KUALA LUMPUR 2012 WORLD GAS CONFERENCE

IGU

25th world gas conference

"Gas: Sustaining Future Global Growth"

NGVs in a Diversified Transport Fuel Market

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Sustainable Transportation

- **Transport mobility requirements are growing throughout the developing world. The issues are:**

  - **Is a car in every driveway, strategically sustainable?**
  - **The world population is predicted to grow from 6 to 9 billion, by 2050. Will we have enough oil to propel all those new vehicles? If so, what does that mean for climate change?**
  - **Will electric or hydrogen cars be necessary?**
  - **Will bullet trains start replacing planes?**
  - **Some estimates indicate there are more than 1 billion cars in the world. This number may approach the 2 billion by 2030**
  - **The auto industry in Brazil is growing at 8% per year, producing some 3 million cars this year to be added to an existing fleet of 60 million**

Options

- Biodiesel
- Biomethane (Obtained from Biogas)
- Compressed Natural Gas (CNG)
- Electrical Vehicles (RVs)
- Ethanol
- Flexible Fuel Vehicles
- Liquefied Natural Gas (LNG)
- Gas-to-Liquids Fuels (Gas-Diesel)
- Liquefied Petroleum Gas (LPG/Propane)
- Natural Gas to Hydrogen & Fuel Cell Vehicles
- Neighborhood Electric Vehicles (NEVs)

This appears to be an excellent opportunity to develop the utilization of Natural Gas in Transportation

The Electrical Option

Limitations to be removed:

- Limited (90-150km) lithium-ion battery capacity
- Battery cost: aprox. US$ 10,000
- Battery weight (220 kg)
- Battery recharge at every 8 hours
- High electricity costs in Brazil (US$ 0.18/kWh)

(Based upon Nissan "Leaf" experience)

Brazilian FIAT Electrical Car, under tests, at Iguassu, Paraná

Vehicle Registration in Brazil by fuel type

(Passenger Cars and light commercials)- Locally manufacture & imported

	Unidades *Units/Unidades*	JAN *JAN/ENE*	FEV *FEB/FEB*	MAR *MAR/MAR*	ABR *APR/ABR*	MAI *MAY/MAY*	JUN *JUN/JUN*	JUL *JUL/JUL*	AGO *AUG/AGO*	SET *SEP/SET*	OUT *OCT/OCT*	NOV *NOV/NOV*	DEZ *DEC/DIC*	ANO *YEAR/AÑO*
2011	Gasolina / *Gasoline / Gasolina*	23.475	24.805	27.456	30.049	34.690	33.446	31.762	34.159	35.567	28.904	33.613	39.072	**376.998**
	Etanol / *Ethanol / Etanol*	4	3	4	4	0	4	7	5	3	4	5	8	**51**
	Flex fuel	193.511	220.657	244.750	227.443	248.657	237.990	239.514	255.203	239.598	218.844	252.895	269.009	**2.848.071**
	Diesel / *Diesel / Diesel*	13.154	13.338	16.514	15.415	17.166	15.472	16.677	18.659	18.392	15.998	18.670	21.099	**200.554**
2012	Gasolina / *Gasoline / Gasolina*	24.563	21.056	26.772										**72.391**
	Etanol / *Ethanol / Etanol*	2	2	4										**8**
	Flex fuel	211.420	202.968	243.874										**658.262**
	Diesel / *Diesel / Diesel*	16.676	11.810	13.136										**41.622**

Source: Anfavea

Ethanol-Gasoline

Ethanol-Gasoline-Natural Gas

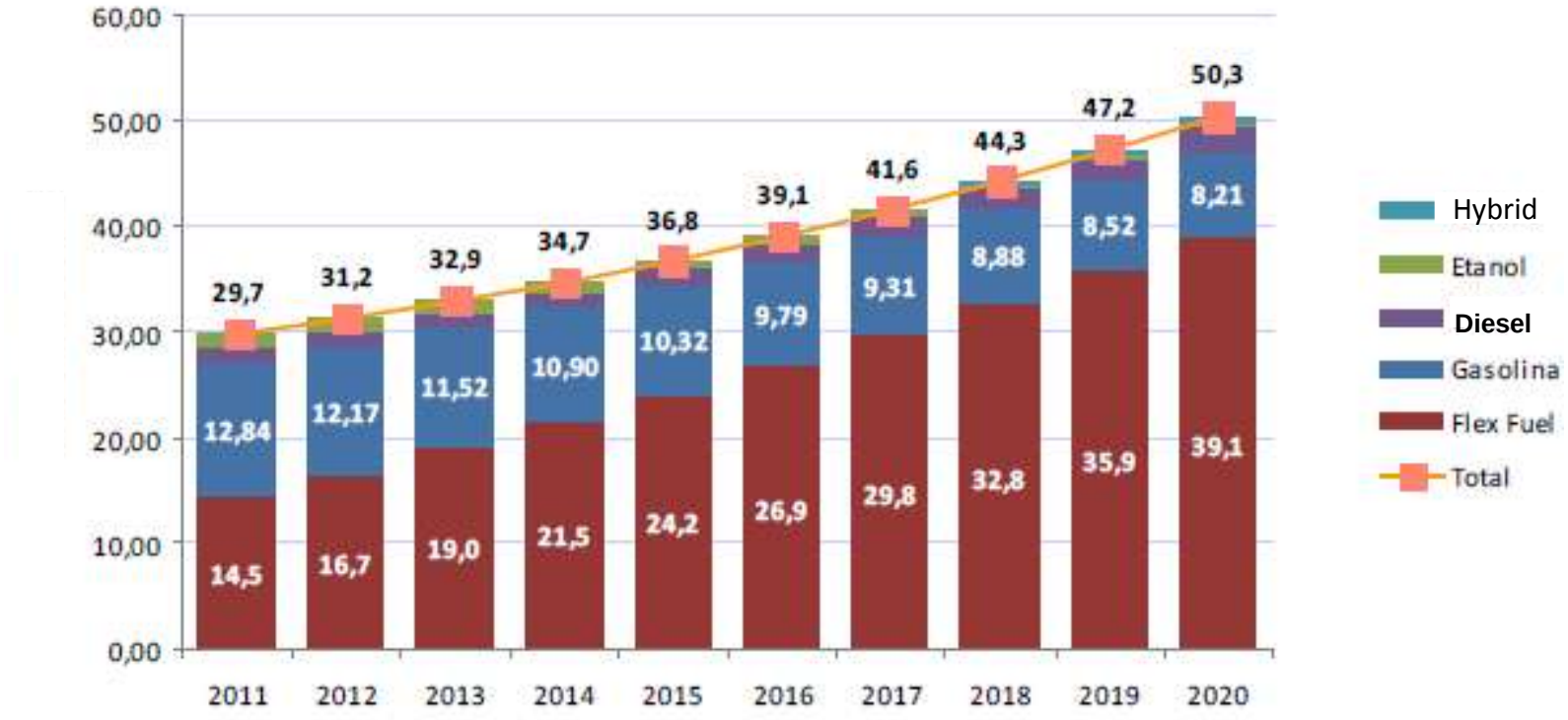
Tetra-Flex

Hydrogen or Fuel Cell Vehicle

Hydrogen is generally obtained from a natural gas feed stream

Brazilian Vehicle Fleet Fuels Projection

Million Vehicles



Source: EPE

Brazilian 5 Fuels Gas Station

Rio de Janeiro, RJ

Natural Gas Vehicles

- **Natural Gas appears to be the best option available to increase security and reduce or eliminate dependence and risks generated by oil, in line with the recently announced *shale gas* resources in North America and the *pre-salt* in Brazil**

- **In addition to that, some better environmental conditions will be generated**

- **High fuel users, such as diesel powered trash trucks, transit buses, urban delivery vehicles, represent ideal vehicle types to use natural gas as a preferential fuel. The dual-fuel (Diesel-Gas) technology now available, facilitates this process in areas with limited gas distribution infrastructure**

NGV Worldwide Fleets – 2010-2011

Year	Natural Gas Vehicles	Nm3 NG monthly sales avge.	Refueling Stations
2010	12,522.531	1,473,085.723	18,504
2011	14,681,758	1,531,283.559	20,662
% Growth	17.24	3.95	11.66

Source: GVReport

Thank you

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