

# **PARMA - ITALY**

## **1<sup>st</sup> CITY INDUSTRY SUMMIT**

### **TROLLEY**

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# Urban service

Service network: **235 km**

**20** scheduled routes

Demand responsive transport service (**Pronto Bus & TBus**)

School bus service (**Happy Bus**)

Paratransit services (**Pollicino**)

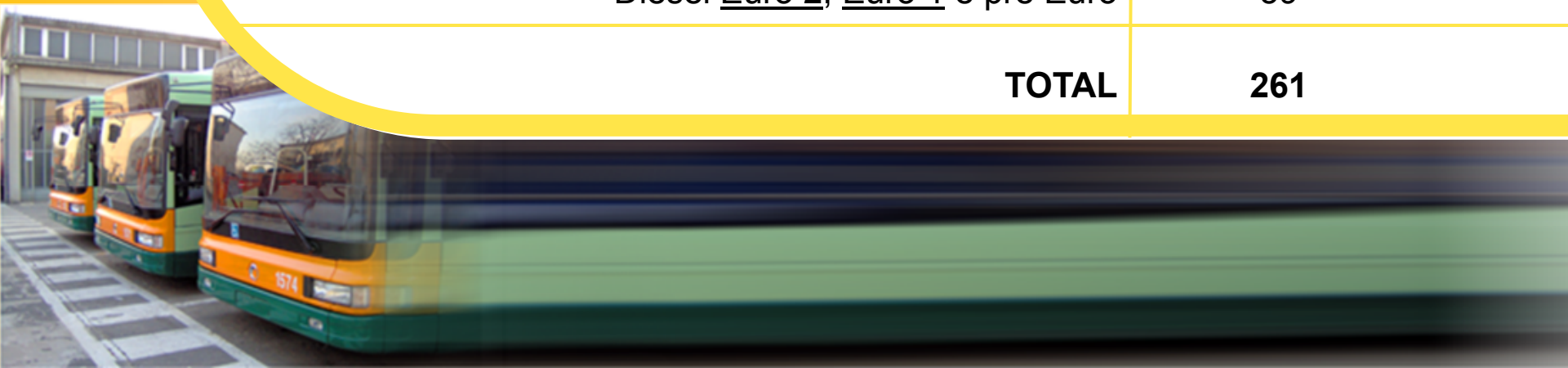
**8,37 millions Km driven in 2009:**

- Trolley bus and dual-mode capability 11,38%
- Diesel 70,08%
- Natural gas 18,54 %

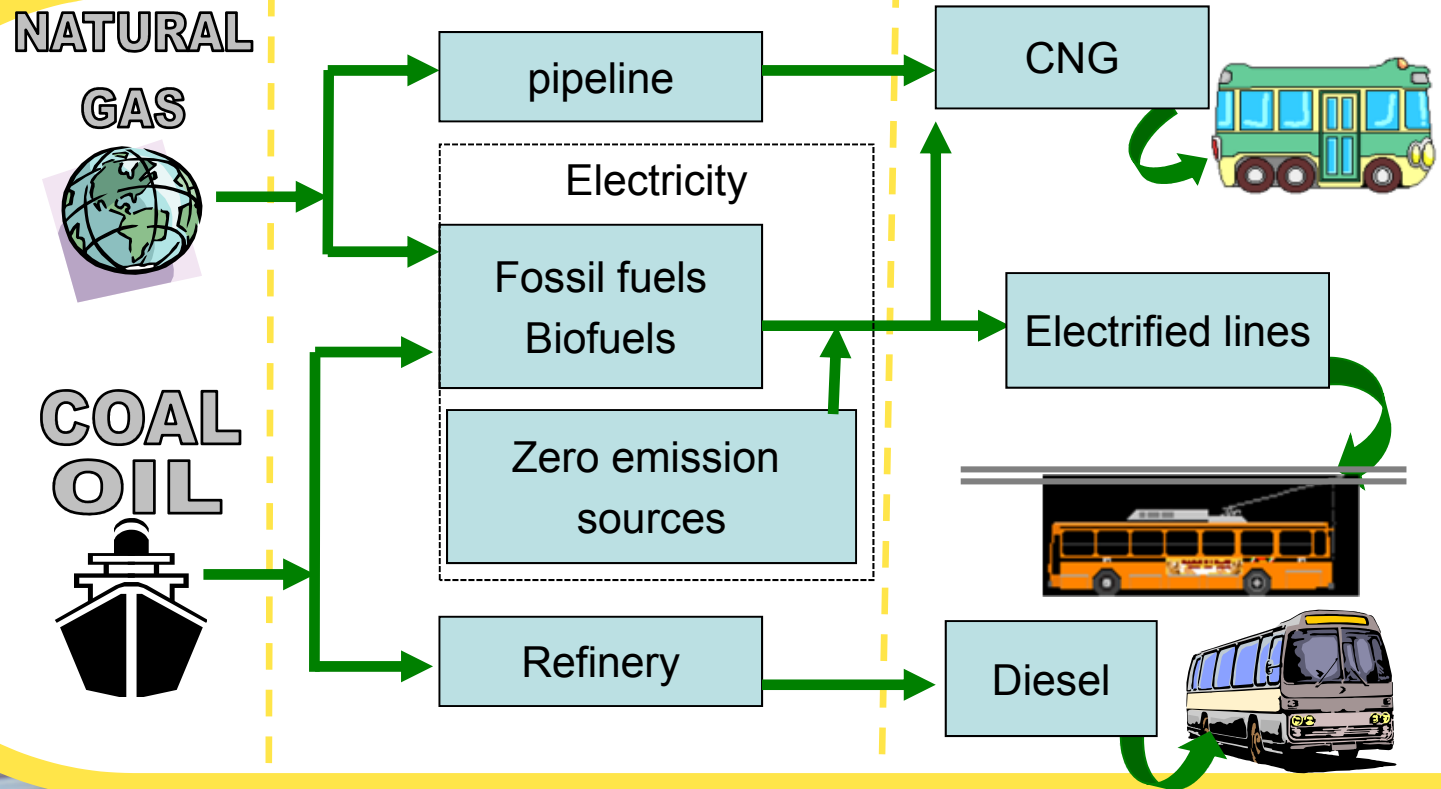


# Tep urban fleet

Environmental Class	Fleet
Electrical and dual mode (electrical & diesel)	33
Hybrid – Diesel/electric	16
Natural gas	91
Diesel <u>Euro 4</u> , <u>Euro 3</u> ed <u>Euro 2</u> with CRT filter	62
Diesel <u>Euro 2</u> , <u>Euro 1</u> e pre Euro	59
<b>TOTAL</b>	<b>261</b>



# Energy flow



# Evaluation model

## *Starting point*

Sustainability Report and ISO 14001 (in development using also EN 16001 - energy management systems as a reference)

## *Enablers*

Urban service network shared between diesel, CNG & trolley bus

Detailed data for each bus



# Energy and emissions

	Trolley	DIESEL		CNG
		Euro 4	Urban fleet	
<b>DIRECT ENERGY (MJ/Km)</b>	<b>8,6</b>	<b>15,0</b>	<b>15,9</b>	<b>25,4</b>
<b>DIRECT EMISSION CO<sub>2</sub> (g/Km)</b>	<b>58</b>	<b>1.092</b>	<b>1.160</b>	<b>1.292</b>
<b>TOTAL ENERGY (MJ/Km)</b>	<b>16,4</b>	<b>15,8</b>	<b>16,7</b>	<b>26,3</b>
<b>TOTAL EMISSION CO<sub>2</sub> (g/Km)</b>	<b>1.137</b>	<b>1.146</b>	<b>1.218</b>	<b>1.344</b>





# References

Indirect CO<sub>2</sub> emissions from electric energy: 500 g/kWh

Total electric energy loss (production + distribution + ....): 50%

Total indirect energy for diesel refinery and delivery: 5%

Total indirect energy for CNG delivery: 1%

COPERT IV used for CO<sub>2</sub> emission calculation

