

# Sustainable Freight

Asilomar 2017

Pascal Amar – Volvo Group



# Talking points

- Productivity and sustainability
- Technology selection – drivers and obstacles
- Technology integration
- Learning from concept vehicles
- Getting to (near) zero emission vehicles

# Productivity is key to a sustainable freight ecosystem

*Truly sustainable freight means both environmental and economic sustainability.*



Downtime

Payload capacity

Utilization

Maneuverability

Routing

Driver training

Connectivity

# Technology selection is a complex process

- There is no 'one-technology-fits-all'
- Emission impact of new technologies depends on how vehicles are used i.e. application
- Technologies must work across multiple applications, markets, infrastructures, etc
- New technologies must provide ROI for customers



# Greater connectivity & automation will play a critical role



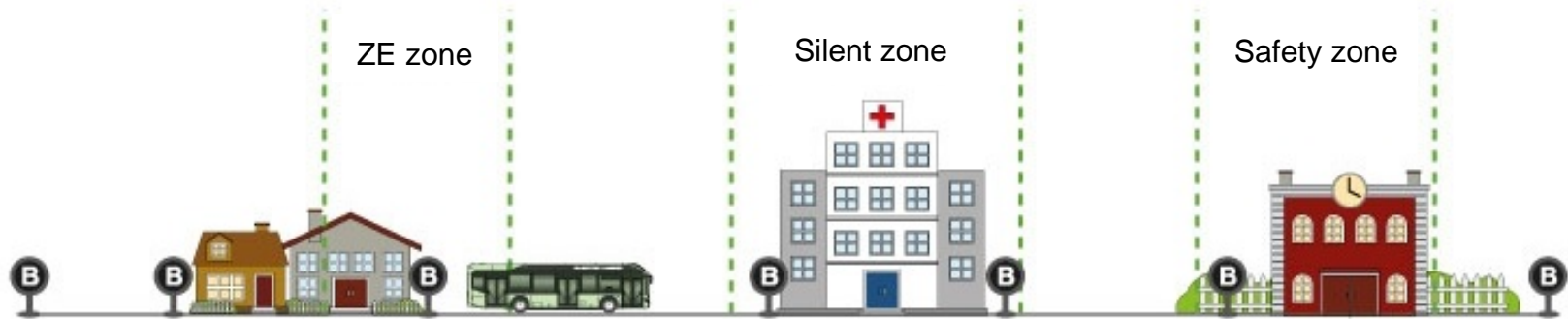
Connectivity and automated driving solutions will advance efficiencies at the vehicle and system levels.

Education/outreach activities and partnership with other technology companies/public agencies are key to realizing these technologies.





# Electrification is a key enabler, in specific applications



# Technology evaluation & selection: drayage trucks



# Technology evaluation & selection: drayage trucks

## PHEV#1



- ✓ Feasibility of PHEV technology & geofencing in port drayage
- ✓ Complete vehicle technology package
- ✓ PHEV#1 concept vehicle built & verified

## PHEV#2



- ✓ PHEV#1 in revenue service >6 months
- ✓ 'self learning' dynamic geofences & refined design to maximize ZE operation
- ✓ PHEV#2 concept built & in revenue service

## PHEV "Ultra"



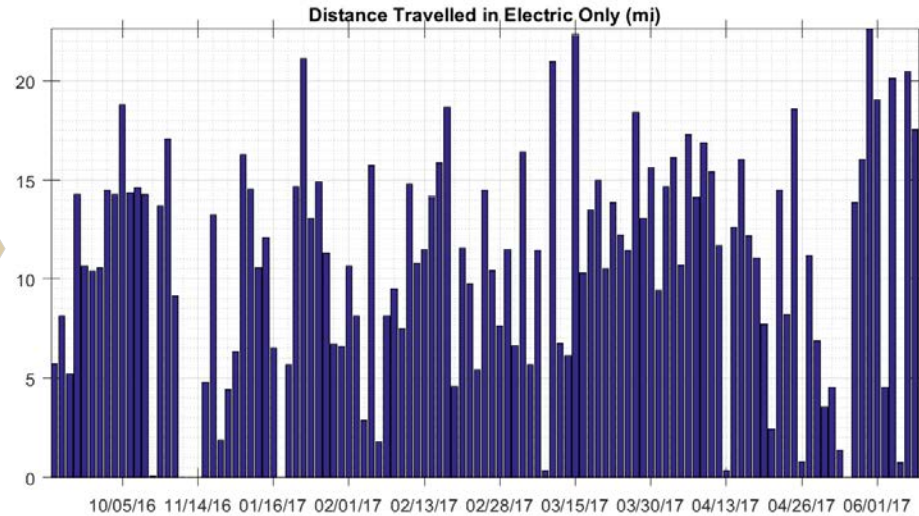
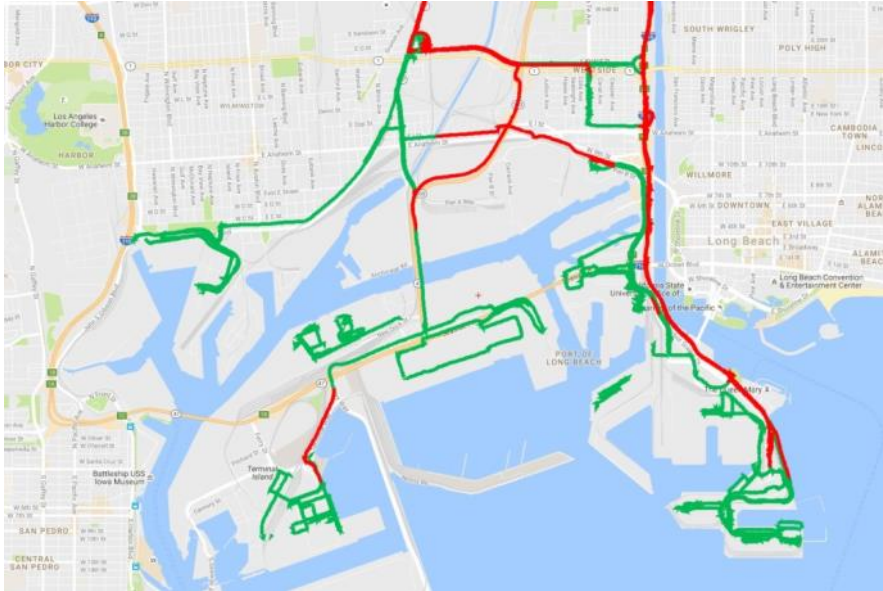
- Integrate ITS / PHEV / EATS technologies to achieve ultra-low in-use NOx emissions
- Evaluate concept#3 in revenue service
- Evaluate pathway to commercialization



# Drayage PHEV – lessons learned

A large battery isn't necessary to deliver Zero Emissions where it matters most

*10kWh ESS / >20 miles in ZE mode per day*



Marrying existing technologies creates significant new opportunities

*GPS & integrated driveline controls maximize Zero Emission operation*

# Productivity and Technology Integration

*Our concept vehicles demonstrate more than just electrification*



- ✓ Replaces a wheel loader one size larger
- ✓ Dramatic reduction in noise
- ✓ Improved visibility
- ✓ Ease of operation



- ✓ Can carry 2,000lb more payload
- ✓ Less rolling resistance and tire scrub
- ✓ Improved maneuverability & steering
- ✓ Vehicle specs optimized for drayage operation

# Evolutionary improvements at work in drayage PHEV#1

'evolutionary improvements' in PHEV#1

- ✓ Vehicle spec optimization
- ✓ Lightweight components
- ✓ Lifiable 6x2 pusher axle
- ✓ Aerodynamic configuration
- ✓ LED lighting & reduced parasitics

→ Boosted Zero Emission range by ~25%

→ Reduced hybrid component size & cost

*(and they improve freight efficiency today)*





# SuperTruck: amplifying effect of incremental improvements

Bumper-to-bumper Aerodynamic optimization

12+  
MPG

High-efficiency Integrated Powertrain

70%  
↓

Lightweight Designs & Materials

Reduced Rolling Resistance

88%  
MORE

Predictive Energy Management

Idle-free Hotel Mode

3,200<sup>11</sup>  
light

# SuperTruck Technology Content

## Available today

Lightweight trailer  
LED interior lighting & headlamps  
Trailer gap fairing  
Trailer tail fairing  
Wide base low RR tires  
Aluminum wheels  
Aluminum drive shaft  
TurboCompound  
Downspeeding  
'Eco-roll'  
6x2 axle configuration  
"wave" piston  
Common rail fuel injection  
1-box aftertreatment muffler  
Engine downsizing

## Evolutionary improvements

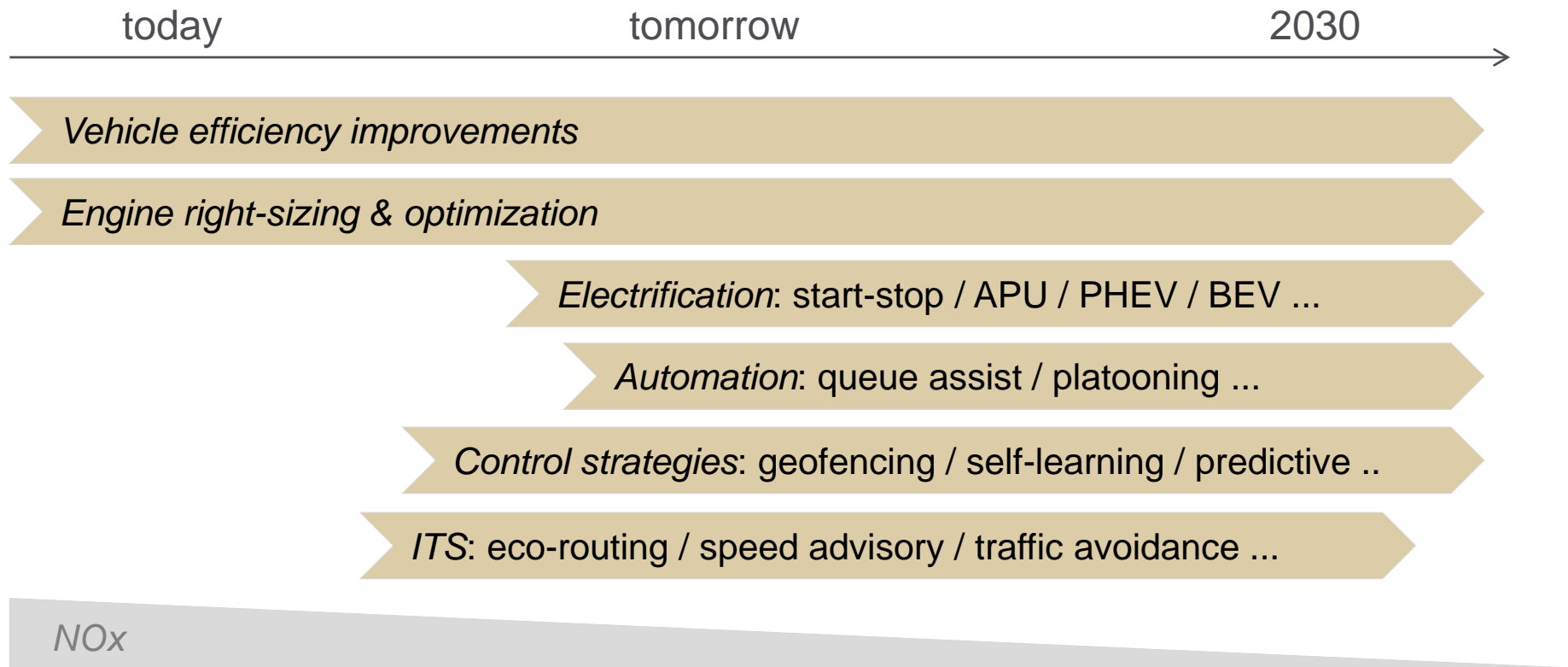
Improved cab thermal insulation  
Trailer full skirts  
Optimized bumper  
Dual-zone 24V A/C system  
15kWh energy optimized APU  
Predictive kinetic energy recovery  
Relocated A/C condenser  
Predictive cruise control  
Cab shape  
Roof mounted solar panel  
Parked fresh air intake  
Variable oil & coolant pumps  
Low friction oil  
PCU friction reduction  
Aluminum cab side walls

## Breakthrough concepts

Curved & sloped windshield  
Cab position  
Artificial windows  
Rankine Waste Heat Recovery  
Light gauge trailer wire harness  
>40% lighter chassis  
Composite trailer aero devices  
Lightweight (CF) hood  
Lightweight (CF) roof  
Lightweight (CF) chassis fairings  
Covered cab steps  
Tractor bogie fairing



# We can address NOx *today* while we work on the long term



# Evolutionary improvements are the foundation of sustainable freight

- They reduce energy requirements & increase freight capacity
  - They prepare the market and increase chances of earlier commercialization
  - They reduce risk of product reliability issues (i.e. market push-back)
  - They reduce total product cost increase to the customers
  - They pave the way for societal acceptance
- Start improving sustainability of goods transport *today*
- Increase chances of market acceptance / real-world impact tomorrow
- Continuously integrate mature solutions instead of forcing technologies to mature faster

# Can Policy Help Expedite Adoption of New Technologies?

**YES!..** by removing obstacles (not by picking a winning technology)

- Cost of compliance on current & new technology: R&D burden curbs innovation
- Local & regional regulations: waivers facilitate cross-pollination between markets
- Absence of clear technology policy positions and deployment timelines hinder connected vehicle infrastructure.
- Absence of guidelines for testing and validating levels of automated driving hinder market introduction and adoption
- Slow, complex & expensive permitting hinders critical investments for some concepts

# Summary & closing thoughts

- The challenges of bringing new technologies to market are far from being just technical
- The real world impact of a technology strongly depends on how (many) vehicles are used
- We need to address NOx today while we keep working on technologies for tomorrow
- Evolutionary improvements are an integral part of the roadmap to meeting California's long-term air quality goals
- Sustainable transport solutions –for freight and people- require technologies that sustainably address environmental, economical, and safety challenges worldwide