



EUROMOT

The European Association of Internal
Combustion Engine and Alternative
Powertrain Manufacturers

The Role of Powertrains in Decarbonising Society

EUROMOT Guiding Principles to Decarbonise
Non-Road Mobile Machinery, Rail, Marine
and Power Plant Applications

Executive Summary

March 2026



About EUROMOT

EUROMOT, the European Association of Internal Combustion Engine and Alternative Powertrain Manufacturers, represents the key manufacturers of internal combustion engines and alternative powertrains installed in Construction, Agriculture and Industrial; Forestry, Lawn and Utility; Marine; Rail; and Stationary power plant applications that are operating in Europe and globally.

Founded in 1991, we provide a recognised hub of expertise for businesses, authorities, regulators, and public stakeholders worldwide. In partnership with major sector associations and institutions, it is our mission to advocate better regulation, and to foster innovation that supports our sustainability and industry objectives.

Delivering reliable power for society at high energy conversion efficiency with low emissions remains a key objective of EUROMOT member companies. EUROMOT asserts internal combustion engines and alternative powertrains are a key enabler to address decarbonisation across multiple industry sectors. This can be achieved by continuing to advance the development of flexible highly efficient energy conversion systems capable of operating on various low and net zero greenhouse gas emissions energy carriers.

Introduction

Climate change is one of society's major challenges and EUROMOT and its members are developing innovative/cost-effective solutions that enable equipment users to achieve their climate objectives.

All activities that contribute to this phenomenon need to participate in its management. EUROMOT members have a comprehensive knowledge of the way machines, powered by their propulsion systems and stationary engine power plants, work and perform.

This knowledge has been captured and documented in the reports referenced here. These reports propose highly effective Decarbonisation Pathways that EUROMOT believes deliver an optimum reduction in greenhouse gas emissions; that is the most efficient and rapidly deployable, that also safeguards industrial competitiveness and minimises inflationary effects.

In essence this is presented as a set of Core Principles; followed by a summary of the key influencing factors, and the evidence base for these.

EUROMOT Guiding Principles to Guide Decarbonisation Pathways

Those Core Principles are:

Technology neutrality:

- Facilitate a diversified energy mix and do not be tempted to force a single technology.
- Base overall GHG reduction objectives in each industry sector on Life Cycle Analysis (LCA) considering different end uses and do not focus solely on emissions at point of use.

Recognition of the needs of end users:

- Ensure the continued ability to deliver dependable power to perform the intended task wherever it is needed.
- Ensure the availability of new low or net zero greenhouse gas (GHG) energy carriers at competitive costs.
- Facilitate the availability and use of low and net zero GHG energy carriers suitable for existing in-use products.

Predictable global approach:

- Align activities and levels of ambition at international level recognising internal combustion engines, alternative powertrains and the applications in which they are installed are developed for global markets.

Important Considerations

Non-Road Mobile Machinery:

- Machines work on sites, or on farms.
- Fuel/energy is taken to the machine on site.
- Time on site, or in a field, can vary greatly and may be short.
- Energy use and Intensity of operation range from low to high. Operation may be intermittent or continuous.
- Electricity, or the required power, is not often available on site.

Marine:

- Ocean going vessels run continuously for up to several weeks consuming large quantities of energy.
- In inland waterways and, more broadly, in tramp shipping, cargo contracts are frequently concluded at very short notice.
- A recreational craft typically operates less than 50 hours per year. This may consist of a small number of intense voyages of several hours.

Stationary Plant:

- Power plants predominantly use engines to generate electricity.
- This generation may be prime power for small remote communities.
- These power plants are an important part of grid systems where they support the variable output from renewable generation – grid balancing.

Key Factors that Define Decarbonisation Pathways

Energy use	Is a large amount of energy used for the task or voyage?
Work intensity	Is the average power the machine or vessel is working at a high percentage of its maximum output power?
Type of use; Type of voyage	Is the machine or vessel running for a high proportion of the task, or voyage, duration, or for a small portion?
Availability of electricity on site	Is electricity at a usable voltage and power available at the site of use of the machine?
Predictability of deployment Predictability of voyage	Can the task or voyage be planned well in advance, or is it required to act urgently depending on circumstances?
Location of site; Remoteness	Is the machine being used in an area with infrastructure and service availability or any area without these?
Time on site; voyage duration	Is the journey length, or time a machine is on site short i.e. days or weeks, or long i.e. months or years?
Required machine mobility	Does the machine used for the task move around the site (>100 m) or does it stay in one position?
Minimise refuelling/ recharging	Is it important to complete the task or journey without significant downtime for refuelling/recharging



Application and Use Case Examples

Combine Harvester



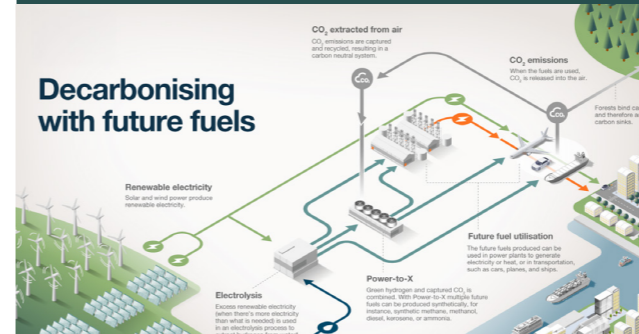
High energy use; high intensity;
short time on site; no electricity
→ Renewable liquid fuel

Medium Field Tractor



Medium energy use; medium intensity;
short time on site; no electricity
→ Renewable gaseous or liquid fuel

Main Grid Support –
Balancing Renewable Generation



High energy use; high intensity;
sporadic use - unplanned
→ Low carbon fuels moving to bio/
renewable fuels including
non-carbon fuels

Primary and Backup Power for
Data Centre



Medium energy use; medium intensity;
sporadic use - unplanned (backup)
→ Low carbon fuels moving to
bio/renewable fuels including
non-carbon fuels

Large Excavator – Repairing Breakwater



High energy use; high intensity;
short time on site; no electricity
→ Renewable liquid fuel

Mini Excavator Working In Basement



Low energy; low intensity;
short time on site
→ Electric

Miscellaneous Cargos
on Varied Inland Routes



High energy use; high intensity; mixed
short & long unplanned voyages; elec-
tricity only at some start or finish points
→ Drop in low carbon fuels moving to bio/
renewable liquid fuels

Intercontinental Container Ship



High energy use; high intensity;
continuous voyage; no electricity
→ Bio/renewable fuel, such as
ammonia or methanol

Chainsaw – Timber Harvesting



High energy use; high intensity;
short time on site; no electricity
→ Renewable liquid fuel

Lawn Mower – Domestic Use



Low energy; low intensity; short duration;
close to infrastructure
→ Electric

Motor Cruiser



High energy use;
medium intensity; continuous
voyages; no electricity
→ Bio/renewable liquid fuels

Freight Train – Bi-Mode



High energy use; high intensity;
continuous use; no electricity for part
of journey
→ Bi-Mode – Direct electric
plus renewable fuels

Recommendations

Manufacturers are developing engines and powertrains that support decarbonisation of all the sectors in which they are used.

For successful deployment of these technologies, policy and regulation need to be technology neutral, recognising the need for the full array of decarbonisation pathways, and assessing these on a life cycle basis (LCA method), which supports GHG reduction technology innovation.

Policy also needs to enable the supply and distribution of renewable electricity and low carbon and renewable fuels. This includes production of drop-in low carbon and net zero fuels (such as biofuels and renewable fuels of non-biological origin (RFNBO)) for use in existing equipment.

It is critical that policy and regulation aiming at decarbonisation takes the continuing need for dependable power across society into account.



Disclaimer

This paper is provided for general informational purposes only and may be updated or revised in the future. It's based on the information available at the time of publication. Technology is advancing and future developments may alter the conclusions made here.

Neither the European Association of Internal Combustion and Alternative Powertrain Manufacturers (EUROMOT) nor any of its member companies provide professional services through the publication of this paper.

The content of this paper is not intended to serve as a basis for business, financial, or other decisions, nor for the execution of any related actions. For such purposes, readers should consult a qualified professional advisor.

No representations, warranties, or guarantees, whether express or implied, are made regarding the accuracy or completeness of the information contained in this paper.

Neither EUROMOT nor any of its member companies, nor their employees, shall be held liable for any loss or damage of any nature, whether direct or indirect, incurred by any individual or organisation as a result of reliance on this paper.

EUROMOT and its member companies operate as legally autonomous and independent entities.

Report Overview

This document is one of a portfolio of decarbonisation reports produced by EUROMOT, which are:

1. EUROMOT Guiding Principles
2. Executive Summary
3. Full Report
4. Sector-specific Summary Reports:
 - Non-road Mobile Machinery
 - Forestry, Lawn and Utility Machines
 - Marine Inland Waterways Transport
 - Marine Seagoing
 - Marine Recreational Craft
 - Rail Transport
 - Stationary Power Plants

Contact

EUROMOT aisbl

The European Association
of Internal Combustion Engine
and Alternative Powertrain
Manufacturers
Rue Joseph Stevens 7
1000 Brussels
Belgium

Email: secretariat@euromot.eu

Web: www.euromot.eu

EU Transparency

Register ID: 6284937371-73

All rights reserved.

© March 2026

© Pictures: Adobe Stock, iStock, Shutterstock, Pexels, EUROMOT member companies