James Kumana

PEER REVIEWERS: Drs. Vladimir Mahalec and Frank Zhu

## 2013

### **Catalytic Routes to CO<sub>2</sub> Conversion: An Assessment of the Technology Pipeline**

AUTHORS: Drs. Gabriele Centi and Siglinda Parathoner

PEER REVIEWERS: Drs. Rubén Martín Romo and Steven Suib

### **CO<sub>2</sub> in Enhanced Oil Recovery (EOR): Sources, Capture Technologies and Applications**

AUTHORS: Drs. Robert Enick and Glen Murrell

PEER REVIEWERS: Drs. Kevin Doran and Ian Duncan

### **Conversion of CO<sub>2</sub> to Syngas and Synthetic Natural Gas (SNG): Technologies and Markets**

AUTHORS: Drs. Danielle Ballivet-Tkatchenko and Riitta Keiski

PEER REVIEWERS: Drs. Eckhard Dinjus and Joel Rosenthal

## 2012

### **Fundamental Limitations on CO<sub>2</sub> Capture Processes**

AUTHORS: Messrs. Hal Gunardson and Ari Minkinen and Dr. Keith Guy

PEER REVIEWERS: Dr. Andre Faaij and Mr. Arnold Keller

### **Analysis of Demand for Captured CO<sub>2</sub> and Products from CO<sub>2</sub> Conversion**

AUTHORS: Drs. Michele Aresta, Angela Dibenedetto and Liang-Nian He

PEER REVIEWERS: Drs. Frank Behrendt and Walter Leitner

### **Retrofit Suitability of Competing CO<sub>2</sub> Capture Technologies**

AUTHORS: Drs. Ben Anthony, Paul Fennell and Niall Mac Dowell

PEER REVIEWERS: Messrs. David Heaven and James Sorensen

## 2011

### **Benchmarking CO<sub>2</sub> Capture Technology (Vol. 2): Pre-Combustion and Oxy-Combustion Routes**

AUTHORS: Messrs. Arnold Keller, Dan Kubek and James Sorensen and Dr. Ravi Prasad

PEER REVIEWERS: Messrs. Mike Floyd, Kurt Torster and Dr. Jennifer Wilcox

### **Advances in Technologies for CO<sub>2</sub> Conversion to Fuels**

AUTHORS: Drs. Gabriele Centi, Giampietro Cum, Athansios Konstandopoulos and Niels-Henrik Norsker

PEER REVIEWERS: Drs. Ricardo Chacartegui, Gilles Flamant and Walter Leitner

### **Innovative Materials and Processes for CO<sub>2</sub> Capture**

AUTHORS: Mr. Dan Kubek and Drs. Ravi Prasad and Michael Whysall

PEER REVIEWERS: Messrs. David Heaven and James Sorensen

## 2010

### **Benchmarking CO<sub>2</sub> Capture Technology (Vol. 1): Post-Combustion Routes**

AUTHORS: Messrs. Arnold Keller, Dan Kubek and Dennis Leppin and Dr. Ravi Prasad

PEER REVIEWERS: Drs. Arie Geertsema and Edward Rubin and Mr. Martin Van Sickels

### **Advances in Technologies for CO<sub>2</sub> Conversion to Chemicals**

AUTHORS: Drs. Gabriele Centi and Giampietro Cum and Mr. Richard Porcelli

PEER REVIEWERS: Drs. Danielle Ballivet-Tkatchenko and Roger Gläser

### **Progress Towards Cost-Effective H<sub>2</sub> Supply and Energy Sources for CO<sub>2</sub>**

#### **Activation in Conversion Applications**

AUTHORS: Mr. Dan Kubek and Drs. Ashish Mhadeshwar, Joel Rosenthal and Ting Wang

PEER REVIEWERS: Messrs. James Sorensen and Robert Miller and Dr. Paul Dauenhauer

**The Industrial Energy Transition and Decarbonization (IETD) Consortium**  
(formerly the CO<sub>2</sub> Capture and Conversion Program – CO<sub>2</sub>CC Program)

The **IETD Consortium** is a membership-directed consortium, launched in January 2010, whose members are seeking technological and commercial progress for pathways that reduce, capture, utilize, and/or permanently store greenhouse gas emissions. Our unique consortium approach allows members to cost-effectively track and access real technology and market developments towards industrial decarbonization and energy transition. By the direction of the member companies (through balloting and other interactive means), the program delivers a range of timely and insightful information and analyses which are accessible exclusively to members and protected by confidentiality agreements. The objective is to document and assess technically and commercially viable options for carbon capture, utilization, and storage (CCUS), the hydrogen economy, power-to-X, biomass, waste, and circular routes to fuels/chemicals, and many more topics that are significant in the energy transition.

Members receive three in-depth **IETD Techno-economic Reports** which are written by leading scientists and experienced industry professionals in areas selected by the membership (via ballot); semiweekly newsletters (*IETD Decarbonization Dispatch* and *IETD Energy Transition Tribune*, delivered via e-mail) which provide the latest updates on technical breakthroughs, commercial events and exclusive development opportunities; and attendance at the IETD Consortium **Annual Meeting**.

The **Industrial Energy Transition and Decarbonization (IETD) Consortium** is available on a membership basis from The Catalyst Group Resources (TCGR). For further details, please contact John J. Murphy at [jmurphy@catalystgrp.com](mailto:jmurphy@catalystgrp.com) or +1.215.628.4447.



P.O. Box 680  
Spring House, PA 19477 U.S.A  
+1.215.628.4447  
[www.catalystgrp.com](http://www.catalystgrp.com)