Mobile Sources Technical Review Subcommittee

Sustainable TRANSPORTATION

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Accelerating the Path to Economic and Sustainable Fuels and Vehicles (Optima)

The Ames Lab · Argonne National Laboratory · Berkeley Lab · Brookhaven National Laboratory · Fermilab · Idaho National Laboratory · Jefferson Lab · NETL · NREL · Oak Ridge National Laboratory · Pacific Northwest National Laboratory · Lawrence Livermore National Laboratory · Los Alamos National Laboratory · PPPL · Sandia National Laboratories · SLAC · SRNL

Goal: better fuels and better vehicles

sooner

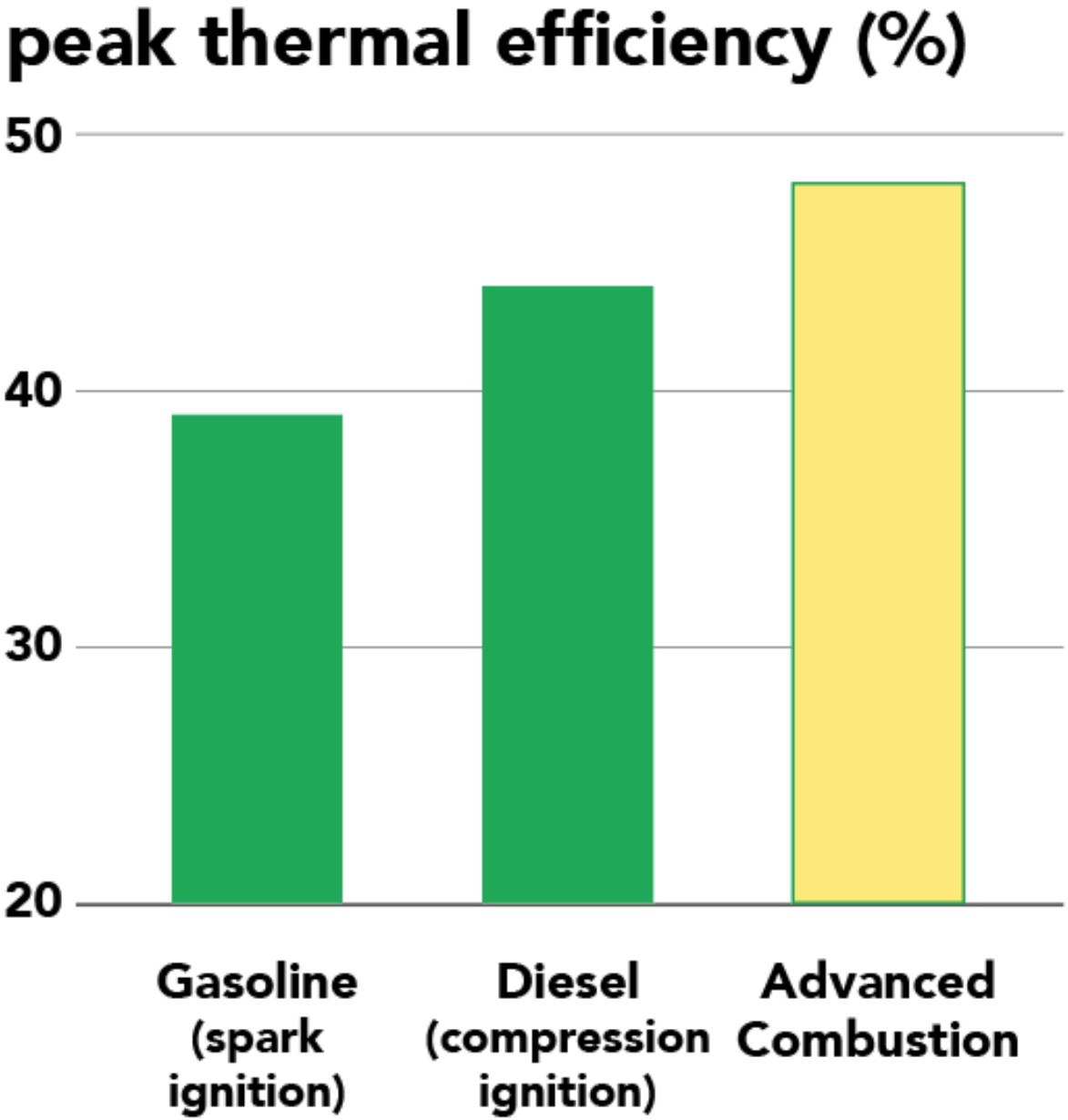
ICEs

will dominate fleet

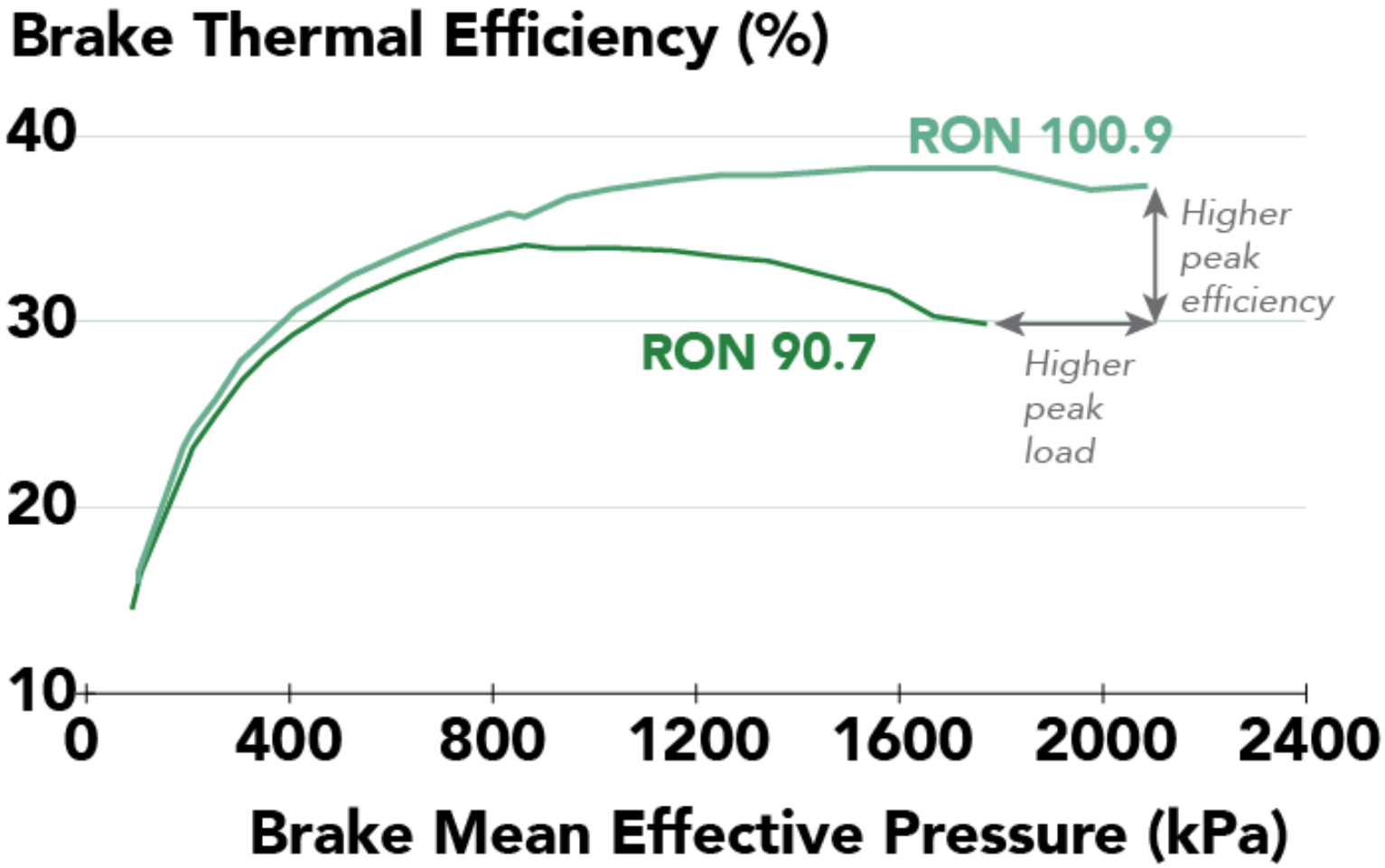
for decades

higher efficiency, low emission engines

are possible



current fuels constrain engine design



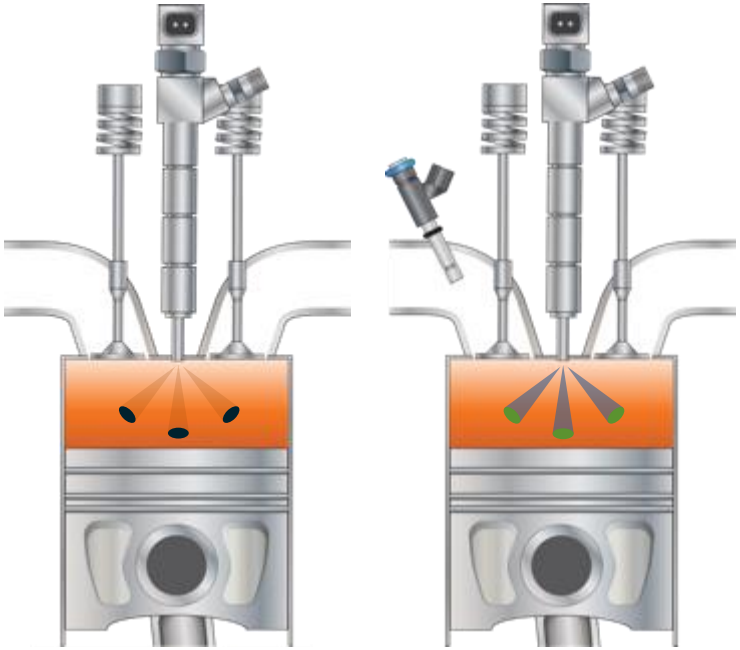
Engine: Ford Ecoboost 1.6L 4-cylinder, turbocharged, direct-injection, 10.1 CR
Source: C.S. Sluder, ORNL

the potential of kinetically-controlled combustion

spark ignition gasoline

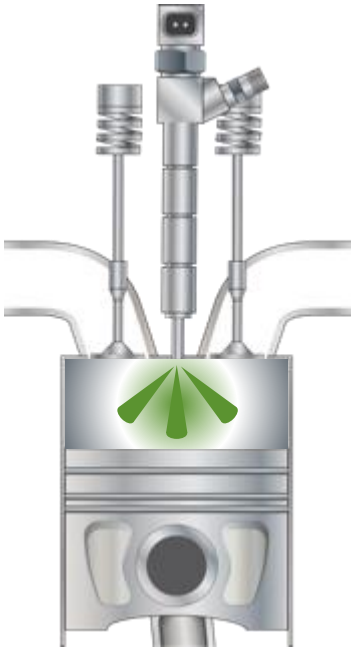
Low Reactivity Fuel

kinetically-controlled combustion



Range of Fuel Properties TBD

compression ignition diesel



High Reactivity Fuel

the

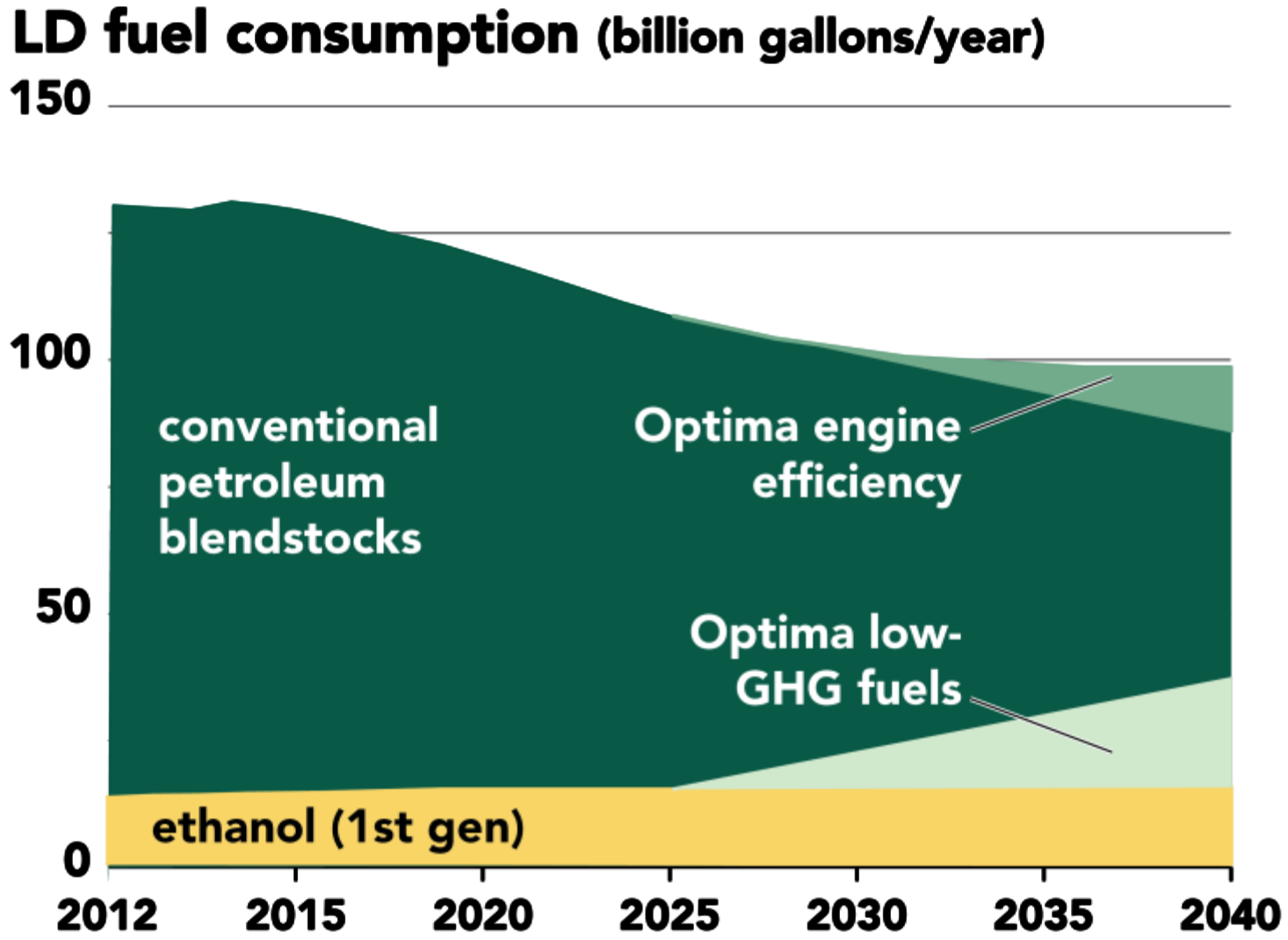
OPPORTUNITY

co-optimize

fuels and engines

accelerate, coordinate, and focus

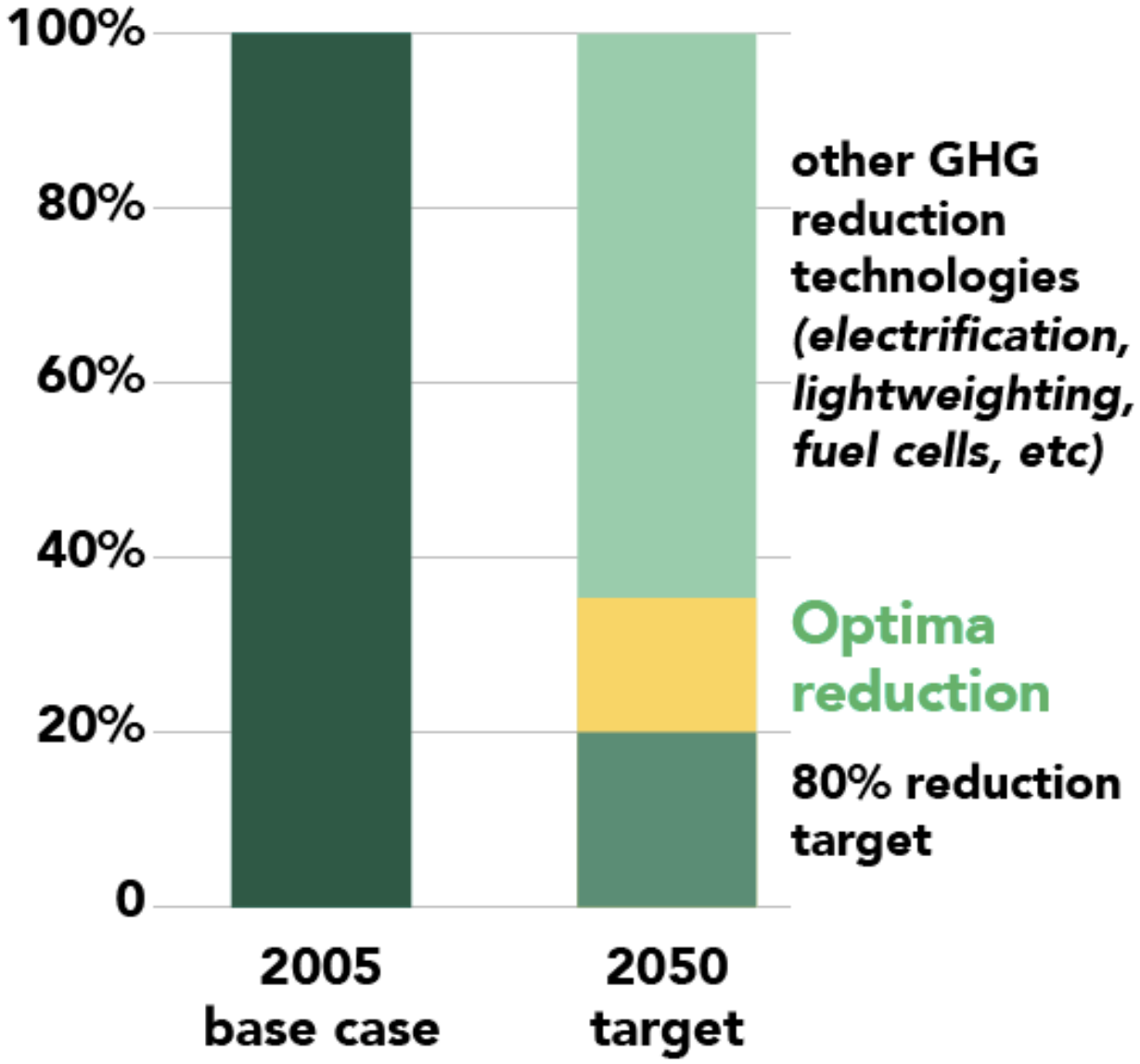
30% per vehicle petroleum reduction via efficiency and displacement



source: EIA 2014 reference case

9-14%

GHG reduction beyond BAU



national level impact

4.5B barrel petroleum reduction

$30-50B fuel cost savings

500,000 permanent jobs

rejuvenate bio-economy

enhanced energy security

science-based policy guidance

17 year
fleet turnover
2050
impact requires
2030
vehicle introduction

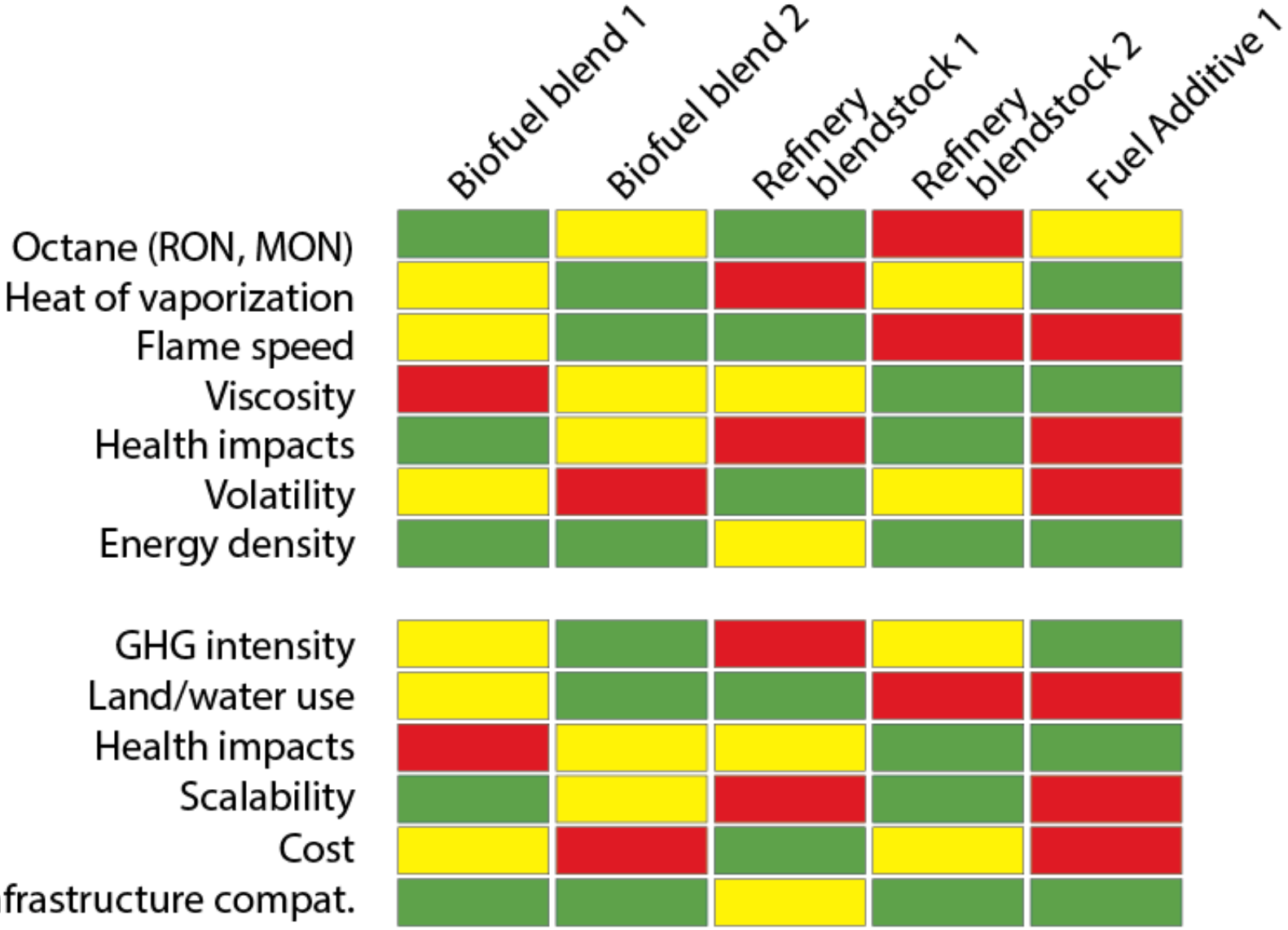
2030
vehicle introduction
requires
2020s
solutions

2020s
solutions requires
R&D
today

the

APPROACH & SCOPE

property-based
selection criteria



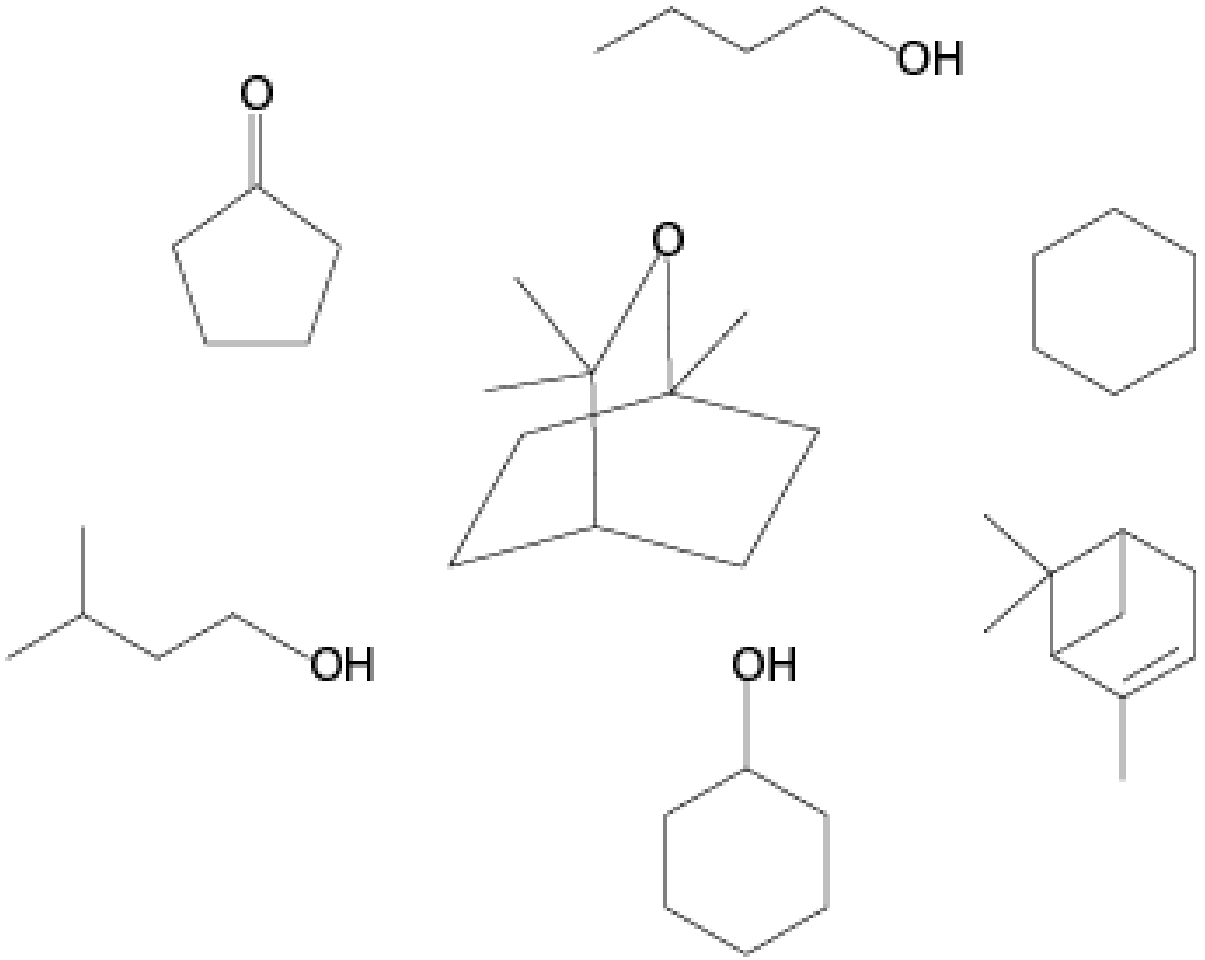
lower GHG fuels are essential

biofuels (biochemical and thermochemical)

low-carbon petroleum-derived fuels

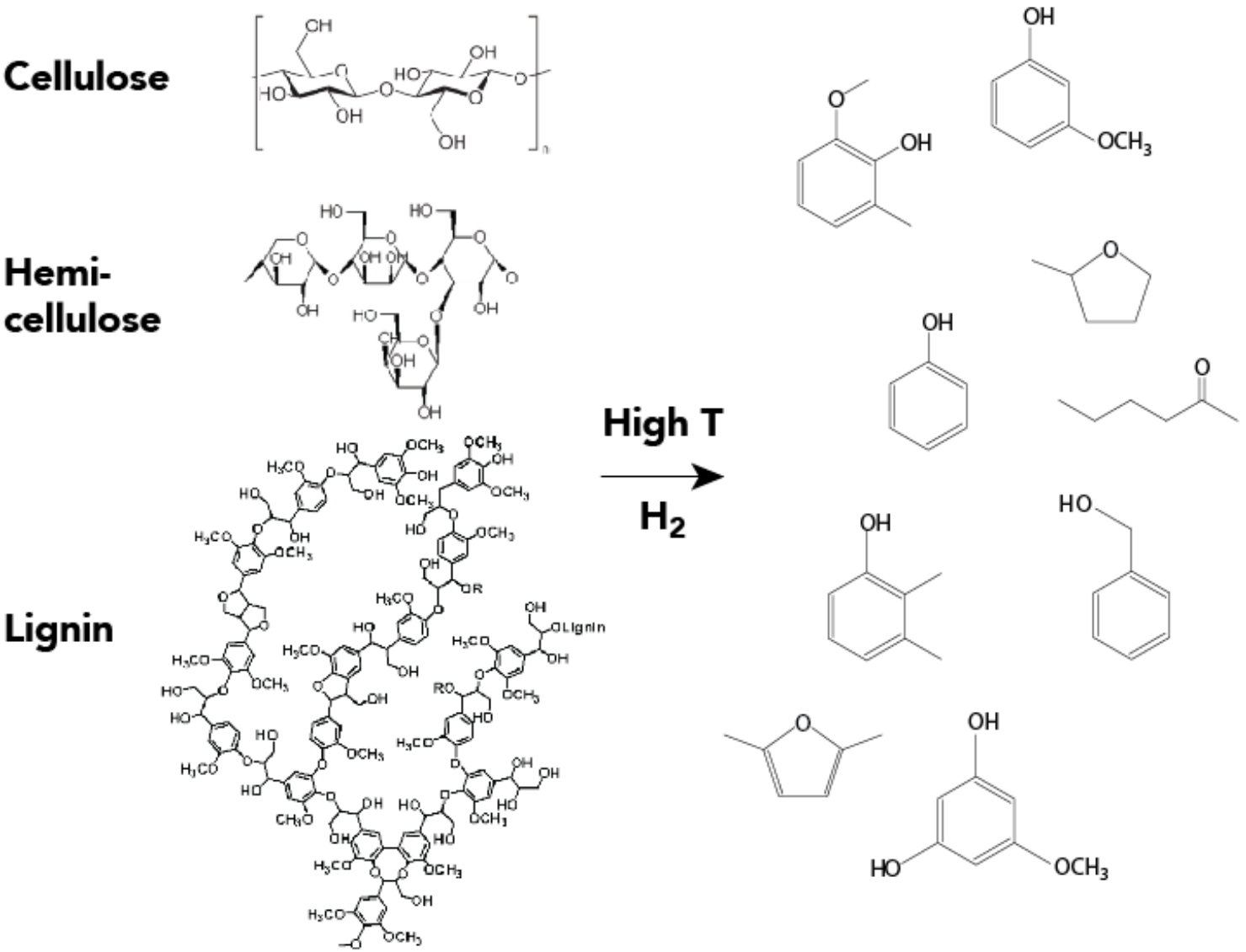
customized molecules

from biomass fermentation



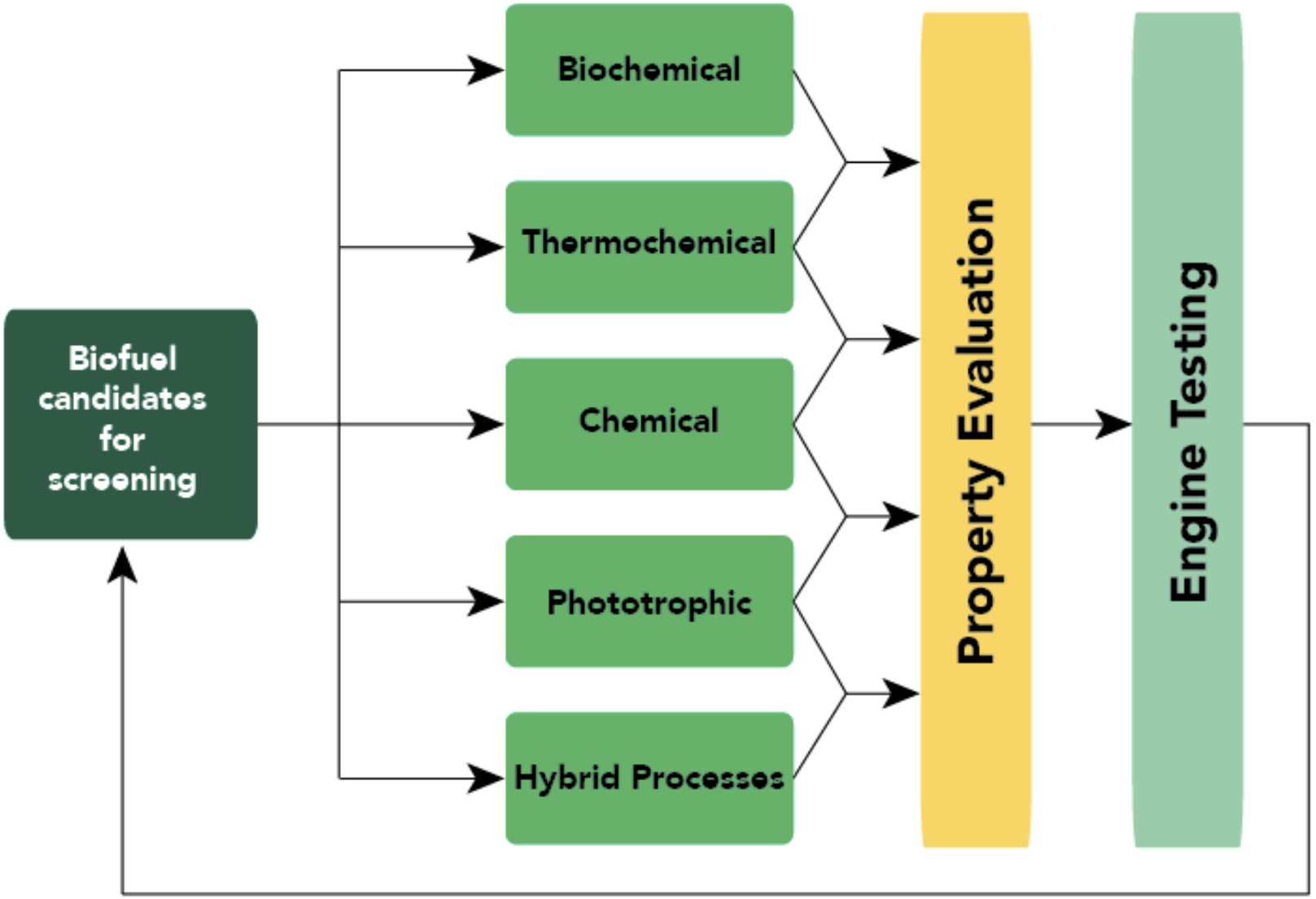
broader range of molecules

from biomass pyrolysis



comprehensive screening

of pathways and molecules



identify
market-driven
solutions

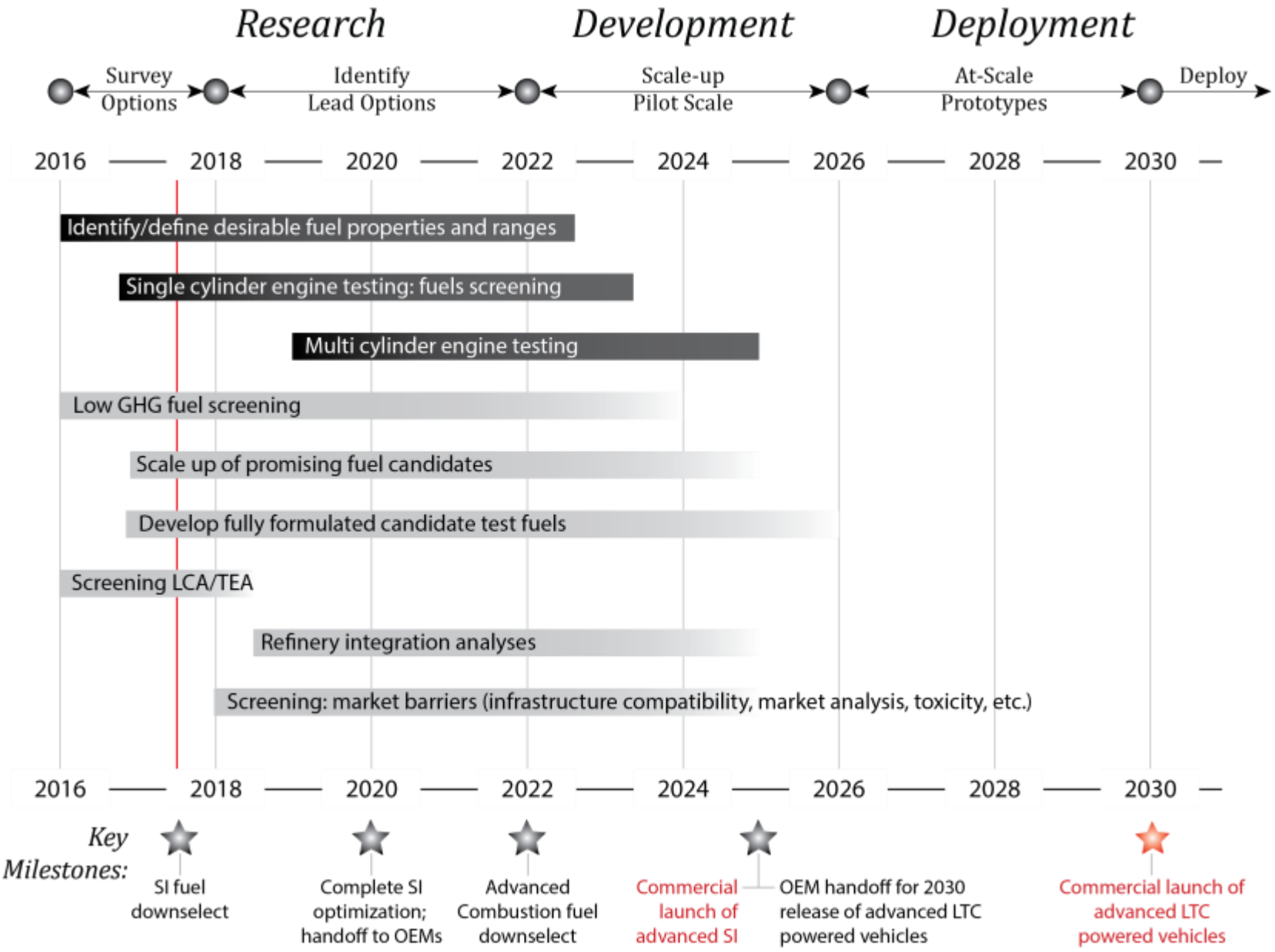
identify and mitigate
barriers to
wide-scale
deployment

solutions for light, medium, and heavy-duty engines

Optima evaluation criteria

1. GHG reduction
2. Petroleum reduction
3. Incremental fuel cost
4. Incremental vehicle cost
5. Land/water use
6. Infrastructure compatibility
7. Backward compatibility
8. Consumer acceptance
9. Scalability
10. Global harmonization

key milestones

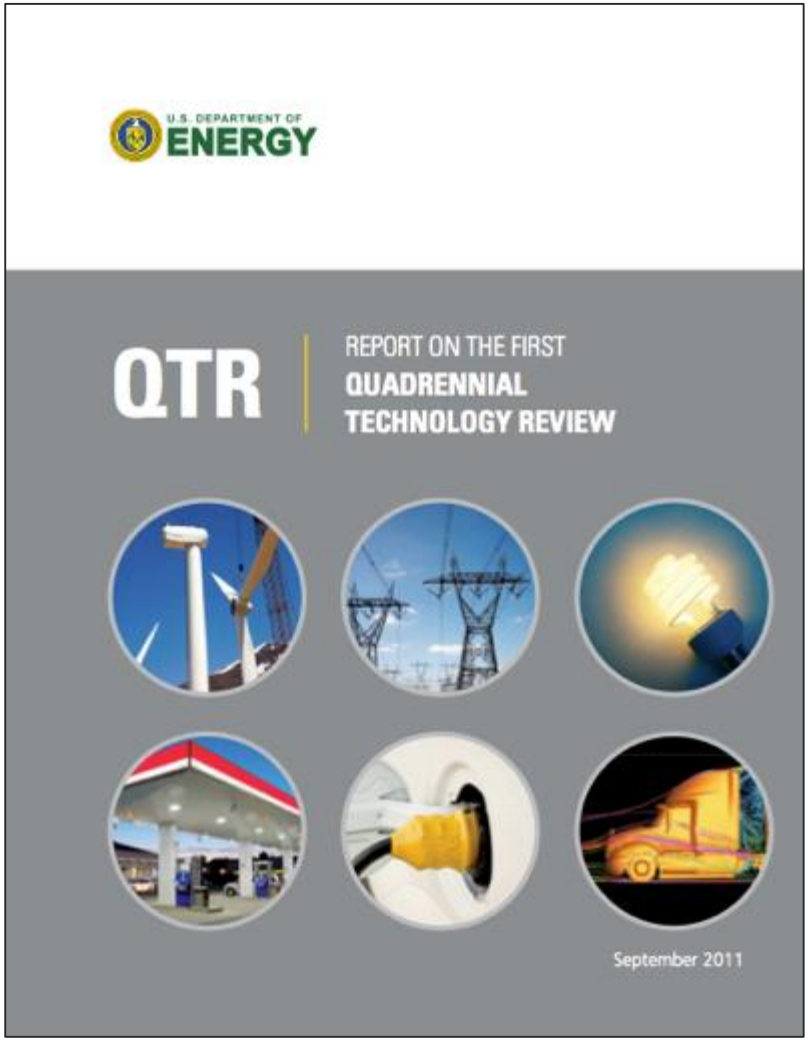


the

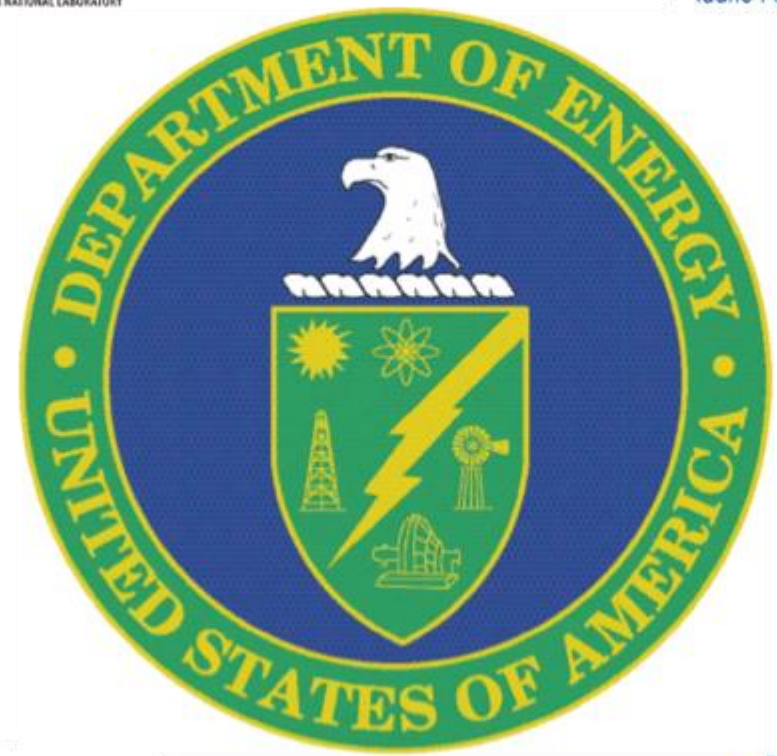
STAKEHOLDERS

why DOE?

"The relationships among fuels, engines, and vehicles are harmonized through standards, and any change in the system **requires coordination across all relevant sectors**, including vehicle manufacturers, fuel producers and distributors, government standards, and the consumer."



the team



Argonne NATIONAL LABORATORY

SRNL SAVANNAH RIVER NATIONAL LABORATORY

INL Idaho National Laboratory

Sandia National Laboratories

BERKELEY LAB

Pacific Northwest NATIONAL LABORATORY

Lawrence Livermore National Laboratory

OAK RIDGE National Laboratory

NREL

Los Alamos NATIONAL LABORATORY EST. 1943

cross-cutting potential

EERE
Science
Fossil
ARPA-E

USDA

role of others

industry:

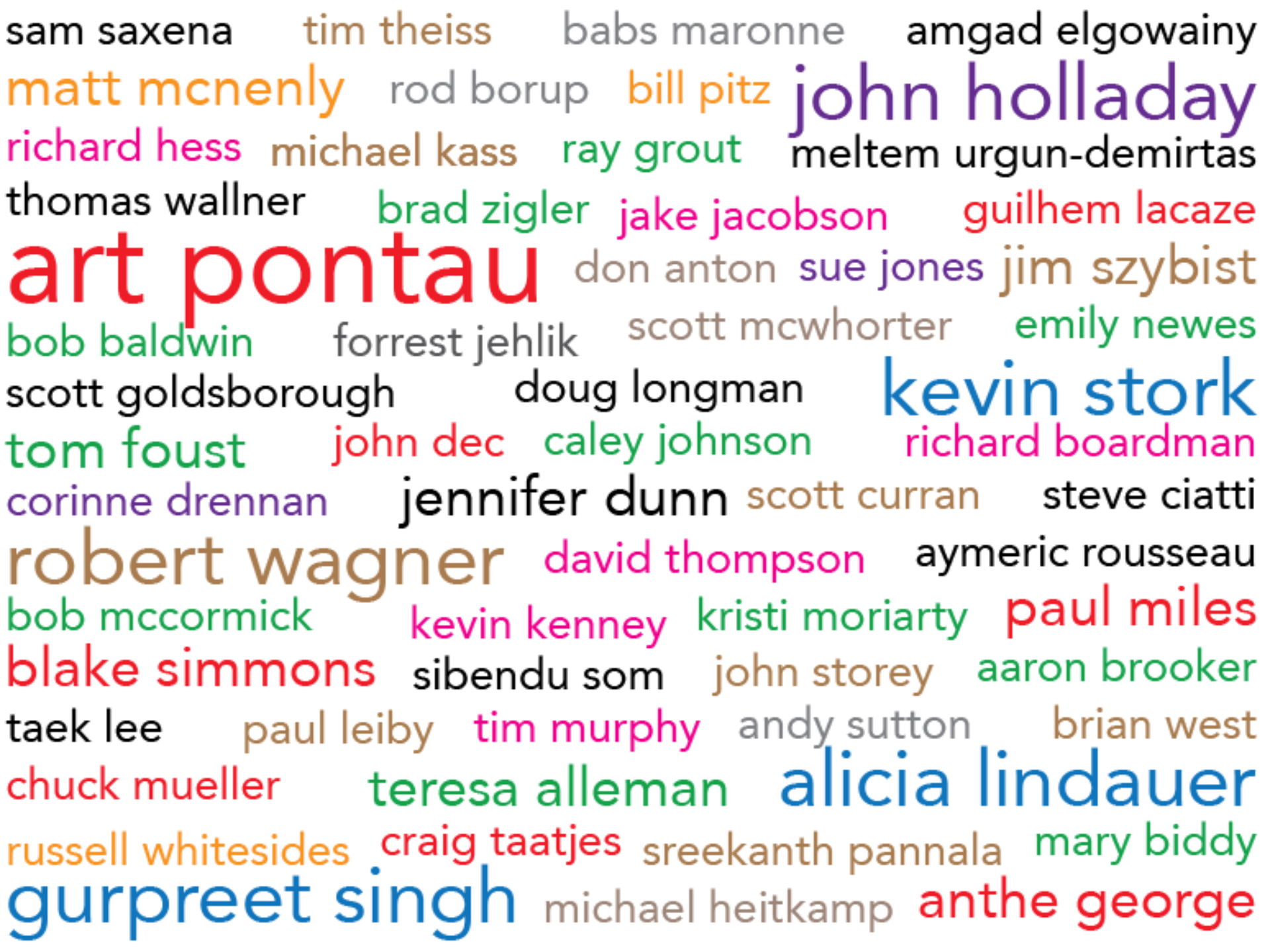
close coordination essential to identify/mitigate barriers and hand-off effectively

R&D community:

leverage work at universities and contract labs as appropriate

others:

technical and implementation guidance from government agencies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richard hess
michael kass
ray grout
meltem urgun-demirtas
thomas wallner
brad zigler
jake jacobson
guilhem lacaze
art pontau
don anton
sue jones
jim szybist
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forrest jehlik
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emily newes
scott goldsborough
doug longman
kevin stork
tom foust
john dec
caley johnson
richard boardman
corinne drennan
jennifer dunn
scott curran
steve ciatti
robert wagner
david thompson
aymeric rousseau
bob mccormick
kevin kenney
kristi moriarty
paul miles
blake simmons
sibendu som
john storey
aaron brooker
taek lee
paul leiby
tim murphy
andy sutton
brian west
chuck mueller
teresa alleman
alicia lindauer
russell whitesides
craig taatjes
sreekanth pannala
mary biddy
gurpreet singh
michael heitkamp
anthe george


better fuels
and
better vehicles
sooner