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Dor Alon Gas Technologies Ltd.

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Agenda

- **Part 1**

  Introduction and advantages of LPG

- **Part 2**

  Diesel blend LPG system

- **Part 3**

  Direct Liqui Max

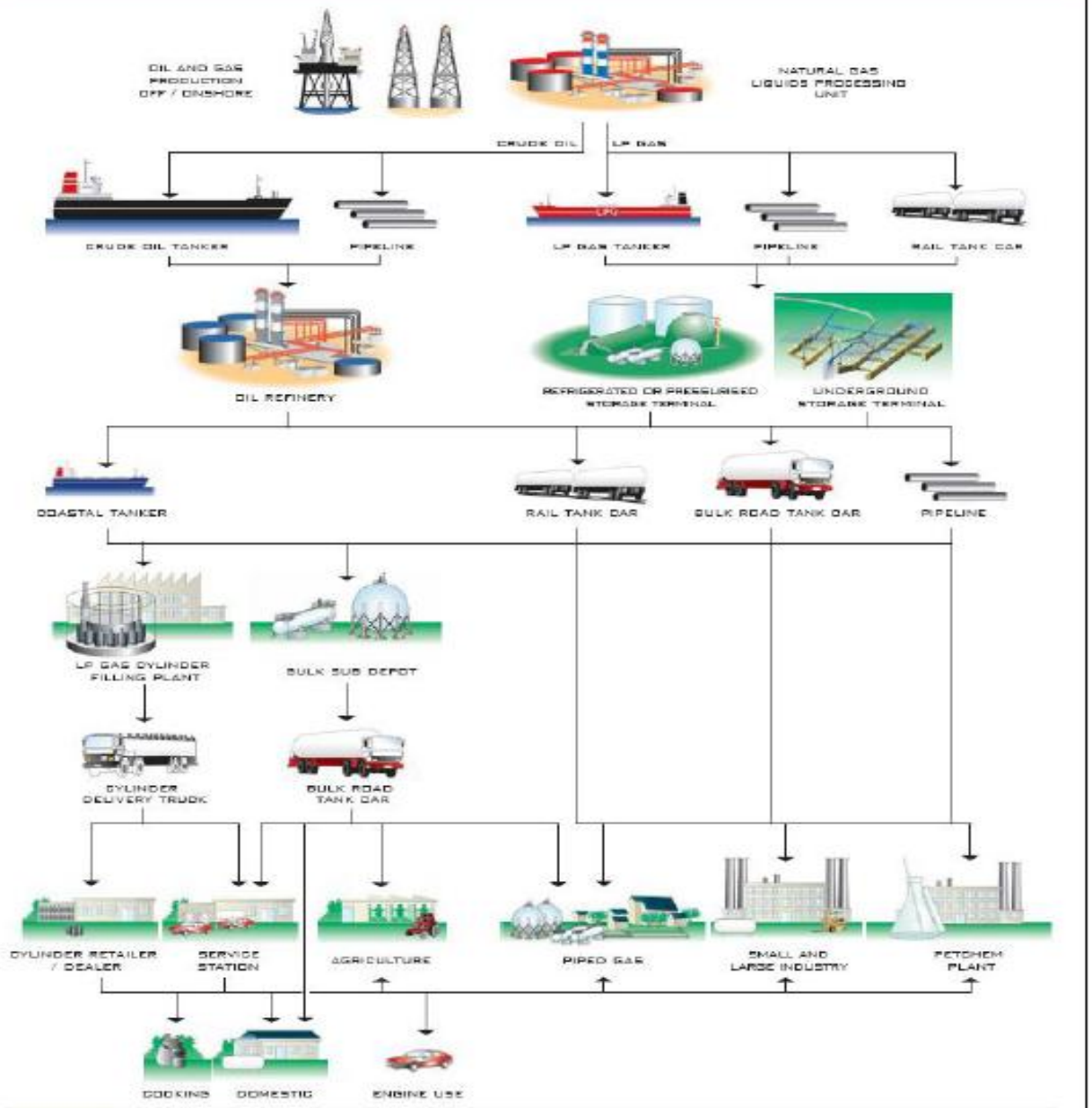
  Prins LPG system for direct injection engines

Prins Facts

- Subsidiary of SHV, world leader in the distribution of LPG.
  ("Super Gas", "Primagaz", "Ipragaz")

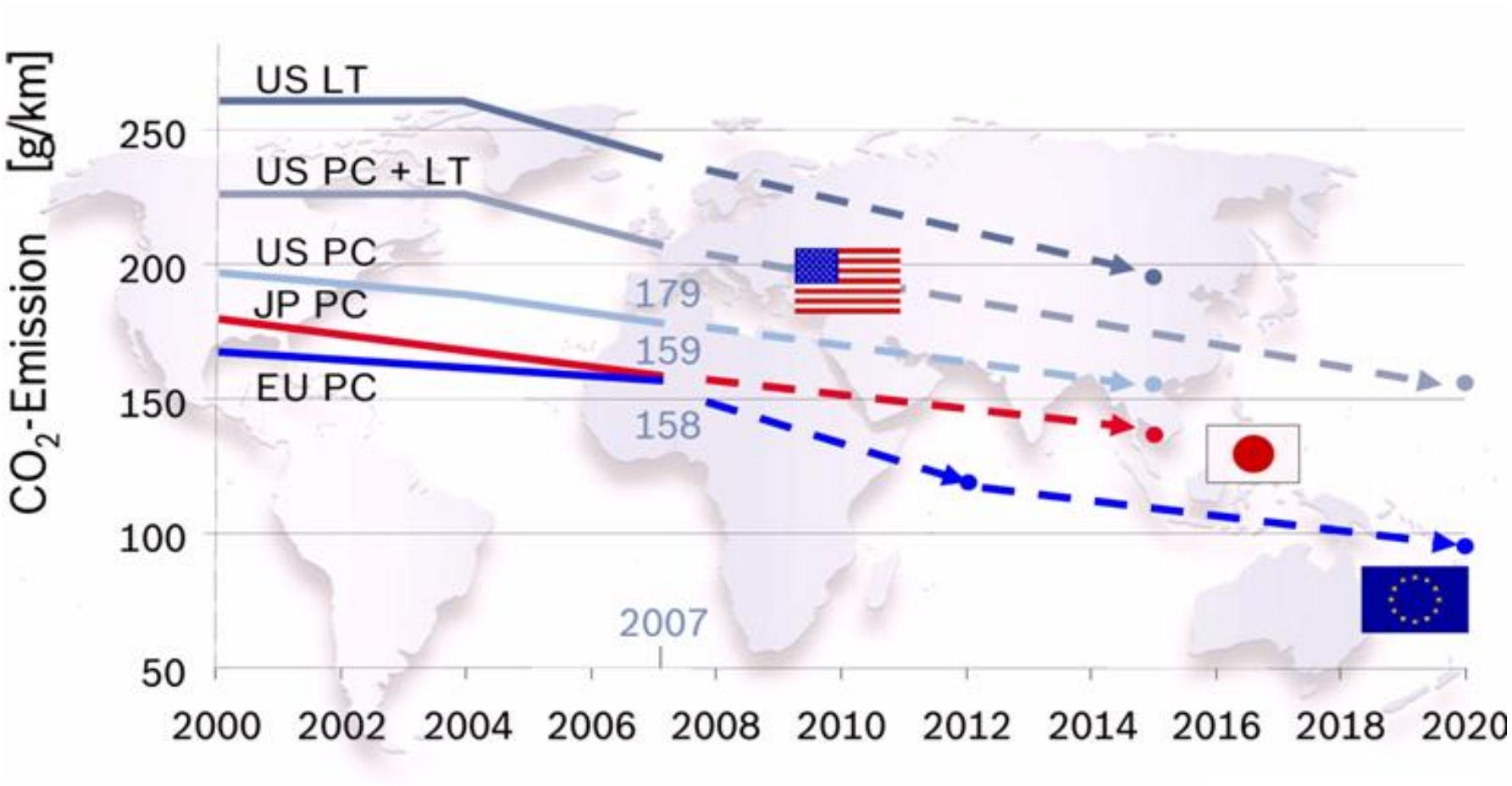
- One of the largest manufacturer of LPG and CNG systems in the world.
- R&D partner of KEIHIN Japan. Exclusive worldwide distributor of injectors and CNG regulators.
- Components comply with R67-01 / R110 / R115 / CSA and EPA regulations.
- In-house product development and test facilities.
- Export to over 50 countries. Customers include OEMs, Country Importers and Distributors.

Figure 16: LP Gas distribution chain



Statistical Review of Global LP Gas 2011 DATAMONITOR

Future CO2 roadmap



- **Automotive CO2 emission standards are becoming more stringent worldwide**

Emission advantages LPG

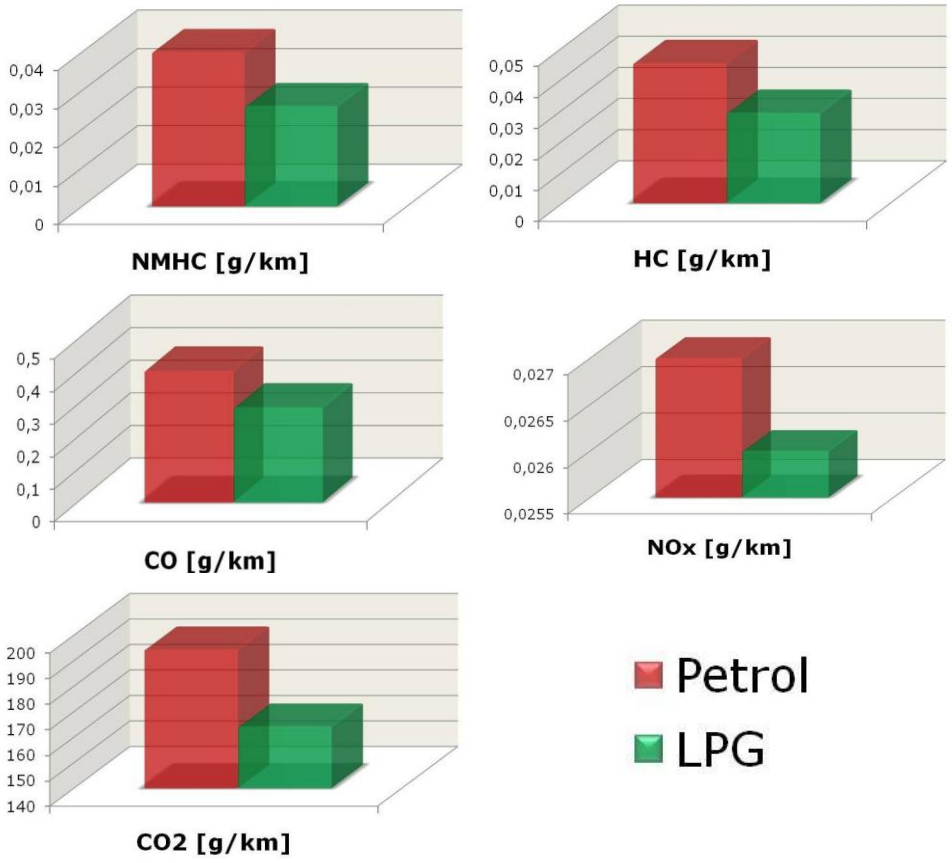
Substance/ fuel	Diesel	Petrol	LPG	Remarks
NOx	☹	😐	😊	Autogas is 96% lower than diesel and 68% lower than petrol
Particulate mass	☹	😊	😊	Autogas even slightly lower than petrol
HC	😐	😐	😊	Close to detection limit
CO	😐	😊	😐	Optimized engine calibration/design can give better results for Autogas
CO_2	😊	😐	😊	Autogas has no disadvantage compared to diesel and further R&D could further improve results.
Unregulated pollutant emissions	☹	☹	😊	Aldehydes, Poly Aromatic Hydrocarbons, BTX and the number of small sized particulates
Ozone formation	☹	😊	😊	Good effects on regional level; opposite for local level (NOX not taken into account)
Global warming	😐	😐	😊	Strongly linked to CO_2 emissions
Acidification	☹	😊	😊	Only NH_3 higher for Autogas

Official TÜV test reports – EURO5

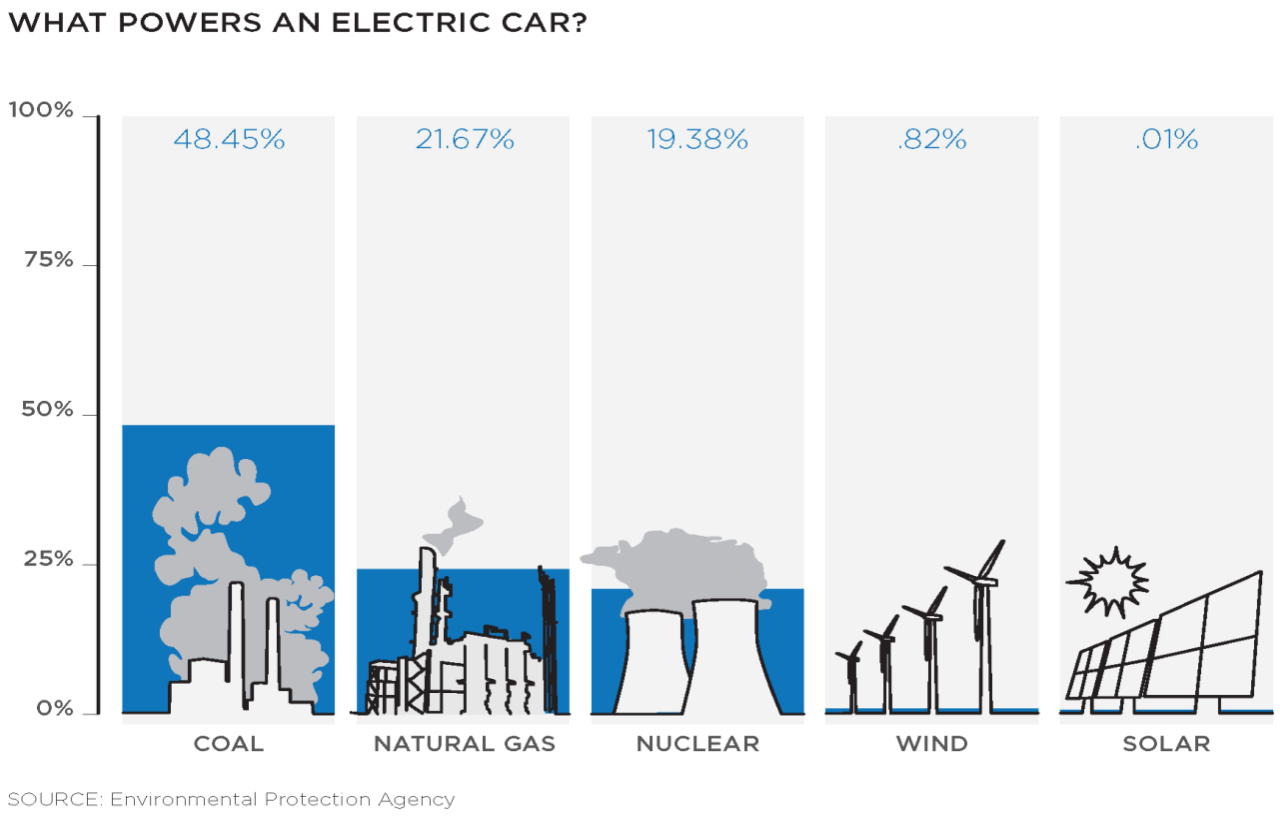
This emission test proves that driving on LPG contributes to a cleaner environment.

Overview of the test results:

- 28% less CO-emission
- 35.6% less HC-emission
- 35% less NMHC-emission
- 3.7% less NO_x emission
- 15.5% less CO_2-emission

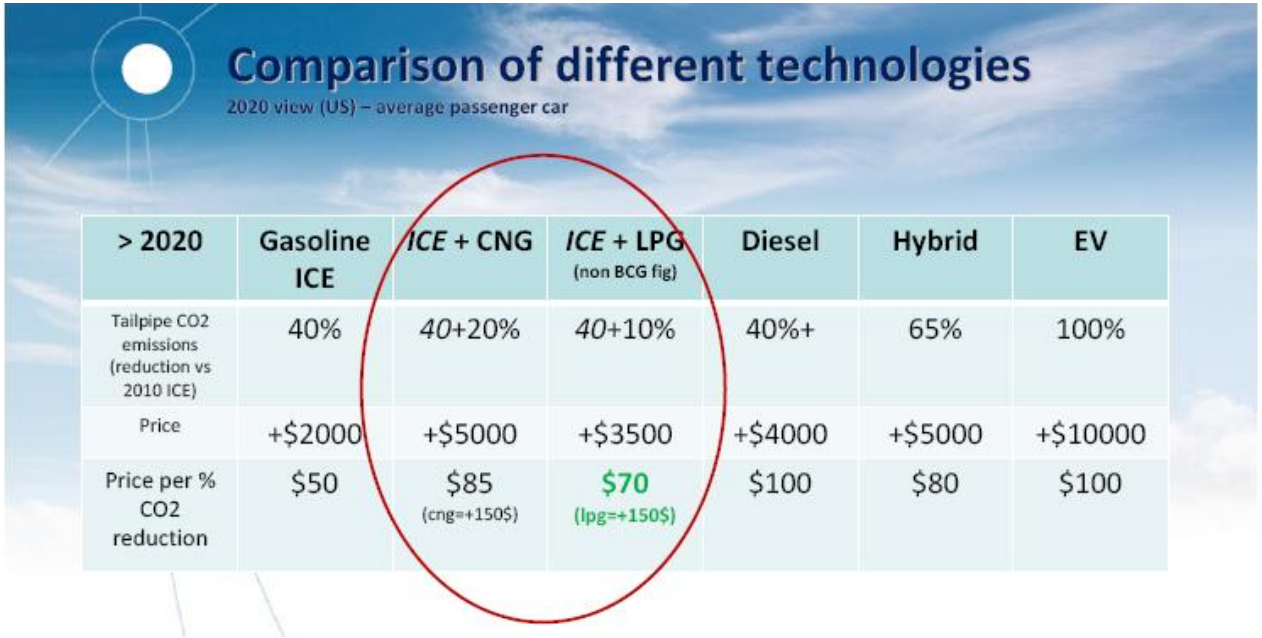


Electricity supply USA



Electric vehicles

- Zero emission only tailpipe!
- Infra-structure to charge Electric Vehicles
- Recycling of old batteries?
- Driving range at the moment
- Substantial cost to increase electric grid in most countries.



Comparison of different technologies

2020 view (US) – average passenger car

> 2020	Gasoline ICE	*ICE* + CNG	*ICE* + LPG (non BCG fig)	Diesel	Hybrid	EV
Tailpipe CO2 emissions (reduction vs 2010 ICE)	40%	*40*+20%	*40*+10%	40%+	65%	100%
Price	+$2000	+$5000	+$3500	+$4000	+$5000	+$10000
Price per % CO2 reduction	$50	$85 (cng=+150$)	$70 (lpg=+150$)	$100	$80	$100

Part 2

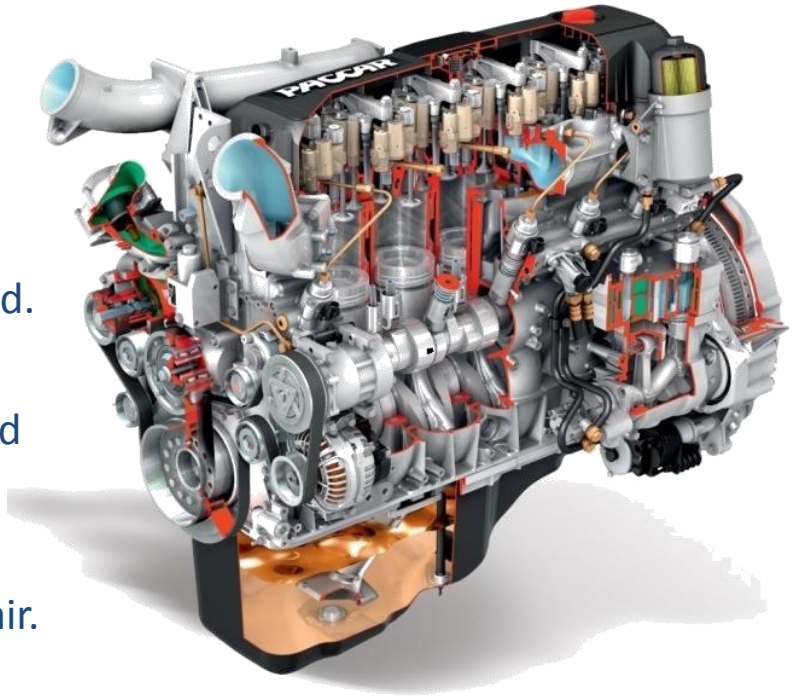
DIESEL BLEND

Vapour Sequential Injection©

Applications

Diesel blending principle

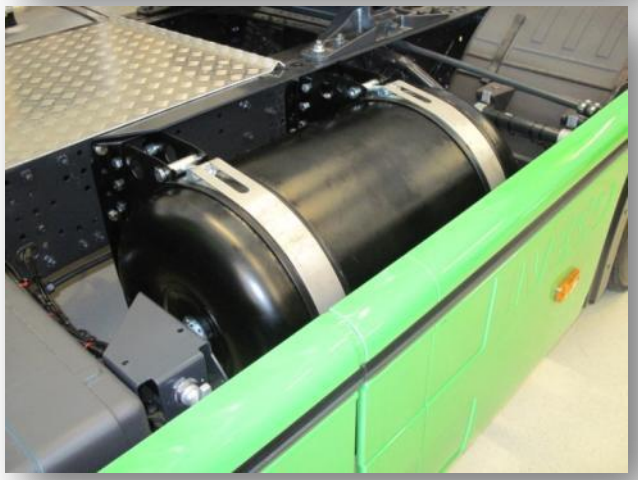
- Diesel blend is based on the injection of LPG / CNG in an existing diesel engine.
- The Prins VSI computer calculates the amount of injected LPG depending on engine load and speed.
- LPG is sequentially injected into the intake manifold.
- Sequential means that the injected gas is calculated and timed per cylinder.
- The amount of injected gas mixes with the intake air.
- The diesel will ignite because of the high compression end pressure in the cylinder and will ignite the gas/air mixture.



Key components Diesel blend LPG

LPG Tank situations

- Different tank situations possible
- Steel cylindrical tanks available in different sizes / diameters
- 1 liter diesel => 1.4 liter LPG
- 250Liter tank LPG x 80%= 200 Liter LPG
- Match driving range with diesel tank capacity



Unique Selling Points (1)

- **Dedicated system application**
  - Optimal average blend rate (LPG 15-30% / CNG 30-50%)
  - Optimal fuel savings (Up to 40% fuel savings depending on use and local fuel prices)
  - Extended driving range

- **Sequential & single point injection**
  - No large air/fuel mixture volume in intercooler and intake
  - Fast engine response
  - Lower emissions compared to other blend systems
  - Contributes to “green” image of your company
  - Meets demand for environmentally conscious ECO-transport

% LPG blend as function from engine load and RPM

RPM/ load	800	1000	1216	1408	1600	1696	1888	2208
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	27.30	27.51	27.40	28.69	0.00	0.00	0.00
40	0.00	50.35	47.66	50.48	49.13	48.25	45.13	0.00
60	0.00	33.14	31.29	31.18	32.56	34.75	30.49	0.00
70	0.00	21.29	21.46	21.37	20.68	22.34	16.49	0.00
80	0.00	14.56	14.96	14.62	10.85	8.21	0.00	0.00
90	0.00	5.71	5.77	5.74	4.64	1.76	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Unique Selling Points (2)

- **No over fuelling**
  - No reduced engine lifetime
- **No modifications to the original diesel engine**
  - No diesel injector interruption
- **Ad-on dedicated systems**
  - Low system costs
- **Very high reliability**
  - 100% diesel fall back
  - No down-time
  - Unique real time monitoring on operation of injectors

Savings

Savings depending on:

- Vehicle /engine type
- Vehicle use
- Engine load
- Type of fuel blending LPG-CNG
- Local fuel prices

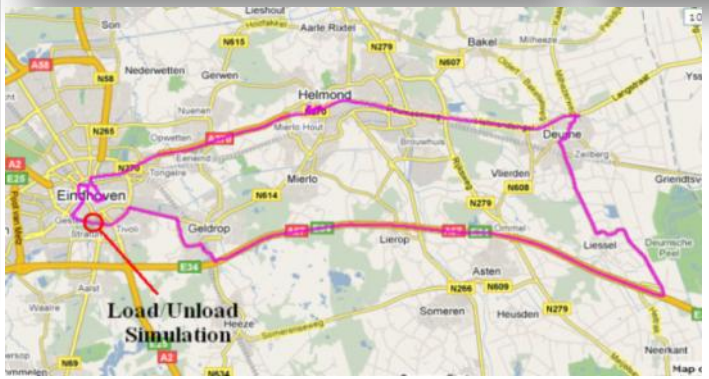
- Savings are achieved because a percentage of the diesel is replaced with LPG which is far cheaper

The more miles covered the greater the savings!!

DAF XF 105 LPG 1x250 liter

Range	XF 105
Total Km/year	160.000
Fuel consumption (diesel)	34 L/100 km
CO_2 reduction	6,4 ton
Average blend percentage	25%
Fuel cost savings	€3.712 (Based on NL fuel prices)
Payback time	24 months
Driving range blend LPG/Diesel Driving range Diesel only	+/- 2500 km +/- 2100 km

Portable Emission Measurement system (PEMS test) - EURO 5



- PEMP test TNO
- MAN TGX 18.440 LPG-blend Euro V

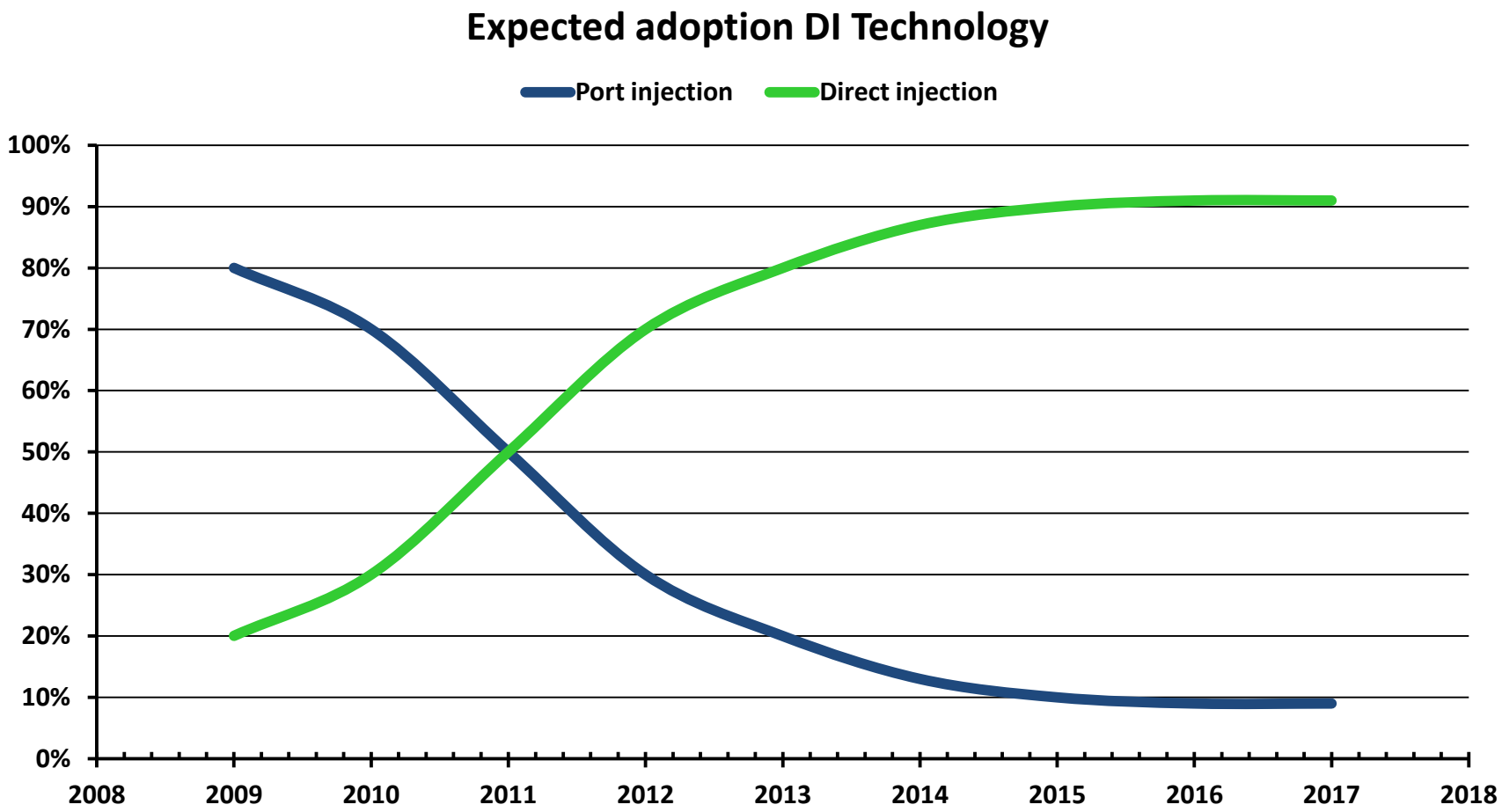
MAN TGX 18.440 (PEMP test)				
	Diesel	DualFuel	Euro 5 limit	
CO	1,01	2,15	4,00	g/kWh
NOx	4,17	4,12	2,00	g/kWh
THC	0,02	0,48	0,55	g/kWh
CO2	689	661	-	g/kWh

Part 3

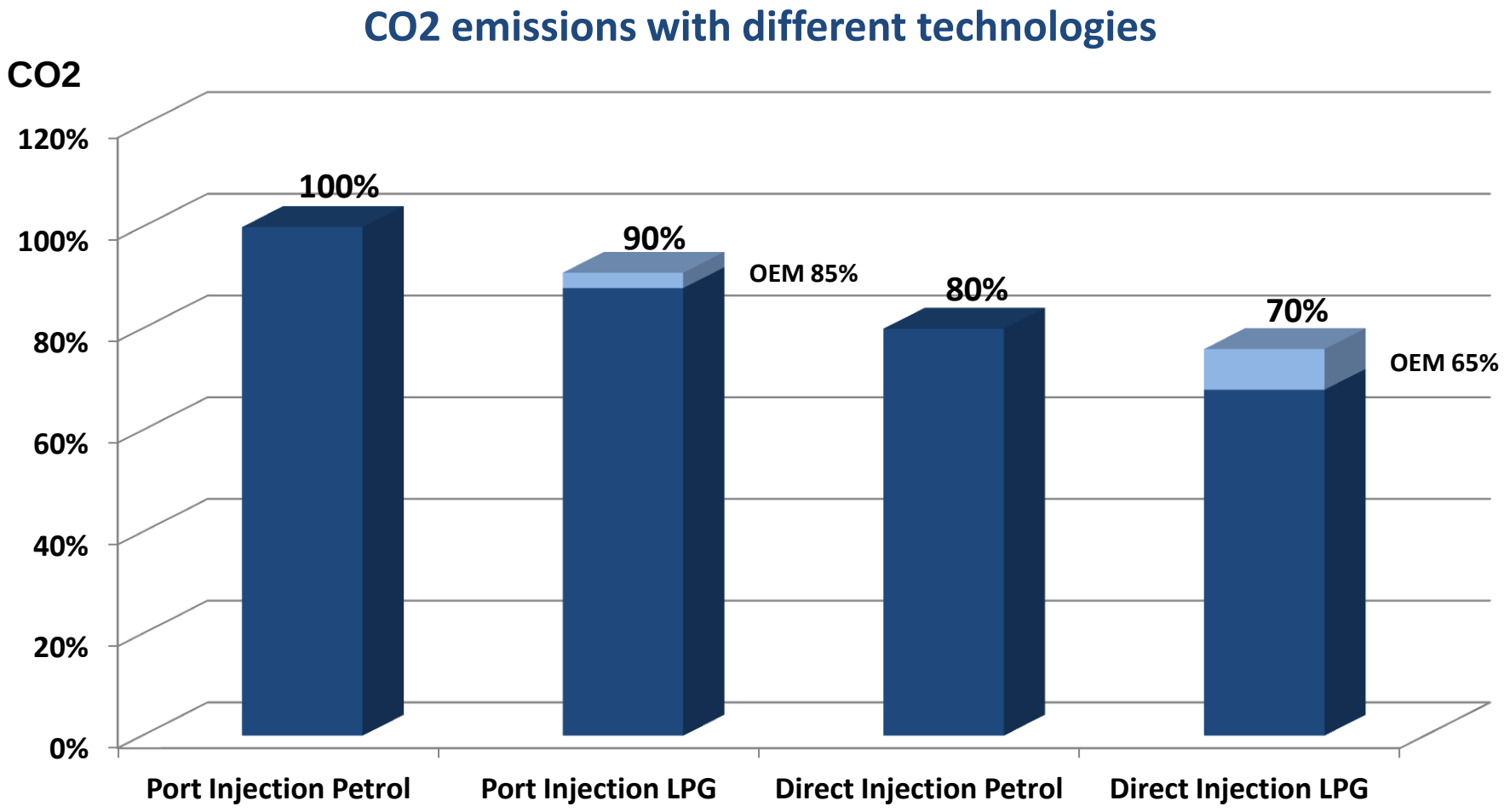
Characteristics DI engines

- **Direct fuel injection into the combustion chamber**
- **Higher engine performance/efficiency**
  - 175 Nm and 100kW per liter piston displacement
- **Fuel reduction and as a result less CO2 emission**
  - 10-15% fuel reduction possible
- **High petrol pressure [up to 200 bar]**
- **Petrol injector controlled by variable current and high voltage**
  - 3 times faster operation
- **Less sensitive for “knock” and higher mixture density**
  - superior ignition timing and higher compression possible
- **Downsizing engines combined with turbo which**
  - allows 1/3 reduction of engine displacement

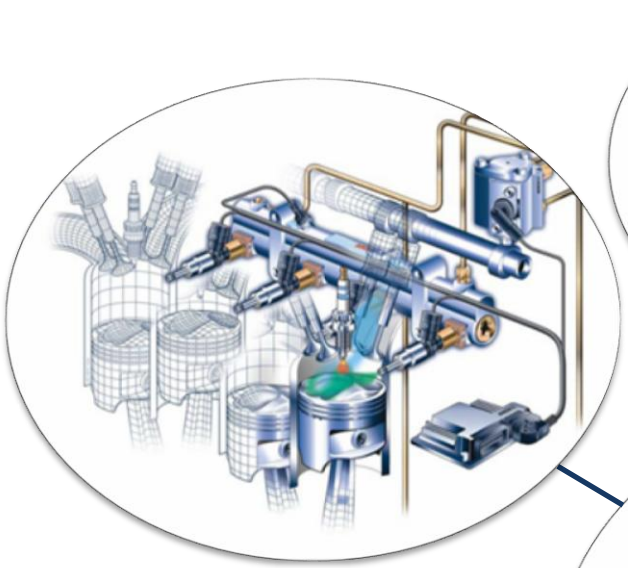
Roadmap DI Technology 2011



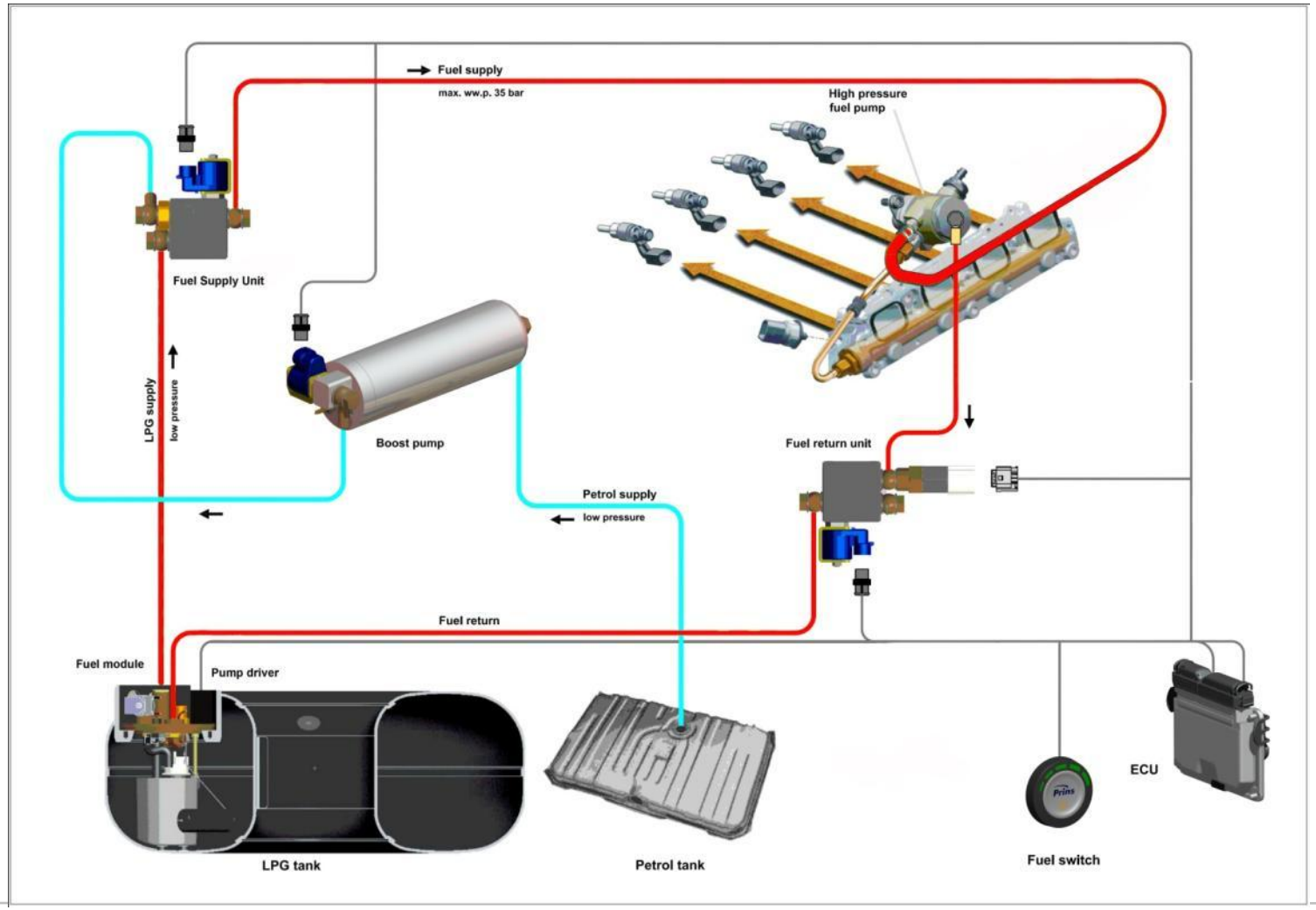
Potential CO_2 reduction DI-LPG



Direct LiquiMax system control



Direct Liqui Max



OEM Partnerships (examples only)

OEM partnerships
- Proton Malaysia
- Workhorse USA
- Maruti / Suzuki India
- Volvo Sweden
- Ford NA
- Ford Thailand

A-OEM partnerships
- Proton Thailand
- Honda Venezuela
- Honda Japan
- Ford Europe
- Cadillac & Corvette Europe
- Chrysler Netherlands
- Jeep Netherlands
- Dodge Netherlands
- Toyota Poland
- VAG Group Netherlands
- Lada Germany /France

Prins Country Importers (> 50)

ALTERNATIVE FUEL SYSTEMS

Prins

Application/developments

- **VAG group**
  (VW/Audi/Seat/Skoda/Porsche)
  - 1.2/1.4/1.8/2.0/2.8V6/5.2V10
- **BMW group** (BMW/Mini)
  - 1.8/2.0/5.0V8
- **GM group**
  (Opel, GM-Holden, Cadillac, GMC)
  - 2.0/3.6V6
- **Mercedes group**
  - 3.5 V6/5.0V8
- **Hyundai /Kia group**
  - 1.6 GDI
- **Ford**
  - 1.6/2.0
- **Volvo**
  - 1.6/2.0
- **Mazda group**
  - 2.0

From 100HP up to 450HP

Thank you for your attention!

Questions