9. Acronyms

The following list of Acronyms cited within the report is provided as a reference for readers.

Acronym	Definition
1D or 1-D	One Dimensional
2D	Two Dimensional
3D	Three Dimensional
3-DEP	Three Dimensional Engineered Preform
5-Cycle	Light-duty testing conducted on a chassis dynamometer
A123	A123 Systems
ABR	Advanced Battery Research
AC	Alternating Current
ACCESS	Advanced Combustion Concepts Enabling Systems and Solutions
ACE	Advanced Combustion Engines
ACEC	Advanced Combustion and Emissions Control
ACERT	Advanced Combustion Emission Reduction Technology
ACES	Advanced Collaborative Emissions Study
ACI	AC Impedance
ADMA	ADMA Products, Inc.
AE	Acoustic Emission
AEC	Advanced Engine Combustion (Sandia National Laboratories)
AFDC	Alternative Fuels and Advanced Vehicles Data Center
AFR	Air Fuel Ratio
Ag	Silver
Ah	Ampere-hour
AIS4+	Abbreviated Injury Severity score of severe-to-fatal
Al	Aluminum
ALMS	American LeMans Series
AMOX	Ammonia Oxidation
AMR	Annual Merit Review
ANL	Argonne National Laboratory
APEEM	Advanced Power Electronics and Electric Machines Program
APRF	Advanced Powertrain Research Facility
APS	Advanced Photon Source
Ar	Argon
ARC	Accelerated Rate Calorimetry
ARL	Army Research Laboratory
ARPA-e	Advanced Research Projects Agency-Energy
ASAP	As Soon As Possible
AS/P	Automotive Supplier / Provider
ASI	Area-specific Impedance
ARRA	American Recovery and Reinvestment Act

Acronym	Definition
ASTM	American Society for Testing and Materials
AT	Aftertreatment
ATP-LD	Advanced Technology Powertrains for Light-Duty Vehicles
ATR-FTIR	Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy
AVFL-18	Project 18 under Advanced Vehicle/Fuel/Lubricants of the Coordinating Research Council
AVTA	Advanced Vehicle Testing Activity
B20	Biodiesel blend of 20% neat biodiesel
BAS	Bioanalytical Systems, Inc. electrochemical detector
BASF	BASF The Chemical Company
BATT	Batteries for Advanced Transportation Technologies
BCN	Boron carbonitride
BDB	Benzodioxaborole
Bi2Te3	Bismuth(III) telluride
BES	DOE Basic Energy Sciences
BET	Brunauer-Emmett-Teller
BEV	Battery Electric Vehicle
BIM	Bonded Interface Material
BLRT	Bond Line Read Through
BMEP	Brake mean effective pressure
BMS	Battery management system
BP	Boiling Point
BRN	Basic Research Needs
BSFC	Brake specific fuel consumption
BSST	BSST Thermoelectric Temperature Control Solutions
BTE	Brake thermal efficiency
BTO	Barium Titanate
BYU	Brigham Young University
C8	Aromatic hydrocarbon with eight carbon atoms
C	Degrees Celsius
C	Carbon
C2H2	Acetylene
CA50	Crank Angle of 50 percent mass fraction burned
Ca3Co4O9	Calcium cobalt oxide
CAE	Computer Aided Engineering
CAEBAT	Computer-Aided Engineering for Electric Drive Vehicle Batteries
CAFE	Corporate Average Fuel Economy
CARB	California Air Resources Board
CASE	Case Western Reserve University
CB	Carbon Black
CBS	Characteristic-Based Split
CD	Charge Depleting

Acronym	Definition
CE	Coulombic Efficiency
CFD	Computational Fluid Dynamics
CFS	Combustive Flow Simulation
CFTF	Carbon Fiber Test Facility
CHA	Chabazite
CHAdeMO	Direct current fast charger for batteries
CI	Compression Ignition
CLEERS	Cross-Cut Lean Exhaust Emission Reduction Simulation
CLOSE	Collaborative Lubricating Oil Study on Emissions
cm	Centimeters
CMC	Carboxymethyl cellulose
CMS	Carboxymethyl starch
CNG	Compressed Natural Gas
CNF	Carbon Nano-Fibers
CNT	Carbon Nanotubes
CO	Carbon Monoxide
COTS	Commercial Off The Shelf
COV	Coefficient of Variation
COVIMEP	Coefficient of Variation of the Indicated Mean Effective Pressure
CR	Compression ratio
CRADA	Cooperative Research and Development Agreement
CRC	Coordinating Research Council
CS	Charge Sustaining
CTE	Coefficient of thermal expansion
CV	Cyclic voltammetry
CVD	Chemical Vapor Deposition
DARPA	Defense Advanced Research Projects Agency
DBA	Direct Bonded Aluminum
DEC	Diethyl carbonate
DERC	Diesel Engine Research Consortium
DeNOx	Reduction of nitrogen oxides
DDC	Detroit Diesel Corporation
DF-2	Diesel Fuel
DFT	Density Functional Theory
DI	Direct Injection
DISI	Direct injection spark ignited
DLFT	Direct Compounded Long Fiber Thermoplastics
DMHP	Dual Mode Hybrid Powertrain
DNS	Direct Numerical Simulation
DOC	Diesel oxidation catalyst
DOD	Department of Defense

Acronym	Definition
DoD	Depth of Discharge
DOE	Department of Energy
DOW	Dow Chemical Company
DP	Dual Phase
DPF	Diesel particulate filter
DRIFTS	Diffuse Reflectance Infrared Fourier Transform Spectroscopy
DSC	Differential Scanning Calorimetry Analysis
E10	10 percent ethanol blend with gasoline
E15	15 percent volume ethanol blend with gasoline
E20	20 percent ethanol blend with gasoline
E85	85 percent ethanol blend with gasoline
EADPF	Electrically-assisted Diesel Particulate Filter
EC	Ethylene carbonate
ECN	Engine Combustion Network
ECU	Electronic Control Unit
EDAB	Electric Drive and Advanced Battery and Components Testbed
EDLC	Electric Double-Layer Capacitor
EDV	Electric Drive Vehicle (HEV, PHEV, BEV)
EDX	Energy-dispersive X-ray spectroscopy
EERE	Energy Efficiency and Renewable Energy
EGR	Exhaust Gas Recirculation
EISA	Energy Independence and Security Act of 2007
EMD	Electro-Motive Diesel
EMS	Ethylmethylsulfone
EMS	PEV/Energy Management System
EN	Electroless nickel
EO	Engine Out
EPA	Environmental Protection Agency
EPAct	Energy Policy Act
EPCOS	EPCOS Electronic Components, Modules, and Systems
EPRI	Electric Power Research Institute
ERDA	Elastic Recoil Detection Analysis
EREV	Extended Range Electric Vehicle
ES	DOE Energy Storage Program
ESM	Electrochemical Strain Microscopy
ESS	Energy Storage System
ETW	EPA Equivalent Test Weight
EUMD	End Use Measurement Device
EV	Electric Vehicle
EVSE	Electric Vehicle Supplemental Equipment
FAA	Federal Aviation Administration

Acronym	Definition
FACE	Fuels for Advanced Combustion Engines
FC	DOE Fuel Cell Technologies Program
FCV	Fuel Cell Vehicles
Fe	Iron
FE	Fuel Efficiency
FEERC	Fuels, Engines, and Emissions Research Center
FEM	Finite Elements Model
FEMS	Trifluoroethylmethylsulfone
Fe-Z	Iron zeolite
FFV	Flexible fuel vehicle
FFVA	Fully Flexible Valve Actuation
FIE	Fuel Injection Equipment
FLD	Forming Limit Diagram
FMC	FMC Corporation
FMVSS	Federal Motor Vehicle Safety Standards
FSN	Filter Smoke Number
FSP	Friction Stir Processing
FSW	Friction Stir Welding
FTP	Federal Test Procedure
FY	Fiscal Year
GaN	Gallium Nitride
GATE	Graduate Automotive Technology Education
GDCI	Gasoline Direct Injection Compression Ignition
GE	General Electric
GeoEVSE	Google-electric vehicle charging installation partnership
GDI	Gasoline Direct Injection
GHG	Greenhouse gases
GITT	Grid Integration Tech Team
GM	General Motors Corporation
GTDI	Gasoline Turbocharged Direct Injection
GT POWER	Gamma Technologies, Inc. computer-aided engineering software
GUI	Graphical User Interface
GWP	Global Warming Potential
HAN	Home Area Network
HBCU	Historically Black Colleges and Universities
HC	Hydrocarbon
HCCI	Homogeneous Charge Compression Ignition
HD	Heavy-duty
HDD	Heavy-duty diesel
He	Helium
HECC	High Efficiency Clean Combustion

Acronym	Definition
HEDGE	High Efficiency Dilute Gasoline Engine
HEV	Hybrid Electric Vehicle
HfN	Hafnium nitride
HIL	Hardware in the Loop
HMI	Human Machine Interface
HMS	Higher Manganese Silicides
HP	Higher-order Ploynomial Approximation
HPL	High Power Lithium
HPLB	High-Pressure, Lean Burn
HT	High Temperature
HTMI	high temperature melt integrity
HTML	High Temperature Materials Laboratory
HV	High Voltage
HVAC	Heating Ventilating and Air Conditioning
HW	Honeywell
HWFE	Highway Fuel Economy
H2	Hydrogen
IAC	International Automotive Components
IC	Internal Combustion
ICE	Internal Combustion Engine
ICP	Inductively-coupled Plasma
IEEE	Institute of Electrical and Electronics Engineers
IGBT	Insulated-gate bipolar transistor
IMEP	Indicated Mean Effective Pressure
INL	Idaho National Laboratory
IP	Intellectual Property
IPM	Interior Permanent Magnet
IR	Infrared
ISFC	Indicated Specific Fuel Consumption
ISO	International Organization for Standardization
ITE	Indicated Thermal Efficiency
ITP	DOE Industrial Technologies Program
ITS	Institute of Transportation Studies
JCI	Johnson Controls Inc.
JM	Johnson Matthey
JMI	John Marvin Inc.
JPL	Jet Propulsion Laboratory
K	Potassium
K	degrees Kelvin
K	Thousand
KAIST	Korea Advanced Institute of Science and Technology

Acronym	Definition
KAMAX	Kamax Auto Parts Co., Ltd.
kg	Kilogram
KIVA	Internal combustion engine simulation code (Los Alamos)
KULI	Software package for thermal modeling
kWh	Kilowatt hour
L	Liter
LBNL	Lawrence Berkeley National Laboratory
LC	Life Cycle
LCCF	Low Cost Carbon Fiber
LD	Light-duty
LDD	Light-duty Diesel
LDRD	Laboratory Directed Research and Development
LDV	Light Duty Vehicle
LEESS	Lower Energy Energy Storage System
LES	Large Eddy Simulation
LEVIII	State of California Low-Emission Vehicle III regulations
LFP	Lithium iron phosphate
LG	LG Chem
Li	Lithium
LLC	Limited Liability Company
LLFC	Lean Lifted Flame Combustion
LLNL	Lawrence Livermore National Laboratory
LLDPE	Linear Low-Density Polyethylene
LLV	Long Life Vehicle (used by USPS)
LMR-NMC	lithium- and manganese-rich transition metal oxides
LNMO	Lithium Nickel Manganese Oxide
LNT	Lean NOx Trap
LSP	Laser shock peening
LT	Low Temperature
LTC	Low Temperature Combustion
LTO	Low Temperature Oxide (form of silicon dioxide)
M	Million
M&S	Modeling and Simulation
MC550	Mesoporous hard carbon
MCE	Multi-cylinder Engine
MCMB	Mesocarbon Microbeads
MD	Medium-duty
MECA	Manufacturers of Emissions Control Association
MEI	Magnetic-electro Imaging
MEMS	Methoxyethyl methyl sulfone
MENA	Magnesium Elektron North America

Acronym	Definition
MFI	Mordenite Framework Inverted
MIT	Massachusetts Institute of Technology
MNC	Metal-Nitrogen-Carbon
MnSi	Manganese Silicide
MO	Molecular Orbital
MOU	Memorandum of Understanding
MS	Masters of Science
MSCl	Methanesulfoneyl chloride
MSF	Methanesulfoneyl fluoride
MSU	Michigan State University
MTU	Michigan Technology University
NA	North America
NaCo2O4	sodium cobalt oxide
NASA	National Aeronautics and Space Administration
NCA	Battery cathode material (nickel cobalt aluminum oxide)
NDA	Non-Destructive Analysis
NDA	Non-Disclosure Agreement
NDE	Non-Destructive Evaluation
NEC	National Electrical Code
NETL	National Energy Technology Laboratory
NFAC	National Full-Scale Aerodynamics Complex
NFPA	National Fire Protection Association
NG	Natural Gas
NGK	NGK Spark Plugs USA
NH3	Ammonia
NHTSA	National Highway Traffic Safety Administration
NiMH	Nickel-metal hydride
NIST	National Institute of Standards and Technology
NMC	Nickel manganese cobalt
NMEP	Net Mean Effective Pressure
NMR	Nuclear Magnetic Resonance
NOx	Nitrogen Oxide
N2	Nitrogen
N2O	Nitrous Oxide
NPBF	Non-petroleum Blend Fuels
NRC	National Research Council
NREL	National Renewable Energy Laboratory
NSF	National Science Foundation
NSR	NOx Storage/Reduction
NTC	Negative Temperature Coefficient
NTIS	National Technical Information Service

Acronym	Definition
NTRC	National Transportation Research Center
NVH	Noise/vibration/harshness
NVO	Negative valve overlap
OE	DOE Office of Electricity Delivery and Energy Reliability
OE	Original Equipment
OEM	Original Equipment Manufacturer
OIT	DOE Office of Industrial Technologies
ORC	Organic Rankine cycle
ORMAT	Ormat Technologies Inc.
ORNL	Oak Ridge National Laboratory
OSU	Ohio State University
OSU	Oregon State University
OVT	Office of Vehicle Technologies
PACCAR	Commercial Vehicle Manufacturer (Kenworth, Peterbilt, DAF)
PAH	Polycyclic Aromatic Hydrocarbon
PAN	Polyacrylonitrile
PASS	Passive Ammonia SCR System
PbTe	Lead(II) Telluride
PCCI	Premixed Charge Compression Ignition
PDF	Adobe Portable Document Format
PEV	Plug-in Electric Vehicle
PFI	Port Fuel Injected
PGM	Precious-group metals
PHEV	Plug-In Hybrid Electric Vehicle
PHEV40	Plug-In Hybrid Electric Vehicle with a 40-mile range on a single charge
PI	Principal Investigator
PIV	Particle Image Velocimetry
PLC	Programmable Logic Controller
PM	Particulate Matter
PM	Propulsion Materials
PN	Particulate Number
PNA	Polynuclear Aromatics
PNNL	Pacific Northwest National Laboratory
PREA	Partnership for Roadway Electrification & Automation
PRESICE	Combustion Model
PSAT	Powertrain Systems Analysis Toolkit
PSD	Particle Size Distribution
PSE gPROMS	Process Systems Enterprise Limited (PSE) advanced process modeling
PV	Photovoltaic
PVdF	Polyvinylidene Fluoride
PZT	Lead zirconate titanate film

Acronym	Definition
RAPTR	Regenerative Air Preheating and Thermochemical Recuperation
RB	Reverse Blocking
RBIGBT	Reverse Blocking Insulated Gate Bipolar Transistor
RBC	Route Based Control
RBS	Rutherford Backscattering Spectrometry
RCCI	Reactivity Controlled Compression Ignition Combustion
RCF	Rapid Compression Facility at the University of Michigan
RCM	Rapid Compression Machine
R&D	Research and Development
RD&D	Research, Development, and Demonstration
RNG	Renormalization Group
RFSII	Renewable Fuel Standard, as amended
RON	Research Octane Number
RPM	Revolutions Per Minute
RSM	Response Surface Methodology
S	Sulfur
SACI	Spark Assisted Compression Ignition
SAE	Society of Automotive Engineers
SAFT	The Saft Group
SANS	Small Angle Neutron Scattering
SA-HCCI	Spark-Assisted Homogeneous Charge Compression Ignition
SBR	Styrene butadiene rubber
ScN	Scandium nitride
SCR	Selective Catalytic Reduction
SEI	Solid electrolyte interface
SEM	Scanning Electron Microscope
SEP	Smart Energy Profile
SHNC	Superhard Nanocomponent
Si	Silicon
SI	Spark Ignition
SiC	Silicon Carbide
SLA	Sealed Lead Acid
SLMP	Stabilized Lithium Metal Powder
SNL	Sandia National Laboratories
SO2	Sulfur Dioxide
SO3	Sulfite
SOC	State of Charge
SOD	Superoxide Dismutase
SOI	Start of Injection
SOM	Solid Oxide Membrane
SOP	Standard Operating Procedure

Acronym	Definition
SP	Single Phase
SPX	SPX Service Solutions
SSITKA	Steady State Isotopic Transient Kinetic Analysis
STEM	Scanning Transmission Electron Microscopy
SUNY	State University of New York
SWRI	Southwest Research Institute
T2B2	Tier 2 Bin 2 Emissions Standards
TACOM	Tank-automotive and Armaments Command
TARDEC	Tank Automotive Research, Development, and Engineering Center
TBC	Thermal Barrier Coating
TDL	Tunable Diode Laser
TE	Thermoelectrics
TEG	Thermoelectric Generator
TEM	Transmission Electron Microscope
TEMats	Thermoelectric Materials
TGA	Thermogravimetric Analysis
TiO2	Titanium dioxide
TNO	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek
TWIP	Twinning-Induced Plasticity
TWC	Three-way Catalyst
UAB	University of Alabama Birmingham
UC	University of California
UCLA	University of California, Los Angeles
UCON	University of Connecticut
UDDS	Urban Dynamometer Driving Schedule
UHC	Unburned Hydrocarbons
UIUC	University of Illinois at Urbana-Champaign
UL	Underwriters Laboratories
UM	University of Michigan
UNLV	University of Nevada Las Vegas
USABC	US Advanced Battery Consortium
USAMP	U.S. Automotive Materials Partnership
USCAR	United States Council for Automotive Research
USDA	United States Department of Agriculture
USPS	United States Postal Service
USW	Ultrasonic Welding
UT	University of Tennessee
V2G	Vehicle to Grid
VDA	Verband der deutschen Automobilindustrie or Association of German Automobile Manufacturers
VGC	Vehicle to Grid Communication
VGCF	Vapor-grown Carbon Fiber

Acronym	Definition
VLBT	Variable-load Bearing Test
VPI & SU	Virginia Polytechnic Institute and State University
VT	Vehicle Technologies
VTC	Vehicle to charger
VtG	Vehicle to Grid
VTP	Vehicle Technologies Program
VVA	Variable Valve Actuation
Wh	Watt hour
WHR	Waste Heat Recovery
WJP	Water Jet Peening
WPAFB	Wright-Patterson Air Force Base
WPT	Wireless Power Transfer
WWMP	World Wide Mapping Point
X-Prize	Progressive Automotive X-Prize Competition
XAFS	X-ray Absorption Fine Structure
XPS	X-ray Photoelectron Spectroscopy
WG	Working Group
XRD	X-ray Diffraction (Crystallography)
Z	Zinc
ZCSI	Z-source Current Source Inverter
ZT	Thermoelectrics figure of merit (measure of efficiency)