



Sustainable TRANSPORTATION

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

Optima Program Overview

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Optima Stakeholder Listening Day

June 16, 2015

what is Optima?

multi office

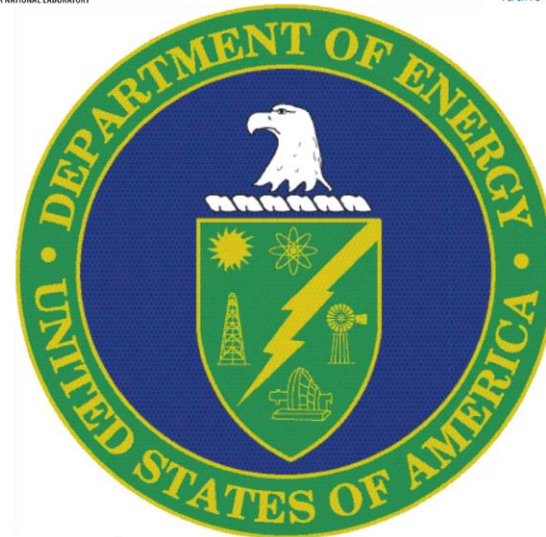
BIOENERGY TECHNOLOGIES OFFICE

VEHICLE TECHNOLOGIES OFFICE

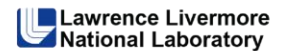
multi lab



multi year



initiative



approach: co-optimize fuels and engines

accelerate, coordinate, and focus



30% per vehicle petroleum reduction via efficiency and displacement

LD fuel consumption (billion gallons/year)

150

100

50

0

2012 2015 2020 2025 2030 2035 2040

conventional petroleum blendstocks

Optima engine efficiency

Optima low-GHG fuels

ethanol (1st gen)

7-14% beyond BAU

16 billion gallons advanced biofuel

source: EIA 2014 reference case

Optima research thrust 1

**spark
ignition (SI)**

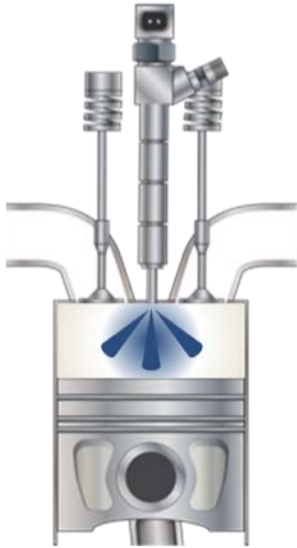


**Low Reactivity Fuel
(gasoline)
high RON**

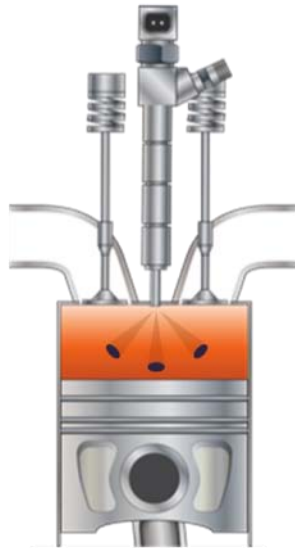
Provide scientific basis to develop optimal fuel/engine systems for spark ignition engines with market introduction by 2025

Optima research thrust 2

Advanced compression ignition (ACI)
including low temperature, kinetic regimes



High Reactivity Fuel
(diesel)
high cetane



Range of Fuel Properties TBD
(new fuel)
undetermined fuel needs



Advanced
compression
ignition with fuels
that enable
maximum engine
performance with
minimal emissions
with 2030
commercial
introduction

Optima evaluation criteria

1. GHG reduction
2. Petroleum reduction
3. Engine/powertrain/vehicle performance
4. Incremental fuel cost
5. Incremental vehicle cost
6. Land/water use
7. Infrastructure compatibility
8. Emissions/aftertreatment
9. Health effects
10. Legacy fleet compatibility
11. Consumer acceptance
12. Scalability
13. Global product harmonization

what fuel properties are important?

RON

bulk modulus of compressibility

sensitivity

soot precursor formation

cetane number

C/H ratio

density

T10

exergy destruction

energy density

viscosity

volatility

flammability limits

PMI

heat of combustion

naphthene level

surface tension

T90

aromatics level

flame speed

cloud point

heating value

MON

heat of vaporization

sulfur level

T50

strain sensitivity

ignition limits

Markstein length

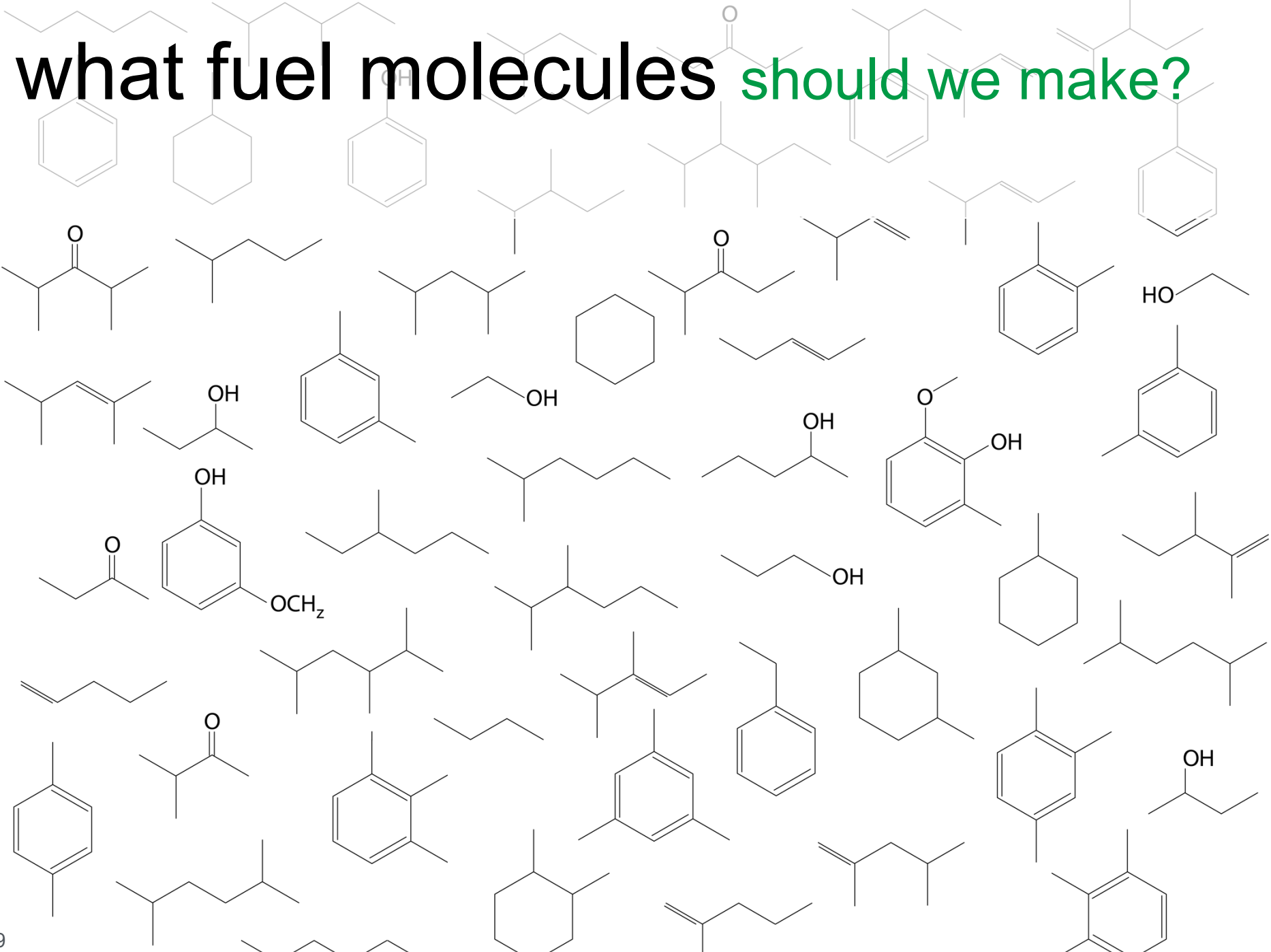
olefin level

oxygenate level

laminar burning velocity

drivability index

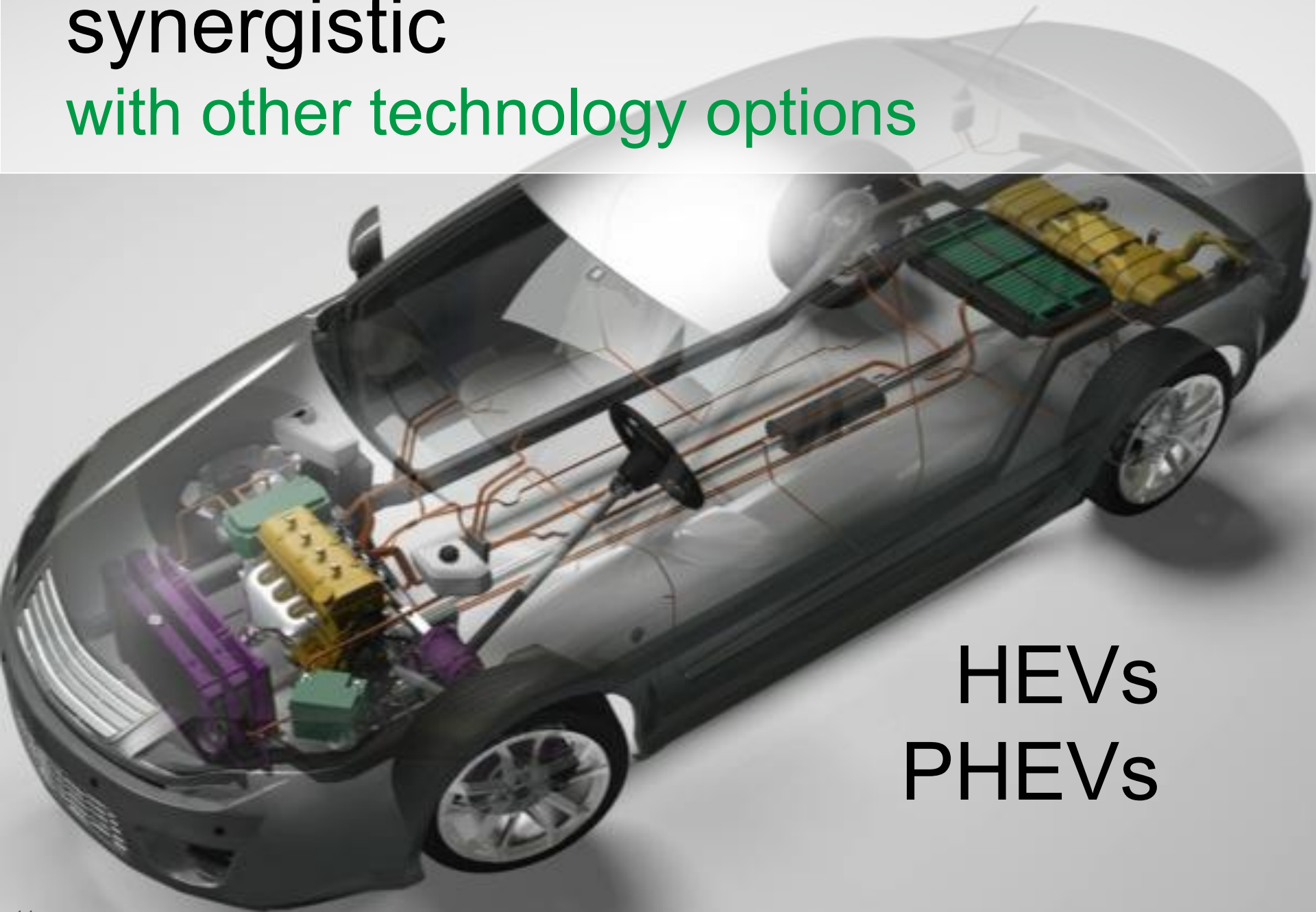
what fuel molecules should we make?



applicable to
light, medium, and heavy-duty
engines



synergistic
with other technology options



HEVs
PHEVs

summary and next steps

Summary

- Optima included in President's FY16 budget request at \$27M
- Selected as "Big Idea" at DOE Idea Summit in April
- First industry "Listening Day" held June 2015

Next Steps:

- Finish draft of three-year R&D plan and project roadmap
- Continue engaging with stakeholders
- Target Oct 1 start



better fuels
and
better vehicles
sooner