9. Acronyms and Abbreviations

°C	Degrees Celsius
1.5 M LiFSI-TEP/BTFE	Lithium-ion battery electrolyte
3-D	Three-dimensional
3GAHSS	Third-Generation Advanced High-Strength Steel
A/F	Air/fuel
ABM	Activity-based model
ABMS	Agent-based modeling and simulation
ABR	Applied Battery Research for Transportation
AC	Alternating current, air conditioning
ACC	Adaptive cruise control, automated cruise control
ACEC	Advanced Combustion & Emissions Control
ACES	Automated, connected, efficient, and shared; automated, connected, electric, and shared
ACI	Advanced compression ignition
ACI-F	Advanced compression ignition: fuel effects
ADAS	Advanced driver assistance system
AEC	Advanced Engine Combustion
AES	Automated electric shuttle
AFDC	Alternative Fuels Data Center
AFIDA	Advanced fuel ignition delay analyzer
AFV	Alternative fuel vehicles
Ah	Ampere-hour
AI	Artificial intelligence
Al	Aluminum
Al_2O_3	Aluminum oxide (alumina)
ALD	Atomic-layer deposition

ALS	Advanced Light Source
AMBER	Advanced Model Based Engineering Resource
AMD	Automated mobility districts
AMFI	Additive-mixing fuel injection
AMR	Annual Merit Review
ANL	Argonne National Laboratory
ANN	Artificial neural network
APRF	Advanced Powertrain Research Facility
ARDL	Akron Rubber Development Laboratory
ARL	Army Research Laboratory
ARPA-E	Advanced Research Projects Agency-Energy
ASIL	Automotive Safety Integrity Level
ASR	Area-specific resistance
ATF	Automatic transmission fluid
ATM	Active traffic management
atm	Atmosphere
ATR	Attenuated total reflection
AV	Automated vehicle
AVL-18a	Fuel for engine testing
AVTC	Advanced Vehicle Technology Competitions
AZ31	Magnesium alloy
B	Magnetic-flux density
Ba	Barium
BAU	Business as usual
BEAM	Behavior, Energy, Autonomy, and Mobility
BEV	Battery electric vehicle
BH_{max}	Maximum energy product
BMR	Battery Materials Research

BNL	Brookhaven National Laboratory
BOL	Beginning of life
BP	Budget Period
Br	Bromine
Br	Residual induction
BTE	Brake thermal efficiency
BU	Binghamton University
C	Charge rate
C	Carbon
C_3H_6	Propene
C70	Fullerene molecule used as a conductor
CA50	Crank angle position at which 50% of heat is released
CAC	Cooperative automated control
CACC	Cooperative adaptive cruise control
CAE	Computer-Added Engineering
CAEBAT	Computer-aided engineering of batteries
CAFÉ	Corporate Average Fuel Economy
CAMP	Cell Analysis, Modeling, and Prototyping Facility
CAN	Controller area network
CAV	Connected autonomous vehicle, connected and automated vehicle
CBD	Carbon-binder domain
CD	Cylinder deactivation
Ce	Cerium
CE	Coulombic efficiency
CEI	Cathode-electrolyte interphase
CeO_2	Cerium oxide (ceria)
CF	Carbon fiber
CFC	Carbon fiber composites

CFD	Computational fluid dynamics
CFP	Capillary flow porometry
CFR	Constant-pressure flow rig
CFRP	Carbon fiber-reinforced polymer
CGI	Compacted graphite iron
CH_4	Methane
CHA	Chabazite
CHT	Conjugate heat transfer
CI	Compression ignition, conversion inflection
Cl	Chlorine
CLEERS	Cross-cut Lean Exhaust Emissions Reduction Simulations
CNG	Compressed natural gas
CNT	Carbon nanotubes
CO	Carbon monoxide
CO_2	Carbon dioxide
CoEx	Co-extrusion
COV	Coefficient of variation
CPC	Capacitive power coupler
CPEC	Close Proximity Electromagnetic Carbonization
CPU	Central processing unit
CR	Compression ratio
CRADA	Cooperative Research and Development Agreement
CRF	Combustion Research Facility
Crr	Coefficient of rolling resistance
CT	Computerized tomography
CTE	Coefficient of thermal expansion
Cu	Copper
CV	Connected vehicle

D	Dimension
DC	Direct current
DCFC	Direct-current fast-charging
DEER	Directions in Engine-Efficiency and Emissions Research
DEF	Diesel-exhaust fluid (urea)
DEGR	Dedicated exhaust gas recirculation
DEM	Discrete-element method
DEMS	Differential electrochemical mass spectroscopy
DFI	Ducted fuel injection
DFT	Density functional theory
DI	Direct-injection
DIC	Digital image correlation
DMC	Dimethyl carbonate
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DPF	Diesel particulate filter
DSF	Dynamic Skip Fire
DSR	Dynamic species reduction
DSRC	Dedicated short-range communications
dT	Change in temperature
DWPT	Dynamic wireless power transfer
E	Young’s modulus
E/S	Electrolyte/sulfur
E10	10% ethanol content gasoline
E85	85% ethanol content gasoline
EC	Ethylene carbonate
ECCE	Energy Conversion Congress and Exposition
ECN	Engine Combustion Network

Eco-CACC-I	Eco-Cooperative Adaptive Cruise Control-I
ECU	Engine control unit
ECV	Electric commercial vehicle
EDLi	Electrochemically deposited lithium
EDS	Electric drive system, energy-dispersive X-ray spectroscopy
EDV	Electric drive vehicle
EELS	Electron energy-loss spectroscopy
EEMS	Energy-Efficient Mobility Systems
EERE	Energy-Efficiency and Renewable Energy
EES	Electrochemical energy storage
EETT	Electrical and Electronics Technical Team
EGR	Exhaust gas recirculation
EHN	Ethylhexyl nitrate
EIS	Electrochemical impedance spectroscopy
ELSA	Euler-Lagrange spray atomization
ELT	Electrification Technologies
EM	Electromagnetic
EMN	Energy Materials Network
EMS	Energy management system
EPA	U.S. Environmental Protection Agency
EPR	Electron Paramagnetic Resonance
EUCAR	European Council for Automotive R&D
EV	Electric vehicle
EVI-Pro	Electric Vehicle Infrastructure Projection
EVSE	Electric vehicle supply equipment
EXAFS	Extended X-ray absorption fine structure
FAA	Federal Aviation Administration
FACE	Fuels for advanced combustion

FASTSim	Future Automotive Systems Technology Simulator
FBJ	Friction Bit Joining
FCA	Fiat Chrysler Automobiles
FCEV	Fuel cell electric vehicle
FE	Fuel economy
FEC	Fluoroethylene carbonate
FFRDC	Federally Funded Research and Development Center
FHWA	Federal Highway Administration
FLD	Forming Limit Diagram
FMCSA	Federal Motor Carrier Safety Administration
FOM	Figure of merit
FOTW	Fact of The Week
FSW	Friction Stir Weld
FT	Fuel and Lubricant Technologies
FTA	Federal Transit Administration
FTIR	Fourier transform infrared
FTP	Federal Test Procedure
FY	Fiscal Year
g/cc	Gram/cubic centimeter
GaN	Gallium nitride
GCI	Gasoline compression ignition
GDI	Gasoline direct injection
GHG	Greenhouse Gas
GM	General Motors
GM	General Motors
GPF	Gasoline particulate filter
GPS	Global positioning system
Gr	Graphite

GREET	Greenhouse gas, Regulated Emissions, and Energy use in Transportation
GTI	Gas Technology Institute
GVW	Gross vehicle weight
GWh	Gigawatt-hour
H	Magnetic-field strength
H_2	Hydrogen gas
HC	Hydrocarbon
HCCI	Homogeneous-charge compression ignition
Hci	Intrinsic coercive force
HCl	Hydrochloric acid
HCP	Hexagonal closed pack
HD	Heavy-duty
HDD	Heavy-duty diesel
HDV	Heavy-duty vehicle
HEDGE	High-Efficiency Dilute Gasoline Engine
HESM	Hybrid excitation synchronous machine
HEV	Hybrid electric vehicle
HIL	Hardware-in-the-loop
HOV	Heat of vaporization
HPC	High-performance computing
HP-RTM	High-Pressure Resin Transfer Molding
HRE	Heavy rare earth
HRR	Heat-release rate
HRTEM	High-resolution transmission electron microscopy
HT	Heat transfer
HTA	Hydrothermal aging
HV	High voltage
HWFET	Highway Fuel Economy Test

Hz	Hertz
I_0	Exchange current
IC	Internal combustion
ICE	Internal combustion engine
ICL	Irreversible capacity loss
ICME	Integrated Computational Materials Engineering
IEEE	Institute of Electrical and Electronics Engineers
IMEP	Indicated mean effective pressure
IMS	Insulated metal substrate
INL	Idaho National Laboratory
IPM	Interior permanent magnet
IR	Infrared
iTiC	International Transportation Innovation Center
ITS-JPO	Intelligent Transportation System Joint Program Office
JMI	Johnson Matthey Inc.
k	Thermal conductivity
KC	Kinetically controlled
kg	Kilogram
kW	Kilowatt
kW/l	Kilowatt per liter
kWh	Kilowatt-hour
L	Liter
L4	Level 4 high automation
L5	Level 5 full automation
LA	Los Angeles
LANL	Los Alamos National Laboratory
LATP	$Li_{1+x}Al_xTi_{2-x}(PO_4)_3$
lb	Pound

LBNL	Lawrence Berkeley National Laboratory
LCA	Life cycle analysis
LCD	Levelized cost of driving
LCO	Lithium cobalt oxide
LD	Light-duty
LDV	Light-duty vehicle
LES	Large eddy simulation
LESI	Lagrangian-Eulerian spark ignition
LFP	Lithium-iron phosphate
LHCE	Localized high-concentration electrolyte
Li	Lithium
Li_3NbO_4	Trilithium niobate
LIDAR	Light imaging, detection, and ranging
LiEDC	Lithium ethylene dicarbonate
LightMAT	Lightweight Materials Consortium
LIGO	Laser Interferometer Gravitational-wave Observatory
LiPON	Lithium phosphorous oxy-nitride
LiS	Lithium-sulfur
LLFC	Leaner lifted flame combustion
LLNL	Lawrence Livermore National Laboratory
LLS	Layered-layered spinel
LLTO	Lithium lanthanum titanate
LLZMO	Lithium lanthanum zirconium molybdenum oxide
LLZO	Lithium lanthanum zirconate
LMO	Lithium manganese oxide
LNG	Liquefied natural gas
LNMO	Lithium nickel manganese oxide
LNRO	$Li_{1.2}Ni_{0.2}Ru_{0.6}O_2$

LRLO	Lithium-rich layered oxide
LSTM	Long short-term memory
LT	Low-temperature
LTAT	Low-temperature aftertreatment
LTC	Low-temperature combustion
LTC	Low-temperature carbonization
LTGC	Low-temperature gasoline combustion
LTO	Lithium titanate
m/s	Meters per second
M2M	Michigan to Montana
MA3T	Market Acceptance of Advanced Automotive Technologies
MaaS	Mobility-as-a-system, mobility-as-a-service
mAh/g	Milliampere-hour/gram
MCCI	Mixed-mode compression ignition
MD	Molecular dynamics
MD	Medium-duty
MDV	Medium-duty vehicle
MEP	Mobility energy productivity
MERF	Materials Engineering Research Facility
mg	Milligram
Mg	Magnesium
mg/cm^2	Milligram/square centimeter
MgO	Magnesium oxide
MGOe	Megagauss Oersted
MHz	Megahertz
MIT	Massachusetts Institute of Technology
ML	Machine learning
ml	Milliliter

mm	Millimeter
MMC	Metal-matrix composites
MMLV	Multi Material Lightweight Vehicle
Mn	Manganese
Mo	Molybdenum
MOC	Model predictive control
MON	Motor octane number
MORPC	Mid-Ohio Regional Planning Commission
MOU	Memorandum of Understanding
MOVES	Motor Vehicle Emission Simulator
MPC	Model-predictive control
MPO	Metropolitan Planning Organization
M_S	Saturation magnetization
MS	Mass spectroscopy
MUD	Multi-unit dwelling
N/P	Ratio of negative to positive electrodes
Na	Sodium
NA	North American
NA	Naturally aspirated
Nb	Niobium
NCA	Nickel cobalt aluminum oxide
NCF	Non-crimp fabrics
NCM	Nickel cobalt manganese oxide
NCMA	$Li_{1.0}Ni_{0.8}[Mn, Co, Al]_{0.2}O_2$
NDA	Non-disclosure agreement
NH_3	Ammonia
NHTSA	National Highway Traffic Safety Administration
Ni	Nickel

nm	Nanometer
NMC	Nickel manganese cobalt oxide
NMP	N-methylpyrrolidone
NMR	Nuclear magnetic resonance
NO_x	Oxides of nitrogen
nPDF	Neutron pair distribution function
NPP	Nuclear power plant
NRC	National Research Council of Canada
NREL	National Renewable Energy Laboratory
NSF	National Science Foundation
NVH	Noise, vibration, and harshness
O_2	Oxygen
OAS	Open architecture software
OBD	On-board diagnostics
O-D	Origins-destination
ODOT	Ohio Department of Transportation
Oe	Oersted
OEM	Original equipment manufacturer
ORNL	Oak Ridge National Laboratory
OS	Octane sensitivity
OTA	Over-the-air
P	Pressure
PAH	Polycyclic aromatic hydrocarbon
Pd	Palladium
PDF	Pair distribution function
PDVF	Polyvinylidene difluoride
PEO	Polyethyleneoxide
PEV	Plug-in electric vehicle

PF	Power factor
PGM	Platinum group metals
PHEV	Plug-in hybrid electric vehicle
PI	Principal Investigator
PLD	Pulsed laser deposition
PM	Particulate matter
PMI	Particulate matter index
PN	Particle number
PNA	Passive NO_X adsorber
PNNL	Pacific Northwest National Laboratory
POLARIS	Planning and Operations Language for Agent-based Regional Integrated Simulation
PSU	Pennsylvania State University
Pt	Platinum
PTFE	Poly(tetrafluroethylene)
PTO	Power takeoff
Q&A	Question and answer
R&D	Research and development
R2R	Roll-to-roll
R_c	Thermal contact resistance
RCEM	Rapid compression expansion machine
RCM	Rapid compression machine
RD587	88-octane research gasoline
RL	Reinforcement learning
RMS	Root mean square
$ROCO_2Li$	Lithium alkyl carbonate
ROI	Return on investment
RON	Research octane number
rpm	Revolutions per minute

RTM	Resin transfer molding
RVE	Representative volume element
s	Second
S	Sulfur
S/cm	Siemen per centimeter
SAE	Society of Automotive Engineers
SCAQMD	South Coast Air Quality Management District
SCO	Selective catalytic oxidation
SCO	Spray/combustion—optical imaging
SCR	Selective catalytic reduction
SCRF	Selective catalytic reduction on filter
SEI	Solid electrolyte interface
SEISta	Silicon Electrolyte Interface Stabilization
SEM	Scanning electron microscope
Si	Silicon
SI	Spark ignition
SiC	Silicon carbide
SIMS	Secondary ion mass spectroscopy
SiO_x	Silicon oxides
SLAC	Stanford Linear Accelerator Center
SMART	Systems and Modeling for Accelerated Research in Transportation
SMC	Sheet molding compound
SME	Subject matter expert
SNL	Sandia National Laboratories
SOC	State of charge
SOH	State of health
SPRINGS	Statistical Planning for Resilience in Next Generation Systems
SS	Sprays—simulation

SSE	Solid-state electrolyte
SSRL	Stanford Synchrotron Radiation Lightsource
SSRM	Scanning spread resistance microscopy
ST	SuperTruck
ST1	SuperTruck I
ST2	SuperTruck II
STEM	Scanning transmission electron spectroscopy
STEM	Science, technology, engineering, and math
SUV	Sport utility vehicle
SVTrip	Stochastic vehicle trip
SX	Sprays—X-ray imaging
sXAS	Soft X-ray absorption spectroscopy
T	Tesla
T50	Temperature at which 50% conversion occurs
T90	Temperature at which 90% conversion occurs
Ta	Tantalum
TARDEC	U.S. Army Tank Automotive Research, Development and Engineering Center
TAZ	Travel analysis zone
TBC	Thermal barrier coating
TCO	Total cost of ownership
TEDB	Transportation Energy Data Book
TEGDME	Tetraethyleneglycoldimethane
TEM	Transmission electron microscopy
TERS	Tip-enhanced Raman spectroscopy
Ti	Titanium
TI	Technology Integration
TiAl	Titanium aluminides
TiB_2	Titanium diboride

TiO_2-S	Titanium dioxide-sulfur
TJI	Turbulent jet ignition
TM	Transition metal
TMPSi	Trimethoxypropylsilane
TNC	Transportation network company
TOU	Time of use
TPG	Thermal pyrolytic graphite
TPI	Transient plasma ignition; tuned port injection
TRANSNET	Traveler Response Architecture using Novel Signaling for Network Efficiency in Transportation
TRL	Technology readiness level
TSDC	Transportation Secure Data Center
TTFP	Tris(2,2,2-trifluoroethyl) phosphite
TTI	Texas Transportation Institute
TWC	Three-way catalyst
TXM	Transmission X-ray microscope
U.S.	United States
U.S. DRIVE	United States Driving Research for Innovation for Vehicle efficiency and Energy sustainability
UC	University of California
UCC	Ultra-conductive copper
UCLA	University of California at Los Angeles
UCSD	University of California at San Diego
UDDS	Urban Dynamometer Driving Schedule
UE	User equipment
UHSS	Ultra-High Strength Steels
UIC	University of Illinois at Chicago
UM	University of Michigan
UMD	University of Maryland

UNR	University of Nevada, Reno
UPS	United Parcel Service
USABC	U.S. Advanced Battery Consortium
USAMP	United States Automotive Materials Partnership
USCAR	United States Council for Automotive Research
UT-Austin	University of Texas at Austin
UV	Ultraviolet
UW	University of Washington
UW	University of Wisconsin – Madison
V	Volt
V	Vanadium
V2G	Vehicle-to-grid
V2I	Vehicle-to-infrastructure
V2V	Vehicle-to-vehicle
VAN	Vehicle Analysis (VTO program)
VATT	Vehicle average travel time
VCR	Variable compression ratio
VERIFI	Virtual Engine Research Institute and Fuels Initiative
VIBE	Virtual integrated battery environment
VIL	Vehicle-in-the-loop
VMT	Vehicle miles traveled
VTO	Vehicle Technologies Office
WBG	Wide bandgap
WFSM	Wound-field synchronous machine
Wh	Watt-hour
Wh/kg	Watt-hour per kilogram
WHR	Waste heat recovery
XAS	X-ray absorption spectroscopy

XPS	X-ray photoelectron spectroscopy
XRD	X-ray diffraction spectroscopy
YS	Yield strength
YSI	Yield sooting index
ZEK100	Magnesium alloy
Zero-RK	Zero-order reaction kinetics
Zr	Zirconium
ZrO_2	Zirconium dioxide (zirconia)

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