Introduction

Coordinating Research Council
&
Sustainable Mobility Committee

August 2025

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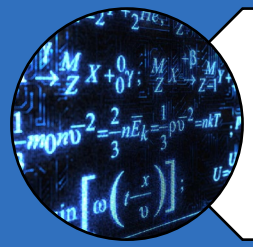
CRC Mission & Objectives

Mission

The Coordinating Research Council (CRC) fosters cooperative scientific research in the technological advancements of fuels, lubricants, vehicles, and equipment in matters of national and global interest.



Be a focal point for cooperative, pre-competitive research.

Provide a forum for all stakeholders to participate in the research.

Make technical information available to industries, governments and the public.

Formed in 1919, incorporation in 1942.	501(c)(3) nonprofit association organized to direct scientific research.	No advocacy or lobbying. Intellectual property and antitrust protections.	All CRC research reports are available to the public.

Coordinating Research Council (CRC) Strategic Plan – established 2025

Research

Facilitate high-quality, science-based precompetitive research.

Credibility
Leverage subject matter experts to uphold the reputation and the quality of research at CRC.

Priorities
Identify and prioritize collaborative research among the mobility industry, energy industry, and government scientists.

Research
Conduct research on emissions, performance, atmospheric and sustainability impacts of fuels, lubricants, vehicles and equipment.

Collaboration

Provide forums for all stakeholders to participate in the research.

Subject Matter Expertise
Nurture subject matter experts throughout member companies.

Recognition
Increase recognized value of CRC participation within Member Companies.

Engagement / Personal Development
Support effective and efficient collaborative processes.

Future Focus
Identify & evaluate processes of collaboration.

Visibility

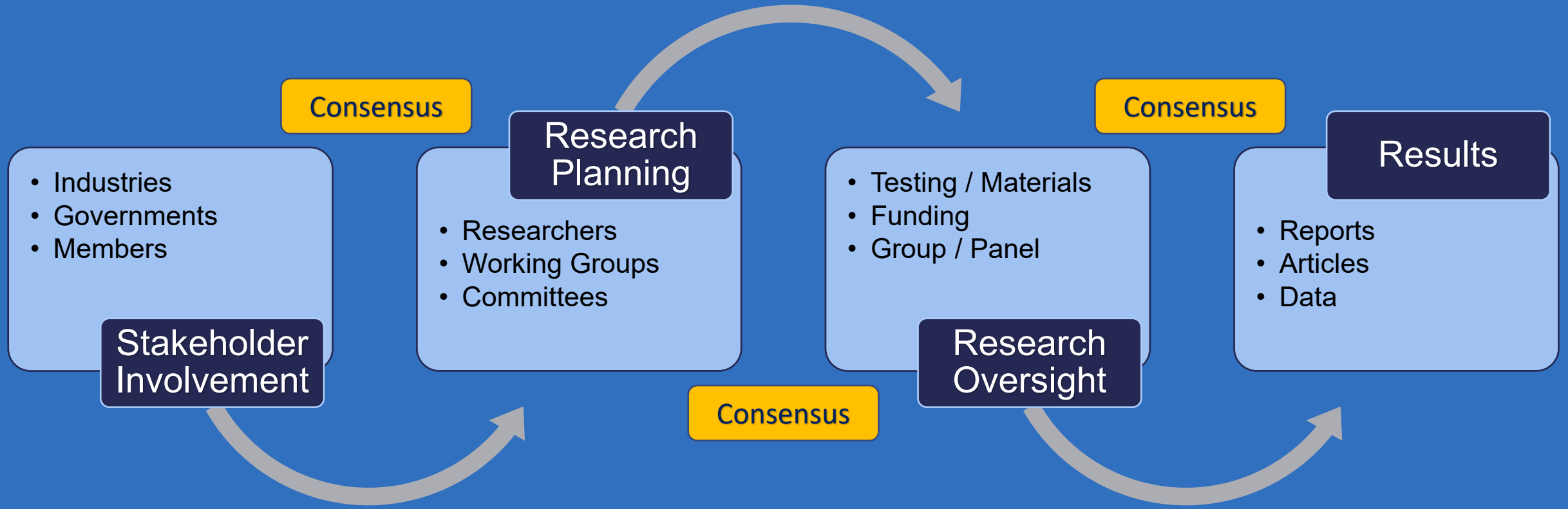
Make technical information available to industries, governments and public.

Internal
Articulate complex research and CRC value within member companies.

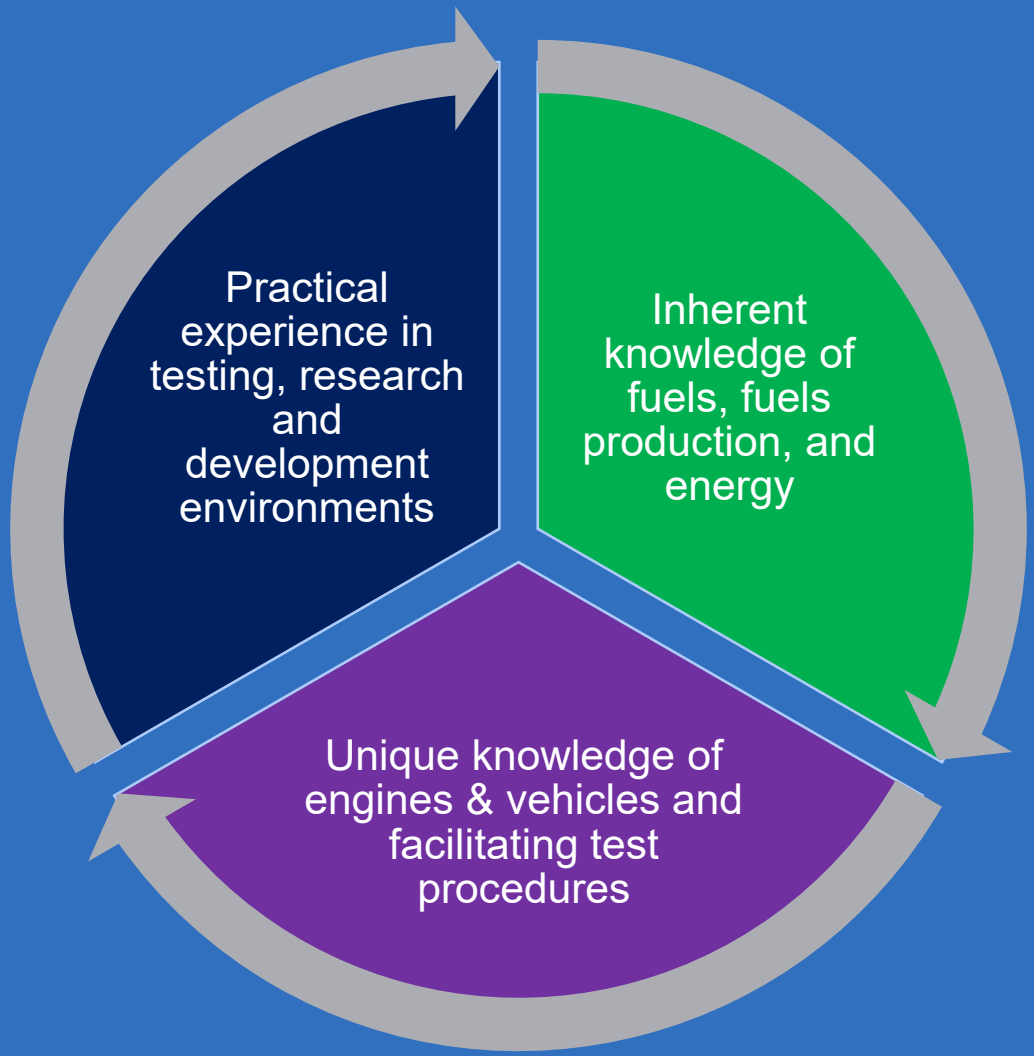
External
Focused outreach of data driven information to the technical community, in easily accessible, searchable, and trackable work products.

Exposure
Access to subject matter experts and the technical community across industries. Collaboration with the broader technical community to advance science.

Core Function of CRC:
Enable a **Process for Cooperative Research**



CRC Research Benefits From Synergy Between Industries



DIVERSITY and **BALANCE** of industry representation and perspectives are the foundation of CRC's objective research.

Benefits of Cooperative Science Facilitated by CRC

Impact

Independent, balanced results available to the public **inform regulations and standards**.

CRC research informs and can be referenced to improve models and regulations from EPA and CARB. CRC research is also used extensively by ASTM.

Leverage

Collective effort supports a **research program value of much larger size** than any individual member contribution.

The current average **leverage** (ratio of the value of total research to the individual Member's contribution) for a CRC Sustaining Member is **a factor of 30.**

Network

Technical expertise is available from a **diverse group of peer researchers** in a noncompetitive environment.

CRC Members have access to Committees, Groups, and Panels made up of hundreds of subject experts. This can be particularly valuable in professional development for newer staff.

Protection

Policies govern **intellectual property** and **compliance with antitrust regulations**.

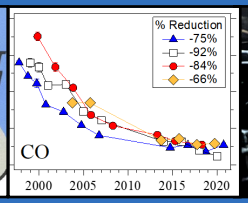
CRC facilitates cooperative research between competitors, different industries, governments, and academia with important protections for all involved.

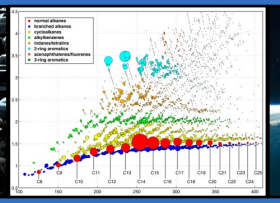
A Century of CRC History

1920s	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020s+
Beginning: Cooperative Fuels Research (CFR) Committee of SAE		**Military Research: Aviation & Vehicle Performance**			**Air Quality: Light-Duty Vehicle Focus**			**Wider View: +Autos, +Committees**		**Global View: Sustainability**








Research emphasis of the Council adapts to the needs of Members. More diverse than this simple summary, research continues today in all topics listed.

CRC Organization: Members & Committees

Board of Directors

CRC Sustaining Members

Expanded Membership Research Program

SMC Funding Members

Sustainable Mobility Committee

Sustaining Members Research Program

- Atmospheric Impacts Committee
- Advanced Vehicle/Fuel/Lubricants Committee
- Emissions Committee
- Performance Committee

Separate Membership Research Program

Aviation Committee Members

CRC Workshops & Technical Meetings

Life Cycle Analysis of Transportation Fuels

9th Event: October 7-9, 2025

Argonne National Lab, IL

Real World Emissions

36th Event: March 8-11, 2026

San Diego, CA

Aviation

Annually - 1st Week of May

2026: Alexandria, VA

Mobile Source Air Toxics

12th Event: February 10-11 2026

Riverside, CA

Sustainable Mobility

4th Event: April 2026

with SAE WCX

Detroit, MI

Special Events

Liquid Hydrogen - NASA (2023)

Air Quality Modeling Research Needs (2016, 2022)

Fuels and Engines: The Road Ahead (2020) / Stochastic Pre-Ignition (2020)

Driveability (2019)

Southern California Ozone Research Symposium (2018)

What's New at CRC?

Expanding Research Focus

- UPSTREAM – SOURCES FOR RENEWABLES
- BRAKE & TIRE WEAR
- WILDFIRES
- ELECTRIFICATION
- HYDROGEN
- TECHNOECONOMIC ASSESSMENT
- TOPICS EVOLVE WITH MEMBER NEEDS

Expanding Industry Membership

MEDIUM / HEAVY-DUTY & NONROAD

BIO- & RENEWABLE FUELS

ELECTRIFICATION EQUIPMENT

NEW STAKEHOLDERS

Advanced Vehicle/Fuel/Lubricants Committee

11 Active Projects

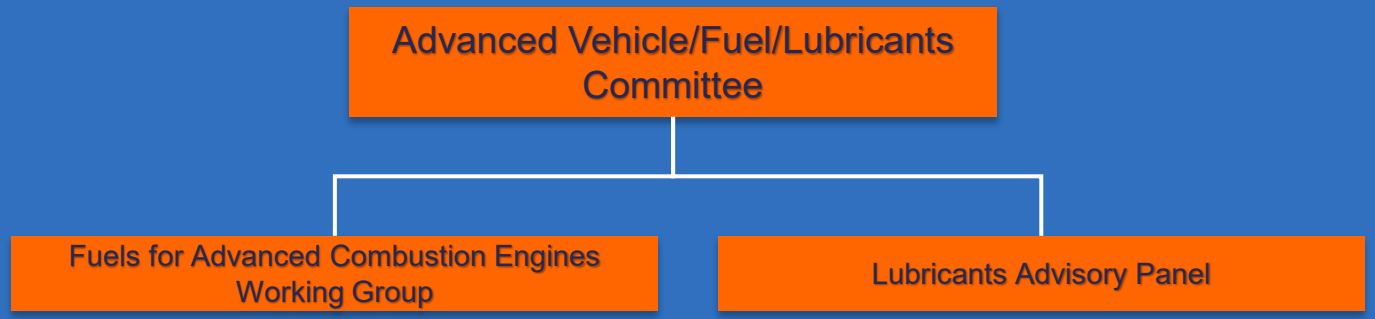
14 Publications in last 5 years

167 Researchers

- Advanced automotive hardware and new fuel formulation effects on automotive emissions (3-10 years out).
- Durability and operability of new fuel formulations in advanced hardware (3-10 years out).

Co- Chair:
Ivan Tibavinsky,
Mercedes Benz

Co- Chair:
Andrew Ickes,
Chevron



11 Active Projects

11 Publications in last 5 years

46 Researchers

Atmospheric Impacts Committee

Co- Chair: Sandy Winkler, Ford

- Focus resources to improve science and regulations related to air quality
- Improve the ability to predict effects of emissions on air quality by:
  - Improving inventories
  - Understanding air chemistry
  - Strengthening air quality models
- Predict the importance of emerging data

Co- Chair: Chris Rabideau, Chevron

Atmospheric Impacts Committee

Atmospheric Impacts Working Group

CRC

Emissions Committee

15 Active Projects

33 Publications in last 5 years

100 Researchers

- Define effects that changes in automotive hardware, fuel compositions, and their interactions have on automotive emissions related to air quality and air-borne toxics
- Address current and future regulatory needs
- Determine the contribution of vehicle/fuel source emissions to the environment and how current computer models reflect these contributions (RWG)

Emissions Committee

Co- Chair: Michael Moore, Stellantis

Co- Chair: Steve McConnell, Marathon

- Determine the contribution of vehicle/fuel source emissions to the environment and how current computer models reflect these contributions
- Open Working Group allowing interactions and collaborative projects with agencies & other industry partners

Real World Emissions & Emissions Modeling Working Group

Performance Committee

8 Active Projects

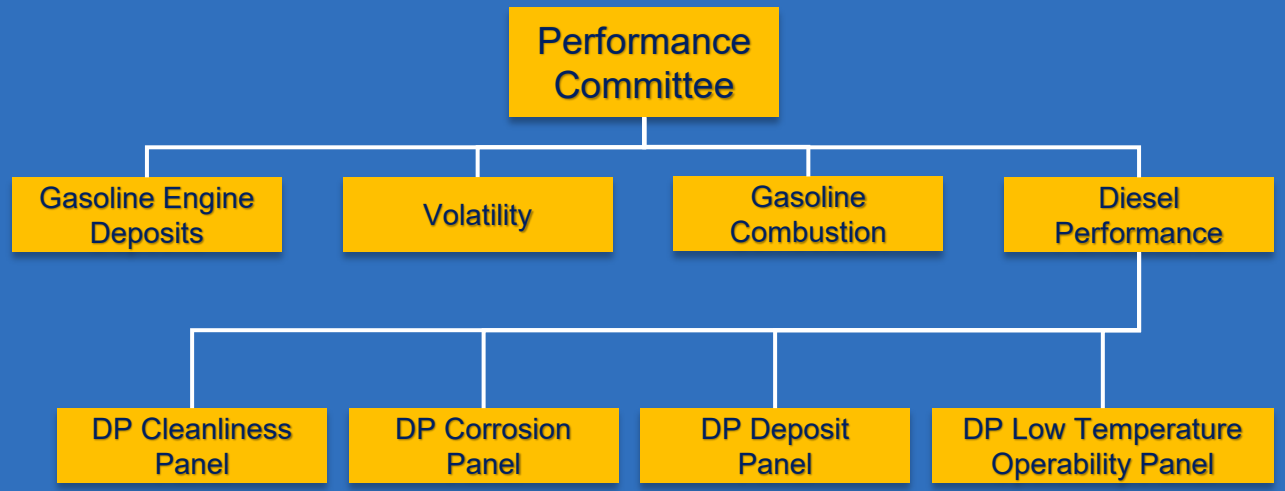
14 Publications in last 5 years

133 Researchers

- Relate physical and chemical properties of fuels to vehicle performance
  - Driveability/ Volatility Relationship
  - Octane Response
- Develop engine and vehicle test procedures to use in commerce and regulations and use these procedures to monitor vehicle/ fuel performance.
  - Deposits
  - Stability / Operability

Co- Chair: Beth Raney-Pablo, Ford

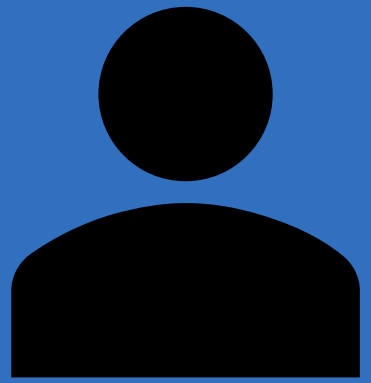
Co- Chair: Russ Lewis, Marathon



Sustainable Mobility Committee Leadership & Vision

Co- Chair:
Elana Chapman
Energy & Emissions Regulatory Technical Specialist
General Motors

Co- Chair:
Brianne Kanach,
Senior Principal Engineer,
Advanced Vehicles and Fuels
ExxonMobil Technology & Engineering



Co- Chair:
In Development
Funding / Charter Member

Vision

A multi-stakeholder forum for collaborative scientific research studies
focused on pathways towards a carbon neutral future
through significant greenhouse gas reductions from mobility
while seeking to understand tangential impacts

CRC's Sustainable Mobility Committee was founded in March 2021

Sustainable Mobility Committee Membership

Steering Committee

Open for New Members

Partner Member Group

- Joint Office of Energy and Transportation
- Department of Transportation
- Federal Highway Administration
- Environmental Protection Agency
- Department of Energy
- National Institute of Standards and Technology
- National Renewable Energy Laboratory
- Oak Ridge National Laboratory
- Argonne National Laboratory
- Pacific Northwest National Laboratory
- Sandia National Laboratory
- Lawrence Livermore National Laboratory
- Idaho National Laboratory
- Brookhaven National Laboratory
- Lawrence Berkeley National Laboratory
- United States Council for Automotive Research

The Partner Member Group membership is open for government agencies and related organizations.

They meet frequently to share information on the latest research and to discuss opportunities for collaborative research programs.

Sustainable Mobility Committee Structure and Research Focus

SMC Partners: Government Agencies & National Laboratories

Sustainable Mobility **Steering Committee**

Working Groups

Electrification SM-E	**Fuels** SM-F	**Hydrogen and Novel Carbon Reduction** SM-HCR	**Life Cycle Analysis** SM-LCA
Investigate challenges in the transition to electric propulsion	Support research in carbon reduction by liquid fuels	Explore systematic approaches to mobility carbon reduction	Provide a forum for review of LCA models and methods
Battery Electric Vehicles & Equipment; Grid Readiness and Resiliency; Vehicle to Grid; Battery Durability; Electric Vehicle Servicing Equipment; Charging Availability.	Low Carbon Fuels, Biofuels, Renewable Fuels, Sustainable Aviation Fuel, E-Fuels	Hydrogen, Energy Feedstocks, Air Quality, Infrastructure, Carbon Capture / Sequestration	Life Cycle Analysis, LCA Models, Methods, Inputs, and Validation; Life Cycle Analysis Workshops

Participation in the SMC Working Groups is open to representatives of Steering Committee Member companies, and individual researchers by invitation.

SM-E **Electrification** Working Group

Leadership


Christopher Brooks
Honda


Melissa Przybylo
Toyota


Ivan Tibavinsky
Mercedes-Benz

Mission & Focus: Investigate challenges in the transition to electric propulsion

Current Research Topics

Battery Durability	Electric Vehicle Servicing Equipment	Charging Availability
Battery Electric Vehicles & Equipment	Grid Readiness	Vehicle to Grid

Recent Publications

SM-E-16	**Exploring DC Fast Charging Load Profiles and Implications for Operators**	Smart Electric Power Alliance (SEPA)	**LINK**
SM-E-18 / E-142	**V2X Requirements to Support the SAE J1634 Short Multi-Cycle Test and Setting Initial SOC for Plug-In Hybrid Electric Vehicles**	Southwest Research Institute (SwRI)	**LINK**
SM-E-20	**Carbon Return on Investment for Electrified Vehicles**	National Renewable Energy Laboratory (NREL)	**LINK**
SM-E-4/8	**Predictive Lifetime Battery Simulations of Intra- and Inter-Cycle Degradation for V2G Use**	University of Michigan	**LINK**

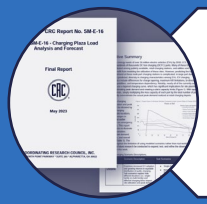
Active / Developing Projects

SM-E-20-2	**Carbon Return on Investment for Electrified Vehicles Follow-On**	*National Renewable Energy Laboratory (NREL)*
SM-E-2023-2	**Survey Of Public EV Charger Interoperability**	*developing & scoping partners*
SM-E-2025-01	**Understanding inefficiencies in an EV- EV charger ecosystem during charging**	

Potential Future Projects

BEV Benchmarking, Cold Operation & Preconditioning	***Prioritization and Development in Progress***
Battery Swapping vs. H2: Comparative Total Cost of Ownership	
Global Study of Charging Interfaces and Standards	
Enabling DC Fast Charging (DCFC) Installations at Traditional Fueling Sites and on Inter-City Corridors	

There are about **70 individual researchers** in the SM-E Working Group and Project Panels, representing Committee Members and partner organizations, including CARB, EPA, and Argonne National Lab.



CRC final reports are internally **peer reviewed** by the Project Panel, Working Group, and Steering Committee.

They are **available to the public** to be used to inform regulations, support standards, and to help Members improve their products.

Active, Developing, and Potential projects are all **opportunities for partnerships** in the form of direct funding or in-kind support.

About 1/3 of all CRC research is funded by a partnership.

Contact CRC Executive Director Chris Tennant to learn more about a partnership or membership options:
ctennant@crcao.org

SM-F **Fuels** Working Group

Leadership

Steve McConnell
Marathon

Michael Moore
Stellantis

Steven Panova
Electric Power Research Institute

Mission & Focus: Support research in carbon reduction by liquid fuels

Current Research Topics

- Low Carbon Fuels
- Biofuels
- Renewable Fuels
- Sustainable Aviation Fuel
- E-Fuels

Recent Publications

SM-1	**Evaluation of the Potential for Significant GHG Emission Reductions from ICEs Operated on Liquid Fuels**	ERM	**LINK**
SM-F-2 / A-134	**Sustainability and Local Air Quality Impacts of Future Electrification and New Vehicle Emission Regulation Scenarios in the U.S.**	University of Houston	**LINK**

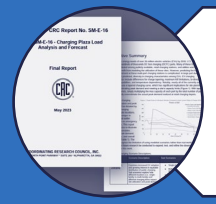
Active / Developing Projects

SM-F-5	**Research in Support of Future Fuel Specifications**	Southwest Research Institute (SwRI)
SM-F-2023-2	**Sustainable Biomass Availability for Existing O&G Infrastructure**	developing scope & partners

Potential Future Projects

Evaluation of Mid-level Ethanol Blends (E16 to E50) [an update to E-97]	***Prioritization and Development in Progress***
Fuel Survey Data Available from Public Sources	
Reactivity Characterization of Alternative Low and Zero-Carbon Fuels	
Fuel Composition Requirements to Maintain Original Equipment Design Performance	
Ducted Fuel Injection (DFI) Multi-Cylinder Engine (MCE) Demonstration	

There are about **50 individual researchers** in the SM-F Working Group and Project Panels, representing Committee Members and partner organizations.



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Leadership

Steve McConnell
Marathon

Andrea Lubawy
Toyota

Sunil Chhaya
Electric Power
Research Institute

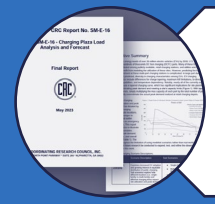
SM-HCR
Hydrogen and Novel Carbon Reduction Working Group

Mission & Focus: Explore systematic approaches to mobility carbon reduction

Current Research Topics

Infrastructure	Carbon Capture / Sequestration	Renewable Energy Storage (Grid)
Energy Feedstocks	Nuclear Power Impacts on Renewables	Hydrogen

There are about **40 individual researchers** in the SM-CR Working Group and Project Panels, representing Committee Members and partner organizations.



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Recent Publications

SM-CR-9	**Assess the Battery-Recharging and Hydrogen-Refueling Infrastructure Needs, Costs and Timelines Required to Support Regulatory Requirements for Light-, Medium-, and Heavy-Duty ZEVs**	ICF	**Executive Summary** **MD/HD ZEV Fact Sheet** **Final Report** New Analysis – Jan'25
SM-1	**Evaluation of the Potential for Significant GHG Emission Reductions from ICEs Operated on Liquid Fuels**	ERM	**LINK**

Projects in Final Reporting

SM-CR-2023-1	**Carbon Sources for E-Fuels (partnered with OGCI)**	Ricardo

Potential Future Projects

TCO for Fuel Cell Hydrogen Engines and BEV	***Prioritization and Development in Progress***
In-Use Emissions Performance of H2 ICE Vehicles	
System Cost Assessment for Electric Pathway vs E-fuel pathway	
H2 ICE Tolerance to Cross-Contamination of H2 Fuel Streams	
Decarbonization Pathways for Plastics	
Evaluation of Hydrogen Fuel Cells as a Power Source for Electric Vehicle Charging	

Contact CRC Executive Director Chris Tennant to learn more about a partnership or membership options:
ctennant@crcao.org

SM-LCA Life Cycle Analysis Working Group

Leadership

Robb De Kleine
Ford

Diep Vu
Marathon

Mission & Focus: Provide a forum for review of LCA models and methods

Current Research Topics

Life Cycle Analysis	LCA Models, Methods, Inputs, & Validation	LCA Workshop

Recent Publications

SM-LCAW 2023	**8th Life Cycle Analysis Workshop**	Argonne National Lab (ANL)	**LINK**
SM-1	**Evaluation of the Potential for Significant GHG Emission Reductions from ICEs Operated on Liquid Fuels**	ERM	**LINK**
SM-LCA-17	**Review of Selected Models Used for Biofuels GHG Determinations and Comparison of Results for Two Fuels**	Trinity	**LINK**

Active / Developing Projects

SM-LCA-17b	**Literature Review of Models Used for Biofuels GHG Emissions Modeling and Comparison of Results on Some Commonly Available Fuels – Follow-on**	Trinity
SM-LCA-2025-02	**9th Life Cycle Analysis Workshop**	***Hosted by Argonne National Laboratory: October 2025*** ***LINK***

Potential Future Projects

Evolution of lifecycle environmental impacts of future critical mineral extraction	***Prioritization and Development in Progress***
Comparative Wells-to-Wheel (WtW) NOx Emissions from ICEVs and BEVs and Impact on NAAQS	
Literature Review: Feedstock Cultivation Emission Factors	
Integrating Biofuels into Scope 3 Emissions Accounting for Enhanced Sustainability Scoring	
Lifecycle Analysis of Direct-Air Carbon Capture Pathways	

There are about **50 individual researchers** in the SM-LCA Working Group and Project Panels, representing Committee Members and partner organizations, including EPA.

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Sustainable Mobility Steering Committee Membership Options –2025

Charter Member $50,000+ / year

4 Steering Committee Voting Seats

Funding Member $25,000+ / year

2 Steering Committee Voting Seats

- Membership dues provide funding for the Committee's research program and support the organization.
- **Members and outside partners may also co-fund specific projects through in-kind or cost sharing.**
- Voting representation is scaled to dues, but Member researcher participation is not limited to voting seats*.

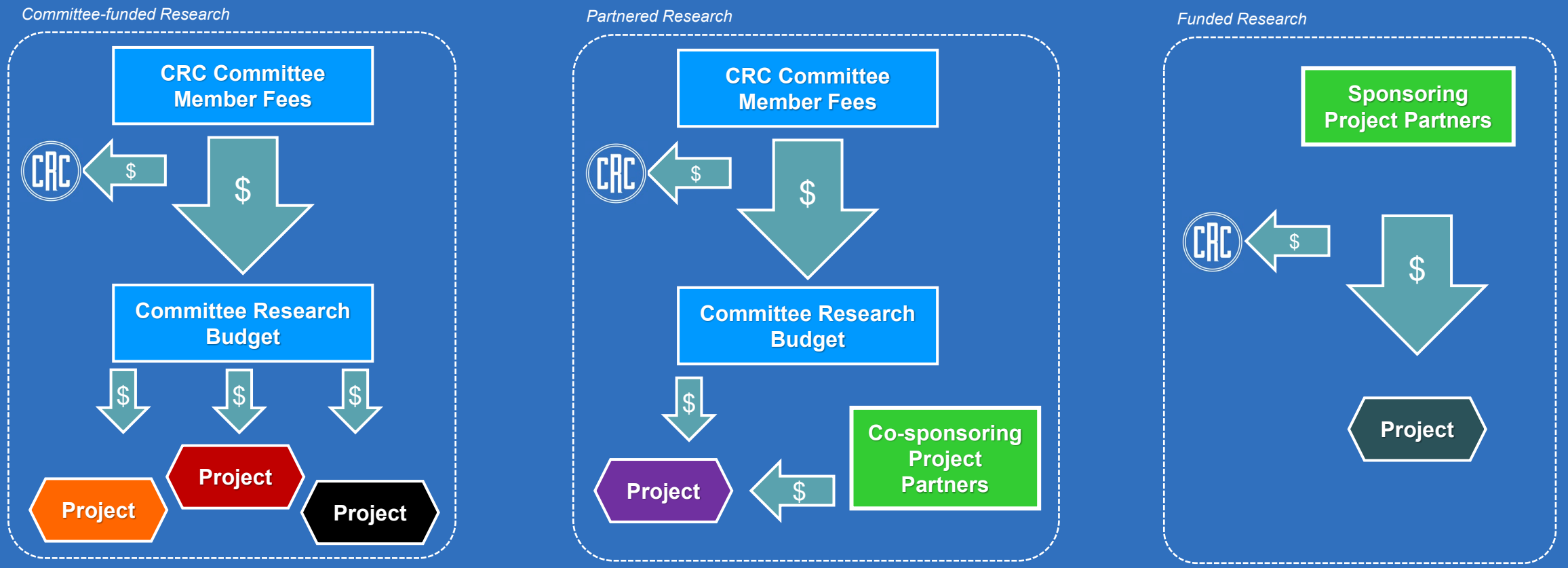
- All 14 current CRC Sustaining Members contribute $200,000 / year. One voting seat is recognized for each company.
- No single company will be accorded more than 25% of the voting seats.

**Membership by other associations is allowed, provided that the association staff are the primary technical participants.*

More Information

See also: www.crcao.org to find all CRC publications, workshop announcements, and requests for proposals.

CRC Research Project Funding - Approaches



These are illustrations of different pathways for our flexible approach to supporting research through Committee action and teaming arrangements. Support can be in-kind as well as funding. Partners can be from within or outside of the Committee.

All CRC research projects, regardless of how they are supported, follow the same process for Committee approval and review of all aspects of the research and the reporting.

What type of research does CRC do?

Experiments

Auto/Oil Air Quality Improvement Research Program 1989-1997 $40M (>$*82M today)*

Mid-Level Ethanol Blends Program 2009-2013 $17M *(>$23M today*)

Advanced Collaborative Emissions Study (ACES) Phases 1 & 2, 2005-2013 $2.6M *(>$4M today)*

Driveability: Hot-Fuel-Handling Program 2014 $1.4M, *(>$2M today*); 'Trick Car' Development; Rater Training Workshop 2021; Automated Driveability Rating System 2022

Remote Sensing of In-Use Vehicle Emissions (1999-2022)

Portable Emissions Measurement (2018-present**)**

Deposits (Gasoline and Diesel)

Low Speed Pre-Ignition (LSPI)

Fuel Properties and PM

Fuel Effects on PM

Test Method Development (Various)

Analysis

Implications of Regulations: Assess Recharging / Refueling Infrastructure for ZEVs

Evaluate Potential of Future Products and Fuels: Potential for ICE, Carbon Return on Investment, Future Fuel Specifications

Review and Analysis of Regulatory Models & Inputs: MOVES, EMFAC

Life Cycle Analysis (LCA)

Fuel Quality & Property Surveys: Gasoline – ethanol fuel blends, Natural Gas, Jet Fuel

Literature Reviews (various)

EV Fluid & Low Carbon Fuel Properties Analysis

Electric Vehicle Transition Modeling: Charging Network, V2X / Battery Durability Modeling

Events

Sustainable Mobility Workshop - Annual

Real World Emissions Workshop - 35+years

Aviation - Annual

Life Cycle Analysis Workshops - 2009 – present

Mobile Source Air Toxics Workshops (11 so far)

Air Quality Research Needs (2 so far)

Southern California Ozone Research Symposium 2018

Fuels and Engines: The Road Ahead 2020

Reference

Special Topics on CRC Website: e.g.:

Detailed Hydrocarbon Analysis (DHA) Research and Resources

Fuels for Advanced Combustion Engines

Books:

Handbook of Aviation Fuel Properties

The Mechanisms of Reactions Influencing Atmospheric Ozone (2015)

The Mechanisms of Atmospheric Oxidation of the Aromatic Hydrocarbons (2002)

History of Emissions Reduction (pending)

Lists are just examples to illustrate the range of research that the CRC technical committees support. *See the CRC website for and individual research project report and program descriptions in the annual reports:* ***www.crcao.org***

More Background on the Coordinating Research Council

Links to short presentations arranged by topic:

Understanding CRC

Impact of CRC Research

CRC Organization

Membership in CRC

History of CRC

CRC Events

This slide works best in Slide Show mode:

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