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BENNETTCLAYTON

18 September 2009

Committee Secretary
Standing Committee on Primary Industries and Resources
PO Box 6021
House of Representatives
Parliament House
CANBERRA ACT 2600
AUSTRALIA

Dear Sir,

Re. Inquiry into the role of government in assisting Australian farmers to adapt to the impacts of climate change

We write to make the committee aware of Commonwealth regulatory and taxation measures that act as disincentives for the take up of alternative technologies in the farming sector, and to suggest measures that would enable the Commonwealth to assist farmers to adapt to the impacts of climate change.

Bennett Clayton Pty Ltd is an engine technology company that specialises in converting diesel engines into alternative fuels including LPG, LNG and Bio-alcohols (methanol and ethanol). Bennett Clayton conversions deliver a range of economic and environmental benefits.

The economic benefits include:

- The reuse of existing diesel engines leveraging the embedded economic and energy value in the engine as well as the vehicle or appliance being used
- Cheaper operations as converted engines operate on cheaper fuel, perform better and need less maintenance
- Savings to the public purse as the costs of health care reduce with reduced emissions
- Improved fuel security as an imported fuel (diesel) is replaced with a local (LPG, LNG or bio-alcohols)
- Growth of a green automotive industry creating a number of new green jobs in manufacturing parts; engine conversion; installation and maintenance.

The environmental benefits include:

- Reuse of existing engines and extended life of vehicles
- Reduced emissions of greenhouse gases (GHG)
- Reduced emissions of regulated pollutants including HC, Co, NOx, PM10, etc
- Reduced emissions of unregulated pollutants including PM2.5
- Near-Carbon neutral operation where bio-alcohols are used

Bennett Clayton is currently working with farmers in the Riverina to develop alternatives to diesel engines used by rice farmers to pump water from deep bores. Bennett Clayton has invested significant R&D in developing a conversion for a commonly used engine (John Deere 6068) from diesel to LPG.

In the first instance LPG was chosen as a locally available fuel, and the technology has been structured for easy local manufacture. The converted engines are essentially ready to operate on renewable fuels (methanol or ethanol) that could in future be produced locally from local farm products (lignocellulose).

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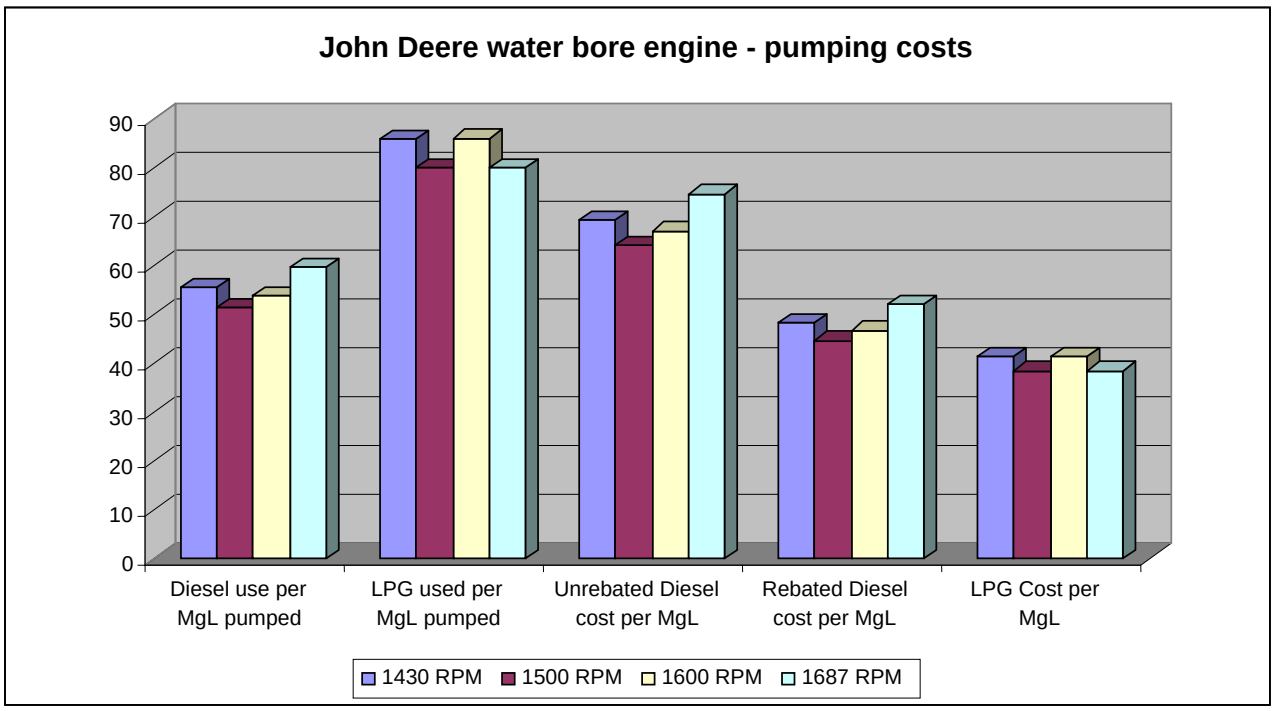
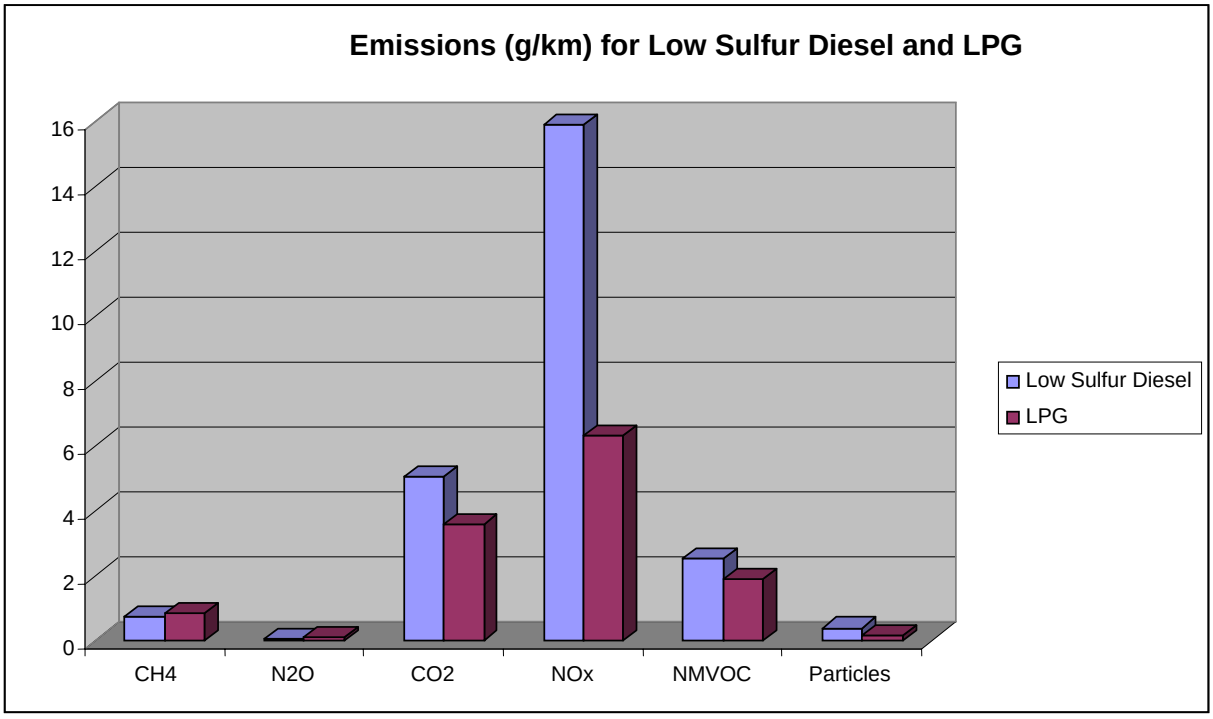
The converted engines have been very successful, reducing the cost of operating the pumps from $51 per megalitre of water pumped to $38 per megalitre of water pumped (on current fuel prices). The engines have also shows emissions reductions of up to 94% (Particulates and NOx).

The following chart shows operating costs at various loads before and after conversion from Diesel to LPG, and costs using Unrebated market cost of Diesel, Diesel cost after $0.38/litre rebate, and Market price for LPG. Tests were conducted when the market price of Diesel was $1.25/litre and LPG $0.48/litre.



The following chart, drawn from CSIRO report to the Greenhouse Office in March 2000, illustrates the emissions advantage of LPG over low sulphur diesel in equivalent applications.



These changes can have a very significant impact in the farm irrigation sector, both by offering farmers greater efficiency, and by reducing emissions. As the engines are essentially ready for renewable bio-alcohols, farmers could transition to an on-farm produced bio-alcohol (e.g. methanol) fuel as soon as production technology, currently in development, becomes available.

ABARE reports an estimated 142,000 licensed bores in Australia. In addition, there are at least that many surface pumps. The vast majority of these pumps are diesel-powered as electricity is only viable if the pump is near power infrastructure, and wind is mostly suitable for low-flow applications.

These alternative fuel engines have demonstrated reliability, having operated in the field for thousands of hours. They exhibit extremely low emissions, and reduced CO2 production. They are more economical than diesels, both in fuel cost, and in maintenance.

They are built in Australia with Australian technology, and are ideally suited for manufacture in rural centers, creating jobs (in green manufacturing and in service) and local economic development.

Diesel Fuel rebate

However, the take up of these engines in the market is hampered by the distortion created by the Commonwealth diesel fuel rebate. Farmers enjoy a Commonwealth Government rebate of about 38c per litre for diesel fuel used on the farm.

On an even playing field, alternative fuel engines are very competitive and would be taken up more rapidly.

We are asking that the diesel fuel rebate scheme be changed to a fuel rebate scheme, with the rebate applied to a fuel in proportion to its energy content.

This would mean that in round figures diesel would attract a rebate of 38cents, LPG 24 cents, Methanol 18 cents and Ethanol 23 cents.

These rebates would provide parity to diesel, and remove a major objection and barrier to the adoption of cleaner, friendlier and ultimately carbon negative fuels.

This small change will have a significant impact on emissions, and CO2 production as well as providing industry development and employment in regional areas.

With a rebate based on energy content, take up of alternative fuels would bring no additional cost to the Commonwealth as increased payments for alternative fuel rebates would be offset by reduction in payments of the diesel fuel rebate.

The Commonwealth would in addition derive benefits in the areas of fuel security (as LPG and Bio-alcohols are locally produced whilst diesel is fully imported); green industry jobs created in rural areas; reduction in emissions, and supporting farmers in adapting to the impacts of climate change.

Research and Development

Bennett Clayton is a small Australian company that brings together proven capabilities and technologies with the purpose of developing alternative fuel engines. The current R&D is funded wholly from private sources. The company is strongly motivated by social corporate responsibility as well as by commercial interests.

The technology being commercialised by Bennett Clayton has applications wherever diesel powered engines are currently used (including agriculture, transport, power generation etc.) and could deliver enormous environmental benefits. The technology has significant export potential.
The pace of research and development is dictated by the availability of funds and could be significantly accelerated through additional funds.

Whilst the company can go to the market for these funds, it has chosen in the first instance not to pursue that option and instead seek to develop a local industry that attempts to develop manufacturing facilities in rural centres, something that would not necessarily make commercial sense to a large multi-national or to a financial institution.

To this end we have approached a number of Government departments, both Commonwealth and State, and we have briefed a large number of public servants and politicians.

Whilst we get a polite, sometimes even enthusiastic, reception and soothing noises of support, we find that access to Government R&D funding programs is structured in such a manner that small, innovative companies always lose out to large corporates in the competition for public R&D grants.

A strong suggestion to the Committee is that it examines ways to improve access to government R&D grants for small innovative start up companies that can demonstrate the viability of their technology.

A small investment in these businesses is very likely to deliver a disproportionate, real and on the ground, benefit. In this case the benefit would accrue to farmers facing the impact of climate change and rural communities in need of economic activity.

For information, I attach a short paper reporting results of testing by the University of South Australia on the implementation of this technology on a heavy transport prime mover. These results clearly demonstrate the potential of this technology and how, with relatively modest investment in R&D, results commensurate with years of Diesel engine development are achieved.

Yours sincerely,

Marcus Clayton
Chief Executive Officer

Assessing the Environmental impacts of heavy vehicles fuels, Diesel V LPG.

Author

R. Zito (University of South Australia)

Abstract

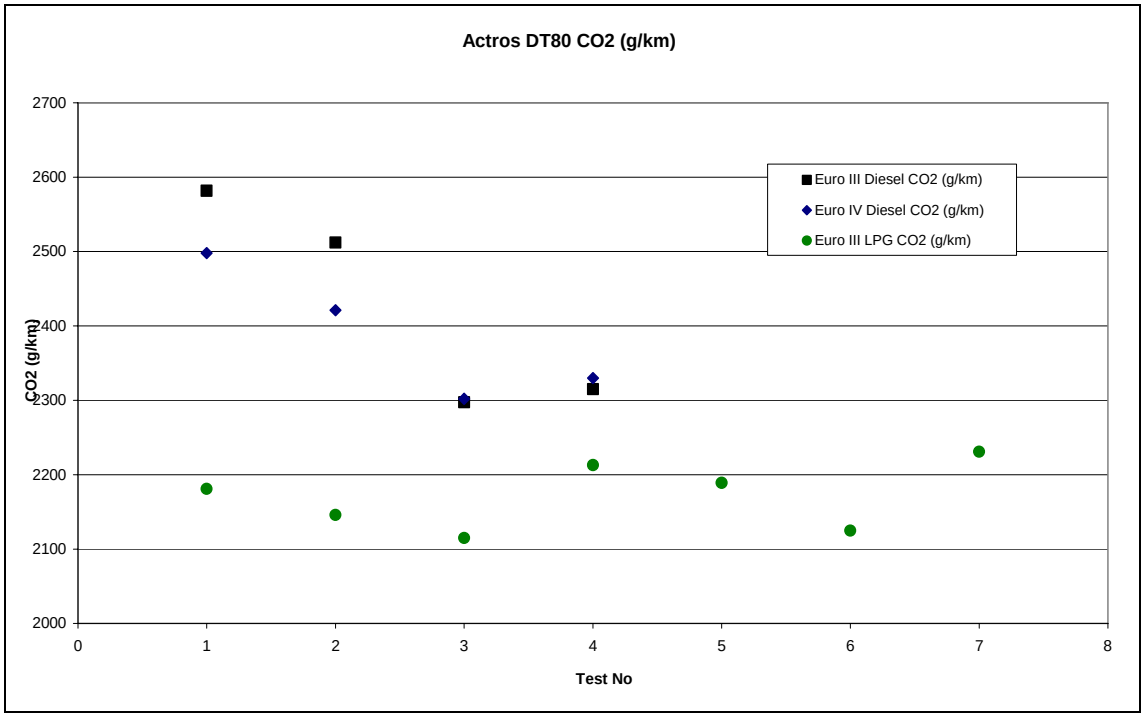
Heavy vehicle transport is dominated by diesel fuelled trucks, which have a long history of providing reliable transport operations. Most recently with the advent of the new European and American emissions standards Heavy Vehicle manufacturers have made significant improvements to regulated emission performance. The introduction of post combustion system such as advanced catalytic converters and particulate traps have seen modern diesel vehicles referred to as clean diesel's. This improved emissions performance can be directly attributed to tightening government emissions regulations, requiring increasing amounts of investment in research and development by the Original Equipment Manufacturers (OEM). The result of this investment sees the current diesel engines and vehicles efficiently manufactured to meet these regulations and eventually sold to an environmentally aware heavy vehicle market. This production and development cycle has been occurring since Rudolf Diesel's engine design of 1897.

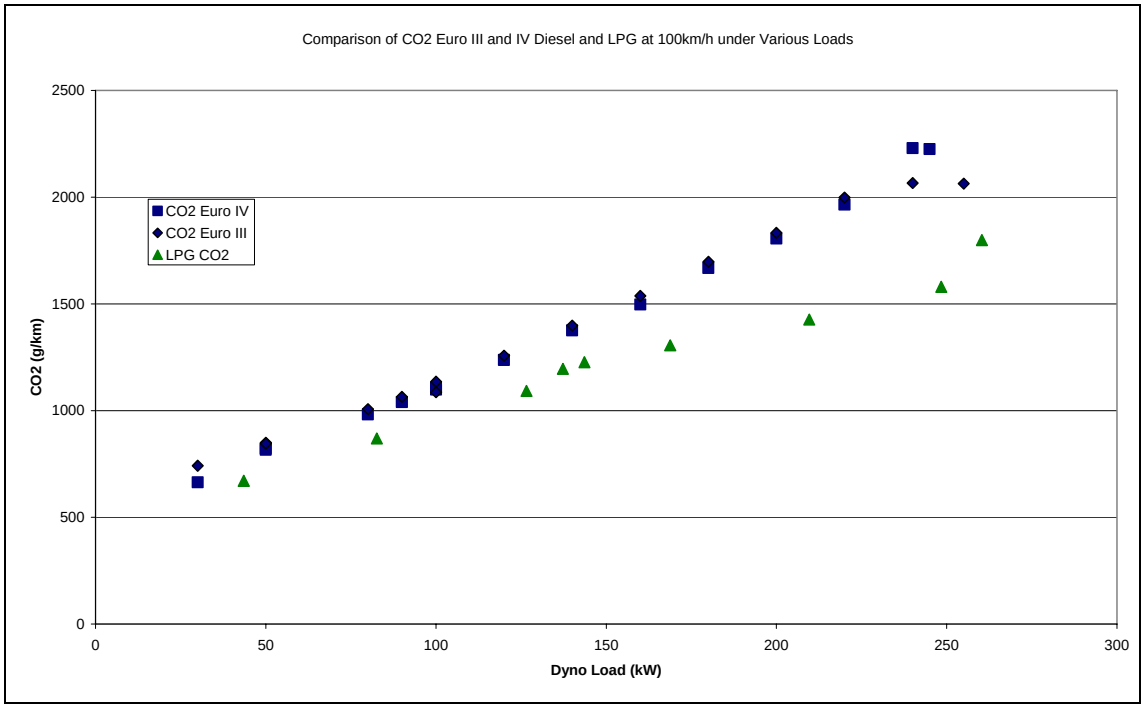
LPG engine technology, however, has not been subject to this same amount of investment and hence development over this period of time. One of the main reasons for this is that the European and American OEM heavy vehicle manufacturers have not considered LPG as a viable transport fuel, given its limited availability in these regions. In Australia however gas is available in plentiful supplies, to such an extent that it is exported. While LPG is gaining in popularity as an alternative fuel source, especially for light vehicles. Its use as an alternative fuel for heavy vehicle transport has been limited. While there are examples of heavy vehicles currently operating in Australia that use fuel sources such as Compressed Natural Gas or Liquefied Natural Gas, these applications are usually relatively small in scale and require specialist infrastructure for refuelling. The advantage of LPG is that the refuelling infrastructure is much wider spread, mainly due to the light vehicle use of LPG. However one of the dis-advantages of LPG and other gas fuels is that there has been limited national or international engine development using this fuel. Auto CRC is currently funding a project that is looking at a 100% LPG conversion of a diesel Mercedes Actros truck. Essentially the existing diesel engine has been modified from running on 100% diesel to run on 100% LPG. The University of South Australia has been asked to perform the environmental evaluation of this conversion. This paper will compare the tailpipe emissions results of a Euro III and Euro IV Actros truck running on 100% diesel, with the results of the Euro III Actros running on 100% LPG. The emissions to be compared include the regulated emissions of NOx, PM, HC and CO as well as the unregulated emission of CO_2.

The results show that when running on diesel and LPG the tailpipe emissions of the two fuels are in fact comparable. This is an encouraging result given the amount of development work that the diesel engines have undergone, in comparison to the LPG research work that has been undertaken as part of this Auto CRC project.

Table 1 Mercedes Actros Specifications

	Euro III	**Euro III LPG**	**Euro IV**
Fuel	Diesel	LPG	Diesel
No Cylinders	6	6	6
Engine Capacity	12L	12L	12L
Max Power	335 KW	TBA	350 KW
Torque	2200 Nm	TBA	2300 NM
Emissions control	Catalyst	None	Selective Catalytic Reduction




Comparison of CO2 Euro III and IV Diesel and LPG at 100km/h under Various Loads
CO2 (g/km)
2500
2000
1500
1000
500
0
0
50
100
150
200
250
300
Dyno Load (kW)
CO2 Euro IV
CO2 Euro III
LPG CO2

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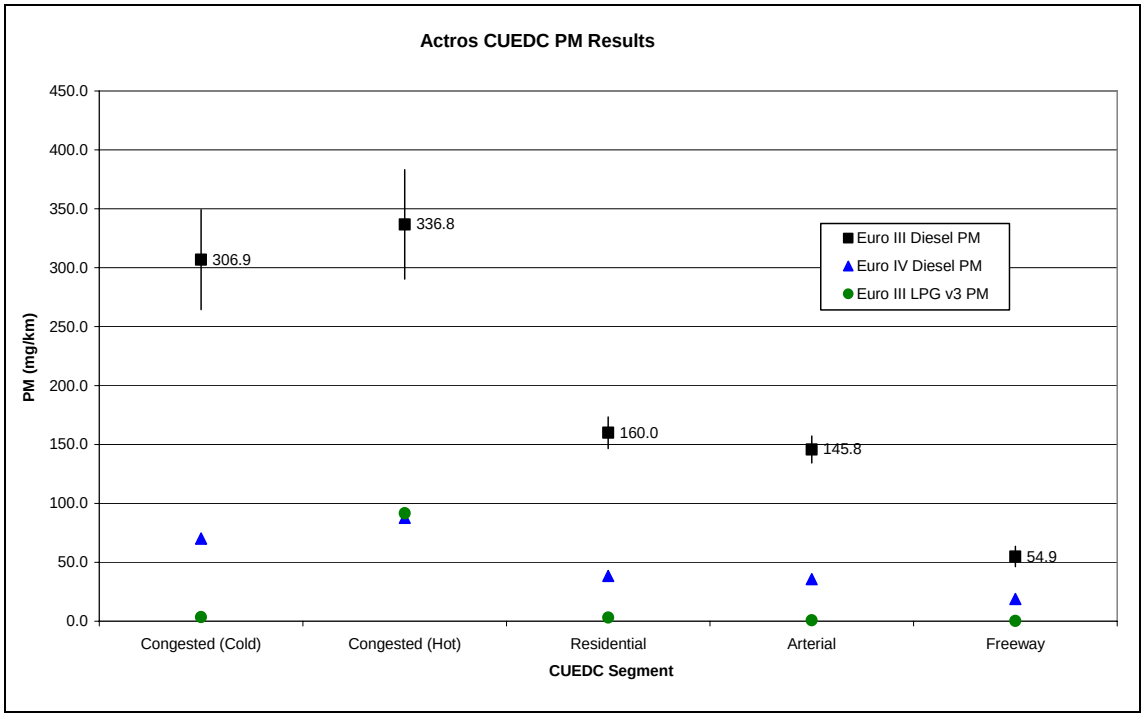
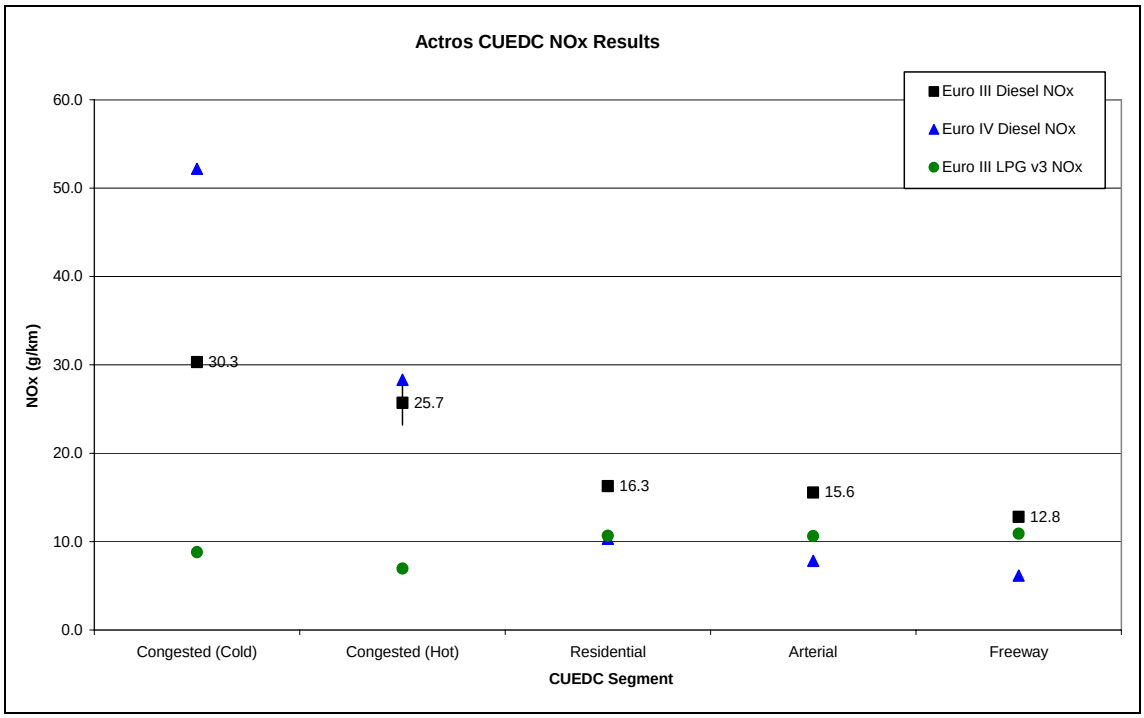

Actros CUEDC PM Results
PM (mg/km)
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
306.9
336.8
160.0
145.8
54.9
Euro III Diesel PM
Euro IV Diesel PM
Euro III LPG v3 PM
Congested (Cold)
Congested (Hot)
Residential
Arterial
Freeway
CUEDC Segment



Conclusions

All the emissions testing that have been performed so far at the DTEI facility has provided results that are accurate and reliable. When comparing results between the Euro III and Euro IV Actros, fuel consumption results are similar. However the Euro IV vehicle has shown significant reductions in both NOx and PM emissions. CO_2 results are comparable between the diesel and LPG versions of the Actros. As expected PM emissions from the LPG Actros are virtually zero with the Euro IV diesel showing lower PM emissions than Euro III diesel in all cases. NOx emissions are interesting in that there were situation when the Euro III diesel had better NOX performance than Euro IV diesel, and there were situation when the LPG Actros had higher NOx than the diesel Actros also, these cases can be mainly attributed to higher loads.

The results show that when running on diesel and LPG the tailpipe emissions of the two fuels are in fact comparable. This is an encouraging result given the amount of development work that the diesel engines have undergone, in comparison to the LPG research work that has been undertaken as part of this Auto CRC project.

References

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