

ANALYSIS OF THE ITALIAN POTENTIAL FOR THE APPLICATION OF HIGH-EFFICIENCY COGENERATION

**Directive 2004/8/EC of the European Parliament and of the Council
of 11 February 2004
on the promotion of cogeneration based on a useful heat demand in
the internal energy market and amending Directive 92/42/EEC**

English summary

May 2009

Foreword

This report was issued in compliance with article 6 of the “Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC”. This report contains an analysis of the Italian potential for high-efficiency cogeneration and high-efficiency micro-cogeneration.

In this report, only CHP qualified by GSE is regarded as high-efficiency CHP. Those economic activities (EA) have been analyzed where CHP is, or is likely to become, common practice. Namely: food industry; paper industry; chemicals; oil refining; health care; greenhouse agriculture; district heating.

For each EA, an overall analysis has first been performed for the Italian territory as a whole. The analysis has then been extended to the individual departments (“Regioni”), based on appropriate apportioning coefficients. In most cases, coefficients were based on the number of employees in each department. However, for health care the number of hospital beds in each department was employed; for greenhouse agriculture, the number of cultivated acres was chosen. As a general rule, the assessment of CHP potential is conservative: the actual development potential for each EA equals or exceeds the declared value.

All the assessments described in the following paragraphs were performed separately for each of the EAs considered. The main results can be found in the Annex.

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Acronyms and definitions

CHP: combined heat and power (cogeneration).

EA: economic activity.

GEA: gross energy consumption.

High-efficiency CHP: cogeneration qualified as high-efficiency by “Gestore Servizi Elettrici (GSE)”.

NEA: net energy consumption.

FA_{chp}: overall fuel amount which was employed in high-efficiency CHP devices during the reference year.

ULD: useful life duration for a piece of machinery.

Reference year: year taken as a basis for CHP development forecasts in each EA (reference years are 2004 or 2005, according to statistical data availability).

1 CHP DEVELOPMENT POTENTIAL IN REFERENCE YEARS (2004; 2005)

1.1 National analysis

1.1.1 New capacity

Based on statistical data available [3], the gross energy amount (GEA, made up of fuel and other energy commodities) purchased during reference year was assessed.

GEA does not include Diesel oil for transportation, but includes (via an appropriate conversion) heat and electricity purchased.

Due to specific manufacturing techniques, a share of GEA is necessarily employed in non-CHP devices, namely back-up boilers and post-firing. This share is estimated and subtracted from GEA, resulting in a net energy amount (NEA).

Yearly applications for CHP qualification yield the overall fuel amount (FA_{chp}) which has been employed in high-efficiency CHP devices during the reference year.

The difference (GEA – FA_{chp}) is the amount of fuel employed in non-CHP processes. Namely:

- a) Heat production stand-alone (no electricity production associated);
- b) CHP which does not qualify as high-efficiency CHP.

1.1.2 Updating existing capacity

In order to assess the CHP potential that can be developed by refurbishing CHP plants already in operation, a “useful life duration” (ULD) was chosen for each kind of plant. A survey of technical literature has provided the following figures.

Stand-alone steam turbines: 30 years

Combined cycles (gas and steam): 25 years.

Stand-alone gas turbines: 25 years (≥ 5 MW) or 10 years (< 5 MW).

Internal combustion engines: 10 years.

Based on high-efficiency CHP applications, plants have been detected which in the reference year had already exceeded their useful life duration. The capacity of such plants, summed for each type (steam, gas, internal combustion), can be regarded as a CHP potential based on refurbishment of existing capacity.

1.2 Analysis by department

Allocation of the National figure on the individual departments has been mostly performed based on the number of employees in each department in the reference year. The following quantities have been taken into account:

- A) number of EA employees in each department in the reference year;
- B) percentage of EA employees in each department in the reference year;
- C) fuel amount consumed in each department during the reference year;
- D) fuel amount consumed in CHP processes during the reference year;
- E) fuel amount consumed in non-CHP processes during the reference year.

C equals B times the national overall fuel amount; C is a reasonable assessment of the overall fuel consumed in each department .

$E (=C-D)$ is fuel which could have been employed in CHP processes, and is therefore a sound estimate of the CHP development potential.

An assessment has been performed of the capacity which would have been necessary in each department to use fuel E in a CHP process. Where possible, the capacity has been allocated on the various technologies available (gas turbines, steam turbines, combined cycles, internal combustion engines) based on the actual share of each technology in that department. Where this was not possible due to lack of data (no high-efficiency CHP in the reference year in that department), the technology deemed as the most suitable was chosen.

In order to “turn” a fuel amount (E) into a capacity, further quantities were needed. Namely: average efficiency, average operation hours, average capacity (size) of each individual piece of machinery.

2 CHP DEVELOPMENT POTENTIAL IN 2010, 2015, 2020

2.1 National analysis

2.1.1 New capacity

The CHP development potential based on new capacity has been estimated for 2010, 2015 and 2020 ("horizon years") with the same criteria as for reference year. Forecasts for the fuel amounts have been obtained from the NEA, by applying the estimated growth rate for energy services [9].

2.1.2 Updating existing capacity

The CHP development potential based on refurbishment of existing capacity has been estimated for each horizon year with the same criteria as for reference year: plants have been detected which will exceed their useful life duration by the relevant horizon year. The capacity of such plants, summed for each type (steam, gas, internal combustion), can be regarded as a CHP potential based on refurbishment of existing capacity.

2.2 Analysis by department

For the allocation of National figures on the individual departments, the same method has been applied as for reference year. However, the fuel consumed in CHP (quantity D) has been corrected by the estimated growth rate for energy services [9].

References

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Annex to English summary – main results of analysis

May 2009

1 CHP DEVELOPMENT POTENTIAL IN REFERENCE YEARS (2004; 2005)

1.1 FOOD INDUSTRY

1.1.1 National analysis

1.1.1.1 Updating existing capacity

During 2004, Italian food industry did not employ, in high-efficiency cogeneration, any significant amount of machinery.

1.1.2 Analysis by department

Table 1.1.2-I - Food industry: national potential for high-efficiency cogeneration in reference year (2004)

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziare sviluppo CAR (GWh)
ABRUZZO	13.371	0,03	1.071	0	1.071
BASILICATA	5.165	0,01	414	0	414
CALABRIA	10.257	0,02	821	0	821
CAMPANIA	36.359	0,08	2.912	44	2.868
EMILIA ROMAGNA	69.364	0,15	5.556	200	5.355
FRIULI VENEZIA GIULIA	9.265	0,02	742	2	740
LAZIO	23.455	0,05	1.879	0	1.879
LIGURIA	10.469	0,02	838	0	838
LOMBARDIA	71.636	0,16	5.737	0	5.737
MARCHE	14.059	0,03	1.126	0	1.126
MOLISE	3.321	0,01	266	0	266
PIEMONTE	38.592	0,08	3.091	1.413	1.678
PUGLIA	24.215	0,05	1.939	23	1.916
SARDEGNA	12.228	0,03	979	0	979
SICILIA	25.685	0,06	2.057	0	2.057
TOSCANA	23.431	0,05	1.877	0	1.877
TRENTINO ALTO ADIGE	9.895	0,02	792	0	792
UMBRIA	9.101	0,02	729	0	729
VENETO	45.604	0,10	3.652	1.083	2.569

Table 1.1.2-II – Food industry: potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines:2,7 MW. Gas turbines:6,3 MW. Steam turbines:29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Campania	MCI	1,000	287	106
Emilia Romagna	MCI	0,044	23	9
Emilia Romagna	TURBOGAS	0,956	280	44
Friuli Venezia Giulia	TURBOGAS	1,000	40	6
Piemonte	CICLOCOMB	0,918	106	1
Piemonte	MCI	0,010	2	1
Piemonte	TURBOGAS	0,072	7	1
Puglia	MCI	0,775	149	55
Puglia	TURBOGAS	0,225	24	4
Veneto	CICLOCOMB	0,945	167	1
Veneto	MCI	0,055	14	5

Table 1.1.2-III - Food industry: potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines:2,7 MW. Gas turbines:6,3 MW. Steam turbines:29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
ABRUZZO	MCI	107,18	40
BASILICATA	MCI	41,40	15
CALABRIA	MCI	82,22	30
LAZIO	MCI	188,02	70
LIGURIA	MCI	83,92	31
LOMBARDIA	MCI	574,23	213
MARCHE	MCI	112,69	42
MOLISE	MCI	26,62	10
SARDEGNA	MCI	98,02	36
SICILIA	MCI	205,89	76
TOSCANA	MCI	187,82	70
TRENTINO ALTO ADIGE	MCI	79,32	29
UMBRIA	MCI	72,95	27

1.2 PAPER INDUSTRY

1.2.1 National analysis

1.2.1.1 Updating existing capacity

1.2.2 Analysis by department

Table 1.2.2-I - Paper industry: national potential for high-efficiency cogeneration in reference year (2004)

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziiale sviluppo CAR (GWh)
BASILICATA	218	0,004	56	0	56
CALABRIA	313	0,006	80	0	80
CAMPANIA	4.066	0,073	1.047	234	813
EMILIA ROMAGNA	6.629	0,120	1.707	437	1.270
LAZIO	3.624	0,065	933	895	38
LIGURIA	810	0,015	209	0	209
LOMBARDIA	18.539	0,335	4.773	1.294	3.478
MARCHE	3.970	0,072	1.022	262	760
MOLISE	129	0,002	33	0	33
PUGLIA	2.007	0,036	517	0	517
SARDEGNA	483	0,009	124	0	124
SICILIA	1.010	0,018	260	0	260
UMBRIA	1.717	0,031	442	0	442
VENETO	11.900	0,215	3.064	1.906	1.158

Table 1.2.2-II - Paper industry: potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziiale sviluppo CAR (MW totali)	Potenziiale sviluppo CAR (n. unità)
Campania	MCI	0,049	4	1
Campania	TURBOGAS	0,951	42	7
Emilia Romagna	TURBOGAS	1,000	69	11
Lazio	TURBOGAS	0,411	1	0
Lazio	VAPORE	0,589	1	0
Lombardia	CICLOCOMB	1,000	239	2
Marche	CICLOCOMB	0,603	32	0
Marche	TURBOGAS	0,397	16	3
Veneto	CICLOCOMB	0,562	45	0
Veneto	TURBOGAS	0,256	16	3
Veneto	VAPORE	0,183	9	0

Table 1.2.2-III - Paper industry: potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
BASILICATA	TURBOGAS	3,058	0
CALABRIA	TURBOGAS	4,393	1
LIGURIA	TURBOGAS	11,385	2
MOLISE	TURBOGAS	1,807	0
PUGLIA	TURBOGAS	28,201	4
SARDEGNA	TURBOGAS	6,785	1
SICILIA	TURBOGAS	14,198	2
UMBRIA	TURBOGAS	24,126	4

1.3 CHEMICAL INDUSTRY

1.3.1 National analysis

1.3.1.1 Updating existing capacity

During 2004, Italian chemical industries have employed, in high-efficiency cogeneration, about 185 MW of steam turbines aged 30 years or more.

1.3.2 Analysis by department

Table 1.3.2-I - Chemical industry: national potential for high-efficiency cogeneration in reference year (2004).

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziiale sviluppo CAR (GWh)
Abruzzo	3.268	0,020	497	0	497
Basilicata	844	0,005	128	0	128
Calabria	920	0,006	140	0	140
Campania	5.619	0,034	854	0	854
Friuli Venezia Giulia	2.205	0,013	335	0	335
Lazio	20.832	0,127	3.167	0	3.167
Liguria	3.418	0,021	520	124	396
Lombardia	84.676	0,516	12.874	1.941	10.933
Marche	2.704	0,016	411	0	411
Molise	742	0,005	113	0	113
Piemonte	14.952	0,091	2.273	1.500	773
Puglia	3.534	0,022	537	0	537
Trentino Alto Adige	1.793	0,011	273	0	273
Valle d'Aosta	65	0,000	10	0	10
Veneto	18.532	0,113	2.818	1.567	1.250

Table 1.3.2-II - Chemical industry: potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziiale sviluppo CAR (MW totali)	Potenziiale sviluppo CAR (n. unità)
Emilia Romagna	CICLOCOMB	0,687	0	0
Emilia Romagna	Vapore	0,313	0	0
Liguria	TURBOGAS	1,000	22	3
Lombardia	TURBOGAS	0,044	27	4
Lombardia	Vapore	0,956	455	15
Piemonte	CICLOCOMB	1,000	55	0
Veneto	Vapore	1,000	55	2

Table 1.3.2-III - Chemical industry: potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Abruzzo	TURBOGAS	27,12	4
Basilicata	TURBOGAS	7,00	1
Calabria	TURBOGAS	7,63	1
Campania	TURBOGAS	46,63	7
Friuli Venezia Giulia	TURBOGAS	18,30	3
Lazio	TURBOGAS	172,88	27
Marche	TURBOGAS	22,44	4
Molise	TURBOGAS	6,16	1
Puglia	TURBOGAS	29,33	5
Trentino Alto Adige	TURBOGAS	14,88	2
Valle d'Aosta	TURBOGAS	0,54	0

1.4 OIL REFINING

1.4.1 National analysis

1.4.1.1 Updating existing capacity

During 2005, Italian refineries have employed, in high-efficiency cogeneration, about 250 MW of steam turbines aged 30 years or more, and at least 70 MW of combined cycles aged 40 years or more.

1.5 HEALTH CARE

1.5.1 National analysis

1.5.1.1 Updating existing capacity

During 2005, Italian health care did not employ, in high-efficiency cogeneration, any significant amount of machinery.

1.5.2 Analysis by department

Table 1.5.2-I – Health care: national potential for high-efficiency cogeneration in reference year (2005)

	A	B	C	D
Regione	Posti letto (n.)	Energia termica totale (GWh)	Energia termica CAR (GWh)	Potenziale sviluppo CAR (GWh)
ABRUZZO	5.428	126	6	120
BASILICATA	1.869	44	0	44
CALABRIA	7.769	181	0	181
CAMPANIA	18.331	427	52	375
EMILIA ROMAGNA	18.125	422	4	418
FRIULI VENEZIA GIULIA	4.373	102	1	101
LAZIO	25.145	586	39	547
LIGURIA	6.468	151	0	151
LOMBARDIA	37.840	882	2	880
MARCHE	5.939	138	0	138
MOLISE	1.678	39	0	39
PIEMONTE	16.795	391	3	389
PUGLIA	14.689	342	0	342
SARDEGNA	7.066	165	0	165
SICILIA	17.150	400	0	400
TOSCANA	13.196	307	4	303
TRENTINO ALTO ADIGE	4.326	101	0	101
UMBRIA	2.653	62	0	62
VALLE D'AOSTA	416	10	0	10
VENETO	17.754	414	18	396

Table 1.5.2-II - Health care: potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2005). Assessment was based on following average powers: Internal combustion engines: 2,4 MW. Gas turbines: 7,3 MW.

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Abruzzo	MCI	1	38	16
Campania	TURBOGAS	1	55	7
Emilia Romagna	MCI	1	132	54
Friuli Venezia Giulia	MCI	1	32	13
Lazio	TURBOGAS	1	79	11
Lombardia	MCI	1	277	114
Piemonte	MCI	1	122	50
Toscana	MCI	1	96	39
Veneto	MCI	1	125	51

Table 1.5.2-III – Health care: potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2005). Assessment was based on following average powers: Internal combustion engines: 2,4 MW. Gas turbines: 7,3 MW.

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
BASILICATA	TURBOGAS	6	1
CALABRIA	TURBOGAS	26	4
LIGURIA	TURBOGAS	22	3
MARCHE	TURBOGAS	20	3
MOLISE	TURBOGAS	6	1
PUGLIA	TURBOGAS	50	7
SARDEGNA	TURBOGAS	24	3
SICILIA	TURBOGAS	58	8
TRENTINO ALTO ADIGE	TURBOGAS	15	2
UMBRIA	TURBOGAS	9	1
VALLE D'AOSTA	TURBOGAS	1	0

1.6 GREENHOUSE AGRICULTURE

1.6.1 National analysis

1.6.2 Analysis by department

Table 1.6.2-I – Greenhouse agriculture: national potential for high-efficiency cogeneration in reference year (2005)

	A	B	C
Regione	Superficie (are)	Superficie (%)	Combust. Totale; potenziale sviluppo CAR(GWh)
ABRUZZO	9.966	0,0025	4
BASILICATA	94.950	0,0239	39
CALABRIA	58.982	0,0148	24
CAMPANIA	977.338	0,2460	400
EMILIA ROMAGNA	129.588	0,0326	53
RIULI VENEZIA GIULI	12.897	0,0032	5
LAZIO	621.300	0,1564	255
LIGURIA	90.672	0,0228	37
LOMBARDIA	204.846	0,0516	84
MARCHE	8.329	0,0021	3
PIEMONTE	80.119	0,0202	33
PUGLIA	118.740	0,0299	49
SARDEGNA	90.758	0,0228	37
SICILIA	954.487	0,2402	391
TOSCANA	74.720	0,0188	31
RENTINO ALTO ADIGE	602	0,0002	0
UMBRIA	4.230	0,0011	2
ValledAosta	901	0,0002	0
VENETO	439.957	0,1107	180

Table 1.6.2-II - Greenhouse agriculture: potential for high-efficiency cogeneration in individual departments in reference year (2005). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
ABRUZZO	MCI	0,408649421	0
BASILICATA	MCI	3,893363688	1
CALABRIA	MCI	2,418518979	1
CAMPANIA	MCI	40,07511616	15
EMILIA ROMAGNA	MCI	5,313672602	2
FRIULI VENEZIA GIULIA	MCI	0,528833191	0
LAZIO	MCI	25,47600694	9
LIGURIA	MCI	3,717947049	1
LOMBARDIA	MCI	8,399578493	3
MARCHE	MCI	0,341525289	0
PIEMONTE	MCI	3,28522807	1
PUGLIA	MCI	4,868857338	2
SARDEGNA	MCI	3,721473423	1
SICILIA	MCI	39,1381256	14
TOSCANA	MCI	3,063845547	1
TRENTINO ALTO ADIGE	MCI	0,024684623	0
UMBRIA	MCI	0,17344843	0
ValledAosta	MCI	0,036944926	0
VENETO	MCI	18,04015385	7

1.7 SETTORE DEL RISCALDAMENTO URBANO

1.7.1 National analysis

1.7.1.1 Updating existing capacity

During 2005, Italian district heating companies have employed, in high-efficiency cogeneration, about 5 MW of internal combustion engines aged 10 years or more.

1.7.2 Analysis by department

Table 1.7.2-I – District heating: national potential for high-efficiency cogeneration in reference year (2005)

	A	B	C	D
Regione	Combustibile totale (%)	Combustibile totale (GWh)	Combust. CAR (GWh)	Potenziiale sviluppo CAR (GWh)
EMILIA ROMAGNA	0,15	2.533	1.499	527
LAZIO	0,01	223	0	114
LIGURIA	0,02	349	319	16
LOMBARDIA	0,34	5.835	3.805	1.035
MARCHE	0,00	56	0	29
PIEMONTE	0,37	6.364	2.414	2.015
TOSCANA	0,00	0	6	0
TRENTINO ALTO ADIGE	0,04	689	63	319
VENETO	0,06	944	736	106

Table 1.7.2-II – District heating: potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2005). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines:2,7 MW. Gas turbines:6,3 MW. Steam turbines:29,7 MW

Regione	Tecnologia	Coefficiente	Potenziiale sviluppo CAR (MW totali)	Potenziiale sviluppo CAR (n. unità)
Emilia Romagna	CICLOCOMB	0,68	25,57	0
Emilia Romagna	MCI	0,03	1,75	1
Emilia Romagna	TURBOGAS	0,15	4,90	1
Emilia Romagna	VAPORE	0,14	3,47	0
Liguria	CICLOCOMB	1,00	1,11	0
Liguria	MCI	0,00	0,00	0
Lombardia	CICLOCOMB	0,24	18,18	0
Lombardia	MCI	0,11	11,61	5
Lombardia	TURBOGAS	0,17	10,65	1
Lombardia	VAPORE	0,47	23,46	1
Piemonte	CICLOCOMB	0,73	105,81	1
Piemonte	MCI	0,17	33,88	14
Piemonte	MISTO	0,10	19,50	1
Piemonte	TURBOGAS	0,00	0,02	0
Toscana	MCI	1,00	0,00	0
Trentino Alto Adige	MCI	1,00	31,98	13
Veneto	CICLOCOMB	0,60	4,59	0
Veneto	MCI	0,40	4,22	2

Table 1.7.2-III – District heating: potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2005). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
LAZIO	MCI	11,39	5,00
MARCHE	MCI	2,87	1,00

2 CHP DEVELOPMENT POTENTIAL IN 2010

2.1 FOOD INDUSTRY

2.1.1 National analysis

2.1.1.1 Updating existing capacity

During 2010, Italian food industries will employ, in high-efficiency cogeneration, about 10 MW of internal combustion engines aged 10 years or more, and about 4 MW of gas turbines aged 15 years or more.

2.1.2 Analysis by department

Table 2.1.2-I - Food industry: national potential for high-efficiency cogeneration in 2010

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziabile sviluppo CAR (GWh)
ABRUZZO	13.371	0,03	1.213	0	1.213
BASILICATA	5.165	0,01	469	0	469
CALABRIA	10.257	0,02	931	0	931
CAMPANIA	36.359	0,08	3.299	44	3.254
EMILIA ROMAGNA	69.364	0,15	6.293	200	6.093
FRIULI VENEZIA GIULIA	9.265	0,02	841	2	838
LAZIO	23.455	0,05	2.128	0	2.128
LIGURIA	10.469	0,02	950	0	950
LOMBARDIA	71.636	0,16	6.499	0	6.499
MARCHE	14.059	0,03	1.276	0	1.276
MOLISE	3.321	0,01	301	0	301
PIEMONTE	38.592	0,08	3.501	1.413	2.088
PUGLIA	24.215	0,05	2.197	23	2.174
SARDEGNA	12.228	0,03	1.109	0	1.109
SICILIA	25.685	0,06	2.330	0	2.330
TOSCANA	23.431	0,05	2.126	0	2.126
TRENTINO ALTO ADIGE	9.895	0,02	898	0	898
UMBRIA	9.101	0,02	826	0	826
VENETO	45.604	0,10	4.137	1.083	3.054

Table 2.1.2-II - Food industry: 2010 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Campania	MCI	1	325,7095297	121
Emilia Romagna	MCI	0,043771976	26,69341526	10
Emilia Romagna	TURBOGAS	0,956228024	318,0261536	50
Friuli Venezia Giulia	TURBOGAS	1	45,75489124	7
Piemonte	CICLOCOMB	0,918465347	132,0226695	1
Piemonte	MCI	0,010023133	2,094751418	1
Piemonte	TURBOGAS	0,071511519	8,150765054	1
Puglia	MCI	0,775006578	168,6020541	62
Puglia	TURBOGAS	0,224993422	26,69443149	4
Veneto	CICLOCOMB	0,944888604	198,6717684	2
Veneto	MCI	0,055111396	16,84768411	6

Table 2.1.2-III – Food industry: 2010 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
ABRUZZO	MCI	121,4151076	45
BASILICATA	MCI	46,90250941	17
CALABRIA	MCI	93,13607131	35
LAZIO	MCI	212,9809183	79
LIGURIA	MCI	95,0635518	35
LOMBARDIA	MCI	650,4769465	241
MARCHE	MCI	127,6582847	47
MOLISE	MCI	30,15593932	11
SARDEGNA	MCI	111,0334817	41
SICILIA	MCI	233,2312225	86
TOSCANA	MCI	212,7599032	79
TRENTINO ALTO ADIGE	MCI	89,84708697	33
UMBRIA	MCI	82,64030581	31

2.2 PAPER INDUSTRY

2.2.1 National analysis

2.2.1.1 Updating existing capacity

During 2010, Italian paper industries will employ, in high-efficiency cogeneration, at least 55 MW of gas turbines aged 10 years or more, and at least 20 MW of steam turbines aged 30 years or more.

2.2.2 Analysis by department

Table 2.2.2-I – Paper industry: national potential for high-efficiency cogeneration in 2010.

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziale sviluppo CAR (GWh)
BASILICATA	218	0,00	66	0	66
CALABRIA	313	0,00	95	0	95
CAMPANIA	4.066	0,06	1.234	234	1.000
EMILIA ROMAGNA	6.629	0,09	2.012	437	1.575
LAZIO	3.624	0,05	1.100	895	205
LIGURIA	810	0,01	246	0	246
LOMBARDIA	18.539	0,25	5.628	1.294	4.334
MARCHE	3.970	0,05	1.205	262	943
MOLISE	129	0,00	39	0	39
PIEMONTE	7.371	0,10	2.238	2.109	128
PUGLIA	2.007	0,03	609	0	609
SARDEGNA	483	0,01	147	0	147
SICILIA	1.010	0,01	307	0	307
TOSCANA	10.806	0,15	3.280	3.107	173
UMBRIA	1.717	0,02	521	0	521
VENETO	11.900	0,16	3.612	1.906	1.707

Table 2.2.2-II - Paper industry: 2010 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Campania	MCI	0,048806118	4,886132554	2
Campania	TURBOGAS	0,951193882	51,93419546	8
Emilia Romagna	TURBOGAS	1	85,99140096	14
Lazio	TURBOGAS	0,410661699	4,604382977	1
Lazio	VAPORE	0,589338301	5,198164566	0
Lombardia	CICLOCOMB	1	298,3085254	3
Marche	CICLOCOMB	0,603362995	39,17904107	0
Marche	TURBOGAS	0,396637005	20,42231619	3
Piemonte	CICLOCOMB	0,95157618	8,402696839	0
Piemonte	TURBOGAS	0,04842382	0,339055517	0
Toscana	CICLOCOMB	0,640860509	7,640754783	0
Toscana	MCI	0,041140451	0,713156833	0
Toscana	MISTO	0,038394106	0,624985701	0
Toscana	TURBOGAS	0,279604934	2,643347234	0
Veneto	CICLOCOMB	0,561804597	66,01297042	1
Veneto	TURBOGAS	0,255688259	23,8227233	4
Veneto	VAPORE	0,182507144	13,37699634	0

Table 2.2.2-III – Paper industry: 2010 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
BASILICATA	TURBOGAS	3,605413392	1
CALABRIA	TURBOGAS	5,18036878	1
LIGURIA	TURBOGAS	13,4243199	2
MOLISE	TURBOGAS	2,130539335	0
PUGLIA	TURBOGAS	33,25318222	5
SARDEGNA	TURBOGAS	8,000044302	1
SICILIA	TURBOGAS	16,74175092	3
UMBRIA	TURBOGAS	28,44795274	5

2.3 CHEMICAL INDUSTRY

2.3.1 National analysis

2.3.1.1 Updating existing capacity

During 2010, Italian chemical industries will employ in high-efficiency cogeneration, at least 250 MW of steam turbines aged 30 years or more, and about 10 MW of gas turbines aged 10 years or more.

2.3.2 Analysis by department

Table 2.3.2-I - Chemical industry: national potential for high-efficiency cogeneration in 2010.

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziale sviluppo CAR (GWh)
Abruzzo	3.268	0,02	558	0	558
Basilicata	844	0,01	144	0	144
Calabria	920	0,01	157	0	157
Campania	5.619	0,03	959	0	959
Friuli Venezia Giulia	2.205	0,01	376	0	376
Lazio	20.832	0,13	3.557	0	3.557
Liguria	3.418	0,02	584	124	460
Lombardia	84.676	0,52	14.458	1.941	12.517
Marche	2.704	0,02	462	0	462
Molise	742	0,00	127	0	127
Piemonte	14.952	0,09	2.553	1.500	1.053
Puglia	3.534	0,02	603	0	603
Trentino Alto Adige	1.793	0,01	306	0	306
Valle d'Aosta	65	0,00	11	0	11
Veneto	18.532	0,11	3.164	1.567	1.597

Table 2.3.2-II - Chemical industry: 2010 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Liguria	TURBOGAS	1	25,09157439	4
Lombardia	TURBOGAS	0,044197414	30,19613043	5
Lombardia	VAPORE	0,955802586	513,713234	17
Piemonte	CICLOCOMB	1	72,49778967	1
Veneto	VAPORE	1	68,58143884	2

Table 2.3.2-III - Chemical industry: 2010 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Abruzzo	TURBOGAS	30,45763856	5
Basilicata	TURBOGAS	7,866048636	1
Calabria	TURBOGAS	8,574365812	1
Campania	TURBOGAS	52,36887119	8
Friuli Venezia Giulia	TURBOGAS	20,55051806	3
Lazio	TURBOGAS	194,1534659	31
Marche	TURBOGAS	25,20117952	4
Molise	TURBOGAS	6,915412427	1
Puglia	TURBOGAS	32,93674867	5
Trentino Alto Adige	TURBOGAS	16,71069337	3
Valle d'Aosta	TURBOGAS	0,605797585	0

2.4 OIL REFINING

2.4.1 National analysis

2.4.1.1 Updating existing capacity

During 2010, Italian refineries will employ, in high-efficiency cogeneration, at least 200 MW of steam turbines aged 35 years or more, and at least 70 MW of combined cycles aged 45 years or more.

2.5 HEALTH CARE

2.5.1 National analysis

2.5.1.1 Updating existing capacity

During 2010, Italian health care will not employ, in high-efficiency cogeneration, any significant amount of machinery.

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2.5.2 Analysis by department

Table 2.5.2-I – Health care: national potential for high-efficiency cogeneration in 2010.

	A	B	C	D
Regione	Posti letto (n.)	Energia termica totale (GWh)	Energia termica CAR (GWh)	Potenziale sviluppo CAR (GWh)
ABRUZZO	5.812	135,4	6,4	129,0
BASILICATA	1.987	46,3	0,0	46,3
CALABRIA	8.380	195,3	0,0	195,3
CAMPANIA	20.332	473,7	51,8	422,0
EMILIA ROMAGNA	19.244	448,4	5,1	443,3
FRIULI VENEZIA GIULIA	4.652	108,4	0,7	107,6
LAZIO	27.389	638,2	39,3	598,8
LIGURIA	6.615	154,1	0,0	154,1
LOMBARDIA	41.526	967,6	1,9	965,6
MARCHE	6.306	146,9	0,0	146,9
MOLISE	1.769	41,2	0,0	41,2
PIEMONTE	17.846	415,8	2,7	413,1
PUGLIA	16.286	379,5	0,0	379,5
SARDEGNA	7.785	181,4	0,0	181,4
SICILIA	18.405	428,8	0,0	428,8
TOSCANA	13.968	325,5	4,2	321,2
TRENTINO ALTO ADIGE	4.758	110,9	0,0	110,9
UMBRIA	2.802	65,3	0,0	65,3
VALLE D'AOSTA	452	10,5	0,0	10,5
VENETO	19.488	454,1	18,5	435,5

Table 2.5.2-II - Health care: 2010 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2005). Assessment was based on following average powers: Internal combustion engines: 2,4 MW. Gas turbines: 7,3 MW.

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Abruzzo	MCI	1	41,1	17
Campania	TURBOGAS	1	61,3	8
Emilia Romagna	MCI	1	141,2	57
Friuli Venezia Giulia	MCI	1	34,3	14
Lazio	TURBOGAS	1	87,0	12
Lombardia	MCI	1	307,6	125
Piemonte	MCI	1	131,6	53
Toscana	MCI	1	102,3	41
Veneto	MCI	1	138,7	56

Table 2.5.2-III - Health care: potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2005). Assessment was based on following average powers: Internal combustion engines: 2,4 MW. Gas turbines: 7,3 MW.

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
BASILICATA	TURBOGAS	6,72	1
CALABRIA	TURBOGAS	28,36	4
LIGURIA	TURBOGAS	22,39	3
MARCHE	TURBOGAS	21,34	3
MOLISE	TURBOGAS	5,99	1
PUGLIA	TURBOGAS	55,11	8
SARDEGNA	TURBOGAS	26,34	4
SICILIA	TURBOGAS	62,28	9
TRENTINO ALTO ADIGE	TURBOGAS	16,10	2
UMBRIA	TURBOGAS	9,48	1
VALLE D'AOSTA	TURBOGAS	1,53	0

2.6 GREENHOUSE AGRICULTURE

2.6.1 National analysis

2.6.2 Analysis by department

Table 2.6.2-I – Greenhouse agriculture: national potential for high-efficiency cogeneration in 2010.

	A	B	C
Regione	Superficie (are)	Superficie (%)	Combust. Totale; potenziale sviluppo CAR(GWh)
ABRUZZO	9.966	0,0025	5
BASILICATA	94.950	0,0239	44
CALABRIA	58.982	0,0148	27
CAMPANIA	977.338	0,2460	454
EMILIA ROMAGNA	129.588	0,0326	60
FRIULI VENEZIA GIULIA	12.897	0,0032	6
LAZIO	621.300	0,1564	288
LIGURIA	90.672	0,0228	42
LOMBARDIA	204.846	0,0516	95
MARCHE	8.329	0,0021	4
PIEMONTE	80.119	0,0202	37
PUGLIA	118.740	0,0299	55
SARDEGNA	90.758	0,0228	42
SICILIA	954.487	0,2402	443
TOSCANA	74.720	0,0188	35
TRENTINO ALTO ADIGE	602	0,0002	0
UMBRIA	4.230	0,0011	2
ValledAosta	901	0,00	0
VENETO	439.957	0,11	204

Table 2.6.2-II - Greenhouse agriculture: 2010 potential for high-efficiency cogeneration in individual departments. Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
ABRUZZO	MCI	0,462912678	0
BASILICATA	MCI	4,410351067	2
CALABRIA	MCI	2,73966642	1
CAMPANIA	MCI	45,39656336	17
EMILIA ROMAGNA	MCI	6,019258283	2
FRIULI VENEZIA GIULIA	MCI	0,599055268	0
LAZIO	MCI	28,85888486	11
LIGURIA	MCI	4,21164141	2
LOMBARDIA	MCI	9,514931802	4
MARCHE	MCI	0,386875345	0
PIEMONTE	MCI	3,721463055	1
PUGLIA	MCI	5,515377416	2
SARDEGNA	MCI	4,215636041	2
SICILIA	MCI	44,3351528	16
TOSCANA	MCI	3,470683851	1
TRENTINO ALTO ADIGE	MCI	0,027962415	0
UMBRIA	MCI	0,196480095	0
ValledAosta	MCI	0,041850725	0
VENETO	MCI	20,43564849	8

2.7 SETTORE DEL RISCALDAMENTO URBANO

2.7.1 National analysis

2.7.1.1 Updating existing capacity

During 2010, Italian district heating companies will employ, in high-efficiency cogeneration, about 15 MW of internal combustion engines aged 10 years or more, and about 23 MW of gas turbines aged 10 years or more.

2.7.2 Analysis by department

Table 2.7.2-I – District heating: national potential for high-efficiency cogeneration in 2010.

	A	B	C	D
Regione	Combustibile totale (%)	Combustibile totale (GWh)	Combust. CAR (GWh)	Potenziale sviluppo CAR (GWh)
EMILIA ROMAGNA	0,15	2.716	1.499	620
LAZIO	0,01	239	0	122
LIGURIA	0,02	375	319	28
LOMBARDIA	0,34	6.255	3.805	1.249
MARCHE	0,00	60	0	31
PIEMONTE	0,37	6.822	2.414	2.248
TOSCANA	0,00	0	6	0
TRENTINO ALTO ADIGE	0,04	739	63	345
VENETO	0,06	1.012	736	141

Table 2.7.2-II – District heating: 2010 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2005). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Emilia Romagna	CICLOCOMB	0,68	30,08	0
Emilia Romagna	MCI	0,03	2,06	1
Emilia Romagna	TURBOGAS	0,15	5,76	1
Emilia Romagna	VAPORE	0,14	4,08	0
Liguria	CICLOCOMB	1,00	2,03	0
Liguria	MCI	0,00	0,00	0
Lombardia	CICLOCOMB	0,24	21,94	0
Lombardia	MCI	0,11	14,01	6
Lombardia	TURBOGAS	0,17	12,85	2
Lombardia	VAPORE	0,47	28,32	1
Piemonte	CICLOCOMB	0,73	118,08	1
Piemonte	MCI	0,17	37,81	15
Piemonte	MISTO	0,10	21,76	1
Piemonte	TURBOGAS	0,00	0,03	0
Toscana	MCI	1,00	0,00	0
Trentino Alto Adige	MCI	1,00	34,52	14
Veneto	CICLOCOMB	0,60	6,09	0
Veneto	MCI	0,40	5,60	2

Table 2.7.2-III – District heating: potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2005). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
LAZIO	MCI	12,21	5,00
MARCHE	MCI	3	1,00

2.8 CHP DEVELOPMENT POTENTIAL IN 2015

2.9 FOOD INDUSTRY

2.9.1 National analysis

2.9.1.1 Updating existing capacity

During 2015, Italian food industries will employ in high-efficiency cogeneration, about 15 MW of internal combustion engines aged 10 years or more, and about 4.5 MW of gas turbines aged 10 years or more.

2.9.2 Analysis by department

Table 2.9.2-I - Food industry: national potential for high-efficiency cogeneration in 2015

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziale sviluppo CAR (GWh)
ABRUZZO	13.371	0,03	1.326	0	1.326
BASILICATA	5.165	0,01	512	0	512
CALABRIA	10.257	0,02	1.017	0	1.017
CAMPANIA	36.359	0,08	3.607	44	3.562
EMILIA ROMAGNA	69.364	0,15	6.880	200	6.680
FRIULI VENEZIA GIULIA	9.265	0,02	919	2	917
LAZIO	23.455	0,05	2.327	0	2.327
LIGURIA	10.469	0,02	1.038	0	1.038
LOMBARDIA	71.636	0,16	7.106	0	7.106
MARCHE	14.059	0,03	1.395	0	1.395
MOLISE	3.321	0,01	329	0	329
PIEMONTE	38.592	0,08	3.828	1.413	2.415
PUGLIA	24.215	0,05	2.402	23	2.379
SARDEGNA	12.228	0,03	1.213	0	1.213
SICILIA	25.685	0,06	2.548	0	2.548
TOSCANA	23.431	0,05	2.324	0	2.324
TRENTINO ALTO ADIGE	9.895	0,02	981	0	981
UMBRIA	9.101	0,02	903	0	903
VENETO	45.604	0,10	4.523	1.083	3.440

Table 2.9.2-II - Food industry: 2015 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Campania	MCI	1	356,5123535	132
Emilia Romagna	MCI	0,043771976	29,26564606	11
Emilia Romagna	TURBOGAS	0,956228024	348,6717888	55
Friuli Venezia Giulia	TURBOGAS	1	50,03578314	8
Piemonte	CICLOCOMB	0,918465347	152,6764481	1
Piemonte	MCI	0,010023133	2,422456744	1
Piemonte	TURBOGAS	0,071511519	9,425880136	1
Puglia	MCI	0,775006578	184,5007794	68
Puglia	TURBOGAS	0,224993422	29,21164539	5
Veneto	CICLOCOMB	0,944888604	223,7799067	2
Veneto	MCI	0,055111396	18,97689445	7

Table 2.9.2-III - Food industry: 2015 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
ABRUZZO	MCI	132,7429971	49
BASILICATA	MCI	51,27845945	19
CALABRIA	MCI	101,8255594	38
LAZIO	MCI	232,8517924	86
LIGURIA	MCI	103,9328715	39
LOMBARDIA	MCI	711,1656954	263
MARCHE	MCI	139,5686554	52
MOLISE	MCI	32,96945368	12
SARDEGNA	MCI	121,3927775	45
SICILIA	MCI	254,9914265	94
TOSCANA	MCI	232,6101569	86
TRENTINO ALTO ADIGE	MCI	98,22971657	36
UMBRIA	MCI	90,35055104	33

2.10 PAPER INDUSTRY

2.10.1 National analysis

2.10.1.1 *Updating existing capacity*

During 2015, Italian paper industries will employ in high-efficiency cogeneration, at least 60 MW of gas turbines aged 15 years or more, at least 20 MW of steam turbines aged 35 years or more, about 40 MW of combined cycles aged 25 years or more and about 14 MW of internal combustion engines aged 10 years or more.

2.10.2 Analysis by department

Table 2.10.2-I – Paper industry: national potential for high-efficiency cogeneration in 2015.

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziiale sviluppo CAR (GWh)
BASILICATA	218	0,00	72	0	72
CALABRIA	313	0,00	104	0	104
CAMPANIA	4.066	0,06	1.350	234	1.116
EMILIA ROMAGNA	6.629	0,09	2.200	437	1.763
LAZIO	3.624	0,05	1.203	895	308
LIGURIA	810	0,01	269	0	269
LOMBARDIA	18.539	0,25	6.153	1.294	4.859
MARCHE	3.970	0,05	1.318	262	1.056
MOLISE	129	0,00	43	0	43
PIEMONTE	7.371	0,10	2.446	2.109	337
PUGLIA	2.007	0,03	666	0	666
SARDEGNA	483	0,01	160	0	160
SICILIA	1.010	0,01	335	0	335
TOSCANA	10.806	0,15	3.586	3.107	479
UMBRIA	1.717	0,02	570	0	570
VENETO	11.900	0,16	3.950	1.906	2.044

Table 2.10.2-II - Paper industry: 2015 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines:6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Campania	MCI	0,048806118	5,448951319	2
Campania	TURBOGAS	0,951193882	57,91633766	9
Emilia Romagna	TURBOGAS	1	96,24521996	15
Lazio	TURBOGAS	0,410661699	6,906032183	1
Lazio	VAPORE	0,589338301	7,796634633	0
Lombardia	CICLOCOMB	1	334,4712501	3
Marche	CICLOCOMB	0,603362995	43,85178259	0
Marche	TURBOGAS	0,396637005	22,85801145	4
Piemonte	CICLOCOMB	0,95157618	22,08445816	0
Piemonte	TURBOGAS	0,04842382	0,891125495	0
Toscana	CICLOCOMB	0,640860509	21,14849979	0
Toscana	MCI	0,041140451	1,973914564	1
Toscana	MISTO	0,038394106	1,729869671	0
Toscana	TURBOGAS	0,279604934	7,316401326	1
Veneto	CICLOCOMB	0,561804597	79,05373659	1
Veneto	TURBOGAS	0,255688259	28,52886759	5
Veneto	VAPORE	0,182507144	16,01960249	1

Table 2.10.2-III - Paper industry: 2015 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines:6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
BASILICATA	TURBOGAS	3,941960935	1
CALABRIA	TURBOGAS	5,663930634	1
LIGURIA	TURBOGAS	14,6774139	2
MOLISE	TURBOGAS	2,329414665	0
PUGLIA	TURBOGAS	36,35720264	6
SARDEGNA	TURBOGAS	8,746808948	1
SICILIA	TURBOGAS	18,30451073	3
UMBRIA	TURBOGAS	31,1034287	5

2.11 CHEMICAL INDUSTRY

2.11.1 National analysis

2.11.1.1 Updating existing capacity

During 2015, Italian chemical industries will employ, in high-efficiency cogeneration, at least 250 MW of steam turbines aged 35 years or more, and about 10 MW of gas turbines aged 15 years or more.

2.11.2 Analysis by department

Table 2.11.2-I - Chemical industry: national potential for high-efficiency cogeneration in 2015.

Regione	A Addetti (n.)	B Addetti (%)	C Combust. Totale (GWh)	D Combust. CAR (GWh)	E Potenziale sviluppo CAR (GWh)
Abruzzo	3.268	0,02	606	0	606
Basilicata	844	0,00	157	0	157
Calabria	920	0,01	171	0	171
Campania	5.619	0,03	1.043	0	1.043
Emilia Romagna	16.346	0,09	3.033	2.801	232
Friuli Venezia Giulia	2.205	0,01	409	0	409
Lazio	20.832	0,12	3.865	0	3.865
Liguria	3.418	0,02	634	124	510
Lombardia	84.676	0,47	15.712	1.941	13.770
Marche	2.704	0,01	502	0	502
Molise	742	0,00	138	0	138
Piemonte	14.952	0,08	2.774	1.500	1.275
Puglia	3.534	0,02	656	0	656
Trentino Alto Adige	1.793	0,01	333	0	333
Valle d'Aosta	65	0,00	12	0	12
Veneto	18.532	0,10	3.439	1.567	1.872

Table 2.11.2-II - Chemical industry: 2015 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Emilia Romagna	CICLOCOMB	0,687025094	10,96311206	0
Emilia Romagna	VAPORE	0,312974906	3,115340501	0
Liguria	TURBOGAS	1	27,85357571	4
Lombardia	TURBOGAS	0,044197414	33,22032003	5
Lombardia	VAPORE	0,955802586	565,1624162	19
Piemonte	CICLOCOMB	1	87,73531629	1
Veneto	VAPORE	1	80,36216964	3

Table 2.11.2-III - Chemical industry: 2015 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Abruzzo	TURBOGAS	33,09842859	5
Basilicata	TURBOGAS	8,548064176	1
Calabria	TURBOGAS	9,317795073	1
Campania	TURBOGAS	56,90944621	9
Friuli Venezia Giulia	TURBOGAS	22,33232406	4
Lazio	TURBOGAS	210,9872902	33
Marche	TURBOGAS	27,38621509	4
Molise	TURBOGAS	7,515004287	1
Puglia	TURBOGAS	35,79248673	6
Trentino Alto Adige	TURBOGAS	18,15957235	3
Valle d'Aosta	TURBOGAS	0,658322478	0

2.12 OIL REFINING

2.12.1 National analysis

2.12.1.1 *Updating existing capacity*

During 2015, Italian refineries will employ, in high-efficiency cogeneration, at least 240 MW of steam turbines aged 40 years or more, and at least 120 MW of combined cycles aged 25 years or more.

2.13 HEALTH CARE

2.13.1 National analysis

2.13.1.1 *Updating existing capacity*

During 2015, Italian health care will employ in high-efficiency cogeneration, about 7 MW of internal combustion engines aged 10 years or more.

2.13.2 Analysis by department

Table 2.13.2-I – Health care: national potential for high-efficiency cogeneration in 2015.

	A	B	C	D
Regione	Posti letto (n.)	Energia termica totale (GWh)	Energia termica CAR (GWh)	Potenziale sviluppo CAR (GWh)
ABRUZZO	6.101	142,2	6,4	135,8
BASILICATA	2.081	48,5	0,0	48,5
CALABRIA	8.875	206,8	0,0	206,8
CAMPANIA	21.988	512,3	51,8	460,6
EMILIA ROMAGNA	19.892	463,5	5,1	458,4
FRIULI VENEZIA GIULIA	4.782	111,4	0,7	110,7
LAZIO	28.957	674,7	39,3	635,4
LIGURIA	6.568	153,0	0,0	153,0
LOMBARDIA	44.013	1025,5	1,9	1023,6
MARCHE	6.585	153,4	0,0	153,4
MOLISE	1.838	42,8	0,0	42,8
PIEMONTE	18.438	429,6	2,7	426,9
PUGLIA	17.432	406,2	0,0	406,2
SARDEGNA	8.469	197,3	0,0	197,3
SICILIA	19.332	450,4	0,0	450,4
TOSCANA	14.289	332,9	4,2	328,7
TRENTINO ALTO ADIGE	5.128	119,5	0,0	119,5
UMBRIA	2.883	67,2	0,0	67,2
VALLE D'AOSTA	479	11,2	0,0	11,2
VENETO	20.785	484,3	18,5	465,8

Table 2.13.2-II - Health care: 2015 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2005). Assessment was based on following average powers: Internal combustion engines: 2,4 MW. Gas turbines: 7,3 MW.

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Abruzzo	MCI	1	43,3	18
Campania	TURBOGAS	1	66,9	9
Emilia Romagna	MCI	1	146,0	59
Friuli Venezia Giulia	MCI	1	35,3	14
Lazio	TURBOGAS	1	92,3	13
Lombardia	MCI	1	326,1	132
Piemonte	MCI	1	136,0	55
Toscana	MCI	1	104,7	42
Veneto	MCI	1	148,4	60

Table 2.13.2-III - Health care: 2015 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2005). Assessment was based on following average powers: Internal combustion engines: 2,4 MW. Gas turbines: 7,3 MW.

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
BASILICATA	TURBOGAS	7,04	1
CALABRIA	TURBOGAS	30,03	4
LIGURIA	TURBOGAS	22,23	3
MARCHE	TURBOGAS	22,28	3
MOLISE	TURBOGAS	6,22	1
PUGLIA	TURBOGAS	58,99	8
SARDEGNA	TURBOGAS	28,66	4
SICILIA	TURBOGAS	65,42	9
TRENTINO ALTO ADIGE	TURBOGAS	17,35	2
UMBRIA	TURBOGAS	9,76	1
VALLE D'AOSTA	TURBOGAS	1,62	0

2.14 GREENHOUSE AGRICULTURE

2.14.1 National analysis

2.14.2 Analysis by department

Table 2.14.2-I – Greenhouse agriculture: national potential for high-efficiency cogeneration in 2015.

	A	B	C
Regione	Superficie (are)	Superficie (%)	Combust. Totale; potenziale sviluppo CAR(GWh)
ABRUZZO	9.966	0,0025	5
BASILICATA	94.950	0,0239	48
CALABRIA	58.982	0,0148	30
CAMPANIA	977.338	0,2460	496
EMILIA ROMAGNA	129.588	0,0326	66
FRIULI VENEZIA GIULIA	12.897	0,0032	7
LAZIO	621.300	0,1564	315
LIGURIA	90.672	0,0228	46
LOMBARDIA	204.846	0,0516	104
MARCHE	8.329	0,0021	4
PIEMONTE	80.119	0,0202	41
PUGLIA	118.740	0,0299	60
SARDEGNA	90.758	0,0228	46
SICILIA	954.487	0,2402	484
TOSCANA	74.720	0,0188	38
TRENTINO ALTO ADIGE	602	0,0002	0
UMBRIA	4.230	0,0011	2
ValledAosta	901	0,00	0
VENETO	439.957	0,11	223

Table 2.14.2-II - – Greenhouse agriculture: 2015 potential for high-efficiency cogeneration in individual departments in reference year (2005). Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
ABRUZZO	MCI	0,506101896	0
BASILICATA	MCI	4,821831735	2
CALABRIA	MCI	2,995274138	1
CAMPANIA	MCI	49,63201037	18
EMILIA ROMAGNA	MCI	6,58084814	2
FRIULI VENEZIA GIULIA	MCI	0,654946434	0
LAZIO	MCI	31,55138554	12
LIGURIA	MCI	4,604582697	2
LOMBARDIA	MCI	10,40266397	4
MARCHE	MCI	0,422970369	0
PIEMONTE	MCI	4,068671267	2
PUGLIA	MCI	6,029955768	2
SARDEGNA	MCI	4,608950022	2
SICILIA	MCI	48,47157143	18
TOSCANA	MCI	3,794494652	1
TRENTINO ALTO ADIGE	MCI	0,030571277	0
UMBRIA	MCI	0,214811461	0
ValledAosta	MCI	0,045755349	0
VENETO	MCI	22,34227093	8

2.15 SETTORE DEL RISCALDAMENTO URBANO

2.15.1 National analysis

2.15.1.1 *Updating existing capacity*

During 2015, Italian district heating compagnie will employ, in high-efficiency cogeneration, about 140 MW of internal combustion engines aged 10 years or more, nearly 30 MW of gas turbines aged 10 years or more, and about 30 MW of combined cycles aged 25 years or more.

2.15.2 Analysis by department

Table 2.15.2-I – District heating: national potential for high-efficiency cogeneration in 2015.

	A	B	C	D
Regione	Combustibile totale (%)	Combustibile totale (GWh)	Combust. CAR (GWh)	Potenziale sviluppo CAR (GWh)
EMILIA ROMAGNA	0,15	2.897	1.499	713
LAZIO	0,01	255	0	130
LIGURIA	0,02	400	319	41
LOMBARDIA	0,34	6.672	3.805	1.462
MARCHE	0,00	64	0	33
PIEMONTE	0,37	7.278	2.414	2.480
TOSCANA	0,00	0	6	0
TRENTINO ALTO ADIGE	0,04	788	63	370
VENETO	0,06	1.079	736	175

Table 2.15.2-II – District heating: 2015 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2005). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines:6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Emilia Romagna	CICLOCOMB	0,68	34,56	0
Emilia Romagna	MCI	0,03	2,36	1
Emilia Romagna	TURBOGAS	0,15	6,62	1
Emilia Romagna	VAPORE	0,14	4,69	0
Liguria	CICLOCOMB	1,00	2,95	0
Liguria	MCI	0,00	0,01	0
Lombardia	CICLOCOMB	0,24	25,67	0
Lombardia	MCI	0,11	16,40	7
Lombardia	TURBOGAS	0,17	15,04	2
Lombardia	VAPORE	0,47	33,14	1
Piemonte	CICLOCOMB	0,73	130,27	1
Piemonte	MCI	0,17	41,72	17
Piemonte	MISTO	0,10	24,01	1
Piemonte	TURBOGAS	0,00	0,03	0
Toscana	MCI	1,00	0,00	0
Trentino Alto Adige	MCI	1,00	37,04	15
Veneto	CICLOCOMB	0,60	7,58	0
Veneto	MCI	0,40	6,97	3

Table 2.15.2-III – District heating: 2015 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2005). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines:6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
LAZIO	MCI	13,03	5
MARCHE	MCI	3,29	1

3 CHP DEVELOPMENT POTENTIAL IN 2020

3.1 FOOD INDUSTRY

3.1.1 National analysis

3.1.1.1 Updating existing capacity

During 2020, Italian food industries will employ in high-efficiency cogeneration, about 15 MW of internal combustion engines aged 15 years or more, at least 25 MW of gas turbines aged 15 years or more, and at least 65 MW of combined cycles aged 25 years or more.

3.1.2 Analysis by department

Table 3.1.2-I - Food industry: national potential for high-efficiency cogeneration in 2020

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziale sviluppo CAR (GWh)
ABRUZZO	13.371	0,03	1.450	0	1.450
BASILICATA	5.165	0,01	560	0	560
CALABRIA	10.257	0,02	1.112	0	1.112
CAMPANIA	36.359	0,08	3.943	44	3.899
EMILIA ROMAGNA	69.364	0,15	7.522	200	7.322
FRIULI VENEZIA GIULIA	9.265	0,02	1.005	2	1.002
LAZIO	23.455	0,05	2.544	0	2.544
LIGURIA	10.469	0,02	1.135	0	1.135
LOMBARDIA	71.636	0,16	7.769	0	7.769
MARCHE	14.059	0,03	1.525	0	1.525
MOLISE	3.321	0,01	360	0	360
PIEMONTE	38.592	0,08	4.185	1.413	2.772
PUGLIA	24.215	0,05	2.626	23	2.603
SARDEGNA	12.228	0,03	1.326	0	1.326
SICILIA	25.685	0,06	2.785	0	2.785
TOSCANA	23.431	0,05	2.541	0	2.541
TRENTINO ALTO ADIGE	9.895	0,02	1.073	0	1.073
UMBRIA	9.101	0,02	987	0	987
VENETO	45.604	0,10	4.946	1.083	3.863

Table 3.1.2-II - Food industry: 2020 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Campania	MCI	1	390,1890452	145
Emilia Romagna	MCI	0,043771976	32,07786302	12
Emilia Romagna	TURBOGAS	0,956228024	382,1766263	61
Friuli Venezia Giulia	TURBOGAS	1	54,71607733	9
Piemonte	CICLOCOMB	0,918465347	175,2572005	1
Piemonte	MCI	0,010023133	2,7807366	1
Piemonte	TURBOGAS	0,071511519	10,81996198	2
Puglia	MCI	0,775006578	201,8828375	75
Puglia	TURBOGAS	0,224993422	31,96371244	5
Veneto	CICLOCOMB	0,944888604	251,2306053	2
Veneto	MCI	0,055111396	21,30475765	8

Table 3.1.2-III - Food industry: 2020 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
ABRUZZO	MCI	145,1277656	54
BASILICATA	MCI	56,06268058	21
CALABRIA	MCI	111,3257666	41
LAZIO	MCI	254,5765961	94
LIGURIA	MCI	113,6296886	42
LOMBARDIA	MCI	777,5166347	288
MARCHE	MCI	152,59025	57
MOLISE	MCI	36,04546569	13
SARDEGNA	MCI	132,7185837	49
SICILIA	MCI	278,7818326	103
TOSCANA	MCI	254,3124162	94
TRENTINO ALTO ADIGE	MCI	107,3944358	40
UMBRIA	MCI	98,78015326	37

3.2 PAPER INDUSTRY

3.2.1 National analysis

3.2.1.1 Updating existing capacity

During 2020, Italian paper industries will employ in high-efficiency cogeneration, nearly 15 MW of internal combustion engines aged 15 years or more, at least 75 MW of gas turbines aged 20 years or more, at least 20 MW of steam turbines aged 40 years or more, and at least 150 MW of combined cycles aged 25 years or more.

3.2.2 Analysis by department

Table 3.2.2-I - Paper industry: national potential for high-efficiency cogeneration in 2020.

	A	B	C	D	E
Regione	Addetti (n.)	Addetti (%)	Combust. Totale (GWh)	Combust. CAR (GWh)	Potenziiale sviluppo CAR (GWh)
BASILICATA	218	0,00	80	0	80
CALABRIA	313	0,00	115	0	115
CAMPANIA	4.066	0,06	1.491	234	1.257
EMILIA ROMAGNA	6.629	0,09	2.431	437	1.994
LAZIO	3.624	0,05	1.329	895	434
LIGURIA	810	0,01	297	0	297
LOMBARDIA	18.539	0,25	6.797	1.294	5.503
MARCHE	3.970	0,05	1.456	262	1.194
MOLISE	129	0,00	47	0	47
PIEMONTE	7.371	0,10	2.703	2.109	593
PUGLIA	2.007	0,03	736	0	736
SARDEGNA	483	0,01	177	0	177
SICILIA	1.010	0,01	370	0	370
TOSCANA	10.806	0,15	3.962	3.107	855
UMBRIA	1.717	0,02	629	0	629
VENETO	11.900	0,16	4.363	1.906	2.458

Table 3.2.2-II – Paper industry: 2020 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines:6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Campania	MCI	0,048806118	6,138862845	2
Campania	TURBOGAS	0,951193882	65,24933561	10
Emilia Romagna	TURBOGAS	1	108,8145022	17
Lazio	TURBOGAS	0,410661699	9,727427657	2
Lazio	VAPORE	0,589338301	10,98187749	0
Lombardia	CICLOCOMB	1	378,8000503	3
Marche	CICLOCOMB	0,603362995	49,57969793	0
Marche	TURBOGAS	0,396637005	25,84372256	4
Piemonte	CICLOCOMB	0,95157618	38,85576255	0
Piemonte	TURBOGAS	0,04842382	1,567860999	0
Toscana	CICLOCOMB	0,640860509	37,70649243	0
Toscana	MCI	0,041140451	3,519369946	1
Toscana	MISTO	0,038394106	3,084252704	0
Toscana	TURBOGAS	0,279604934	13,04469981	2
Veneto	CICLOCOMB	0,561804597	95,03929971	1
Veneto	TURBOGAS	0,255688259	34,29772854	5
Veneto	VAPORE	0,182507144	19,258948	1

Table 3.2.2-III - Paper industry: 2020 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines:6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
BASILICATA	TURBOGAS	4,354505867	1
CALABRIA	TURBOGAS	6,256687873	1
LIGURIA	TURBOGAS	16,21347497	3
MOLISE	TURBOGAS	2,573198972	0
PUGLIA	TURBOGAS	40,16215655	6
SARDEGNA	TURBOGAS	9,662204043	2
SICILIA	TURBOGAS	20,2201647	3
UMBRIA	TURBOGAS	34,35855022	5

3.3 CHEMICAL INDUSTRY

3.3.1 National analysis

3.3.1.1 Updating existing capacity

During 2020, Italian chemical industries will employ in high-efficiency cogeneration, at least 250 MW of steam turbines aged 40 years or more, nearly 10 MW of gas turbines aged 20 years or more, and about 30 MW of combined cycles aged 25 years or more.

3.3.2 Analysis by department

Table 3.3.2-I – Chemical industry: national potential for high-efficiency cogeneration in 2020.

Regione	A Addetti (n.)	B Addetti (%)	C Combust. Totale (GWh)	D Combust. CAR (GWh)	E Potenziale sviluppo CAR (GWh)
Abruzzo	3.268	0,02	671	0	671
Basilicata	844	0,00	173	0	173
Calabria	920	0,01	189	0	189
Campania	5.619	0,03	1.153	0	1.153
Emilia Romagna	16.346	0,09	3.355	2.801	554
Friuli Venezia Giulia	2.205	0,01	453	0	453
Lazio	20.832	0,12	4.276	0	4.276
Liguria	3.418	0,02	702	124	578
Lombardia	84.676	0,47	17.379	1.941	15.437
Marche	2.704	0,01	555	0	555
Molise	742	0,00	152	0	152
Piemonte	14.952	0,08	3.069	1.500	1.569
Puglia	3.534	0,02	725	0	725
Trentino Alto Adige	1.793	0,01	368	0	368
Valle d'Aosta	65	0,00	13	0	13
Veneto	18.532	0,10	3.803	1.567	2.236

Table 3.3.2-II - Chemical industry: 2020 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Emilia Romagna	CICLOCOMB	0,687025094	26,18117049	0
Emilia Romagna	VAPORE	0,312974906	7,439790849	0
Liguria	TURBOGAS	1	31,52626209	5
Lombardia	TURBOGAS	0,044197414	37,24164321	6
Lombardia	VAPORE	0,955802586	633,5753853	21
Piemonte	CICLOCOMB	1	107,9969491	1
Veneto	VAPORE	1	96,02723441	3

Table 3.3.2-III - Chemical industry: 2020 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Abruzzo	TURBOGAS	36,60993798	6
Basilicata	TURBOGAS	9,454953382	1
Calabria	TURBOGAS	10,30634729	2
Campania	TURBOGAS	62,94713632	10
Friuli Venezia Giulia	TURBOGAS	24,70162584	4
Lazio	TURBOGAS	233,3715508	37
Marche	TURBOGAS	30,29169899	5
Molise	TURBOGAS	8,31229314	1
Puglia	TURBOGAS	39,58981665	6
Trentino Alto Adige	TURBOGAS	20,08617466	3
Valle d'Aosta	TURBOGAS	0,728165841	0

3.4 OIL REFINING

3.4.1 National analysis

3.4.1.1 Updating existing capacity

During 2020 Italian refineries will employ, in high-efficiency cogeneration, at least 240 MW of steam turbines aged 45 years or more and about 170 MW of combined cycles aged 25 years or more.

3.5 HEALTH CARE

3.5.1 National analysis

3.5.1.1 Updating existing capacity

During 2020, Italian health care will employ , in high-efficiency cogeneration, about 7 MW of internal combustion engines aged 15 years or more.

3.5.2 Analysis by department

Table 3.5.2-I –Health care: national potential for high-efficiency cogeneration in 2020.

	A	B	C	D
Regione	Posti letto (n.)	Energia termica totale (GWh)	Energia termica CAR (GWh)	Potenziale sviluppo CAR (GWh)
ABRUZZO	6.456	150,4	6,4	144,1
BASILICATA	2.202	51,3	0,0	51,3
CALABRIA	9.448	220,1	0,0	220,1
CAMPANIA	23.922	557,4	51,8	505,6
EMILIA ROMAGNA	20.903	487,0	5,1	482,0
FRIULI VENEZIA GIULIA	4.963	115,6	0,7	114,9
LAZIO	30.821	718,1	39,3	678,8
LIGURIA	6.621	154,3	0,0	154,3
LOMBARDIA	46.908	1093,0	1,9	1091,0
MARCHE	6.945	161,8	0,0	161,8
MOLISE	1.928	44,9	0,0	44,9
PIEMONTE	19.138	445,9	2,7	443,2
PUGLIA	18.676	435,2	0,0	435,2
SARDEGNA	9.175	213,8	0,0	213,8
SICILIA	20.475	477,1	0,0	477,1
TOSCANA	14.793	344,7	4,2	340,4
TRENTINO ALTO ADIGE	5.614	130,8	0,0	130,8
UMBRIA	2.995	69,8	0,0	69,8
VALLE D'AOSTA	509	11,9	0,0	11,9
VENETO	22.392	521,7	18,5	503,2

Table 3.5.2-II - Health care: 2020 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2005). Assessment was based on following average powers: Internal combustion engines: 2,4 MW. Gas turbines: 7,3 MW.

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Abruzzo	MCI	1	45,9	19
Campania	TURBOGAS	1	73,4	10
Emilia Romagna	MCI	1	153,5	62
Friuli Venezia Giulia	MCI	1	36,6	15
Lazio	TURBOGAS	1	98,6	14
Lombardia	MCI	1	347,5	141
Piemonte	MCI	1	141,2	57
Toscana	MCI	1	108,4	44
Veneto	MCI	1	160,3	65

Table 3.5.2-III - Health care: 2020 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2005). Assessment was based on following average powers: Internal combustion engines: 2,4 MW. Gas turbines: 7,3 MW.

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
BASILICATA	TURBOGAS	7,45	1
CALABRIA	TURBOGAS	31,97	4
LIGURIA	TURBOGAS	22,41	3
MARCHE	TURBOGAS	23,50	3
MOLISE	TURBOGAS	6,52	1
PUGLIA	TURBOGAS	63,20	9
SARDEGNA	TURBOGAS	31,05	4
SICILIA	TURBOGAS	69,29	9
TRENTINO ALTO ADIGE	TURBOGAS	19,00	3
UMBRIA	TURBOGAS	10,14	1
VALLE D'AOSTA	TURBOGAS	1,72	0

3.6 GREENHOUSE AGRICULTURE

3.6.1 National analysis

3.6.2 Analysis by department

Table 3.6.2-I – Greenhouse agriculture: national potential for high-efficiency cogeneration in 2020.

	A	B	C
Regione	Superficie (are)	Superficie (%)	Combust. Totale; potenziale sviluppo CAR(GWh)
ABRUZZO	9.966	0,0025	6
BASILICATA	94.950	0,0239	53
CALABRIA	58.982	0,0148	33
CAMPANIA	977.338	0,2460	542
EMILIA ROMAGNA	129.588	0,0326	72
FRIULI VENEZIA GIULIA	12.897	0,0032	7
LAZIO	621.300	0,1564	345
LIGURIA	90.672	0,0228	50
LOMBARDIA	204.846	0,0516	114
MARCHE	8.329	0,0021	5
PIEMONTE	80.119	0,0202	44
PUGLIA	118.740	0,0299	66
SARDEGNA	90.758	0,0228	50
SICILIA	954.487	0,2402	529
TOSCANA	74.720	0,0188	41
TRENTINO ALTO ADIGE	602	0,0002	0
UMBRIA	4.230	0,0011	2
ValledAosta	901	0,00	0
VENETO	439.957	0,11	244

Table 3.6.2-II - Greenhouse agriculture: 2020 potential for high-efficiency cogeneration in individual departments. Assessment was based on following average powers: combined cycle:118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
ABRUZZO	MCI	0,55332062	0
BASILICATA	MCI	5,271703075	2
CALABRIA	MCI	3,274729761	1
CAMPANIA	MCI	54,2626197	20
EMILIA ROMAGNA	MCI	7,194833682	3
FRIULI VENEZIA GIULIA	MCI	0,716052181	0
LAZIO	MCI	34,49509342	13
LIGURIA	MCI	5,034184952	2
LOMBARDIA	MCI	11,37322052	4
MARCHE	MCI	0,462433016	0
PIEMONTE	MCI	4,448273604	2
PUGLIA	MCI	6,592543688	2
SARDEGNA	MCI	5,038959744	2
SICILIA	MCI	52,99391314	20
TOSCANA	MCI	4,148516627	2
TRENTINO ALTO ADIGE	MCI	0,033423541	0
UMBRIA	MCI	0,234853123	0
ValledAosta	MCI	0,05002427	0
VENETO	MCI	24,42677904	9

3.7 SETTORE DEL RISCALDAMENTO URBANO

3.7.1 National analysis

3.7.1.1 Updating existing capacity

During 2020, Italian district heating companies will employ, in high-efficiency cogeneration, about 150 MW of internal combustion engines aged 10 years or more, at least 60 MW of gas turbines aged 15 years or more and about 80 MW of combined cycles aged 25 years or more.

3.7.2 Analysis by department

Table 3.7.2-I – District heating: national potential for high-efficiency cogeneration in 2020.

	A	B	C	D
Regione	Combustibile totale (%)	Combustibile totale (GWh)	Combust. CAR (GWh)	Potenziale sviluppo CAR (GWh)
EMILIA ROMAGNA	0,15	3.075	1.499	804
LAZIO	0,01	271	0	138
LIGURIA	0,02	424	319	54
LOMBARDIA	0,34	7.082	3.805	1.671
MARCHE	0,00	68	0	35
PIEMONTE	0,37	7.725	2.414	2.708
TOSCANA	0,00	0	6	0
TRENTINO ALTO ADIGE	0,04	837	63	395
VENETO	0,06	1.145	736	209

Table 3.7.2-II – District heating: 2020 potential for high-efficiency cogeneration in departments where cogeneration was performed in reference year (2005). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Coefficiente	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
Emilia Romagna	CICLOCOMB	0,68	38,96	0
Emilia Romagna	MCI	0,03	2,66	1
Emilia Romagna	TURBOGAS	0,15	7,47	1
Emilia Romagna	VAPORE	0,14	5,29	0
Liguria	CICLOCOMB	1,00	3,85	0
Liguria	MCI	0,00	0,01	0
Lombardia	CICLOCOMB	0,24	29,35	0
Lombardia	MCI	0,11	18,74	8
Lombardia	TURBOGAS	0,17	17,19	2
Lombardia	VAPORE	0,47	37,88	1
Piemonte	CICLOCOMB	0,73	142,25	1
Piemonte	MCI	0,17	45,56	18
Piemonte	MISTO	0,10	26,22	1
Piemonte	TURBOGAS	0,00	0,03	0
Toscana	MCI	1,00	0,00	0
Trentino Alto Adige	MCI	1,00	39,51	16
Veneto	CICLOCOMB	0,60	9,04	0
Veneto	MCI	0,40	8,32	3

Table 3.7.2-III – District heating: 2020 potential for high-efficiency cogeneration in departments where cogeneration was not performed in reference year (2004). Assessment was based on following average powers: combined cycle: 118,7 MW. Internal combustion engines: 2,7 MW. Gas turbines: 6,3 MW. Steam turbines: 29,7 MW

Regione	Tecnologia	Potenziale sviluppo CAR (MW totali)	Potenziale sviluppo CAR (n. unità)
LAZIO	MCI	13,83	6
MARCHE	MCI	3,49	1