



INTERNATIONAL ENERGY AGENCY

Energy Policies of IEA Countries



ITALY

2003 Review

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The International Energy Agency (IEA) is an autonomous body which was established in November 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an international energy programme.

It carries out a comprehensive programme of energy co-operation among twenty-six* of the OECD's thirty member countries. The basic aims of the IEA are:

- to maintain and improve systems for coping with oil supply disruptions;
- to promote rational energy policies in a global context through co-operative relations with non-member countries, industry and international organisations;
- to operate a permanent information system on the international oil market;
- to improve the world's energy supply and demand structure by developing alternative energy sources and increasing the efficiency of energy use;
- to assist in the integration of environmental and energy policies.

* *IEA member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, the Republic of Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States. The European Commission also takes part in the work of the IEA.*

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Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

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Figure 1
Map of Italy



SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Italy's energy policy is currently driven by market liberalisation, transfer of relevant political and administrative decision-making powers to the regional authorities, diversification of supply sources, energy security, efficiency improvements and environmental protection.

Since the last IEA in-depth review (1999), Italy has made significant progress in implementing electricity and gas market reforms and in restructuring its energy industry. The European Commission directives for electricity and gas market liberalisation have been transposed into legislation. Large state-owned energy companies began to be privatised and the government reduced its shares in both ENEL (electricity) and Eni (oil and gas). New institutions, including an energy sector regulator, are now fully operational, which will ensure a much more market-oriented energy economy, in line with the IEA Shared Goals (see Annex B). Italy ratified the Kyoto Protocol in June 2002 and on 19 December 2002 released the first national action plan for the reduction of greenhouse gas (GHG) emissions, the Revised Guidelines for National Policies and Measures Regarding the Reduction of Greenhouse Gas Emissions.

In Italy, as in other IEA member countries, the simultaneous achievement of energy security, market liberalisation and climate change mitigation is not easy given the sometimes contradictory nature of these objectives. Diversification of energy sources is particularly challenging in this respect. Italy's energy mix is shifting from oil to more use of gas, with little probability of rapidly diversifying much further owing to the limited growth of renewable energy, local resistance to coal and the fact that the nuclear option was abandoned in 1987. Significant reliance on oil and gas, including from external supply sources, raises concerns about security of supply and the risk of high energy costs.

Timely investment in energy production, transportation and interconnection is essential to secure energy supply and more active competition. Italy's high level of local resistance to new infrastructure is becoming increasingly serious in the context of the transfer of power to local authorities. Uncertainties regarding responsibilities for clearing new energy projects and complexity in the authorisation procedures are consequences of the legal changes initiated to enable decentralisation. From April 2002, the government introduced a fast track procedure for new electricity generating plants (Sblocca Centrali), thereby streamlining the decision-making process.

Despite Italy's target to reduce GHG emissions by 6.5% between 1990 and 2008-12, energy-related CO₂ emissions have been constantly growing and in

2000 were already 6.5% above the 1990 level. Italy's carbon intensity measured as CO₂ emissions per unit of gross domestic product (GDP) is relatively low, owing to high energy prices, a low energy-intensive industry structure and a mild climate. Lower energy prices potentially resulting from market liberalisation and growing energy demand in the transport sector could erode this advance. Italy faces the challenge to define coal's role in the electricity sector, striking a balance between climate change mitigation, energy security and the urgent need to reduce power generation costs. The domestic measures considered in the scenarios of the Inter-Ministerial Committee for Economic Planning (CIPE) deliberation of 19 December 2002, together with the full utilisation of sinks and the Kyoto flexible mechanisms will allow Italy to achieve its GHG emissions reduction target, provided the corresponding projects and funding are clarified and implemented without delay.

Italy's energy intensity measured as total primary energy supply (TPES) per unit of GDP remains low. This is commendable, but it is imperative to identify to what extent it has been achieved as a result of effective energy efficiency policy efforts or because of structural changes induced by the economic environment and high electricity prices in Italy, and to ensure that all possible measures are implemented to maintain Italy's advance. In 2001, in addition to the existing efficiency standards, the government introduced and defined for each year up to 2006 tradable energy saving obligations to be applied to both electricity and natural gas distributors. Details still need to be finalised before this new scheme becomes fully operational.

Italy is moving away from using fixed feed-in tariffs for renewable energy to a more market-oriented minimum quota obligation scheme with tradable green certificates. This should increase the amount of renewable energy in a country where, despite its significant potential, renewable energy represented only 5.4% of TPES in 2000. While this is a positive step in promoting renewable energy in a compatible manner with market liberalisation, several challenges and uncertainties need to be addressed to secure its effectiveness. The government's intention to monitor this new mechanism is wise.

Italy is highly dependent on external sources for its oil supply. It does have the potential to increase its domestic oil production; however, demand far exceeds potential supply. The complex administrative procedure required to conduct exploration and production investments has led to delays and additional costs for the expansion of domestic production. Italy has an important role as a refining centre, the first in Europe, selling a large part of its products to other countries in Europe. The oil market is free and the government is to be commended for its continued efforts to stimulate competition in the markets. After several years' non-compliance with the International Energy Program (IEP) obligation to hold sufficient strategic oil stocks, the government is correcting the situation. Italy has been satisfying the obligation of 90-day net imports equivalent in stocks during the first half of 2003. It now has to ensure a continuous compliance.

The Italian gas market has developed rapidly, mainly because of the increased use of gas in power generation. Given that this additional gas must be imported, diversification of gas supplies has been an important policy objective. Italy's potential as a growing gas market is huge. The reform of the gas market is moving in the right direction. The 2000 Italian decree implementing the European Commission (EC) directive on the single market for natural gas goes far beyond the minimum requirements established by the EC gas directive. The Energy Authority (Autorità per l'Energia Elettrica e il Gas, AEEG) has compiled rules for market opening and established tariffs for transportation, regasification, storage and distribution. The Energy Authority promotes the development of gas trading hubs. This development would provide Italy with the opportunity to improve security of supply and the option to become a key trading centre for the Mediterranean region. From a legal viewpoint, the Italian market is now fully opened; however, Eni remains in a dominant position and barriers still exist for new entrants. Access to external supply is difficult for small companies unlike large or international companies. Saturation of the existing import pipelines creates an additional entry barrier. Only competitors with capacities to establish their own import facilities, such as liquefied natural gas (LNG) terminals, will be able to compete on an equal basis with Eni. The government needs to encourage investment in LNG terminals and cross-border gas pipelines delivering gas to Italy to secure success of gas market liberalisation and security of supply. Given the potential for domestic gas extraction and the current decline in domestic production, the national strategy for gas exploration and production needs to be intensified. However, local authorities strongly oppose the realisation of this objective.

Since the 1999 in-depth review, Italy has continued to liberalise the electricity market. ENEL was partially privatised and part of its generating capacity was divested to reduce its share in electricity supply to less than 50%, which enabled new participants to enter the market. In May 2003, the retail electricity market was liberalised up to 50%, with full liberalisation planned for 2007. Production and importation activities were fully liberalised from the beginning of the reform process in 1999. Transmission networks were legally unbundled and a transmission system operator (TSO) was established. A market operator was created to facilitate the development of the wholesale electricity market. These arrangements have led to Italy being considered one of the European Union countries with the most rigorous conditions for network unbundling. Despite recent progress, current developments in the generating capacity may hinder the achievement of public objectives, such as electricity mix diversification, unit production cost reduction and sufficient electricity supply. This could occur either because the investment plans do not materialise, making it difficult to secure sufficient supply at a lower unit cost, or because they increase the dependency of an even larger portion of the generating capacity on natural gas. While the market is developing with new participants, there are still challenges to avoid abuse of dominant position by the incumbent.

It is commendable that in 2000 the government, largely in line with the conclusions of the 1998 National Conference on Environment and Energy, shaped a new energy R&D policy under the National Research Programme (PNR). This resulted in new research priorities and focus on the public R&D budget and prepared the way for a reform of the National Agency for New Technology, Energy and Environment (ENEA).

RECOMMENDATIONS

The government of Italy should:

General Energy Policy

- ▶ *Strengthen the national energy strategy on the basis of energy supply and demand scenarios, integrating in a balanced and consistent way the main policy objectives, namely security of supply, reform of the gas and electricity markets and climate change mitigation.*
- ▶ *Enhance the visibility of the national energy strategy and the dissemination of energy information on the national energy situation and future challenges to the general public.*
- ▶ *Co-ordinate with the Ministry of Productive Activities the actions of relevant ministries in the implementation of energy policy.*
- ▶ *Put more emphasis on achieving energy diversification, especially in the electricity sector in order to improve security of supply and reduce electricity generation cost.*
- ▶ *Clarify the respective roles and competences of the regional authorities and the government in implementing energy policy. Encourage the regional authorities to develop regional energy plans consistent with the national energy strategy.*
- ▶ *Keep the necessary tools to guarantee that investments needed in energy production, transportation and particularly interconnections with European and world markets are achieved in a timely manner and are not subjected to excessive bureaucratic procedural delays.*
- ▶ *Continue the liberalisation process of the electricity and gas markets. Ensure that newcomers compete on a fair and equal basis with the gas and electricity incumbents. Evaluate the progress of the liberalisation process through benchmarking.*
- ▶ *Confirm the independence of the Energy Authority.*

- ▶ *Increase transparency of information on the energy market by circulating non-confidential market information to all energy stakeholders.*

Energy and the Environment

- ▶ *Implement the national action plan to reduce GHG emissions with least cost measures in order to fill the remaining gap to achieve the Kyoto target. Monitor the progress in reaching this target. Strengthen co-ordinated efforts for CO₂ emissions mitigation.*
- ▶ *Reassess the contribution of voluntary agreements (VAs) to emissions reduction, taking into account the forthcoming EU emissions trading system.*
- ▶ *Monitor and analyse the effects on emissions of the planned increase in coal use for electricity generation, the changes in carbon tax design/structure and the projected end-use energy price changes.*
- ▶ *Strengthen the strategy to disseminate energy efficiency technologies and measures to small and medium-sized enterprises.*

Energy Efficiency

- ▶ *Monitor and evaluate the impact and cost-effectiveness of existing and new energy efficiency policies with a view to maintaining low energy intensity in the changing energy market environment.*
- ▶ *Promote effective co-ordination between the regional authorities and the government in all areas of energy efficiency. Facilitate sharing of best practices among the regional authorities and the government through information dissemination by ENEA.*
- ▶ *Integrate energy efficiency objectives in pursuing the transport policy, in areas such as modal shift and transport infrastructure development, through enhanced co-ordination among relevant ministries (energy, environment, finance and transport).*
- ▶ *Accelerate the elimination of old vehicles and promote more efficient low-emission vehicles, in particular trucks, buses and two-wheelers through regulatory (e.g. periodic inspection) and economic measures (e.g. tax incentives, review of tax exemptions on fuel for commercial transport).*
- ▶ *Decrease the share of individual road transport in urban areas through efforts to boost the quantity and quality of collective transport.*
- ▶ *Finalise details of, and implement, the energy efficiency certificate scheme as soon as possible, implement it and review it periodically. Publish information on the results and impacts of the scheme as early as possible to keep energy policy stakeholders, both inside and outside Italy, informed about the unfolding of this policy experiment.*

- ▶ *Actively participate in co-operation at EU level in setting efficiency performance requirements for energy labelling and energy performance standards for appliances, equipment and buildings.*

Renewable Energy

- ▶ *Increase the share of renewable energy in domestic production to improve energy security and CO₂ mitigation. Increase the renewable energy obligation above the current level.*
- ▶ *Facilitate access to the capital market for renewable energy projects and green certificates that will eventually increase the profitability of renewable energy projects.*
- ▶ *Streamline authorisation procedures for setting up renewable energy projects.*
- ▶ *Ensure an effective and balanced contribution from all the regional authorities to achieve the national renewable energy target, particularly with regard to informing the general public about the possible use of renewables and access to stimulation programmes.*
- ▶ *Ensure that ENEA provides sufficient information and expertise to the regional authorities and the general public about funding possibilities and support mechanisms.*

Oil

- ▶ *Given the potential for extraction of domestic oil resources and the current decline in domestic production, enhance and improve the national strategy for oil exploration and production.*
- ▶ *Given the ongoing process of devolution of power and the security of supply constraints, ensure that the granting of upstream licences for exploration and production does not meet unnecessary obstacles.*
- ▶ *Continue to engage in international co-operation with producing and transiting countries through different global and regional forums to reinforce security of supply.*
- ▶ *Considering the importance of the IEA emergency preparedness mechanism, ensure that the recent improvements to meet the 90-day IEA stock obligation are sufficient to guarantee permanent compliance.*

Natural Gas

- ▶ *Continue the unbundling of the transportation and supply businesses to ensure equality of treatment.*

- ▶ *Proceed with gas market liberalisation by defining rapidly clear rules, especially for access to storage (Storage Code), LNG terminals (LNG Code) and distribution (Distribution Code).*
- ▶ *Encourage the development of the virtual gas hub (National Balancing Point) to facilitate the exchange of gas between shippers and to foster competition.*
- ▶ *Enforce a strict regulatory control to prevent abuse of a dominant market position. Preserve the independence of the Energy Authority and streamline the decision process inside the Energy Authority to ensure that it produces the missing codes in the shortest possible time.*
- ▶ *Continue to encourage geographical diversification of gas supply.*
- ▶ *In the new framework of market liberalisation, update and develop a policy of gas supply security, defining minimum criteria and the responsibilities of individual players.*
- ▶ *Given the potential for extraction of domestic gas resources and the current decline in domestic production, enhance and improve the national strategy for gas exploration and production.*
- ▶ *As a prerequisite for the success of gas market liberalisation and security of supply, encourage investments in LNG terminals and cross-border gas pipelines delivering gas to Italy. Streamline authorisation procedures for LNG terminals and pipelines. Encourage investments in storage by providing the appropriate tariff incentives.*
- ▶ *Assess the costs and benefits of the strategic storage reserve obligation for shippers importing gas from non-EU countries and consider if the portfolio of flexible tools could be expanded to allow the same level of security of supply at a lower cost.*

Electricity

- ▶ *Consider the possibility of reopening a public debate on the nuclear energy option in light of current and future energy policy challenges.*
- ▶ *Monitor and publish regularly information on the electricity sector reserve margin and consider additional investment incentives to avoid blackouts in the coming years. Expand the role of the transmission system operator (GRTN) and of the Energy Authority to support the government in this respect.*
- ▶ *Analyse options to provide incentives in the transmission and distribution tariff to ensure investment in new transmission capacity.*
- ▶ *Further streamline authorisation procedures for building electricity infrastructure.*
- ▶ *Expand interconnection for electricity imports.*

- ▶ *Encourage dissemination of information to local authorities and communities on electricity projects.*
- ▶ *Continue the electricity market liberalisation process, enforcing strict regulatory control to prevent abuse of dominant market position and maintaining the independence of the Energy Authority.*
- ▶ *Enable the power exchange to begin its operations as rapidly as possible, facilitate measures that aim to increase its liquidity and create a surveillance structure to avoid abuse of market power.*
- ▶ *Ensure independence of the power exchange (GME) and the single buyer (AU) from the transmission system operator (GRTN) and monitor the latter's market power once it has been privatised and GME and AU are fully operational.*
- ▶ *Organise the sale of ENEL's transmission assets to GRTN.*
- ▶ *Increase international co-operation in the decommissioning of nuclear power plants.*

Research, Development and Demonstration

- ▶ *Continue to provide sustainable budgetary support to energy research and development (R&D).*
- ▶ *Consider making clear priorities in public R&D. Provide special attention to clean coal technology and the improved efficiency of coal combustion.*
- ▶ *Improve the co-ordination of research and development projects and the dissemination of its results to the regional authorities.*
- ▶ *Urge ENEA to join the IEA Implementing Agreement on solar concentration.*

RIASSUNTO DELLE CONCLUSIONI E DELLE RACCOMANDAZIONI

La politica energetica dell'Italia è attualmente guidata dalla liberalizzazione del mercato, dal trasferimento di specifici poteri decisionali politici e amministrativi alle autorità regionali, dalla diversificazione delle fonti di approvvigionamento, dalla sicurezza energetica, da miglioramenti dell'efficienza e dalla tutela dell'ambiente.

Rispetto all'esame 1999 dell'AIE, l'Italia ha conseguito notevoli progressi nell'attuazione delle riforme dei mercati dell'elettricità e del gas e nella ristrutturazione della sua industria dell'energia. Le direttive dell'Unione Europea per la liberalizzazione dei mercati dell'elettricità e del gas sono state recepite dalla legislazione. È iniziata la privatizzazione delle grandi imprese di proprietà dello Stato e il governo ha ridotto le sue partecipazioni in ENEL ed Eni. Nuove istituzioni, fra cui una autorità per il settore energetico, sono ora pienamente operative e assicureranno una politica economica dell'energia molto più orientata al mercato, conformemente agli *Shared Goals* dell'AIE. L'Italia ha ratificato il Protocollo di Kyoto nel giugno 2002 e il 19 dicembre 2002 ha pubblicato il primo Piano nazionale di riduzione dei gas serra, la Revisione delle Linee Guida per le Politiche Nazionali di Riduzione delle Emissioni dei Gas Serra.

In Italia, così come in altri paesi membri dell'AIE, non è facile garantire simultaneamente la sicurezza degli approvvigionamenti, la liberalizzazione del mercato e l'attenuazione dei cambiamenti climatici; tali obiettivi non sono sempre compatibili fra di loro. La diversificazione delle fonti d'energia è una sfida particolarmente difficile da affrontare. A tale riguardo, il *mix* energetico dell'Italia si sta spostando dal petrolio verso un maggior uso del gas ed ha poche probabilità di diversificarsi ulteriormente in tempi rapidi a causa della limitata crescita delle energie rinnovabili, delle resistenze locali al carbone e del fatto che l'opzione nucleare sia stata scartata nel 1987. Una significativa dipendenza nei confronti del petrolio e del gas, che comporta un notevole ricorso a fonti di approvvigionamento esterne, è causa di preoccupazione per la sicurezza degli approvvigionamenti ed il rischio di costi energetici elevati.

Investimenti tempestivi nei settori della produzione, trasporto e distribuzione d'energia sono essenziali per garantire la sicurezza dei rifornimenti energetici e una concorrenza più attiva. In Italia, l'elevato livello di resistenza locale alle nuove infrastrutture diventa sempre più preoccupante nel contesto del trasferimento delle competenze alle autorità locali. Le incertezze concernenti le responsabilità nell'approvazione dei nuovi progetti in campo energetico e la complessità delle procedure d'autorizzazione sono conseguenza dei cambiamenti giuridici introdotti per attuare il decentramento delle competenze. Dall'aprile 2002, il governo ha

introdotto una procedura rapida per l'approvazione dei nuovi impianti di produzione d'energia elettrica (Sblocca Centrali), semplificando così il processo decisionale.

Malgrado l'obiettivo dell'Italia di ridurre le emissioni di gas a effetto serra del 6,5% fra il 1990 e il 2008-2012, le emissioni di CO₂ del settore dell'energia sono aumentate costantemente e nel 2000 superavano già del 6,5% il livello del 1990. L'intensità di biossido di carbonio dell'Italia, misurata come emissioni di CO₂ per unità di PIL, è relativamente bassa a causa dei prezzi elevati dell'energia, di una struttura industriale a bassa intensità di energia e di un clima temperato. Tale vantaggio potrebbe essere compromesso da una diminuzione dei prezzi dell'energia che potrebbe risultare dalla liberalizzazione del mercato e da un aumento della domanda di energia nel settore dei trasporti. L'Italia stenta a definire un ruolo per il carbone nel settore elettrico che concili allo stesso tempo la mitigazione dei cambiamenti climatici con la sicurezza energetica e l'urgente necessità di ridurre i costi della produzione d'energia elettrica. Le misure nazionali considerate negli scenari della delibera del Comitato interministeriale per la programmazione economica (CIPE) del 19 dicembre 2002, associate al pieno uso dei *sinks* e dei meccanismi flessibili del Protocollo di Kyoto, consentiranno all'Italia di raggiungere il suo obiettivo di riduzione delle emissioni di gas a effetto serra, a condizione che i relativi progetti e finanziamenti siano definiti e realizzati senza ritardo.

L'intensità energetica dell'Italia, misurata come la domanda di energia primaria per unità di PIL, rimane bassa. Ciò è lodevole, ma è essenziale capire in che misura tale risultato sia stato ottenuto mediante sforzi effettivi per migliorare l'efficienza energetica, o a seguito di cambiamenti strutturali indotti dal contesto economico e dagli alti prezzi dell'elettricità in Italia. È anche importante assicurarsi che tutte le misure possibili siano attuate per mantenere il vantaggio dell'Italia in questo campo. Nel 2001, oltre gli standard d'efficienza esistenti, il governo ha introdotto e definito per ogni anno fino al 2006 degli obblighi negoziabili di risparmio energetico che saranno applicati ai distributori di elettricità e di gas naturale. Per consentire a questo piano di diventare pienamente operativo, occorre prima perfezionare alcuni dettagli.

L'Italia sta progressivamente abbandonando l'uso di prezzi fissi garantiti ai produttori di elettricità da fonti rinnovabili per passare a un sistema più orientato al mercato, con quote minime obbligatorie di energie rinnovabili associate a certificati verdi negoziabili. Ciò dovrebbe aumentare la quota di energie rinnovabili in un paese dove, malgrado un notevole potenziale, le fonti rinnovabili rappresentavano solo il 5,4% dell'energia primaria nel 2000. Benché questo rappresenti un passo in avanti per promuovere le energie rinnovabili, compatibilmente con la liberalizzazione del mercato, numerose sfide e incertezze devono essere affrontate per garantirne l'efficacia. L'intenzione del governo di controllare questo nuovo meccanismo è apprezzabile.

L'Italia dipende fortemente dalle importazioni di petrolio. Esiste in Italia il potenziale per aumentare la produzione interna di petrolio; tuttavia, la domanda supera notevolmente l'offerta potenziale. La complessa procedura amministrativa richiesta per realizzare gli investimenti di esplorazione e di produzione ha causato ritardi e costi supplementari per l'espansione della produzione nazionale. L'Italia svolge un considerevole ruolo di centro di raffinazione, il primo in Europa, vendendo buona parte dei suoi prodotti ad altri paesi europei. Il mercato del petrolio è libero e il governo va elogiato per i continui sforzi di stimolo della concorrenza sui mercati. Dopo numerosi anni di inadempienza dell'obbligo definito dal Programma Internazionale dell'Energia (PIE) di detenere sufficienti scorte strategiche di petrolio, il governo sta correggendo la situazione. Nella prima metà del 2003, l'Italia ha soddisfatto l'obbligo di detenere scorte equivalenti a 90 giorni d'importazioni nette; deve ora garantirne il mantenimento.

Il mercato italiano del gas si è sviluppato rapidamente, principalmente a causa di un uso crescente del gas nella produzione d'energia elettrica. Considerando che questo consumo addizionale di gas deve essere soddisfatto con importazioni, la diversificazione dei rifornimenti di gas è stata un importante obiettivo della politica energetica. Il potenziale di espansione del mercato del gas in Italia è vasto. La riforma del mercato del gas procede nella direzione giusta. Il decreto del 2000 per l'attuazione della direttiva della Commissione Europea (CE) sul mercato unico del gas naturale, va ben oltre i requisiti minimi stabiliti dalla direttiva sul gas della CE. L'Autorità per l'Energia Elettrica e il Gas (AEEG) ha elaborato le regole per l'apertura del mercato e ha stabilito tariffe per il trasporto, la rigassificazione, lo stoccaggio e la distribuzione. L'AEEG promuove lo sviluppo di terminali di scambio per il gas. Tale sviluppo offrirà all'Italia l'opportunità di migliorare la sicurezza degli approvvigionamenti e la possibilità di diventare un centro strategico di scambi nell'area del Mediterraneo. Da un punto di vista giuridico, il mercato italiano è ora completamente aperto; tuttavia l'Eni rimane in posizione dominante ed esistono ancora barriere per i nuovi entranti. L'accesso al rifornimento dall'estero è difficile per le piccole società, a differenza di quanto avviene per le grandi società o quelle internazionali. La saturazione dei gasdotti d'importazione esistenti crea un'altra barriera all'entrata. Solo i concorrenti capaci di creare le proprie infrastrutture d'importazione, quali terminali per il gas naturale liquefatto (GNL), potranno competere alla pari con l'Eni. Il governo dovrebbe incoraggiare gli investimenti nei terminali GNL e nei gasdotti internazionali che trasportano il gas verso l'Italia per garantire il successo della liberalizzazione del mercato del gas e la sicurezza degli approvvigionamenti. Considerato il potenziale per l'estrazione di gas nazionale e l'attuale calo della produzione interna, la strategia nazionale per l'esplorazione e la produzione di gas dovrebbe essere intensificata. Tuttavia, le autorità locali si oppongono con forza all'attuazione di tale obiettivo.

Dall'esame della politica energetica italiana condotto nel 1999, l'Italia ha continuato a liberalizzare il mercato dell'elettricità. L'ENEL è stato parzialmente privatizzato e

parte della sua capacità di produzione è stata ceduta per ridurre la sua quota dell'offerta d'elettricità a meno del 50%, consentendo così ai nuovi entranti di competere sul mercato. Nel maggio del 2003, il mercato al dettaglio dell'elettricità finale è stato liberalizzato fino al 50%, mentre la completa liberalizzazione è prevista per il 2007. Le attività di produzione e d'importazione sono state completamente liberalizzate sin dall'inizio del processo di riforma nel 1999. Le reti di trasmissione sono state scorporate giuridicamente ed è stato istituito un Gestore del sistema di trasmissione (GRTN). È stato creato un operatore del mercato per facilitare lo sviluppo del mercato dell'elettricità all'ingrosso. Tale legislazione ha fatto sì che l'Italia sia considerata come uno dei paesi dell'UE con le condizioni più rigorose per l'*unbundling* delle reti d'interconnessione. Gli attuali sviluppi nella capacità di produzione elettrica, malgrado recenti progressi, potrebbero ostacolare l'attuazione degli obiettivi pubblici, quali la diversificazione del *mix* di generazione, la riduzione del costo unitario di produzione e un sufficiente approvvigionamento d'elettricità. Ciò potrebbe verificarsi, sia perché i piani d'investimento non si materializzano, rendendo difficile la garanzia di un sufficiente approvvigionamento a un costo unitario più basso, sia perché fanno dipendere dal gas naturale una fetta ancora più estesa della capacità di generazione. Mentre il mercato si sviluppa con nuovi entranti, c'è ancora molto da fare per evitare l'abuso di posizione dominante da parte dell'operatore storico.

Nel 2000 il governo, ampiamente in linea con le conclusioni della Conferenza Nazionale sull'Ambiente e sull'Energia del 1998, ha elaborato una nuova ed encomiabile politica pubblica per la Ricerca e Sviluppo (R&S) nel campo dell'energia con il Programma Nazionale di Ricerca (PNR). Tale programma ha formulato nuove priorità di ricerca, focalizzandosi in particolare sul bilancio della R&S pubblica e ha preparato il terreno per una riforma dell'Ente Nazionale per le Nuove Tecnologie, l'Energia e l'Ambiente (ENEA).

RACCOMANDAZIONI

Il governo italiano dovrebbe:

Politica energetica generale

- ▀ *Rafforzare la strategia energetica nazionale sulla base di scenari di offerta e di domanda energetica, integrando in modo equilibrato e coerente i principali obiettivi programmatici; in particolare: la sicurezza degli approvvigionamenti, la riforma dei mercati del gas e dell'elettricità e la mitigazione dei cambiamenti climatici.*
- ▀ *Aumentare la visibilità della strategia energetica nazionale e la diffusione d'informazioni al pubblico in generale sulla situazione energetica nazionale e le sfide future.*

- ▶ *Coordinare l'azione del Ministero delle Attività Produttive con quelle degli altri ministeri competenti per l'attuazione delle politiche energetiche.*
- ▶ *Insistere sulla realizzazione della diversificazione energetica, in particolare nel settore dell'elettricità per migliorare la sicurezza degli approvvigionamenti e diminuire i costi di produzione dell'elettricità.*
- ▶ *Chiarire i rispettivi ruoli e le competenze delle autorità regionali e del governo nell'attuazione delle politiche energetiche. Incoraggiare le autorità regionali a sviluppare piani energetici regionali coerenti con la strategia energetica nazionale.*
- ▶ *Prendere i necessari provvedimenti per garantire che gli investimenti occorrenti alla produzione di energia, al trasporto ed in particolare alle interconnessioni con i mercati europei e mondiali siano realizzati rapidamente e non siano sottoposti ad eccessivi ritardi di carattere burocratico.*
- ▶ *Continuare il processo di liberalizzazione dei mercati dell'elettricità e del gas. Assicurare che i nuovi entranti sul mercato competano su una base giusta ed equa con gli operatori storici. Valutare i progressi del processo di liberalizzazione mediante un'analisi comparativa.*
- ▶ *Confermare l'indipendenza dell'Autorità per l'Energia Elettrica e il Gas.*
- ▶ *Migliorare la trasparenza dell'informazione sul mercato energetico, diffondendo a tutte le parti interessate informazioni non confidenziali sul mercato.*

Energia e ambiente

- ▶ *Attuare il piano nazionale d'intervento destinato a ridurre le emissioni di gas a effetto serra con misure di minor costo per colmare il divario rispetto all'obiettivo del Protocollo di Kyoto. Controllare i progressi verso tale obiettivo. Rafforzare gli sforzi coordinati per mitigare le emissioni di CO₂.*
- ▶ *Riesaminare il contributo degli Accordi Volontari (AV) alla riduzione delle emissioni, prendendo in considerazione il futuro sistema UE di scambio delle emissioni.*
- ▶ *Verificare e analizzare gli effetti sulle emissioni del previsto aumento dell'uso di carbone per la produzione di elettricità, delle modifiche nella struttura della carbon tax e dei cambiamenti previsti nel prezzo finale dell'energia.*
- ▶ *Rafforzare la strategia per diffondere le tecnologie e le misure per l'efficienza energetica a favore delle piccole e medie imprese.*

Efficienza energetica

- ▶ *Controllare e valutare l'impatto e l'efficacia economica delle attuali e delle nuove politiche di efficienza energetica con l'obiettivo di mantenere una bassa intensità energetica nel contesto di un mercato dell'energia in mutamento.*
- ▶ *Promuovere un efficace coordinamento fra le autorità regionali e il governo in tutti i settori dell'efficienza energetica. Facilitare la diffusione delle best practices fra le autorità regionali e il governo, mediante l'attività di disseminazione delle informazioni condotta dall'ENEA.*
- ▶ *Integrare gli obiettivi di efficienza energetica nella politica dei trasporti, in settori quali l'intermodalità e lo sviluppo d'infrastrutture, mediante un migliore coordinamento fra i ministeri competenti (per l'energia, l'ambiente, le finanze ed i trasporti).*
- ▶ *Accelerare la rottamazione dei veicoli usati e promuovere l'uso di veicoli più efficienti a basse emissioni, in particolare per i camion, gli autobus e i ciclomotori mediante misure di regolamentazione (ad es. ispezioni periodiche) e misure economiche (ad es. incentivi fiscali, riesame degli esoneri fiscali sul carburante per il trasporto merci).*
- ▶ *Diminuire la quota del trasporto stradale individuale nelle aree urbane mediante sforzi per aumentare la quantità e la qualità dei trasporti pubblici.*
- ▶ *Perfezionare il più rapidamente possibile i dettagli e rendere operativi i certificati di efficienza energetica, riesaminandoli periodicamente. Pubblicare tempestivamente informazioni sui risultati e gli impatti del programma per tenere informate sugli sviluppi di tale esperimento le parti interessate, sia in Italia che all'estero.*
- ▶ *Partecipare attivamente in collaborazione con l'UE alla definizione dei requisiti di efficienza dei risultati per l'energy labelling (etichettatura del consumo energetico) e per gli standard di efficienza energetica di apparecchiature, impianti ed edifici.*

Energie rinnovabili

- ▶ *Aumentare la quota di fonti rinnovabili nella produzione nazionale per migliorare la sicurezza energetica e ridurre le emissioni di CO₂. Incrementare l'obbligo dell'uso di fonti rinnovabili di energia al di sopra del livello attuale.*
- ▶ *Facilitare l'accesso al mercato dei capitali per i progetti relativi a fonti rinnovabili di energia e per i certificati verdi che potrebbero aumentarne la redditività.*
- ▶ *Semplificare le procedure di autorizzazione per la costruzione di nuovi impianti di energia rinnovabile.*
- ▶ *Assicurare un efficace ed equilibrato contributo di tutte le autorità regionali al raggiungimento degli obiettivi nazionali relativi alle energie rinnovabili, in*

particolare per l'informazione al pubblico sull'uso possibile di tali fonti e l'accesso a programmi di incentivazione.

- ▶ *Assicurarsi che l'ENEA fornisca sufficienti informazioni e competenze alle autorità regionali ed al pubblico sulle possibilità di finanziamento e i meccanismi di sostegno.*

Petrolio

- ▶ *Rafforzare e migliorare la strategia nazionale per la ricerca e la produzione di petrolio, considerato il potenziale per l'estrazione di risorse petrolifere nazionali e l'attuale calo della produzione interna.*
- ▶ *Assicurare che la concessione di autorizzazioni per l'esplorazione e la produzione non incontri ostacoli inutili, visti l'attuale processo di decentramento dei poteri ed i vincoli di sicurezza dell'offerta energetica.*
- ▶ *Continuare l'impegno nella cooperazione internazionale con i paesi produttori e con i paesi di transito tramite incontri a livello mondiale e regionale allo scopo di rafforzare la sicurezza degli approvvigionamenti.*
- ▶ *Assicurare che i recenti miglioramenti per soddisfare l'obbligo dell'AIE dei 90 giorni di scorte siano sufficienti a garantire una osservanza costante di tale obbligo, vista l'importanza del meccanismo di risposta operativa in caso di emergenza.*

Gas naturale

- ▶ *Continuare l'unbundling delle attività di trasporto e di rifornimento nell'ambito delle imprese energetiche per garantire l'eguaglianza di trattamento.*
- ▶ *Procedere con la liberalizzazione del mercato del gas definendo rapidamente chiare regole, in particolare per l'accesso allo stoccaggio (Codice di Stoccaggio), per i terminali di GNL (Codice GNL) e la distribuzione (Codice di Distribuzione).*
- ▶ *Incoraggiare lo sviluppo di una borsa virtuale per il gas (National Balancing Point) per facilitare gli scambi di gas fra gli operatori (shippers) e per stimolarne la concorrenza.*
- ▶ *Attuare un severo controllo regolamentare per impedire l'abuso di posizione dominante. Tutelare l'indipendenza dell'Autorità per l'Energia Elettrica e il Gas e semplificare il processo decisionale all'interno della stessa Autorità per assicurarsi che elabori i codici mancanti nei tempi più brevi possibili.*
- ▶ *Continuare ad incoraggiare la diversificazione geografica dell'approvvigionamento di gas.*

- ▶ *Nel nuovo contesto di liberalizzazione del mercato, aggiornare e sviluppare una politica di sicurezza dell'approvvigionamento di gas, definendo criteri minimi e le responsabilità dei singoli operatori.*
- ▶ *Rafforzare e migliorare la strategia nazionale di esplorazione e di produzione del gas, considerato il potenziale per l'estrazione di risorse nazionali di gas e l'attuale calo della produzione interna.*
- ▶ *Incoraggiare gli investimenti nei terminali di GNL e gasdotti transfrontalieri che trasportano il gas verso l'Italia, quale prerequisito per il successo delle politiche di liberalizzazione del mercato del gas e della sicurezza degli approvvigionamenti. Semplificare le procedure di autorizzazione per i terminali di GNL e per i gasdotti. Incoraggiare gli investimenti nel sistema di stoccaggio, offrendo appropriati incentivi tariffari.*
- ▶ *Valutare i costi e i benefici delle scorte strategiche obbligatorie per gli operatori che importano gas da paesi non appartenenti all'UE e verificare se la gamma di strumenti di flessibilità possa essere estesa per consentire lo stesso livello di sicurezza ad un costo inferiore.*

Elettricità

- ▶ *Valutare la possibilità di rilanciare un dibattito pubblico sull'opzione nucleare alla luce delle sfide presenti e future della politica energetica.*
- ▶ *Monitorare e pubblicare regolarmente informazioni sul margine di riserva del settore dell'elettricità e prendere in considerazione nuovi incentivi agli investimenti per evitare blackout negli anni futuri. A tale riguardo, ampliare il ruolo del GRTN (Gestore Rete Trasmissione Nazionale) e dell'Autorità per l'Energia Elettrica e il Gas al fine di offrire un sostegno al governo in tale ambito.*
- ▶ *Analizzare le possibilità di offrire incentivi nelle tariffe di trasmissione e di distribuzione al fine di garantire investimenti in nuove capacità di trasmissione.*
- ▶ *Semplificare ulteriormente le procedure di autorizzazione richieste per la costruzione d'infrastrutture elettriche.*
- ▶ *Estendere le interconnessioni per le importazioni d'elettricità.*
- ▶ *Incoraggiare la diffusione di informazioni su progetti nel settore elettrico alle autorità e alle comunità locali.*
- ▶ *Continuare il processo di liberalizzazione del mercato dell'elettricità, attuando un severo controllo per impedire l'abuso di posizione dominante e mantenendo l'indipendenza dell'Autorità per l'Energia Elettrica e il Gas.*
- ▶ *Consentire alla borsa elettrica di iniziare le proprie operazioni il più rapidamente possibile; facilitare le misure che mirano ad aumentare la sua liquidità e creare una struttura di vigilanza per evitare abusi di posizione dominante.*

- ▶ *Assicurare l'indipendenza della borsa elettrica (Gestore del Mercato dell'Energia) e dell'Acquirente Unico (AU) rispetto al Gestore della rete di trasmissione nazionale (GRTN) e controllare il potere di mercato del GRTN, non appena il GRTN sarà stato privatizzato e il GME e AU saranno pienamente operativi.*
- ▶ *Organizzare la vendita delle attività di trasmissione dell'ENEL al GRTN.*
- ▶ *Aumentare la cooperazione internazionale nello smantellamento d'impianti di energia nucleare.*

Ricerca, sviluppo e dimostrazione

- ▶ *Continuare a offrire un supporto finanziario duraturo alla ricerca e allo sviluppo (R&S) nel settore dell'energia.*
- ▶ *Studiare la possibilità di elaborare chiare priorità nel settore della R&S pubblica. Dedicare particolare attenzione alle tecnologie pulite del carbone e al miglioramento dell'efficienza nella combustione del carbone.*
- ▶ *Migliorare il coordinamento della R&S e la diffusione dei suoi risultati alle autorità regionali.*
- ▶ *Insistere affinché l'ENEA aderisca all'Implementing Agreement dell'AIE sui sistemi solari a concentrazione.*

Il team di esaminatori dell'AIE ha effettuato una visita in Italia nel mese di gennaio 2003 per studiare le politiche energetiche del paese. Il presente rapporto è stato redatto sulla base di informazioni ricevute durante e prima della visita. Esso tiene conto della risposta ufficiale del governo italiano al questionario dell'AIE del 2002 sulle politiche energetiche e dei punti di vista espressi dalle varie parti durante la visita.

REVIEW TEAM

An IEA review team visited Italy in January 2003 to review the country's energy policies. This report was drafted on the basis of information received during and prior to the visit, including the official Italian government's response to the IEA 2002 policy questionnaire, and the views expressed by various parties during the visit. Pierre Audinet managed the review process and is the main author of this report. The team greatly appreciated the openness and co-operation shown by everyone it met.

The members of the team were:

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(Team Leader)
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Ministry of Economy, Finance and Industry
France

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Ministry of Petroleum and Energy
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Deputy Head, Market Introduction of Renewable Energy Division
Federal Ministry of Economics and Labour
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Mr. Jun Arima
Head, Country Studies Division
International Energy Agency

Ms. Sylvie Cornot-Gandolphe
Administrator, Energy Diversification Division
International Energy Agency

Mr. Pierre Audinet
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Administrator, Country Studies Division
International Energy Agency

ORGANISATIONS VISITED

Ministero delle Attività Produttive (minindustria.it)

Ministero dell'Ambiente e della Tutela del Territorio (www.minambiente.it)

Ministero delle Infrastrutture e dei Trasporti

Ministero dell'Economia e delle Finanze

ENEA (www.enea.it)

Autorità Garante della Concorrenza e del Mercato (www.agcm.it)

Autorità per l'Energia Elettrica e il Gas (www.autorita.energia.it)

Coordinamento Regionale Energia, with representatives from the regions of
Abruzzi, Toscana and Lombardia

Gestore della Rete di Trasmissione Nazionale (www.grtn.it)

Gestore del Mercato Elettrico (www.mercatoelettrico.org)

ENEL (www.enel.it)

EDISON (www.edison.it)

ENDESA Italia

Fedelettrica (www.fedelettrica.it)

Assoelettrica (www.assoelettrica.it)

Assocarboni (www.assocarboni.it)

Eni (www.eni.it)

Snam Rete Gas (www.snamretegas.it)

Italgas (www.italgas.it)

Assomineraria (www.assomineraria.it)

Unione Petrolifera (www.unione petrolifera.it)

Italian representatives of the Climate Action Network from Legambiente
(www.legambiente.com) and the World Wide Fund (www.wwf.it)

ECONOMY, ENERGY SUPPLY AND DEMAND

Italy comprises 20 regions, 103 provinces and 8 101 municipalities¹. Five regions (Friuli-Venezia Giulia, Trentino Alto Adige, Sardinia, Sicily and Val d'Aosta) have a higher degree of autonomy than the other regions. Italy's total surface area is 301 300 km². Its population in 2001 was 57.9 million. With a population density figure of 192 inhabitants per square kilometre, Italy has one of the highest population densities among OECD countries.

In 2001, gross domestic product (GDP) grew by 1.8% and reached €1 031 billion. GDP per inhabitant was about €18 000. The government aims to reduce the budget deficit, which amounted to 1.4% of GDP in 2001. Inflation was 2.7% in 2001, while the unemployment rate decreased to 9.2% at the beginning of 2002.

In 2001, total primary energy supply (TPES) was 172 Mtoe², a relatively low figure considering the size of the economy. Between 1990 and 2000, Italy's TPES grew slowly at a 1.2% average annual rate.

Total final consumption of energy (TFC) has grown in line with TPES and reached 134 Mtoe in 2001. Annual growth between 1990 and 2000 was 1.1%, in line with TPES. Industry currently represents 35% of TFC, while transport and other sectors represent 32% each. Since 1999, TFC of oil has been decreasing while TFC of natural gas has been slowly but continuously increasing.

Almost all of Italy's energy supply is derived from fossil fuels, with limited diversification compared to other European or IEA member countries. Oil still represents the largest share, 51.3% of TPES in 2000, but is gradually decreasing. Gas confirms its growing role with 33.7% of TPES in 2000 (it represented 25.6% in 1990). Coal's share is relatively stable at 7.3%. Italy has no nuclear power. Combustible renewables and wastes, including geothermal, solar and wind (3.2% in 2000 against 2.5% in 1990) and hydro (relatively stable at 2.2%) are increasing but remain small.

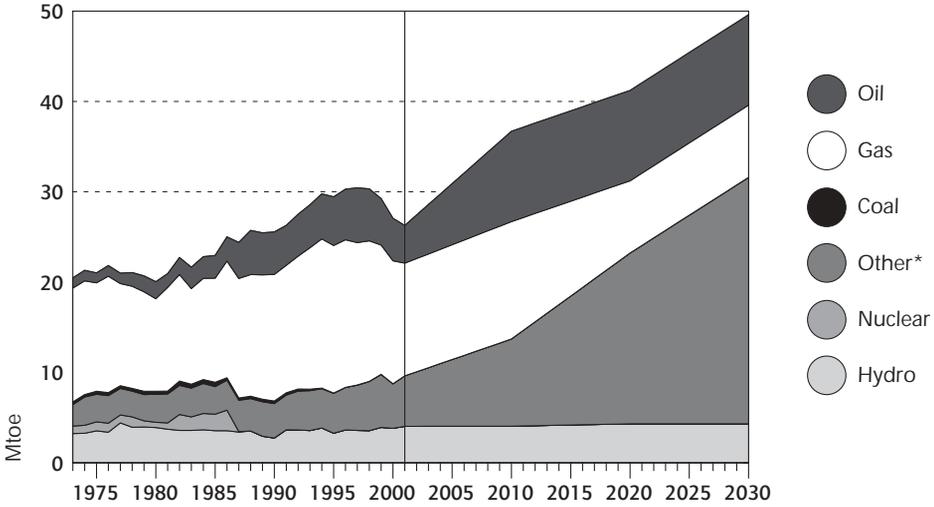
Italy is a small producer of oil (5.5 Mt in 2002) and gas (14.6 bcm in 2002). In 2000, Italy's net imports accounted for almost 88% of its energy supply; namely 85.2 Mtoe of crude oil and oil products, 47.0 Mtoe of gas, 13.1 Mtoe of coal and 3.8 Mtoe of electricity. Italy exported 0.1 Mtoe of coal and 22.1 Mtoe of oil products.

1. Provinces and municipalities are referred to as "local authorities".

2. This figure is different from the official Italian figure of 186.6 Mtoe, owing to the various conversion factors used by IEA and Eurostat

Figure 2

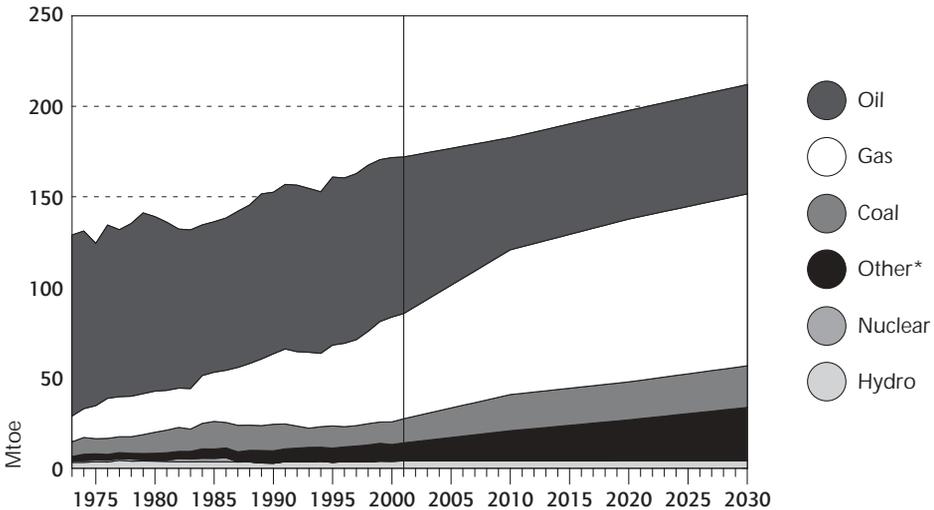
Energy Production by Source, 1973 to 2030



* includes geothermal, solar, wind, combustible renewables and wastes and ambient heat production.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

Figure 3

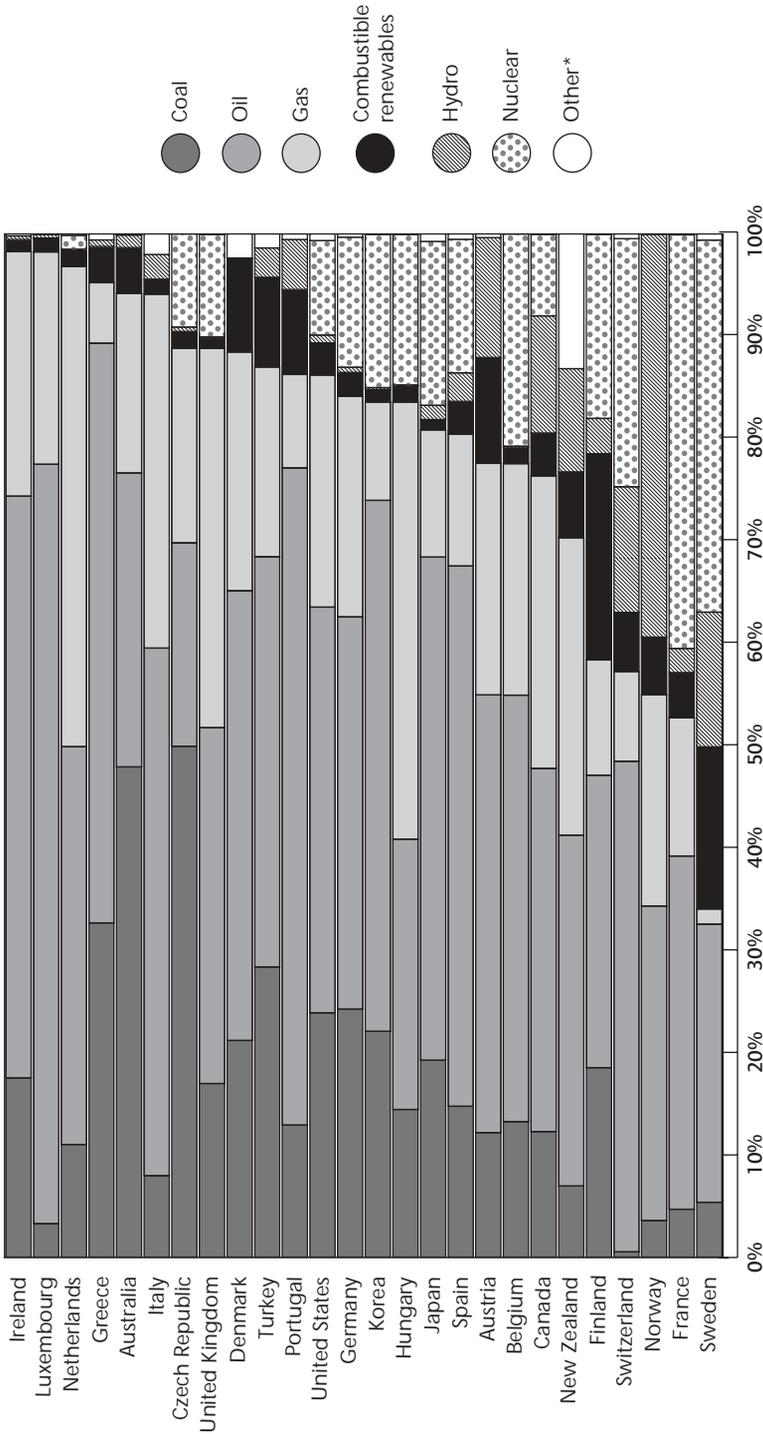
Total Primary Energy Supply, 1973 to 2030



* includes geothermal, solar, wind, combustible renewables and wastes, electricity and heat trade and ambient heat production.
Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

Figure 4

Total Primary Energy Supply in IEA Countries, 2001



* includes geothermal, solar, wind and ambient heat production.
 Note: Countries are ranked according to TPES dependence on fossil fuels.
 Source: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003.

Italy's energy intensity, measured as a ratio of TPES to GDP (toe per thousand US\$ 1995 purchasing power parity), improved from 0.140 in 1990 to 0.136 in 2000. In 2000, it was the lowest in OECD European countries³ and was roughly 60% below the IEA member country average (0.216). Similarly, the energy consumed in Italy per capita is significantly lower than the IEA member country average, reaching less than 3 toe per capita in 2000 (against 5 toe for IEA member countries).

ENERGY ADMINISTRATION

Energy policy design and implementation responsibilities are shared between the government and the regional authorities (see the section on Decentralisation in this chapter). The Ministry of Productive Activities, formerly the Ministry of Industry, Commerce and Crafts, is responsible for energy policy. It acts in coordination with other ministries, including the Ministry for Environment and Territory, inter-ministerial committees, government organisations and independent agencies. The Energy Directorate of the Ministry of Productive Activities has a staff of 150. The Inter-Ministerial Committee for Economic Planning (CIPE) co-ordinates national energy policy with economic policy. It issues specific goals and guidelines that provide an energy policy framework. The Ministry for Environment and Territory, in consultation with the Ministry of Productive Activities, other ministries such as Health, Public Works or Infrastructure and Transport and the regional authorities, is responsible for establishing restrictions on emissions from energy use, for specifying technical quality standards for fuels and oil products, and for evaluating the environmental impact of energy-related facilities and installations.

The Energy Authority (Autorità per l'Energia Elettrica e il Gas, AEEG) is independent from the government based on Law 581/1995 of November 1995, a general law pertaining to the regulation of public utility services in the areas of gas and electricity. It has been operating since April 1997 and has a staff of 120. The three commissioners of the Energy Authority, one of which is the acting president, are appointed by the President of the Republic and serve seven-year terms that cannot be renewed. The Energy Authority is financed through a tax on the revenue of utilities and its decisions are subject to appeal by the regional administrative court of Lombardia and the Council of State. The government sets the relevant energy policy objectives and the Energy Authority's task is to find the best way to meet these objectives, taking into account the interests of both energy producers and consumers. The Energy Authority's responsibilities include the following:

3. OECD Europe includes Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

- Definition and monitoring of electricity and gas tariffs for non-eligible consumers.
- Overview of electricity and gas market performance and contracts, including the move towards unbundling.
- Definition of quality requirements for services and standards.
- Advice to the government on the promotion of competition.
- Formal investigation of individual disputes and complaints.

Its annual report is presented to the Parliament and the Prime Minister.

The role of the public sector in Italian energy industries has considerably diminished. Eni, the Italian oil and natural gas conglomerate, and ENEL, the principal Italian electric utility, no longer have legal monopolies.

The Antitrust Authority was set up to enforce the Competition Law of October 1990. It is independent from the government and has a staff of 180. Its main tasks are to evaluate claims made against abuse of dominant position and to review possible mergers and acquisitions. The Antitrust Authority's decision can be subject to appeal by the regional administrative court of Lazio and the Council of State. The Antitrust Authority also makes recommendations to the government and the Parliament on the impacts of possible market restructuring on competition.

MAJOR POLICY DEVELOPMENTS

Since the last IEA in-depth review, the government has continued to pursue an energy policy driven by the following three major orientations:

- Market liberalisation.
- Devolution of relevant political and administrative decision-making powers to the regional authorities.
- Diversification of supply sources, security and efficiency improvements as well as climate change mitigation.

Another notable development was Italy's ratification of the Kyoto Protocol in June 2002. Italy is adopting various policies and measures, such as energy efficiency obligations for electricity and gas distributors and a portfolio obligation of renewable energy in the electricity sector (see Chapters 4, 5 and 6 on energy and the environment, energy efficiency and renewable energy).

MARKET LIBERALISATION

The opening of the Italian energy market is perceived to be an integral part of the single EU energy market creation process. Its pace of implementation is partly driven by the rhythm of market reforms in neighbouring EU countries. The EC directives for electricity and gas market liberalisation were transposed into national legislation in 1999 and 2000 respectively⁴.

In the electricity sector, Decree 79/1999 called for a separation of the generation, import, export, transmission and distribution of electricity. From 2003, the decree imposed a cap to stop individual companies controlling more than 50% of the electricity produced or imported in Italy. Consequently, ENEL sold 15 000 MW of its own capacity. The decree also foresees the creation of a power exchange (see Chapter 9 on electricity).

In the gas sector, Decree 164/2000 called for a legal unbundling of natural gas transport, distribution and storage activities by 1 January 2003. No single gas undertaking can control more than 73% of Italy's total gas supply. This cap will decrease by 2 percentage points each year, until it reaches 61% by 2009. A second cap imposes that no single gas undertaking can control more than 50% of total sales to end-consumers. From 1 January 2003, all natural gas consumers are free to choose their own suppliers (see Chapter 8 on natural gas).

Both decrees reinforced the role of the Energy Authority. The Energy Authority is entrusted with a range of functions including the regulation of the network, third-party access (TPA) tariffs, consumer protection, end-use tariffs, implementing unbundling obligations and some consultative and support activities. The decrees introduced an obligation for electricity and gas distributors to reach quantitative end-use energy saving targets (see Chapter 5 on energy efficiency).

Large state-owned energy companies, including Eni and ENEL, have started to be privatised. As of February 2003, the State's share in Eni has been reduced to 30.33%, and its share in ENEL to 67.58%. Consequently, the structure of the energy markets has been substantially modified and new market participants have emerged.

DECENTRALISATION

Since the late 1990s, successive governments have been taking important measures to devolve more power to the regional authorities. Act 59/1997 (the Bassanini Act) accelerated the transfer of power to ordinary status

4. Through Legislative Decrees 79/1999 transposing the EC directive on Internal Markets in Electricity (96/92/EC) and Legislative Decree 164/2000 transposing the EC directive on Internal Markets in Gas (98/30/EC).

regions, communes and provinces, and defined government powers. Subsequent laws and decrees refined the devolution of powers, abolishing ex-ante control of local authorities' measures; providing for direct election of presidents of ordinary status regions and for their statutory autonomy; extending direct election of regional presidents by direct universal suffrage, with the exception of Trentino-Alto Adige and Val d'Aosta, which have kept the previous electoral system; etc.

Decree 112/1998 of 31 March 1998 as modified by Decree 443/1999 of 29 November 1999 conferred new energy policy responsibilities to regional authorities. Following a referendum on 7 October 2001, full legislative powers were given to regional authorities, except in the areas of foreign policy, defence, economy and finance, immigration, justice and environment.

The government retains the power to regulate environmental protection, the ecosystem and cultural heritage, but an amendment to Article 117 of the Constitution made in 2001 empowers regional authorities to issue specific legislation to protect health and to manage land, in line with the national framework legislation. Regional authorities have the exclusive power to issue legislation in any sector concerning the environment that is not explicitly mentioned in the Constitution.

Another amendment to Article 117 of the Constitution made the production, transport and national distribution of energy part of the "concurrent list of legislation". Concurrent legislation means that the national government sets the policies, the principal guidelines and the general objectives by law, while the regional authorities determine specific laws and rules to achieve these objectives.

The government's principal administrative responsibilities in the energy sector are as follows:

- General energy policy objectives and guidelines.
- Co-ordination of energy planning at a regional level.
- National objectives and programmes for renewables and energy efficiency.
- Energy statistics.
- National mining policy, including policies related to offshore exploration, production and storage of hydrocarbons and fees and taxes on mining activities.
- Granting licences for onshore and offshore hydrocarbon exploration and production.
- Regulations related to the import, export and storage of energy.

- Geothermal resources inventory.
- Public research and development in the energy field and supervision of the National Agency for New Technology, Energy and Environment (ENEA).
- Standards on building techniques, technical standards for the functioning of energy plants, production, distribution and the use of energy.
- Licensing for the building and management of electricity plants with a capacity superior to 300 MW (excluding plants that produce electricity from renewable energy), of transmission networks with a voltage superior to 150 kV and the establishment of technical standards for the building of power lines.
- Authorisation for LNG terminals and for building crude oil transport pipelines.

The regional authorities' principal administrative responsibilities in the energy sector are as follows:

- Drafting and adopting programmes to promote renewable energy and energy efficiency.
- Funding energy savings and controlling the energy efficiency of industrial plants.
- Assisting local authorities responsible for the control of energy savings, rational use of energy and other rules implemented by regional legislation.
- Licensing for the building and management of electricity plants with a capacity inferior to 300 MW and of transmission networks with a voltage inferior to 150kV.
- Granting, through an agreement with the government, licences for onshore hydrocarbon exploration and production.

The system of legislative competences is likely to undergo significant changes to clarify the role of the regional authorities and to achieve national energy policy objectives, including security of supply. The current national administration is trying to reinforce this move by clarifying the different responsibilities, attempting to devolve to the regional authorities all powers over sectors where competition should prevail, and centralising responsibilities for monopolistic economic activities. In the energy sector, this effort is contained in the new framework energy bill ("Reform and Rearrangement of the Energy Sector").

The devolution of power has a number of consequences. One of the immediate impacts is to slow down the process of investment in new energy infrastructure, such as power plants or LNG import terminals. To accelerate this process, the government has evolved exceptional procedures to reduce unnecessary delays

and unlock situations where the uncertainties generated by delayed decision-making are detrimental to investments and general interest. Several decrees have introduced accelerated procedures for new electricity generating capacity (Sblocca Centrali) or for electricity transmission capacity (Sblocca Trasmissione) (see below).

DIVERSIFICATION OF ENERGY SOURCES

Diversification of energy sources is an important policy priority in Italy owing to a high dependence on imported oil and gas in TPES (51% and 34% in 2001 respectively), which is principally imported from a limited number of supply sources (Middle East, Russia, North Africa). The Italian authorities often underline the singularity of Italy's electricity mix, which has no nuclear power (apart from nuclear electricity imported from France) and where coal represents a limited 11% (in 2000) compared to the OECD Europe (including Italy) average of 30%. Consequently, the role of oil and gas is excessively high (27.6% and 38.3% respectively in 2001). Moreover, Italy's refining industry consumes large quantities of feedstock, with part of the oil products eventually being exported, thereby inflating even further the share of hydrocarbons in TPES. Difficulty to exploit domestic energy resources also explains the strong historical dependency on primary energy imports and the need to diversify energy supply to spread the security of supply risks. However, the options for energy diversification are relatively limited because Italy ruled out the nuclear option in a 1987 moratorium that is still valid today.

The government expects to achieve diversification through the promotion of renewable energy and an increased role of coal in power generation, with the use of cleaner coal conversion technologies to curb the growth of emissions linked to coal consumption. For oil and gas, the government aims to increase the number of suppliers for each country of origin and source and the number of available countries from which it imports⁵.

ENERGY SECURITY

Energy security is perceived by Italian policy-makers to be highly important for the following reasons:

- The high level of dependence on external energy supply⁶ that represented approximately 89% in 2000 and 84% in 2001. From a peak at almost 94% in 1966, Italy's dependency decreased regularly, down to 83% in

5. Possible new sources of supply include Kazakhstan, Azerbaijan or Indonesia.

6. Defined as total imports minus exports, divided by TPES.

1993, and increased again slightly after. In 2001, net imports represented 95% of oil supply, 77% of gas supply and 100% of coal supply.

- The limited domestic energy resources.
- The growing energy demand that is increasingly shifting towards imported gas.
- The low diversification of the energy supply, in which oil and gas have a strong dominance, both totalling 85% of the supply.
- The ageing electricity generating capacity and the limited reserve margin, which increase the need for more electricity capacity. At the end of 2001, the average age of Italian generating plants was 24 years (median age: 19 years)⁷. The reserve margin has been decreasing and reached 9% in 2002⁸.
- The limited electricity interconnections with neighbouring countries, which is a factor of growing congestion in a country that imported 15% of its electricity requirements in 2001 and 17% in 2002.

Some of the measures taken to accelerate energy infrastructure developments contribute towards reinforcing the security of supply. In November 2002, the Parliament allocated €230 million for the period 2002 to 2004 as investment grants for improved or new infrastructures in the transport and storage of natural gas, the construction of LNG terminals and international electric interconnections. The investment grants were used for the following:

- Creation of a company to carry out the feasibility study of the Algeria-Sardinia gas pipeline.
- Construction of a 4 bcm initial annual capacity LNG terminal near Brindisi, to be expanded to 8 bcm.
- Consideration of an upgrade of the gas transport Transmed pipeline between Algeria, Tunisia and Italy to increase the capacity to 6.5 bcm per annum; a similar project is being studied for the Tag pipeline from Austria bringing a similar capacity of Russian gas.

The Sblocca Centrali⁹, the simplified procedure to accelerate the authorisation of new power plants, contributes to boosting security of supply in the electricity sector by facilitating capacity increases. The Sblocca Centrali was

7. As compared, for example, to 12 years for Dutch plants (median age: 11 years) or 14 years for British plants (median age: 8 years). Calculated from the Platts UDI, *World Electric Power Plants Data Base* (2002).

8. Source: Union for the Co-ordination of Transmission of Electricity (UCTE).

9. Literally "unlocking" power plants; actually a fast-track power plant authorisation procedure.

implemented by a decree that was approved by the Parliament in April 2002. It resulted in more than 70 applications for a total of 42 000 MW of new capacity that were filed for evaluation. Since January 2003, 8 200 MW have already been selected and authorised. Taking this trend into account, the government envisages to have an additional 10 000 MW in operation by 2006. The Sblocca Centrali retains the basic features of the normal authorisation procedure, including the need for an environmental impact assessment. Since it introduces the possibility for the national administration to take over where regional authorities take excessive time, it reduces the risks for investors and provides an added incentive for them to come forward.

In 2003, the electricity import capacity of the northern and southern borders will also be increased.

Security of TPES is further reinforced by storage. Since 1995, Italy was unable to meet the International Energy Program (IEP) requirement of 90 days of net imports for strategic oil storage (see Chapter 7 on oil). However, in January 2003, stocks reached 96 days of net 2002 imports. Natural gas security is enhanced by the volumes of Italian gas storage facilities, representing approximately 66 days of gas consumption (12.7 mcm in 2001).

A proposed energy bill being discussed at the time of writing this report could also help to improve energy security.

ENERGY SECTOR REFORM BILL

At the end of 2001, the Parliamentary Commission for Productive Activities launched a national review of the energy situation and its perspectives that look at Italy's position in the EU energy market. The Parliamentary Commission drew up guidelines for the government to enable suitable conditions to provide good quality and cheaper energy, thereby improving the competitiveness of the Italian industry. On 18 April 2002, the Parliamentary Commission published a document entitled "Situation and Perspectives in the Energy Sector" (Indagine conoscitiva sulla situazione e sulle prospettive del settore dell'energia), delineating the following strategic action lines:

- *Diversifying energy sources.*
 - Diversifying the energy supply sources to reduce the import dependency from the Middle East.
 - Exploiting domestic oil and gas resources by simplifying the administrative procedures regulating exploration and production.
 - Increasing natural gas supply capacity by building pipelines and LNG terminals.

- Developing the clean use of coal, mainly through the diffusion of new available coal conversion technologies (gasification) with improved conversion efficiency and lower emissions per unit of electricity output.
- Developing renewables by increasing the obligatory production quotas of electricity from renewables, extending the duration of such quotas and promoting energy production from wastes.
- Giving further thought to the possibility of using nuclear again.
- *Improving end-use energy efficiency*, which would be compatible with the development of renewable energy sources to minimise the costs of mitigating GHG emissions.
- *Developing the international linkages of energy production, transport and transformation*, by facilitating private-sector joint ventures, strategic alliances and, for climate change mitigation purposes, taking advantage of the flexible mechanisms of the Kyoto Protocol (see Chapter 4 on energy and the environment).

Taking into consideration the Parliamentary Commission's guidelines, the government presented an energy bill, "Reform and Rearrangement of the Energy Sector" (Riforma e riordino del settore energetico), to the Parliament at the end of 2002¹⁰. The energy bill aims to achieve the following:

- Accelerate market liberalisation.
- Diversify energy sources.
- Lower the cost of electricity to benefit Italy's competitiveness.
- Further clarify the responsibilities of the regional authorities and the government.
- Secure timely investment in energy-related infrastructures by obliging regional authorities to respect a maximum 180-day delay for replying to applications for authorising new energy infrastructures and, if this delay cannot be respected, by giving the authority to the government.

In particular, the proposed energy bill attempts to clarify the public/private division of roles, defining sectors that should:

- Be fully liberalised – production of electricity, imports of gas and electricity, exports of hydrocarbons and electricity, transformation of hydrocarbons, above-ground storage of hydrocarbons, purchase and sale of gas and electricity to eligible consumers and distribution of oil products.

10. Also referred to as the "Marzano" Law, from Antonio Marzano, the Minister of Productive Activities. The Parliamentary discussion of this law began in June 2003.

- Remain controlled by the criteria of public interest – wholesale transport and dispatching of gas and electricity, high-tension electricity grid or high-pressure gas network.
- Operate as government concessions – exploration and production of hydrocarbons, underground storage of hydrocarbons, distribution and supply of electricity and gas.

ENERGY PRICES

Energy prices in Italy are generally higher than in the rest of OECD Europe. This is because of Italy's relatively high external electricity dependency and the relatively high level of taxes compared to other IEA member countries. In the case of electricity, another reason for higher prices is the lower efficiency of Italy's electric power generating capacity owing to its relatively older age and the high use of hydrocarbons with limited coal consumption.

Table 1
Energy End-use Prices, 2001
 US\$/toe (converted using exchange rates)

<i>Fuel</i>	<i>Price</i>	<i>Tax (%)</i>	<i>OECD Europe</i>	<i>Ratio to OECD Europe</i>
High-sulphur fuel oil for industry	205.7	28.9	-	-
Low-sulphur fuel oil for industry	188.0	15.6	-	-
Light fuel oil for industry	721.5	53.7	358.7	2.0
Light fuel oil for households	865.8	61.4	448.9	1.9
Automotive diesel for commercial use	725.5	52.9	730.3	1.0
Automotive diesel for non-commercial use	978.9	60.7	917.4	1.1
Premium leaded gasoline	1 236.6	67.6	-	-
Premium unleaded gasoline (95 RON)	1 188.0	66.1	1 131.8	1.0
Natural gas	c	c	-	-
Steam coal	61.3	-	-	-
Coking coal	76.1	-	-	-
Electricity for industry	1 034.2*	15.2*	608.8*	1.7
Electricity for households	1 575.4*	22.9*	1 245.1*	1.3

* 2000 value; – is not available; c is confidential.

Source: IEA, *Energy Prices and Taxes*, Third Quarter 2002.

ENERGY TAXES

EXCISE TAX, VAT AND OTHER TAXES ON ENERGY

Italy applies different rates of value-added tax (VAT) and excise tax on a national basis to all energies. The Ministry of Economy and Finance is responsible for taxation policy, while regional authorities are responsible for applying their own taxes.

Oil products are subject to excise tax and VAT. VAT is 20% for gasoline, diesel and liquefied petroleum gas (LPG), and 10% for both high- and low-sulphur fuel oils.

Natural gas is subject to excise tax and VAT. It is also subject to additional taxes at regional level. Table 2 reports the excise rates established by Law 388/2000 of 23 December 2000 and shows that the southern regions benefit from slightly lower rates. The VAT rate is 20% for all uses, except household cooking and water heating in southern Italy where it is 10%. The excise rate is €0.75 per m³ for consumption superior to 1.2 mcm per annum.

Table 2

Excise Rates for Natural Gas, from 1 January 2002

(euro cents per m³)

	Cooking and water heating	Single house heating		Building heating, commercial uses	Industrial uses	Transport	Electricity production	Self production
		<250m ³ per annum	>250 m ³ per annum					
Excise rates standards	4.00	4.00	17.00	17.00	1.25	1.08	4.9	1.3
Excise rates for areas defined by Law 218/1978*	3.87	3.87	12.42	12.42	1.25	-	-	-

* South of Italy, including Sardinia and Sicily.

Source: Ministry of Productive Activities.

Additional taxes at a regional level on natural gas vary between €0 and €0.3 per m³ and cannot exceed 50% of the national excise tax. The Lombardia excise tax is 0. Among other regions, Umbria has the lowest (€0.05 per m³) and Lazio the highest (€0.3 per m³).

Electricity is subject to VAT, national excise tax and additional taxes at a regional level. VAT is 10% for residential and industrial consumers and 20% for others. Table 3 reports the excise and municipal tax rates on electricity for residential use in 2002. It shows that low consumption is tax-exempted.

Table 3

Tax Rates on Electricity for Residential Consumers, 2002

(euro cents per kWh)

	<i>Excise</i>	<i>Additional municipal tax</i>	<i>Total</i>
Main residence	Up to 150 kWh/month	0	0
	Above 150 kWh/month	0.47	1.86
Other houses	0.47	2.04	2.48

Source: Ministry of Productive Activities.

Law 388/2000 of 23 December 2000 modified and simplified the electricity tax scheme for non-residential end-use, as shown in Table 4.

Table 4

Tax Rates on Electricity for Non-residential Consumers, 2002

(euro cents per kWh)

<i>Demand</i>	<i>Excise rate</i>	<i>Additional provincial tax</i>	<i>Total</i>
Up to 200 000 kWh/month	0.31	0.93	1.24
Above 200 000 kWh/month	0.31	0	0.31

Note: Provinces can raise additional tax up to €1.14 per kWh.

Source: Ministry of Productive Activities.

It also introduced tax relief for industries consuming large amounts of electricity:

- If consumption exceeds 1 200 GWh per month, no excise tax is applied.
- Electricity used by electrochemical, electro-metallurgical and iron and steel industries is exempt from excise tax and additional taxes at a regional level.

- Electrical energy produced by gasification plants using national coal is exempt from the national excise tax.

Steam and coking coal and orimulsion are subject to a tax of 51.65 euros cents per tonne and to carbon tax. VAT on coal is 9% for households.

Italy applies a carbon tax and several other taxes on environmental emissions from the power sector (see Chapter 4 on energy and the environment).

CRITIQUE

Italy's energy policy is currently driven by market liberalisation, devolution to the regional authorities of relevant decision-making powers, diversification of supply sources, energy security, efficiency improvement and environmental protection.

Since the last IEA in-depth review, Italy has made significant progress to implement electricity and gas market reforms and to restructure the energy industry. The EC directives for electricity and gas market liberalisation have been transposed into legislation. The government reduced its share in ENEL and Eni. New institutions, including an energy sector regulator, are now fully operational, which will ensure a much more market-oriented energy economy, in line with the IEA Shared Goals. Italy ratified the Kyoto Protocol in June 2002 and is instigating various policies and measures to achieve its challenging GHG emissions reduction target.

All these developments are positive and commendable. However, in Italy as in other IEA member countries, the simultaneous achievement of energy security, market liberalisation and climate change mitigation is not easy given the sometimes contradictory nature of these objectives. Diversification of energy sources is particularly challenging in this respect. Italy's energy mix is shifting from oil to gas, but significant reliance on these two fuels, of which external dependency is also very important, causes concerns about security of supply and the risk of high energy costs. The large and growing dependency on gas renders Italy more vulnerable to international gas (and oil) price volatility, given that gas prices are likely to be linked to oil prices for a long time to come. There are limited options for fuel mix diversification, partly because Italy has abandoned the nuclear option. Increased use of coal in the electricity sector is an option to strengthen fuel diversification. However, in order to avoid further increases of GHG emissions, increased use of coal must be accompanied with significantly cleaner coal combustion technologies that improve the efficiency and thus lower the need for raw coal. Despite the introduction of clean coal technologies, it may be challenging to achieve Italy's national climate change mitigation targets. There could be additional pressure on the increased introduction of renewable energy, which comes at a relatively high cost per unit of electricity produced. It will further increase

energy prices in Italy, which are generally higher than in the rest of OECD Europe.

Security of supply in the gas and electricity markets is handled increasingly less by the former integrated incumbents than it was in the past. In this context, the opening-up of gas and electricity markets introduces new challenges. All of these factors suggest the strong need for a cohesive approach incorporating security of supply, liberalisation of the market and climate change policy.

The energy stakeholders are aware of the current difficulties. The parliamentary investigation (*Indagine conoscitiva sulla situazione e sulle prospettive del settore dell'energia*) that was completed in mid-2002 shows a good level of understanding on the nature of the challenges. The government needs to integrate competitiveness, security of supply and climate change mitigation into the national energy strategy in a more consistent manner. Explicit use of clear scenarios on energy supply and demand should be used to build up the national energy strategy. All relevant ministries should be involved in the implementation of this strategy.

In order to enhance security of supply and more active competition, timely investment in energy production, transportation and interconnection with European and world markets is critical. However, these investments suffer from acute "nimby" symptoms in Italy¹¹. This issue is becoming increasingly important in the context of the devolution of powers to local authorities, which has led to a series of legal changes enabling a very decentralised system in Italy. These changes have introduced uncertainty about the responsibility for clearing new energy projects. Although more responsibilities are being put on the regional authorities, their competence in many cases remains to be developed. Another aspect of the devolution of power is that the regional authorities do not have to fulfil national obligations such as the Kyoto target and the renewable energy target and do not fully recognise energy security challenges at a national level.

Consequently, investment in energy infrastructure has been slowing down substantially over the past two years, which has impeded the development of domestic energy production and the renewal and/or expansion of the electricity system (generation and transmission). The government designed a mechanism, implemented from 2002, to streamline the decision-making process for some energy projects through the accelerated *Sblocca Centrali* procedure. However, in many cases, the investment slow-down is actually a result of the local community's opposition to or refusal of new infrastructure.

More specific measures to facilitate the decision-making process are likely to emerge from the energy bill (the "Marzano" Law) currently debated in Parliament,

11. Nimby: "not in my backyard", an acronym coined to reflect the lack of public acceptance for the construction of infrastructure perceived to be damaging to the environment.

which seeks to detail the competences that should remain with the government. It is essential that the government keeps the tools to guarantee the energy investments that are necessary to achieve the national energy strategy. Italy's decentralised system requires that the general public, in particular local authorities and communities, should be fully informed of the national energy situation and its challenges so that their decisions may reflect national as well as local interests. It is also crucial to communicate illustrating national challenges with clear scenarios on energy supply and demand.

Despite Italy's impressive progress in formulating a legal framework for gas and electricity market liberalisation, major efforts still need to be made to complete the secondary legislation to ensure real competition in the market. A legal framework alone does not automatically bring about effective competition. In particular, the market power of the incumbents remains strong and needs to be closely monitored and strictly controlled so that newcomers can compete with them on a fair and equal basis. Internal market power is high, while the possibilities to resort to external trade are limited given that existing capacity is already extensively used¹².

The issue of the role and independence of the Energy Authority is currently a source of tension within the government. Although Italy was relatively ahead of other European countries when it created the Energy Authority, the government is still indecisive about the extent of the Energy Authority's independence concerning decision-making, especially as regards energy prices. In August 2002, the government blocked an Energy Authority decision to increase electricity prices. Price freezes were announced after consumer groups voiced concern about inflation which, in 2002, exceeded the targeted 1.7% to reach 2.4%. Price freezes lasted until December 2002 and were lifted with a new tariff system that responds more slowly to oil price changes to guarantee more stability and to lower the impact of inflation.

The government intends to sell more of its shares in ENEL in the future. In March 2003, the government indicated that the plans to transform the Energy Authority into a government agency had been deferred. It is important to insist that significantly weakening the independence of the Energy Authority could create uncertainty in the regulatory framework.

In liberalised energy markets, participants require a certain amount of confidentiality concerning their operations to gain and maintain a market advantage. This impacts negatively on the availability of energy data. Several institutions have been expressing their regrets about the worsening quality of

12. In 2001 and 2002, the three principal electricity companies controlled 69% of the electricity capacity and the largest gas company controlled 75% of the available gas. Possibilities to resort to external cross-border capacity use in 2000 were 84% for electricity and 69% for gas (CEC, *Second Benchmarking Report on the Implementation of the Internal Electricity and Gas Market*, SEC(2002)1038, Brussels).

energy quantitative information over the past two to three years, which seems to be linked to increased private ownership of capital and unbundling in the energy sector. This blurs the understanding of market dynamics and may affect the design and implementation of sound energy policies.

RECOMMENDATIONS

The government of Italy should:

- ▶ *Strengthen the national energy strategy on the basis of energy supply and demand scenarios, integrating in a balanced and consistent way the main policy objectives, namely security of supply, reform of the gas and electricity markets and climate change mitigation.*
- ▶ *Enhance the visibility of the national energy strategy and the dissemination of energy information on the national energy situation and future challenges to the general public.*
- ▶ *Co-ordinate with the Ministry of Productive Activities the actions of relevant ministries in the implementation of energy policy.*
- ▶ *Put more emphasis on achieving energy diversification, especially in the electricity sector in order to improve security of supply and reduce electricity generation costs.*
- ▶ *Clarify the respective roles and competences of the regional authorities and the government in implementing energy policy. Encourage the regional authorities to develop regional energy plans consistent with the national energy strategy.*
- ▶ *Keep the necessary tools to guarantee that investments needed in energy production, transportation and particularly interconnections with European and world markets are achieved in a timely manner and are not subjected to excessive bureaucratic procedural delays.*
- ▶ *Continue the liberalisation process of the electricity and gas markets. Ensure that newcomers compete on a fair and equal basis with the gas and electricity incumbents. Evaluate the progress of the liberalisation process through benchmarking.*
- ▶ *Confirm the independence of the Energy Authority.*
- ▶ *Increase transparency of information on the energy market by circulating non-confidential market information to all energy stakeholders.*

CLIMATE CHANGE

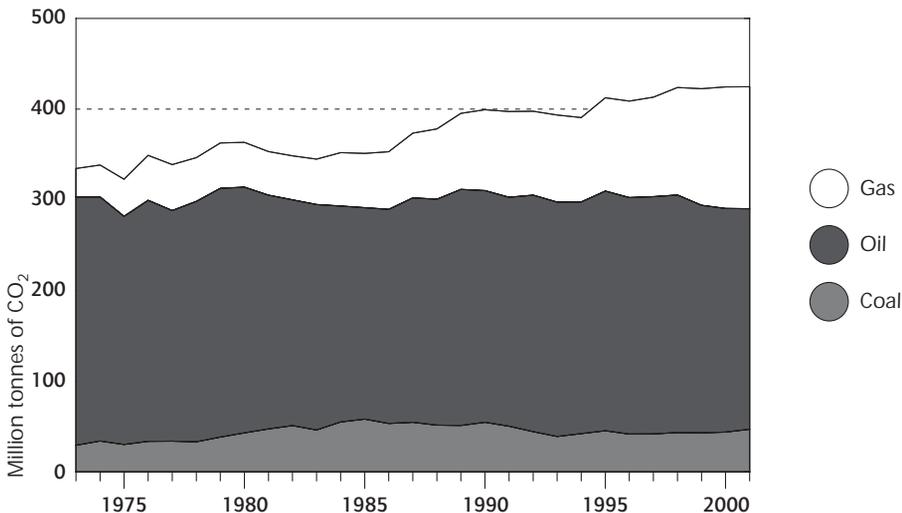
GREENHOUSE GAS EMISSIONS

Under the 1997 Kyoto Protocol and the 1998 European Union Burden-Sharing Agreement, Italy is committed to reduce its total greenhouse gas (GHG) emissions in the period 2008 to 2012 by 6.5% compared to the baseline year 1990. However, energy-related CO₂ emissions have been growing gradually and were 6.5% above the 1990 level in 2000, reaching 425 Mt of CO₂.

In 2000, the carbon intensity of the Italian economy reached 0.35 kg CO₂ per US\$ 1995 of GDP, which was inferior to the IEA member country average of 0.43 kg but close to the OECD Europe average of 0.37 kg¹³. Since 1990, it has been decreasing marginally at an annual rate of 0.8% per annum.

Figure 5

Carbon Dioxide Emissions by Fuel*, 1973 to 2001



* estimated using the IPCC Sectoral Approach.

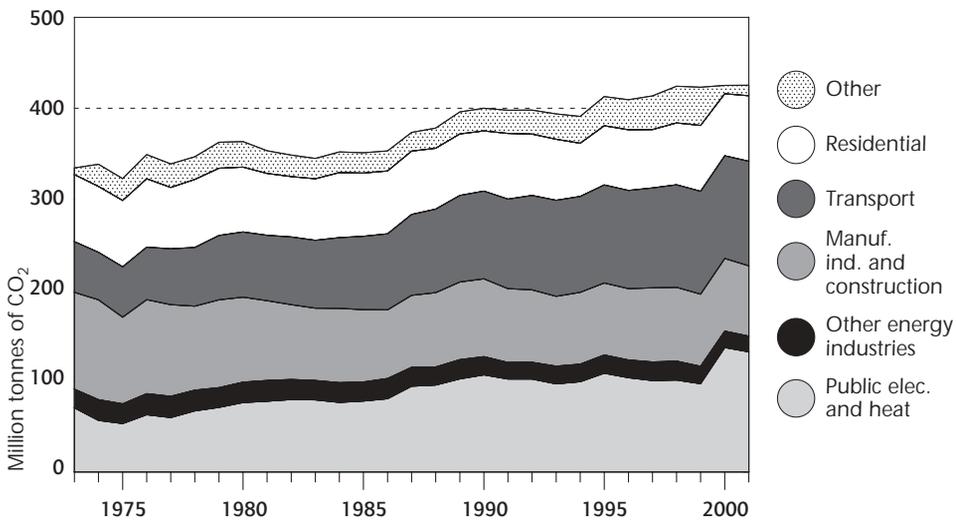
Source: *CO₂ Emissions from Fuel Combustion*, IEA/OECD Paris, 2003.

13. The carbon intensity is lower than the OECD Europe average if GDP is expressed with purchasing power parity.

Emissions from the power sector are the largest, with 137 Mt of CO₂ in 2000, or one-third of total emissions. They also drive the bulk of the emissions growth, with a 28% growth since 1990. Repowering of the generating capacity and growth of electricity demand resulted in a strong increase in emissions from gas-fuelled power plants, from 16 Mt to 44 Mt of CO₂ between 1990 and 2000. Emissions from the transport sector are second, with 113 Mt in 2000, and grew by 17% since 1990. Emissions from other sectors stagnated between 1990 and 2000 and represented 78 Mt of CO₂ in 2000.

Figure 6

Carbon Dioxide Emissions by Sector*, 1973 to 2001



* estimated using the IPCC Sectoral Approach.

Source: *CO₂ Emissions from Fuel Combustion*, IEA/OECD Paris, 2003.

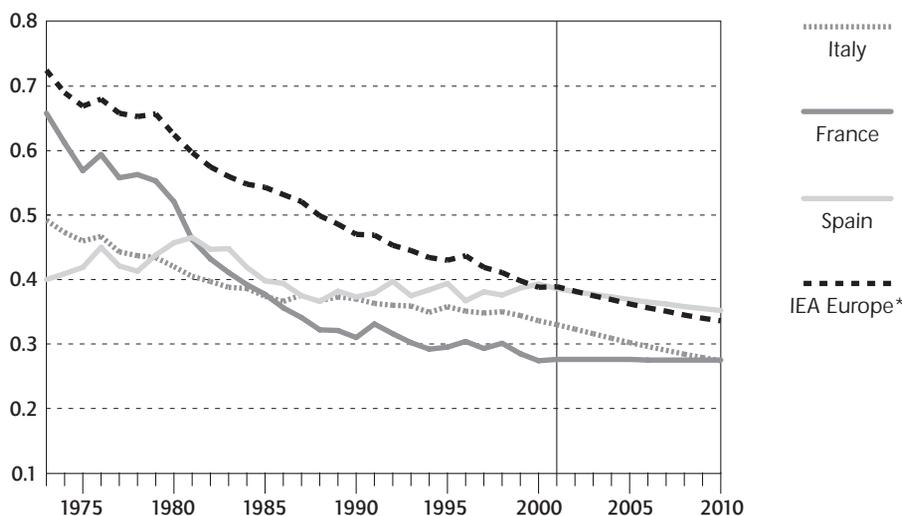
CLIMATE CHANGE MITIGATION POLICIES

In order to achieve its GHG emissions reduction objective by 2000, a set of policy measures were defined by the Inter-Ministerial Committee for Economic Planning (CIPE) in 1994 in the National Programme for the Containment of Carbon Dioxide Emissions. Italy submitted its second and third national reports to the United Nations Framework Convention on Climate Change (UNFCCC) in 1997 and 1998 respectively. The government defined in these reports a framework for the preparation of the individual mitigation programmes by each administration. The CIPE deliberation of 1997 stated that the programmes must be co-ordinated and an inter-ministerial work

Figure 7

Energy-related Carbon Dioxide Emissions per GDP in Italy and in Other Selected IEA Countries, 1973 to 2010

(CO₂ emissions/GDP using 1995 prices and purchasing power parities)



* excluding Norway from 2002 to 2010.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; *National Accounts of OECD Countries*, OECD Paris, 2003; and country submissions.

group appointed in order to achieve a higher level of integration in the elaboration of the above-mentioned programmes.

The measures initially included the following:

- Improvements in the efficiency of electricity plants.
- Large-scale diffusion of more efficient electrical appliances.
- Reduction of losses in electricity transmission, distribution and in the gas grids.
- Increased use of gas in industry and the residential and commercial sectors.
- Reduction of traffic congestion and increase in urban mobility.
- Promotion of renewable energy resources.
- Monitoring efficiency standards for space heating equipment.

In 1998, ministries were given individual emissions reduction targets for the six GHG (CO₂, CH₄, N₂O, SF₆, HFC, PFC) corresponding to their sector of

competence, with milestones in 2002, 2006 and 2008 to 2012. Additional measures were promoted by CIPE, along with the allocation of special funds to implement them for the relevant ministry. The 1998 measures included the following:

- Substitution of oil and coal by natural gas, in particular in the electricity sector.
- Voluntary agreements (VA) with industry.
- A CO₂ tax.

Italy has been actively developing VAs as a tool to mitigate CO₂ emissions in industry. In November 1998, industry entered into a framework agreement with the government (Patto per l'energia ed ambiente) to develop specific VAs to mitigate CO₂ emissions through increased energy efficiency and the use of renewables. In July 2000, ENEL signed an agreement with the Ministry for Environment and Territory to reduce CO₂ emissions by 20% from the 1990 level by 2006. In terms of carbon intensity of electricity output, ENEL aims to reach an equivalent average of CO₂ emissions of 0.55 kg CO₂ per net kWh in 2002 (-13.5% compared to 1990) and 0.51 kg CO₂ per net kWh in 2006. Although ENEL believes this target can be achieved by implementing efficiency measures and resorting to the Kyoto flexible instruments (emissions trading and clean development mechanisms), ENEL will simultaneously increase its share of coal in the electricity fuel mix up to 50% from the current 13%. ENEL's climate change mitigation measures will require an investment of US\$ 3.6 billion to US\$ 4.8 billion.

In June 2001, the Conference of the Presidents of Regional Authorities and Autonomous Provinces agreed to a protocol (Protocollo di Torino) for the coordination of policies aimed at reducing GHG emissions. In 2002, a VA was signed by FIAT and Unione Petrolifera with the Ministry for Environment and Territory to improve air quality in cities through the diffusion of compressed natural gas vehicles and the construction of the corresponding gas delivery network in large cities. Five agreements were signed with Edison, to invest in co-generation and combined cycle gas turbines in several existing power generating plants, or to develop a zero-emissions technology for Edison service vehicles operating in an urban environment.

The public sector has been mandated to increase its purchases of electric, hybrid and natural gas vehicles to 50% of total new vehicle procurement between 2000 and 2005. The government estimates that this measure will put some 60 000 vehicles with low CO₂ emissions on Italy's roads by 2003.

A carbon tax, applicable to all hydrocarbon fuels, was established in December 1998 (Law 448/1998). The law fixed the initial value of the carbon tax for 1999 at €0.52 per metric tonne of coal, petroleum coke and orimulsion used in combustion plants, and determined the target rate for

2005, to be reached progressively. Increases between 1999 and 2004 were to be decided on a yearly basis by the government and set by decrees. However, in September 2000 the planned CO₂ tax increases were suspended by Decree 268/2000 because they were excessively burdening energy prices at a time of high oil prices. The tax continued to be implemented at the 2000 level. To lower the electricity prices by increasing the conversion efficiencies while simultaneously lowering emissions, the government envisages transforming the existing carbon tax into a tax on actual emissions. This is expected to facilitate the conversion from oil to gas and "cleaner" coal combustion technologies for electricity production.

In June 2002, Italy ratified the Kyoto Protocol. In December 2002, the CIPE approved the national action plan for the reduction of GHG emissions, the Revised Guidelines for National Policies and Measures Regarding the Reduction of Greenhouse Gas Emissions, containing the government's strategy to achieve Italy's emissions reduction target of 93 Mt by 2010 from the projected 2010 level (without using any measures). The national action plan is based on the "emissions trend scenario" and the "emissions reference scenario". Specific measures on the development of carbon sinks ("measures for the agricultural and forestry sectors") and a set of additional options for emissions reduction were also included in the national action plan.

The "emissions trend scenario" for 2010, "under current legislation", includes the following measures that have already been adopted:

- Minimum share (2%) of electricity production from new plants using renewable sources (Law 79/1999).
- Prime Minister Decree of 4 August 1999 launching the divestment of ENEL (15 000 MW), and the compulsory conversion of existing oil-fired thermal plants into natural gas combined cycle plants for about 10 000 MW.
- Increase in use of coal in power plants from 9% of TPES in 1990 to 14% in 2010.
- Ministry of Industry decrees of 24 April 2001 to increase end-use energy efficiency.
- Implementation of Law 449/1997 enabling tax exemption up to 41% of building retrofitting expenses, including renewable energy-based plants.
- Exemption from excise rates for the production of 300 000 tonnes per annum of biodiesel, as set forth in Article 21 of Law 388/2000.

Measures taken under the "emissions trend scenario" are expected to yield around 23 Mt CO₂ equivalent reductions, leaving a gap of 70 Mt CO₂ emissions reductions.

The measures presented in the “emissions reference scenario” are expected to reduce emissions by around 52 Mt CO₂ equivalent. This includes emissions reduction from measures already assumed in the “emissions trend scenario” (see Table 5). Other measures, such as those related to the transport sector and joint implementation (JI)/clean development mechanisms (CDM) have been newly added.

Table 5
Emissions Reductions in the “Emissions Reference Scenario”

	<i>Reduction (Mt CO₂ equivalent per annum)</i>
Electricity production	26.0
Gas combined cycle expansion (3 200 MW)	8.9
Import expansion capacity (2 300 MW)	10.6
Further growth of renewable electricity production capacity (2 800 MW)	6.5
Decreases on end-use energy efficiency	6.3
Transport	7.5
Buses and private vehicles running on low carbon density fuels (LPG, methane)	1.5
Traffic rationalisation and better fuel use in private transport through tax reformulation and computer-telematic traffic control systems	2.1
Development of national infrastructures and incentives for combined road transport and coasting navigation	3.9
Total domestic measures	39.8
Carbon credits from JI and CDM	12
Total measures	51.8

Source: CIPE deliberation, 19 December 2002.

Measures to enhance GHG absorption in the agricultural and forestry sectors are expected to reduce emissions by an additional 10.2 Mt CO₂ equivalent. These measures include the implementation of programmes and initiatives aimed at increasing the quantity and improving the management of forest areas and woodlands, reclaiming of abandoned territories and protecting ecologically vulnerable territories that face instability or desertification risks:

- Management of existing forests.
- Re-vegetation of farmlands and grazing lands.
- Natural reforestation.
- Afforestation and reforestation in existing woodlands, in new areas and in areas subject to hydro-geological instability risks.

To fill the remaining gap (between 30 to 60 Mt CO₂ equivalent) to reach the Kyoto target, additional emissions reduction options have been defined. A first assessment of these mitigation options identifies a "package" of measures and projects corresponding to a reduction of 50 Mt to 60 Mt CO₂ equivalent (see Table 6), performed on the basis of:

- Least net cost criteria.
- Opportunities for the development of new initiatives in the energy technology sector.
- Opportunities available at the international level to open new markets to Italian companies.

On 30 October of every year, on the basis of the analysis carried out by the Technical Committee on Greenhouse Gas Emissions (CTE), the Ministry for Environment and Territory will propose to CIPE the adoption of additional measures necessary to comply with the Kyoto target, taking into account the priority criterion of reaching the best result at the lowest cost.

Emissions inventories are implemented by the National Environment Agency (APAT), and are based on the European standard polluting emissions inventory system (CORINAIR). Following the establishment of the European Environment Agency, co-ordination with the European Topic Centre on Air Emission is beginning to speed up emissions evaluation, to extend the number of investigated pollutants, to update methodological tools and to develop guidelines for inventories. The national activities on inventories are supported using funds raised through the carbon tax.

The CIPE deliberation of December 2002 states that the Ministry for Environment and Territory must ensure the promotion and the co-ordination of the projects carried out in the framework of the Kyoto mechanisms. Law 120/2002 allocated €25 million per annum for the period 2002 to 2004 to support pilot projects, to enhance energy efficiency both domestically and internationally, to promote clean fuels and engines and to increase carbon sinks. By 2002, an additional €68 million per annum was allocated to support projects in the developing countries aimed at reducing GHG emissions and to promote adaptation to adverse effects of climate change.

OTHER ENVIRONMENTAL ISSUES

During the past few years, Italy introduced a wide range of measures to reduce CO₂ emissions and conventional pollutants¹⁴ and made significant progress in

14. This chapter focuses on energy and climate change policies. However, Italy suffers from a number of environmental problems that are not exclusively linked to energy. For an analysis of policies to curb local air pollution, see *Environmental Performance Reviews - Italy*, OECD Paris, 2003.

Table 6

Additional Emission Mitigation Options

	<i>Potential reduction (Mt CO₂ equivalent per annum)</i>
A) DOMESTIC OPTIONS	
From energy use	
<i>Industrial sector</i>	
Replacement of industrial engines with high-efficiency engines with saving between 2 and 7.2 TWh	1.0 to 3.6
Replacement of transformers	1.0
Replacement of cooling and chilling units with saving of 1 TWh	0.5
Co-generation of small/medium-sized plants with production capacity between 10 and 20 TWh	0.8 to 1.5
Energy production from biogas generated by municipal waste and residues of agricultural and agro-alimentary processing equal to 750 to 1 300 MW	0.9 to 1.9
Waste recycling in cement industry	0.9 to 1.1
<i>Renewable energy production</i>	
Increase in electricity production from renewable sources between 500 and 1 200 MW	1.5 to 3.1
Diffusion of thermal solar energy	0.2
Research and development in photovoltaic with deployment of "niche" products	0.1
<i>Residential and tertiary sector</i>	
Extension of decrees on end-use efficiency (MICA 24/4/01) and regional measures with savings between 1.5 and 2.9 Mtoe per annum	3.8 to 6.5
<i>Agricultural sector</i>	
CO ₂ reduction from energy consumption	0.28 to 0.34
<i>Transport sector</i>	
<i>– Technological measures</i>	
Replacement of existing vehicles with low-consumption, low-emission vehicles (120 g CO ₂ per km) with savings between 1.5 and 2.5 Mtoe	3.5 to 6.0
Gains in energy efficiency for heavy transport means with savings between 0.1 and 0.3 Mtoe	0.3 to 0.8
Up to 5% blending of oil and biodiesel used as fuels for motor propulsion	4.0
Revision of tax calculation method for vehicles and correlation with periodical overhauls	1.3
<i>– Infrastructure</i>	
Reorganisation of urban traffic	0.8

	<i>Potential reduction (Mt CO₂ equivalent per annum)</i>
Promotion of regional railway networks and connections with exchange park areas	0.6
Urban mobility plans (PUM)	1.5 to 3.0
Telematic solution for transport	0.5
<i>- Research and development</i>	
Pilot projects for the utilisation of hydrogen-propelled and cell-combustion systems for energy production, for railcars and for car engines	0.1 to 0.3
Experimental development and use of materials enabling a reduction of vehicles and trains weight	0.2 to 0.6
Realisation and diffusion of direct-injection monofuel natural gas and monofuel GLP optimised engines	0.5 to 1.2
From other sources	
<i>Industrial sector</i>	
Reduction of N ₂ O emissions resulting from adipic and nitric acids production	6.2
<i>Agricultural sector</i>	
Reduction of CH ₄ emissions from manure management	0.15 to 0.83
Reduction of N ₂ O emissions from agricultural soils	0.46
<i>Waste</i>	
Stabilisation of the organic fraction	0.64
<i>Others (solvents, fluorinated)</i>	
Reduction of PFC emissions through aluminium recycling	0.05
Installation of abatement devices and adoption of low GWP substances in the production of semiconductors	0.02
Reduction of HFC leaks from mobile air-conditioners	0.65
Reduction of SF ₆ leaks from electrical equipment	0.04

B) JOINT IMPLEMENTATION AND CLEAN DEVELOPMENT MECHANISMS

Carbon removal

Jl projects	2.0 to 5.0
CDM projects	3.0 to 5.0

Projects in the energy sector

Jl project to improve the efficiency of electricity generation and industrial activities	3.0 to 10
CDM projects for the production of energy from renewable sources	1.0 to 5.0
CDM projects to improve the efficiency of electricity generation and industrial activities	1.5 to 3.0
Jl and CDM gas-flaring and gas-venting projects in oil wells	10.0 to 20.0

Source: CIPE deliberation, 19 December 2002.

improving air quality over the last ten years. While 1990 data are far from complete, the number of occurrences where measures of major pollutants (e.g. SO₂, NO₂, CO) exceeded air quality standards generally decreased. This principally reflects the huge progress in reducing emissions from power plants and the reduction of emissions of all common pollutants by industry, including SO_x, NO_x, CO₂, VOCs (volatile organic compounds) from solvents, dioxins and furans, and CO. Italy's progress also reflects significant, though insufficient, reductions in transport sector emissions of NO_x, CO, VOCs and lead, despite large increases in total vehicle-kilometres travelled. Although Italy has met several of its international commitments regarding air pollution, including those for SO_x in the Helsinki and Oslo Protocols and for NO_x in the Sofia Protocol, much remains to be done, especially in the transport sector. Many areas, such as urban areas, continue to have poor air quality, particularly with respect to ozone and fine particulate matter¹⁵.

SO₂, NO_x and VOC emissions from power generation plants with a capacity superior to 50 MW are capped (see Table 7) and Law 449/1997 of December 1997 introduced taxes on SO_x and NO_x emissions from the same plants, namely €53.20 per tonne of SO_x and €104.84 per tonne of NO_x. The decree of 23 November 2000 clarified fuel specifications for gasoline and diesel for transport use and the decree of 8 March 2002 provided new fuel specifications for combustion plants.

Italy has offered tax incentives to companies that produce cleaner fuels and fuel additives, anticipating several EC directives. Since Italy did not succeed in phasing out leaded gasoline by January 2000 as required in the EC directive, it was granted an additional two-year extension. A recent proposal to introduce tax incentives to accelerate the introduction of fuels meeting the Euro 4 Emission Standard of 50 parts per million sulphur content ahead of the 2005 deadline was rejected by the Ministry of Economy and Finance.

Table 7
Maximum Authorised Emissions (mg/Nm³) for Power Plants Exceeding 50 MW Capacity (P)

<i>Fuel</i>	<i>Pollutant</i>	<i>50 MW < P < 500 MW</i>	<i>P > 500 MW</i>
Solids and liquids	SO ₂	1 700	400
	NO _x	650	200
	VOC	50	50
Gas	SO ₂	35	35
	NO _x	650	200
	VOC	5	5

Source: Ministry for Environment and Territory.

15. Source: OECD, *ibid*.

CRITIQUE

Meeting the climate change mitigation target is a very challenging task for Italy. Despite its target to reduce GHG emissions by 6.5% between 1990 and 2008-12, energy-related CO₂ emissions have been growing gradually and were already 6.5% above the 1990 level in 2000. In 2002, the sectoral emissions reduction milestones determined by CIPE in 1998 had not been reached. The carbon intensity of Italy's economy measured as CO₂ emissions per unit of GDP has been maintained at a lower level than in other IEA member countries because of the country's specific features of high energy prices, a low energy-intensive industrial structure, a mild climate, etc. However, this advantage may not be maintained owing to lower energy prices resulting from market liberalisation, growing energy demand in transport and a share of coal in electricity generation that could grow in response to the requirements for fuel diversification.

It is commendable that the government approved the Revised Guidelines for National Policies and Measures Regarding the Reduction of Greenhouse Gas Emissions on 19 December 2002, containing further obligations and mitigation strategies with a view to achieving additional GHG reductions and established the CTE, composed of representatives from different ministries, to monitor progress and identify additional measures. As indicated in the guidelines, measures identified under the "reference emissions scenario" and the agriculture/forestry sectors are insufficient to achieve the reduction target of 93 Mt CO₂. Consequently, a set of additional measures was identified. In order to fill the remaining gap to meet the Kyoto target, on 30 October of every year starting in 2003, the Ministry for Environment and Territory will propose to the CIPE the adoption of the necessary additional measures. Unless Italy is able to implement these measures very quickly, both domestically and with full utilisation of Kyoto mechanisms, it is unlikely to achieve its GHG emissions reduction target. While additional options identified cover a wide range of areas, the difference between them and those already included in the reference scenario is not clear. Continuous monitoring of the progress of current measures and refining an additional strategy, if necessary, are also essential. The importance of cost-effectiveness analysis and monitoring should be reiterated, even if they are envisaged under the existing guidelines.

Italy is counting on VAs to reduce GHG emissions in the industrial sector. However, additional measures will need to be formulated and implemented to curb the emissions from Italy's large share of small and medium-sized enterprises. Given their important number, it may be difficult to work out VAs similar to those with large industries. A specific strategy will need to be considered, for example to disseminate energy efficiency technologies and measures to small and medium-sized enterprises, in addition to the general energy efficiency obligation. The transport sector also deserves particular attention in addressing GHG mitigation. The government's projection of

energy consumption in the transport sector between 2005 and 2020, showing an almost stable consumption, seems to be too ambitious given that the final energy consumption from transport significantly increased between 1990 and 2000. The existing climate change strategy is not seriously addressing these sectors.

Another important task for the government is the clarification of the future role of VAs in the forthcoming framework of the domestic emissions trading scheme, in line with the EU directive on emissions trading. For example, while domestic emissions trading would inevitably entail absolute caps for GHG emissions, ENEL's voluntary target is an intensity target, where total emissions could increase with the volume of electricity produced. Therefore, in certain circumstances, ENEL could be obliged to purchase emissions credits even though it fulfills its intensity target under the VA. This could have implications for the relevance of VAs.

It is a challenge for Italy to define the role of coal in the electricity sector, striking a good balance between climate change mitigation and energy security. More than 10% of the GHG emissions reduction is expected to come from the closure of aged coal-fired power plants being replaced by combined cycle gas turbine (CCGT) plants. This will increase the share of gas in the power sector to almost 50% by 2010, raising serious energy security concerns. Although gas appears to be available through that time period, mainly from Algeria, and possibly from new domestic gas developments, over-reliance on one fuel, much of which is imported, leaves Italy vulnerable to price shocks and/or supply disruptions. Alternatively, measures to diversify the fuel mix by increasing the share of coal in electricity production may have negative implications for GHG emissions if not accompanied with more efficient technologies. Although this diversification effort is carried out in the backdrop of a strong willingness to decrease the unit cost of electricity production by boosting conversion efficiency rates, coal is expected to double its share in electricity from 11% in 2000 to 22% in 2010. The effects of the use of coal on emissions will have to be clearly monitored.

RECOMMENDATIONS

The government of Italy should:

- *Implement the national action plan to reduce GHG emissions with least cost measures in order to fill the remaining gap to achieve the Kyoto target. Monitor the progress in reaching this target. Strengthen co-ordinated efforts for CO₂ emissions mitigation.*

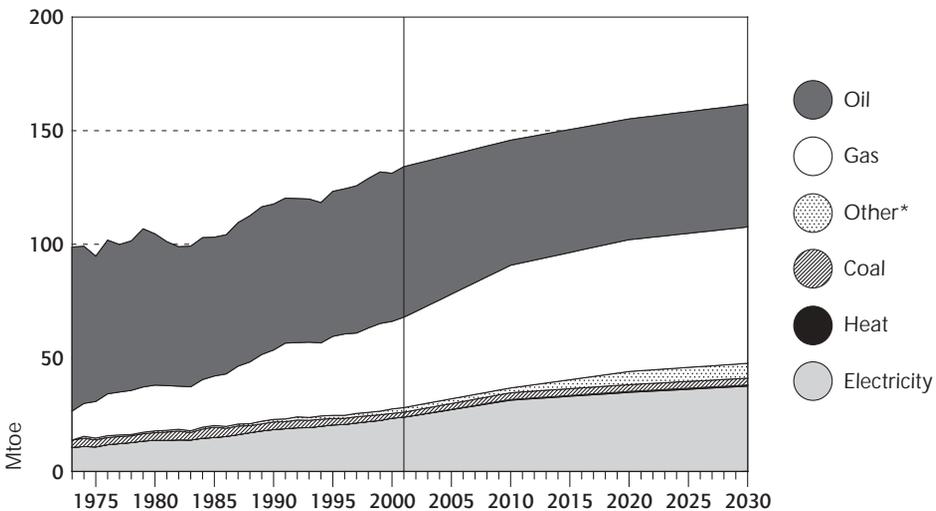
- ▶ *Reassess the contribution of voluntary agreements (VAs) to emissions reduction, taking into account the forthcoming EU emissions trading system.*
- ▶ *Monitor and analyse the effects on emissions of the planned increase in coal use for electricity generation, the changes in carbon tax design/structure and the projected end-use energy price changes.*
- ▶ *Strengthen the strategy to disseminate energy efficiency technologies and measures to small and medium-sized enterprises.*

ENERGY CONSUMPTION

In 2001, total final consumption of energy (TFC) in Italy amounted to 134 Mtoe. Since 1990, it has shown a slight efficiency gain and has grown marginally faster than total primary energy supply (TPES), 1.3% versus 1.2% per annum respectively.

Figure 8

Total Final Consumption by Source, 1973 to 2030



* includes solar, wind, combustible renewables and wastes.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

This is due in particular to the rapidly increasing use of natural gas, for electricity production and residential use, which is boosting efficiency especially in electricity production. Italy's TFC is dominated by oil and gas, which currently represent 80% of TFC. In 2001, electricity represented 18% of TFC.

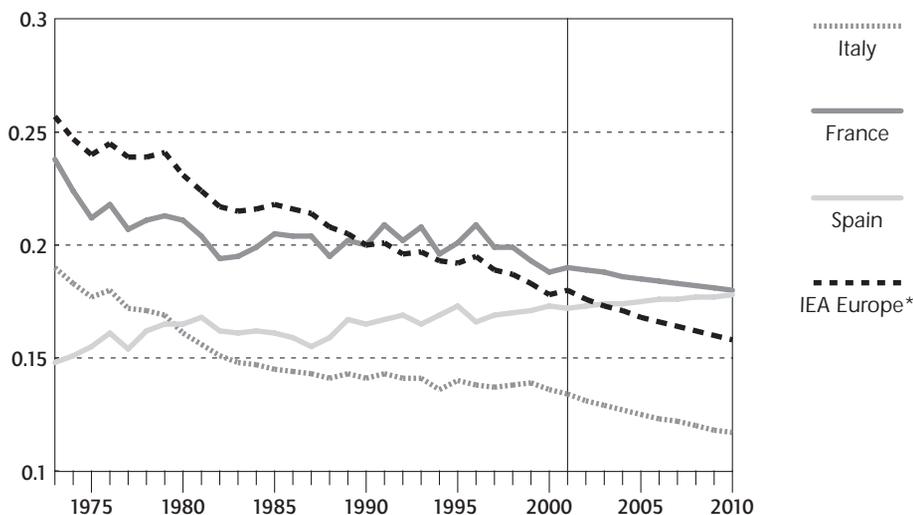
Italy's TFC is currently divided into three relatively equal shares between industry (34% and 46 Mtoe), transport (32% and 43 Mtoe) and other sectors (33% and 45 Mtoe). In the future, the government projects faster growth in industry and other sectors than in transport. In 2010, TFC from industry is expected to be 14% higher than in 2000, at 53 Mtoe. Similarly, other sectors

– in which residential consumption represents the largest share – are expected to see TFC grow by 22% to 52 Mtoe. The government considers that the transport sector has an important energy efficiency potential. Consequently, this sector’s TFC is expected to remain stable in the coming decades or even to decrease by around 3% between 2000 and 2010 to reach 41 Mtoe in 2010¹⁶.

Italy has one of the lowest energy intensities amongst IEA member countries when measured as a ratio of energy supply to GDP¹⁷. Energy intensity continues to decrease slowly. Low energy intensity is the result of energy efficiency efforts, but also of relatively high energy prices and Italy’s specific features, such as a mild climate and an industrial structure comprising a majority of small industries with low energy intensity. Most energy-intensive goods consumed in Italy are imported.

Figure 9
Energy Intensity in Italy and in Other Selected IEA Countries,
1973 to 2010

(toe per thousand US\$ at 1995 prices and purchasing power parities)



* excluding Norway from 2002 to 2010.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; *National Accounts of OECD Countries*, OECD Paris, 2003; and country submissions.

16. In contrast, projections used by governments in neighboring countries generally display positive growth in TFC from the transport sector between 2000 and 2010. E.g.: Spain +45%, France +18%, Germany 0% and Switzerland +1%.

17. In 2000, Italy’s TPES per unit of GDP (US\$ 1995 purchasing power parity) was 0.14, against 0.18 on average in the European Union and 0.23 on average in all IEA member countries.

Table 8

Sectoral Indicators of Energy and Electricity Intensity, 1995 and 1999

<i>Energy intensity (toe/eurolire million 1995) *</i>	<i>1995</i>	<i>1999</i>	<i>Change</i>
Agriculture and fisheries	116.1	101.7	-12.4%
Manufacturing industry	187.5	195.4	4.2%
Transport	40.2	41.1	2.2%
Services	17.1	19.3	12.9%
Residential	48.4	43.1	-11.0%
<i>Electricity intensity (MWh/eurolire million 1995)</i>	<i>1995</i>	<i>1999</i>	<i>Change</i>
Manufacturing industry	429.1	482.1	12.4%
Services	78.8	87.9	11.5%
Residential	104.1	100.7	-3.3%

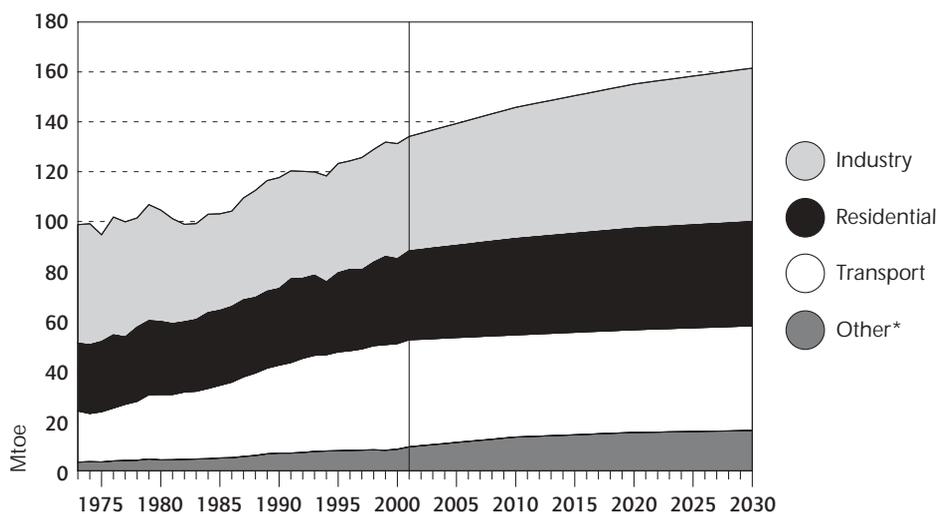
* Eurolire is a term coined by *Istituto Nazionale di Statistica* (ISTAT) to refer to Italian lire converted to euros before the currency change, using a fixed exchange rate of lire 1 936.27 for one euro. Values are expressed in constant 1995 prices.

Source: ENEA, 2002, *Rapporto Energia e Ambiente*, Vol. 2, Roma.

Major work on the development of energy efficiency indicators has been carried out by the National Agency for New Technology, Energy and Environment (ENEA) within the framework of the "Energy and Environment Statistics"

Figure 10

Total Final Consumption by Sector, 1973 to 2030

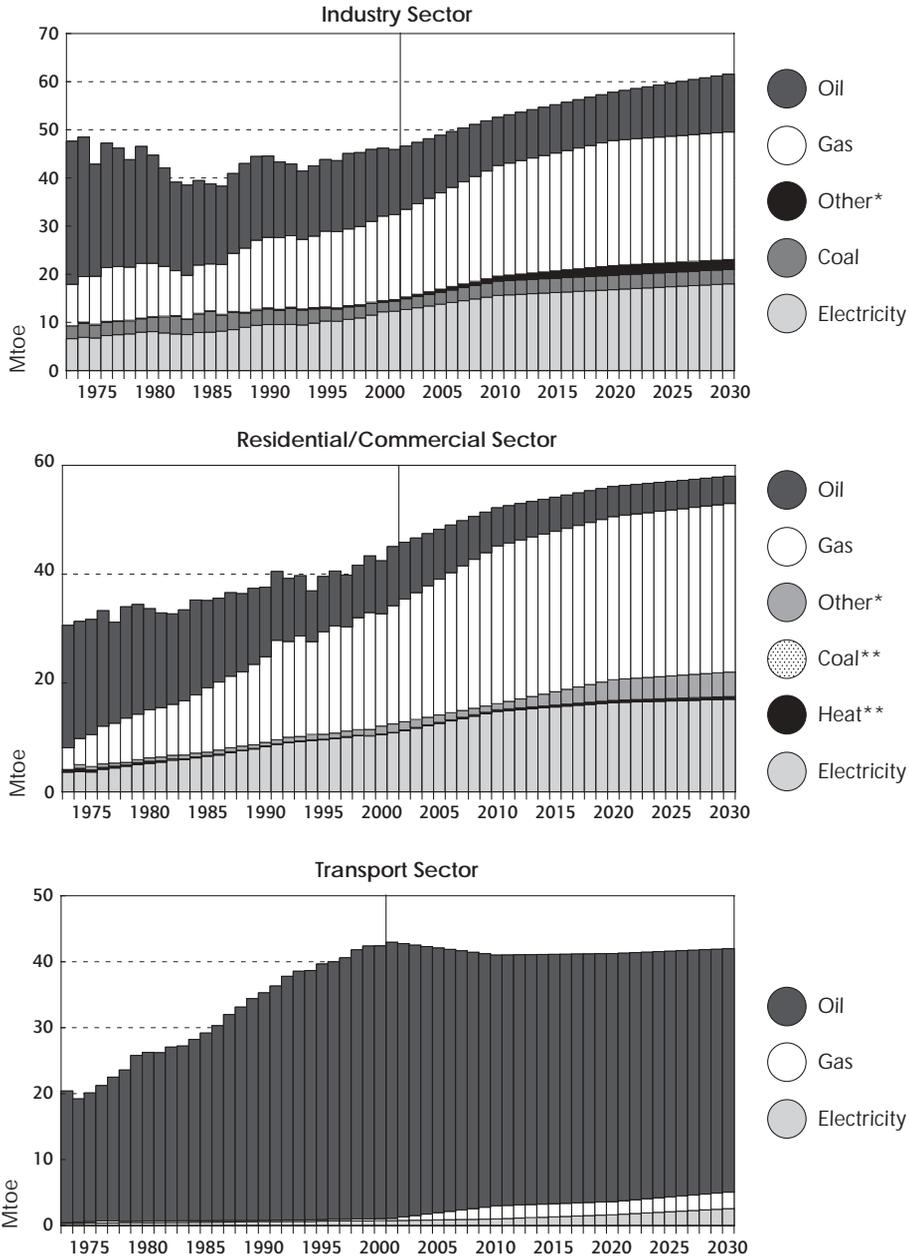


* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

Figure 11

Total Final Consumption by Sector and by Source, 1973 to 2030



* includes solar, wind, combustible renewables and wastes.

** negligible.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

project conducted with the National Statistics System (SISTAN). Two general indicators are normally used to characterise overall energy efficiency trends, namely primary energy intensity and final energy intensity. The ENEA methodology weighs sectoral TFC with corrective factors, such as yearly climatic fluctuations, inflation, share of industrial output, technological innovation, etc. Sectoral figures confirm the growing intensity of the services and manufacturing sectors. They also show a strong, but efficient, diffusion of the use of electricity in households as the reduction of electricity intensity of households is much lower than the decrease in their aggregate energy intensity.

ENERGY EFFICIENCY AND CONSERVATION POLICIES¹⁸

Italian energy efficiency and conservation policies have long been based on the implementation of minimum standards for equipment and appliances (also transposing EC directives into the Italian framework). VAs, supported by incentives, have recently become an expected source of potential gains. High energy end-user prices also contributed to the relatively lower energy consumption per unit of value added. In the context of the implementation of legislative decrees to transpose the EC directives on the electricity and natural gas markets, Italy experimented with a new tool to promote energy efficiency in final uses, introduced by the ministerial decree of 24 April 2001. While continuing the minimum standards policy, obligations have now been placed on electricity and natural gas distributors to achieve energy efficiency targets in final uses through interventions that, without reducing service quality standards, decrease the consumption of primary energy.

Table 9

Cumulative Energy Saving Targets for Electricity and Gas Distributors (Mtoe)

<i>Year</i>	<i>Electricity distributors</i>	<i>Natural gas distributors</i>
2002	0.10	0.10
2003	0.50	0.40
2004	0.90	0.70
2005	1.20	1.00
2006	1.60	1.30

Source: Ministry of Productive Activities.

18. See also IEA, *IEA Energy Efficiency Update*, Italy: <http://www.iea.org/pubs/newslett/eneeff/it.pdf>

The energy efficiency targets are differentiated at the distributors' level in proportion to the energy they distribute. The ministerial decree outlines a set of typical actions, such as substitution of existing appliances with more efficient ones, optimal management of energy consumption, building insulation or the use of heat produced by renewable energy sources. Electricity and gas distributors can choose the sector in which they apply efficiency-increasing measures as long as they reach at least 50% of their target through savings achieved in their sector.

To achieve their targets, distributors use a mechanism similar to the green certificates for renewables (see Chapter 6 on renewable energy). Distributors can either save energy themselves, or purchase energy efficiency certificates produced by projects carried out by energy service companies. The project costs are partially reimbursed by applying a specific charge to electricity and gas tariffs and by the sale of energy efficiency certificates.

The Energy Authority produces the guidelines for the preparation and implementation of efficiency projects. The guidelines define methods to measure the energy savings achieved, certify the energy savings to produce certificates and define the costs that can be charged in the electricity and gas tariffs as part of the energy distributors' energy saving efforts. The Energy Authority verifies the conformity of projects *ex post* and the compliance of distributors with the target *ex post*. It also defines the penalty for non-compliance with the target.

Specific functions are assigned to regional authorities that, in some cases, decide their own targets (whilst maintaining the overall national targets) and can specify sectors in which they would prefer to see savings achieved. The Energy Authority has to work out specific agreements with the regional authorities to verify the achievement of the targets.

Although the scheme has a large potential for enabling energy savings at least cost, it has yet to show significant results, mainly owing to the complexity of its administration that has delayed its implementation. Consequently, binding targets will probably only be implemented from 2004, after the Energy Authority approves the technical rules.

INDUSTRY

With the exception of 1998, industry's energy consumption has grown continuously in the last five years at 1.6% per annum. This trend is valid for almost all the industrial branches, but in particular for the construction, chemistry and food industries. On the other hand, the metallurgical and petrochemical industrial sectors have displayed slower growth or even decreases. The government foresees industry's consumption to continue to grow at the annual rate of 1.1% until 2030.

While industry recorded fairly substantial energy savings (about 14 Mtoe) from 1971 to 1995, no significant savings can be observed since then (a gain of about 0.1 Mtoe per annum). This is partly because of a slight expansion of the value added by energy-intensive industry and partly the result of a period of lower oil prices before 1999, which provided a reduced incentive to save energy, and an increasing marginal cost of energy efficiency measures. According to the IEA, the aggregate energy intensity of Italy's manufacturing industry has been decreasing at a slow rate of -0.7% between 1990 and 2000, and increasing in the second half of the 1990s (see Table 8).

Energy managers are responsible for energy saving in individual companies. In 1991, Law 10/1991 "Regulations for the Implementation of the National Energy Plan with regard to the rational use of energy, energy saving and the development of renewable energy sources" imposed that energy managers are mandatory in industrial companies that consume more than 10 000 toe per annum and in commercial, public and transport companies that consume more than 1 000 toe per annum. Energy managers can also operate within an Energy Saving Company (ESCO) to identify, plan, manage and eventually finance energy saving projects. The FIRE association (Federazione Italiana per l'uso Razionale dell'Energia) represents a group of around 2 000 Italian energy managers. The FIRE web site (<http://www.fire-italia.it>) contributes to defining efficiency indicators and serves as a project facilitator.

The bulk of energy efficiency is expected to come from the above-mentioned efforts to implement the saving obligation imposed on electricity and gas distributors. Since ESCOs are an obvious choice for the energy distributors to find support in designing and implementing energy saving projects and achieving the efficiency obligation, the number of ESCOs is likely to grow significantly from their present number of 24.

The VA signed in July 2000 by ENEL, the Ministry of Productive Activities and the Ministry for Environment contains a demand-side management (DSM) component, with particular emphasis on the following:

- Supplying energy services after the meter.
- Increasing efficiency in electrical end-uses.
- Optimising energy consumption in public lighting.
- Developing and disseminating electrical equipment and technologies.
- Defining agreements with ENEL's suppliers to produce and employ low GHG emissions products and equipment.

TRANSPORT

The Ministry of Infrastructure and Transport is responsible for Italy's transport sector. From 1990 to 2001, passenger and goods traffic grew regularly, along with the corresponding TFC, which increased by 21% from 35.3 Mtoe to 42.9 Mtoe. In 2000, road transport and passenger transportation accounted for 88% and 68% respectively of the bulk of final transport energy consumption. The share of road transport is higher than the IEA member country average of 80%.

Between 1990 and 2000, the intensity of transport activities improved at 2.2% per annum on average for road freight and 1.5% for passenger road transport¹⁹ (see Table 8).

Italy displays other specific features. Cars are relatively small, a factor which benefits energy efficiency. The number of liquefied petroleum gas (LPG) fuelled vehicles is higher than in many other IEA member countries, explaining why 34% of total LPG consumption is for transport, against 8% on average in IEA member countries in 2000. Italy also has the world's second-largest vehicle fleet using compressed natural gas (CNG), with more than 300 000 vehicles. Despite a global increase in traffic volumes, rail transport's share in extra-urban passenger mobility fell from 9% to 7% in the period 1990 to 2000. Freight transport is overwhelmingly carried out by road and only marginally by rail. Despite Italy's important coastal development, the maritime transport option is often neglected.

The General Transport Plan (PGT), revised every three years, sets out national transport objectives. Based on this plan, regional and municipal authorities develop their own Regional Transport Plans (PRT), Urban Traffic Plans (PUT) and Urban Mobility Plans (PUM). Companies with over 300 employees must draw up mobility plans. The 1994 PGT aimed to reduce environmental impacts and other negative externalities of the transport sector. The 2001 PGT reiterates many of the 1994 objectives, with targets to fill the gap between transport supply and demand and targets to improve economic efficiency and environmental effectiveness. These objectives are expected to be attained through a combination of the following actions:

- Infrastructure development.
- Privatisation of transport services at municipal level and improved logistics.
- Promotion of environment-friendly vehicles and modes of transport.
- Management of transport demand.

19. Source: IEA indicators of energy use for Italy. Calculated using MJ/tonne of freight-km for freight truck energy intensity and litres of gasoline per 100 km for passenger car fuel intensity.

- Application of Strategic Environmental Assessment (SEA) to the definition of priorities, plans and infrastructure programmes.
- Measures responding to the specific needs of southern Italy are also foreseen.

In 1996, government incentives were introduced to progressively eliminate old cars and reduce the share of vehicles bought before 1990 to 75% by 2000. Combined with incentives for low-emissions vehicles, they have resulted in the renewal of the car fleet and reductions in air emissions. By 2000, the proportion of old passenger cars had fallen to 37.2%. The share of cars equipped with catalytic converters increased from 8.5% in 1992 to almost 50% in 2000. However, the number of cars in use and the average engine size have increased. The share of trucks (50.8%), buses (60.9%), and two-wheelers (56.6%) over ten years old remains high. In the period 2001 to 2003, the Ministry for Environment invested €7.7 million per annum to support individual purchases of new electric, CNG or LPG vehicles and the retrofitting of cars with LPG or CNG.

The government has taken measures to tackle the air emissions from the large number of two-wheelers in cities. A VA signed in November 1999 between the Ministry for Environment, the Ministry of Infrastructure and Transport, municipalities and the motorcycle industry was intended to promote two-wheeled electric vehicles and speed up the renewal of the fleet, with an obligation on new vehicles to comply with the Euro 2 Emission Standard (100% of new two-wheelers by July 2003), anticipating the compliance dates of the 1997 EC directive.

Italy applies a tax on vehicles proportionate to the engine size and equal to €2.58 per kW per annum, except in Veneto (€2.84 per kW) and Marche (€2.79 per kW). The tax is proportionately higher for polluting vehicles and lower for cleaner ones (see Table 10).

Table 10
Vehicle Taxes

<i>Fuel/supply</i>	<i>Unleaded gasoline or eco-gasoil (EC Directive 91/441/EC and following)</i>	<i>Gasoil (non eco)</i>	<i>Hybrid gasoline/natural gas or gasoline/LPG</i>	<i>Electrical (first 5 years)</i>	<i>Electrical (after 5 years)</i>	<i>Natural gas or LPG (EC Directive 91/441/EC and following)</i>
€ per kW per annum	2.58	7.82	2.58	0	0.65	0.65

Source: Ministry of Infrastructure and Transport.

Fuel tax exemptions and refunds are granted to commercial transport, civil and military aviation, agriculture and the fishing industry. Commercial diesel fuel is exempt from VAT. Heavy goods vehicles are granted an additional reduction on the price of diesel of about €0.09 per litre. For a long time Italy opposed the EU plan for a tax on energy products, which could lead to the elimination of tax exemptions benefiting road freight transport, until EU member States came to an agreement at the beginning of 2003.

RESIDENTIAL AND COMMERCIAL SECTORS

Energy consumption in the commercial and public services sectors has been growing rapidly (4% per annum between 1990 and 2000), although the volume – 5 Mtoe in 2000 – is far less than that of the residential sector – 34 Mtoe in 2000. Residential consumption accounts for more than 70% of energy consumption in the residential and commercial sectors and has been growing slowly at around 1% per annum since 1990. While Italy's final commercial consumption is almost entirely satisfied by electricity, 60% of residential consumption came from natural gas in 2000. Subsequently, the energy intensity of commercial activities has been deteriorating, increasing at a rate of 2% per annum on average between 1990 and 2000²⁰ (see also Table 8).

However, some efficiency gains are still obtained but at a much slower rate than before. Using space heating per square metre per degree-days as a measure of the energy efficiency of residential energy consumption demonstrates a strong decrease until 1994, and a very slight decrease thereafter. Despite what could be an increasing difficulty to achieve significant efficiency gains, as in many other European countries, technical potential for further efficiency improvements in the Italian residential sector is considered to be important²¹.

The energy-saving technical requirements for household appliances have been set implementing EC directives. Italy has transposed all of the existing energy efficiency-related EC directives.

Law 10/1991 and the subsequent Presidential Decree 412/1992 implemented numerous energy efficiency regulations in buildings and provided rules for the design, installation and operation of thermal systems in buildings. Law 10/1991 also set technical and constructive criteria for new public and private buildings, as well as for restorations. The implementation of the December 2002 EC directive on the energy performance of buildings

20. Source: IEA indicators of energy use for Italy. Calculated using TFC per unit of service sector GDP (MJ/US\$ 1995 purchasing power parity).

21. See the results of the EURECO project carried out within the EC SAVE Programme (perso.club-internet.fr/sidler/Eureco_A.pdf).

Table 11

EC Directives on Energy Efficiency Transposed into the Italian Legal Framework

<i>Object</i>	<i>EC directive</i>	<i>Acceptance date</i>	<i>Norm</i>	<i>Italian legal transposition</i>
Information on energy consumption	92/75/EC	1/1/1994	-	Presidential Decree 107/1998 of 9/3/98
Refrigerators and freezers	94/2/EC	1/1/1995	EN 153	Ministerial decree of 2/4/98
Washing machines	95/12/EC 96/89/EC	1/4/1996 15/5/1997	EN 60456	Ministerial decree of 7/10/98
Drying machines	95/13/EC	1/4/1996	EN 61121	Ministerial decree of 7/10/98
Washing-drying machines	96/60/EC	1/8/1997	EN 50229	Ministerial decree of 7/10/98
Dishwashers	97/17/EC 99/9/EC	1/7/1998 28/2/1999	EN 50242	Ministerial decree of 10/11/99
Lamps	98/11/EC	1/7/1999	-	Ministerial decree of 10/06/01
Fluorescent lamps	2000/55/EC	21/11/2001	EN 50294 EN 60920	Ministerial decree of 2002

Source: Ministry of Productive Activities.

(2002/91/EC) will provide a new framework to establish a methodology for energy efficiency in buildings, including minimum efficiency requirements, priority use of renewables and co-generation as well as the introduction of energy certification.

Although the energy savings targets within the efficiency obligation policy are defined nationwide, regional authorities are entirely responsible for conceiving and funding specific programmes to promote energy efficiency as well as for assisting local authorities in implementing these programmes.

CRITIQUE

Italy's energy intensity measured as a ratio of TPES to GDP is one of the lowest in OECD member countries. This is not only due to the industrial structure that comprises few heavy energy-intensive industries, but is also a consequence of the climatic factors and higher energy prices affecting energy consumption. Although Italy has the normal range of energy efficiency programmes commonly found in other IEA member countries (*e.g.* standards, labelling, VAs,

etc), it has been relying heavily on the transposition of EC directives into national law as the main policy measures to improve efficiency. More accompanying policies may be required if Italy wants to retain its advantage of relatively low energy intensity.

While this impressively low energy intensity is commendable, it is imperative to identify to what extent it has been achieved through current energy efficiency policy efforts rather than the structural factors described above. Given that market liberalisation will bring about significant change in the Italian energy sector, factors underlining low energy intensity, such as high energy prices, might change and thereby affect future energy consumption patterns. This is a concern for all sectors, but even more for sectors where significant deterioration of energy efficiency is observed, such as the commercial sector.

In order to achieve the Kyoto target, Italy needs to adopt additional policies and measures, including additional energy efficiency improvement, especially given that the government expects the share of coal in the electricity sector to be increased for energy diversification. Further promotion of energy efficiency is a challenging task because the marginal costs of efficiency increases could be higher owing to the already low energy intensity. It is therefore crucial to analyse the cost-effectiveness of the various energy efficiency measures to take the least-cost approach.

Given the regional authorities' major role in implementing energy efficiency policies, information-sharing on energy policy "best practices" should be further strengthened among the regional authorities and the government. The role of ENEA could be enhanced in this context.

According to government projections, TFC in the industry and residential sectors will continue to grow in the coming decades (at around 1.5% to 2% per annum), whereas TFC in the transport sector is expected to stagnate. This seems unlikely given that TFC from transport increased by 21% between 1990 and 2000. For its consumption to stabilise, the transport sector would need to undergo a significant transformation, combining large investments in railways, which would boost electricity demand but could reduce diesel consumption for trucks; a large shift to diesel vehicles, since their unit consumption is lower compared to gasoline consumption; and an important increase in the use of alternative motor fuels, such as biofuels, natural gas and LPG. Otherwise, consumption in the transport sector can only grow in the coming decade, following the development of intra-European trade and exchanges. Co-ordination among the relevant ministries (Productive Activities, Environment, Economy and Transport) needs to be enhanced in order that energy efficiency objectives can be better integrated in the transport policy. A large share of old cars in the transport sector is a matter of concern, as is the trend displaying a strong growth in road freight. The elimination of old vehicles and the introduction of new vehicles should be

promoted through regulatory and economic measures. Periodic inspection should be effectively utilised. The current tax exemptions on fuel for sectors such as commercial transport should be reviewed to see how they are affecting fuel consumption and the replacement of old vehicles. More investments to improve the quality and the quantity of collective urban transport are also required.

In 2001, in addition to the existing efficiency standards, the government introduced and defined for each year up to 2006 energy saving obligations for electricity and natural gas distributors. The range of actions that the distributors can undertake were outlined by the government. The cost of the efficiency measures is partially borne by an additional charge on the price of gas and electricity. The new energy efficiency certificate scheme will be introduced to achieve this obligation in a cost-effective manner. The regulator approves energy efficiency projects presented and implemented by ESCOs and the electricity and gas distribution companies, and issues the certificates to reflect achieved energy savings. This approach has the potential advantage to achieve certain energy efficiency targets in a most cost-effective manner. However, details that need to be finalised before this new scheme becomes operational include how to verify the net effect of the energy savings from the approved projects, who will monitor and verify the savings, how to minimise the administrative cost and how energy certificate trading, green certificate trading and emissions trading can fit together.

Given the expansion of external trade and intra-European trade, a number of cost-effective energy efficiency improvements can be obtained by the implementation of standards and regulations defined at European level. Italy has a strong role to play in European co-operation to define these standards. Italy's manufacturing industry is producing a number of the appliances being used by households and small to medium-sized enterprises throughout Europe. In this context, Italy needs to take a leading role in promoting the development of more ambitious standards and efficiency measures, such as labelling, especially since such standards are a source of competitiveness for the industry worldwide.

RECOMMENDATIONS

The government of Italy should:

- ▶ *Monitor and evaluate the impact and cost-effectiveness of existing and new energy efficiency policies with a view to maintaining low energy intensity in the changing energy market environment.*
- ▶ *Promote effective co-ordination between the regional authorities and the government in all areas of energy efficiency. Facilitate sharing of best practices*

among the regional authorities and the government through information dissemination by ENEA.

- ▶ *Integrate energy efficiency objectives in pursuing the transport policy, in areas such as modal shift and transport infrastructure development, through enhanced co-ordination among relevant ministries (energy, environment, finance and transport).*
- ▶ *Accelerate the elimination of old vehicles and promote more efficient low-emission vehicles, in particular trucks, buses and two-wheelers through regulatory (e.g. periodic inspection) and economic measures (e.g. tax incentives, review of tax exemptions on fuel for commercial transport).*
- ▶ *Decrease the share of individual road transport in urban areas through efforts to boost the quantity and quality of collective transport.*
- ▶ *Finalise details of the energy efficiency certificate as soon as possible, implement it and review it periodically. Publish information on the results and impacts of the scheme as early as possible to keep energy policy stakeholders, both inside and outside Italy, informed about the unfolding of this policy experiment.*
- ▶ *Actively participate in co-operation at EU level in setting efficiency performance requirements for energy labelling and energy performance standards for appliances, equipment and buildings.*

OVERVIEW

In 2000, despite a significant potential for renewable energy, this energy source represented only 5.4% of TPES, less than the IEA members' average of 6.1%. Hydroelectricity amounted to 2.2% of TPES (3.8 Mtoe), similar to the IEA member countries average. Geothermal energy amounted to 3.1 Mtoe (1.8% of TPES), biomass and waste to 2.2 Mtoe (1.3%) and solar and wind energy to 0.1 Mtoe (0.1%). Italy is the fourth-largest producer of geothermal energy in the IEA. In 2000, Italy produced 52 TWh of power from renewable energy sources; 44.2 TWh of hydroelectricity and 4.7 TWh of geothermal energy. Wind power production represented 1.12 TWh in 2002 (with 744 MW of installed capacity); between 1997 and 2001 wind power capacity grew sixfold. This sustained growth slowed down in 2002, with less than 100 MW of wind power being installed.

On 6 August 1999, the Inter-Ministerial Committee for Economic Planning (CIPE) approved the "White Paper for the Valorisation of Renewable Energy Sources" defining the government's policies to gradually integrate renewables into energy markets. The White Paper defines a 5% target for the share of non-hydro renewables in TPES in 2010, to be reached gradually, from 3.1% in 2000. This objective will contribute to mitigating GHG emissions, as defined by the CIPE resolution dated 19 November 1998 (Resolution 137/1998 approving the "Guidelines for National Policies and Measures Regarding the Reduction of Greenhouse Gas Emissions"). Current renewable energy development is in line with the 1999 target. A new CIPE resolution of December 2002 confirms the overall renewable energy target but prepares the way for flexible mechanisms under the Kyoto Protocol to be used to achieve the national renewable energy target.

The Ministry for Environment and Territory Decree 337/2000 of 20 July 2000, "Regulations for the use of financial resources deriving from the application of the carbon tax", allocated €150 million to be used for programmes to reduce GHG emissions: approximately €80 million for financing regional efforts in particular to increase renewable energy production; approximately €26 million for financing investments in renewable energy and €43 million for financing renewable energy research.

ELECTRICITY

The White Paper foresees an increase in electricity generation from renewables from 46 TWh in 1997 to 76 TWh (6.5 Mtoe) by 2010, augmenting installed capacity from 17 100 MW in 1997 to 24 700 MW. Out of the 7 600 MW of

additional capacity, 2 819 MW are expected to come from biomass, 2 381 MW from wind and 1 869 MW from hydro²². CIPE's projections are in line with the EU target of 22% electricity from renewable energy sources (EC Directive 2001/77/EC). The government expects that this will engender savings of around 24 Mt CO₂ equivalent GHG emissions, compared with emissions resulting from an equivalent growth in conventional power.

Table 12

Renewable Electricity Capacity and Production

Technology	Present situation				Forecast of the White Paper					
	1997	1997	2001	2001	2002	2002	2006	2006	2010	2010
	MW	TWh	MW	TWh	MW	TWh	MW	TWh	MW	TWh
Hydro										
> 10 MW	13 942	33.47	14 493	38.20	14 300	34.32	14 500	34.8	15 000	36
Hydro										
< 10 MW	2 187	8.12	2 233	8.70	2 400	8.88	2 600	9.62	3 000	11.1
Geothermal	559	3.90	573	4.50	650	4.78	700	5.14	800	5.9
Wind	119	0.12	664	1.20	700	1.40	1 400	2.80	2 500	5
Solar	16	0.01	16	0.01	25	0.03	100	0.11	300	0.3
Combustible renewables and wastes	281	0.82	740	2.60	730	4.03	1 300	7.30	3 100	17.8
Total	17 104	46.44	18 719	55.30	18 805	53.44	20 600	59.77	24 700	76.1

Sources: CIPE, *White Paper for the Valorisation of Renewable Energy Sources*, 1999; L. Barra, "Il mercato dei certificati verdi", *QualEnergia*, 1/2003.

Italy's major initial support measure for renewable energy has been the fixed feed-in tariff scheme introduced in 1992 (based on the Inter-Ministerial Committee on Price Decision, CIP 6/92). The feed-in tariffs were defined on a project basis and were differentiated by technology and producer. They vary from about €0.1 per kWh for small hydro (less than 3 MW, run-of-the-river), to about €0.12 per kWh for wind and about €0.17 per kWh for geothermal electricity. Feed-in tariffs apply for the initial eight years of production and are expected to decrease to around €0.07 per kWh thereafter. Feed-in tariffs were applied to projects proposed before 30 June 1995 to ENEL, which was

22. This corresponds to a 35% capacity availability factor on average for renewables, which seems a reasonable rate for electricity production in which the relatively low factor wind electricity is compensated by a significant share of combustible renewables and wastes that display a higher capacity availability factor.

mandated to manage the scheme. No specific support mechanisms were implemented for projects initiated between 1995 and 1999; however, the impact was considered negligible by the government as very few new proposals were presented during this period. The lengthy authorisation process and construction time also meant that investors concentrated on building projects proposed before 1995.

In 2002, the government introduced a renewable energy obligation associated with green certificates to increase the cost-effectiveness of public support for renewable energy development and to stimulate further investments in electricity production from renewable energy sources (Decree 79/1999). Transitional arrangements were made for projects with applications for feed-in tariffs, which have been presented since 1999, so that they may also be eligible for the green certificate scheme from 2002. Since 2002, companies importing or generating electricity from non-renewable sources exceeding 100 GWh per annum are obliged to supply a minimum 2% of their total electricity imports or generation from renewable energy sources produced from greenfield projects²³. The obligation is planned to increase gradually from 2% in 2002 to 2.35% in 2005, 2.7% in 2006 and 3.05% in 2007. Further increases are being discussed in Parliament. Before 31 December 2005, the Ministry of Productive Activities could establish a further increase for the period 2008 to 2010, and before 31 December 2008, for the period 2011 to 2013. Electricity generated from a renewable energy source has priority access to the transmission grid.

The renewable energy obligation does not distinguish between various renewable energy sources; the choice of source is left to operators based on market principles. This obligation can be fulfilled through the trading of green certificates between electricity producers using renewable sources of energy and importers or generators using conventional energy sources. Operators that do not comply with the obligation receive a warning from the Energy Authority and, in the most serious cases, see their participation in the electricity market restricted and are obliged to pay financial penalties. Green certificates are issued by the electricity transmission system operator, GRTN (see Chapter 9 on electricity). The green certificate system has only been fully operational since its pilot phase ended on 25 March 2003. In 2002, around 0.9 TWh were certified and green certificates were traded at around €0.08 per kWh.

Other support mechanisms are either technology-specific or involve direct financial support. This is the case for photovoltaics (PV), which were allocated approximately €100 million by the Ministry for Environment and Territory to stimulate its diffusion in a context of limited sources of capital to develop PV

23. Including electricity from large hydroelectric plants. Italy's potential for large hydroelectric plants is considered to be saturated.

projects and slow growth since 1997. In 2002, 1.3 MW PV systems were installed; 22 MW are expected to be operating at the end of 2004. For the coming years, no additional capital support is foreseen by the government. Instead, the Ministry of Productive Activities is working on the possibility of a specific feed-in tariff proposal for PV, to be included in the forthcoming decree adopting EC Directive 01/77/EC, to be approved before October 2003. Finally, PV systems in buildings can avail of white certificates under the energy efficiency decree of 24 April 2001 (see Chapter 5 on energy efficiency).

BIOFUELS AND HEAT

The 2001 budget law provided an incentive to biofuels through the exemption of excise duties over a three-year period. The total amount exempted over this period was over €300 million, for a quantity of approximately 1 Mt of biofuels. This programme was subsidised by the government and was therefore subject to EU approval. In May 2002, the biodiesel programme was approved, absorbing around 80% of the total incentives provided for biofuels.

Combined heat and power (CHP) plants that produce heat using renewables can obtain green certificates and energy efficiency certificates based on useful heat produced (in addition to the green certificates they can obtain for their electricity production), under the ministerial decrees of 24 April 2001 that introduce energy efficiency targets (see Chapter 5 on energy efficiency). The Energy Authority is currently defining the conditions for access to these incentives.

Minor incentives regarding connection to the district heat grid are provided for heat produced from renewable energy sources. Italy also has numerous regional support schemes in addition to its national incentives. In particular, each region of southern Italy has defined its own supporting programme, thereby taking advantage of the EC Structural Funds 2000 to 2006, which provide financial support to renewable energy projects in regions where per capita GDP is below 75% of the EU average²⁴.

The Ministry for Environment and Territory has allocated €6.5 million to fund the development of renewable energy, energy efficiency and clean transport in Italian small islands. The decree aims at a process ultimately leading to the establishment of 100% renewable energy-supplied communities. In September 2003, work will begin on the five projects that were financed in 2002 (Giglio, Gorgona, Panarea, Pantelleria and Ventotene)²⁵.

24. The regions concerned are Campania, Puglia, Basilicata, Calabria, Sicily, Sardinia and Molise. EC funds are allocated to private developers according to the criteria established by each region.

25. The Italian programme for small islands has won the 2002 EC award for communities that are 100% renewable energy-supplied, as part of the EC renewable energy Campaign for Take-Off initiated in 2000.

CRITIQUE

Italy is moving away from using fixed feed-in tariffs for renewable energy and towards a more market-oriented minimum quota obligation scheme with tradable green certificates. Non-electricity renewable energy is also likely to benefit from the energy efficiency obligation mentioned in Chapter 5, since heat-related renewable energy can obtain white certificates.

On the one hand, this is a positive step in promoting renewable energy while reducing technology costs and increasing efficiency in production. It is also a more compatible approach with ongoing electricity market liberalisation. On the other hand, its effectiveness highly depends on the firmness of targets, including the level of penalties for non-compliance with the renewable energy obligation. The implementation of this system creates a number of complex steps in the market. The price of green certificates has been capped by a reference value corresponding to the difference between the average feed-in tariff and the average price of electricity sold to the market. There is pressure from renewable generators to increase the obligation up to 4% per annum.

The government's intention to monitor the effectiveness of this new mechanism is wise. It is critical to ensure that the quota obligation will lead to more investment opportunities for renewable projects. The government needs to continue to monitor the development of the market for green certificates and keep the energy stakeholders informed. The Italian banking sector should be informed about the existing obligations and mechanisms to obtain green certificates as a means to facilitate access to the capital market for renewable energy promoters. On the consumers' side, involving more non-governmental organisations (NGOs) and consumer associations could also help to promote the renewable energy development strategy given their close relationship with local communities.

Generation from wind, solar and biomass will need to almost double every year in order to meet Italy's target to increase renewable electricity generation from 52 TWh in 1997 to 76 TWh by 2010. This is a very ambitious target. The government's current plan to increase the renewable energy obligation from 2% of the electricity generated (beyond 100 GWh) in 2002 to 3.05% in 2007 is insufficient to meet this target. Having monitored the effectiveness of this mechanism, the government is considering the possibility of accelerating the obligation above the current level to achieve significant renewable energy production with a view to addressing energy security and CO₂ emissions reduction.

The quota obligation with tradable green certificates will benefit mostly the technologies that are closest to market competitiveness and consequently may undermine the development of potentially promising technologies by locking them out of the market. The government should ensure that other support measures are sufficient for renewable energy sources.

A significant share of the renewable energy obligation could be satisfied through electricity imports from renewable energy sources²⁶. If this is the case, then Italy would lose the security of supply benefits associated with expanded domestic production of renewable energy. It should be noted that renewable energy sources need to be promoted not only for GHG mitigation but also for enhancing energy security.

In this context, the government needs to maximise the development of domestic renewable energy sources. Currently, renewable energy projects often meet with difficulties linked to slow proceedings in local authorities and, in some cases, local opposition. Although the government has introduced the accelerated procedure (Sblocca Centrali), the renewable energy projects cannot benefit from it because this process does not apply to small projects of less than 300 MW. The government should ensure that renewable energy projects are not burdened by unnecessary administrative procedures, such as the over-complexity of the authorisation procedure.

Given the regional authorities' strong role in energy policy, the government must ensure that the regional authorities are aware of the national renewable energy target and are involved in its achievement. Furthermore, specific efforts are necessary to inform the general public about the possible benefits of renewable energy. In this context, ENEA has a critical role in supporting regional authorities and informing the general public about renewable energy promotion. Such efforts should be further strengthened.

RECOMMENDATIONS

The government of Italy should:

- ◆ *Increase the share of renewable energy in domestic production to improve energy security and CO₂ mitigation. Increase the renewable energy obligation above the current level.*
- ◆ *Facilitate access to the capital market for renewable energy projects in addition to green certificates that will eventually increase the profitability of renewable energy projects.*
- ◆ *Streamline authorisation procedures for setting up renewable energy projects.*

26. It is difficult to measure precisely the extent to which the renewable energy obligation will be sufficient to achieve the EU target. However, since the EC directive defines a target in terms of consumption of renewable energy, imported renewable electricity can also be accounted for. In 2001, a significant share of imported electricity was certified as renewable.

- ▶ *Ensure an effective and balanced contribution from all the regional authorities to achieve the national renewable energy target, particularly with regard to informing the general public about the possible use of renewables and access to stimulation programmes.*
- ▶ *Ensure that ENEA provides sufficient information and expertise to the regional authorities and the general public about funding possibilities and support mechanisms.*

Figure 12
Oil Pipelines in Italy



Source: Comité Professionnel du Pétrole.

INDUSTRY STRUCTURE

Eni has a dominant position in the Italian upstream oil and gas sector, although some private Italian and foreign companies, including Edison, CPL Concordia, Enterprise Oil (owned by Shell since 2002), Total (France) and ExxonMobil (United States), have also established a presence in the sector.

Until 1995, Eni was a fully state-owned company with a large number of subsidiaries created to supply the Italian energy system, involving activities upstream, purchasing, refining, distribution and marketing of oil products. In 1992, a programme was launched to privatise Eni. Between 1995 and 2001, the government reduced its share in Eni to 30.3%. The government raised approximately US\$ 25 billion through this privatisation. In parallel to its privatisation, Eni restructured its activities to focus on the oil, natural gas and petrochemicals businesses. In 1997, Agip, Eni's subsidiary, became Eni's Exploration and Production Division, and in 2002 Eni absorbed the functions of its subsidiary Agip Petroli, which became Eni's Refining and Marketing Division.

The Italian oil market is currently fully open. Import, export, trade and prices are free. The government intervenes only to protect competition and avoid abuse of dominant position. Companies willing to set up refineries and oil product storage need a concession to do so.

There are few crude oil pipelines because most of the refineries are located near the sea. The majority of the pipelines are situated in the north of the peninsula. Eni owns 60% of Italy's 1 170 km of crude oil pipelines and 43% of the 1 690 km of oil products pipelines.

Distribution is principally undertaken by integrated oil companies. While Eni (through Agip) has the largest share of the market (29.9%), a number of other companies are also active.

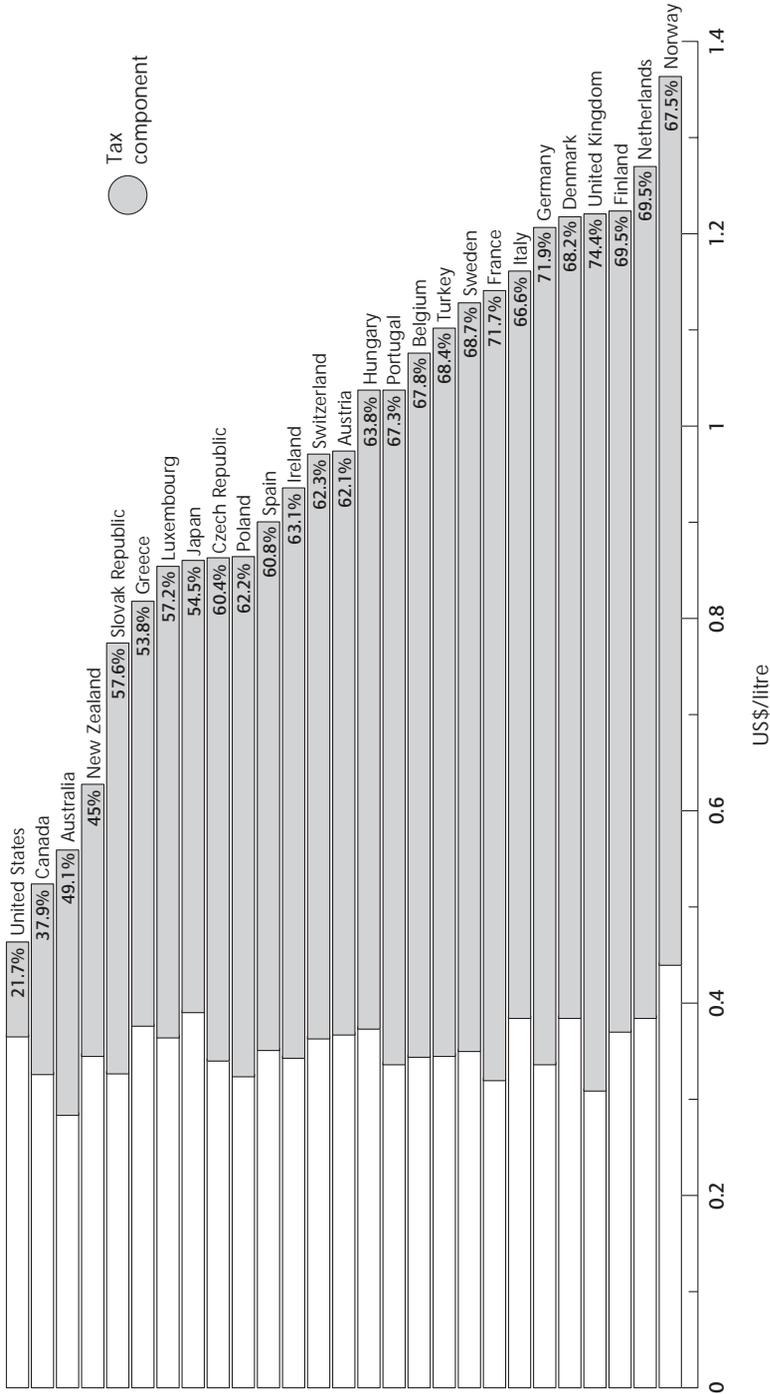
MARKET TRENDS

SUPPLY AND DEMAND

In 2001, total oil consumption amounted to 88 Mtoe. The share of oil in TPES decreased from 59% in 1990 to 50% in 2001. The government expects it to decline further owing to fuel switching in the power sector and a demand in the transport sector that could be stable (see Chapter 5 on energy efficiency).

Figure 13

OECD Unleaded Gasoline Prices and Taxes, First Quarter 2003

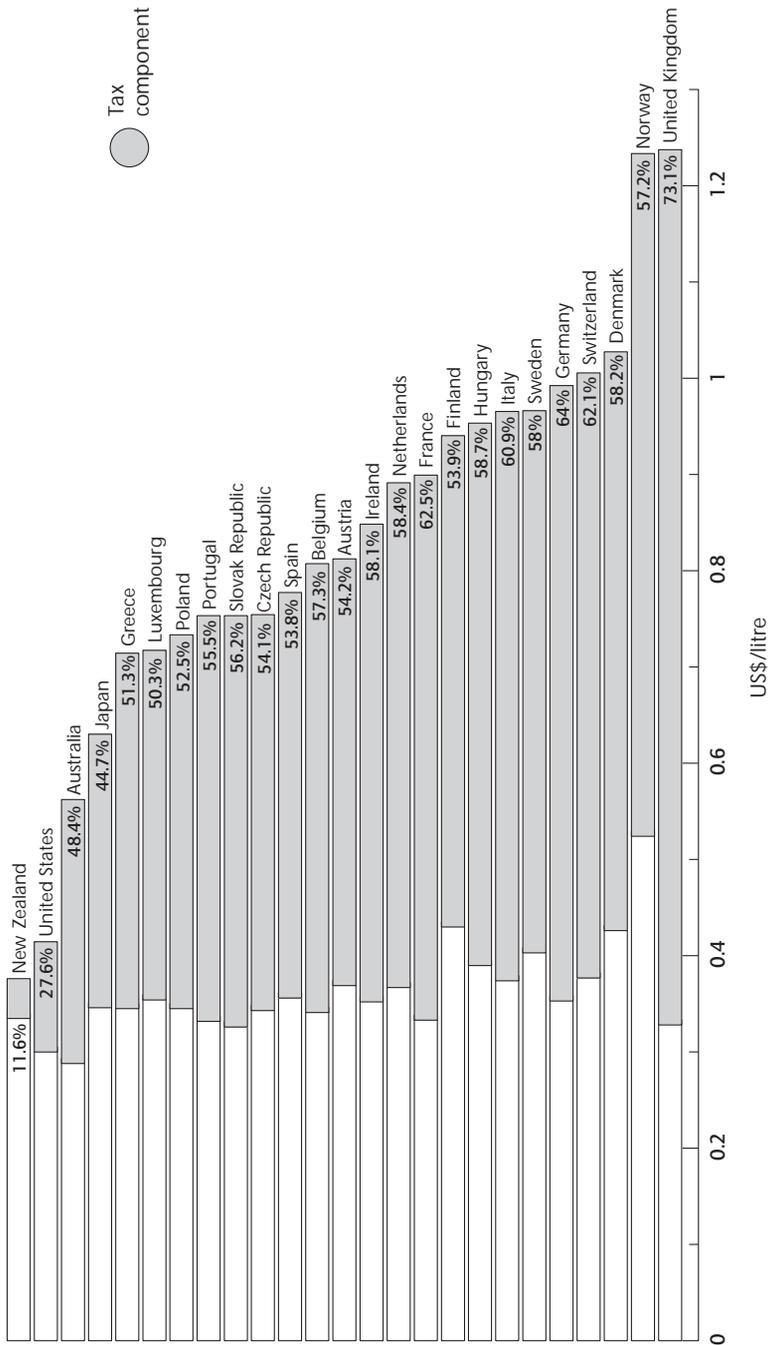


Note: Data not available for Korea and Mexico.

Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

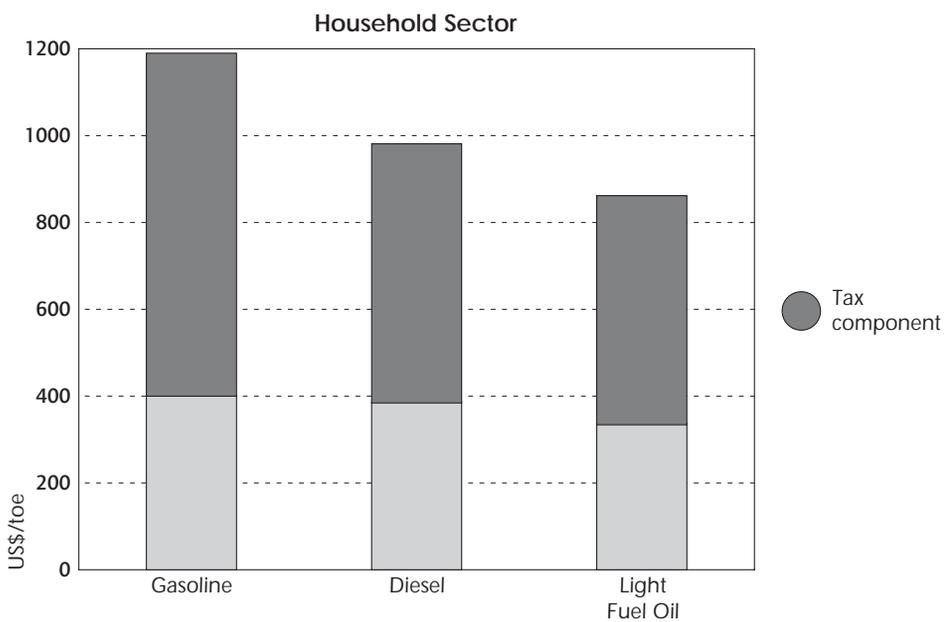
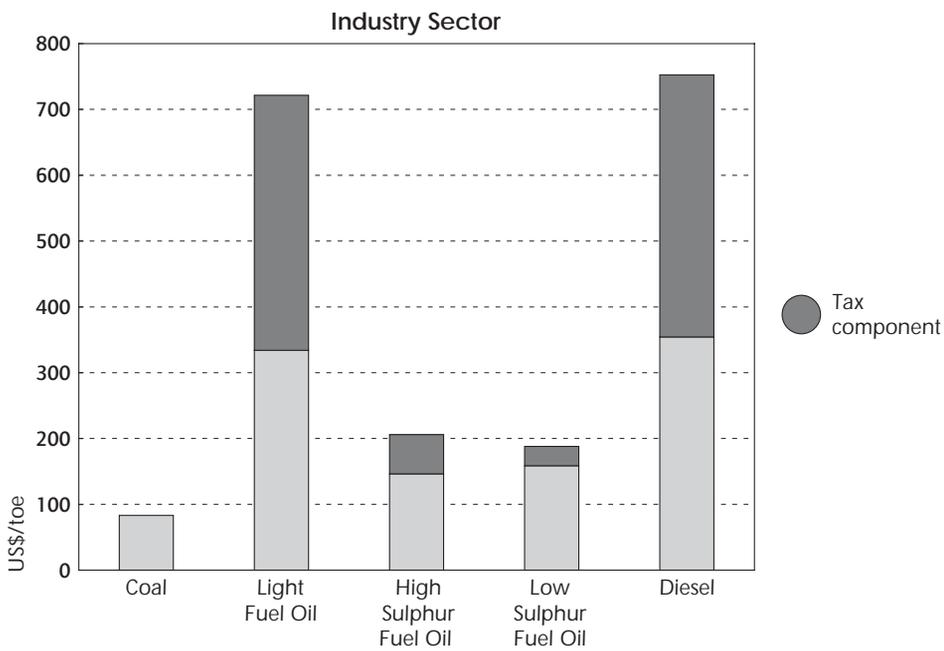
Figure 14

OECD Automotive Diesel Prices and Taxes, First Quarter 2003



Note: Data not available for Canada, Korea, Mexico and Turkey.
 Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

Figure 15
Fuel Prices, 2001



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

Table 13

Oil Products Market Shares and Number of Service Stations, as of December 2000

<i>Company</i>	<i>Sales to the local market for oil products (%)</i>	<i>Service stations</i>
AgipPetroli	29.9	9 045
Esso	12	3 156
KPI	7.9	2 868
Erg Petroli	6	2 130
Tamoil	5.7	1 701
Total	4.9	1 288
Api	3.8	1 519
Shell	3.5	1 307
Others	26.3	886
Total	100	23 900

Source: Unione Petrolifera.

In 2000, consumption of petroleum products by sector was 63.5% for transport, 16.5% for industry and 14.9% for other sectors. In addition, 19 Mtoe of petroleum products were used as primary energy for the production of electricity during this period, an amount twice as large as the consumption of products by industry.

DOMESTIC PRODUCTION

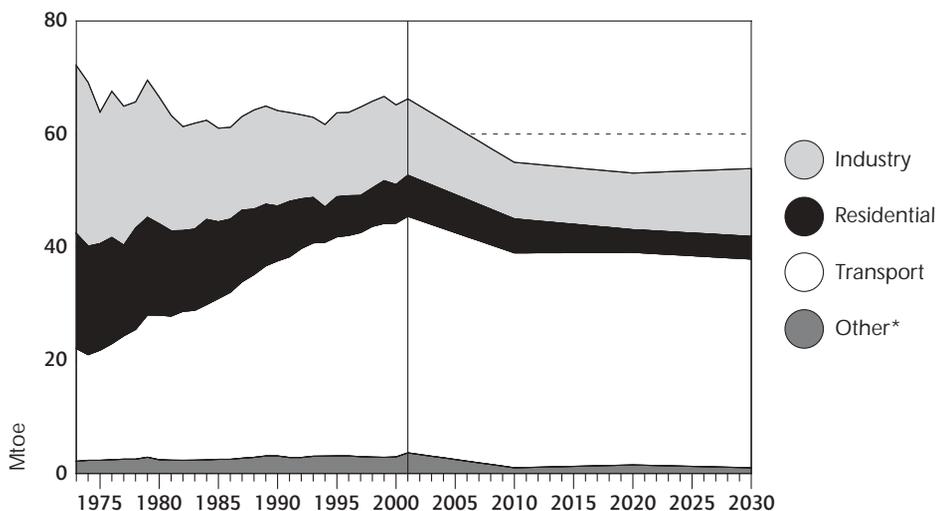
Although Italy's proven recoverable oil reserves amounted to 79 Mt (580 million barrels) in 2000, Italy is still considered to have significant potential for oil reserves. Estimates for yet-to-find oil range from 850 million barrels, according to Eni, to 3 750 million barrels, according to Enterprise Oil.

In 2001, oil production decreased by 11% to 4 Mt (80 000 barrels per day) from 2000, with 76% onshore oil and 24% offshore. This decrease was principally a consequence of the combination of two distinct factors, namely a delay in the development of oilfields in the southern Basilicata region and the gradual depletion of northern and offshore oilfields.

Italy is trying to increase domestic oil production. New projects have been developed onshore in the southern Apennines (Basilicata region) at Val d'Agri (490 million barrels of oil equivalent of oil and gas) and Tempa Rossa (420 million barrels of oil equivalent of oil and gas). Other efforts to increase domestic

Figure 16

Final Consumption of Oil by Sector, 1973 to 2030



* includes commercial, public service and agricultural sectors.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

production are conducted principally in the northern Lombardia region, in Sicily, offshore in the Adriatic Sea and in the Mediterranean Sea, south of Sicily.

Decree 112/1998 of 31 March 1998, modified by Decree 443/1999 of 29 November 1999 on decentralisation, gave the regional authorities the competence to grant, in agreement with the government, licences for onshore hydrocarbon exploration and production. The government transferred to the regional authorities the competence for onshore environmental protection, while maintaining its full competences on granting concessions for offshore exploration and production. As exceptions, the five regions of Sicily, Sardinia, Friuli-Venezia Giulia, Val d'Aosta and Trentino-Alto Adige are allowed to make their own laws for the exploitation of domestic oil resources. Only Sicily has exercised this right with Regional Law 14/2000 of 3 July 2000²⁷ implementing EC Directive 94/22/EC on "licensing", which has already been implemented by the government with Decree 625/1996.

The normal rate of royalties on onshore hydrocarbons production (and offshore gas) is 7%, although there are exemptions for small quantities. Royalties on offshore net oil production are 4%; 55% of the royalties on onshore or

27. "Disciplina della prospezione, della ricerca, della coltivazione, del trasporto e dello stoccaggio di idrocarburi liquidi e gassosi e delle risorse geotermiche. Attuazione della direttiva 94/22 CE".

offshore production in territorial waters must be paid to the regional authority and 15% of onshore production must be paid to the municipalities where the facilities are situated. The residual share must be paid to the government.

EXTERNAL TRADE

In 2001, Italy's dependence on oil imports was 95%. During this period, it imported more than 82.8 Mt of crude oil (1.7 million barrels per day), 8.2 Mt of semi-finished products, about 17.7 Mt of final products and exported 21 Mt of final products.

Libya's share in crude oil imports remains high. Imports of crude oil from Russia and other former Soviet Union (FSU) countries have been moderately increasing in recent years, while the flow from the Middle East is slightly decreasing. The supply from Norway grew significantly until 1999 and slowed down thereafter.

Table 14
Crude Oil Imports, 1990 to 2001
(million tonnes)

	1990	1995	1999	2000	2001
OECD total	1.0	1.7	5.1	4.4	3.4
Norway	0.1	0.1	4.3	3.7	2.9
Former Soviet Union	6.1	11.3	14.6	16.1	19.5
Middle East	26.8	25.7	31.3	30.7	28.9
Islamic Republic of Iran	9.5	11.4	13.6	10.4	10.2
Iraq	3.4	0.0	6.4	8.3	3.9
Saudi Arabia	8.1	10.9	8.3	8.4	9.0
Africa	40.5	33.9	29.5	32.2	30.6
Algeria	4.6	2.2	2.0	3.2	2.7
Egypt	6.2	4.3	3.5	3.3	2.9
Libya	24.5	23.7	20.4	21.9	20.3
Total imports	74.7	73.5	80.6	83.7	82.6
Memo: Total OPEC	55.4	49.6	52.2	55.1	48.7

Note: Minor quantities imported from Latin America are not indicated in this table.

Source: IEA.

With the largest refining industry in Europe, Italy has a significant external trade of products, importing for its final consumption and exporting products as an important hub, mainly for central and southern Europe. Italy is a net exporter of oil products.

Table 15

Oil Products Imports and Exports, 2001

(million tonnes)

<i>Total imports</i>	<i>17.7</i>	<i>Total exports</i>	<i>21.8</i>
OECD total	7.4	OECD total	12.8
Belgium	0.3	France	1.9
France	1.6	Greece	0.7
Norway	0.3	Spain	4.2
Turkey	0.6	Switzerland	0.9
United Kingdom	1.5	United Kingdom	1.1
United States	1.8	United States	2.4
Latin America	1.6	Non-OECD Europe	2.7
Venezuela	1.5	Former Yugoslavia	0.8
Former USSR	1.1	Other non-OECD Europe	1.5
Middle East	1.2	Middle East	0.8
Other Middle East	0.7	Asia	0.5
Africa	5.5	Africa	3.5
Algeria	1.5	Libya	0.9
Libya	3.6	Tunisia	1.4

Source: IEA.

REFINING

Italy has the largest refinery industry in Europe with 17 refineries. Six of the refineries are owned and operated by Eni (Agip Petroli). The refineries are able to process 100 Mt annually and operated at close to 100% capacity utilisation in 2000 and 2001.

Substantial investments have been carried out to adapt the refineries to the drop in heavy fuel oil demand in the power sector and the growth of cleaner fuels consumption in the transport sector. In compliance with EC Directive 88/609/EC, the oil sector was obliged to reduce SO_x emissions by more than 50% and NO_x emissions by about 25% from refineries. Decree 434/2000 was implemented to eliminate leaded gasoline by the end of 2001.

From 1991 to 2001, investment in refining totalled €6.7 billion, of which three-fourths were allocated to develop the capacity to produce cleaner fuels. More investment for environmental purposes is expected. Since 1997, €2.6 billion have been invested to build three gasification plants for electricity generation using refinery residues near the Api, Isab and Saras refineries.

DISTRIBUTION AND MARKETING POLICIES

In May 1994, oil prices were fully liberalised and further efforts have since been made to promote the deregulation of the oil product market.

In 1998, the Ministry of Industry issued a measure to improve access to the wholesale market. Companies owning storage capacities of oil products are obliged to guarantee equitable and non-discriminatory access to unused storage facilities and transport infrastructures. This additional measure calls for complete transparency, obliging the companies to communicate their own product flows to the administration. Such data can be diffused in aggregate form to whoever applies for it. If rejection of access is reported to the administration, it will ask the owner concerned for explanations. Decree 112/1998 decentralised the control of oil refineries and oil storage to regional authorities.

To stimulate competition, to accelerate the restructuring of the distribution network and to reduce margins, the government strengthened the safety standards applied to filling stations based on Decree 32/1998 in February 1998. This decree, however, called for a two-year transition phase in which the current standards remained in effect. To achieve a sizeable reduction in the number of gas stations, operating companies were provided an incentive to close two or three old stations in exchange for one new one. Compensation was offered to managers of closing stations. Municipalities were also involved in the restructuring process through identifying stations incompatible with various environmental, safety or urban regulations and defining criteria and locations for new sales points. With growing competition on the retail market, companies also acted voluntarily to restructure their retail network. Decree 32/1998 liberalised the procedure to open new filling stations from 2000. Unlike the former concession process, anyone meeting the requirements set by the decree was allowed to open a filling station. In order to accelerate the procedure, Decree 346/1999 of 8 September 1999 set the municipalities the deadlines for action. If municipalities failed to perform their duty within a certain period, the authority would be taken by the regional administration. A mechanism of silence/consent was introduced for the acquisition of building permits.

While the government expected to reduce the number of retail stations to less than 20 000 by 2000, this target has not yet been achieved. In December 2000, there were 23 900 filling stations, down from 28 200 in 1995. Another 3 500 stations are expected to close during the next few years. To accelerate the restructuring process, the decree of 31 October 2001 of the Ministry of Productive Activities set guidelines for the modernisation of the fuel distribution network to be carried out by regional authorities.

EMERGENCY PREPAREDNESS

According to EU regulations, Italian stocks must exceed 90 days of inland consumption for three oil product categories (gasoline, middle distillates and heavy fuel oil) during the previous year. Law 61/1986 of March 1986, amended by Law 427/1993 and Law 30/1997, authorises the Ministry of Productive Activities to use compulsory stocks by decree. The Executive Board, created within the Ministry of Productive Activities, which is headed by the Director-General of the Department of Energy and Mineral Resources, is responsible for co-ordinating and implementing emergency policies and procedures.

Law 22/1981 of 10 February 1981 assigned Eni the responsibility of creating and managing the strategic oil stocks on behalf of the government. Budget Law 30/1997 of 28 February 1997 abolished state-owned oil stocks, which were consequently sold in 1997. The obligation to hold the equivalent amount of stocks was transferred to the oil industry. The oil industry currently holds 90 days of consumption.

All operators that have marketed oil products of one of the three major product categories in the preceding calendar year are subject to the emergency stockholding obligation. The stocks held are mixed with operational stocks, thus ensuring constant quality turnover and low storage costs. No financial support is given to the approximately 100 oil companies concerned. In case of severe operational problems, oil companies may be permitted to temporarily lower their compulsory stocks below 90 days of consumption. The government granted this exceptional permission several times in recent years.

The maximum ceiling for the amount of oil stocks held abroad is 10% for individual oil companies. At present, Italy holds approximately 3.5% of total oil stocks abroad under bilateral agreements with Germany and the Netherlands; most of these stocks are motor gasoline and gas/diesel oil.

Italian emergency stockholding legislation is based on EU requirements and is not always consistent with the International Energy Program (IEP) obligations. The main differences being that the IEA bases its calculation on net imports of all crude oil and oil products, whereas Italy refers to consumption and three main product groups; and that the IEA deducts 10% of all stocks to account for technically unavailable stocks (*e.g.* tank bottoms). Consequently, in the past Italy has not always complied with its IEP obligation. From December 1997 to December 2002, it only held stocks covering an average of 88 days of net imports.

To revise the legislation on oil stocks, the government passed Decree 22/2001 on 31 January 2001, which contains an article referring explicitly to the IEP stockholding obligation. It specifies that the difference between the obligatory stockholding levels of the Italian legislation and the IEP requirements

be gradually added to Italian oil companies' obligations. It further specifies that the companies will have to bear IEP standard obligatory levels entirely by 2005. Over the second half of 2002, Italy's stockholding showed signs of recovery, as it had complied with its 90-day IEP obligation consistently for six months.

In case of an emergency, the administration expects oil companies to participate voluntarily in stock draw, following advice from the Ministry of Productive Activities. Since oil stocks are held by companies and delivered through normal market channels, no test for stock draw has been conducted. The time required from a government's decision to draw stocks to physical deliveries is estimated to be less than 24 hours.

The government regards demand restraint as the first line of response to an oil crisis and will adopt measures to safeguard the country's industrial sector, concentrating the restrictions primarily in the civil sector. The legal basis for demand restraint measures is provided by Law 608/1994. The Executive Board is responsible for the development and implementation of all necessary demand restraint measures in an emergency, subject to approval by the Council of Ministers.

CRITIQUE

Italy is highly dependent for oil supply on external sources. Italy has an important role as a refiner selling a large part of its products to other European countries. The oil market is free and the government needs to be commended for its efforts to stimulate competition in the oil markets, through a number of measures taken during the past decade.

Italy still has the potential to increase its domestic oil production even though demand far exceeds potential supply. However, the complex administrative procedure required to conduct exploration and production investments has led to delays and additional costs for the expansion of domestic production. The devolution of powers to regional authorities has increased complexity, also adding uncertainty regarding the responsibility for the administrative procedure in the hydrocarbon upstream onshore sector, hindering the development of new projects for oil (and even gas) exploration. These difficulties are reflected in the continuous decrease of drilling activity for oil exploration in the past two decades. Lead time between exploration and actual commercial production is around 30% to 50% longer than the world average, according to Assomineraria.

The current decline of oil production in Italy can be reversed. However, for this to occur, the government will need to clarify its oil exploration and production strategy, to make it more visible and to increase the local and regional authorities' awareness of the country's energy security requirements.

The government will need to ensure that the administrative process for licensing and authorisation is simplified to eliminate unnecessary obstacles.

Given Italy's important role in Europe as a supplier of oil products and given its high external dependence on oil, Italy will need to pursue a very active role in the different global and regional forums to co-operate with the oil-producing and transiting countries.

After several years' non-compliance with the IEP obligation, the government has now prepared the way for holding strategic stocks that comply with the IEP requirements. It is highly commendable that Italy has been satisfying the 90-day obligation during the last six months. The government should ensure that the improvements to meet the 90-day IEP stock obligation are sufficient to ensure permanent compliance.

RECOMMENDATIONS

The government of Italy should:

- ▶ *Given the potential for extraction of domestic oil resources and the current decline in domestic production, enhance and improve the national strategy for oil exploration and production.*
- ▶ *Given the ongoing process of devolution of power and the security of supply constraints, ensure that the granting of upstream licences for exploration and production does not meet unnecessary obstacles.*
- ▶ *Continue to engage in international co-operation with producing and transiting countries through different global and regional forums to reinforce security of supply.*
- ▶ *Considering the importance of the IEA emergency preparedness mechanism ensure that the recent improvements to meet the 90-day IEP stock obligation are sufficient to guarantee permanent compliance.*

INDUSTRY STRUCTURE

The structure of the Italian gas industry is changing as a result of the liberalisation of the market. Eni, followed far behind by ENEL and Edison, are still the three principal companies, but a number of new players are entering the market.

Eni is however the dominant player and the major gas producer. Eni, ENEL and Edison are the principal gas importers. Gas transport is carried out by Snam Rete Gas (SRG), Edison T&S and Società Gasdotti del Mezzogiorno (SGM), a subsidiary of Edison. SRG was established by Eni as a new company and Eni has transferred to it all the network assets and related dispatching (40% of SRG was privatised in November 2001). SRG also owns and operates the only Italian LNG import terminal located at Panigaglia (La Spezia).

The storage facilities, which were owned and operated by Agip, have been transferred to another Eni subsidiary, Stoccaggi Gas Italia (STOGIT), which is now legally unbundled from transmission and supply. Edison T&S is also developing its own gas storage facilities.

Beginning 2003, there were 24 shippers purchasing natural gas for resale to final consumers (power plants, industry) and local distributors. The shippers sell gas that Eni cannot sell because of the regulatory restrictions.

Gas distribution to the residential sector is highly fragmented, with 774 companies (municipal, public or private). However, a process of mergers and acquisitions is currently under way. Italgas, now fully owned by Eni, is Italy's leading distributor, with a market share of 27%. In 2002, ENEL bought Camuzzi, the second-largest distribution company and, with previous acquisitions, managed to acquire a market share of 12%.

New players include major EU gas companies and consortia of Italian large industrial customers or municipalities. Among the EU companies, British Gas (UK) has received authorisation to build a new LNG terminal in Brindisi. Gaz de France (France) bought the distribution company Arcalgas Progetti (Italy), and Gas Natural (Spain) expects to take 3% to 4% of the total Italian market within three years, starting with industrial and commercial users. Examples of Italian consortia include Plurigas, set up by the local distribution companies Aem Milano (40%), Amga Genoa and Asm Brescia (30% each); Lombardia Gas trader, a gas buying consortium formed by a number of north Lombardy-based Italian municipalities; Gas Incentive, a consortium of several major Italian industrial associations (representing 88 industrial customers with an annual gas consumption of over 9 bcm per annum); Blugas, a Po Valley consortium of municipalities based in Mantova; and Bologna-based Hera, another consortium of municipalities from the Romagna region.

Figure 17

Natural Gas Infrastructure



Source: Snam Rete Gas.

GAS DEMAND

Italy has the third-biggest gas market in Europe, with a consumption of 72 bcm in 2002, of which 23 bcm was for power generation. From 1996 to 2001, natural gas consumption in Italy grew from around 56.2 bcm to 71 bcm, an increase that derived primarily from growth in the power generation sector, in which consumption doubled. During the same period, natural gas was the primary energy source that grew most rapidly, increasing at an average annual rate of 5.8%.

Since 1990, the residential and commercial sectors' share in total consumption has stayed at around 35% to 40%, while that of power generation has risen from 20% to 30%. In 2001, industry represented 32% of gas sales and transport 1%.

Table 16
Natural Gas Balance, 2001
 (bcm)

	<i>Eni</i>	<i>ENEL</i>	<i>Edison</i>	<i>Others</i>	<i>Total</i>
Total supply	58.4	6.4	3.7	1.9	70.4
Domestic production	13.6	1.4	0.6	15.5	
Imports	44.8	6.4	2.3	1.3	54.8
Domestic sales	30.3	13.5	3.1	23.2	70.1
Electricity generation	7.5	12.3	1.6	1	22.4
Industrial users	16.6	0.4	1.2	6.1	24.3
Civil users	6.1	0.8	0.1	16	23
Others	0.1		0.1	0.1	0.3

Note: Figures are rounded and do not include losses and stock changes.

Source: Ministry of Productive Activities; Energy Authority.

A strong growth in gas demand is expected during the next few years. By 2010, gas demand could reach 92 bcm to 95 bcm, about 40 bcm being consumed in the power sector: 90% of new power plant projects will be gas-fired.

The Italian gas market still has a strong growth potential, although penetration in the residential market is already high (over 90% of the population has access to gas). The seasonality of gas consumption is pronounced, with 62% of demand in winter months. To cover this seasonality, Italy has developed a large storage infrastructure.

Gas consumption is mainly concentrated in the north of the country (70% of total demand), of which more than 50% is concentrated in Lombardia, Piemonte and Veneto.

EXPLORATION AND PRODUCTION

In 2002, domestic production reached 14.9 bcm – an 11% decline compared with 2000 – and accounted for 21% of total gas supply. Most of Italy's natural gas fields are located in the Po Valley and offshore in the Adriatic Sea. Proven gas reserves are estimated at over 200 bcm. A decrease in indigenous production is expected, owing to major difficulties in obtaining permits for new exploration and production activities, in particular in the Adriatic Sea. The development of the Adriatic fields project (Alto Adriatic project), financed by Eni, has been on hold for several years because of a moratorium on production in the Adriatic Sea established by the Ministry for Environment and Territory in 1995.

During 2001, only 40 wells were drilled in Italy, eleven of which were for exploration (the lowest figure in the past 20 years), while 53 wells were drilled in 2000. This is the consequence of the depletion of existing fields and of a lack of new discoveries put on stream, and confirms the challenge facing the upstream sector. In comparison with 1994, domestic gas production declined by about 25%. The production forecast for 2010 is about 8 bcm to 11 bcm.

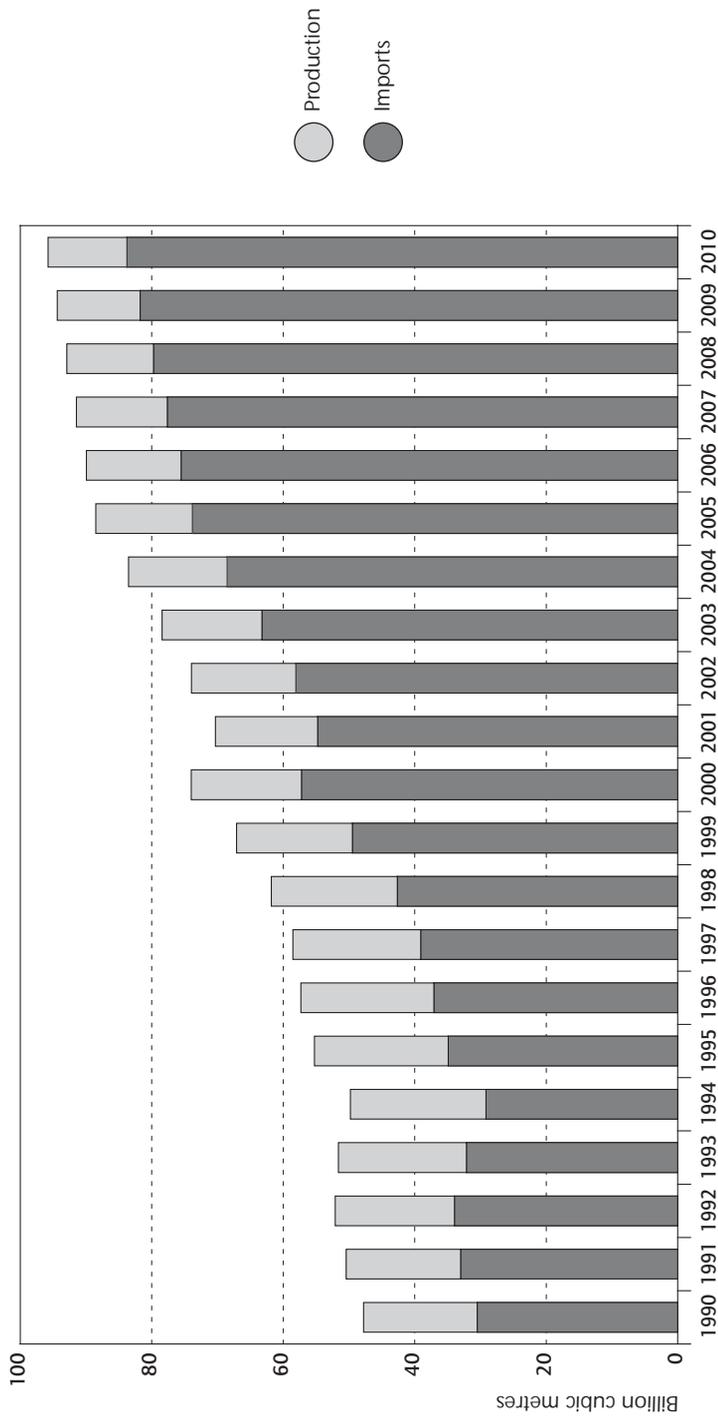
IMPORTS

Italy is increasingly dependent on imports. Diversification of supply is an important issue, as Italy relies heavily on Algeria and Russia. In 2001, Italy imported 54.8 bcm: 44% from Algeria, 36% from Russia, 13% from the Netherlands, 5% from Nigeria and 2% from Norway. The Algerian figure includes liquefied natural gas (LNG) and pipeline gas. Nigerian LNG is imported to Italy under a swap agreement with France. It is received at the LNG terminal in Montoir-de-Bretagne and swapped against Russian and Algerian gas. Supplies from Norway started at the end of 2000 (1.2 bcm in 2001) and will reach 6 bcm per annum in 2010.

The main importing companies include Eni, ENEL, Edison Gas, Energia, Plurigas, Gaz de France, and the minor ones include Dalmine, Unendo Energie, Energas (ex-Bridas), Gas Plus, Camuzzi, Radici Group, Italcogim, Blugas, BP Italia, Electrabel Italia and Gas Natural Vendita. ENEL has an import portfolio of 18 bcm per annum at plateau level (from Algeria, Nigeria, Qatar and Russia). In 2002, it signed an agreement with Gazprom to directly purchase 3 bcm per annum of Russian gas. It is followed by Edison Gas (12 bcm per annum at plateau volume; 2 bcm from Russia, 1.4 bcm from Norway, 4 bcm from Libya – all piped gas – and 4.6 bcm from Qatar as LNG). Next is Energia (3.5 bcm per annum), Plurigas (3 bcm per annum), Argentina's Bridas (2.5 bcm per annum), Gaz de France (2 bcm per annum) and Dalmine (1 bcm per annum). Gas is principally imported through long-term contracts, although LNG spot cargoes are also imported.

Figure 18

Gas Imports and Production, 1990 to 2010



Source: Ministry of Productive Activities.

Eni Gas & Power has started to divest part of its contracted imported gas to the profit of third-party buyers, to conform with Italian regulations on competition. At the end of 2000, Eni decided to transfer to third parties 8 bcm per annum of gas that it had to import from Libya by 2004; 4 bcm per annum of the gas was transferred to Edison, 2 bcm per annum to Gaz de France and 2 bcm per annum to Energia. In 2001, Eni signed a contract with Plurigas to sell 3 bcm per annum of Dutch gas, under a ten-year contract. Eni also transferred 1.3 bcm per annum of gas from its Norwegian imports to Energia. The contract started in October 2001 at the initial rate of 0.5 bcm per annum. The plateau volume will be reached at the end of three years. The company also sold 1 bcm per annum of Norwegian gas to Dalmine. All these contracts known as "innovative deals" were signed at the Swiss border and allowed Eni to respect the domestic cap on total imports imposed by the new regulation, while retaining a strong market power.

A substantial and growing dependence on imported gas is foreseen, from 78% in 2001 to 90% to 95% in 2010. The government wants to further diversify gas supplies. Libya (by pipeline) and Qatar (LNG) are major future suppliers. Libyan deliveries will start in 2004. Libyan gas will be transported through a 600-km pipeline, "Green Stream", built by Eni. The line will run under the Mediterranean Sea and connect Libya to Sicily where it will join the TransMed pipeline.

A 25-year contract has been signed by Edison Gas to import 3.5 Mt per annum of LNG (4.6 bcm) from Qatar's Ras Laffan LNG Company (RasGas), beginning in 2005. The agreement represented the first Qatari long-term LNG contract to Europe. ENEL has announced that it also has an agreement with Qatar and Repsol-YPF to import LNG, but exact volumes have not yet been determined.

According to the new regulation, natural gas imports from non-EU countries must be authorised by the Ministry of Productive Activities. To obtain authorisation, the importer must confirm that it has the required technical skills and financial capacities. It must also confirm the reliability of the gas supply, the place of production, the availability of the transportation capacity from the place of gas production to the Italian border and that it has requested a strategic storage capacity. The strategic storage requirement is defined as 10% of projected non-EU annual imports (equivalent to 5.1 bcm in 2002) and 50% of the expected daily demand at the end of the winter season. The importer must also present an investment plan for contributing to the development and safety of the Italian gas system corresponding to 5% of the annual income from imported gas. The plan can include investments in import infrastructure (to develop the transportation capacity, including pipelines outside Italy but connected to pipelines used to import gas to Italy), or in new storage fields, or in the distribution networks. Investments may occur throughout the entire period of the import. The only requirement is that the importer reports his investments at the end of the import period.

To favour supply source diversification, gas importers from new producing countries do not have to present an investment plan, whereas gas importers from countries contributing to less than 15% of total imports must present an investment plan to develop the Italian gas system for an annual funding corresponding to 2.5% of the annual income.

TRANSPORT, LNG IMPORT TERMINALS AND STORAGE

There are only three entry points for gas: one for Russian gas (Tarvisio), one for Algerian gas (Mazara del Vallo) and one for Norwegian and Dutch gas (Gries Pass). There is one LNG regasification terminal at Panigaglia. Gas is transported to Italy through the following four major pipelines:

- The Transmed pipeline linking Algeria to Italy via Tunisia.
- The TAG pipeline on Austrian territory for Russian gas via Ukraine and Slovakia.
- The TENP and Transitgas pipelines through Switzerland for Dutch gas via Germany and Norwegian gas via France.

Italy has a pipeline connection to Slovenia, which allows Algerian and Russian gas to be exported via Italy to Slovenia.

An expansion of the Transmed pipeline (+6.5 bcm per annum to 27.5 bcm per annum) will be realised by upgrading compressor stations on Tunisian territory. It is also foreseen to expand the capacity of the TAG pipeline (+6.5 bcm per annum). There is a pipeline project between Greece and Italy, a new project between Algeria and Italy via Sardinia (Galsi project) and a pipeline linking Turkey and Greece for transportation of Caspian Sea sources that will be extended to Italy.

Gas infrastructure is well developed in Italy. The transportation network includes 17 000 km of high-pressure pipelines and the distribution grid is 182 000 km long. Gas transport is carried out by SRG and Edison T&S. The SRG transmission system consists of approximately 29 600 km of natural gas pipelines (as at 31 December 2001) with diameters ranging from 25 mm to 1 200 mm and pressure ranging from 0.5 to 75 bars. It comprises a high-pressure national network and a lower-pressure regional network. The network is directly connected to the production fields, import lines and storage centres. Edison T&S has more than 1 100 km of pipelines. The Italian network has been defined with a level of redundancy, which allows flexibility.

SRG transports natural gas for all the operators active on the Italian market under a regulated TPA regime. Allocation of access to the grid is done under five-year contracts, whereas most gas volumes are imported under long-term

contracts of 20 years. SRG has an investment plan of €2.4 billion for the period 2003 to 2006 (80% in development and 20% in maintenance).

The Energy Authority has set criteria for granting priority access to the importation entry points for supplies linked to take-or-pay contracts (TOPs). Priority access has been attributed to long-term TOPs signed before 10 August 1998 – in this case, capacity is assigned for the average daily quantity, in each year, under the import contract. Priority access has also been assigned for all other kinds of TOPs and all other contracts (short-term). In cases of congestion, when applications to import gas exceed the pipelines' transportation capacity, a proportional allocation method has been drawn up in line with the priorities already assigned. With regard to new import pipelines and upgrades of existing ones, priority will be given to parties providing funding for the construction of pipelines, using a similar system to the one drawn up for access to regasification plants. This priority will apply to 80% of pipeline capacity for a period of up to 20 years.

The Panigaglia LNG terminal is owned by GNL Italia, a subsidiary of SRG. It is situated at Fezzano di Portovenere. The terminal has two 50 000 m³ storage tanks. The plant has been in operation since 1971 and in 2001 and 2002 delivered around 3.6 bcm of gas into the network.

There are ten projects for new LNG terminals, two of which have recently received governmental and regional approvals and should start operation by 2006 (Brindisi by British Gas and offshore Rovigo by Edison). British Gas has been given approval for a 6 Mt per annum (8 bcm) LNG terminal at Brindisi on the south-east coast of Italy. In February 2003, ENEL joined the project. The government has placed the terminal on the priority infrastructure list of strategic projects. Edison's project consists of an offshore LNG terminal in the Adriatic Sea, 15 km offshore Porto Levante. The plant is expected to process 6.5 bcm per annum.

Several other LNG projects are currently being considered in Italy. The Italian downstream oil company, Gioia Tauro Oil in Calabria, recently requested approval to build an LNG terminal in the southern port of Gioia Tauro, which is in competition with another LNG terminal project by Italian Falck in San Ferdinando, very near Gioia Tauro. Other projects include the Italian gas company OLT Offshore's plan to build an offshore terminal 10 to 15 miles off the coast of Livorno; Edison's project at Rosignano Marittima in Tuscany and three proposals by ENEL in Taranto, Vado Ligure and Muggia.

During the next ten years, Italy will need an additional 30 bcm per annum of gas. The planned LNG facilities will help to offset the expected expansion of the market and will foster competition.

Italian gas storage is 98% controlled by Stoccaggi Gas Italia (STOGIT), Eni's subsidiary. The STOGIT system is made up of ten depleted fields; nine of

Table 17

LNG Import Terminals

<i>Company</i>	<i>Site</i>	<i>bcm/year</i>	<i>Status</i>
Edison Gas	Rovigo (offshore Adriatic Sea)	6.5	Authorised
British Gas/ENEL	Brindisi	8	Authorised
ENEL	Taranto	5 – 8.9	Under authorisation
ENEL	Vado Ligure	5 – 9	Under authorisation
ENEL	Muggia (Friuli)	5 – 9	Under authorisation
LNG Terminal	San Ferdinando (Calabria)	6 – 10	Under authorisation
LNG Terminal	Corigliano Calabro (Calabria)	8	Under authorisation
OLT Offshore	Livorno offshore	3	Under authorisation
Edison Gas	Rosignano (Tuscany)	3	Under authorisation
Gioia Tauro Oil	Gioia Tauro (Calabria)	2 – 8	Under authorisation

Source: Ministry of Productive Activities.

which are located in northern Italy and one in central Italy. Their working capacity is 12 bcm with 267 mcm per day withdrawal capacity at the beginning of the season. The Bordolano and Alfonsine storage fields are not yet operational. Edison T&S is also developing two storage sites with a current working capacity of 0.6 bcm, to be expanded to 1.3 bcm by 2007.

Table 18

Underground Gas Storage

<i>Name</i>	<i>Operator</i>	<i>Working capacity (mcm)</i>	<i>Peak output (mcm per day)</i>
Brugherio	STOGIT	300	11
Cellino	Edison Gas	110	..
Conegliano	Edison Gas	545	..
Cortemaggiore	STOGIT	960	18
Minerbio	STOGIT	2 360	65
Ripalta	STOGIT	1 580	20
Sabbioncello	STOGIT	847	22.5
S. Salvo	STOGIT	2 895	44
Sergnano	STOGIT	2 000	55
Settala	STOGIT	1 150	31.5
Total	10	12 747	267

.. not available.

Source: Snam Rete Gas.

The storage activity requires a licence (maximum duration of 20 years). The licence holders must provide storage services for strategic and modulation requests. In April 2001, the Ministry of Productive Activities published a decree to allow TPA to major gas fields under production (with original gas reserves over 1 bcm, 80% already produced) to use them for storage activities, on the basis of a competition system open to all companies. The ministry gave access to six depleted fields (owned by Eni) for new storage projects and received 16 applications in competition for five of them.

Access to storage is regulated. The Energy Authority is developing a storage code and has defined tariffs for access to STOGIT storage. In 2001, STOGIT introduced "virtual" access to all reservoirs with uniform charges.

DISTRIBUTION

Gas distribution is extremely fragmented, with 774 companies in 2000 (municipal, public or private). The gas distribution service is predominately managed by municipalities and private or public companies like Italgas and ENEL. The latter companies are the largest players in the natural gas retail market, each holding around one-third of the market. The rest of the market is divided between the remaining over 700 suppliers. Local distribution consists almost entirely of sales by urban distribution companies to customers in the residential and commercial sectors and to small industrial customers. The gas is distributed in Italy to approximately 5 300 municipalities, with about 16 million customers.

Distribution is defined as a public service and includes an obligation for the distribution operator to connect the customers, taking into account the existing capacity and the economic and technical criteria elaborated by the Energy

Table 19
Distributors' Average Size, 2000

<i>Number of customers</i>	<i>Number of distributors</i>	<i>% total customers</i>	<i>% total volume</i>
> 500 000	4	40	32
100 000 - 500 000	17	18	19
50 000 - 100 000	24	10	11
10 000 - 50 000	162	21	25
<10 000	567	11	14
Total	774	100	100
		(16 139 000 customers)	(30 064 million m ³)

Authority. While sales to eligible customers did not require any authorisation, starting 1 January 2003, the law requires that gas sales receive an authorisation from the Ministry of Productive Activities to protect small customers who are also eligible²⁸. The distribution service is assigned by tender and for periods of not more than 12 years. Commercial quality standards defined by the Energy Authority entered into force on 1 January 2001.

Consolidation of the sector has begun; from 814 companies in 1995, the number of distribution companies is now 774. There have been numerous acquisitions of distribution companies by the major energy companies in order to increase their market share. In January 2003, Eni purchased the remaining 54.3% share of Italgas it did not already own. ENEL bought Camuzzi, Italy's second-largest distributor, as well as 30 other smaller local distribution companies. The second important trend in the distribution sector is the mergers of distribution companies, such as the creation of Gas Plus, Plurigas and Hera, to obtain stronger gas buying power. Concentration is expected to accelerate, given that not all small companies are able to comply with Decree 164/2000, which required distribution companies to unbundle their supply and distribution activities as of 1 January 2003 and apply for a licence to sell gas.

GAS MARKET LIBERALISATION

Italy has taken important steps to liberalise its gas market. Decree 164/2000 of 23 May 2000 ("Letta" Decree) was issued to implement EC Directive 98/3/EC on natural gas. The decree introduced the following:

- Legal unbundling of transport and distribution as well as storage activities (a company performing both transport and storage may unbundle these two activities only for accounts and management).
- By 1 January 2003, all distribution companies must comply with legal unbundling requirements.
- Selling gas can be performed only by companies that do not perform other activities within the gas sector, except production, import, export and wholesale activities.
- Since 1 January 2002, no single gas operator could represent more than 75% of total gas supply (production and imports) for Italy; the percentage will decrease by 2% per annum until it reaches 61% by 2009. Since 1 January 2003, no single gas operator can represent more than 50% of total sales to end-consumers. After 2009, the two thresholds of 61% and 50% will be abolished.

28. In May 2003, the Energy Authority had not yet submitted the standard contract to the Ministry of Productive Activities.

- All power generators, distributors and final customers consuming more than 200 000 m³ per annum and associations of enterprises consuming more than 200 000 m³ per annum (and each more than 50 000 m³ per annum) were eligible to choose their supplier (*i.e.* 96% of the total market). Since 1 January 2003, all customers are eligible (100% opening).
- Regulated access to transportation, distribution, existing underground storage and LNG regasification terminals. Tariffs are established by the Energy Authority.
- No need to obtain authorisation for gas imports inside the EU. Informing the government about the transaction will suffice.
- Obligation for the availability of strategic storage located in Italy for gas imports from non-EU countries (10% of annual volume imported and 50% of the expected daily peak at the end of the season), and the capacity to contribute to the development and security of the gas system and/or supply diversification.

The ceilings on the market share established by the decree go far beyond the requirements of the EC gas directive and have put a lot of stress on the incumbent company to rapidly comply. In order to respect the limits established on the share of gas imports, Eni sold an important quantity of gas beyond Italian boundaries to other Italian resellers, such as Edison, Dalmine Energia, Plurigas and Energia, which brought it into the country instead of Eni. These companies were also given long-term entry capacity to import and transport their gas into and within Italy. These contracts were reviewed by the Antitrust Authority, which accused Eni of abuse of dominant position. In November 2002, it was decided that Eni must expand its existing pipeline capacity to allow third parties to transport their gas into Italy.

This legislation is complemented by the "Marzano" Law, currently being discussed in Parliament, which aims to foster competition and could also introduce major changes for new investment, with the exemption of TPA for newly built infrastructure ("priority access").

On 16 May 2002, the Energy Authority approved Resolution 91/2002 defining access priority rules for gas operators investing in new LNG regasification terminals. The objective is to improve the total availability of regasification capacity in order to match the growing demand for domestic gas within the next eight years, while simultaneously allowing all market operators access to gas capacity amounting to at least 5 bcm per annum. Under the new rules, operators constructing new regasification plants before the end of the decade will have the right to use up to 80% of the new available regasification capacity of each plant. The priority rights cannot last more than 20 years, and can also be established for a shorter period by the energy regulator, according to his deliberation. No operator can have reserved capacity amounting to more

than 8.3 bcm per annum of new capacity. The remaining capacity (20%) and any unassigned capacity on a priority basis will be made available to all other operators at tariffs set by the Energy Authority.

SECURITY OF SUPPLY

Decree 164/2000 gives domestic producers priority access to seasonal storage; the amount is determined each year by the Ministry of Productive Activities. Given that exploitation facilities could be disrupted, the decree also gives domestic producers access to an extra volume of storage equal to the gas flowing in eight days in the largest treatment plant for raw gas linked to the maximum cluster of producing wells they own. The decree also includes mandatory strategic storage (see above).

The Energy Authority set further requirements encompassing transporters' balancing needs, suppliers' needs up to one in 20 winters and the needs of eligible customers. STOGIT must report capacity bookings and use to the Energy Authority on a monthly basis.

Decree 164/2000 places responsibility on the Ministry of Productive Activities to provide for the safety, profitability and long-term planning of the national gas system. It must reach these objectives through specific measures in order to safeguard the continuity and security of supplies, the co-ordinated operation of the storage system and to reduce the vulnerability of the national gas system. The decree assigns special powers to intervene in the event of crises in the energy market or of serious risks for public safety or damages to the system infrastructures (emergency and safety). In these cases, the Ministry of Productive Activities may adopt the temporary safety measures deemed necessary.

The Ministry of Productive Activities has established an industry committee (Comitato tecnico di emergenza e monitoraggio del sistema del gas) to define and oversee procedures applying to gas emergencies in Italy. The industry committee has defined procedures for dealing with emergency situations on the transmission network, in particular those arising from extreme climatic conditions.

TARIFFS AND PRICES

In accordance with Decree 164/2000 and the successive resolutions, the Energy Authority is responsible for setting basic tariffs for the regulated sectors. It defines maximum prices net of tax and tariff adjustments based on a price cap mechanism. In 2001, the Energy Authority set tariffs for distribution to non-eligible customers, approved tariffs for transport and access to LNG regasification terminals and in February 2002 set tariffs

for access to STOGIT storage. Although all customers are now eligible, the distribution tariff is still applicable for a transitional period to protect small customers.

Natural gas transmission tariffs are based on the booked capacity, the distance and the transported quantities according to an entry-exit model. Entry charges are assessed at the entry points and are based on capacity used and the number of interconnection points transited. By contrast, Italy's regional high-pressure networks are being divided into 15 zones, each with a flat-rate "postage-stamp" charge. The Energy Authority has set network tariffs based 70% on capacity and 30% on commodity which are tailored to encourage optimal utilisation of the networks. Approved rates of return on capital are 7.94% for high-pressure pipelines and 9.15% for LNG regasification terminals. In Italy, transportation accounts for 15% of the final cost of gas.

In February 2002, the Energy Authority set price controls for access to STOGIT storage and established charges for the period beginning in April 2002, as follows. The charge per volume is €0.257 per GJ per annum; €10.160 per GJ per annum for peak daily capacity; a commodity charge for injection/withdrawal of €0.092 per GJ per annum; and a leasing charge for strategic storage of €0.163 per GJ per annum. The new tariffs will remain in force until 2006 and will be adjusted annually subject to a price cap that takes into account inflation and a productivity recovery of 2.75% per annum. The cost of capital was set at 8.33% real pre-tax.

In 1999, the tariff reform was implemented for gas distributed over urban networks. The new tariff system includes a distribution tariff and a tariff for sales to captive customers. Distribution tariffs are based on costs and a regulated mark-up. In July 2002, the price-setting mechanism was changed for large gas distributors so that their tariffs may be calculated from historic costs rather than the standard cost. Since January 2003, the sales tariff applies to captive customers, *i.e.* those consuming less than 200 000 m³ up to 2002. The tariff includes three elements, namely the cost of the raw material, fixed costs including transportation, storage and distribution costs, and taxes. The reform included a review of the method for setting the raw material tariff, which was anchored to international primary fuel prices and uncoupled from national heating-oil price indicators. In November 2002, the average tariff was fixed by the Energy Authority at €56.6 per m³. The tariff includes the cost of the raw material (€12.14 or 21.5%), transportation, storage and distribution costs (€18.77 or 33.2%) and taxes (€25.69 or 45.4%). As shown in the following table, fixed costs slightly decreased (-7%) between 1998 and 2002. The evolution of the tariff over the past five years reflects strong price increases in international oil markets, which began in the early months of 1999 and continued throughout 2000, a trend that was only reversed in December 2000. The depreciation of the lira and then of the euro against the US dollar, was another factor fuelling the increase.

Table 20

Evolution of Average Gas Tariff to Captive Customers (net of taxes)
(euro/m³)

	<i>Jan 1998</i>	<i>Jan 1999</i>	<i>Jan 2000</i>	<i>Jan 2001</i>	<i>Jan 2002</i>	<i>Nov 2002</i>
Fixed costs	20.10	19.99	18.95	18.93	18.77	18.77
Raw material	8.43	5.46	9.38	17.72	13.26	12.14
Total	28.53	25.45	28.33	36.65	32.03	30.91

Source: Energy Authority.

In September 2002, for anti-inflationary reasons the government introduced an emergency decree to hold public service prices at their 1 August 2002 level until 30 December 2002 latest. The decree suspended the normal regulatory processes developed by the Energy Authority. Recently, the Energy Authority has modified the rules governing the calculation of distribution tariffs. Tariff reviews are now quarterly rather than bimonthly and alterations are based on international energy prices in the nine months rather than six months preceding any quarter. The existing 5% variance threshold remains unchanged.

Prices for eligible customers are negotiated freely between suppliers and customers. As they are considered confidential, they are not published. Industry's and the Energy Authority's estimates show that Italian gas prices (net of taxes) remain among the highest in Europe.

The tariffs established by the Energy Authority for transportation and access to LNG regasification terminals are clear, fair and stable, with incentives to encourage new investments and efficiency. However, Italian residential and industrial consumers currently pay among the highest natural gas prices in Europe. This is only partly explained by the high level of tax (almost 50%). If prices are considered excluding all taxation, industrial prices are still 10% higher than the EU average, while residential prices are lower than the EU average for small consumers and higher for the larger consumer, with an average level of +3.3 % in comparison with the EU.

CRITIQUE

MARKET DEVELOPMENT AND LIBERALISATION

The Italian gas market has developed rapidly, mainly owing to the increased use of gas in the power sector. As an increasing share of gas must be imported, diversification of gas supplies has been an important policy objective measure.

Table 21

Natural Gas Prices for Industrial Customers (net of taxes)

(euro/m³ as of 1 January 2002)

<i>Annual consumption in GJ</i>	<i>418.6</i>	<i>4 186</i>	<i>41 860^a</i>	<i>41 860^b</i>	<i>418 600^b</i>	<i>418 600^c</i>	<i>Average</i>
Austria	30.91	26.57	21.39	19.72	18.24	16.90	21.20
Belgium	28.55	22.96	19.99	16.98	16.98	15.99	20.24
Denmark	28.67	26.84	17.09	17.09	14.20	14.20	19.68
France	29.99	25.52	18.76	18.36	13.74	12.81	19.86
Germany	32.75	29.00	27.46	26.25	22.90	22.66	24.91
Italy	36.59	28.32	22.35	21.59	18.62	17.82	24.21
United Kingdom	23.72	21.85	20.63	19.64	18.84	..	20.16
Spain	30.61	17.82	16.52	16.07	15.91	15.49	18.27
Switzerland	27.22	24.97	22.57	21.66	19.19	19.19	22.29
Europe	30.71	25.45	21.85	20.86	18.38	17.62	21.93
Difference							
Italy/Europe	+19.2%	+11.3%	+2.3%	+3.5%	+1.3%	+1.1%	+10.4%

a: load factor from 200 to 1 600 hours.

b: load factor from 250 to 4 000 hours.

c: load factor from 330 to 8 000 hours.

.. not available.

Source: Energy Authority.

Italy's potential as a growing gas market is large, which creates plenty of opportunities for new entrants.

The reform of the gas market is moving in the right direction. The market has been totally transformed by Decree 164/2000, which implemented EC Directive 98/30/EC. The decree goes far beyond the minimum requirements established by the EC gas directive, and creates the basis for a competitive and liberalised market. It liberalises the transportation, storage, distribution and supply of natural gas.

The gas sector is radically changing following the reform of the market. Eni, ENEL and Edison Gas are still the principal companies in the gas market. However, a number of new players are entering the market, including foreign companies that are importing gas, especially from non-EU countries, and are acquiring shares in Italian gas distribution and sales companies.

The "Marzano" Law envisages further unbundling. Eni's share in SRG could decrease to 10%. This would ensure complete independence of SRG in its

decision-making and equality of treatment between Eni and new entrants. This would also decrease cross-shareholdings between different levels of the gas chain.

The Energy Authority has created rules for the liberalisation of the gas market and has established tariffs for transportation, regasification, storage and distribution. However, regulations have not yet been worked out for some areas of the market, including network, distribution, LNG terminals and storage. The Network Code is expected to be issued shortly and will prepare the way for the establishment of a virtual gas hub together with a spot gas market. In order to proceed with the liberalisation, the remaining codes should be issued as rapidly as possible.

The Energy Authority promotes the evolution of the structure of the gas network from the current mono-directional model, from point of extraction or importation to supply zone, to a meshed model that enables contracts to co-exist and intersect, *i.e.* a structure that enables the development of trading hubs. This development would provide Italy with interesting opportunities to improve security of supply and become a key trading centre for the Mediterranean region.

In Italy, as in other continental European countries, the move towards a competitive market has met with three major obstacles. The first is the ongoing process of industrial concentration, which is creating companies capable of exercising power over significant portions of the EU market. The second is the lack of competition on the supply side as most supply comes from a limited number of external suppliers. The third is the continuous existence of the physical, legislative and commercial barriers to free circulation on the EU networks.

From a legal viewpoint, the Italian market is now fully open; however, barriers still exist for new entrants and Eni remains in a dominant position. Newcomers must overcome the following major obstacles:

- Access to supply is an issue on the Italian market. Small companies cannot buy gas directly from Algeria or Russia; this can only be done by big national or international companies. Established long-term contracts are protected by the law, which does not force Eni to give up any of its long-term contracts provided it can meet its supplies and sales quotas. Furthermore, the imports and/or production that companies use for their own consumption (including power generation) are exempt from market share limits. This allows Eni to sell its excess gas to customers outside Italy ("innovative deals"), as well as to shift gas to the CCGT power plants.
- Saturation of the existing import pipelines creates an additional barrier for new operators, be they Italian or foreign. Only the competitors with capacities to establish their own import facilities will be able to compete on an equal

basis with Eni. The simpler alternative today is to build LNG regasification terminals.

- The obligation put on imports from non-EU countries is too stringent and costly for newcomers.

Although the Energy Authority and the Antitrust Authority recognise that Eni has a dominant position in the market, both consider that an efficient liberalised gas market needs to be established gradually, taking into consideration a necessary balance between the protection of captive customers, the established long-term contracts and competition. Nevertheless, the consolidation move at distribution level indicates a reinforcement of cross-shareholdings and market power of the principal Italian players (Eni, ENEL and Edison). The Energy Authority and Antitrust Authority will need to closely monitor this development and, if necessary, enforce a strict regulatory control of abuse of dominant position.

In the new liberalised gas market, it is absolutely necessary to define objectives for security of supply and assign responsibilities to the different players. This has to be further developed in the Italian context, which is characterised by a high import dependence, a high share of gas in the energy mix and a growing use of gas in the power sector.

NEW INFRASTRUCTURE AND SECURITY OF SUPPLY

While the fiscal regime favours upstream investments, the approval process is arduous, particularly at the regional level. Obtaining the necessary licences for exploration and production is a lengthy process in Italy. The process is even more difficult given that the majority of new fields are located near Venice, and their development encounters strong regional opposition. The devolution of powers to regional authorities has introduced uncertainty about the responsibility for administrative procedures and has hindered or discouraged the development of new projects. Given Italy's potential for the extraction of domestic gas resources and the current decline in domestic production, the government needs to improve its gas exploration and production strategies. The "Marzano" Law includes new specific measures to simplify the procedures for obtaining oil and gas field exploration permits and concessions in Italy. The objective is to encourage and support investments for the exploration of new prospects and the development of already discovered fields. This is a very welcome move towards reducing Italy's growing import dependence.

Italy has a well-developed pipeline network. However, there are only three entry points for gas and one LNG regasification terminal at Panigaglia. These entry points are currently saturated and represent a bottleneck for possible additional supply. New infrastructure is necessary to satisfy the expected strong growth in gas demand. However, there are two major obstacles to the

building of new infrastructure, namely the devolution of powers to the regional authorities and the consequent “nimby” problem and the lack of incentives for Eni to invest in additional capacities owing to the cap on its market share.

Given that gas imports are likely to increase, it is necessary to implement additional import capacities. For new LNG regasification terminals, the adoption of the “priority access” decree, according to which up to 80% of access to the new terminals may remain in the hands of the promoter for a maximum period of 20 years, will guarantee profitability and availability and will foster investment in new LNG regasification terminals. The decision has already been taken to build two new LNG terminals.

There is also a need to develop the major gas pipelines supplying the Italian system with gas originating from a long distance away. The “Marzano” Law simplifies and reduces to 180 days the authorisation process for building power lines and oil and gas pipelines that connect to the national system. This and the obligation put on Eni to invest in capacity expansions from Algeria and Austria would allow new supplies to be transported to the Italian market and will also foster competition. These measures should continue to encourage diversification of gas supply.

New storage facilities will need to be built to accommodate rapidly increasing gas demand and investment in new storage should be encouraged by an appropriate return on investment. The tariff elaborated by the Energy Authority for access to STOGIT storage appears to favour investment in volume, but is insufficient for peak storage and is not attractive enough to allow new storage development.

The decision of the Ministry of Productive Activities to impose mandatory strategic storage is a stringent measure. It is not discriminatory given that it is applied in proportion to each company's imports from a non-EU country. However, the measure does add an extra cost, which could act as one more entry barrier and therefore reduce competition. The Energy Authority will need to assess the costs and benefits of such a measure and monitor its possible effect on the development of competition.

RECOMMENDATIONS

The government of Italy should:

- ▶ *Continue the unbundling of the transportation and supply businesses to ensure equality of treatment.*

- ▶ *Proceed with gas market liberalisation by defining rapidly clear rules, especially for access to storage (Storage Code), LNG terminals (LNG Code) and distribution (Distribution Code).*
- ▶ *Encourage the development of a virtual gas hub (National Balancing Point) to facilitate the exchange of gas between shippers and to foster competition.*
- ▶ *Enforce a strict regulatory control to prevent abuse of a dominant market position. Preserve the independence of the Energy Authority and streamline the decision process inside the Energy Authority to ensure that it produces the missing codes in the shortest possible time.*
- ▶ *Continue to encourage geographical diversification of gas supply.*
- ▶ *In the new framework of market liberalisation, update and develop a policy of gas supply security, defining minimum criteria and the responsibilities of individual players.*
- ▶ *Given the potential for extraction of domestic gas resources and the current decline in domestic production, enhance and improve the national strategy for gas exploration and production.*
- ▶ *As a prerequisite for the success of gas market liberalisation and security of supply, encourage investments in LNG terminals and cross-border gas pipelines delivering gas to Italy. Streamline authorisation procedures for LNG terminals and pipelines. Encourage investments in storage by providing appropriate tariff incentives.*
- ▶ *Assess the costs and benefits of the strategic storage reserve obligation for shippers importing gas from non-EU countries, and consider if the portfolio of flexible tools could be expanded to allow the same level of security of supply at a lower cost.*

INDUSTRY STRUCTURE

The electricity sector, dominated for several decades by ENEL²⁹, is evolving following the implementation in 1999 of a wide-ranging reform affecting all of its components. New operators are entering the market and trying to take advantage of the opportunities offered by the introduction of competition in generation, distribution and supply.

ELECTRICITY GENERATION INDUSTRY

On the supply side, ENEL is now partially privatised and is listed on the Milan and New York stock exchanges. In November 1999, 34.5% of ENEL stock was sold, with the government retaining a majority of more than 60% of ENEL's capital. Until 1996, ENEL was a vertically integrated electricity company, after which it unbundled its generation, transmission and distribution activities. Since 1999, ENEL has become a holding establishment of companies for generation, distribution and sales to eligible and non-eligible consumers, ENEL is also the owner of the transmission grid and of diversified support businesses (see figure 20).

The government wants to stimulate more competition in the electricity market. In 1999, the government launched an electricity release programme imposing ENEL to divest 15 000 MW of its total 56 000 MW installed capacity of generation facilities to reduce its share in power generation to less than 50% by 1 January 2003. Consequently, 15 000 MW of ENEL's generation assets were split into three companies, namely Eurogen (7 008 MW, based in Rome and Milan), Elettrogen (5 438 MW, based in Rome and Piacenza) and Interpower (2 611 MW, based in Naples and Rome). By November 2002, all three were sold:

- On 23 July 2001, Elettrogen was sold to a consortium led by Endesa (Spain), with Banco Santander Central Hispanico (Spain) and ASM Brescia (Italy).
- On 18 March 2002, Eurogen was sold to a consortium led by Edipower (Italy), with AEM Milano (Italy), AEM Torino (Italy), ATEL (Switzerland), Unicredito Italiano (Italy), Interbanca (Italy), and MRSB Capital Partners.
- At the end of 2002, Interpower was sold to a consortium comprising Energia Italia (Italy), Electrabel (Belgium) and ACEA (Italy).

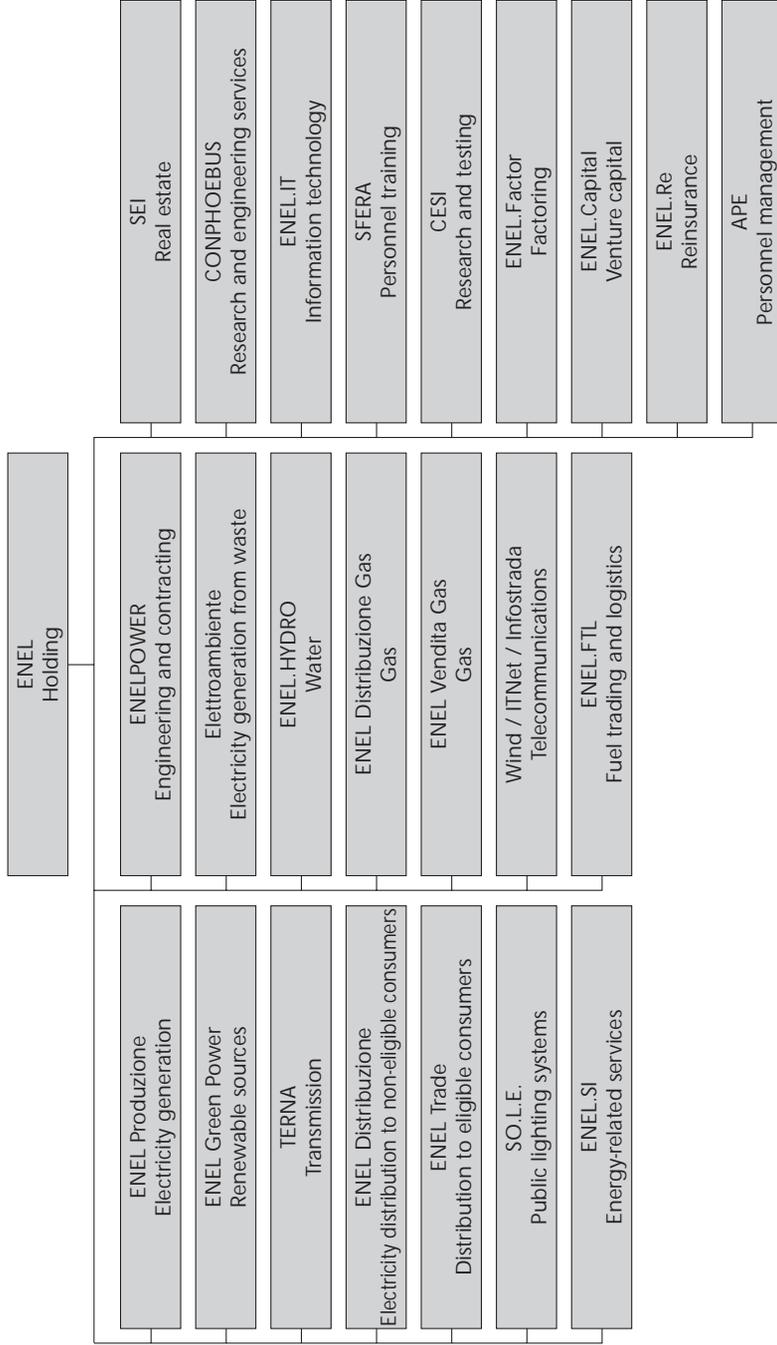
29. ENEL was created as a state-owned company in 1962, following the nationalisation of the previously existing regional private assets.

Figure 19
Map of the Electricity Grid



Source: ENEL.

Figure 20
ENEL Group until July 2002



Source: ENEL.

In 2001, Edison was bought by Italergergia, an energy consortium in which Electricité de France (EDF) has an 18% stake. After the acquisition, the government passed a decree to reduce EDF's voting rights in Italergergia to 2% in order to block EDF from becoming the majority shareholder. The government took this action because EDF was a state-owned company and the degree of competition between France and Italy was not similar. This resulted in a dispute between Italy and the EU, and in June 2001, the European Commission ruled that capital flows cannot be restricted merely because of varying degrees of liberalisation.

ENEL will divest its transmission assets when it is allowed to do so. ENEL still holds a substantial share of around 50% in electricity generation. At the end of 2001, the share of the three main electricity producers was 68%. Both these figures compare relatively favourably with the rest of Europe. Table 22 summarises the new industry structure envisaged by the government and the Energy Authority. It shows the extent to which ENEL is losing importance in the generation sector and the competitors are taking a stronger role. In the past, competition in the electricity generation industry developed at the margins, with ENEL holding the main share of electricity production, and

Table 22
The New Electricity Structure

<i>1 January 1999</i>		<i>1 January 2004</i>	
<i>ENEL</i>	<i>Competitors</i>	<i>ENEL holding</i>	<i>Competitors</i>
Generation 72%	Independent power producers and municipalities 28%	ENEL Produzione <50%	Others >50%
Imports 100%	-	Long-term imports <30%	Import traders >70%
Transmission 95%	Others 5%	Terna	Independent TSO (100% state-owned)
Distribution and retail 91%	Municipalities 9%	ENEL Distribuzione <80%	Municipalities >20%
Trading	-	ENEL Trade <30%	Traders and retailers >70%
Eligible consumers: above 100 GWh per annum by February 1999, eligible market <5%		Eligible consumers above 0.1 GWh per annum by May 2003, all non-household consumers by 1 January 2004, eligible market >70%	

Source: Energy Authority.

municipal utilities or independent power producers sharing around 30% of the generating capacity. Competition is growing between the large entities that have emerged following the divestment of ENEL. Some independent power producers, municipal producers, foreign banks and electricity companies also have a share in these new entities.

TRANSMISSION

Under a ministerial decree of 25 June 1999, the national electricity transmission system has been defined for all electricity lines with a voltage superior or equal to 220 kV and for lines with a voltage between 120 kV and 220 kV, which are used for transmission activities. The total length of the national electricity transmission system is 42 650 km, with 267 electrical substations. Around 90% of the transmission assets belong to Terna, which is a 100% subsidiary of ENEL.

As of 31 December 2001, the following operators owned transmission lines:

● Terna	37 218 km
● Edison Rete	2 122 km
● AEM Trasmissione Milano	1 092 km
● ACEA Trasmissione	700 km
● Self	436 km
● Sondel Trasmissione	427 km
● AEM Trasmissione Energia Torino	197 km

DISTRIBUTION AND SUPPLY

The majority of companies involved in production and transmission activities also have distribution subsidiaries. Distribution companies own the transmission lines as well as some of the companies involved in electricity supply, such as the municipal utilities (ACEA, etc.). Given that distribution is considered a public service, companies operating in this sector need to acquire licences issued by the Ministry of Productive Activities. Currently, the government is in the process of reallocating licences. The expiration of the current licences is fixed at 31 December 2003. Thereafter, new licences will be allocated through a competitive bidding procedure to be announced at least five years ahead of the end of each licence. In an effort to rationalise and increase the efficiency of the distribution activity, only one distribution licence per municipal area will be issued. This provision compels distribution

companies, currently operating in the same municipal area, to reach an agreement for only one of them to do so. If no agreement is achieved, ENEL must sell its distribution assets to the other distribution companies within the boundaries of the municipalities where ENEL has at least 20% of the final users. Once the process has been completed, ENEL's share in distribution activities is expected to decrease from 92% to about 85%. ENEL has already sold several distribution grids, including the Rome network to ACEA for €568 million in April 2001 and the Turin and Milano networks to AEM in 2002. However, some municipal electricity companies have accused ENEL of blocking their access to sales of distribution grids. Several lawsuits have been engaged in this respect with some of the decisions in favour of municipalities.

The Ministry of Productive Activities has issued 75 licences. The few remaining licences will be released once the aggregation process in different territorial areas has been defined.

The reform also seeks to establish convergence in the technical quality of supply, which varies widely across Italy. The government has taken several measures to boost the quality of distribution and supply. Decree 201/1999 and Decree 202/1999 of 28 December 1999 upgraded the electricity supply and distribution standards and redefined quality/reliability standards for electricity supply outages. Decree 55/2000 of 16 March 2000 introduced rules to improve the transparency of the billing process.

On the retail supply side, some 170 retailers are qualified/registered by the Energy Authority. There are around 50 principal companies, mainly subsidiaries of companies such as ENEL (Italy), EDF (France), RWE (Germany), EnBW (Germany), EGL (Switzerland) and Endesa (Spain). The majority of the principal supply (or retail) companies are independent from distribution companies and only supply the eligible market that consists of large industrial consumers. In 2002, the majority of the market was shared between the following companies:

- ENEL Trade: 33%
- Edison Energia: 14%
- Assoenergia: 7%
- EGL Italia: 5%
- Energia Italia: 5%.

DEMAND

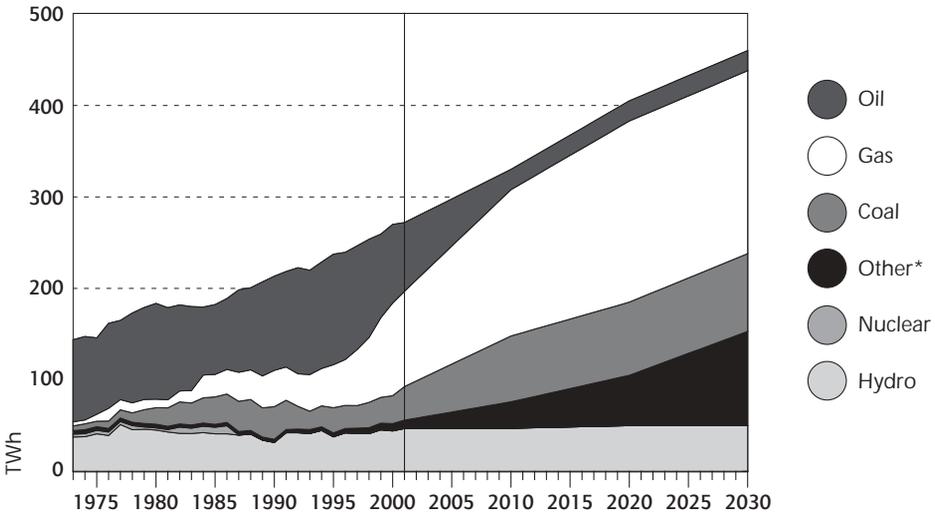
In 2000, electricity consumption was 269.2 TWh, compared to 213.2 TWh in 1990. This corresponds to a growth rate of 2.3% per annum, almost double the TPES, showing the expansion of the use of electricity in the Italian economy, which is substituting other sources of energy. This significant growth rate is expected to

be sustained in the coming decade. Consumption per capita was 5 227 kWh in 2000 against 6 547 in the EU.

The electricity annual load curve is currently displaying a growing summer peak in addition to the winter one. Average peak load was 64.1 GW in 2002.

Industry is the largest consuming sector with 52% of the total final electricity consumption in 2000. Residential consumption comes second with almost 25%, while commercial and public services represent almost 19%. Over the past decade, this allocation remained stable, with a slight growth in residential consumption and a slight decrease in commercial and public services consumption.

Figure 21
Electricity Generation by Source, 1973 to 2030



* includes geothermal, solar, wind, combustible renewables and wastes and electricity from heat pumps.

Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

SUPPLY

DOMESTIC GENERATION

At the end of 2001, the total generating capacity of public utilities³⁰ was 76 210 MW, of which 54 570 MW was thermal and 21 640 MW was hydro-electricity and other renewables:

30. Sources: Energy Authority and IEA.

● Thermal	54 570 MW
• Liquid fuels	14 560 (27%)
• Natural gas	5 870 (11%)
• Renewables	690 (1%)
• Solid/liquid	7 690 (14%)
• Liquid natural gas	20 360 (38%)
• Solid/liquid/natural gas	4 850 (9%)

● **Hydroelectricity and other renewables 21 640 MW**

An additional 13 000 MW of autoproduction increased the capacity of public utilities, of which 11 900 MW being combined heat and power (CHP) plants, with 7 700 MW from independent power producers and 4 200 MW from autoproducers.

Total net generation reached about 266 TWh in 2001, which can be broken down as follows:

● Thermal	207
of which:	
• Natural gas	95
• Oil products	70
• Coal	28
• Other fuels	9.5
• Others	4.5
● Hydroelectricity	54
● Geothermal	4
● Other renewables	1

Italy has a distinct fuel mix with no nuclear, a relatively small quantity of coal-based electricity and a large share of electricity production from natural gas. The share of natural gas is approximately 40%, which is more than double the EU average, but is in the same range as other IEA member countries that are highly dependent on gas, such as the UK or Turkey. In the 1990s, a large majority of additional power plants were gas-fired. Consequently, between 1990 and 2000, the share of gas in electricity production doubled from 20% to 40%, while the share of oil decreased from 48% to 32%.

The share of coal dropped from 17% in 1990 to 11% in 2000, mainly owing to local opposition to the use of coal in power production. The government would like future use of coal in electricity production to grow to a level closer to its average use in other EU countries (around 30% in 2000), in order to

contribute to the diversification of the primary energy mix. The government favours the development of cleaner coal combustion technologies given coal's possible negative impact on the environment.

All of Italy's power generating companies have submitted plans to improve existing plants and raise their current thermal efficiency by four to five percentage points, through the following actions:

- Fuel-switching from oil to gas, or in a few cases from orimulsion to coal.
- Technical changes enlarging the size of boilers to reduce losses and production costs.
- Transforming conventional combustion units into combined cycle gas turbine units.

ENEL aims to enlarge its capacity to deliver baseload power.

With an available capacity of 62 GW in 2001 and a peak demand currently above 52 GW, the total current average reserve margin is limited at around 20%³¹. The Energy Authority estimates that this will decrease to 16% in 2004 owing to an increase in peak demand. The solution lies in improving production efficiency and in expanding domestic generation to diversify the primary sources of electricity production, but investment in generation infrastructure tends to take longer in Italy than in other IEA member countries, mainly because of local resistance.

The government decided to boost investments in electricity generation through Decree 7/2002, eventually converted into Law 55/2000 on 9 April 2002, also referred to as the Sblocca Centrali (see Chapter 3 on the general energy scene and energy policy), which streamlined the authorisation process for new plant construction. Consequently, generation plants and the necessary infrastructure³² are authorised through a single 180-day procedure. The government expects approximately 10 GW of new power capacity to be commissioned by 2006 and around 20 GW by 2010, maintaining the reserve margin in 2006 at around 15%. Currently, 11 GW have already been authorised and applications are being considered for a further 37.2 GW.

NUCLEAR POWER

Italy has four nuclear power plants, namely Caorso in the north-east, Latina and Garigliano in central Italy and Trino Vercellese in the north-west. Their operation was stopped after a five-year moratorium on nuclear power that

31. Including autoproducers' capacity.

32. Connections to the electrical and gas networks, but also, if necessary, railway and port infrastructure.

Conversion Plan of Italian Electricity Plants

<i>Company, plants</i>	<i>From</i>	<i>Current fuel</i>	<i>To</i>	<i>New fuel</i>	<i>Commissioned</i>
ENEL					
La Casella	4x304	Oil	4x380	Gas (in combined cycle)	2003
Pietrafitta	61	Coal	370	Gas (in combined cycle)	2003
Porto Corsini	2x146	Oil	2x380	Gas (in combined cycle)	2003
Priolo	2x302	Oil	2x380	Gas (in combined cycle)	2003
Termini Imerese	1x105 + 2x240	Oil	3x380	Gas (in combined cycle)	2005
Sulcis	220	Coal	330	Coal/Orimulsion	2005
Torre Nord	4x603	Oil	4x610	Coal/Orimulsion	2008
Porto Tolle	4x462	Oil	4x615	Coal/Orimulsion	2007
EUROGEN					
Sermide	4x303	3 Oil / 1 Gas	3x380	Gas (in combined cycle)	2004
Chivasso	243+133	Coal	3x380	Gas (in combined cycle)	2005
Brindisi Nord	4x296	Oil	3x380	Gas (in combined cycle)	2005
Piacenza	2x312	Oil	2x380	Gas (in combined cycle)	2005
San Filippo del Mela	2x293	Oil	2x283	Coal/Orimulsion	2003
ELETTROGEN					
Ostiglia	4x313	Oil	3x380	Gas (in combined cycle)	2005
Tavazzano	4x300	Oil	3x380	Gas combined cycle	2006
Monfalcone	2x302	Oil	2x380	Gas (in combined cycle) or Coal/Orimulsion	2005
INTERPOWER					
Vado	2x311	Coal	2x380	Gas (in combined cycle)	2006
Torre Sud	4x312	Oil	3x380	Gas (in combined cycle)	2005
Napoli L.	3x137	Coal	1x380	Gas (in combined cycle)	2007

Sources: ENEL; Utility Database Institute.

Coal in Electricity Generation

By 2000, the share of coal in TPES had decreased to 7.3% (12.6 Mtoe) from 9.6% in 1990 (14.6 Mtoe). In 2001, coal represented 13% of primary energy used for electricity production, down from 17% in 1990, but up by 2 points from 2000.

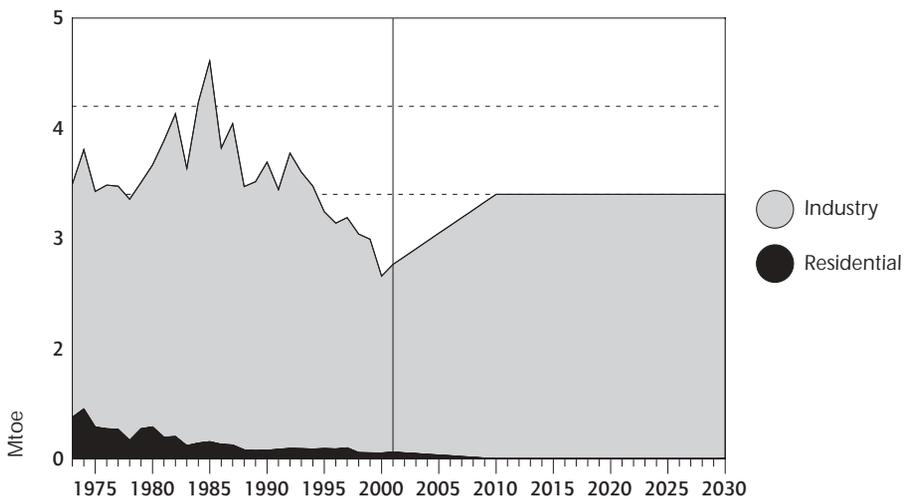
In 2010, the government expects the share of coal to reach 22% of the energy used to produce 330 TWh, driven by plans to repower power plants or to build new ones, using coal as the primary energy source.

Local opposition to coal is common, but the government is confident in the power companies' abilities to negotiate with the municipalities on the appropriate technical improvements to maximise emissions reductions and to render coal more acceptable. The electricity companies highlight that increasing the efficiency of electricity production will result in a reduction in unit emissions, which could also help the government and the utilities to reduce overall emissions. The example of ENEL's Torre Valdaliga Nord project near Civitavecchia in the Lazio region north of Rome is interesting in this respect. ENEL is planning to convert a plant that used fuel oil (and orimulsion) into a super critical coal plant of 45% conversion yield (compared to a rather low overall efficiency average in Italian thermoelectric plants of around 40%). This project has been opposed locally. In March 2003, in order to obtain public acceptance, ENEL reduced the size of the envisaged plant (from 2600 MW to 2 000 MW) and guaranteed some local employment during the construction phase.

Almost 100% of coal used in Italy is imported. Italy has a marginal domestic coal production; however, its future is uncertain. The closure of mines in Umbria and Tuscany ended the lignite production. The last remaining coal mine is in Sardinia (Sulcis).

Figure 22

Final Consumption of Coal by Sector, 1973 to 2030



Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003; and country submission.

began in 1987 and has been extended to the present day. While there are no plans to start the nuclear programme anew, a recent parliamentary debate on energy concluded that Italy may want to reconsider nuclear, as an option to diversify the energy mix, if the economics of producing nuclear electricity make it an attractive solution in the context of a liberalised electricity market³³.

Policies in this area are aimed at decommissioning old nuclear power plants and safely disposing of nuclear waste. The government is in the process of identifying a single site to store all radioactive waste located within the country in order to increase security.

CROSS-BORDER TRADE

Imports play an important role in electricity supply. In the 1990s, net electricity imports were steady at 14% to 16% of the supply. In 2001, Italy imported 48.4 TWh, corresponding to a 9% increase from 2000 (44.3 TWh). In 2000, electricity was imported from Switzerland (50%; 22 TWh), France (36%; 16 TWh), Slovenia (10%; 4.5 TWh) and Austria (4%; 2 TWh). Italy exported 0.5 TWh in 2000, mainly to France (0.4 TWh) and marginally to Switzerland (0.05 TWh) and Slovenia (0.04 TWh).

Apart from the 500 MW direct current (DC) undersea cable linking Italy and Greece, which will soon be operational, the entire import/export capacity depends on alternating current (AC) interconnections jointly operated by the transmission system operator (TSO), GRTN, and the neighbouring countries' TSOs. The overall net available capacity amounts to 6 000 MW, almost achieving the 10% minimum level of interconnection between EU member States targeted by the EC³⁴. Interconnections located at the French and Swiss borders provide 5 400 MW out of the total available capacity. Capacity available on the Austrian and Slovenian borders amounts to 220 MW and 380 MW respectively. Three lines are expected to be commissioned by 2006, adding 3 800 MW of cross-border transmission capacity.

Despite this level of interconnection, demand for interconnection capacity exceeds supply and the prospect to build new lines is seriously challenged locally by the lack of public acceptance of new transmission infrastructure. The current regulatory framework allocates capacity on a pro-rata basis of operators' capacity requirements. An antitrust limit prevents any operator from acquiring more than 10% of available capacity. Specific provisions are set for non-firm capacity as GRTN accepts applications for non-firm capacity

33. Camera dei Deputati, Commissione Attività Produttive, Commercio e Turismo, *Indagine conoscitiva sulla situazione e sulle prospettive del settore dell'energia*, Documento Conclusivo, Roma, April 2002.

34. European Commission, *Medium-Term Vision for the Internal Electricity Market*, Strategy Paper, Brussels, 2003.

posted by “interruptible” clients. The allocation procedure is jointly managed by the French TSO, RTE, and the Italian TSO, GRTN for the Italy-France border, and by the regional Swiss TSO for the Italian-Swiss interconnection. Unused available import capacity is sold by GRTN to market players through tenders published monthly.

PRICES AND TARIFFS

In 1999, the government initiated a programme to reduce electricity retail prices in the regulated sector by as much as 17% and to eliminate cross-subsidies by 2001.

Tariffs for supply to captive, non-eligible consumers are determined by the Energy Authority (Law 481/1995 and Decree 79/1999). A new tariff system was implemented on 1 January 2000. Criteria to fix tariffs are unique for captive consumers in Italy. The Energy Authority establishes tariffs for captive consumers while the distributors fix tariffs for other categories of clients, in accordance with Energy Authority rules. The Energy Authority has determined nine types of consumers on the basis of voltage and use. The distributors are allowed to have a limited price differential linked to geographical location. The distributing companies must guarantee grid connection to all applicants. The new tariff reform, which will enter into force for residential consumers in 2003, provides a special tariff to low-income consumers.

From beginning 2001, two price ceilings have been effective, one limiting profits from a single consumer and the other limiting profits from each user group. The Energy Authority monitors the compliance of the distribution companies. If the supplier's profits exceed the ceiling, the supplier must refund the consumer. However, if the consumer is undercharged, there is no compensation mechanism for the supplier.

Electricity prices observed between 1996 and 2002 have decreased more on the eligible market than on the captive market. However, higher prices of oil and gas have limited the price decrease in the eligible market. The decrease, which is significant in nominal terms (see Table 24), is limited in real terms. Between January 1996 and August 2002, the all consumers' average electricity price decreased by 9% in real terms, an average rate of -1.5% per annum. Despite these positive developments, electricity prices remain high in Italy owing to a combination of high fuel costs and high tax levels. End 2002, the electricity price for eligible consumers was 11.4 euro cents per kWh in Italy, against the IEA member countries' average of less than 7 euro cents. The principal reason for the relatively high cost of electricity in Italy is its dependence on gas and particularly oil-fired generation. Most of the plants are old and their thermal efficiencies are much lower than modern combined cycles (see Chapter 3 on the general energy scene and energy policy). The tax

Table 24

Changes in Nominal Electricity Tariffs between 1999 and 2001

<i>Consumers</i>	<i>Annual consumption (kWh)</i>	<i>Electricity price change (%)</i>
Residential	600	-3.3
	1 200	-9.4
	3 500	-20.1
	7 500	-22.0
Industrial	160 000	-13.4
	2 000 000	-23.8
	10 000 000	-23.8
	24 000 000	-24.8

Source: Energy Authority.

level on electricity prices, which was 15.2% in 2000 for industry consumers, is higher than in most IEA member countries. In a large number of IEA member countries, industrial consumers benefit from low levels of taxation on electricity.

Table 25

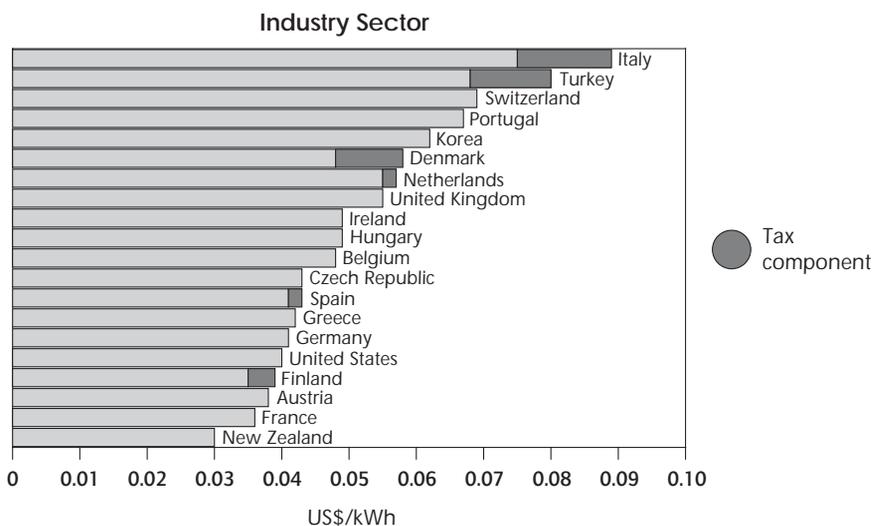
Components of Average Electricity Price to Eligible Consumers, as of 1 November 2002

<i>Cost components</i>	<i>Shares (%)</i>	<i>Euro cents per kWh</i>
General costs	10.5	1.2
- stranded costs		
- R&D		
- subsidies		
Fixed costs	41.6	4.8
- production	20.2	2.3
- transmission	2.6	0.3
- distribution, measurement and retail	19.3	2.2
Fuels	38.0	4.3
Taxes	9.9	2.16
Total	100.0	11.4

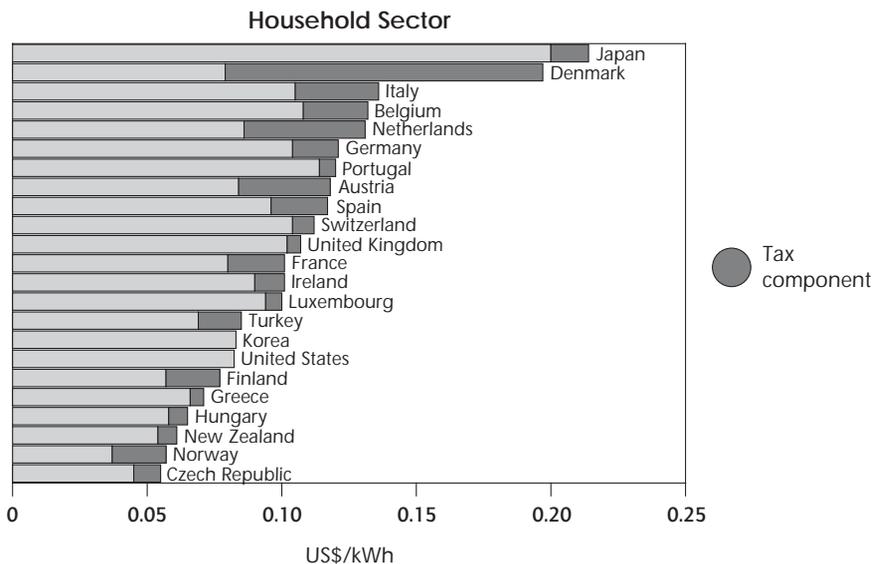
Source: Energy Authority.

Figure 23

Electricity Prices in IEA Countries, 2000



Note: Price excluding tax for the United States. Tax information not available for Korea. Data not available for Australia, Canada, Japan, Luxembourg, Norway and Sweden.

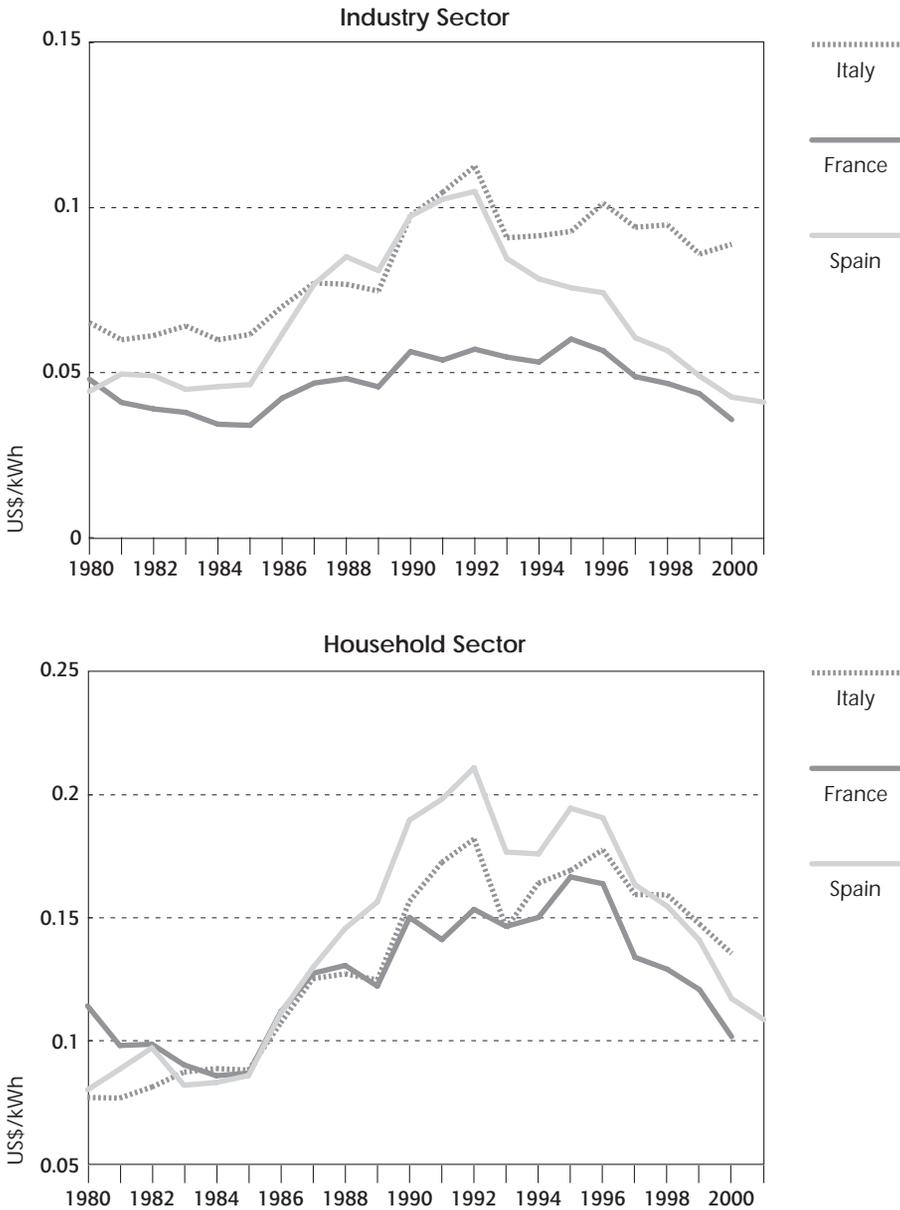


Note: Price excluding tax for the United States. Tax information not available for Korea. Data not available for Australia, Canada and Sweden.

Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

Figure 24

Electricity Prices in Italy and in Other Selected IEA Countries, 1980 to 2001



Source: *Energy Prices and Taxes*, IEA/OECD Paris, 2003.

REGULATION

PRINCIPLES

On 1 April 1999, Italy began its electricity market reform based on Decree 79/1999, "Implementing EC Directive 96/92/EC with common rules for the single market of electricity".

The decree determined the general architecture of the electricity sector, establishing the following:

- Two parallel markets. The captive market (supplying non-eligible consumers) and the free market (supplying consumers eligible to choose their supplier).
- Three main operators with separate functions: the TSO, the single buyer and the market operator.

The decree clarified which activities are to be:

- Liberalised, such as generation, import-export, trading, measurement and retail to eligible consumers.
- Reserved for the public sector, such as national transmission grid operation and dispatching; wholesale purchase of electricity for non-eligible consumers (see single buyer below).
- Subject to licensing, such as transmission grid ownership, maintenance and development; and distribution grid ownership, supply to non-eligible consumers.

The system is regulated by the Ministry of Productive Activities, which is responsible for the security and economy of the electricity sector and by the Energy Authority for Electricity and Gas (Autorità per l'Energia Elettrica e il Gas, AEEG). The Energy Authority was established in 1995 and began operations in April 1997. Its main competences are related to tariff-setting, defining the quality of services and ensuring transparency. The Energy Authority is fully autonomous and makes independent decisions and assessments. However, the government can provide general policy indications in its annual economics and finance planning document (DPEF, Documento di Programmazione Economico-Finanziaria). The Antitrust Authority is responsible for preventing anti-competitive behaviour.

To encourage competition in the electricity generation sector, the market share was capped from 1 January 2003, so that no market participant can produce or import, directly or indirectly, more than 50% of the total electricity produced and imported. This threshold is calculated on the basis of a three-year average. Should this threshold be exceeded, the Antitrust Authority would intervene.

Furthermore, no shareholder is allowed to acquire or hold stakes in more than one of the companies created in the framework of the electricity release programme, namely Elettrogen, Eurogen and Interpower. Companies with more than 30% of their capital being government-held are barred from entering the competition. This requirement was introduced to prevent public companies, such as EDF, from acquiring a large share of the electricity market.

Decree 79/1999 imposes legal unbundling for transmission activities. Accounting and administrative separation is imposed as a minimum requirement for other activities. However, large distribution companies with more than 300 000 end-users are an exception, and must constitute separate companies for distribution and sale to captive consumers. In order to comply with these requirements ENEL created different companies for production, transmission, distribution and sales to eligible consumers, distribution and sales to captive consumers and for managing the nuclear decommissioning activities.

The market opening to all consumers is expected to be achieved in several phases, based on the following eligibility criteria:

- 1999: 30 GWh per annum.
- 2000: 20 GWh per annum.
- 2002: 9 GWh per annum.
- 2003: 0.1 GWh per annum.
- 2007: all consumers.

Groups of companies as well as consumers being supplied on multi-sites can be considered as one eligible consumer. Based on the above thresholds, 30% of the market was considered open in 2000. In 2002, this figure reached 40%. The government accelerated market liberalisation with the implementation of Law 57/2001 of 5 March 2001, "Dispositions for market opening and regulation". This law lowered the eligibility threshold to 0.1 GWh per annum and entered into force in January 2003, 90 days after the compulsory sale of 15 000 MW generation capacity by ENEL. The government expects that this new eligibility threshold will open 70% of the market. Full opening of the electricity market is planned for 2007.

Regulated third-party access (TPA) to the transmission and distribution network has been implemented. The tariffs are established by the Energy Authority and are based on the price cap method to stimulate efficiency improvements through the reduction of operating costs.

NEW MARKET PARTICIPANTS

Transmission System Operator (TSO)

Decree 79/1999 created new mechanisms to facilitate competition in the electricity market. Given that transmission and dispatching of electricity have become government-controlled activities, a TSO (GRTN, Gestore della Rete di Trasmissione Nazionale) was created, based on a decree of 17 July 2000. GRTN, initially a stock company constituted by ENEL, is now entirely controlled by the Ministry of Economy and Finance. While ENEL still owns the transmission assets, GRTN manages the transmission network and owns the necessary dispatching equipment.

GRTN's principal functions are similar to those of a typical TSO:

- Responsibility for the energy dispatching and real time balancing of the electricity supply-demand.
- Security of the electricity delivery system.
- Managing of import-export interconnection lines.
- Grid connection of generating plants and consumers.
- Responsibility for transmission network maintenance and development.

Given that ownership of the transmission lines and the operation of the transmission system have been separated, GRTN entered into agreements with transmission grid owners (mainly Terna) using a specific framework convention defined by the Ministry of Productive Activities. To overcome this complex mechanism and to increase the efficiency and quality of the transmission service, the "Marzano" Law foresees the reunification of the transmission ownership and management under a single (separate) company to be privatised.

GRTN offers non-discriminatory TPA to all producers and eligible customers provided they comply with the technical conditions. The tariff for the use of the network is the same regardless of the distance between the generator and the eligible customer.

Single Buyer

GRTN constituted a stock company to guarantee the availability and security of supply for captive customers, the single buyer (AU, Acquirente Unico), based on directives issued by the Ministry of Productive Activity on 3 May 2001. The single buyer must develop annual forecasts of its energy demand over a three-year period. On the basis of the forecasts, the single buyer will either buy electricity on the market through bilateral contracts or will buy it on the wholesale electricity market.

The role of the single buyer will be tailored to the evolution of the market opening process. Even in a fully liberalised market, the single buyer is expected to operate as a "provider of last resort" for small customers (typically domestic customers) that cannot or do not want to acquire supply directly from the market. The opening of the market will gradually decrease the single buyer's role. The single buyer may enhance the liquidity of the pool market by entering it, but it is not obliged to do so. At the time of writing this report ENEL was still responsible for this task because the single buyer was not yet operational.

Market Operator

Decree 79/1999 envisaged the creation of a pool market for wholesale electricity trade. In June 2001, GRTN created a stock company, the market operator (GME, Gestore del Mercato Elettrico), to set up this market. GME's role is to ensure economic management of the market through competition among producers and to minimise energy costs. The "market rules" have already been approved by the ministerial decree of 9 May 2001 and the "market instructions" (the detailed market rules) were finalised end 2002.

The wholesale electricity market is planned to be launched in 2003, when 70% of the market will be open. Prior to this date, GRTN is required to have performed generation plant dispatching according to order of economic merit within the market. Until then, dispatching is performed on the basis of bilateral contracts for the free market and on the basis of marginal costs for the captive market.

Given that the pool is not yet operational, all the electricity in the free market is currently traded through bilateral contracts. After the establishment of the pool, eligible consumers will be able to make purchases either from the pool or through bilateral contracts with electricity producers. Under provision of Decree 79/1999, the Regulatory Authority can authorise bilateral contracts. The pool is not compulsory. A surveillance structure operated by the regulator and/or the Antitrust Authority to detect abuse of dominant position in the electricity market exchange has yet to be created. The development of a derivatives market is left to the market itself. Trading of green certificates will also take place on the electricity exchange (see Chapter 6 on renewable energy).

Combined Heat and Power

Decree 79/1999 promotes combined heat and power (CHP) through the following measures:

- GRTN must ensure priority dispatch of co-generated electricity (immediately after renewable electricity).

- Operators of CHP plants are exempted from the renewable electricity obligation.

In 2002, the Regulatory Authority defined the criteria for CHP plants, which can benefit from the above-mentioned preferential treatment. The criteria take into account generation efficiency and the relevant energy savings when compared to a separate production of the same quantity of power and heat. It also requires a minimum 15% heat content in the total energy output. A rough preliminary estimate shows that approximately 50% of the currently installed co-generation capacity can satisfy these criteria.

CRITIQUE

Since the last in-depth review, Italy continued to liberalise the electricity market and made remarkable progress in this respect. The EC directive for electricity market liberalisation has been transposed into legislation. ENEL has been partially privatised and part of its generating capacity has been divested to reduce its share to less than 50%, which has enabled a number of new participants to enter the market. The electricity market has been liberalised up to 70% in several phases, with full liberalisation planned for 2007. Transmission networks have been legally unbundled and a transmission system operator has been established. In order to facilitate the wholesale electricity market, a market operator has also been created. Through these arrangements, Italy is considered to be one of the EU countries with the most rigorous conditions for network unbundling³⁵. The government should be commended for these positive developments.

Despite recent progress, there are still problems to be overcome. Some of these are becoming more acute. There is a risk that current developments in generating capacity could hinder the achievement of public objectives, such as electricity mix diversification, unit production cost reduction and sufficient electricity supply. This could occur either because the investment plans do not materialise, making it difficult to secure sufficient supply at a lower unit cost, or because they increase the dependence of an even larger portion of the generating capacity on natural gas as a source of primary energy. While the market is developing with new participants, there are still challenges to avoid abuse of dominant position by the incumbent.

The electricity supply mix has been changing, but not diversifying as expected. Faced with a strong dependence on oil for the electricity production, efforts made in the past decade have reinforced the role of natural gas in electricity production more than any other primary source. The dependence on natural

35. Commission of the European Communities, 2002 (*op. cit.* in footnote 12).

gas has now reached levels comparable to those of countries with abundant domestic gas resources, such as the UK. The plans to repower some of the existing plants, mainly by switching from oil or coal to gas is likely to reinforce further the gas dependence. For Italy, which has to import most of its gas supply, strong dependence on natural gas may increase the vulnerability of the electricity supply.

On the other hand, alternative sources of electricity production are unlikely to increase to a level that is sufficient to compensate for the growth in natural gas consumption. Renewable energy sources have not been fully exploited despite their significant potential. Coal has been playing a limited role partly owing to local opposition. This has been the case even for the projects for “repowering” existing coal plants or for new projects using cleaner coal-conversion technologies. While ENEL expects to increase the use of coal in some of its plants, it is not necessarily easy to overcome local opposition, especially in the current context where decision-making is devolved to the local authorities. Increased use of coal also needs to be balanced with Italy’s GHG reduction target. Such diversification is required to secure electricity supply and eventually to lower the cost of electricity production by spreading the risks associated with price fluctuations of imported oil and gas and by helping to increase capital stock turnover, shifting to newer and more efficient power plants. Italy would need to consider more proactive measures to diversify its electricity mix, such as resorting to higher levels of renewable energy obligation.

Italy’s energy diversification challenge is partly a consequence of its abandonment of nuclear. Italy’s four nuclear reactors were stopped in 1987 after the referendum on nuclear energy. The government acknowledges the role nuclear could play to diversify the electricity mix. The Parliamentary Commission’s report on the “Situation and Perspectives in the Energy Sector” mentions this issue. Although the likelihood of local authorities clearing the way for additional nuclear sites is limited in the near future, Italy may benefit from reopening the debate on nuclear electricity.

If tight supplies are anticipated, greater efforts to encourage a demand-side response to the market should be facilitated. ENEL is in the process of installing 30 million electronic meters that can be read remotely, at a cost of €2 billion. The ability to read meters on an hourly basis could enable the widespread application of time-sensitive pricing and thereby enhance the demand response of consumers. Stronger demand response also has the benefit of limiting the market power of potentially dominant generating companies.

The government should ensure that GRTN monitors the reserve margin for electricity generation or the additional need for domestic or international transmission, bearing in mind the sufficient lead times. Tight supplies may also require more involvement of the Energy Authority to provide technical

support in designing the government's response to such a situation, and to encourage new investments.

Investors are encountering difficulties in setting up new electricity facilities (generation or transmission). The biggest problem is that the acceptability of new energy infrastructure is generally low within local communities. In such a decentralised system as Italy's, more information needs to be provided to the local authorities and residents on the national electricity situation and on the specificity of electricity projects that are likely to be developed in their neighbourhood.

The government's provision for taking over the authorisation process for new power plants if local authorities are unable to complete the procedure within 180 days (Sblocca Centrali) is a step in the right direction to push the local authorities to streamline the administrative procedures at their level. However, this may be insufficient given that local authorities could respect the delay yet still refuse the necessary additional infrastructure. Further streamlining of the authorisation procedure for building electricity infrastructure would be required. More specific measures proposed in the "Marzano" Law are being discussed to facilitate the decision-making process (see Chapter 3 on the general energy scene and energy policy).

The problem is also linked to the lack of incentives for investors. Noting the difficulties surrounding energy investments in local communities, investors should be compensated for their efforts in convincing the local authorities and in investing in additional measures to protect the local communities from the perceived negative side effects of new infrastructure.

Although the government and the Energy Authority have evolved a clear and convincing picture of how the electricity sector could look by 2004, when all the new elements are in place for competition to be fully implemented, incumbents' market power is still a major concern. Despite the government's decision to set a 50% cap on market shares and the subsequent divestiture of 15 000 MW of ENEL's generating capacity, ENEL still manages to retain a significant share in some portions of the market. In particular, ENEL is still able to set prices using its dominant position in the peak generating capacity. It is the role of the Energy Authority and the Antitrust Authority to enforce a strict regulatory control of abuse of dominant position. Depending on the situation, it may be necessary to divest further generating capacity of ENEL. The government may take such an option especially as it is a shareholder of ENEL.

The implementation of the power exchange (GME), which was originally planned for 2003, has been delayed. Given its potential positive effect on reducing electricity prices in Italy, GME should be operational as soon as possible. Once it is operational, the Energy Authority and the Antitrust Authority should establish clear rules and surveillance mechanisms to monitor the market and avoid abuse of dominant position.

The power exchange and the single buyer (AU) are both owned by the TSO. Although they are state-owned, both should be made fully independent from the TSO to avoid conflicts of interest, especially after the GRTN privatisation.

The ownership of transmission assets should rapidly be transferred from ENEL to the TSO, in order to facilitate investments in the transmission network, particularly cross-border.

Since Italy is currently dismantling its nuclear power plants, decommissioning may benefit from reinforced co-operation with both EU and non-EU countries that are involved in similar operations.

RECOMMENDATIONS

- ▶ *Consider the possibility of reopening a public debate on the nuclear energy option in light of current and future energy policy challenges.*
- ▶ *Monitor and publish regularly information on the electricity sector reserve margin and consider additional investment incentives to avoid blackouts in the coming years. Expand the role of GRTN and of the Energy Authority to support the government in this respect.*
- ▶ *Analyse options to provide incentives in the transmission and distribution tariff to ensure investment in new transmission capacity.*
- ▶ *Further streamline authorisation procedures for building electricity infrastructure.*
- ▶ *Expand interconnection for electricity imports.*
- ▶ *Encourage dissemination of information to local authorities and communities on electricity projects.*
- ▶ *Continue the electricity market liberalisation process, enforcing strict regulatory control to prevent abuse of dominant market position and maintaining the independence of the Energy Authority.*
- ▶ *Enable the power exchange to begin its operations as rapidly as possible, facilitate measures that aim to increase its liquidity and create a surveillance structure to avoid abuse of market power.*
- ▶ *Ensure independence of the power exchange (GME) and the single buyer (AU) from the transmission system operator (GRTN) and monitor the latter's market power once it has been privatised and GME and AU are fully operational.*
- ▶ *Organise the sale the latter's of ENEL's transmission assets to GRTN.*
- ▶ *Increase international co-operation in the field of decommissioning of nuclear power plants.*

RESEARCH, DEVELOPMENT AND DEMONSTRATION

RESEARCH AND DEVELOPMENT FUNDING

With public and private gross expenditures of €15 billion for overall research and development (R&D) representing 1.1% of its GDP in 2000, Italy has one of the lowest R&D investment rates of all industrialised countries³⁶. The government funded almost half of the total R&D expenditure.

The government is concerned that the low level of R&D investment is a threat to the country's overall competitiveness. Consequently, it has reorganised the research and educational infrastructures to make them more effective and focused. Reforms implemented in recent years included introducing financial incentives for good performance, more streamlined organisations and an effort to develop national R&D priorities for spending limited resources effectively.

Energy R&D accounts for only a few percentage points of public R&D spending, and less than 5% of total R&D spending. Public funding for energy R&D was about €263 million in 2000 and €283 million in 2001.

Public energy R&D investment has dropped significantly since the late 1980s, from a peak at €1 billion in 1985 (in 2001 euros). This is primarily the result of funding cuts for fission and fusion. Since 1998, the public R&D budget has been increasing, but remained stable when expressed as a share of GDP at around 0.025%, a figure similar to the IEA EU country average.

GENERAL R&D POLICY

The National Research Programme (PNR) was established by the Ministry of Education, Universities and Research and was approved by the Inter-Ministerial Committee for Economic Planning (CIPE) on 22 December 2000. It is the government's principal tool for identifying trends, strategic priorities and financial resources for scientific and technological research.

The main objective of the PNR is to improve the strategic and organisational performances of the Italian scientific network with regard to:

- Life quality.
- Sustainable competitive growth.

36. OECD average in 2000 was 2.2%.

- Environment and energy.
- Mediterranean cultures inside the global system.

An inter-ministerial decree issued on 17 December 2002 provides support to the priority themes of the PNR. Funds are allocated to the following strategic programmes of the Integrated Fund for Research (Fondo integrativo speciale per la ricerca, Decree 224/1998 of 5 June 1998):

- Food quality and well-being (€24 million).
- Sustainable development and climate change (€27 million).
- New systems for energy generation and management (€51 million).

Co-operation will be carried out to promote scientific research on climate variability, its uncertainties and ecological, technological and health implications in the framework of the bilateral agreement between Italy and the United States.

In addition to national programmes, many regional support schemes are also available. In particular, some regions of southern Italy have defined their own R&D programmes, taking advantage of the EC Structural Funds 2000 to 2006. According to Decree 112/1998 of 31 March 1998, funds allocated by Law 10/1991 for sustaining innovative and demonstrative energy projects have been attributed to the regional authorities to fund such projects.

ENERGY R&D

The environment and energy section of the PNR is in line with the conclusions of the November 1998 National Conference on Environment and Energy. The conclusions indicated that the government should promote and support major medium- and long-term research projects, as well as technological innovation aimed at broadening the range of options for sustainable development, and should address the objective of the country's competitiveness.

The major energy R&D funding agencies in Italy contributing to the PNR are the Ministry of Productive Activities, the Ministry for Environment and Territories and the Ministry of Education, Universities and Research. The National Agency for New Technology, Energy and Environment (ENEA) is the main public body conducting energy research. The Ministry of Productive Activities provides oversight of all aspects of research at ENEA.

ENEA

On 29 January 1999, the Council of Ministers approved the decree for the reform of ENEA, Law 36/1999. The law clearly defines ENEA's mission and equips it with normative tools that allow more effective operation.

Under the new regulatory framework, ENEA is defined as a public undertaking operating in the fields of research and innovation, with a view to promoting solutions aimed at enhancing development, competitiveness and employment, while at the same time protecting the environment.

ENEA is also entrusted with the task of supporting public administrations, especially by providing high-tech services in the fields of energy, environmental protection and technological innovation.

ENEA's subsequent three-year (2001 to 2003) strategic plan defines the following seven objectives or areas of focus:

- Energy for the future.
- Protection of the planet.
- Protection of mankind.
- Large-scale advanced techniques.
- New technologies for competitiveness.
- Global changes.
- Services for the country.

Under this reform, the focus of ENEA's R&D activities has been further clarified, with the objective to facilitate the development of frontier energy technology enabling a possible future shift away from fossil fuels. ENEA also holds the new mandate of being an agency supporting central and local administration to disseminate energy technology (*e.g.* operation of 10 000 solar roofs).

ENEA has a staff of approximately 3 500 and since 1 December 2001 has a new organisational structure that is composed of Large Projects, Technical Scientific Units, Great Services for the Country and the Agency.

RESEARCH PROGRAMMES AND PRIORITIES

In 2000, approximately 40% of the R&D budget was allocated to nuclear research, 20% to energy conservation, 30% to power and storage technologies and 9% to renewables. In 2002, the R&D budget grew to about €287 million and the share for renewables increased to 18% while the share of nuclear decreased to 34%. Most of the increase in public renewable energy R&D is the consequence of money allocated by ENEA to solar energy (thermal and concentrated photovoltaic).

R&D activities on energy conservation include the promotion of technological development in all the industrial sectors, as well as in the residential sector, with lower emphasis on the transport sector. Activities include information diffusion,

Table 26

Italian Government Energy R&D Budget by Sector, 1996 to 2002

(million euros)

	1996	1997	1998	1999	2000	2001	2002
Conservation	48.2	45.7	46.7	23.0	23.1	25.0	25.0
Fossil fuels	1.0 ⁽⁺⁾	1.0 ⁽⁺⁾	1.0 ⁽⁺⁾	1.5 ⁽⁺⁾	13.5	13.5	13.5
Renewables	34.8	32.8	31.4	27.0	22.3	37.8	52.0
Nuclear	100.0	100.7	97.1	107.0	107.0	107.0	96.4
Power and storage	14.3	13.5	14.5	72.0	78.2	78.2	78.2
Other	40.5	29.2	32.4	31.0	32.1	35.0	35.0
Total	238.8	222.9	223.1	261.5	276.2	296.5	300.1

Note: Figures include ENEA budget and, since 1999, CESI budget. CESI is a subsidiary of ENEL involved in R&D on electricity.

⁽⁺⁾ Until 1999, the research, development and demonstration activities have been carried out by ENEL; corresponding data are not available.

Source: Ministry of Productive Activities.

the training of energy managers and technical support to the regional authorities. The budget share for conservation sharply decreased after 1998, mainly because the Programme Agreement between ENEA and the Ministry of Industry ended.

In the past, R&D activities on renewable energy sources were concentrated on photovoltaic (PV) materials, devices and systems, solar heating and cooling, and energy use of biomass, while wind energy was the subject of much less research. Some of the past activities are still continued. In 2001, ENEA was attributed €100 million by the Parliament, through the Ministry for Environment and Territory, for a three-year programme on the development of solar thermal power generation and heat collection. In 2002, ENEA was allocated an additional €15 million for this programme. ENEA focuses its work on the following three areas of solar energy:

- Solar thermal power generation through medium-temperature heat collection and storage (550°C).
- Solar thermal hydrogen production through very high heat collection (above 850°C).
- Concentrated photovoltaic³⁷.

In 2001, ENEA launched new R&D activities related to hydrogen and renewables, which are devoted to:

37. The electricity yield per unit of cell area is higher when sunlight exposure is concentrated.

- Hydrogen storage through metal hydrides.
- Fuel cells development, both for stationary and transport applications.
- Development of gas turbines (using hydrogen as a fuel).
- Energy use of gasified biomass for small distributed power generation units and biofuel production for transport.

In the fuel cells R&D sector, ENEA is carrying out R&D activities on both polymeric and molten carbonate fuel cells for stationary and transport applications as part of a programme funded by the Ministry of Education, Universities and Research; a 15-kW polymeric system has been performed. Relevant activities are also conducted in association with a subsidiary of the Finmeccanica Group, Ansaldo Ricerche, a company that has developed significant expertise in its laboratories located in Genoa.

The inter-ministerial decree of 17 December 2002 allocated €51 million to research on hydrogen and €39 million to research on fuel cells as part of the strategic programmes of the Integrated Fund for Research, Decree 224/1998 of 5 June 1998.

Nuclear research in Italy principally includes the International Atomic Energy Agency (IAEA) project on experimental thermonuclear reactors and research on nuclear fusion. Nuclear waste processing and disposal is also an important task among nuclear research activities. The nuclear strategic priority of ENEA is to develop sub-critical accelerator-driven reactors known as ADS (Accelerator Driven System) and modular, safe and non-proliferating reactors using innovative fuel cycles, in co-operation mainly with partners from EU countries. R&D on nuclear fusion is carried out under the EURATOM-ENEA Association for Fusion. Funding for the year 2000 has been provided by the Fifth Framework Programme of the European Commission and amounted to €12.2 million, of which €8 million were for ENEA; €1 million for the National Research Council and €2.6 million for the RFX experiments³⁸.

Decree 79/1999 of 16 March 1999 introduced the "Financial Fund for Research Activities", which allows R&D on the electricity system to be financed through a fee on electricity collected from the consumer (€0.05 per kWh). These funds are assigned to CESI, a research company owned by ENEL. The main

38. The RFX experiment refers to efforts to build a reactor where nuclear fusion conditions can be created. The solution experimented upon in Italy is based on quasi stationary hot plasma magnetically confined and is currently supported as the reference path to fusion by the EU. The RFX Experiment (Padova, Italy) is a toroidal device where a ring of high-temperature ionised gas (called "plasma") is confined by a magnetic field in the Reversed Field Pinch configuration (RFP). Consorzio RFX is a research organisation promoted by CNR, ENEA, Università di Padova, Acciaierie Venete, within the framework of the EURATOM-ENEA Association.

R&D activities on electricity are carried out by CESI and include electrical power conversion, electricity system evolution and the interaction between the electricity system and the environment. CESI's activities on renewables are related to wind energy mapping, parabolic dish for solar concentration and PV cells. ENEA is involved in R&D activities on advanced power cycles, with an emphasis on innovative combustion systems. ENEA is also carrying out R&D activities on high temperature components together with ENEL and Ansaldo Ricerche.

The majority of R&D activities on fossil fuel energy and energy efficiency are financed by the private sector. A large proportion of Italy's energy R&D is devoted to fossil fuels, principally because of the private sector investments. Italy's two largest energy companies, ENEL and Eni, are both major R&D investors.

R&D activities in the oil and gas sectors are carried out by Eni. Eni conducts R&D activities in each of its principal operating subsidiaries and through its subsidiary EniTecnologie (formerly Eniricerche), which is responsible for corporate R&D. Eni's R&D expenses amounted to €203 million in 2001. In 2001, R&D relating to exploration and production, natural gas and refining and marketing activities as well as strategic research accounted for 52% of Eni's total R&D expenditures, while 34% was attributed to petrochemical activities. The remaining 13% was attributed to oilfield services and engineering activities. In 2001, approximately 1 500 employees were involved in R&D activities.

There are no significant R&D activities on coal power plants in Italy. Sotacarbo, a 50% ENEA-owned company located in Sardinia, which is responsible for R&D on clean coal technologies, has recently submitted a €12 million R&D programme to the Ministry of Education, Universities and Research. The programme would focus on coal gasification and hydrogen production to be performed in the Sulcis mines area.

Italy participates in 23 IEA Implementing Agreements and in the nuclear fusion Reversed Field Pinch Agreement through EURATOM. Despite the high priority Italy places on solar and hydrogen energy, it has not participated in the related Implementing Agreements.

CRITIQUE

It is worth noting that despite a sharp decrease from the late 1980s to the early 1990s, the budget for energy R&D expressed in terms of GDP percentage has been stable during the past three years. However, given the relatively low level of Italy's overall investment in R&D and the energy security and environmental protection challenges it faces, the government should ensure

that its energy R&D budget is not reduced and should try its best to enable its R&D expenditure to increase.

The government is commended for shaping a new energy R&D policy under the PNR in 2000. This has resulted in new research priorities and has prepared the way for a reform of ENEA.

The new priorities of ENEA to conduct R&D mainly for medium- and long-term technology developments reflect a growing awareness that liberalisation of the energy sector may result in less investment by private market participants in long-term research. The specific focus of ENEA on solar energy and hydrogen production also partly addresses this concern. The specific ENEA focus on solar concentration R&D is worth commending as this technology could become an important component of future low-emissions energy systems, especially in countries receiving high levels of direct sunlight.

It is not sure to what extent the current public R&D budgetary priorities are sufficient to cover all of Italy's energy requirements. While renewable energy development has recently benefited from the change in R&D budget allocations, the current priority does not appear to fully reflect the strong share of fossil fuels in supply and the expected growth of coal for electricity production. More emphasis could be placed on clean coal technology and better efficiency of coal combustion. Similarly, despite the non-existence of nuclear energy in Italy, the government continues to devote one-third of its R&D budget to nuclear R&D, spending it mainly on frontier nuclear fusion technology. Although this specific nuclear effort is partly justified in the framework of Italy's participation in joint international research efforts, this specific budget allocation is questionable. The government needs to redefine its R&D budgetary priorities accordingly so that institutions concerned can eventually translate them into their respective strategies.

The regional and local authorities should be fully involved in energy technology dissemination given their increasing role in energy-related issues following the decentralisation process. In this regard, it is commendable that ENEA plays a role in supporting the regional and local authorities in energy technology dissemination. Additional efforts to intensify co-operation between ENEA and the local authorities are required. Furthermore, noting that some regional authorities are conducting their own R&D programmes, co-ordination with national R&D programmes merits consideration with a view to maximising the cost-effectiveness of scarce resources.

Although ENEA participates in several IEA Implementing Agreements, it is not a member of the Implementing Agreements on hydrogen and solar concentration (Solar PACES). Given the focus of ENEA on these technologies, the government should urge ENEA to join these agreements.

RECOMMENDATIONS

The government of Italy should:

- ▶ *Continue to provide sustainable budgetary support to energy R&D.*
- ▶ *Consider making clear priorities in public R&D. Provide special attention to clean coal technology and the improved efficiency of coal combustion.*
- ▶ *Improve the co-ordination of R&D projects and the dissemination of their results to the regional authorities.*
- ▶ *Urge ENEA to join the IEA Implementing Agreement on solar concentration.*

ENERGY BALANCES AND KEY STATISTICAL DATA

Unit: Mtoe

SUPPLY							
	1973	1990	2000	2001	2010	2020	2030
TOTAL PRODUCTION	20.5	25.5	27.1	26.3	36.7	41.2	49.6
Coal ¹	0.3	0.3	0.0	-	-	-	-
Oil	1.1	4.7	4.7	4.2	10.0	10.0	10.0
Gas	12.6	14.0	13.6	12.5	13.0	8.0	8.0
Comb. Renewables & Wastes ²	0.2	0.8	1.7	2.2	5.0	12.0	18.0
Nuclear	0.8	-	-	-	-	-	-
Hydro	3.2	2.7	3.8	4.0	4.0	4.3	4.3
Geothermal	2.1	3.0	3.1	3.2	3.6	4.5	5.7
Solar/Wind/Other ³	-	0.0	0.1	0.2	1.1	2.4	3.6
TOTAL NET IMPORTS⁴	109.3	128.9	149.6	143.9	146.0	156.5	162.4
Coal ¹	0.4	0.1	0.1	0.1	-	-	-
Exports	8.2	13.9	13.2	13.7	20.0	21.0	23.0
Imports	7.7	13.7	13.1	13.6	20.0	21.0	23.0
Oil	29.4	20.1	22.1	23.0	22.0	18.0	18.0
Imports	136.4	109.5	110.0	106.9	76.5	70.0	70.0
Bunkers	7.1	2.7	2.7	2.8	2.5	2.0	1.6
Net Imports	99.9	86.7	85.2	81.1	52.0	50.0	50.4
Gas	-	0.0	0.0	0.1	-	-	-
Imports	1.6	25.3	47.0	44.8	67.0	82.0	87.0
Net Imports	1.6	25.3	47.0	44.8	67.0	82.0	87.0
Electricity	0.2	0.1	0.0	0.0	-	-	-
Exports	0.3	3.1	3.9	4.2	6.0	3.0	1.0
Imports	0.1	3.0	3.8	4.2	6.0	3.0	1.0
Net Imports	0.1	3.0	3.8	4.2	6.0	3.0	1.0
TOTAL STOCK CHANGES	-0.9	-1.8	-5.0	1.8	-	-	-
TOTAL SUPPLY (TPES)	128.9	152.6	171.7	172.0	182.7	197.7	212.0
Coal ¹	8.1	14.6	12.6	13.4	20.0	21.0	23.0
Oil	100.1	89.3	88.2	86.5	62.0	60.0	60.4
Gas	14.2	39.0	57.9	58.1	80.0	90.0	95.0
Comb. Renewables & Wastes ²	0.2	0.9	2.2	2.5	6.0	12.5	19.0
Nuclear	0.8	-	-	-	-	-	-
Hydro	3.2	2.7	3.8	4.0	4.0	4.3	4.3
Geothermal	2.1	3.0	3.1	3.2	3.6	4.5	5.7
Solar/Wind/Other ³	-	0.0	0.1	0.2	1.1	2.4	3.6
Electricity Trade ⁵	0.1	3.0	3.8	4.2	6.0	3.0	1.0
Shares (%)							
Coal	6.3	9.6	7.3	7.8	10.9	10.6	10.8
Oil	77.6	58.5	51.3	50.3	33.9	30.3	28.5
Gas	11.0	25.6	33.7	33.8	43.8	45.5	44.8
Comb. Renewables & Wastes	0.2	0.6	1.3	1.4	3.3	6.3	9.0
Nuclear	0.6	-	-	-	-	-	-
Hydro	2.5	1.8	2.2	2.3	2.2	2.2	2.0
Geothermal	1.7	1.9	1.8	1.9	2.0	2.3	2.7
Solar/Wind/Other	-	-	0.1	0.1	0.6	1.2	1.7
Electricity Trade	0.1	2.0	2.2	2.4	3.3	1.5	0.5

0 is negligible, - is nil, .. is not available.

DEMAND**FINAL CONSUMPTION BY SECTOR**

	1973	1990	2000	2001	2010	2020	2030
TFC	98.7	117.6	131.2	134.1	145.8	155.1	161.5
Coal ¹	3.3	3.4	2.1	2.2	3.0	3.0	3.0
Oil	72.1	64.2	65.1	66.2	55.0	53.1	53.9
Gas	12.8	30.6	38.6	39.7	54.0	58.0	60.0
Comb. Renewables & Wastes ²	-	0.9	1.7	1.8	1.5	4.5	5.1
Geothermal	-	0.2	0.2	0.2	-	-	-
Solar/Wind/Other	-	0.0	0.0	0.0	0.6	1.3	1.5
Electricity	10.6	18.5	23.5	23.9	31.4	34.8	37.6
Heat	-	-	-	-	0.3	0.4	0.5
Shares (%)							
Coal	3.3	2.9	1.6	1.6	2.1	1.9	1.9
Oil	73.0	54.5	49.6	49.4	37.7	34.2	33.4
Gas	12.9	26.0	29.4	29.6	37.0	37.4	37.1
Comb. Renewables & Wastes	-	0.7	1.3	1.4	1.0	2.9	3.2
Geothermal	-	0.2	0.2	0.2	-	-	-
Solar/Wind/Other	-	-	-	-	0.4	0.8	0.9
Electricity	10.7	15.7	17.9	17.8	21.5	22.5	23.3
Heat	-	-	-	-	0.2	0.3	0.3
TOTAL INDUSTRY⁶	47.6	44.6	46.2	45.9	52.6	57.8	61.6
Coal ¹	2.6	3.3	2.0	2.1	3.0	3.0	3.0
Oil	29.7	16.9	14.1	13.5	10.0	10.0	12.0
Gas	8.7	14.6	17.6	17.6	23.0	26.0	26.5
Comb. Renewables & Wastes ²	-	0.2	0.3	0.3	0.5	1.5	1.5
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	0.5	0.5	0.6
Electricity	6.6	9.5	12.2	12.3	15.6	16.8	18.0
Heat	-	-	-	-	-	-	-
Shares (%)							
Coal	5.6	7.3	4.3	4.6	5.7	5.2	4.9
Oil	62.3	37.9	30.5	29.4	19.0	17.3	19.5
Gas	18.2	32.9	38.1	38.4	43.7	45.0	43.1
Comb. Renewables & Wastes	-	0.5	0.6	0.7	1.0	2.6	2.4
Geothermal	-	-	-	-	-	-	-
Solar/Wind/Other	-	-	-	-	1.0	0.9	0.9
Electricity	13.9	21.4	26.4	26.8	29.7	29.1	29.2
Heat	-	-	-	-	-	-	-
TRANSPORT⁷	20.5	35.3	42.4	42.9	41.0	41.2	42.0
TOTAL OTHER SECTORS⁸	30.6	37.8	42.7	45.3	52.2	56.1	58.0
Coal ¹	0.5	0.1	0.1	0.1	-	-	-
Oil	22.5	12.8	9.7	10.9	7.0	5.5	5.0
Gas	4.0	15.7	20.7	21.7	29.0	30.0	31.0
Comb. Renewables & Wastes ²	-	0.6	1.4	1.5	1.0	3.0	3.6
Geothermal	-	0.2	0.2	0.2	-	-	-
Solar/Wind/Other	-	0.0	0.0	0.0	0.1	0.8	0.9
Electricity	3.6	8.3	10.5	10.8	14.8	16.4	17.0
Heat	-	-	-	-	0.3	0.4	0.5
Shares (%)							
Coal	1.5	0.3	0.2	0.2	-	-	-
Oil	73.5	33.8	22.8	24.0	13.4	9.8	8.6
Gas	13.1	41.6	48.4	48.0	55.6	53.5	53.4
Comb. Renewables & Wastes	-	1.7	3.4	3.4	1.9	5.3	6.2
Geothermal	-	0.5	0.5	0.5	-	-	-
Solar/Wind/Other	-	-	-	-	0.2	1.4	1.6
Electricity	11.8	22.1	24.7	23.9	28.3	29.2	29.3
Heat	-	-	-	-	0.6	0.7	0.9

DEMAND**ENERGY TRANSFORMATION AND LOSSES**

	1973	1990	2000	2001	2010	2020	2030
ELECTRICITY GENERATION⁹							
INPUT (Mtoe)	28.0	43.1	52.1	50.4	55.3	67.8	81.1
OUTPUT (Mtoe)	12.4	18.3	23.2	23.4	28.4	34.8	39.6
(TWh gross)	143.9	213.2	269.9	271.9	330.0	405.0	460.0
Output Shares (%)							
Coal	3.6	16.8	11.3	13.5	21.8	19.8	18.5
Oil	62.4	48.2	31.8	27.6	6.7	5.4	4.8
Gas	3.1	18.6	37.5	38.3	48.5	48.9	43.5
Comb. Renewables & Wastes	0.9	0.1	0.7	1.0	5.4	8.6	15.2
Nuclear	2.2	-	-	-	-	-	-
Hydro	26.1	14.8	16.4	17.2	14.2	12.3	10.9
Geothermal	1.7	1.5	1.7	1.7	1.8	1.7	1.7
Solar/Wind/Other	-	0.0	0.5	0.7	1.6	3.2	5.4
TOTAL LOSSES	29.9	35.0	40.4	37.6	36.9	42.6	50.5
<i>of which:</i>							
Electricity and Heat Generation ¹⁰	15.6	24.8	28.8	27.1	26.6	32.6	41.0
Other Transformation	6.0	1.0	2.2	1.1	1.5	1.0	0.5
Own Use and Losses ¹¹	8.3	9.2	9.4	9.4	8.8	9.0	9.0
Statistical Differences	0.3	-0.0	0.0	0.3	-	-	-

INDICATORS

	1973	1990	2000	2001	2010	2020	2030
GDP (billion 1995 US\$)	647.03	1030.05	1203.89	1225.27	1490.35	1816.73	2214.58
Population (millions)	54.75	56.72	57.76	57.93	58.49	58.04	56.98
TPES/GDP ¹²	0.20	0.15	0.14	0.14	0.12	0.11	0.10
Energy Production/TPES	0.16	0.17	0.16	0.15	0.20	0.21	0.23
Per Capita TPES ¹³	2.35	2.69	2.97	2.97	3.12	3.41	3.72
Oil Supply/GDP ¹²	0.15	0.09	0.07	0.07	0.04	0.03	0.03
TFC/GDP ¹²	0.15	0.11	0.11	0.11	0.10	0.09	0.07
Per Capita TFC ¹³	1.80	2.07	2.27	2.32	2.49	2.67	2.83
Energy-related CO ₂ Emissions (Mt CO ₂) ¹⁴	334.4	400.1	425.1	425.3	428.6	451.4	473.9
CO ₂ Emissions from Bunkers (Mt CO ₂)	26.3	15.0	19.3	19.3	18.3	16.7	15.5

GROWTH RATES (% per year)

	73-79	79-90	90-00	00-01	01-10	10-20	20-30
TPES	1.5	0.7	1.2	0.2	0.7	0.8	0.7
Coal	4.3	3.1	-1.5	6.4	4.6	0.5	0.9
Oil	-0.0	-1.0	-0.1	-1.8	-3.6	-0.3	0.1
Gas	8.1	5.1	4.0	0.3	3.6	1.2	0.5
Comb. Renewables & Wastes	23.4	0.8	9.0	10.6	10.4	7.6	4.3
Nuclear	-2.9	-	-	-	-	-	-
Hydro	3.4	-3.3	3.4	5.9	0.0	0.6	-
Geothermal	0.1	3.0	0.4	2.8	1.4	2.3	2.4
Solar/Wind/Other	-	-	38.3	43.8	21.4	8.6	4.1
TFC	1.3	0.9	1.1	2.2	0.9	0.6	0.4
Electricity Consumption	4.0	3.0	2.4	1.7	3.1	1.0	0.8
Energy Production	0.2	1.9	0.6	-2.9	3.8	1.2	1.9
Net Oil Imports	-0.4	-1.1	-0.2	-4.8	-4.8	-0.4	0.1
GDP	3.5	2.4	1.6	1.8	2.2	2.0	2.0
Growth in the TPES/GDP Ratio	-1.9	-1.6	-0.4	-1.6	-1.5	-1.2	-1.3
Growth in the TFC/GDP Ratio	-2.1	-1.5	-0.5	0.4	-1.2	-1.3	-1.6

Please note: Rounding may cause totals to differ from the sum of the elements.

FOOTNOTES TO ENERGY BALANCES AND KEY STATISTICAL DATA

1. Includes lignite and peat.
2. Comprises solid biomass, biogas, industrial waste and municipal waste. Data are often based on partial surveys and may not be comparable between countries.
3. Others include tide, wave and ambient heat used in heat pumps.
4. Total net imports include combustible renewables and waste.
5. Total supply of electricity represents net trade.
6. Includes non-energy use.
7. Includes less than 1% non-oil fuels.
8. Includes residential, commercial, public service and agricultural sectors.
9. Inputs to electricity generation include inputs to electricity and CHP plants. Output refers only to electricity generation.
10. Losses arising in the production of electricity and heat at public utilities and autoproducers. For non-fossil-fuel electricity generation, theoretical losses are shown based on plant efficiencies of 100% for hydro.
11. Data on "losses" for forecast years often include large statistical variations covering differences between expected supply and demand and mostly do not reflect real expectations on transformation gains and losses.
12. Toe per thousand US dollars at 1995 prices and exchange rates.
13. Toe per person.
14. "Energy-related CO₂ emissions" have been estimated using the Intergovernmental Panel on Climate Change (IPCC) Tier I Sectoral Approach. In accordance with the IPCC methodology, emissions from international marine and aviation bunkers are not included in national totals. Projected emissions for oil and gas are derived by calculating the ratio of emissions to energy use for 2001 and applying this factor to forecast energy supply. Future coal emissions are based on product-specific supply projections and are calculated using the IPCC/OECD emission factors and methodology.

INTERNATIONAL ENERGY AGENCY “SHARED GOALS”

Member countries* of the IEA seek to create the conditions in which the energy sectors of their economies can make the fullest possible contribution to sustainable economic development and the well-being of their people and of the environment. In formulating energy policies, the establishment of free and open markets is a fundamental point of departure, though energy security and environmental protection need to be given particular emphasis by governments. IEA countries recognise the significance of increasing global interdependence in energy. They therefore seek to promote the effective operation of international energy markets and encourage dialogue with all participants.

In order to secure their objectives they therefore aim to create a policy framework consistent with the following goals:

1. **Diversity, efficiency and flexibility within the energy sector** are basic conditions for longer-term energy security: the fuels used within and across sectors and the sources of those fuels should be as diverse as practicable. Non-fossil fuels, particularly nuclear and hydro power, make a substantial contribution to the energy supply diversity of IEA countries as a group.
2. Energy systems should have **the ability to respond promptly and flexibly to energy emergencies**. In some cases this requires collective mechanisms and action: IEA countries co-operate through the Agency in responding jointly to oil supply emergencies.
3. **The environmentally sustainable provision and use of energy** is central to the achievement of these shared goals. Decision-makers should seek to minimise the adverse environmental impacts of energy activities, just as environmental decisions should take account of the energy consequences. Government interventions should where practicable have regard to the Polluter Pays Principle.
4. **More environmentally acceptable energy sources** need to be encouraged and developed. Clean and efficient use of fossil fuels is essential. The development of economic non-fossil sources is also a priority. A number of IEA members wish to retain and improve the nuclear

* Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States.

option for the future, at the highest available safety standards, because nuclear energy does not emit carbon dioxide. Renewable sources will also have an increasingly important contribution to make.

5. **Improved energy efficiency** can promote both environmental protection and energy security in a cost-effective manner. There are significant opportunities for greater energy efficiency at all stages of the energy cycle from production to consumption. Strong efforts by governments and all energy users are needed to realise these opportunities.

6. Continued **research, development and market deployment of new and improved energy technologies** make a critical contribution to achieving the objectives outlined above. Energy technology policies should complement broader energy policies. International co-operation in the development and dissemination of energy technologies, including industry participation and co-operation with non-member countries, should be encouraged.

7. **Undistorted energy prices** enable markets to work efficiently. Energy prices should not be held artificially below the costs of supply to promote social or industrial goals. To the extent necessary and practicable, the environmental costs of energy production and use should be reflected in prices.

8. **Free and open trade** and a secure framework for investment contribute to efficient energy markets and energy security. Distortions to energy trade and investment should be avoided.

9. **Co-operation among all energy market participants** helps to improve information and understanding, and encourage the development of efficient, environmentally acceptable and flexible energy systems and markets worldwide. These are needed to help promote the investment, trade and confidence necessary to achieve global energy security and environmental objectives.

(The Shared Goals were adopted by IEA Ministers at their 4 June 1993 meeting in Paris.)

GLOSSARY AND LIST OF ABBREVIATIONS

In this report, abbreviations are substituted for a number of terms used in the International Energy Agency. While these terms generally have been written out on first mention and subsequently abbreviated, this glossary provides a quick and central reference for many of the abbreviations used.

AC	alternating current
bcm	billion cubic metres
CCGT	combined-cycle gas turbine
CHP	combined heat and power
CIPE	Inter-Ministerial Committee for Economic Planning
CO	carbon monoxide
CO ₂	carbon dioxide
CORINAIR	European standard polluting emissions inventory system
DC	direct current
EC	European Commission
ENEA	National Agency for New Technology, Energy and Environment
EU	European Union
GDP	gross domestic product
GHG	greenhouse gases
GJ	gigajoule, or one joule $\times 10^9$
GRTN	Gestore della Rete di Trasmissione Nazionale
GW	gigawatt, or one watt $\times 10^9$
GWh	gigawatt x one hour
GWP	global warming potential
HFC	hydrofluorocarbon
IAEA	International Atomic Energy Agency
IEA	International Energy Agency
IEP	International Energy Program
IPCC	Intergovernmental Panel on Climate Change

JI	joint implementation
kV	kilovolt, or one volt $\times 10^3$
kWh	kilowatt x one hour
LNG	liquefied natural gas
m ³	cubic metre
mcm	million cubic metres
Mt	million tonnes
Mtoe	million tonnes of oil equivalent
MW	megawatt, or one watt $\times 10^6$
MWh	megawatt-hour
NGO	non-governmental organisation
Nm ³	normal cubic metre
NO _x	nitrogen oxides
OECD	Organisation for Economic Co-operation and Development
PFC	perfluorocarbon
R&D	research and development
SO ₂	sulphur dioxide
SO _x	sulphur oxides
SRG	Snam Rete Gas
TFC	total final consumption of energy
toe	tonne of oil equivalent
TOP	take-or-pay contract
TPA	third-party access
TPES	total primary energy supply
TSO	transmission system operator
TW	terawatt, or one watt $\times 10^{12}$
TWh	terawatt x one hour, or one watt $\times 10^{12}$
UCTE	Union for the Co-ordination of Transmission of Electricity
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
VA	voluntary agreement
VAT	value-added tax
VOCs	volatile organic compounds

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