



SCANIA AUSTRALIA

GREEN POWER

[DRIVING THE SHIFT TO A SUSTAINABLE TRANSPORT SYSTEM]



Time to clear the air

MARCH 2019

SCANIA



TRANSPORT'S SUSTAINABLE TRANSFORMATION

There is no need to wait, and no time to lose.

Alternatives to diesel are available here and now to power your commercial transport vehicles, be they buses or trucks, large or small.

All it takes is the willingness to act to make a difference.

Scania is a world leader in the development of high-performance, low-emission, heavy-duty engines, for trucks and buses, for work boats and pleasure craft, industrial stationary engines and power generators.

At Scania, we are driving the shift towards a sustainable transport solution, not by simply talking about the issues, but getting on and engineering solutions that are now not only ready for implementation in Australia, but which have already been proven in operation in Europe and other progressive countries around the world.

As you can read in these pages, in Australia we have set in motion agreements and partnerships that can assist you in transforming your transport fleet into a low emission fleet today and a zero emission fleet tomorrow.

It is not realistic to expect a society such as Australia to transform overnight, and with our geography, we cannot dispense with our trucks and buses.

Yet as population growth and congestion pressure attacks our cities, we must act now to preserve not only air quality today but for future generations.

Scania is proud to offer the industry's widest range of cost-effective, ready-to-go, alternative-fuel solutions today.

To solve the problems of polluted air, CO₂ emissions, congestion and energy security that plague most growing cities today, many parallel developments are necessary. Improved public transport, better logistics, driver training, new energy-efficient vehicle technologies (such as hybridisation) and alternative fuels are all important elements in our green toolbox.

To make the transition towards sustainable transport as quickly as possible and in scale, we also need these solutions to be cost-efficient and proven.

Scania is convinced that the transition to alternative fuels and biofuels, based on existing and proven technology, can – and should – start here and now!

We have the technology. All you need is the will.

Please ask us how we can help you create a cleaner, cost-effective transport environment for Australia.

Anthony King
Sustainable Solutions Manager
Scania Australia

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MOUs TO DRIVE DOWN EMISSIONS IN AUSTRALIA

Scania Australia is taking bold strides towards making the adoption of alternative fuels an easier choice for the country's transport operators.

The company has recently signed memoranda of understanding with three providers in the bio-fuels industry, in order to lubricate the path towards adoption of more sustainable and cleaner transport solutions for its customers.

Wilmar Bioethanol Australia; Ecotech Biodiesel and the NGV Group, infrastructure suppliers and consultants for Natural Gas and Biogas, have all signed up with Scania.

"Having held many discussions at high levels with a number of transport-related entities this year, from governments to operators and suppliers, and having noted significant enthusiasm for actually turning this into action, Scania is now moving to facilitate the adoption of alternative-fuelled vehicles in Australia," said Anthony King, Scania Australia's Sustainable Solutions Manager.

"We want to secure reliable, consistent and widely available biofuels for customers nominating alternative fuels for their future Scania vehicles, as part of our drive towards creating a sustainable transport future," Mr King said.

Scania has a broad alternative fuels engine portfolio, and these can operate on Compressed Natural Gas (CNG -15 % CO₂), Compressed Biogas (CBG -90 % CO₂), Liquefied Natural Gas (LNG -5 % CO₂) Bioethanol (-90 % CO₂), Biodiesel (-85 % CO₂) and HVO (-90 % CO₂) and Hybrid + HVO (-90 % CO₂).

"Transport contributes a quarter of total energy-related CO₂ emissions. Operators do not have to wait to adapt their businesses to a sustainable transport system – the solutions are already here. Scania can provide a broad range of platforms and services to support our customers today and tomorrow," he said.

"Scania has been a leader in the provision of Euro 6 vehicles in Australia – notably with the fleet of close to 100 Euro 6 buses delivered to Transport Canberra since 2014 – plus the delivery of many Scania trucks similarly compliant, so it is only natural that we now look at rolling out access to further alternative fuel vehicles to a wider body of customers," Mr King said.

"For a fuel to be considered sustainable it needs to fulfil three criteria: reduce CO₂ from wheel-to-wheel; be available in sufficient volumes to make a difference; and provide a competitive business case against regular diesel to make it commercially viable."





ICE NOT MELTING YET

While the future belongs to electric vehicles, the internal combustion engine is not dead yet, not by a long way.

Battery electric vehicles will be instrumental in achieving a fossil-free commercial transport system by 2050 in line with the United Nations Sustainable Development Goals and the Paris Agreement. However, biofuels used in internal combustion engines constitute the best near-term alternative.

“We are developing all alternative technologies bearing in mind their commercial viability,” says Christian Levin, Head of Sales and Marketing at Scania.

“It would be futile to launch products that fail to meet the business reality of our customers. The basic premise must be that the technology offers a reasonable cost of ownership in the near term.”

The plug-in hybrid truck, above, and battery electric bus, which were both exhibited at IAA, meet these criteria.

“Scania is well-positioned as the

technology develops with more cost-effective solutions,” says Levin.

Scania is exploring pathways towards achieving zero fossil emissions, ranging from full electrification to a portfolio of powertrain types. A recent study showed that the rapid spread of electric vehicles will require four to five times more infrastructure investment relative to the present situation but will, by 2050, decrease operating expenses by 40 %.

In fact, battery electric vehicle growth offers the most cost-effective course of action in total abatement of fossil-fuel heavy transport. By 2031, the total cost of ownership for battery electric vehicles will reach parity with diesel for all vehicle segments, including long-haulage.

Scania is committed to providing all technologies that can immediately help reduce CO₂ emissions. An adoption rate growth of new fossil-free powertrain technologies of at least 5 to 10 % per year on average throughout the world is needed to achieve full sales penetration by 2040.

NO DIESEL TO SHOW

Scania showcased its wide range of practical, effective and efficient real-world alternative fuel solutions for the transport and logistics industries as well as passenger transport at the bi-annual IAA Show in Hannover, Germany in September, 2018.

None of the manufacturer’s vehicles on display ran only on diesel; there were biodiesel, ethanol, HVO, and battery electric hybrids on display, and the first LNG-powered coach that Scania has shown, below, complete with a 1,000 km range, or more than enough to travel from Melbourne to Sydney with fuel to spare.

“We are in the midst of a fundamental shift in heavy transport and Scania aims to lead the way with all the low-carbon and zero tailpipe emission vehicles that hauliers require for their operations,” said Alexander Vlaskamp, Senior Vice President, Head of Scania Trucks. “Cities are now in the forefront but all forms of transport will need to adjust to meet the carbon reduction target as set forth in the Paris Agreement.”

The star of the Scania stand was a plug-in hybrid distribution truck. This gives distribution haulage transporters the needed option of covering the distance from suburban warehouse depots in the combustion engine mode while switching to electric propulsion when entering the city centre. While unloading or resting along the distribution route, drivers can charge batteries in 20 minutes for continued deliveries,” Mr Vlaskamp said.





Scania's range of alternative fuel solutions is already on the road

Scania offers 'here and now' solutions for alternative fuels to diesel for powering heavy-duty vehicles such as trucks and buses: Bioethanol, biodiesel and gas either in compressed or liquefied formats.

All of these reduce noxious emissions and CO₂ compared with traditional diesel fuel.

Ethanol

Scania has engineered its ethanol compatible engine to be Euro 6 compliant, and one of the key benefits to ethanol is that

it is 43 % efficient, compared with diesel's 44 % combustion efficiency.

For trucks, the Scania ethanol engine comes in 280 hp and 410 hp and 280 hp for buses.

The Scania modular system allows for minor changes to the standard diesel engine and offers very similar performance to diesel. Scania is producing its fourth generation ethanol engine currently.

The technology is proven and has been in commercial operation since 1986.

Biodiesel

Scania's biodiesel and HVO (Hydrotreated Vegetable Oil) range is also Euro 6 compliant, with engine outputs between 320 hp and 580 hp.

The exhaust after treatment system uses SCR or EGR and is fitted with a particulate filter.

Scania is particular to ensure it only works with suppliers of high-grade biodiesel meeting the standards of EN14214 for biodiesel and EN15940 for HVO.



Gas

Scania Euro 6 gas engines are the most efficient way to use gas for fuel. The gas engine works on the Otto principle and is the most efficient engine of its type.

The Scania gas engine provides 40 % thermal peak efficiency and delivers diesel engine torque levels.

Using the Scania modular system of engine construction, the Scania gas engine has less than 40 parts that differ from a diesel engine, meaning there is excellent access to regular service and maintenance parts for operators.

The engines are available in 280 hp and 320 hp for bus applications, and 280 hp, 340 hp and 410 hp for trucks.

The Scania engine is less sensitive to the quality of the gas fuel and has 100 % operability at 2000 m+ above sea level. It can operate on Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG), and no complex SCR or EGR after-treatment is required to reach Euro 6 exhaust emissions: only a 3-way catalyst is necessary.

Hybrid

Scania's hybrid solution and electrified driveline with a traditional engine performs best in suburban operation. Combined with alternative fuels there is up to a 92 % CO₂ reduction.

There is also a 'Silent' drive option for low noise levels.



Refuelling a gas truck, above, an LNG-powered truck, middle, and an electric hybrid truck, left, comprise part of the Scania range of alternative fuels solutions that are available today.

Here and now sustainable solutions

clean and low carbon solutions for all alternative fuels



BIODIESEL & HVO

Low blends to B100
Diesel engine

Up to 83 %
CO₂ reduction

All types of
applications, including
long-haulage and
coaches.



ETHANOL ED95

World's No. 1 biofuel
Diesel engine

Up to 90 %
CO₂ reduction

Buses, coaches
waste collectors,
distribution trucks.



BIOGAS & NATURAL GAS

Compressed or liquid
Otto engine

Up to 90 %
CO₂ reduction

City/Intercity buses,
waste collectors,
distribution trucks.



HYBRIDS & ELECTRIFICATION

Diesel hybrids
Biofuel hybrids
BEV Demo tests

Up to 98 %
CO₂ reduction

City buses,
waste collectors,
distribution trucks.



BUS SYSTEMS

Bus System packages

Buses
Service and R&M
Workshops
Financing
ITS and FMS systems
Ticketing systems
Alternative Fuels

SCANIA ASSISTS BIOENERGY REPORT LAUNCH

Bioenergy Australia has released the first 'Bioenergy State of the Nation Report' produced in collaboration with KPMG, which identifies Australia's significant bioenergy opportunity and provides a criteria for kick-starting Australia's bioenergy economy.

"The report reviews the policies of states and territories in order to share learning and facilitate policy transfer across Australia, with much to be gained through the adoption of 'best practice' approaches throughout Australia. Queensland has already adopted a number of successful policies which can be adapted and deployed to drive bioenergy uptake across the country," said Shahana McKenzie, Bioenergy Australia CEO, at the launch at Parliament House in Canberra in December.

The event was attended by Scania representatives, including Anthony King, Scania's Sustainable Solutions Manager, accompanied by a Scania Euro 6 emissions compliant bus, capable of running on 100 % biodiesel, delivering an 85 % reduction in CO₂ emissions.

"The key to the report is that job creation by local people in regional areas is a win/win for biofuels, and carbon reduction allows for cleaner air," Anthony King said. "Biofuels and economic growth go hand-in-hand. This is a sustainable combination.

"At Scania we are not only part of the problem but we are also part of the solution. We are planting the biofuel seeds now for tomorrow's transport generation.

"Future generations will hold us accountable, so we should start driving the shift to a sustainable transport future now," he said.



Independent MP Bob Katter, biofoods producer Manildra's Kirsty Beavon, Bioenergy Australia CEO Shahana McKenzie and former Liberal leader and bioenergy advocate Dr John Hewson, with the Scania Euro 6 bus at the launch.

Bioenergy is generated from the conversion of solid and liquid biomass products for use as electricity, heat, gas, liquid fuels and bio-based products and delivers a range of benefits such as employment and economic development of rural/agricultural communities, energy security, utilisation of waste streams and reduction in greenhouse gas emissions.

Report assessments were based on bioenergy performance measured against five evaluation criteria: Policy development and effectiveness, bioenergy project development, technology and feedstock, sustainability guidance, advocacy and education.

"Queensland is driving the bioenergy agenda on a number of fronts, and should be commended for the incredible work happening across the state. They have a government who recognises bioenergy as a priority industry, actively rolling out new projects through the delivery of the Biofutures Roadmap and Biofutures Program," said Ms McKenzie.

To read the report visit: bioenergyaustralia.org.au



Commercial transport can be fossil-free by 2050

A fossil-free commercial transport system in the timeframe of the Paris Agreement target is not only possible, but also financially attractive from a societal perspective. This is the key conclusion of a study initiated by Scania.

"Reaching zero CO₂ emissions in our sector in the timeframe of the Paris Agreement is attainable but will call for change at an unprecedented high speed, and for serious and joint private and public sector commitment," says Henrik Henriksson, Scania's President and CEO.

"We can achieve more than 20 percent reduction of CO₂ emissions by working even smarter in the current transport systems, for example through improved routing and better load management. On top of that, we see several fuel and powertrain pathways to a fossil-free future. Biofuels offer the fastest CO₂ emissions reductions and electrification is the most cost-effective," Henriksson says.

New technologies can take a long time to achieve wide adoption, as the existing stock of vehicles turns over slowly. To be fossil-free by 2050 therefore requires, changes at scale already by 2025, including not only new technologies but also new infrastructure..

An average global growth rate of new fossil-free powertrain technologies of at least 5 to 10 percentage points per year, which achieves full sales penetration by 2040 is required. To reach this goal, the transport sector and adjacent industries must initiate change rapidly and immediately.

These are the key conclusions of The Pathways Study: Achieving fossil-free



TAKING TO THE E-HIGHWAY

The German Government is to co-finance a research project to test and develop electric road technology for eHighways. Volkswagen Group Research together with Siemens will develop technology and electric hybrid long-haulage trucks supplied by Scania for the project.

The project aims to reduce carbon emissions from long-haul heavy-duty commercial vehicles.

"For long-haulage transport, Scania sees electric roads as one promising technology for a sustainable transport future," says Claes Erixon, Executive Vice President Research and Development, at Scania.

commercial transport by 2050:

Smarter logistics: Carbon emissions can be cut by more than 20 percent by optimising systems, for example improving routing and load management. The remainder can be reached with alternative powertrains and fuels.

Electrification: Battery electric vehicle growth constitutes the most efficient, quickest and cost-effective pathway in countries with the infrastructure potential to provide universal charging systems and non-fossil energy. Full-scale electrification will require significant infrastructure investment relative to the present situation. In return, operating expenses will be 40 % lower than for heavy diesel vehicles.

Biofuel: Biofuels will initially offer an effective and viable pathway, taking advantage of traditional combustion engine technology. The technology and fuels are both available here and now. Biofuel-fed combustion engines will power 20 % of vehicles in 2050.

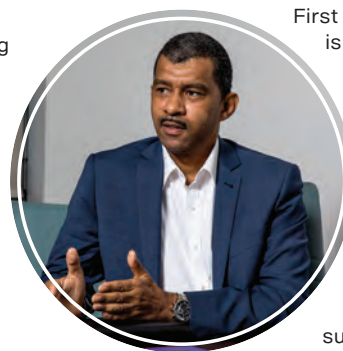
Fuel Cells: These vehicles will be more expensive, so substantial growth for this pathway comes later. If cost of technology decreases and renewable hydrogen is available and plentiful at low cost, by 2050, fuel cell can be a substantial part of the vehicle fleet.



SUSTAINABILITY EXPLAINED

We asked Anthony King, Scania Australia's Sustainable Solutions Manager, a few good questions. For example, what does 'sustainability' mean to Scania?

Sustainability at Scania is about driving the shift towards a Sustainable Transport system based on the three pillars of Energy efficiency, Alternative fuels and Electrification and Smart and safe transport. This we call "Doing the right things". However, we also have to be responsible corporate citizens hence we have also embarked on an internal sustainable journey focussing on how we conduct responsible business internally. This we call "Doing things right". It is this approach that aligns Scania with the United Nations Sustainable Development Goals and our contribution to the fulfilment of these SDGs through our innovative solutions and partnerships.



Why does it matter to transport operators?

Transport contributes a quarter of total energy related CO₂ emissions and it is these emissions that are contributing to climate change. In order to mitigate against climate change transport operators have to act now. They do not have to wait to adapt their businesses to a sustainable transport system – the solutions are already here. Scania offers a broad range of platforms and services now, to support our customers today and tomorrow.

How can we be more sustainable?

Scania does not see a 'one-size' fits all solution however by driving the shift through optimised transport systems and by choosing fossil-free pathways we are already reducing emissions. Internally we are creating an awareness around one of our core values of 'elimination of waste' whereby we are addressing all areas of the business where we can make a difference.

What alternative fuels solutions are available now?

First of all our philosophy at Scania is to always offer solutions for all sustainable fuels. For a fuel to be considered as sustainable it needs to fulfill three criteria:

- It needs to reduce CO₂ including the whole production cycle from well to wheel.
- It must be available in sufficient volumes to be able to make a difference.
- It needs to provide a competitive business case towards the fossil alternative to be commercially viable.

Scania has a broad alternative fuels engine portfolio and these can operate on Compressed Natural Gas (CNG - 15 % CO₂), Compressed Biogas (CBG - 90 % CO₂), Liquefied Natural Gas (LNG - 5 % CO₂) Bioethanol (-90 % CO₂), Biodiesel (-85 % CO₂) and HVO (-90 % CO₂) and Hybrid + HVO (-90 % CO₂).

Industry experts believe that the internal combustion engine will continue to play a significant role in transport into the future.



HYBRID TEST BUS COMING

Scania Australia is soon to welcome its first hybrid bus chassis, to be bodied locally to demonstrate its suitability for Australian city operating conditions.

Australian bus operators have been slow to adopt alternative fuels, despite some Scania operators experimenting more than a decade ago with gas and ethanol vehicles.

But the reality is in Australia, unless there's a government incentive or new legislation, we look set to continue leaving the same emission signature from diesel across the skies of our increasingly densely-populated cities, despite several viable options being available in Europe.

Without Euro 6 legislation, Australia is slipping behind Europe in terms of emissions reduction. Europe's Euro 6 rules mean noxious exhaust emissions are significantly reduced compared with previous generations, so the emphasis has turned to carbon dioxide emissions reduction. As with NOx, one of the easiest ways to reduce CO₂ emissions is to reduce fuel use.

Scania offers a complete selection of alternative fuels in European markets and they are growing in popularity, and the latest is a diesel hybrid bus that teams a traditional (though biodiesel-compatible) diesel engine with an electric motor and batteries mounted on the roof.

Spain's capital has 51 Scania Citywide buses in operation. Madrid swelters in 40-degree summers and freezes through very cold winters, quite similar to Melbourne, in fact.

Madrid's route bus operators using these Scania Hybrids have seen a consistent



and reliable 23-25 % reduction in diesel consumption, plus added driveability its drivers love. This smoothness has also been noted by passengers. And the buses have proven to be exceptionally reliable in service.

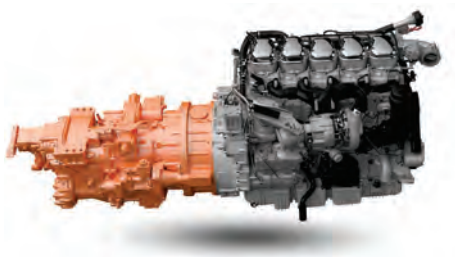
The routes the Madrid-based Scania Hybrids run are broadly similar to common Australian suburban routes where there's a decent gap between stops. This means the engines get up to speed and maintain speed, allowing the electric motor to assist the diesel which for short periods can drive the bus entirely on battery power.

Scania uses the diesel engine to maintain battery charge as well as propel the bus, though a refined version (due here soon) allows the bus to shut down the diesel motor and run silently for a short distance.

The new Class II specification Scania Hybrid Citywide can operate at speeds of up to 100 km/h, using the 320 hp Scania 9-litre with SCR-only aftertreatment technology that can run on up to 100 % biodiesel and Hydrotreated Vegetable Oil (HVO). Madrid's hybrids run on up to 100 % biodiesel, providing CO₂ savings of 60-65 %.

"We are excited to be bringing the Scania Hybrid chassis to Australia and we are very confident its on-road performance, its low fuel consumption and its drastically reduced emissions will spur a lot of interest from local operators in outer-urban areas," said Julian Gurney, Scania Australia Director of Sales for Bus, Coach and Engines.

"Hybrid offers extra passenger comfort, and the fuel savings go straight to the bottom line. And anything that helps clean up the air we're all breathing has to be a step in the right direction," Julian said.



POSITIVE RESULT FOR BATTERY BUS

Scania is moving towards serial production of a battery electric bus for city route work, based on the success of a lengthy trial programme using a Scania Citywide bus in the northern Swedish city of Östersund.

"We have an uptime level which is basically in line with our conventional buses," said Karin Rådström, Head of Buses and Coaches at Scania.

"The buses are performing very well, and both the operator and the public transport authority are pleased."

"We know that all cities and operators have varying demands and that won't change just because the buses are electrically powered. However, robustness and uptime will remain as important as ever," Ms. Rådström said.

"In the long run, the total cost of operating battery electric buses will come down since we can use and reuse technology and the same parts as in our conventional buses. That will also enable us to provide a wide range of different versions of electric buses, such as articulated variants and buses with different bodies."

Ms. Rådström stressed that battery electric buses are only effective in curbing carbon emissions if the charging electricity is generated through clean energy. In Östersund, the buses are charged on hydroelectric power and are thereby fully fossil free.

Battery electric buses are best suited for inner city bus operations that actually only account for one-fifth of bus operations in urban areas.

"In different areas of the city, there will be different needs. Our electric bus has its place in the inner city, but in suburbs and in traffic between the inner city and suburbs we have other solutions that we believe are more suitable such as buses fuelled by natural and biogas, as well as our hybrid buses," she said.

