



Meeting the Challenges of Developing Sustainable Propulsion Systems for Future Net-Zero and Emissions Regulatory Demands.

Driving Innovations In Emission Control for a Sustainable Tomorrow

16th International Conference & Exhibition

07th October 2025

Hotel Taj Vivanta, Dwarka, New Delhi
Steve Whelan – HORIBA MIRA

The Exam Question

How do we stop using fossil fuels ASAP?

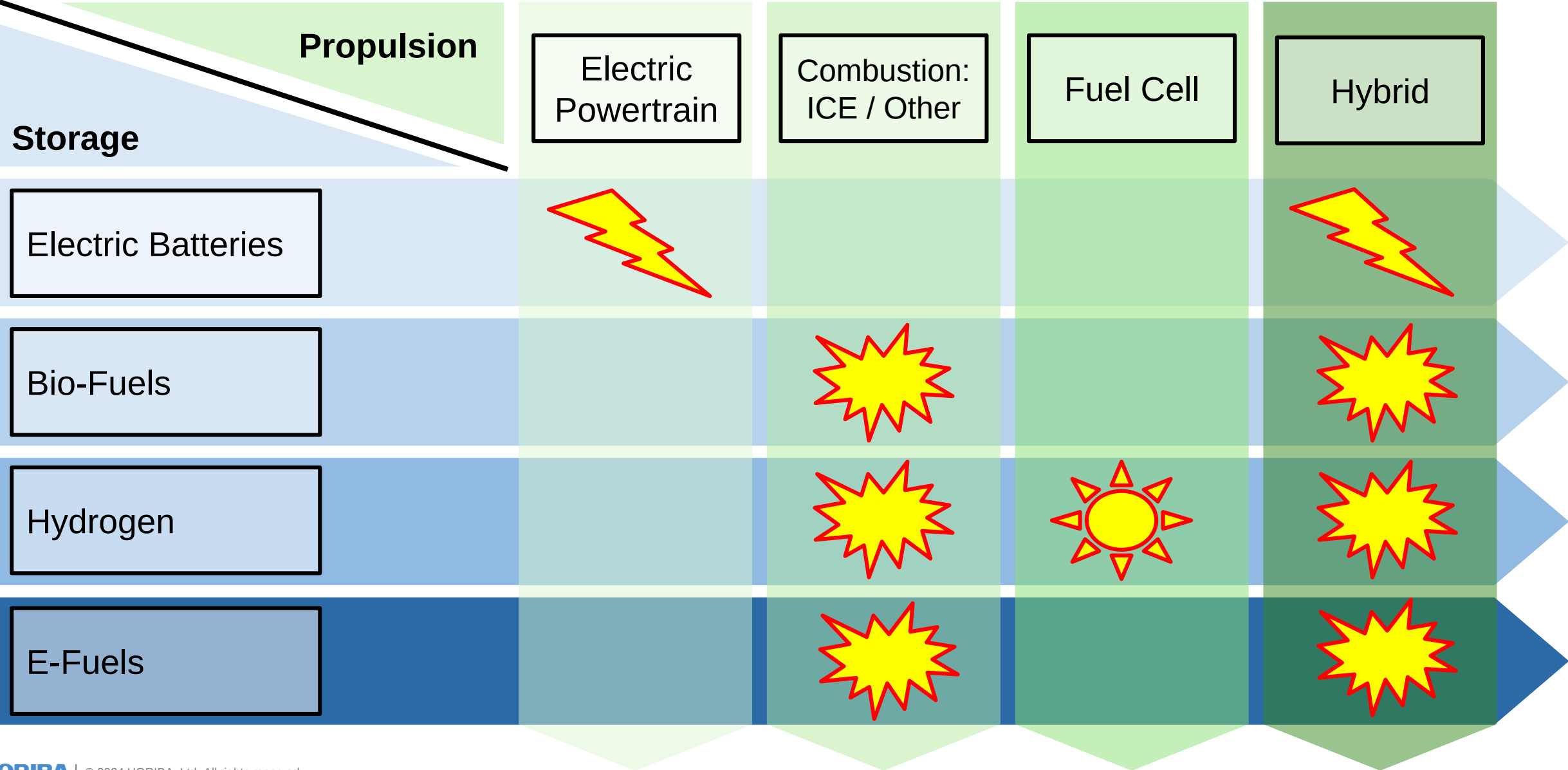
The exam question is not:

1. How can we electrify everything?
2. How can we stop burning stuff?

Spoiler:

The answer to the Exam Question is a complex and eclectic mix of the best technologies that maximises the earliest use of renewable energy

How Do We Use Renewable Energy ?

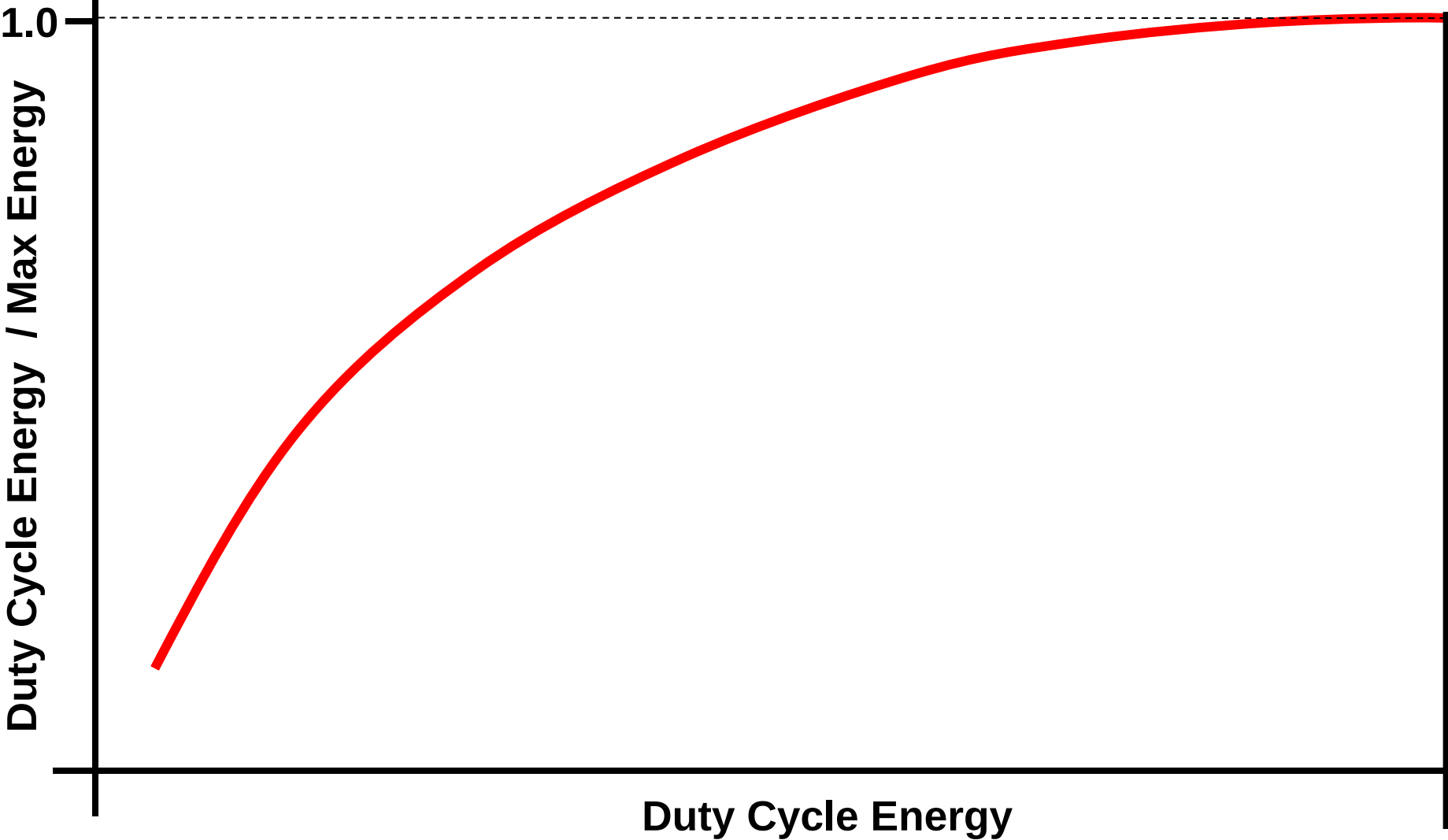


It's All About Energy

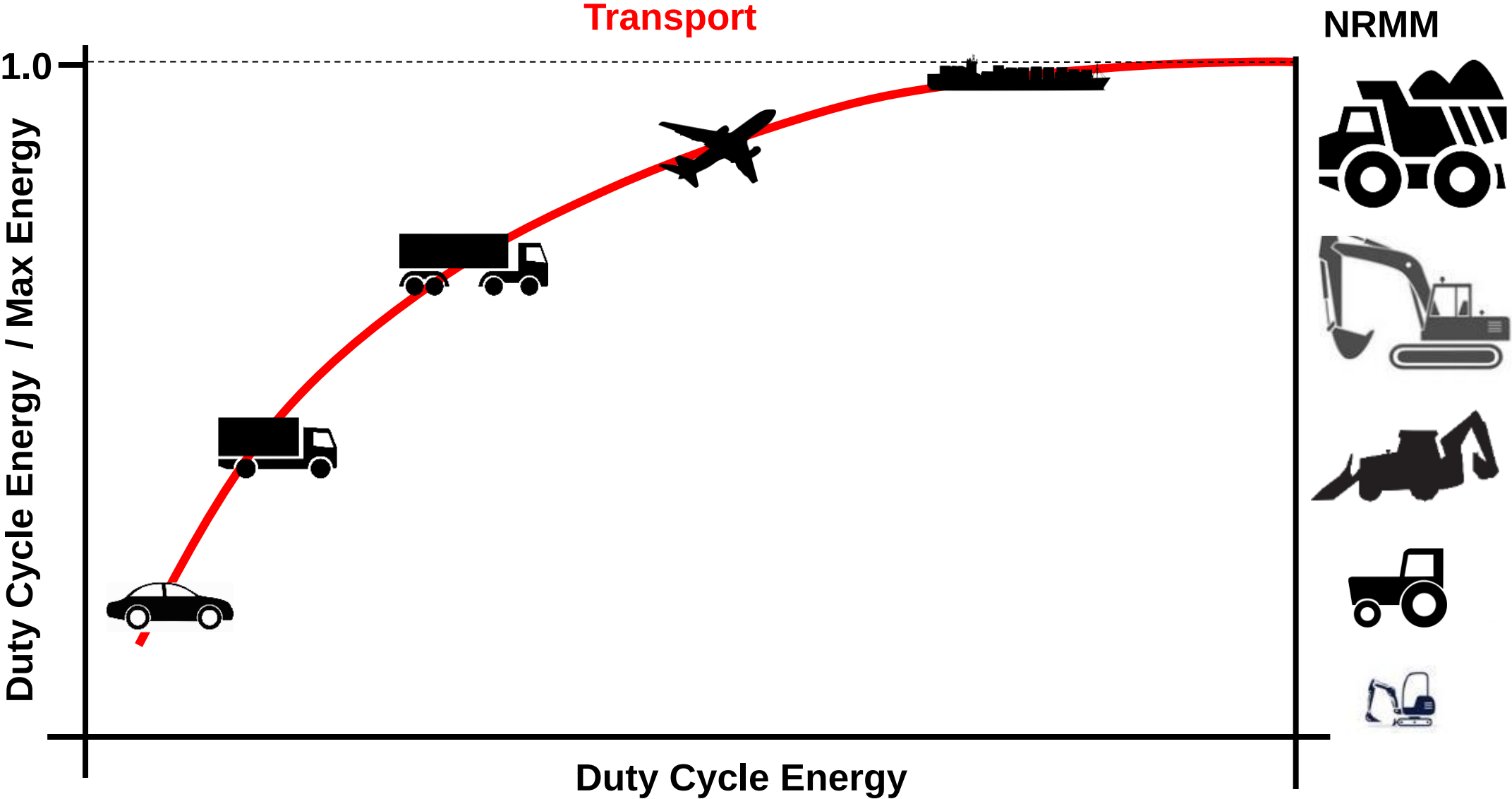
Transport



NRMM

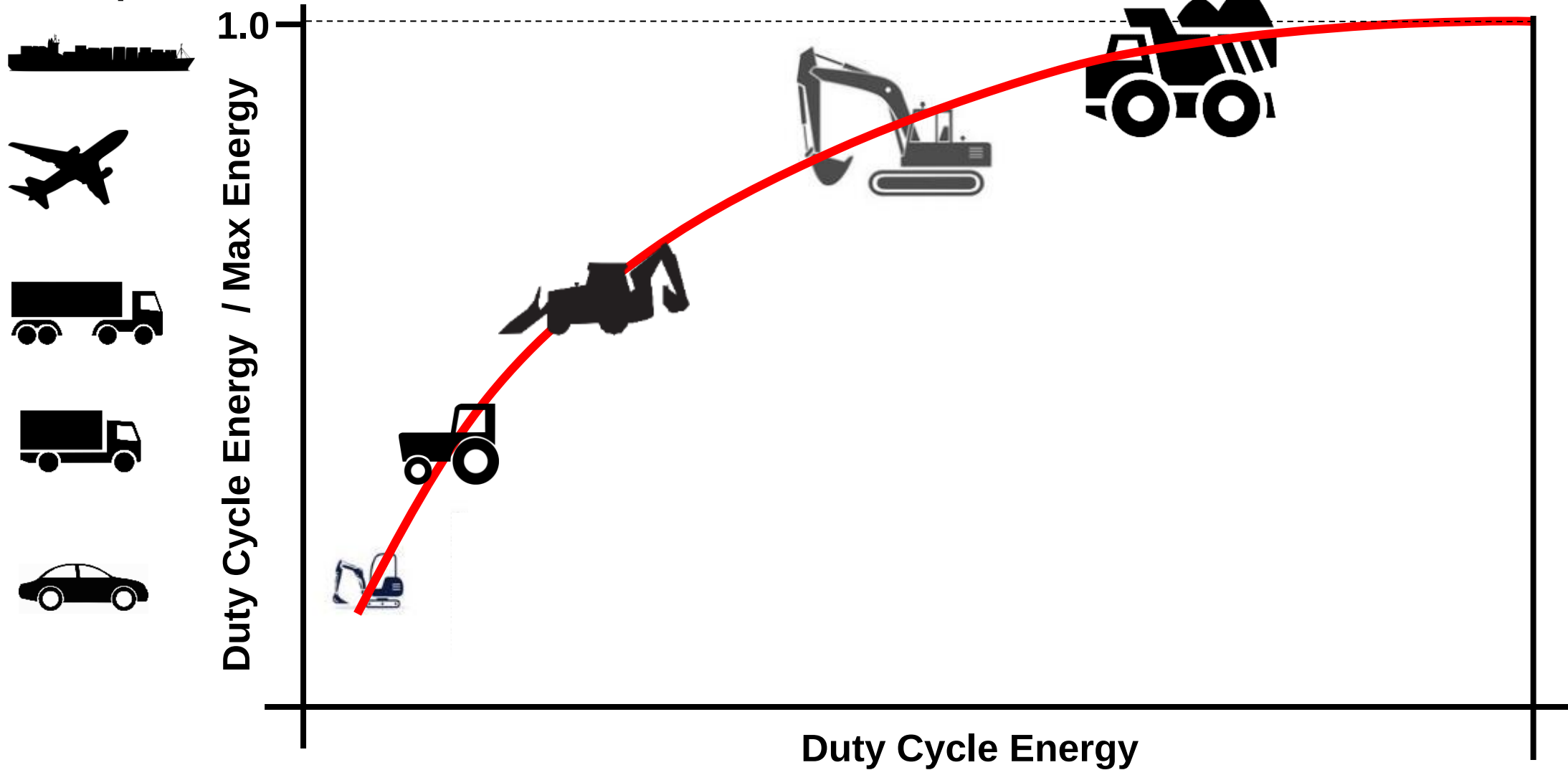


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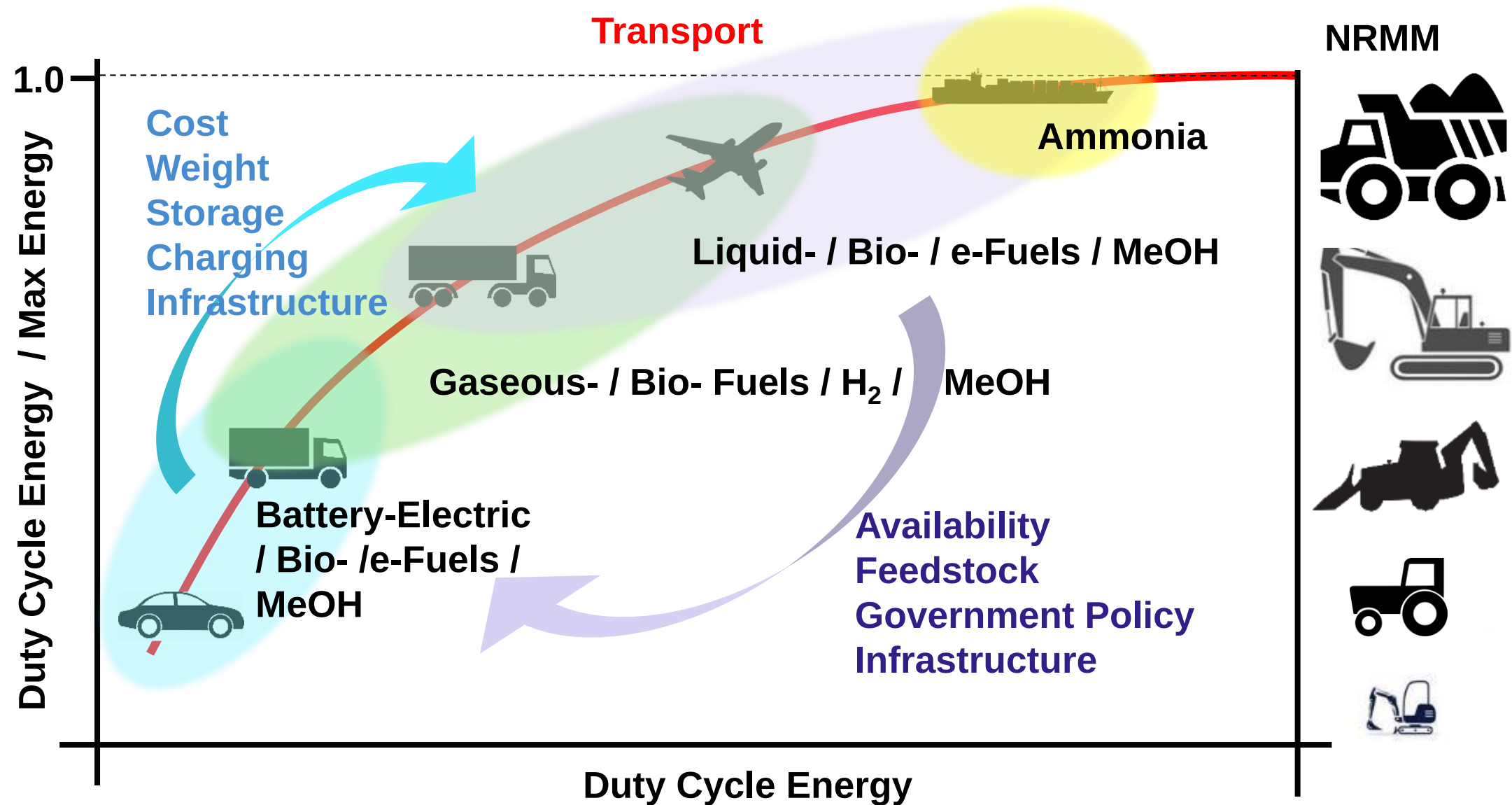


It's All About Energy

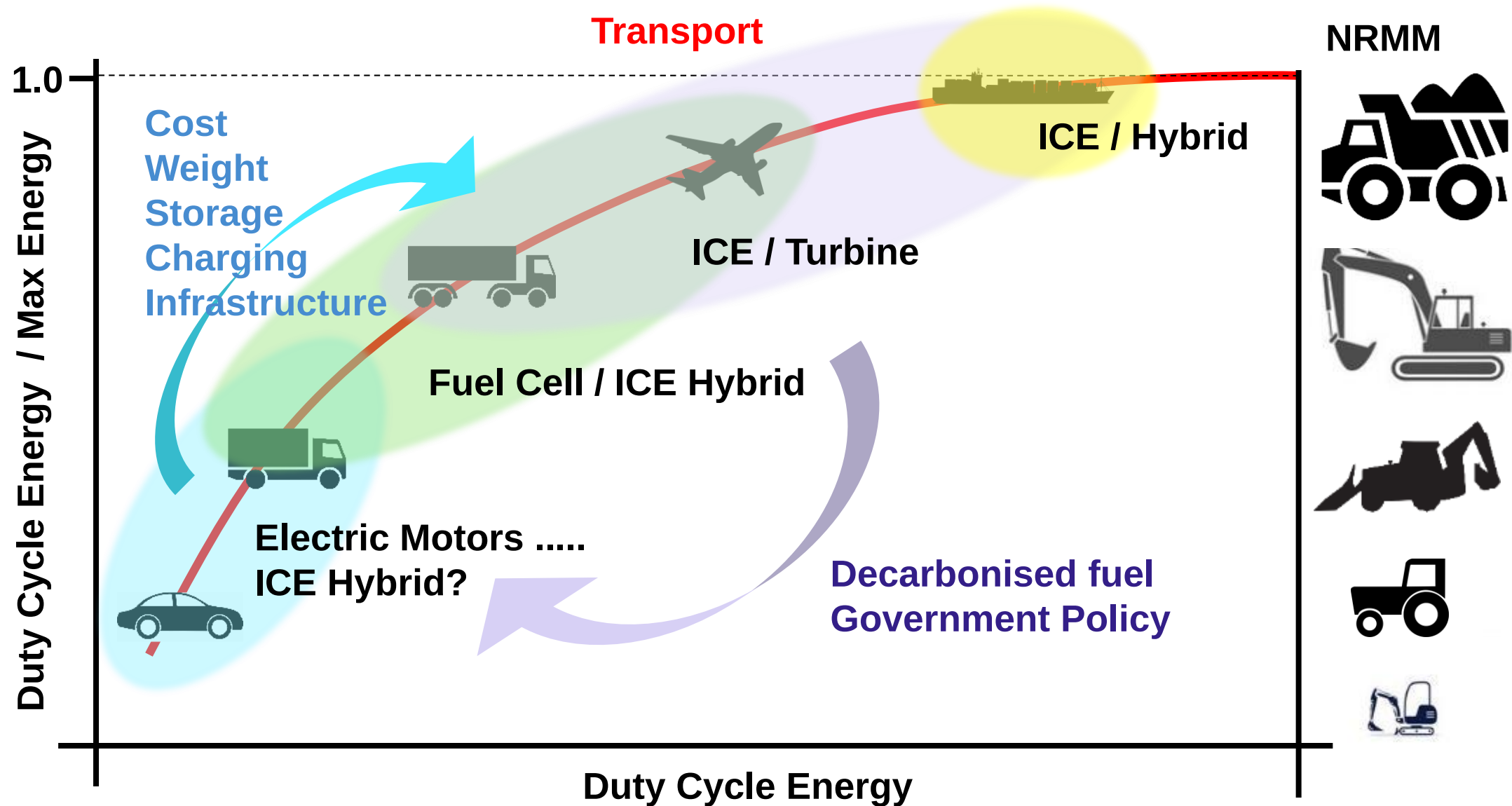
Transport



It's All About Energy – Fuels (Storage)

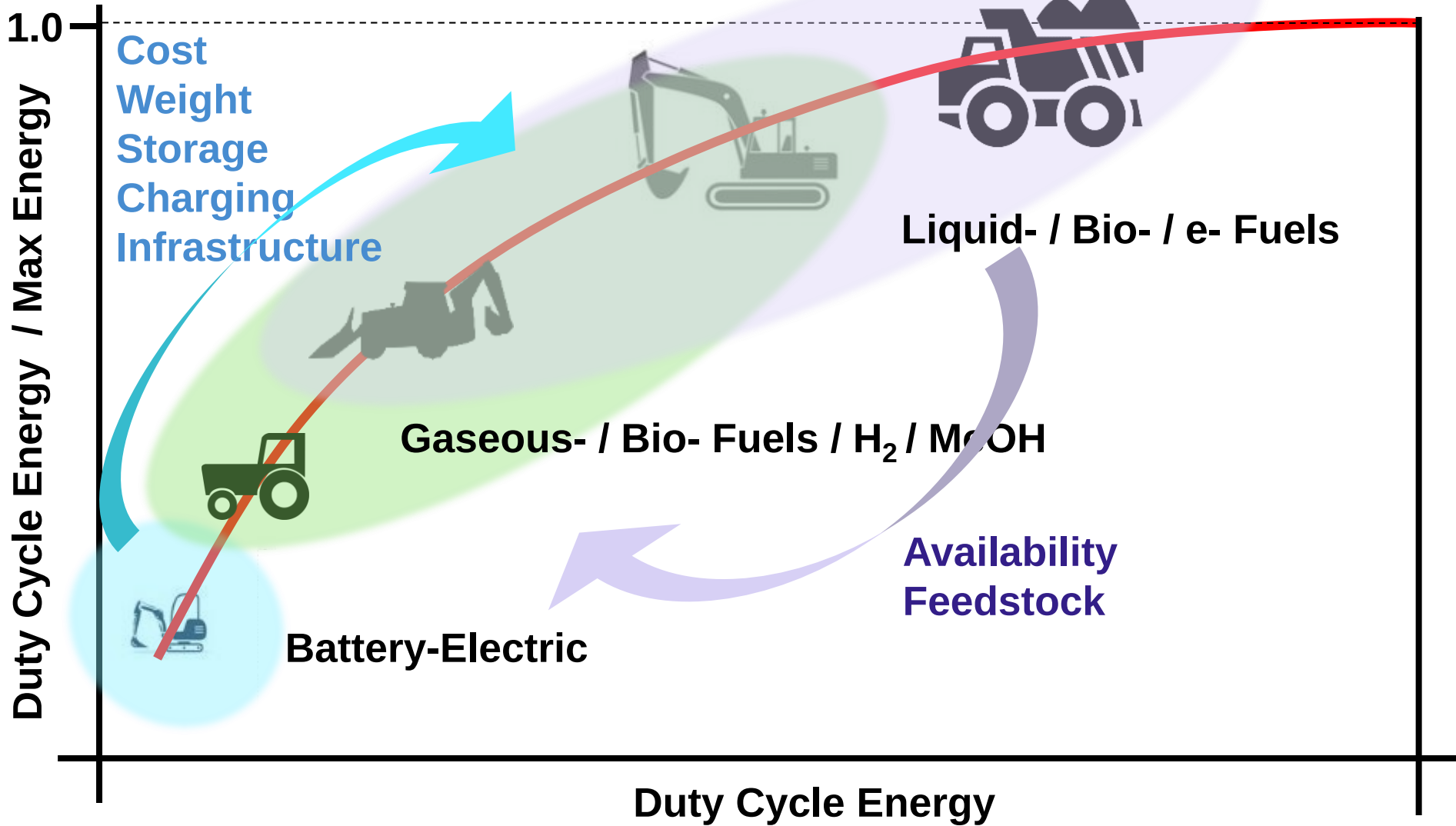
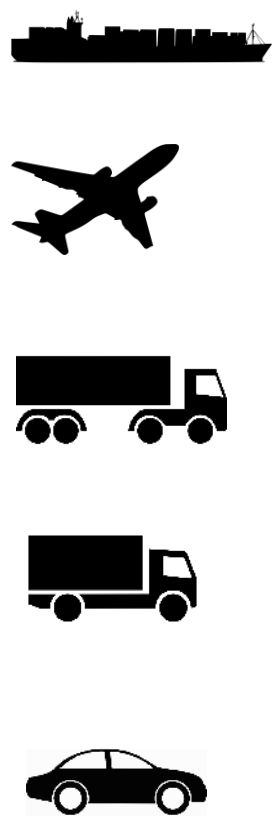


It's All About Energy – “Motors” (Propulsion)



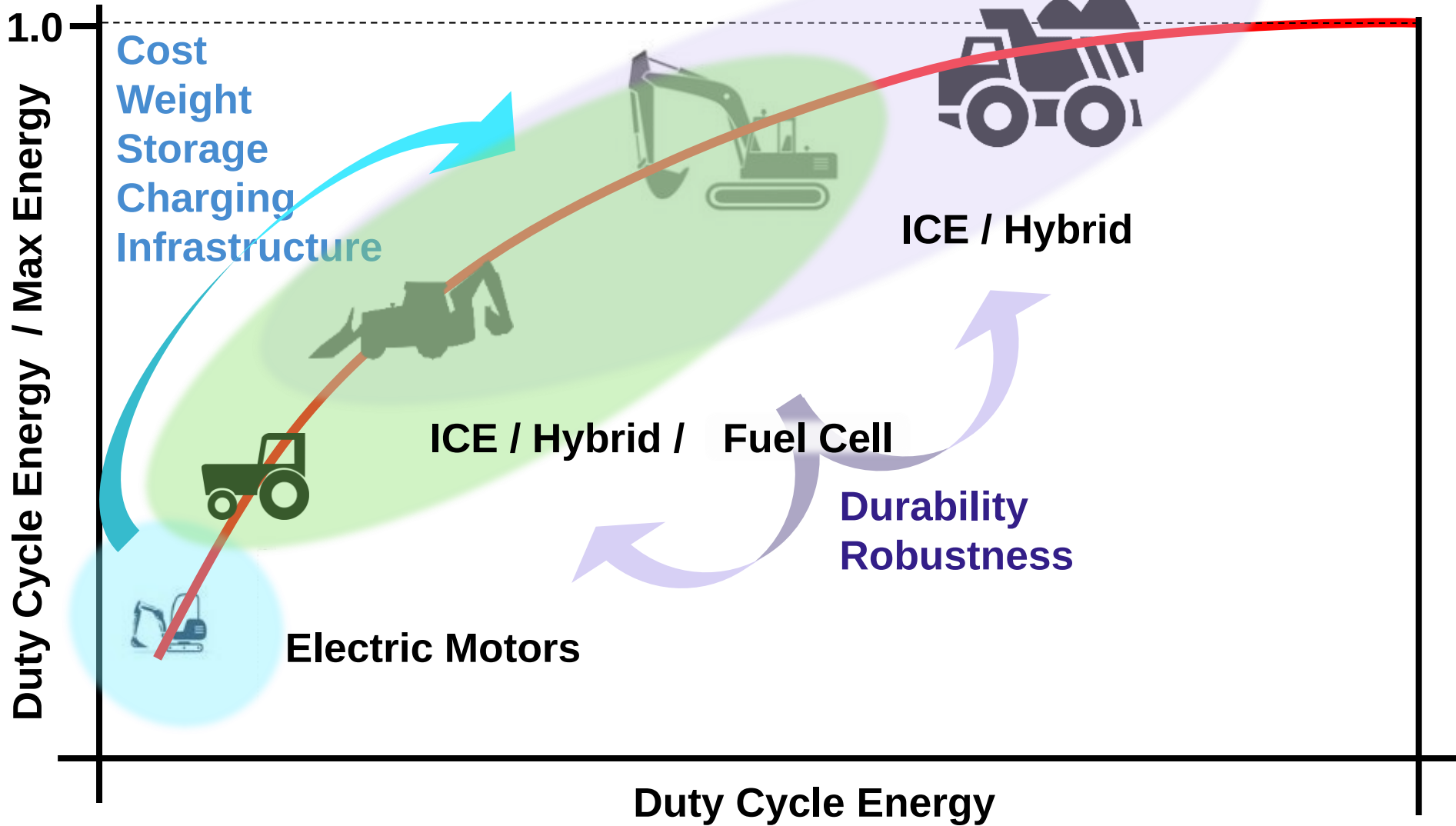
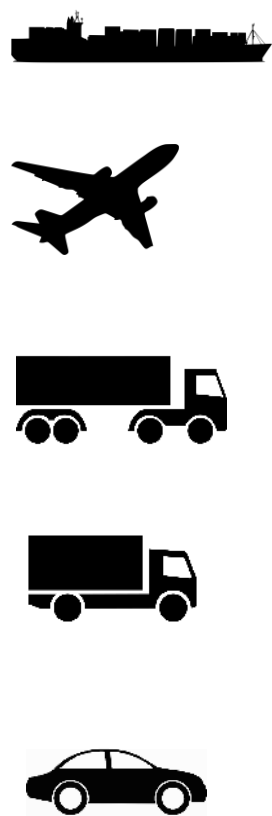
It's All About Energy – Fuels (Storage)

Transport

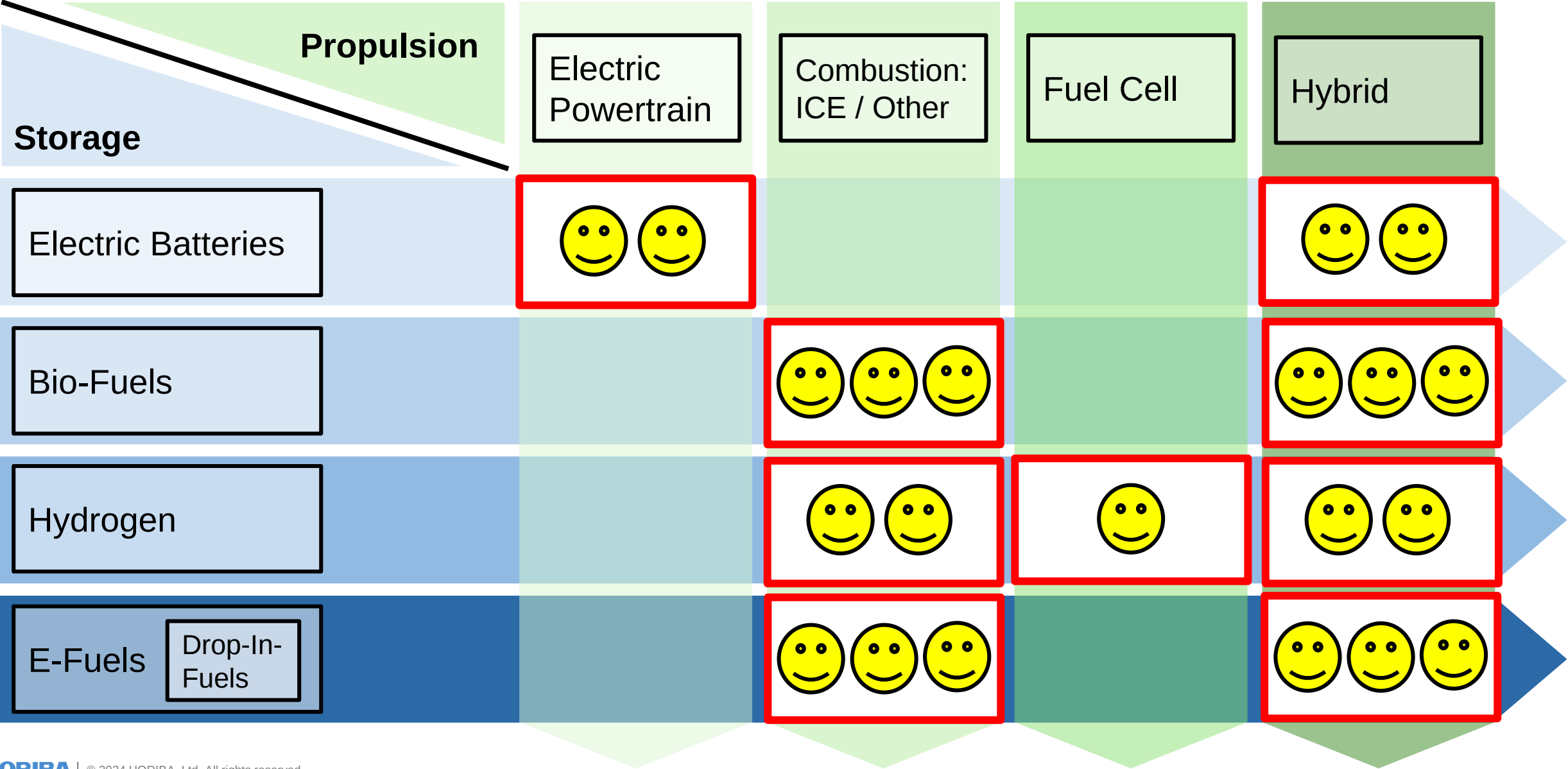


It's All About Energy – “Motors” (Propulsion)

Transport



Are We Ready to Develop Solutions?



Are We Ready to Develop Solutions?

Yes, we are ready in ALL technologies.

Some technologies are more mature than others, but all technologies will find successful applications in the most appropriate sector

The priority propulsion solution areas are:

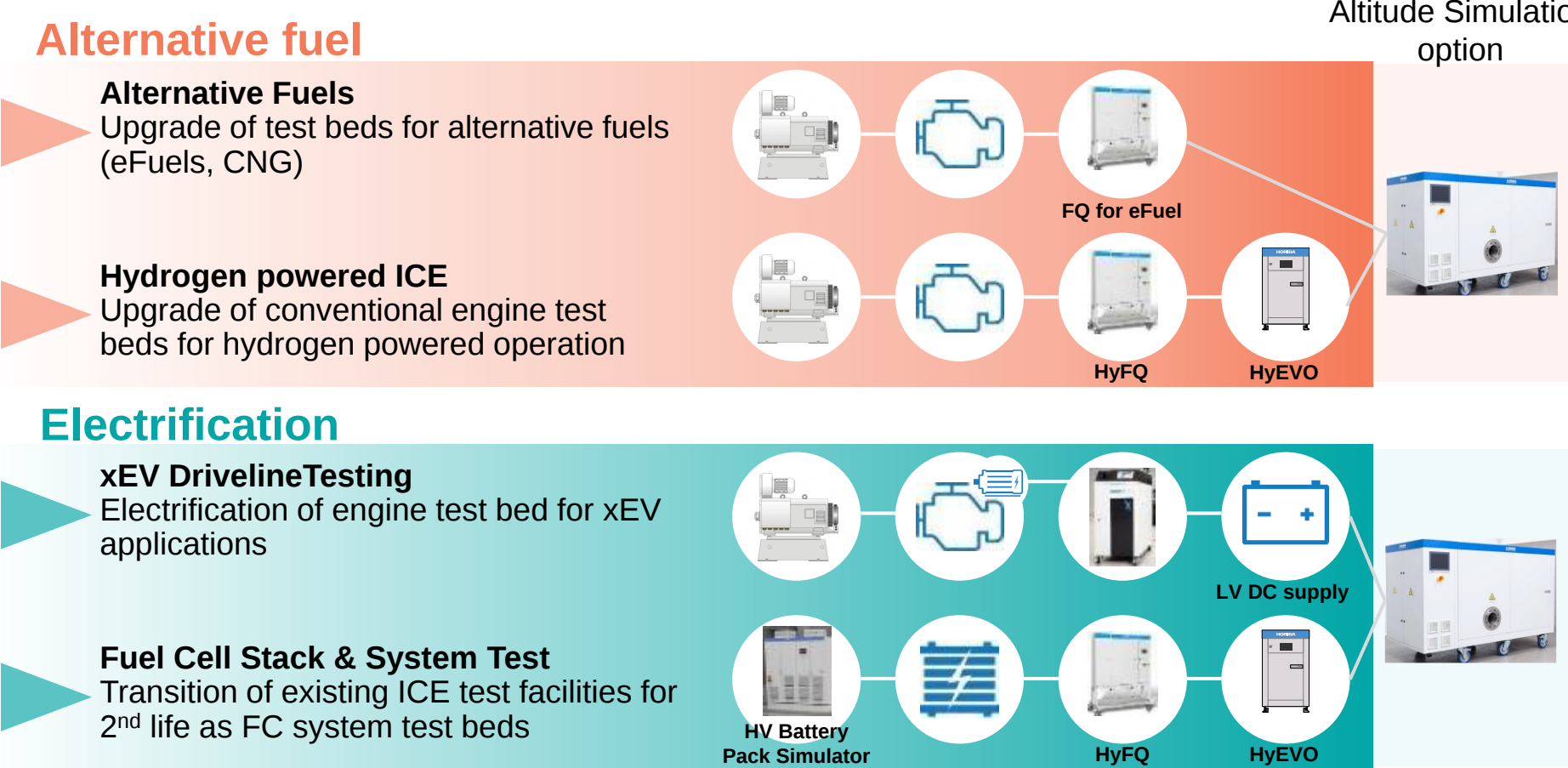
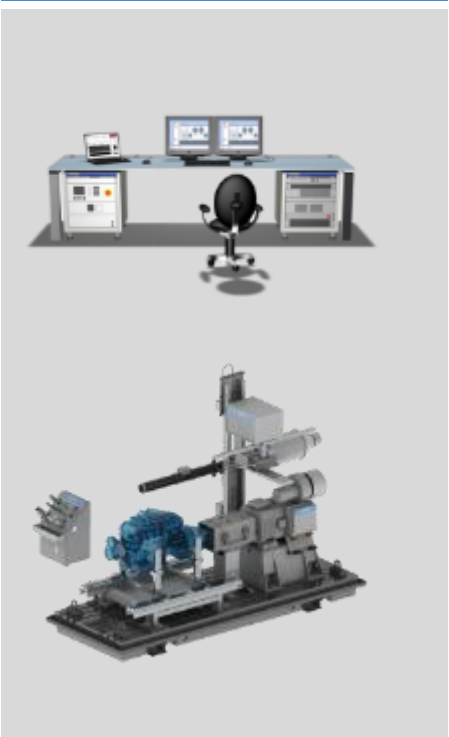
- 1. Electric propulsion systems**
- 2. H2 ICE & HFCs**

**With security and quantity of supply, bio-fuels and e-fuels will “drop-in” to the existing infrastructure and ICE propulsion solutions.....
.....this is easier said than done !!!**

Propulsion Testing Solutions

Flexible Test Bed Design for the Transition to New Applications

Using a
Conventional Engine
Test Bed



HORIBA INDIA TECHNICAL CENTER – H₂ ICE

Commissioned Q2 2024

India's first H₂ICE operation

JCB H₂ICE from UK

Successful test in India

Ready for Certification tests

Transient PM 380kW dyno



HORIBA INDIA TECHNICAL CENTER – H₂ICE

H₂ sensors & ventilation

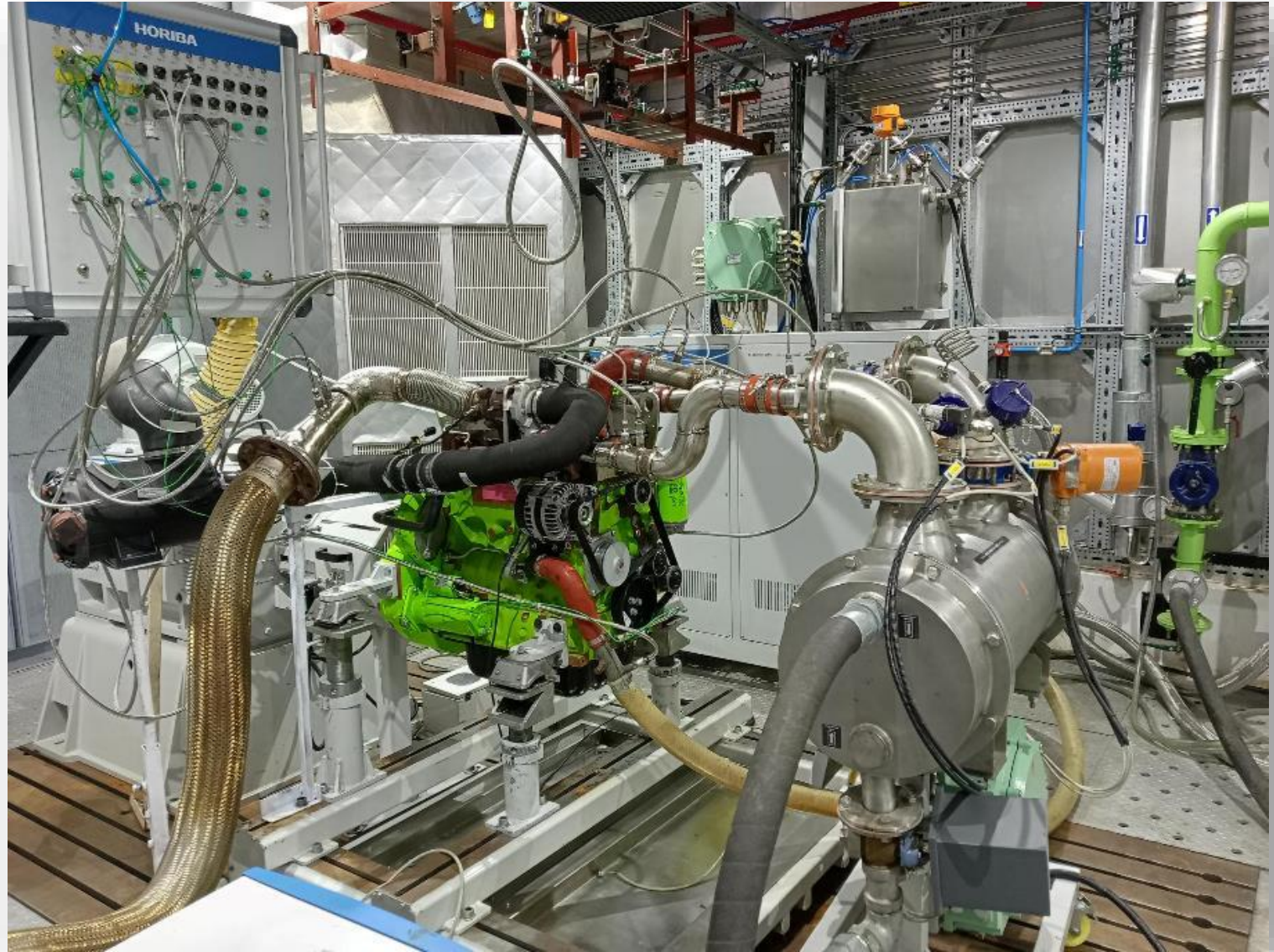
H₂ safe & ATEX rated

200 bar H₂ supply

H₂ consumption with HyFQ

H₂ emissions with Hy EVO

Water analyser



HORIBA INDIA TECHNICAL CENTER – E-Propulsion



So Much To Do So Little Time!

Many new technologies need to be developed ASAP.

Time is running out !!



Just because it's zero-carbon, it doesn't get a free pass!

- Euro 7 (ICE Emissions, Break & Tyre Emissions, Range/Battery Durability)
- Real World Emissions (RDE) In-Service Compliance (ISC)
- Stage 6 NRMM

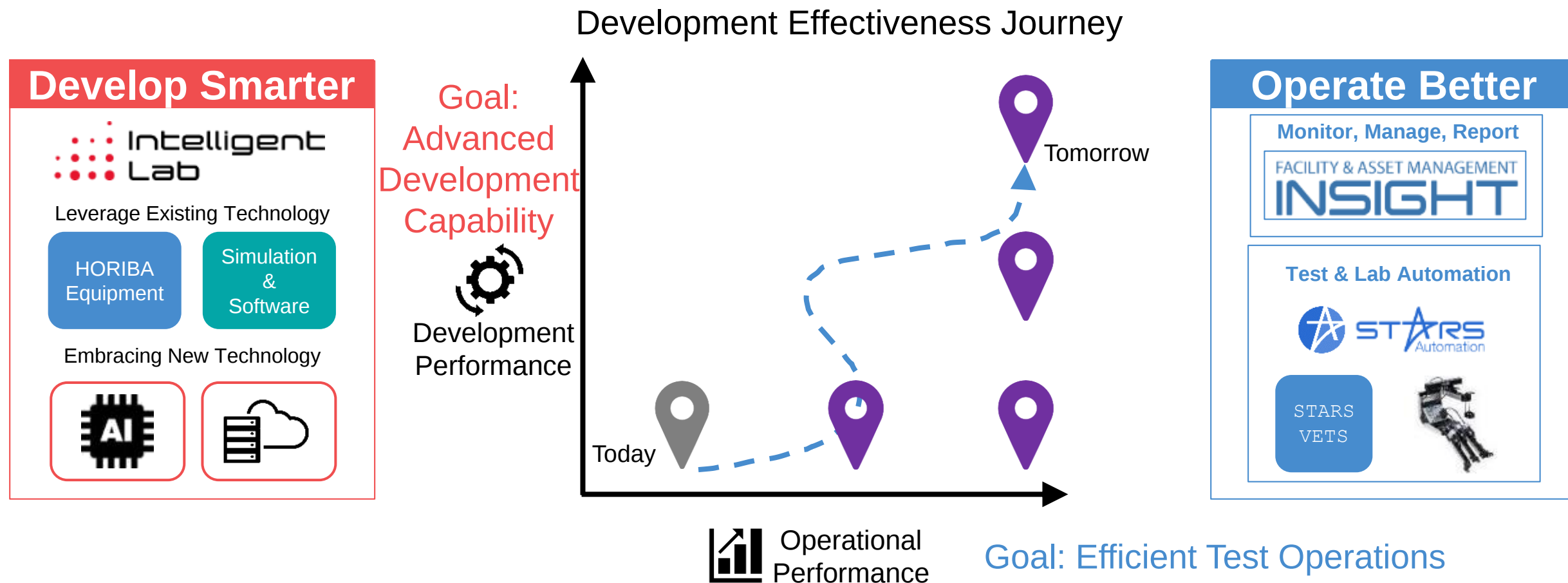
Real-World Driving and In-Service-Compliance lead to an almost infinite number of scenarios to develop & validate!

How can we do this? The meter is running!!!



Develop Smarter !

Problem: The time & cost of development is increasing (e.g. Euro7, xEV complexity, CAV)

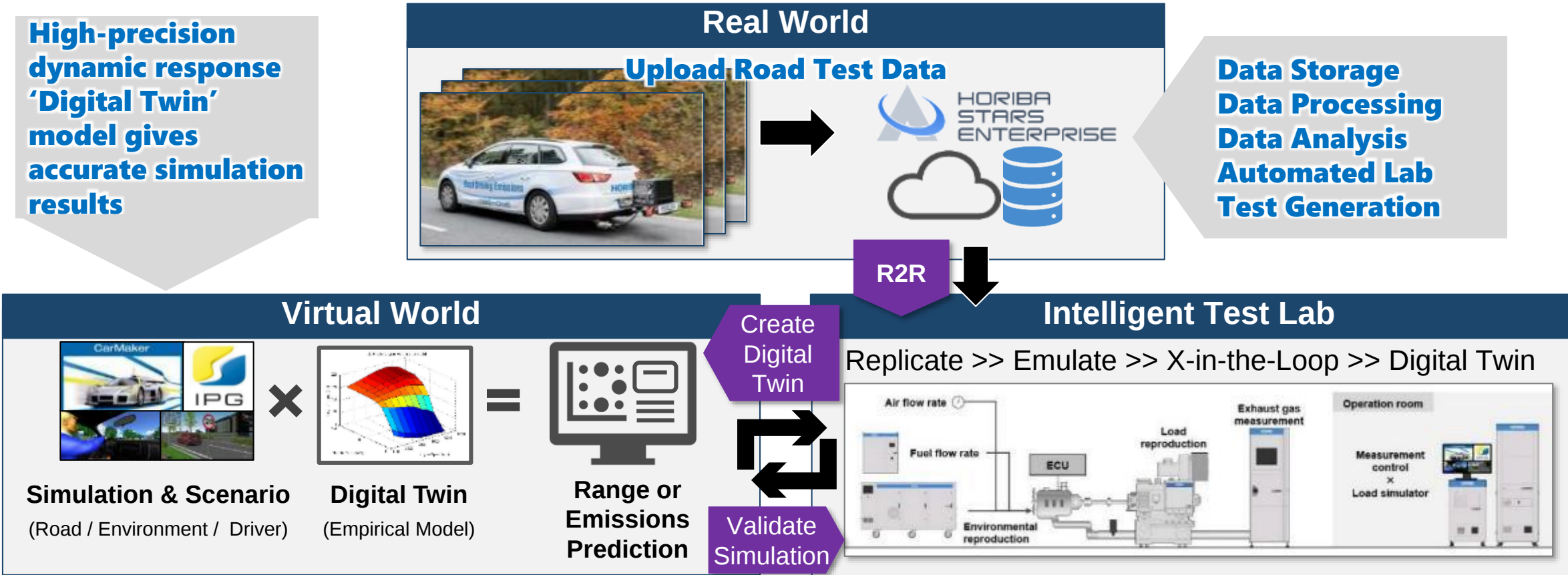


Intelligent Lab delivers smarter ways to develop products

Intelligent Lab Solutions to Virtualize Development

Combines Road-to-Rig and Digital Engineering inside an Intelligent Lab

- ✓ Minimize cost & man-hours
- ✓ Highly repeatable environment & scenarios
- ✓ Use existing equipment



Empirical Digital Twins – Bringing Trust to Simulation

Accurately predict: Fuel, air, NOx, PN, Range, Efficiency, ADAS, Functional Safety responses

Create Empirical Digital Twins of critical, complex systems

Especially suited to complex or non-linear

Powertrains



Thermal



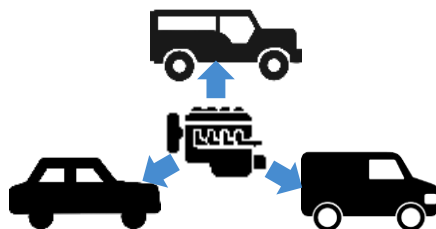
Sensors

Brake Dust

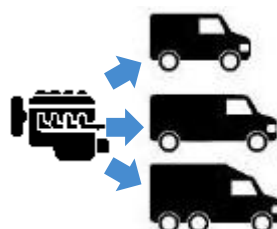


Analyse 1,000s of scenarios and model combinations

Models



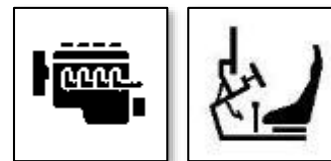
Variants



Scenarios



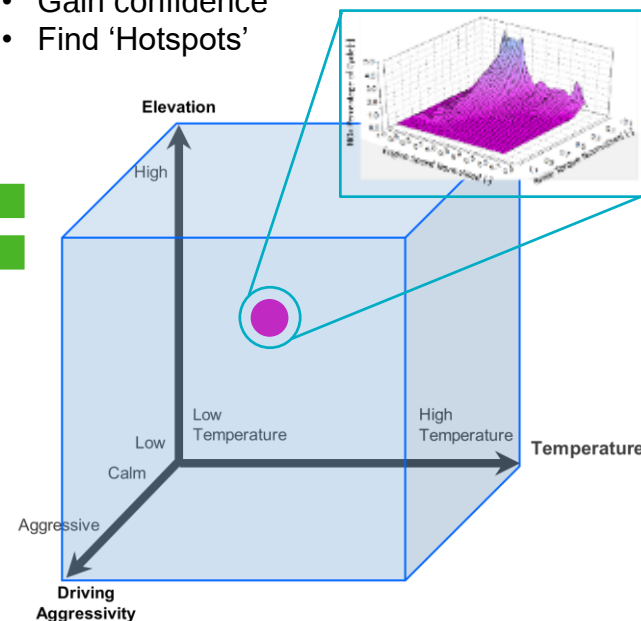
Departments



Accurately predict responses

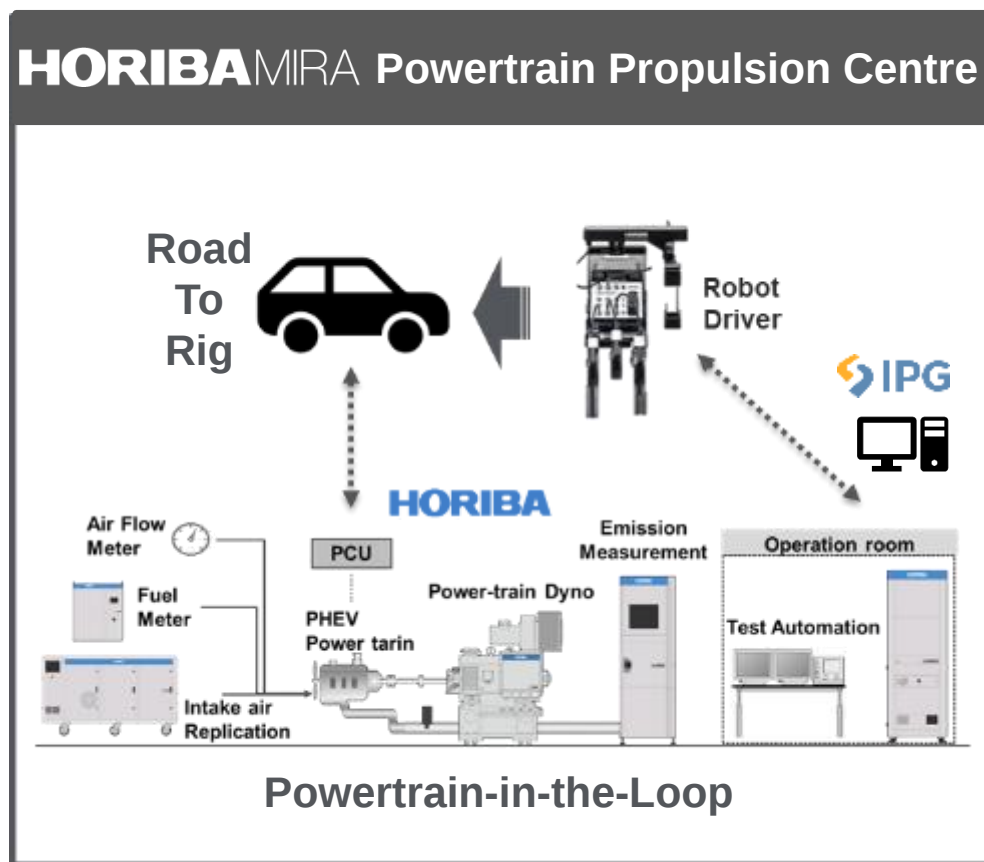
Explore the Operational Design Domain

- Demonstrate coverage
- Gain confidence
- Find 'Hotspots'



Whole Vehicle Digital Development

- The integration of simulation, digital twins, hardware-in-the-loop and road-to-rig enables full digital development of a vehicle using the DMU (digital mock-up)
- Ride & handling, performance, efficiency, range, emissions, ADAS can all be developed in the virtual domain



Making it Happen – Be Pragmatic Not Dogmatic

- A multitude of renewable energy vectors and new propulsion solutions
- An amazing collection of new tools and processes

Energy

There are a myriad of new “fuels”, each with their own optimal applications.

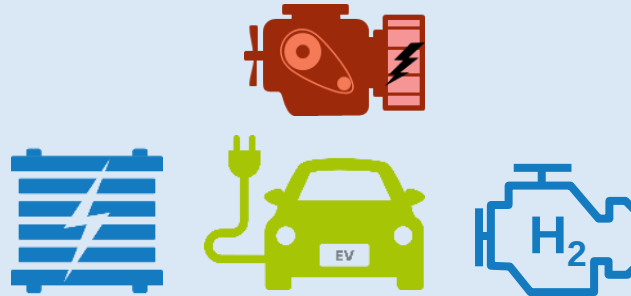
All options should be supported



Propulsion

Propulsion technologies exist in readiness to exploit all energy vectors and comply with air-quality regulations

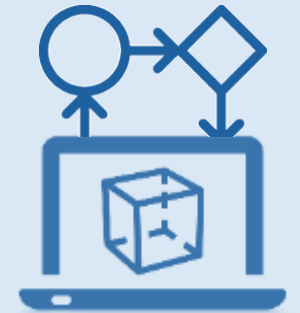
All options should be supported



Development

Development capability exists to deliver NPI in all sectors

Digital Engineering methods deliver accelerated NPI



Each solution needs the best energy & propulsion, and a fast road through development

It is the **Most Exciting Time!** Please join us on this journey

Omoshiro-okashiku
Joy and Fun

おもしろ可笑

THANK YOU

Gracias Terima kasih 谢谢 Tack ska du ha Danke Σας ευχαριστώ πάρα πολύ धन्यवाद शुक्रًا ขอบคุณครับ Большое спасибо Obrigado Cảm ơn Merci 감사합니다 Dziekuje