# The Restructuring of the Italian Electricity Sector: Proposals for the Inclusion of Objectives for Increased Energy Efficiency and Renewables Exploitation

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## Synopsis

Ongoing restructuring of the electricity industry and tariff re-regulation offer a unique opportunity for embedding objectives of energy efficiency and renewables exploitation in the new structure. Important results have already been achieved.

## Abstract

A profound restructuring of the electricity industry is underway in Italy. Privatisation of ENEL, the national, vertically integrated, state owned electricity utility, is planned to start in 1997, and a final decision about the degree of vertical and horizontal integration is expected shortly. A Regulatory Authority has been created for the first time, a new price regulation mechanism (price-cap) will be adopted, and new concessions and contracts will be issued. Municipal utilities are also undergoing changes in ownership and a strong debate is underway as to the price to be paid to IPPs.

No one yet knows in detail what the future structure will look like or how long the evolution from the present structure will take. In this paper, we rely on emerging trends to speculate on some of the possible transition and end-states for this evolution. We first consider whether additional promotion of energy efficiency and renewable energy would be warranted in any of these states. We then describe the incentives and disincentives for energy efficiency and renewable energy programs that would be created in each of these states. Finally on the basis of these considerations we propose, where appropriate, additional public policies to promote energy efficiency and renewable energy development in the evolving Italian power sector.

## Introduction

A profound restructuring of the electricity industry is underway in Italy. Privatisation of ENEL, the national, vertically integrated, state owned electric utility, is planned to start in 1997, and a final decision about the degree of vertical and horizontal integration is expected shortly. A Regulatory Authority (“Autorità per l’energia elettrica ed il gas”) has been created for the first time, a new price regulation mechanism (price-cap) will be adopted, and new concessions and contracts will be issued. Municipal utilities are also undergoing changes in ownership and a strong debate is underway on the price to be paid to IPPs. No one yet knows what the future structure will look like in detail or how long the evolution from the present structure will take. A key concern for those interested in curbing emissions of greenhouse gasses is the compatibility of the new structure with efforts to increase end use energy efficiency and the exploitation of renewable energy resources.

In the first part of the paper we examine the current system of ownership, organisation, and control of the Italian electricity sector. We follow with a description of the changes to this system that have already occurred or are expected to occur in the near future. On the basis of these considerations we discuss three elements of an inte-

grated strategy to encourage end use energy efficiency and the exploitation of renewable energy resources: (1) the accommodation of energy efficiency within the proposed price-cap system of rate regulation; (2) the inclusion of least-cost planning principles in the incorporation of electricity distribution franchises; and (3) the use of existing electricity taxes to support the development of a more competitive energy-efficiency and renewable energy industry. We develop the three arguments independently because they rely on different (but not mutually exclusive) assumptions regarding the future Italian electricity system. As such it would be possible to pursue a singular implementation of any one element. However, we believe they can and should be designed to reinforce one another as part of an integrated strategy.

# 1. The Restructuring Process in Italy: main Features and Differences with Respect to Other EU Countries

## 1.1. Current Status and Organisation of the Italian Power Sector

Since the merging/nationalisation of a oligopolistic cartel in 1962, ENEL has had the almost exclusive right to operate in the power sector. Other companies allowed in the market were municipal companies, generators consuming at least 70% of produced electricity (autogenerators) and minor private companies (<15 GWh/y).
The first important reform occurred in 1991, when Law 9 imposed on ENEL the duty to buy the power produced by IPPs, subject to qualification. Bill 6/92 established the price to be paid by ENEL to IPPs, setting a minimum level equal to long run avoided costs for ENEL, based on a hypothetical combined cycle plant, plus an incentive differentiated according to the type of generation facility: cogeneration (over a certain overall efficiency threshold), waste incineration, renewables (*Fonti Rinnovabili e Assimilate* or *FRA*).

The largest share of electricity generation is due to ENEL (80%), followed by autoproducers and IPPs (15%), Municipal utilities (4%), and minor private companies (less than 1%). Something less than 93% of energy is distributed by ENEL, 7% by Municipal utilities, and 0,2% by minor private companies. Consider also that imports account for around 15% of total consumption, sourced mainly from France and Switzerland. In 1994 the fuel mix of ENEL generation was roughly: 19% hydro, 8% coal, 12% gas, 58% oil (Italy shows the largest production of electricity from oil in Europe: 113 TWh in 1993, compared with 24 in UK and 10 in Germany), 4% geothermal & other Renewables.

## 1.2. Current Tariff Regulation

Presently for each customer group, the tariff structure is uniform throughout the country irrespective of geographic area and distribution company (ENEL or municipal/local companies). The Italian rate setting system has till now been overseen by the Ministry for Industry in the form of a loose cost-plus regulation, but the rationale for rate setting has never been completely made explicit, and beyond recovery of costs also other objectives of social policy and inflation control have been pursued.

The total bill to customers is composed of a number of elements:
(a) a tariff ("*tariffa energia*") made up of two components: a monthly fixed component ("*quota fissa mensile*") correlated with the maximum power demand set for the specific contract type (L/kW), and a variable component correlated with the energy consumption (L/kWh), called energy price ("*prezzo dell'energia*");
(b) a distinct charge also correlated with the energy consumption ("*sovrapprezzo termico*", L/kWh)
(c) tax revenues to national, municipal and county (provincie) level (L/kWh)
(d) value added tax on top of everything.

The tariff (a) is meant to remunerate fixed costs, while element (b) is meant to cover variable costs, that is fuel costs, and electric energy acquired from other companies/generators. In fact for some customers, including households, besides the fuel component proper (*sovrapprezzo ordinario*) the *sovrapprezzo termico* (b) includes a collection of otherwise unrelated surcharges: *sovrapprezzo nuovi impianti*, *maggiorazione straordinaria sovrapprezzo maggiori imposte di fabbricazione sugli oli combustibili*. Of particular interest here is the *sovrapprezzo nuovi impianti*, a small surcharge (L/kWh) used to pay for the incentives given to IPPs for energy produced from renewables,

cogeneration and waste incineration (*Fonti Rinnovabili e Assimilate* or *FRA*) for the first 8 years of production, as established in the bill CIP 6/92.
The surcharge for funding incentive payments to energy produced through cogeneration and renewables is one of the key elements of the present debate. Since 1992, the greater number of plants realized after approval in the specific graduatoria established by ENEL with state oversight have been large industrial cogeneration plants, with only a few generation plants based on renewables (mainly biomass and wind: 20 MW of wind turbines installed in1995-96). Large cogeneration plants started first and grew faster, thus absorbing much of the funds available. More recently many projects for renewables exploitation have been presented (around 700 MW wind and 1200 biomass have been included in the graduatoria at June 95). But at the end of 1995 the fund showed a deficit of 280 billion lire (147 million ECU), and ENEL declared its unwillingness to anticipate money to IPPs. In July and November 1996 the government established by law that only those plants already included in the *graduatoria* in June 1995 would be granted the incentives, if built within a certain time horizon. At the same time the surcharge has been increased (see Table 1.1), but at present it's unclear how many MW from renewables will be really installed, if the fund will reach a balance and if this level of funding will be sufficient for any further development.

*Table 1.1. Surcharge on kWh sold for funding cogeneration and renewables*

| | April 92 (Lire '92/kWh) | from July 96 (Lire '97/kWh) | from July 96 (ECU'97/100 kWh) |
|---|---|---|---|
| low voltage customer | 0,7 | 3,2 | 0,168 |
| medium voltage customer | 0,5 | 2,7 | 0,142 |
| high voltage customer | 0,4 | 2,3 | 0,121 |

Three features of the present tariff system are worthy of note since they differentiate the Italian situation from that of other European countries and/or have an effect on conservation programs and renewable exploitation:
(1) the accepted principle of tariff uniformity over the whole territory
(2) the price of kWh is strongly progressive with consumption for domestic customers
(3) the attempt to set tariffs according to marginal costs at least for large customers through time of use tariffs.

The principle of tariff uniformity for electric energy (but not for gas or other fuels) was stated, though with opposition, in law 481 of 1995. If this decision to maintain uniform tariffs proves conclusive this might increase the complexity of the mechanisms required to reward utilities for DSM programmes.

The price of kWh to household customers with a contract with power limit at 3 kW is highly progressive with consumption, as shown in Figure 1.1. The general characteristics of this contract established in 1974, have lead to its uptake by 90% of household customers. This has probably had the effect of limiting the total power demand of the domestic sector (virtually no central electric heating is in place). The tariff based on night/day prices for energy is available only for a power of 6 kW or more and due to the high level of the *quota fissa* (32000 to 51000 L/month) and is economically attractive only for very high consumption levels. In December 1993, as a part of a price increase requested by ENEL in order to "preserve financial and economic balance", and backed also by the Government in order to facilitate ENEL's privatisation, the structure became even more progressive. However since customers have not been informed of the considerable financial savings to be made by lowering consumption levels, the large potential for energy savings has been little exploited.

Industrial customers (>50 kV and 500 kW) have access to a 'time of use' tariff (based on four time blocks), which roughly reflects marginal costs. In 1993, 68 TWh, or more than 70% of energy sold to the industrial sector was delivered through 'time of use' contracts. Tariffs for other customer classes are, in principle, based on average costs.

Taxation is a relatively important component of the overall price of energy. For example for household customers

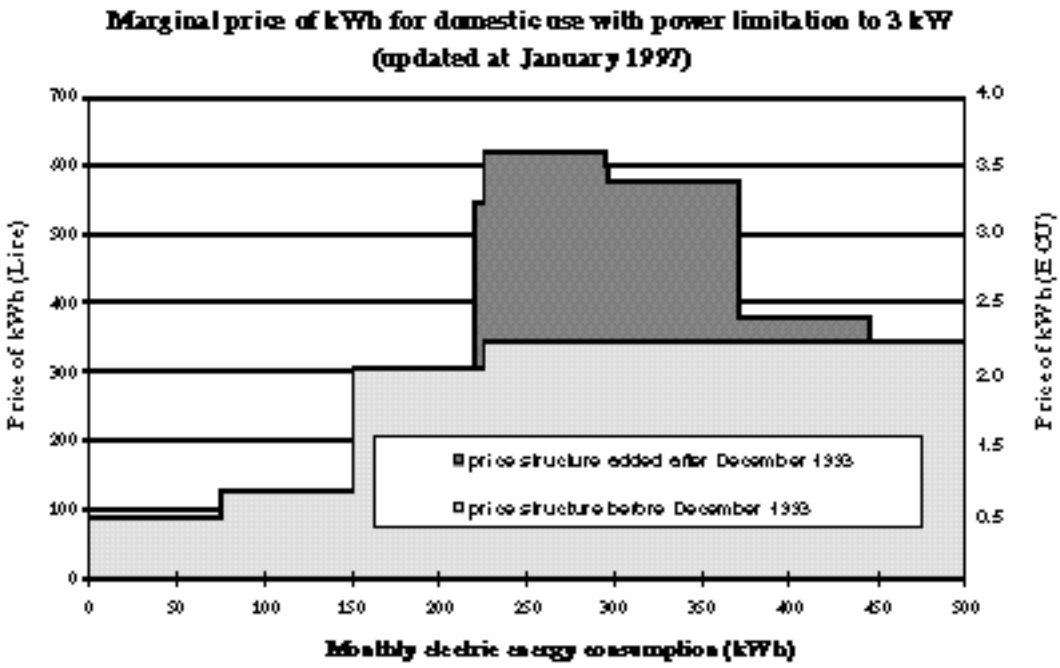


*Figure 1.1. Structure of prices for domestic customers, before and after December 1993.*

*Table 1.2. Average prices for different customer classes*

| | L/kWh | ECU/100kWh |
|---|---|---|
| household customers | 216,1 | 11,37 |
| external public lighting | 174,0 | 9,16 |
| non household < 30 kW | 273,1 | 14,37 |
| non household 30 kW∏500 kW | 180,3 | 9,49 |
| non household > 500 kW | 111,6 | 5,87 |

with 3 kW contracts taxation accounts for 15-30% of total expenditure, depending on consumption levels. The average price paid by different customer classes in 1995 is shown in Table 1.2.

### 1.3. Energy Efficiency and Environmental Protection

ENEL has implemented some DSM programs in the past (solar hot water panels in 83-86, power factor correction in 79-92, heat pumps in 89-92, CFLs in 1990. In most cases, from the few data made available from ENEL, programs appear to be cost effective, when cost of conserved energy is compared with avoided costs. No explicit mention to new DSM programs was made in the investment plan approved in 1994. In the latest “Contratto di Programma”, which regulates the State concession to ENEL, the utility is required to invest 10 BL/year in information campaigns on efficient use of energy, that is 0,03% of total revenues (in the order of 35000 BL/year).

In 1994 ENEL presented a scenario for the evolution of the system up to 2010 (G. Carta et al. 1994 ) where the capacity needed in 2010 was forecasted to be 73 GW, a roughly 50% increase on present capacity. According to this scenario, if no nuclear plants are built, $CO_2$ emissions produced by the electricity sector will grow by 48% (reaching 215 Mt/year) in the years 2000 to 2010. ENEL proposes that this increase in emissions could be limited to 40% if 4 GW of nuclear could be gradually commissioned starting in 2005. In 1990 the contribution of the

electricity sector to total $CO_2$ emissions was 30% (120 of 413 Mt). Not surprisingly in conclusion the report states that «Such projections are strongly diverging from the theoretical "$CO_2$ stabilisation" target at the 1990 level, and show that for Italy this is *unrealistic*»

## 2. Restructuring Developments. Steps Already Achieved in the Direction of Energy Efficiency and Renewables Exploitation

The following laws and documents are shaping the new "operational environment" for the electricity industry in Italy:

- in July '92 ENEL became a Ltd company (Law 359/92) although currently the sole shareholder is the Treasury Ministry. Privatisation, even if long announced will not take place until the lines of the reform are established. Some municipal utilities are also to be privatised, in particular the process is advanced for AEM Milano, and ACEA Roma.
- Law 481 issued in November 1995 has created for the first time in Italy a Regulatory Authority for energy (-*Autorità per l'Energia Elettrica ed il Gas*-) and chosen a price-cap formula as the basis for the new tariff regulation
- in December 1995 a concession was granted to ENEL for the next 40 years
- a new *Contratto di Programma* expected soon, is to define more precisely the objectives and duties of the companies granted the concessions. The Ministry for the Environment hopes that the concessions will include DSM obligations.
- a commission (*Commissione Carpi*) is set up by the Ministry for Industry published in January '97 draft guidelines for the restructuring of the electricity industry

Following we briefly summarise these developing trends with an emphasis on current status and areas of uncertainty, and on the effects for future utility sector energy efficiency and renewable energy policies.

Law 481/95 has created for the first time in Italy a regulatory authority for energy, independent from the Government (members are appointed for seven years), with adequate funding (20 billion Lire/y, 102 million ECU/y) and staff (80 people). The president and the two members were appointed at the end of 1996, and the first public hearing with Consumer Associations was held on 11$^{th}$ February '97. Their powers range from advise to the government on the structure of the market; renewal, modification or withdrawal of concessions, control over quality of service, customer protection, and decisions about tariff structure and level. The reform of the tariffs according to a price-cap mechanism will be the first task for the Regulatory Authority, and the Government is expecting this task to be performed by June 97, pending a new tariff increase of 1,5% requested by ENEL.

The draft of the law approved by the Senate in April 1995 declared as its main objectives: quality of the service and low costs to individual customers; reasonable profits to new shareholders; revenue maximisation to the State from the sale of the utility. It also chose a new tariff making mechanism (price-cap) to foster increased economic efficiency. Other societal goals, such as environmental protection or efficient resource use were not even mentioned in the draft.

We (Eto and Pagliano) after evaluation concluded that the draft provided a number of disincentives for energy efficiency and environmental protection. Therefore we prepared a series of amendments to be presented during a seminar held in the Parliament House in May 1995, in the presence of the Ministry of Industry A. Clò, and representatives of several Political Parties. During the following months the second branch of the Parliament (Camera) approved 4 of the proposed amendments. Especially important is the inclusion, detailed in Art. 1, of environmental objectives among the goals/duties of the Authority and of the new tariff regulation: "*The tariff making mechanism must harmonise the economic goals of Utilities with the general societal objectives of environmental protection and efficient use of resources*". As a first implementation of this principle the new version of the law contains a price-cap formula modified according to our suggestions. Under the new formula, utility investments in DSM activities can be recovered through the tariffs.

The resulting mechanism, which will be applied both to *electric energy & gas* and to *telecommunications*, can be summarised with the following price-cap formula where:

$P_t = P_{t-1} \times (1 + \%change in CPI - X) + Z$

$P_t$ = an index of maximum prices or tariff to captive customers in year t (the law defines tariffs as "the maximum unitary price of services, at the net of taxes" and does not specify if this definition has to be referred to a basket of goods, at every customer class unitary price, or else...)
$P_{t-1}$ = an index of utility prices or tariff at year t-1
CPI = a specified inflation index such as the Consumer Price Index (parameter)
X = an assumed rate of productivity improvement (parameter)
Z = Z factor not subject to indicization
The Z factor has to take into account the following elements:
(a) change in the quality of service with respect to standards established over a period of at least 3 years
(b) adjustment for unforeseen events beyond the management's control
(c) costs incurred for the implementation of programs for the control and management of demand, through efficient use of resources (what we will call in the following DSM component of price-cap)

The law distinguishes two procedures by which tariffs are updated to cover respectively two sets of cost elements. With respect to changes in the cost of fossil fuels and electric energy bought from abroad or from national IPPs tariffs will be updated automatically, based on criteria set by the authority and correlated to market trends. For the remaining costs the utilities utilities will prepare a proposal for updating the tariff every year before September 30 on the basis of inflation (CPI) and productivity increases (X), and in consideration of changes to quality of service, unforeseable events and energy efficiency programs. The value of the parameters CPI and X are determined by the Authority.. The Authority will reply to the proposal within 60 days; after which time the proposal is to be considered automatically approved. The new tariffs will come into force on 1st January of every year.

Even if not explicitly stated in the law, we can therefore conclude that the price-cap indicization is limited to the fixed cost components: capital recovery, labour, operation and maintenance, transmission and distribution, billing and metering, while a number of voices are kept out of the cap:
a) change in the quality of service
b) adjustment for unforeseen events beyond the management's control
c) costs incurred for the implementation of DSM programs
d) fossil fuel costs
e) electric energy bought from abroad or IPPs.

As with every price-cap, this scheme will prompt utilities to increase the productivity of the factors under the cap, eventually shifting costs toward the elements outside the cap, which are directly passed on to customers through tariffs. Careful scrutiny from the regulatory authority on the prudence of use of these latter elements, mainly fuel and electricity bought from other generators, will be needed.

The recently published report produced by the Commissione Carpi proposes a possible structure for the electricity market, designed to accommodate for partial liberalisation of the market, and customer and environmental protection. The report suggests the establishment of two parallel markets.
An open market, where largest customers, representing about 30% of energy sales will progressively be allowed to choose directly from whom to buy.

A franchised market, accounting for about 70% of sales, made up of small and medium customers. They will continue to be served by distribution companies which will exercise a monopoly over a geographical area.
The co-ordination between the three markets (open, franchised and renewables) will be ensured by the wholesale electricity market (*Mercato Elettrico all'Ingrosso* or *MEI*). The commission proposes that the MEI should be operated by the company owning the transmission grid and exerting the dispatching function. This company should be independent from the generation and distribution companies, owned and controlled by the state, and eventually will own the hydro and pumping plants, in consideration of their function of equilibrium between demand and supply. ENEL should be transformed initially into a holding company, owning a number of generation companies and one or more distribution and service companies, (see figure 2.1)

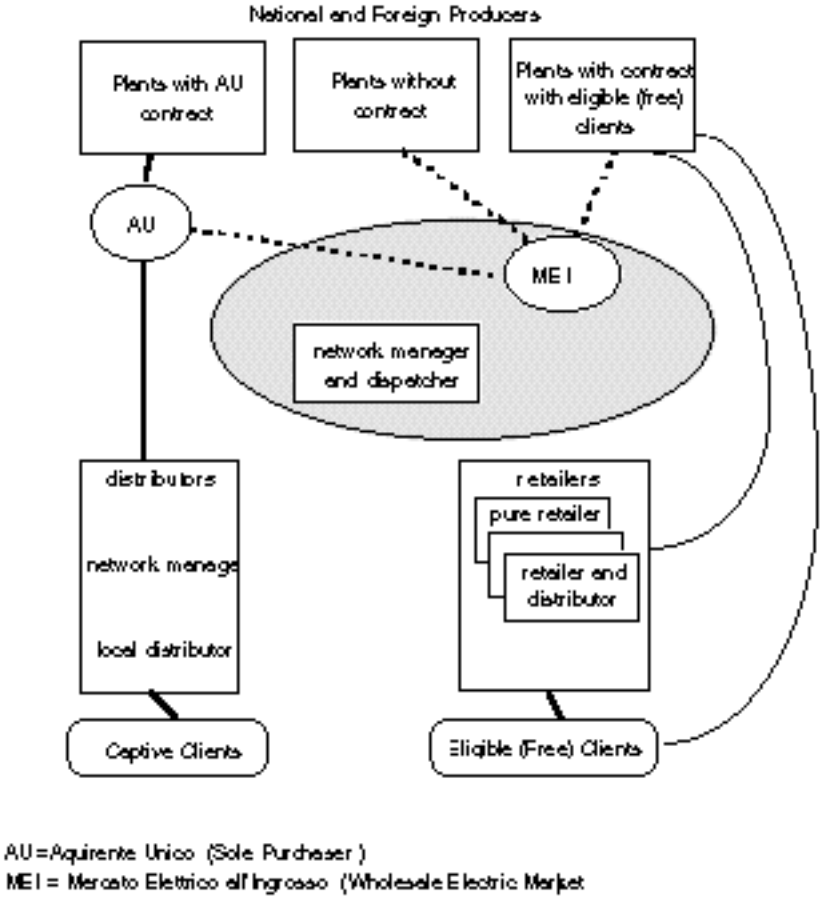


*Figure 2.1. Structure of the electricity industry as proposed in the conclusive report of the Commisione Carpi, January 1997.*

Among the elements of the picture still missing is a decision as to whether to maintain the incentive payments to energy generated through renewables/cogen/waste-to-energy (Fonti Rinnovabili e Assimilate, FRA) and if so at what level. The report of Commissione Carpi states most importantly that incentives to these sources are still justified for their contribution to environmental protection (locally and globally), to fuel diversity, and to employment; and that extra-payments to these sources should be collected from customers. The previously existing rules will continue to apply to plants approved until June 1995 (6° graduatoria). New rules have to be set for the future and the report makes a number of suggestions. Incentives should be, as in the past, proportional to the amount of energy produced, but the total amount of incentives per year and the share for each source/technology should be predetermined; the selection of new plants to be built and unitary the incentive (L/kWh) will be based on bidding procedures for each source/technology. The payments should be made through a fund, administered by the MEI, and overseen by the Authority, which will establish the amount of the surcharge to be paid by customers, with the obligation to keep the fund in balance. Plants generating electricity from FRA should have priority in the dispatching procedures.

## 3. Should there be Public Policies for Energy Efficiency and Renewables in a Restructured Italian Power Sector?

Power sector restructuring throughout the world is predicated as a means to capture economic efficiencies resulting from price setting by market forces.. Market-based pricing, if it is not unduly affected by abuses of market power or other influences, could lead to prices closer to the marginal cost of production. Thus, market-based pricing would begin to address an early rationale for utility energy efficiency and renewable energy programs, which was that regulated prices did not accurately reflect the true marginal cost of production, leading to inefficient production and consumption decisions.

However, it seems unlikely that power sector restructuring will, by itself, address the myriad additional failures that plague energy service markets. These failures include imperfect information, which manifests in the high transaction costs consumers face when making energy use decisions, as well as externalities (notably, those associated with the environmental consequences of electricity generation) that are unlikely to be reflected in market-based prices for electricity. Hence, we believe that, despite the prospects (but not necessarily the guarantee of) improved allocative efficiencies promised by electricity restructuring, the continuing presence of these market failures is compelling justification for continued government intervention.

As for Italy, evidence for the value of continued policies to promote energy efficiency comes from technical potential studies that suggest substantial cost-effective energy savings at current electricity prices. The Energy Plan for The City of Rome, compiled in 1994/95 by Ambiente Italia and the Fisica Tecnica Ambientale group of Politecnico Milano, showed that 30% of electric energy could be saved through measures whose cost of conserved energy is lower than the energy price to customers of the domestic, service and industry sectors.

Traditional rationales for utility funding of energy-efficiency DSM programs have included: (1) ratepayer funding is fair because the “problems” addressed by the programs are unique to electricity use; (2) it is more practical than alternative public-policy responses; and finally (3) it is more consistent with other social objectives. We now briefly expand on these rationales, which we maintain are unaffected by electricity restructuring.

*It’s fair.* The environmental consequences of electricity generation are significant and electricity consumers have a unique responsibility for the consequences of their purchase decisions. Ratepayer funding for energy-efficiency programs, which are a partial solution to these environmental problems, is consistent with this responsibility. Whether such programs or ratepayer funding of them are the most appropriate ways to fulfil this responsibility is separate from accepting the basic principle that the polluter should pay.

*It’s practical* Because the existence of environmental externalities in many activities is widely accepted, there is substantial debate about the appropriateness of policies that specifically target the utility sector. For example, economic theory has been used to argue that a tax levied uniformly on all forms of greenhouse gas emissions according to their relative contributions offers a more efficient approach to address one significant environmental consequence of activities that include electricity production. However, to the extent that such a tax or even agreement that this type of approach is appropriate is unlikely or may only partially internalise these costs in the short term, additional efforts may be warranted because electricity generation is a major contributor to the problem.

*It’s consistent with other social objectives* A final justification for ratepayer-funded energy-efficiency programs is pragmatic: these programs promote public support and acceptance for policies that rely on *voluntary* participation. From the consumer’s point of view, DSM programs, unlike government product standards and building codes, represent a non-coercive approach to promoting energy efficiency. Moreover, these programs can be designed to provide a stimulus to the private sector that, in the long run, may decrease the need for them.

## 4. Challenges for Future Energy Efficiency and Renewables

In the first and second sections we described how the Italian power sector is changing. In the third section, we considered the continuing need for energy efficiency and renewable policies. We now examine three issues which we believe are the key to the future development of energy efficiency and renewables exploitation.
(1) tax policy and the recycling of taxes to support energy efficiency and renewable programs
(2) modifications to the price cap to reduce disincentives to utility DSM
(3) introduction of explicit LCUP/IRP principles into the regulation of distribution companies for franchise monopoly customers

We develop the three arguments independently because they rely on different (but not mutually exclusive) assumptions regarding the future Italian electricity system. As such it would be possible to pursue a singular implementation of any one element. However, we believe they can and should be designed to reinforce one another as part of an integrated strategy.

### 4.1. Tax Policies

Current Italian electricity prices are relatively high when compared to other European countries. A primary reason is the high level of taxation (see earlier discussion). To some extent, these taxes currently can be seen as reflecting in prices the effect of internalising (to some, as yet unknown, degree) environmental externalities. Yet, as noted above, substantial e-e opportunities remain at current market prices which is indicative of additional market failures that high prices alone have not led the market to overcome (and hence a role for intervention).

There are two possibilities. The first is that taxes go away, and prices move closer to their true market value; in this case whatever effect prices (made higher due to taxes) have had on consumption in the past will be lost creating more pressure for other means of internalising externalities and improving the efficiency of the market. The second is that taxes remain; in this case we would recommend that a proportion of them be redirected to fund public purpose programs. Examples include the Energy Savings Trust scheme in UK, wires charges in the US (California), and the levy collected in Holland by distribution companies to fund energy efficiency and renewables, under a voluntary agreement with the government. With this structure utilities will no longer be requested to collect taxes in the name of the state for generic purposes, but simply to contribute to solve some of the environmental problems connected with their activities.

### 4.2. Price Caps

By themselves, price caps provide strong disincentives to utilities to promote energy efficiency (and renewables). There are two reasons: firstly it is advantageous to the utility to minimise all costs associated with production (including elimination of activities not necessarily associated with production, such as energy efficiency programs or higher cost renewables). Secondly it is additionally advantageous to expand sales whenever marginal cost of production is less than the price cap; lowering sales (improved end use efficiency) generates less revenues. In Italy the first disincentive has been addressed by allowing recovery of DSM program expenses outside of the price cap. The second disincentive can be resolved through some sort of net lost revenue adjustment.

In the following we provide an example based on data taken from the ENEL end of year financial balance for 1995. Considering total revenues at 36 000 BL, and total sales of 212 TWh, we arrive at an average unitary revenue of about 171 L/kWh. Under the new price-cap regulation the fixed margin for the utility will be given by average revenue from elements within the cap less their short run marginal costs. Average revenues from elements within the cap can be calculated as total revenues from sales less total fuel and electric energy expenses, divided by total sales. See table 4.1.

*Table 4.1. Average revenue from elements within the cap calculation*

| | *Lire* | *ECU* | | |
|---|---|---|---|---|
| A) Total revenues from salesA) | 36111,8 | BL | 19,006 | BECU |
| B) Fuel expenses | 7270,4 | BL | 3,827 | BECU |
| C) Expenses for buying electricity from other generators | 5062,5 | BL | 2,664 | BECU |
| A - ( B + C ) | 23778,9 | BL | 12,515 | BECU |
| Total sales | 211,6 | TWh | - | - |
| Average revenue from elements within the cap | 112,4 | L/kWh | 0,059 | ECU/kWh |

Short run marginal costs for elements within the cap will be nearly zero for capital and labour, and small for O&M and T&D (mainly losses), coming to a total of about 10 L/kWh. The fixed margin on each kWh sold is thus in the order of 112-10 ª 100 L/kWh. Due to the high value of this margin, there is a strong incentive to increase sales, regardless of whether the sales are economic or could be displaced by a less costly energy efficiency meas-

ure. The goal of harmonisation between the interests of the utility and the objectives of efficient use of resources is far from being achieved as required by art. 1 of law 481.

A way to offset this incentive to increase sales is a net lost revenue adjustment (NLRA). The net lost revenues,, calculated by multiplying utility's fixed margin with the net loss of sales attributable to its efficiency programs is recovered by distributing the sum across those kWh which are still sold. The combined result is a slight increase in the price of the kWh for the user, no profit losses for the utility, and energy and hence economic savings for society.

In order to assess the effect of NLRA in Italy we developed some short term (1996-2000) scenarios about the evolution of energy demand on the ENEL grid. The business as usual scenario is based on the growth rates assumed in the ENEL report for year 1995, that is a growth in energy demand of 2% in 1996 and 2.5% per annum till year 2000. The economic analys is made in real terms, that is without the effect of inflation, using 1995 prices.

Assuming that DSM programs could offset at least part of this forecasted growth, we calculate the impact on tariffs and the reduction to the total energy bill of the nation, when applying the NLRA. A phased introduction of energy efficiency measures commencing in 1996 arriving at a 2.6 % reduction in consumption in the year 2000 with respect to the BAU scenario would result in an increase of 1,6% in tariffs. In the same year the energy bill would be reduced by 420 BL, or if we consider the incremental gains over the phasing in period (1996-2000) a cumulative reduction of 1050 BL. See Figure 4.1.

For the purpose of comparison, we also considered a very aggressive DSM program, again implemented by phased introduction, which would completely offset growth in the year 2000 to provide a 7% reduction in consumption with respect to the BAU projections. Even in this case tariffs would only increase by 4,3 %. The saving on the total bill would be 1100 BL in year 2000 or 2700 BL cumulative for the years 1996-2000, (see Figure 4.2). However such an agressive programme would be both politically and tecnically difficult to achieve.

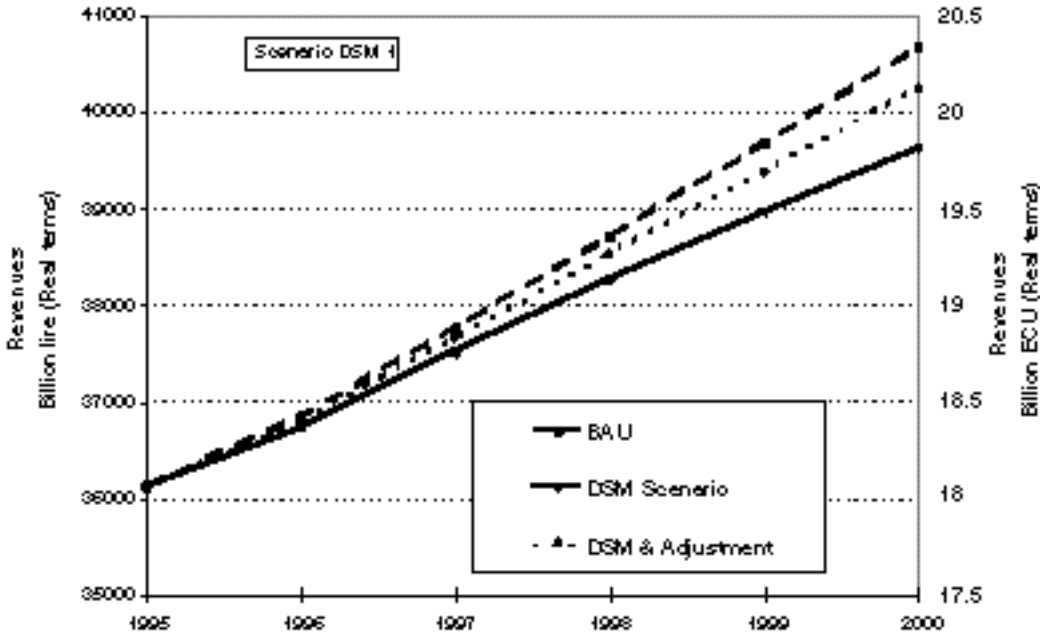


*Figure 4.1. Evolution of revenues for BAU, DSM, and for DSM with net lost revenue adjustment . Limited intervention case, resulting in 2.6% reduction in consumption by the year 2000*

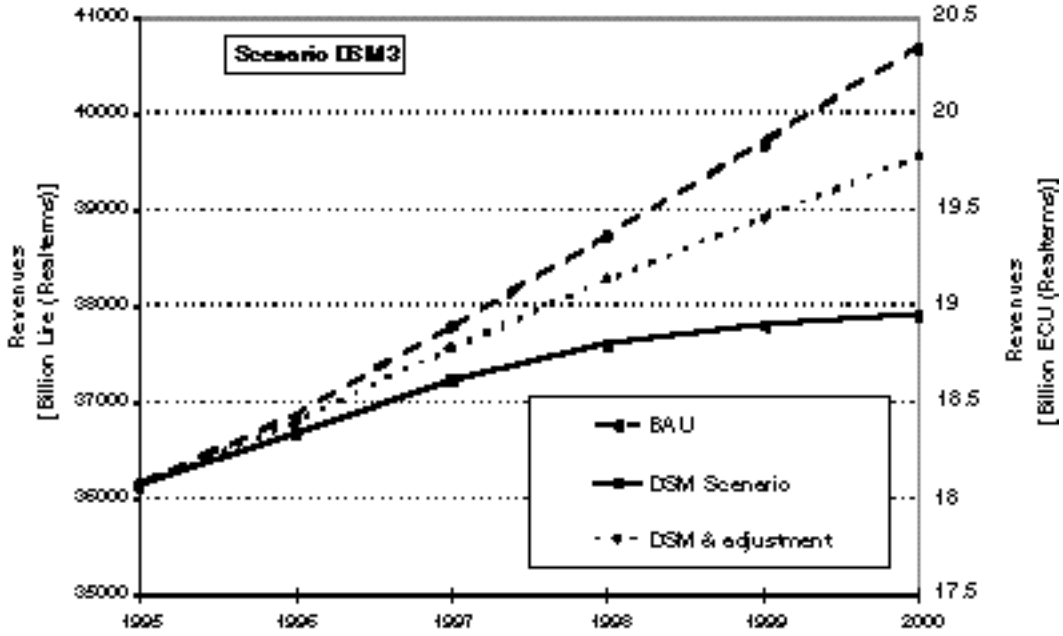


*Figure 4.2. Evolution of revenues for BAU, DSM, and for DSM with net lost revenue adjustment. DSM interventions are such as to offset growth by the year 2000.*

In both cases, the resulting impact on tariffs, even in the case of an extremely aggressive program is very limited, when compared to other recent changes; a 20% increase for some customers in 1993, a 3% increase in November 1996 for fuel cost escalation, and an ENEL proposed rate increase of 1.5% (1997) to cover supply side investments.

While DSM cost recovery, and NLRA will remove present disincentives if properly designed and implemented, it might be necessary to ensure that DSM investments will result as profitable as others available to the utility, through for example shared savings or other similar mechanisms. The detailed assessment of how big this additional incentive should be is outside the scope of this paper, and will also depend on the definitive structure of industry following the reform. If distribution is to be separated from production and transmission, then distribution companies will be the candidate for DSM actions and incentives will have to be calibrated against the return these companies can earn on alternative investments.

### 4.3. Regulation of Distribution Companies

It is worth reiterating that the price-cap method will apply to captive customers only who will be serviced by a number of distribution companies which will exercise a monopoly over a geographical area. The Commissione Carpi suggests that these companies could be derived from the 14 management subdivisions (*Direzioni)*currently operated by ENEL and would inherit 70% of the present distribution activities.

The Commission also suggests that in urban areas where presently distribution franchise are attributed to different companies (for example in Milano 50% of customers are served by ENEL and 50% by AEM), it will be necessary, in order to obtain higher economic efficiencies, to redefine the concessions and to create single distribution companies for the whole area.

Distribution companies will be able to offer additional services connected with the distribution of electricity (e.g. end-use energy efficiency services), though it will be necessary to maintain separate accounts and management structures.

Organised in this way the electricity industry will provide an ideal structure for the promotion of energy efficiency and renewables exploitation. Distribution companies with captive customers are in an ideal situation to con-

duct LCUP/IRP. Further, confined to distribution activities, with for example, no capital recovery of generating plant to cloud choice, management of demand will prove at least as attractive as increased supply.

We would recommend that the regulatory authority incorporates LCUP/IRP principles into the regulatory framework of the distribution companies and ensure that other legislation affecting the operation of distribution companies (such as the modifications to the price cap, suggested above) be adapted to ensure harmony with the use of the same principles.

## References

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## Notes

[1] The official list of projects seeking funding.