
Chilean Energy Overview

Shift to renewable alternatives

Claudio Córdova
Industrial Engineer
ccordova@metrogas.cl

Stockholm – April 2006

Chile Overview



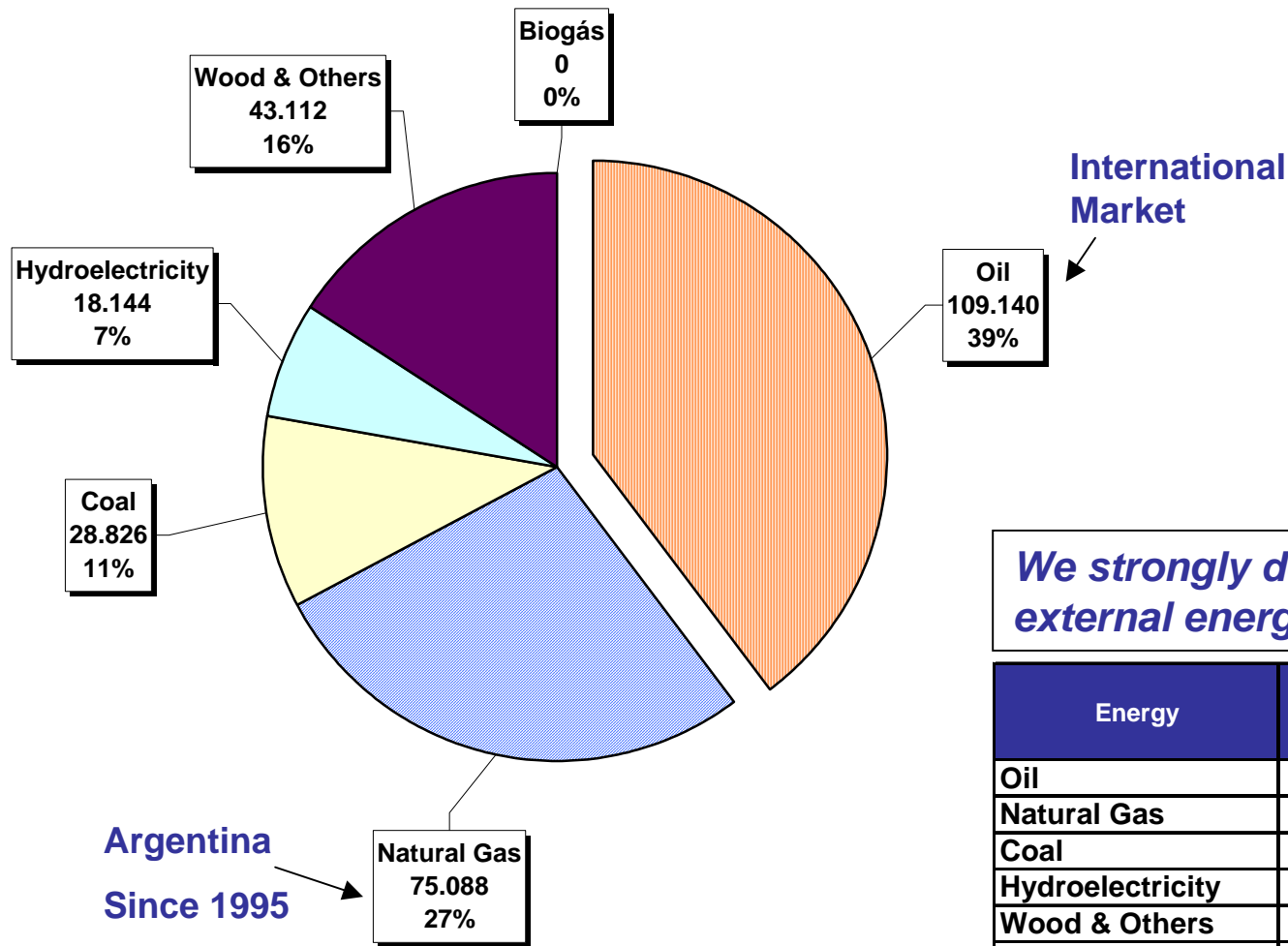
CHILE

- Population: 15.116.435 inhbs.
- GDP 2005: MUS\$115,300 (+6.3%)
- Capital City: Santiago
- Main cities: Santiago, Viña del Mar, Valparaíso, Concepción, Antofagasta, Punta Arenas
- Country risk** : 65 basis points over US Treasuries

Country Risk SA:

- Argentina = 390 bp
- Brazil = 220 bp
- Peru = 206 bp
- Chile = 65 bp

Chilean Energy Gross Consumption (Primary Energy Balance-Teracalories per year-2004)



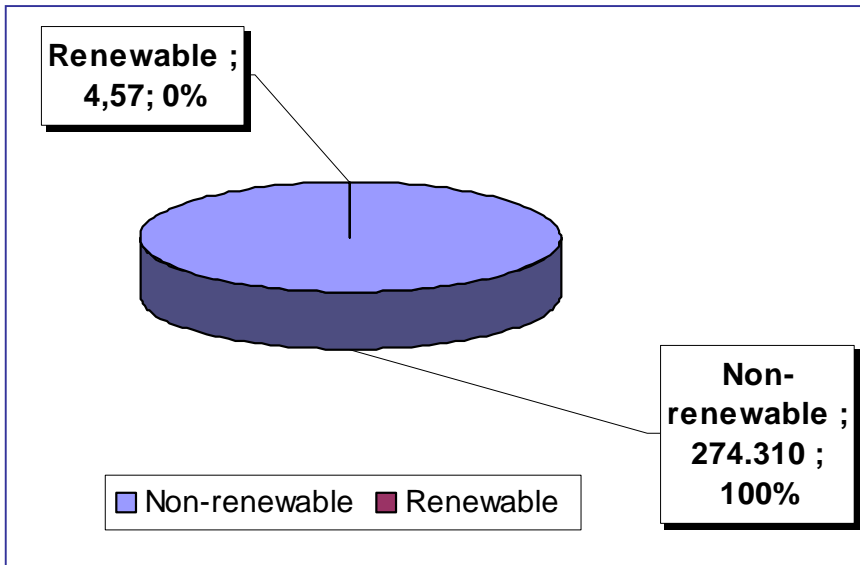
We strongly depend on external energy sources...

Energy	Gross Production	Imports
Oil	2%	98%
Natural Gas	26%	74%
Coal	4%	96%
Hydroelectricity	100%	0%
Wood & Others	100%	0%
Biogás	0%	0%
TOTAL	31%	69%

Energy Distribution in Chile

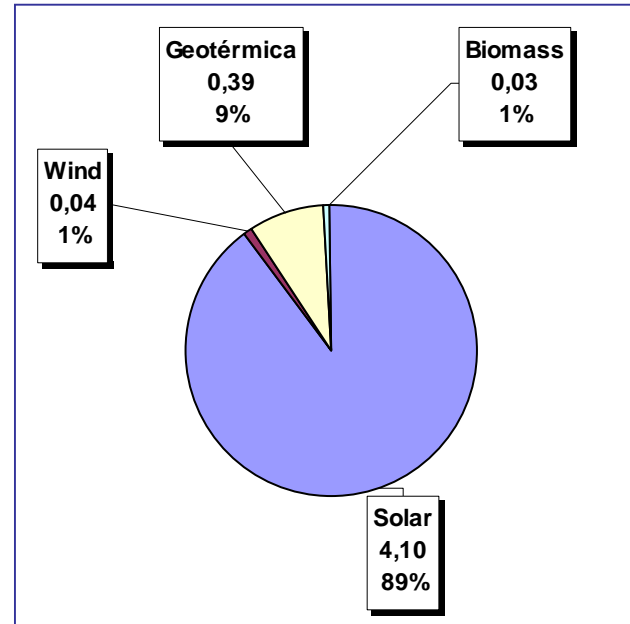
Renewable & Non-renewable

(Teracalories per year)

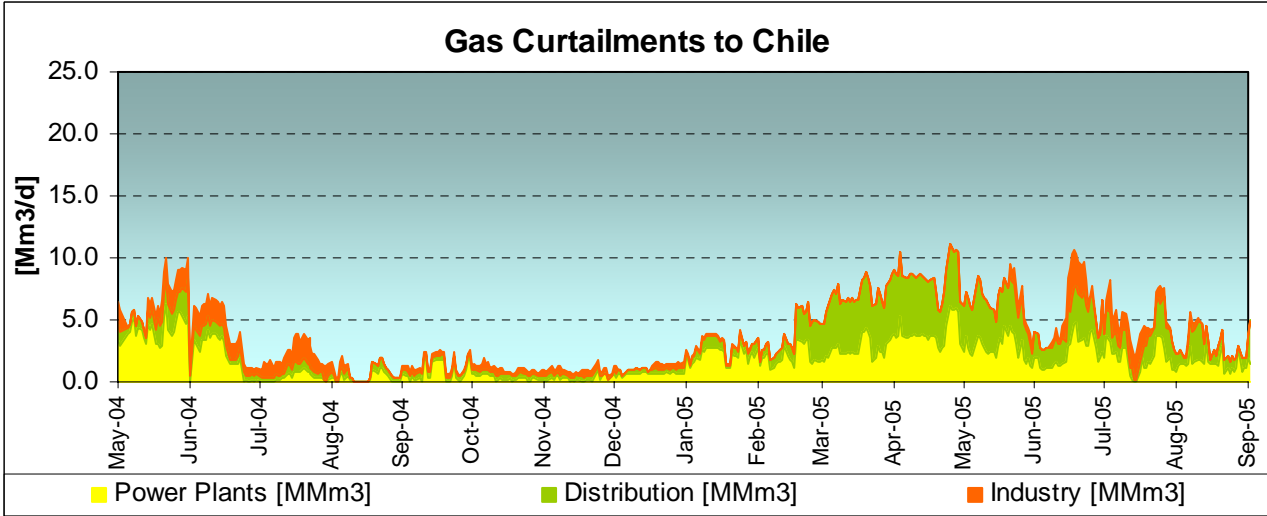
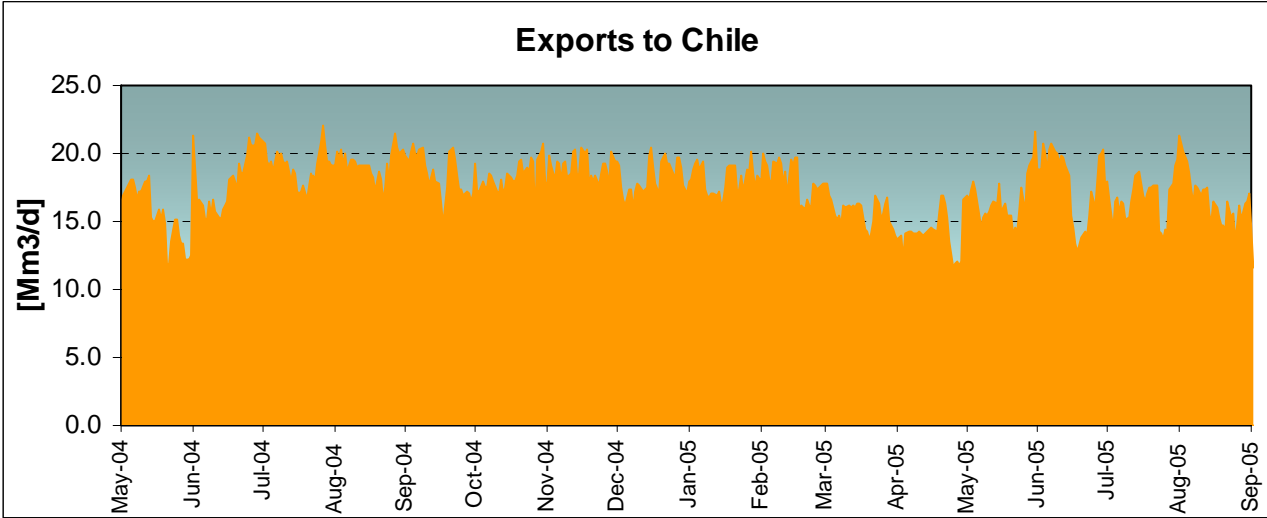


Non-renewable energy is not developed yet

Distribution of renewable kind of energies



Since 2004: Interruption of NG flow from Argentina to Chile



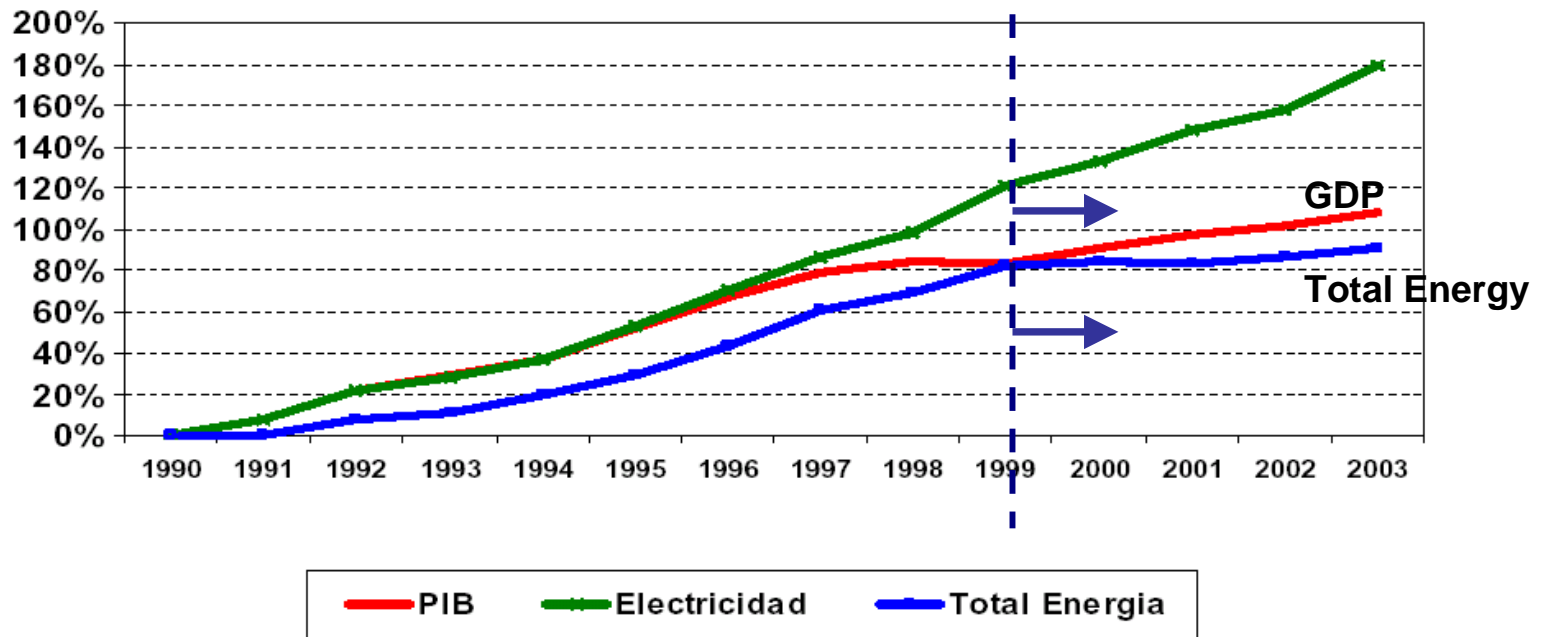
Drivers of NG crisis in Argentina

- 2002 → Argentinian authority decide to freeze gas&electricity prices
- Gas&electricity at very low prices
- Demand of gas&electricity increase over 20% in one year
- No new investments in capacity where undertaken
- 2004 → Shock of internal demand → Cut the exports to Chile
- 2007 → Argentinian exportation license will be cancel

GDP and Energy Consumption

(Growing in relation to consumption of 1990)

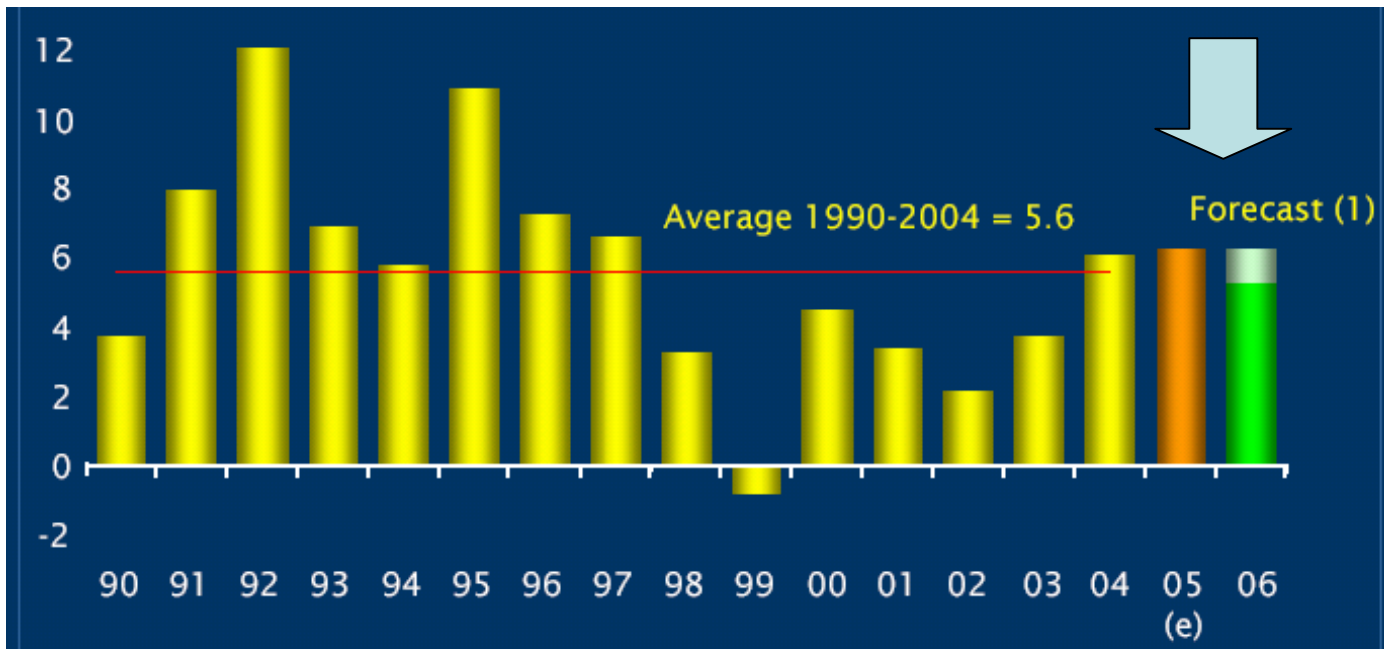
- Chilean energy consumption is growing at the same rate of GDP



GDP and Energy Consumption

(Growing in relation to consumption of 1990)

- Chilean Economy will grow over 6% in the coming years
- Chile must develop alternatives source of energy in order to make its growing sustainable
 - LNG – Landfills – Sewage - Biomass

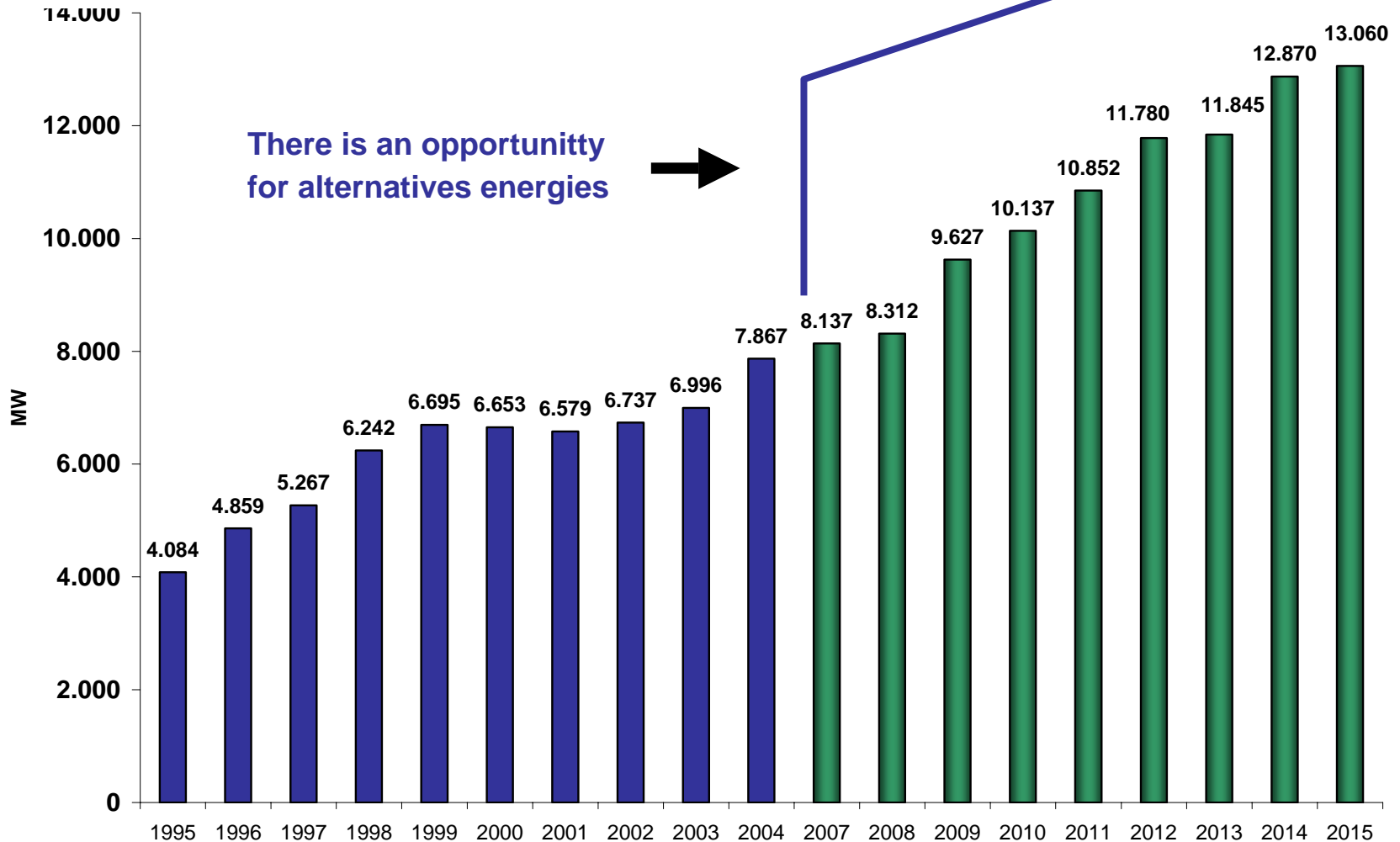


(e) Estimate. (1) Monetary Policy Report, January 2006.

Source: Central Bank of Chile.

Electricity generation forecast MW

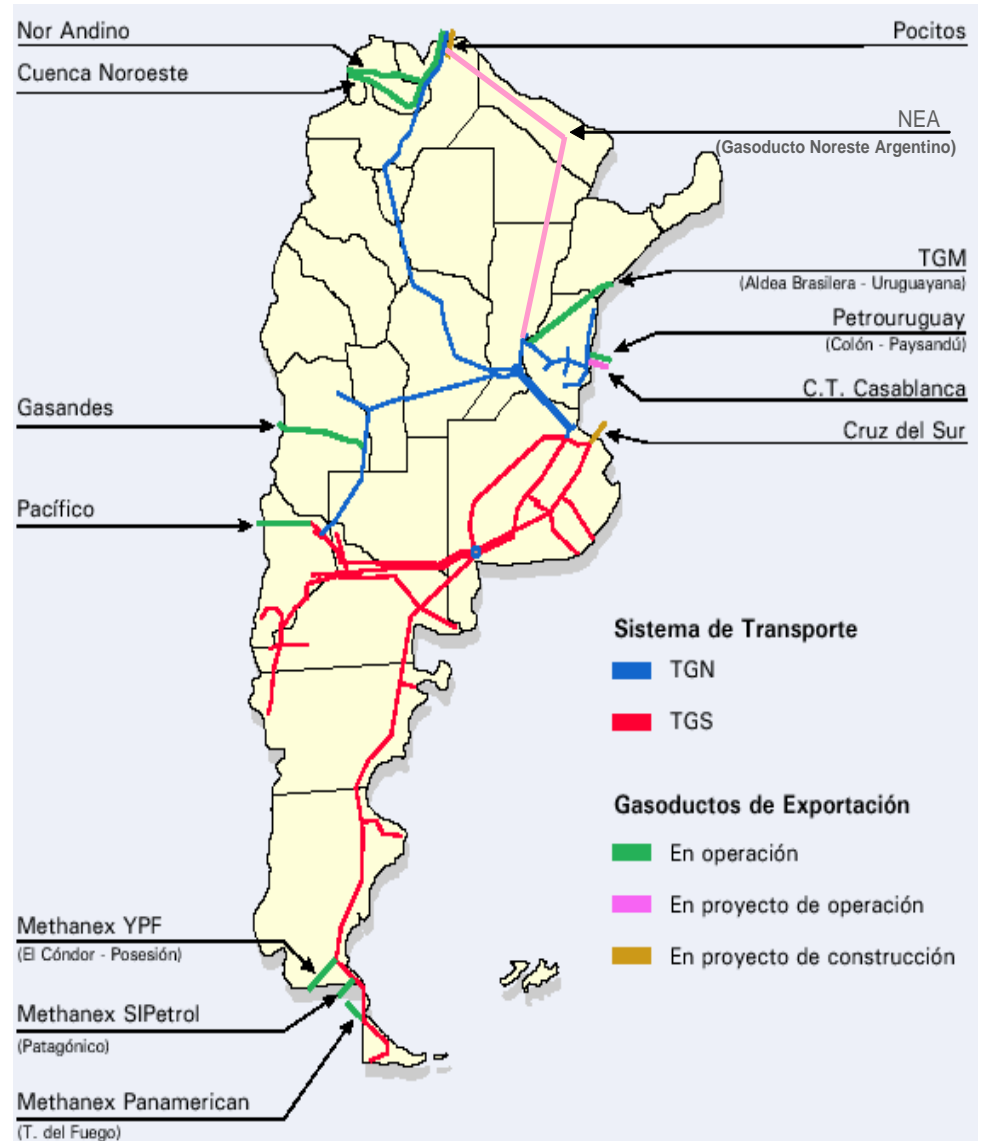
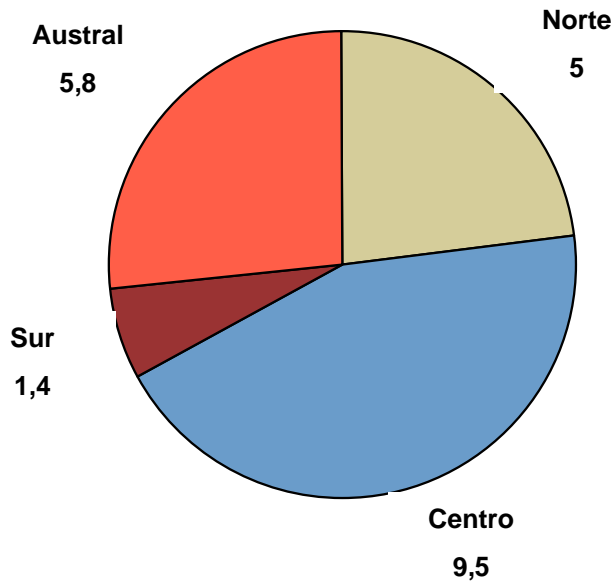
- Up to 2015 Chile needs to multiply by 2 its electricity power generation



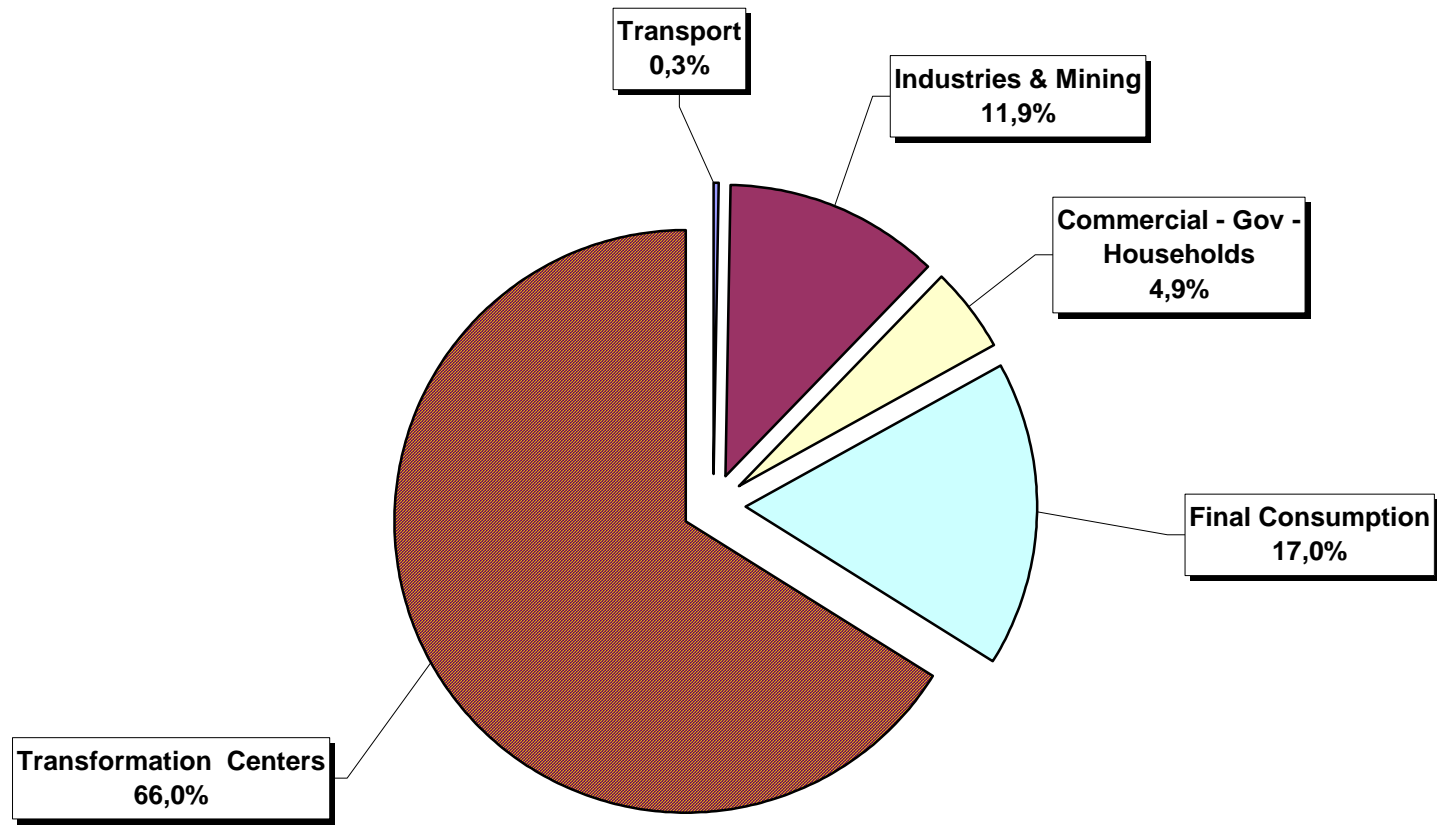
Geographic Areas consuming Natural Gas in Chile

Gas consumption in Chile - in MM m3/day

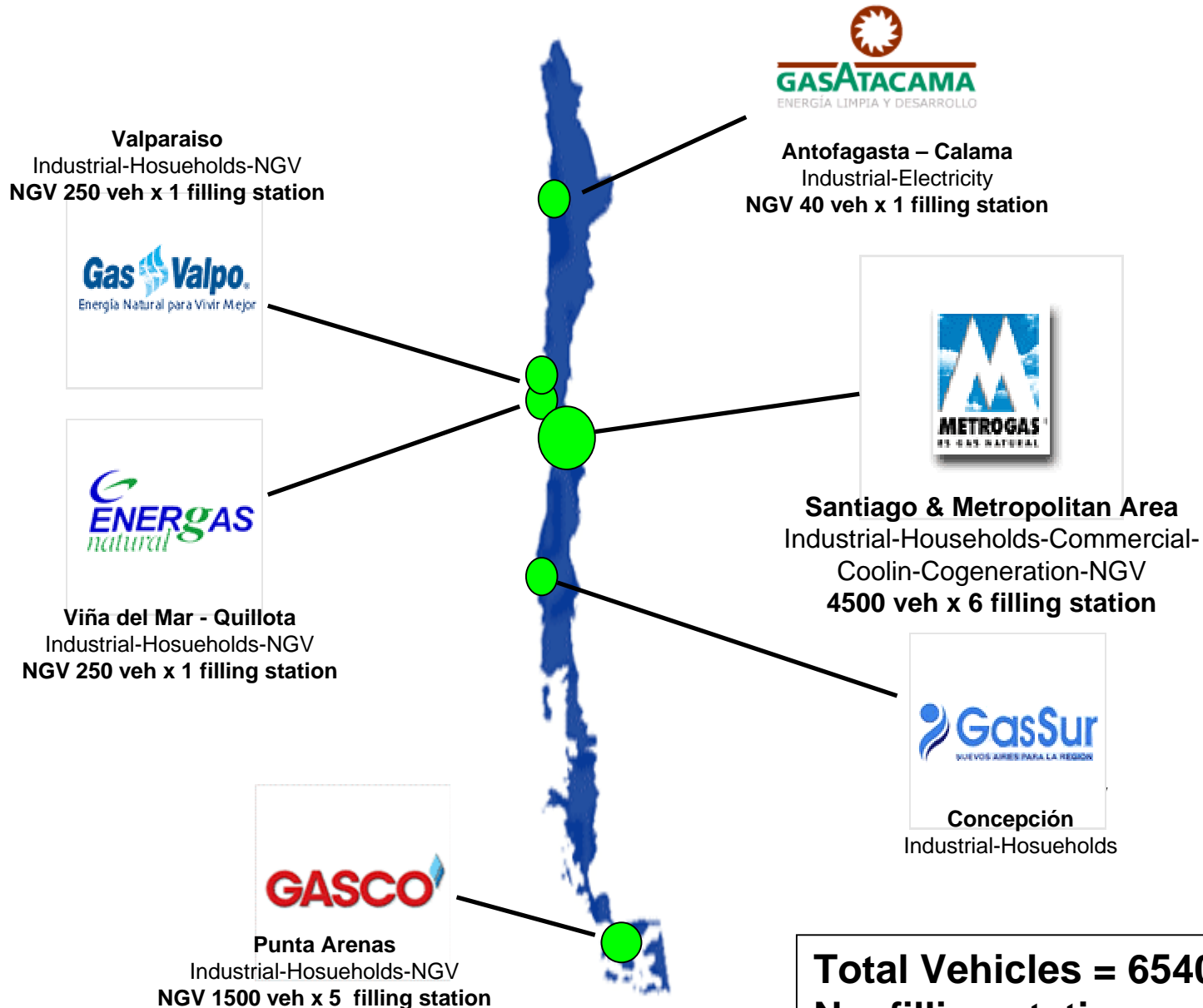
Total: 22MM m3/day 2004 figures



Natural Gas Consumption by sectors (%) - Chile 2004



Natural Gas Distributors in Chile & NGV Market



Total Vehicles = 6540 Veh
No. filling stations = 14

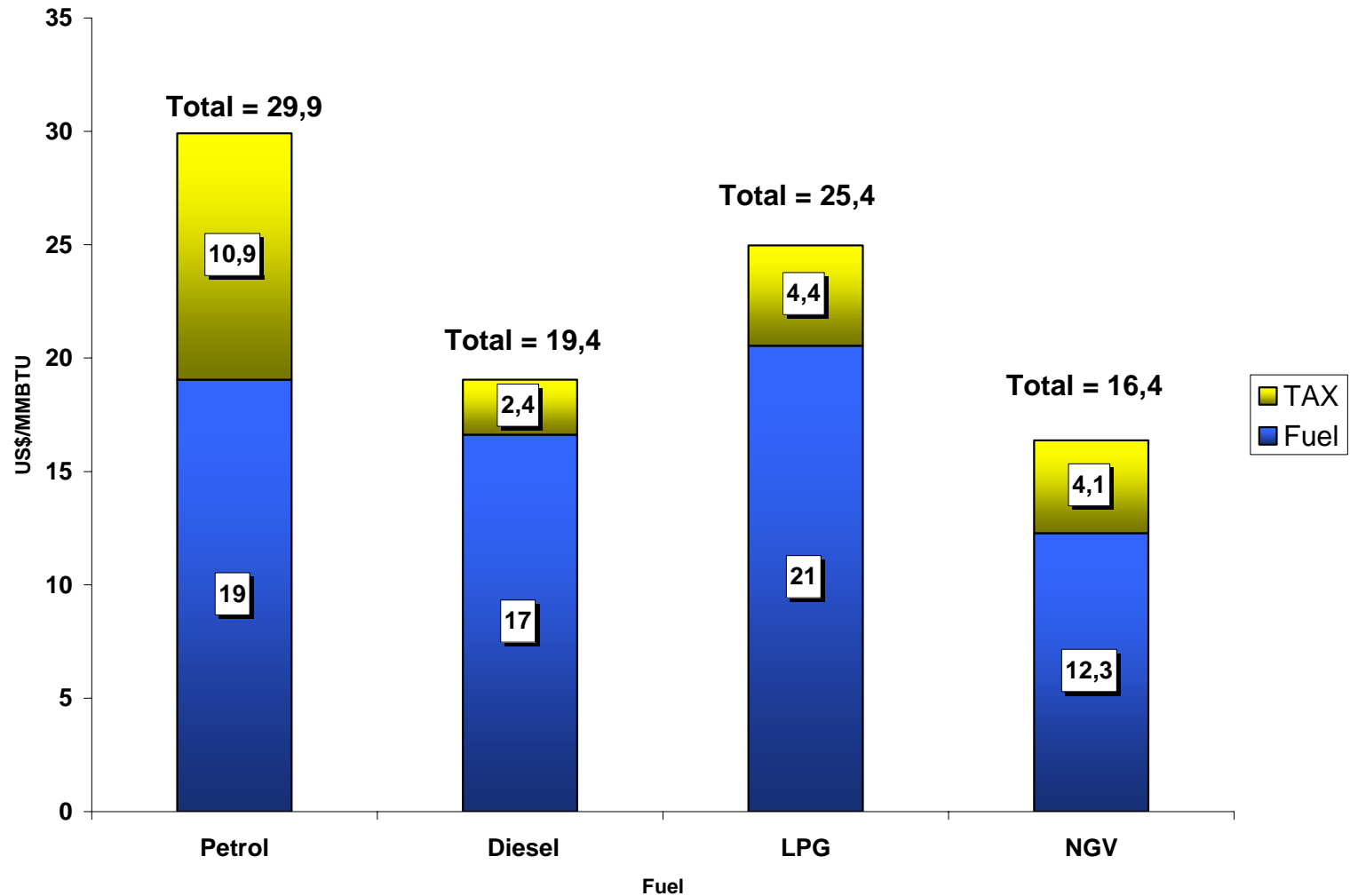
NGV : Important Issues

- Transport Authority focused on NGV emissions and safety control → very strong regulations
- NG distribution companies promote use of NGV by using marketing incentives
- NGV filling stations → Mainly owned by oil companies (Shell – ESSO – Repsol – Copec)
- NGV users → Taxis 86% & Fleets 14%
- 100% of vehicles have been converted to use NGV (bi-fuel)
→ no OEM's vehicles

NGV : Emmision standard

- Chilena emmissions standard

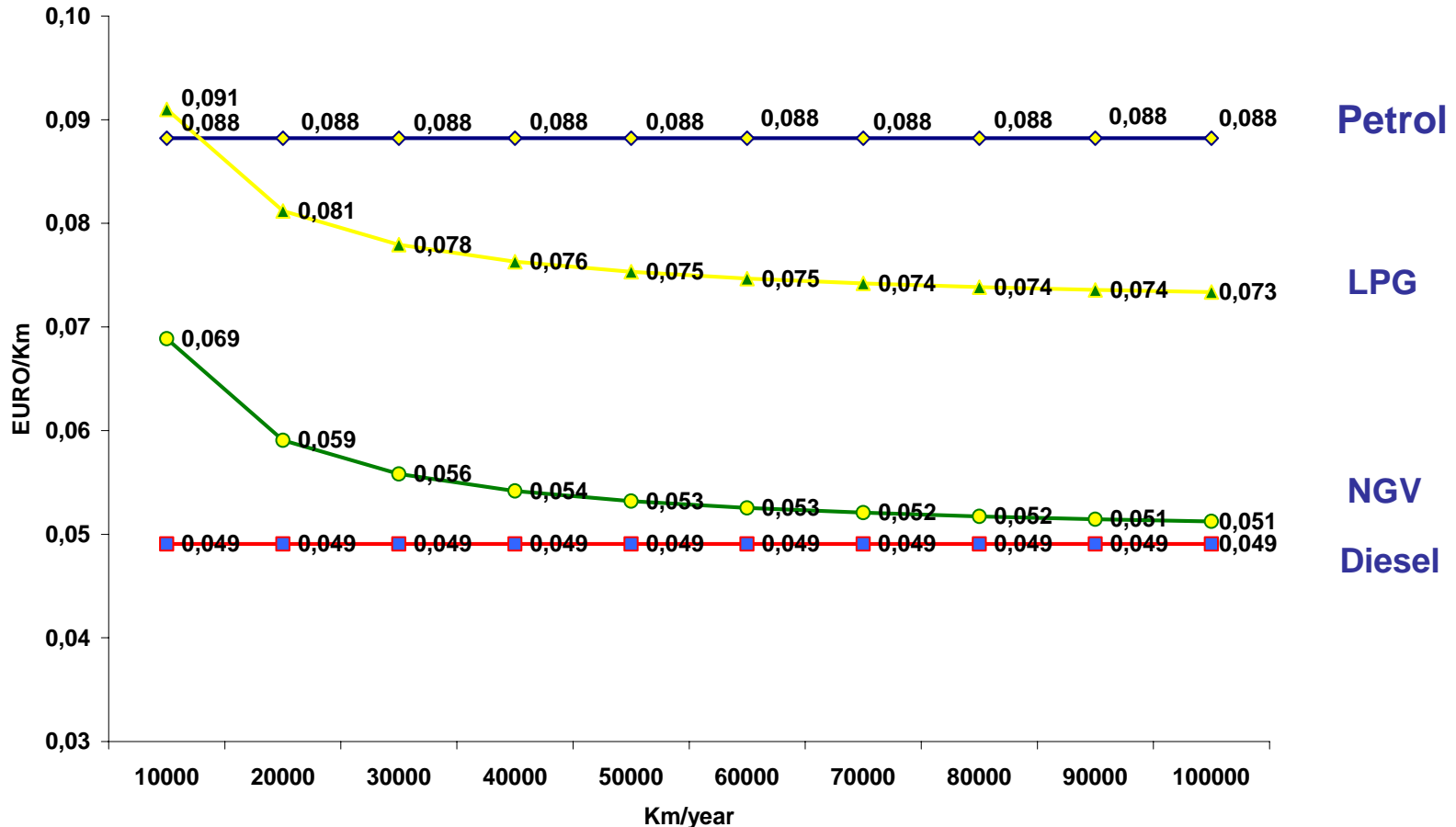
Fuel for transport: Equivalent comparison



Petrol price 0,9 EURO/L (VAT included); Diesel price 0,67 EURO/L (VAT included); NGV price 0,54 EURO/m3 (VAT included); LPG price 0,57 EURO/L (VAT included). Petrol performance 10,24 Km/L; Diesel performance 13,65 Km/L; NGV performance 11 Km/m3; LPG performance 8 Km/L.. Fixed Tax rate for NGV and LPG = 196 EURO/year; Variable Tax for NGV use = 0,09 EURO/m3; Variable Tax for LPG use = 0,07 EURO/m3; 644 CLP/Euro

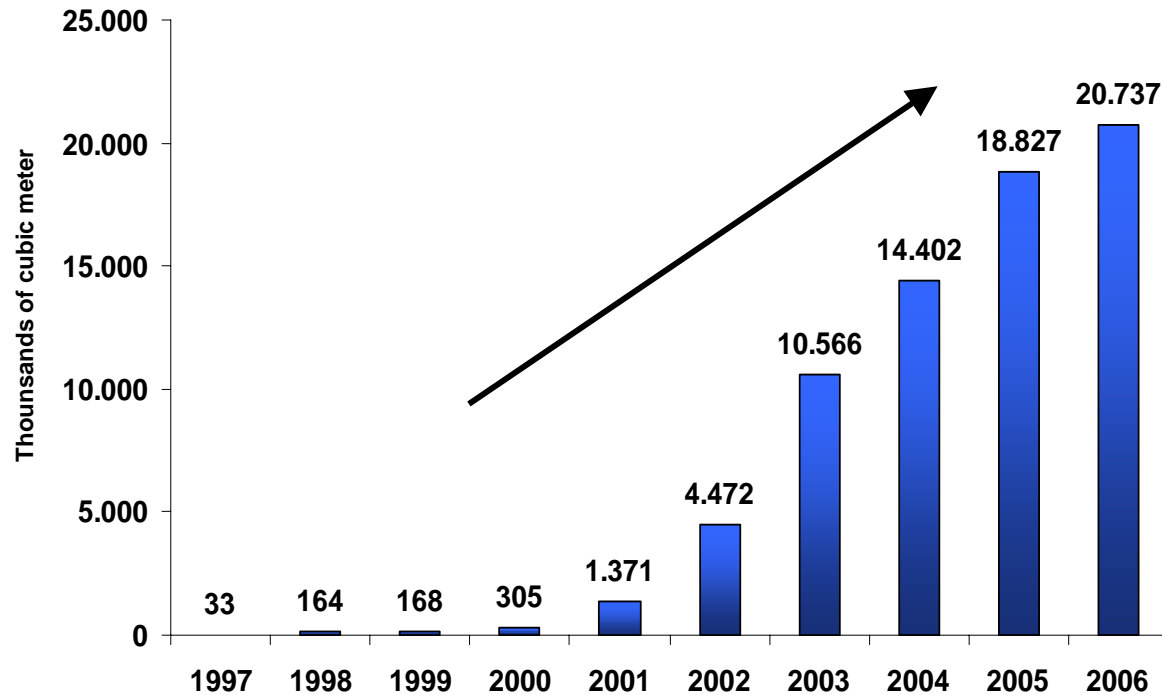
NGV : Very inexpensive fuel

- NGV is a very inexpensive fuel, but it is not the cheapest one...



Petrol price 0,9 EURO/L (VAT included); Diesel price 0,67 EURO/L (VAT included); NGV price 0,54 EURO/m3 (VAT included); LPG price 0,57 EURO/L (VAT included). Petrol performance 10,24 Km/L; Diesel performance 13,65 Km/L; NGV performance 11 Km/m3; LPG performance 8 Km/L.. Fixed Tax rate for NGV and LPG = 196 EURO/year; Variable Tax for NGV use = 0,09 EURO/m3; Variable Tax for LPG use = 0,07 EURO/m3; 644 CLP/Euro

NGV development in Metropolitan Area

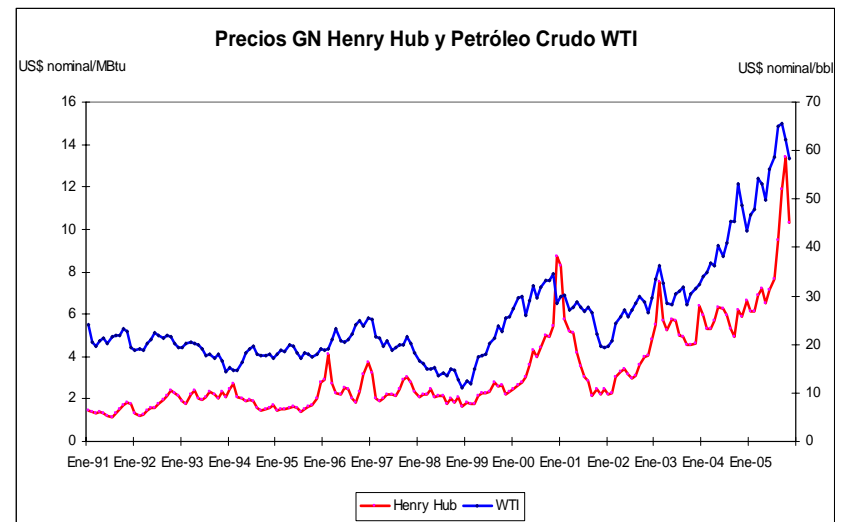
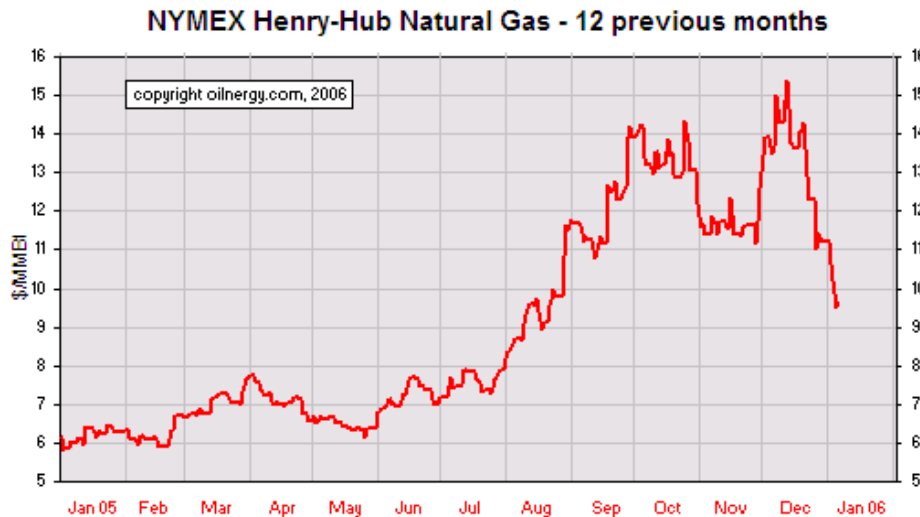


- NG distributors expect to continue pushing the NGV market in Chile

Alternative Solutions

- **LNG**

- April 2005 → 5 largest energy companies → Pool Agreement
- February 2005 → British Gas was selected by the Pool to supply LNG and to build infrastructure required
- By 2009 the project will be finished and available
- Lately, as well as Oil, LNG price shows high volatility



Alternative Solution

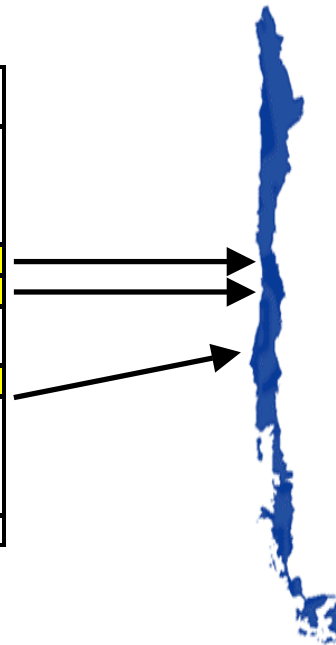
- **BIOGAS (around Santiago)**
 - There is a number of potential projects nearby Santiago
 - Around 90 Million m³ of Biogas per year

Name	Type	Capacity	Unit	Dist. From Santiago	Biogás Production m ³ /day
El Trebal	Sewage Treatment Plant	4,4	m ³ /s	15 Km	1800
La Farfana	Sewage Treatment Plant	8,8	m ³ /s	10 Km	36000
Los Nogales	Sewage Treatment Plant	6,6	m ³ /s	20 Km	24000
Santiago Poniente	Landfill	1000	Ton/d	25 Km	36000-50000
San Martín	Landfill	1000	Ton/d	30 Km	36000-50000
Los Colorados	Landfill	5000	Ton/d	80 Km	72000-100000

Alternative Solution

- **BIOGAS (potential uses)**
 - Grid injection (Gas & electricity)
 - Biogas for industries
 - CHP (Co-generation)
 - NGV
- **BIOGAS IN CHILE**
 - Along Chile there are 282 landfills (Catastro Rellenos sanitarios 2002)
 - Over 300 Millions m3 Biogas in the whole country

Región	Population Thousands	TON/Año	Millions m3 Biogás/Año	Millions m3 GN Eq
I	353	83.880	8,39	4,19
II	430	102.240	10,22	5,11
III	232	55.080	5,51	2,75
IV	394	93.600	9,36	4,68
V	1.355	341.280	34,13	17,06
Metropolitan	5.553	1.819.080	181,91	90,95
VI	494	106.560	10,66	5,33
VII	544	117.720	11,77	5,89
VIII	1.468	317.160	31,72	15,86
IX	536	115.920	11,59	5,80
X	649	140.040	14,00	7,00
XI	66	14.400	1,44	0,72
XII	140	30.240	3,02	1,51
TOTAL	12.214	3.337.200	333,72	166,86



Production of Home Solid Waste – Chile, 1996

Conclusions

1. Chile needs to diversify its energy sources

- Chile depends strongly on external sources
- Oil Price will remain high in the meantime
- Our Natural Gas supplier is no longer reliable
- GDP depends strongly on new energy projects
- Renewable energies are not developed yet!

2. There is a national concern about Energy procurement

- Government
 - CNE National Energy Authority
 - ENAP National Petroleum Company
 - Corfo supporting local and external projects (financing tools)
- Private Sector
 - Electricity companies
 - Natural Gas Companies → developing Biogas projects

Conclusions

3. Biogas projects: high interest to developed them

- There are 282 landfills along Chile
- Represents over 300 millions m³ of Biogas
- Natural Gas distributors are already developing Biogas projects
- Chile does not have comprehensive expertise in Biogas technology
 - Cleaning
 - Up-grade techniques
 - NGV

4. It could be feasible to apply Swedish expertise in Chile

Conclusions

5. Chile: the strongest economy in the region
 - Open market
 - Low risk
 - GDP growing forecast will be around 6%
 - Low inflation (3%)
 - Low corruption index

6. So far, Chile is the investment platform for multinational companies that wish to invest in Latin America

Thank you very much

Chilean landscapes



Claudio Córdova - Chile
Industrial Engineer
ccordova@metrogas.cl

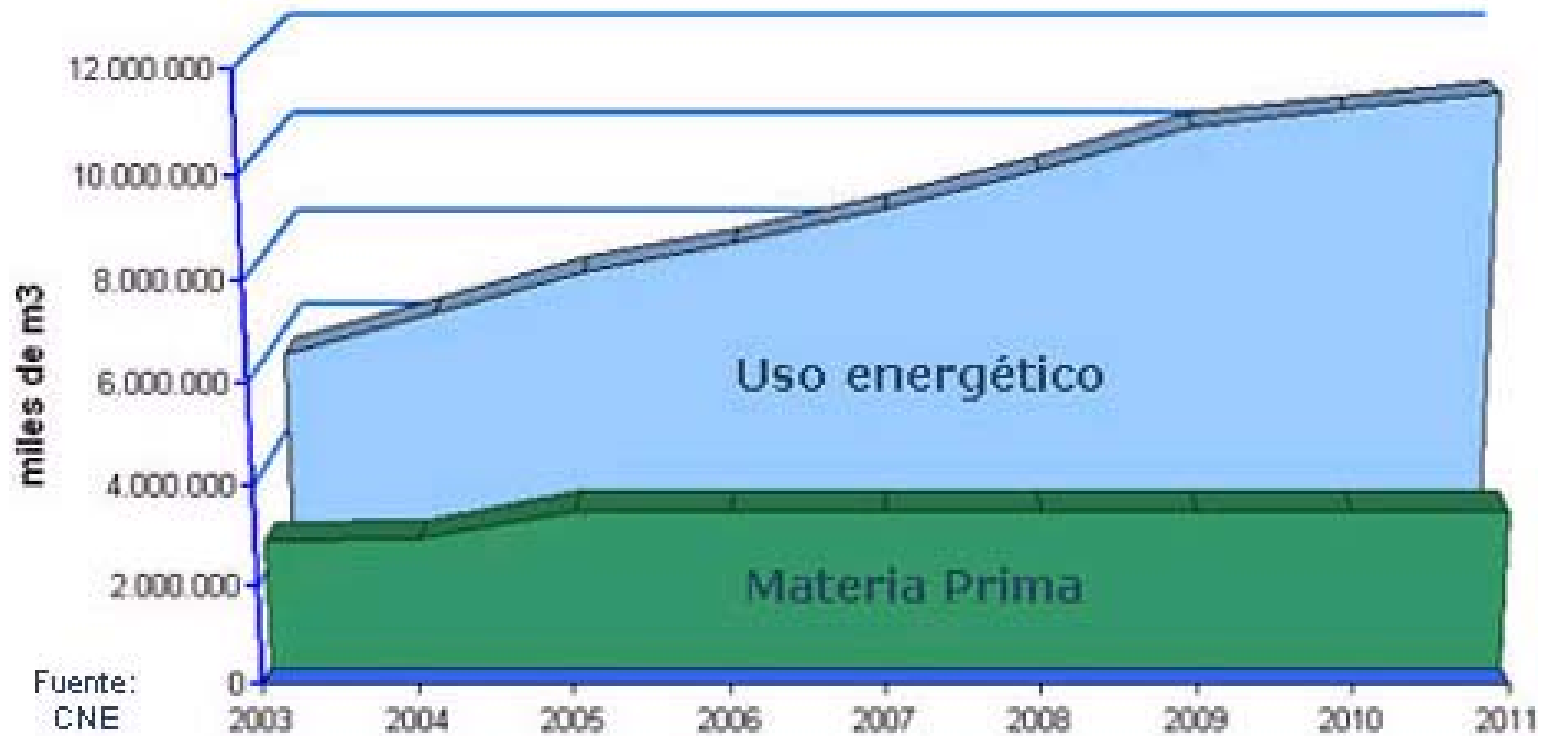
Landfills composition in Latin America (% Weight)

	H2O	Paper	Metal	Glass	Textile	Plastic	Organics	Others
México	45	20	3,2	8,2	4,2	6,1	43	27
Peru	50	10	2,1	1,3	1,4	3,2	50	32
Chile	50	18,8	2,3	1,6	4,3	10,3	49,3	13,4
Colombia	0	18,3	1,6	4,6	3,8	14,2	52,3	5,2
Ecuador	0	10,5	1,6	2,2	0	4,5	71,4	9,8
Argentina	50	20,3	3,9	8,1	5,5	8,2	53,2	0,8

Source: Diagnóstico de situación del manejo de residuos sólidos municipales en América Latina y el Caribe; BID – Organización Panamericana para la Salud 1998

Natural Gas Consumption Forecast 2003-2011

(For Households & as raw material)



ENTRADA EN VIGENCIA



GOBIERNO DE CHILE
SUBSECRETARÍA DE TRANSPORTES

Tipo de Vehículo	Norma que se aplicará	Regiones (excluida RM)	Solicitud de primera inscripción en el Registro Nacional de Vehículos Motorizados del Servicio de Registro Civil e Identificación
LIVIANOS	EPA 91	I a XII	A contar de 9 meses de publicada la norma en el Diario Oficial
	EPA 94 FEDERAL o EURO III	I a XII	sept. 2006
MEDIANOS	EPA 91	I a XII	A contar de 9 meses de publicada la norma en el Diario Oficial
	EPA 94 FEDERAL o EURO III	I a XII	sept. 2006
PESADOS	EPA 94 o EURO II (Diesel)	I a III y XI a XII	A contar de 9 meses de publicada la norma en el Diario Oficial
	EPA 98 o EURO III (Diesel)	IV a X	3 meses después de la entrada en vigencia a nivel nacional de la norma que establezca un contenido azufre diesel < 350 ppm.
	EPA 98 o EURO III (Gas)	I a XII	A contar de 9 meses de publicada la norma en el Diario Oficial