

Progressive electricity tariffs in Italy and California – prospects and limitations on electricity savings of domestic customers

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Keywords

impact assessment, bottom-up analysis, demand-side management, electricity savings, electricity consumption, policy evaluation

Abstract

After the oil crisis in 1973 countries around the globe tried to reduce the electricity consumption of private households by introducing progressive electricity tariffs, invoicing rising kWh price for increasing electricity consumption. Besides the well known cases of California and Japan, in Europe only Italy has introduced a national progressive electricity scheme for private households in 1974.

This paper deals with policy instruments to reduce electricity consumption in private households. The overall question is: what can we learn from policy instruments applied in other countries for a possible transfer to Germany? These question will be answered by conducting a comparative ex-post analysis of the implementation and outcomes of progressive electricity tariffs for households in Italy and California.

Results show that the progressive tariffs have been introduced to reduce electricity consumption, load and independence, but also as a social instrument to redistribute rising costs of electricity from low consumption to high consumption households. Around 90 % of all households in Italy still use the cheapest tariff option connected to low consumption and, beside other structural influences in Italy, some impact on electricity consumption can be assigned to progressive tariffs. Although social reasons – keeping the electricity price low for the majority of customers – seem to stop any major changes in the tariff scheme, today, tariff adjustments are also used to stimulate energy efficiency, especially of high consumption

customers. In California, the freezing of social rates after the energy crisis in 2000/01 made it suitable to introduce even higher progressive rates. Although the analyzed instrument-mixes have more or less limitations regarding efficiency and sufficiency impacts, some fruitful lessons and indications for a transfer of these instruments are discussed at the end.

Introduction

At last during the 1990s environmental policies and related instruments to promote environmental friendly behavior were broadened towards directing more responsibility to citizens and consumers. They were asked to contribute more towards a sustainable future by consuming fewer resources in everyday life. Also an increasing number of actors on the consumer environment level (electricity suppliers, appliance manufacturers, retail, etc.) were assigned to develop technological solutions and actively engaged in the implementation of policy instruments (Jänicke and Jörgens 2006). Our assumption is, that for environmental policy to be effective, it has to take into account and address both levels with a mix of policy instruments.

The aim of this paper is to compare ex-post the implementation and impact of progressive electricity tariffs in Italy and California. The overall question is: what can we learn from policy instruments applied in other countries and about their effects on the consumer and consumer environment level and which conclusions can be drawn for a possible transfer to Germany? Two basic questions guided the research: Why have these policy instruments been implemented and why have they been effective? And what are their prospects and limits in terms of energy-efficiency and -sufficiency? Using the framework of the transdisciplinary project association

“Transpose – Transfer of Electricity Saving Policies”, the aim is to identify the most effective policy instruments to facilitate electricity saving behavior and to suggest policy measures on the national level.

Italy is one of the few countries in Europe with long experience in offering a nationwide progressive tariff for the electricity consumption of private households. The price per kWh of consumed electricity increases with the growing amount of electricity consumed, providing an incentive for keeping consumption levels low. Progressive tariffs on the electricity market belong to a group of market-based interventions that influence consumer behavior through price signals (Tews 2009). Electricity distributors in Italy are mandated by the governmental regulatory authority (AEEG) to offer a progressive price component in the overall electricity price. Such arrangements, which are subsumed as “Demand-Side-Management” (DSM), are addressing consumers’ electricity consumption through the electricity supply companies. While **California** also has a mandatory progressive electricity tariff scheme for customers of the big investor owned utilities (IOU), it has a different liberalization and regulation history. The comparison of the two cases will show that progressive electricity tariffs are an option to set electricity saving incentives for households in liberalized and deregulated electricity markets.

In the first section of the paper I will introduce the theoretical framework guiding the whole research process: the Multiple Governance Framework provided by Hill and Hupe (2009). Then, in the second section the two case studies are presented along the following structure: (1) Political and socio-economic context (2) Policy-mix (3) Introduction and implementation (4) Outcome of the policy instruments and impact on household electricity consumption. In section three, a synthesis will be developed along different action levels of governance. In the last section some conclusions regarding prospects and limitations of the policy instruments will be drawn with regard to a possible transfer to Germany.

Theoretical Framework

The theoretical approach for this study is based on policy analysis with a focus on processes (George and Bennett 2005) and evaluation research stressing outcomes and impacts of certain policies (Knoepfel et al. 2007). I applied the Multiple Governance Framework from Hill and Hupe (2009) to empirically identify various influential factors and actors involved directly or indirectly in the introduction and implementation of the policies. It is based on approaches from neo-institutionalism, mostly on the studies by Ostrom and Kiser on Institutions and Development (Kiser and Ostrom 1982, Ostrom 2007) and is characterized as a concept of “government-in-action” (Hill and Hupe 2009: 14). To comprehend the different elements in the policy process, Hill and Hupe propose a guiding meta-question “Who acts where, doing what, on which scale and how?” (Hill and Hupe 2009: 124). Each part of the question refers to a central concept:

- **Who? Actors:** Which kinds of actors are involved in the political process? From the governance perspective it is a question to be decided empirically, actors could be individuals or organizations from politics, the economy or the civil society.

- **Where? Administrative layers:** Which administrative layers including representatives with territorial competences are involved in the political process?
- **What? Action levels:** What kind of governance activities could be found in the political process? Hill and Hupe discriminate between three different dimensions of action, they call it “trias gubernandi”:
 - By “constitutive governance” they embrace “both fundamental decisions about the content of policy and about the organizational arrangements for its delivery” (Hill/Hupe 2009: 125) or decisions about decision rules.
 - The next dimension, “directional governance”, covers the formulation and decision making process to reach certain political aims, whereupon the mode of the governance, how certain decisions are taken, remains empirically open.
 - “Operational governance” finally comprehends the management in the realization process.
- **On which scale?** Hill and Hupe speak of the locus of action situations that could be action situations between individuals, organizations or composed systems.
- **How?** This question embraces individual qualities, how the political process is affected by specific actions of individuals

The “Multiple Governance Framework” can be visualized in Table 1, which is a modification of the original matrix from Hill and Hupe (2009). The application of this theoretical framework guided the data collection and analysis process, whereupon the focus has been on the kind of actors involved, the action level (*trias gubernandi*) and the action scale. Its character is rather meta theoretical “while it makes a variety of dimensions of governance visible” (Hill/Hupe 2009: 129).

Methodologically, I used a bottom-up approach, going backward from the outcomes and impacts of certain policies to identify causal relations explaining decisions on instrument choice and successful conduct. Data sources have been previous research on the topic, especially evaluations, legal texts, environmental strategy papers, press releases and publications in other relevant journals. Guided expert interviews with researchers, actors from the regulatory authority, ministries and consumer organisations complemented the data base.

Introduction, functioning and evaluation of progressive electricity tariffs

The aim of this section is to identify those influential factors and causal mechanisms explaining how and why progressive electricity tariffs have been introduced in Italy and their effect on electricity savings in private households. In order to understand most comprehensively the tariff scheme, I will first discuss the political context in Italy and California and then differentiate the most relevant features of the policy-mix along a taxonomy of political instruments used by Tews (Tews 2009). Afterwards the introduction, implementation and impacts of the tariffs schemes will be analysed.

Table 1: The Multiple Governance Framework.

action level (trias gubernandi) action scale	Constitutive governance (decision rules)	Directional governance (aims)	Operational governance (management in the realization phase)
SYSTEM	Institutional design and frame	General rule setting	Managing trajectories
ORGANIZATION	Designing contextual relations	Mission formulation	Managing relations
INDIVIDUAL	Internalisation of values and norms	Situation bound rule application	Managing contacts
<i>Specifications</i>	<i>Decisions about decision making and framing</i>	<i>Formulation and decision making</i>	<i>Cooperation along decided rules</i>
Source: modified after (Hill and Hupe 2009: 128)			

POLITICAL CONTEXT IN ITALY AND CALIFORNIA

Like in most other European countries, the electricity production and distribution has been nationalized in **Italy**. In 1962 the state owned Ente Nazionale per l'Energia Elettrica (*ENEL*) was established, being the most important actor of a vertically integrated electricity sector. But even before the nationalization the inter-ministerial panel for prices and services (*CIP*) installed a national electricity price for all private households. Electricity was mostly produced from oil due to the geographic location near one of the most important oil transport routes in the Mediterranean Sea (Colombo 1984). Therefore the rising prices for oil severely hit the energy sector in Italy, highly dependent on oil imports. Aiming at the reduction of the dependency on oil and electricity, and also to keep the prices for the basic electricity consumption in households low, the progressive tariff scheme was introduced in 1975. Another important step was the introduction of a 3 kW electricity capacity limit for households to reduce capacity overload in the power grid (Bottazzi 1998).

In **California** quite similar developments led to the introduction of progressive tariffs called "lifeline rates". Energy policy was on the one hand guided by securing the provision of electricity and on the other hand by balancing electricity rates for customers with revenues for electricity providers. During the oil crisis from 1973 onwards the low level of consumer rates could not kept up and distributors where allowed to increase rates. But the vertically integrated electricity sector, basically three investor owned utilities (*IOU*)¹, did not needed the extra revenues due to rainy seasons, better use of hydro-electric electricity production and less use of oil (Anderson 1981). Becoming a critical issue in the media, electricity rates were now discussed in terms of social justice and more and more environmental and consumer organisations like the Environmental Defense Fund and *TURN* (Toward Utility Rate Normalisation) also criticised wasteful consumption of electricity.

The act no. 9/91 formed the legal basis for the opening of the **Italian** electricity market. Soon afterwards *ENEL* was transformed into a corporation, although the monopoly in the electricity sector remained for some time (International Energy Agency 1999, Evans 1999). Although *CIP* stopped their work

in 1993, it was not until 1999 that the new established regulating authority *Autorità per l'Energia Elettrica e il Gas* (*AEEG*) started with their work. In the same year the Directive 96/92/EC about the opening of European energy markets has been transposed into Italian law, the so called "Bersani Decree". As in other European countries, the former vertical integrated electricity sector had to be separated in several smaller units regarding electricity production, distribution and transmission, electricity had to be sold and bought at the new national electricity exchange market (*GME*) (Eurostat 2007; Polo, Scarpa 2003). Another important request by the Bersani Decree has been the establishment of a protected electricity market (*Maggior Tutela*) for customers, who do not want to change their energy distributor.

In **California** the three big *IOUs* had monopolies in terms of transmission and distribution of electricity serving 77 % of Californian households (Weare 2003: 7). Only in the electricity production other private energy producers had together a bigger share (58 %), compared to the *IOUs* (25 %) and public companies (17 %) (IEPA 2008). After deregulation measures in 1996 (Assembly Bill 1890) the three *IOUs* still had the greatest absolute share in terms of production, transmission and distribution of electricity, but their transmission capacities had to be controlled by an independent system operator (*ISO*) and they had to compete against other private electricity producers on the newly introduced wholesale electricity market (Power Exchange) (Weare 2003). The rising complexity of the electricity market let to a situation, that private electricity producers started to speculate on wholesale market prices and to provide false data on their transmission capacities (Weare 2003, McCullough 2002). Together with a heatwave, rising electricity consumption and limited hydro electricity production resource, an energy crisis starting in the year 2000 hit California (Dormady and Maggioni 2009). The Californian Public Utilities Commission (*CPUC*) together with the Californian government introduced a price cap on electricity rates to protected consumers and also limited the free choice of the energy distributor again in 2001. The *IOUs* were forced to buy electricity on high rates on the market, but could not increase electricity rates for customers any more causing severe debts and bankruptcy. These factors are the context for the introduction of higher progressive electricity rates, which will be discussed later.

Regarding overall energy efficiency policy in **Italy**, progressive tariffs did not play an important role. Also in the EU Directive 2006/32/EC on energy end-use efficiency and energy

1. Regulation and later deregulation mostly affected the *IOUs* and other privately owned energy companies. Publicly owned utilities had the right to keep their local electricity market closed and are still vertically integrated utilities and provide today around 25 % of the electricity in California. All following statements refer only to the regulation of the *IOUs*.

services, tariffs to increase efficient usage of electricity are not mentioned prominently. “Only” social tariff components are referred to, but “Member States may permit components of schemes and tariff structures with a social aim, provided that any disruptive effects on the transmission and distribution system are kept to the minimum necessary and are not disproportionate to the social aim” (Directive 2006/32/EC, 10,2). Those social aims could go hand in hand with efficiency aims, but progressive electricity tariffs are rarely mentioned by the interviewees to achieve those aims. Also in the national energy efficiency action plans (*NEEAP*) progressive tariffs are not classified as efficiency instruments. In **California**, electricity conservation played a much bigger role right from the beginning to introduce progressive electricity tariffs. But there has been no environmental policy in favor of the progressive rates (Mazmanian et al. 2008).

POLICY INSTRUMENTS

With *regulative instruments*, I mean the basic regulation set by regulation authority about the different components of the total electricity price and the organization of the electricity sector. Those instruments mostly address energy producer and distributor. They also indicate financial incentives or disincentives for consumers to use more or less electricity. Therefore, I will speak of *economic instruments* regarding effects on consumer’s behavior. Those effects could be enhanced, if *informational instruments*, like a well designed electricity bill or continuous campaigns, accompany the other instruments.

Regulative instruments

To understand the current regulation of the electricity price in **Italy**, at least three regulations have to be taken into account: First, the total electricity rate is composed of four different parts, the rate for electricity production established now on the market, transmission fees and general system costs regulated by the *AEEG*, and taxes. Second, all electricity contracts for household customers still come with a limitation of the capacity up to 3 kW (called D2 tariff) or more than 3 kW (called D3 tariff). If you own a second home, you automatically have the D3 tariff. Regarding the total electricity price, D2 and D3 cover the transmission fees. The basic rate for D2 is much lower than for D3, just as the rate component linked to the consumption. Furthermore, the rates for general system costs and taxes are linked to D2 and D3 tariffs. All in all, transmission fees, general system costs and taxes have a progressive element linked to consumption. The lower revenues of the D2 tariff are covered by the costlier D3 tariffs. Only the price for electricity production is not progressive any more. The third important element of regulation in Italy is the distinction between a free market for electricity distribution and the protected market (*Maggior Tutela*). Households, who did not change their supplier, receive their electricity automatically at a rate set by the *AEEG* to protect them from price changes on the free market and disadvantageous new contracts. To conclude, all households in Italy have a progressive electricity rate equal if they are still in the protected market or chose a new electricity distributor on the free market, cause the progressivity is linked to transmission costs, general system costs and taxes, all customers have to pay.

In **California** two different regulations regarding progressive electricity tariffs are important: First, in 1975 the so called

“lifeline rates”, since 1982 called “baseline rates” have been introduced by the *CPUC* ensuring that households get around 50 to 70 percent of their electricity consumption at a cheaper rate (Hennessy et al. 1989: 124). The baseline rates increased in a progressive way, making the second tier of consumption a bit more expensive than the first tier. In 1988 the difference between baseline and non-baseline-rates has been limited to 15 % (Faruqui 2008: 25). Second, as one answer to the energy crisis in California in 2000 this baseline rates have been frozen by Assembly Bill 1X to ensure cheap basic electricity consumption. Baseline rates could not be adjusted by energy distributors and customers could not change their electricity distributor any more. The already discussed problems due to the deregulation, caused new regulations, the introduction of a 5-tier progressive electricity tariff for all *IOU* household customers. Unlike in Italy, in California the progressivity is linked to the part of the electricity price for production and distribution costs, transmission fees and other general and system costs are flat.

Economic instruments

As economic instrument, the regulated electricity price in Italy sets financial incentives to chose the tariff D2 and not D3 and also to cut back overall electricity consumption. Beside the costs for the used kWh, the basic cost and costs due to the capacity limitations differ: In 2010 the basic costs for D2 have been 6 Euros per year and 23,45 Euros for D3. For each kilowatt D2 customers (3 kW) have to pay additional 5,13 Euros and D3 customers (6 kW) have to pay 14,44 Euro². In Table 2 the progressivity in the different elements of the electricity price are shown. The transmission fees for both, D2 and D3 contracts are quite similar, except for the first 1.800 kWh per year. For the general system costs, there is only a progressivity for D2. Also D2 is excluded from taxes for the first 1.800 kWh per year. Overall, there is a progressivity in the rates for the different capacity contracts and also in most of the consumption rates. Especially for the first 1.800 kWh per year, the tariff D2 is much cheaper than D3.

The total additional cost for a 6 kW electricity contract compared to a 3 kW contract are shown in Table 3. They rise from 127 Euro (300 kWh/a) up to 219 Euro for an average consumption level (around 2.700 kWh/a) and then decrease.

In relation, the additional cost decrease from over 180 % (300 kWh/a) to around 52 % for an average consumption level (around 2.700 kWh/a). Overall the financial incentives to use less capacity and less electricity are quite high up to an average consumption level, like in California around 50-70 % of the overall electricity consumption is rather cheap. But the question remains, if households are aware of these incentives because of the long time progressive tariffs are in use now. Some experts stated, that progressive tariffs are not an issue for household customers.

In **California** the progressivity in the baseline rates set some financial incentives to use electricity more sensible and reduced costs for basic consumption, especially for households with low consumption (Hennessy et al. 1989: 125). These rates have been totally reformed with the introduction of the 5-tier-progressive

2. The tariff D3 applies also for second homes regardless of the used capacity. Customers can chose also other capacity limits like 4,5 kW, but to keep the discussion simple, these are left out.

Table 2: Progressive electricity elements in the overall tariffs D2 and D3 in 2010.

Progressive elements in the overall tariffs		Electricity price per consumption block in kWh/a				
		0-1.800	1.801-2.640	2.641-3.540	3.541-4.440	Over 4.440
Transmission fees per used kWh	D2	0,0036	0,0390	0,0769	0,0769	0,1173
	D3	0,0200	0,0390	0,0769	0,0769	0,1173
General system costs per used kWh	D2	-	0,01399	0,01972	0,02787	0,02787
	D3	-	0,02787			
Taxes per used kWh	D2	-	0,023290			
	D3	0,0251				

Source: <http://www.autorita.energia.it>

Table 3: Yearly electricity costs of different capacity contracts and overall consumption 2010.

Total cost for electricity in Euro per year	Electricity consumption in kWh per year							
	300	600	900	1.800	2.700	3.500	4.500	5.700
Tariff D2 (3 kW)	69	104	139	243	422	624	879	1245
Tariff D3 (6 kW)	196	249	302	461	641	832	1074	1414
Additional cost for Tarif D3 (6 kW) compared to D2 (3kW)	127	145	163	217	219	209	195	169

Source: Own calculations on the basis of figures from <http://www.autorita.energia.it>

rates in 2001 by the CPUC for all IOU customers. The rate for the first tier is still called baseline. It is based on actual electricity price, climate zone of the customer, season, average electricity consumption of households in a certain climate zone, energy source of the heating system and days of delivery (CPUC 2010). In Italy rates for households are the same everywhere. The rate for the second tier with 101 % to 130 % of the baseline is still moderate, like in the two-tier baseline rates before. Between tier 2 and tier 3 the rate almost doubles and rises up to tier 4 and 5 more moderately again, as shown in Figure 1. The prices are already overall prices, the progressivity is in the production and distribution cost calculated by each IOU on their own, all other elements like transmission fees are flat (for example PG&E 2010). But due to the calculation of the baseline the variance of the total rate is quite high. But still the financial incentive to use electricity more sensible rise quite a lot.

Informational instruments

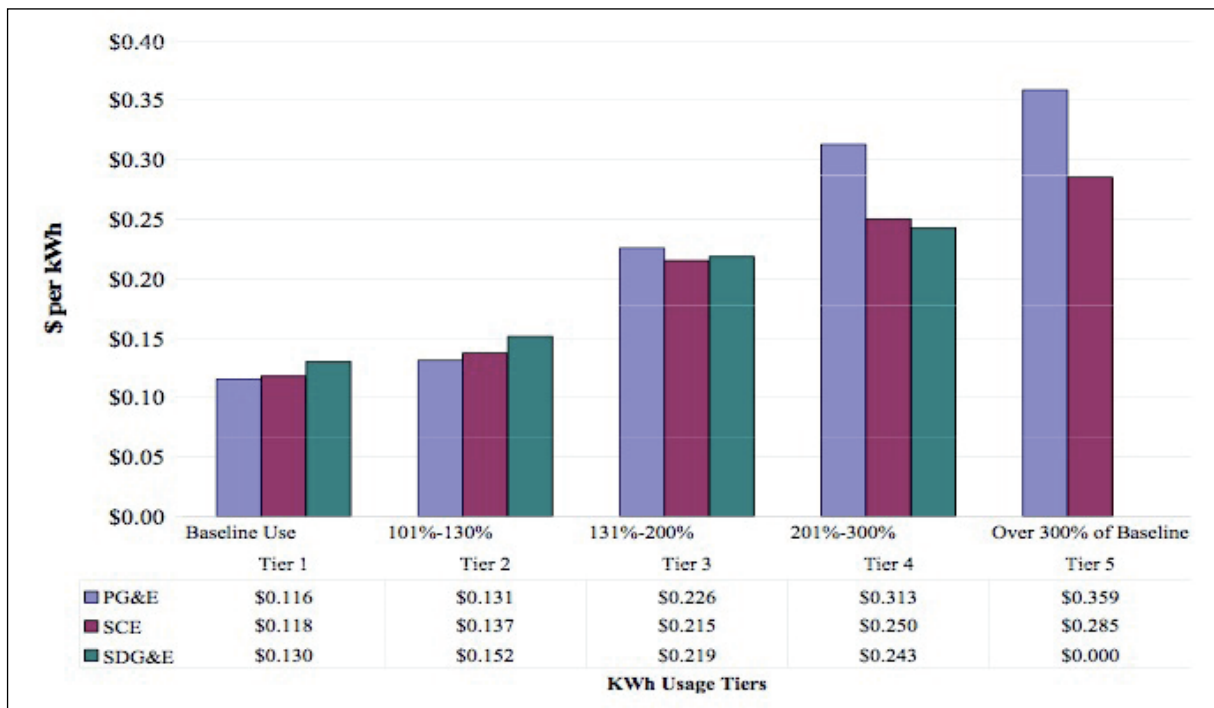
If the progressive electricity tariffs in Italy and California have been promoted prominently since their introduction cannot be answered sufficiently. The interviewed experts denied any kind of awareness raising campaigns over the years to give advice on how to save electricity and money. In addition, on electricity bills used in Italy normally no explicit information is given to understand the link between the extent of consumption and the price. Electricity bills are rather complicated to read and understand in detail, which is one reason why the AEEG is launching new regulations for the layout of electricity bills in 2011. Electricity bills in California seem to be much more understandable due to less progressive elements in the overall rate. In the meantime in both countries customers can find lots of different information on how to save electricity and to reduce costs on the websites of the regulation authorities, but without great reference to the progressive electricity rates.

INTRODUCTION AND IMPLEMENTATION

As already mentioned, the introduction of progressive electricity tariffs in Italy can be traced back to two major influences: (1) the low general electricity capacity in Italy and (2) the wish to support low-income-households. The constantly rising oil price and electricity production costs were not passed to the households, so that ENEL was in the red. From a certain point the state was not able to co-finance the increasing electricity costs anymore, making a rising electricity price unavoidable. To protect low-income-households and to limit consumption, the progressive tariff as well as the electricity capacity limitation was introduced. The political intent was to mainly burden rich households, who were expected to use relatively more electricity.

Altogether, either socio-political and energy-saving goals were targeted by the new tariffs (Botazzi 1998), some experts calling it a radical change in energy-policy. However, a central question is how the action of the participating actors can be explained. Because the whole electricity sector was nationalized the setting was clearly defined. The Ministry of Industry could, in cooperation with ENEL and the Commission on prices (CIP), develop and implement changes by an official decree. Moreover, workers' unions were in favour of the new tariff structure and could promote it through ENEL. The industrial lobby did not really care about the domestic tariffs, so ENEL could inherit a neutral position. However, as a nationalized enterprise, it was anyway directed by the Ministry of Industry. Overall the adoption of the progressive tariffs could be exercised easily because of the nationalization of energy supply, but have been highly influenced by party politics, industrial interests and labour unions (Prontera 2010: 497).

Major changes and discussions occurred during the liberalization process in 1990 and the installation of the regulatory authority AEEG in 1997. This involved the unbundling of



Source: Benjamin 2008

Figure 1: 5-tier electricity rates for IOU customers in California.

ENEL into several companies for production, transmission and distribution of electricity. Along with the decisions 204/1999 and 205/1999 came the key alterations of the tariff system that became effective in January 2000 (AEEG 2001:9). First the different tariff groups were reduced from 52 to 9, one of them for domestic households. The tariffs should reflect the costs of electricity production and distribution in a better way including a price cap for production costs. Second, at this time the two these days used tariffs D2 and D3 were introduced to protect the consumers. Thereby the lower costs of D2 are subsidized by the higher costs of D3 (AEEG 2001: 9f). Tariff D1 represents the average price, a theoretical tariff, that would result if the progressive tariffs D2 and D3 would be abolished, as planned in the Bersani Decree. But the initially intended gradual elimination of the progressive tariffs due to market liberalization has not happened until now. There are two main reasons: One is that electricity costs for the majority of domestic households would rise quite highly, which is socially not intended. The second is that the progressive elements of the electricity price have been restructured. Production and distribution costs were not progressive anymore and therefore the overall progressive tariff scheme could be integrated into liberalized market structures.

The restructuring of the tariff system has been a process involving different actors from the energy business, ministries and consumer representatives. This means a clear transition from more hierarchical, centralized decision making towards mechanisms of consultation. The regulatory authority AEEG has high competences for the definition of tariffs and is quite independent from policy-makers, though still following general political guidelines. Alongside the restructuring of the

electricity tariffs, rules for implementing and financing were decided by the AEEG, which will be described consecutively.

It is important to note that even if new rules for the competition of the electricity producers were introduced, the production price for electricity is not regulated as before. For instance, all prices that are offered to private households have to be approved by the AEEG, nonetheless they are generated on the free market. On the protected market, the costs for the electricity production are set by the AEEG, but they are bought under equal conditions on the free market by a single buyer. A regulation of these markets would contradict the idea of a common and competitive European electricity market. Only in the realm of the national grid, where is no competition, the price is regulated in order to enforce political objectives. The different prices are adjusted every three months by the AEEG.

All parts of the electricity costs are collected within one electricity bill by the responsible electricity distributor. Then the collected transmission and system fees are delivered to an redistribution fund (*Cassa Conguaglio*). All tariff changes by the AEEG are delivered to the consumer in cooperation with this fund. Its job is to equalize the difference between the nationwide consistent price for the transmission paid by the customer and the real costs of the various network operators. This procedure is equally applied for the tariffs D2 and D3 (AEEG 2001: 12f). General system costs are also equalized by the fund and set by the AEEG. Taxes are exclusively raised by the political authorities and are not regulated by the AEEG.

To put it in a nutshell, the implementation of progressive electricity tariffs in Italy is mainly provided by the cooperation of the AEEG, the *Cassa Conguaglio* and the electricity distributors. A significant change is that alongside the restructuring of the electricity market through the AEEG, a

new form of transparency and consultation with producers and consumers has been introduced for the process of regulation. In the end the responsible Ministry for Economics and the national government have not a direct influence on the tariff design. Nevertheless, a decision for completely abolishing progressive tariffs is depending on the political intention to do so.

In **California** the introduction of the lifeline rates in 1975 was also due to social reasons and a growing environmental awareness as described before. The *CPUC* made the new progressive rates for basic consumption compulsory for the *IOUs* by the act AB 167. But due to some confusion, how to assess essential electricity needs the lifeline rate have been replaced by the baseline rate (AB 2443), providing an algorithm to calculate the rate: 50-60 % of the average consumption in summer times and 60 to 70 % in winter times for households with electric heating (Hennessy et al. 1989: 124). The same political idea as in Italy, support low income households with low rates and burden high consumption with higher rates, forced electricity distributors to charge higher rates for the second tier of consumption. Rate affordability was again the driving force of Senate Bill 987 to limit the difference between baseline and non to baseline rates to 15 % and also to include different seasonal and geographical baseline reductions (Faruqui 2008: 25). Although the clear commitment of the Californian legislature to provide social electricity rates and the oil crisis promoted the introduction of the lifeline rates, interviewed experts stated that the “World Leader of Environmental Reform” is missing any clear environmental line of argumentation for the introduction of progressive rates until the late 1990s (also Mazmanian et al. 2008). The 5-tier progressive rate scheme has rather been implemented in 2001 because of a mix of different reasons.

Although official reasons have been the promotion of electricity savings, interviewed experts stated, that this was rather to receive a green image in the public and that there has been almost no alternative to the introduction of the 5-tier progressive scheme. How can you explain that? First, during the energy crisis 2000/01 the government passed the Assembly Bill 1X to freeze the rates for the baseline due to rising average rates. Energy distributors could not adjust them any more (Pfannenstiel et al. 2008: 50, Faruqui 2008: 25). Second, the deregulation of the electricity market caused coordination problems between the newly established wholesale market (Power Exchange) and the *ISO* in charge of transmission capacity led to volatile markets (Dormady and Maggioni 2009: 10). Furthermore, severe speculations on the electricity rates on the wholesale market amplified the rise of electricity rates due to the energy crisis. But energy distributor could not raise their customers rates any more. To compensate for their revenue losses, the *CPUC* in agreement with the government and the *IOUs* introduced the 5-tier progressive rates, giving the *IOUs* the basis to charge higher rates from customers with high consumption. Like in Italy in the 1970s, social and economic interests could be brought in line with a progressive electricity rate scheme. Another important decision stabilized the new system: *IOU* customers were not allowed any more to change their energy distributor from September 2001 onwards, the *CPUC* closed the free market for energy distribution again (Decision 01-09-060 by the

CPUC). Therefore customers with high electricity consumption could not switch to a energy distributor without high rates for high consumption.

As the system came into effect the positive side-effects to stay into the first two consumption-tiers or to invest into own renewable energy source like photovoltaic's have been emphasized by the government, although they were not the origin of the implementation. Gradual changes of the progressive rate scheme are likely the next years, in the Senator Bill 695 from 2009 the increase of the frozen baseline rates is provided until the total abolishment in 2016. But it is the goal to keep the overall progressive structure with reduced rates for the highest consumption tiers, which are still much more expensive than the first two consumption tiers (U.S. Senate 2009). Overall the Californian electricity market remains one of the most regulated markets in the USA (Compete Coalition 2010). Although the tariff design is much more the responsibility of the *IOUs* than in Italy, all tariffs have to be approved and are strongly monitored.

Outcome and impact

Unfortunately, data from the time of introduction in 1975 and from the following years is not available easily in **Italy**. But as the progressive tariff scheme used these days has been changed anyway in the year 2000 the *outcome* analysis is based mainly on actual figures from 2008. These figures represent only households in the protected market, but against the background that only 3.1 % of all households changed to the free market at that time, the data can be considered representative (AEEG 2009). Around 94 % (20.53 mil.) of consumers in principal residences use a tariff with a capacity limit of 3 kW, whereby only 6 % have one over 3 kW. The latter show an average consumption of 4615 kWh/a, the former one of 2290 kWh/a. Concerning the consumption levels it can be stated that ca. 38 % of all households with a 3 kW tariff use less than 1.800 kWh/a, whereby only 10.5 % of households with a 6 kW tariff reach this level. On the level between 3.500 and 5.000 kWh/a the allocation is inverted: ca. 12.3 % of all consumers with the 3 kW tariff and 27.6 % of all consumers with the 6 kW tariff can be found in these consumption blocks. All together, these figures show that the progression in the overall prices for the tariffs D2 and D3 is likely to have a positive impact on the electricity consumption. The question, if the differences between the consumption levels can be explained either by the capacity limits and their progressive prices or by the progression in the price for consumed kWh electricity, cannot be answered sufficiently. The majority of the interviewed experts believe the capacity limits to be more effective.

The *impact* of progressive tariffs on the overall electricity consumption of private households in Italy has almost not been evaluated, at least no comprehensive study is known by the interviewed experts. Methodologically an evaluation is complicated due to missing control groups³ and several other factors that influence electricity consumption such as the rising numbers of electric appliances or the use of other energy source for heating instead of electricity. Nevertheless, one app-

3. The progressive tariffs are compulsory for all households, therefore one cannot compare their overall electricity consumption to households without such a tariff scheme.

proach is to estimate the impact by analysing changes in the rates for electricity and thereupon variation in electricity consumption. The national trade union in Italy used the approach to analyse the development of electricity consumption between 1969 and 1987 (FNLE/CGIL 1989). The actual electricity consumption was compared with a hypothetical consumption inferred from the linear slope of consumption of the last four years without interference of the oil crisis or the progressive tariffs. Until the next oil crisis in 1979, a decreased electricity consumption of around 200 kWh/a has been calculated. From 1979 onwards, the consumption level first decreased again due to higher progressivity in the rates and then rose until 1985, but again on a much lower level as one could expect from the hypothetical line. From 1979 until 1986, the calculated savings in electricity consumption are around 355 kWh/a. After the decrease of the progressivity in the tariffs in 1986, especially in the higher consumption blocks (CIP Resolution 32/198), the electricity consumption increased again, which could be partly due to those adaptations. Although other factors influenced electricity consumption in the discussed time period, the development of electricity consumption can be explained by the described changes in the level of rates and tariff scheme quite well. As these adaptations have been mostly related to the prize level of the different consumption blocks, a certain influence of the price level on the overall electricity consumption can be assumed.

In **California**, the data base is also difficult. Due to the long time since the first introduction of the lifeline rates, the focus of studies have been rather on the social goals of electricity rates, not on electricity savings (Hennessy et al. 1989, Acton 1980). Also there is no single rate for all *IOU* customers like in Italy, so consumption figures for households are hard to get. Like in Italy the progressive rates are compulsory for all *IOU* customers, so no control group is available to see, if the reductions in electricity consumption are related to progressivity. In terms of *impact* on the overall electricity consumption, one of the few studies on this topic tried to model the electricity price elasticity of Californian households with an econometric model (Reiss and White 2005). They could not find a significant effect of price signals similar to those of progressive electricity rates on electricity consumption, but as they conclude themselves, there are lots of methodological problems still to solve. Another source is the article of Faruqui (2008), who concludes that inclining block tariffs like the 5-tier progressive scheme in California can have a positive effect on electricity consumption, especially with a well developed design taking into account various effects. But even without more sophisticated rate designs, the 5-tier progressive rates helped reduce electricity consumption in Californian in 2001 by 10 % together with the mild climate and energy crisis advertising campaigns (Faruqui 2008: 25).

As it looks, the direct influence of progressive electricity rates are hard to measure due to the influence of other factors and methodological problems like including non-linear pricing into models (Reiss and White 2005, U.S. Department of Energy 2009). But after all, both Italy and California have a electricity price above average⁴ compared to the EU and likewise

to the USA and also both cases have an residential electricity consumption below average (Kandel et al. 2008, Bürger 2009, AEEG 2008) Beside the problems using average consumption levels, especially in California consumption levels vary a lot, studies estimated at least for California a rather big influence of efficiency policy measures on electricity consumption (Sudarshan and Sweeney 2008, Kandel et al. 2008). Combining progressive tariff schemes with other efficiency policy instruments could therefore be a useful approach, as will be also discussed in the conclusions.

Synthesis and discussion

The impact of the analysed policy instruments to promote electricity savings are the consequences of governance decisions taken by various actors from government and private organizations on different levels of governance. The essential conclusions regarding their introduction, implementation and conditions for their operation will be summarized in the last section along the Multiple Governance Framework. The paper concludes with a final evaluation of the applied policy-mix, its potential and limitations and first insights for a transfer to Germany.⁵

CONSTITUTIVE GOVERNANCE

The decision frame for the introduction of progressive tariffs in Italy and California was set by the horizontal integration of the electricity sector. The ministry in charge and the commission on prices (*CIP*) had full authorization to introduce the new tariff scheme in Italy, while in California the already established regulation authority had similar rights. One important reason to introduce progressive electricity tariffs has been higher energy security and in the case of Italy the reduction of energy imports. Because of the nationalization of the energy sectors, the decision have been taken by legal monopolies, but those political decisions usually depend on competition between different political interests. Another reason can be seen in the provision of a cheap basic electricity supply for low income households. Together with the energy crisis and early energy conservation efforts, the socially motivated goals supported the formation of a political consensus.

For the realignment of the tariff structure during the market liberalization in Italy, the new regulation authority *AEEG* had the political mandate to reform the whole electricity sector. On the one hand, they wanted to abolish the progressive tariff scheme step by step, as requested by the Bersani Decree. But this was and is politically not an option, only small changes in terms of progressivity have been possible due to social reasons. On the other hand, consultation and transparency are two important aims of the *AEEG*. Therefore, it has been much easier e.g. for consumer organizations to demand the perpetuation of the progressive tariff scheme. Also the *AEEG* use their independency, as one of the interviewed staff members stated, to set incentives to support political goals like energy efficiency. In California the new energy crisis and also the deregulated electricity market caused too much instability. New and even stricter politically motivated regulations have been the conse-

4. For average and high overall electricity consumption.

5. The transfer study will be conducted in the following working package of TRANSP-POSE.

quence. Comparing the electricity markets in Italy and California, they are both highly regulated, the frame for progressive tariff scheme is set by the regulation authorities and progressive rates are compulsory for all consumers.

DIRECTIONAL GOVERNANCE

Both energy-related aims and social aims influenced the introduction and also the concrete design of the progressive electricity scheme in Italy and California. The capacity limitation in Italy was a request by *ENEL*, the ministry of industries and the government to reduce energy import dependency and to relieve the strain on the power lines. Trade unions pushed for low electricity prices due to the assumption that low-income households have also a low electricity consumption. If one of the aims had more influence than the other on the decisions taken is hard to say, both aims could be reached by the specific structure of the progressive scheme. One important aspect is also the obligation to introduce the tariff scheme for all households due to the aim of cheap basic provision with electricity. But in Italy the electricity rates have always been set by commissions or the regulation authority for all households, while in California the rates varied between customers. Here energy distributors calculated the rates on their own and also seasonal and geographic differences have been included.

During and after the market deregulation processes in both cases the progressivity in the rates have been adjusted and were not abolished due to social reasons, again. The progressive part of the total price for electricity in Italy was just relocated into those parts, where no competition on the market is possible (transmission fees general system costs, taxes). The social aspects of the progressive tariffs prevented the quick abolishment of the scheme, because most households would have had to pay a much higher electricity bill. In California the freezing of the baseline rates during the energy crisis in 2000/01 facilitated the introduction of even higher progressive rates. But here the economic interests of the *IOUs* played also an important role. They could stabilize their revenues again and due to the limited competition between energy distributors, they are in the comfortable position to decide on the electricity rates only in the limits set by the regulation authority.

In Italy no actor in the electricity sector has direct disadvantages from the progressive rates. The revenues from the progressive parts of the total costs are redistributed (compulsory for all actors) and electricity production and distribution are exempted from progressivity. These three aspects, relocation of the progressivity into the net transmission fees (transmission networks have the character of a natural monopoly with no competition), redistribution and also competition on the market for electricity production and distribution, have to be seen as the fundamental conditions for operation of progressive electricity tariffs in Italy on the level of directional governance. In California, where the progressivity is part of the production and distribution costs of the *IOUs*, conditions for the operation of the 5-tier progressive are also redistribution, a compulsory rate frame for all *IOUs* and also no competition between energy distributors on the market.

OPERATIONAL GOVERNANCE

The introduction of progressive tariffs took place in highly regulated markets in Italy and in California. The relevant political and administrative actors set rather clear rules the electricity sector. Any kind of adjustments were decided and implemented by few closely interlinked actors. In the deregulated Italian market a more or less strict partition of the different actors under the control of the *AEEG* is characteristic. The management of the different flows of revenues is therefore in the hand of another organization, *Cassa Congualio*, which coordinates the exchange between energy producers, distributor, owner and operators of the transmission network. For the redistribution of revenues, the price level of the electricity tariffs has to be adjusted every three months in close cooperation with *AEEG*, because total revenues highly depend on the total consumption of all households. In California, the *IOUs* have a much higher responsibility to calculate the tariffs and adjust them on their own only with the approval of the regulation authority. But there is a long tradition in California to balance price level for customers and revenues for electricity companies, therefore rate adjustments have a certain limitation, too. Management and operation procedures in both cases are highly complex and are based on their respective regulation traditions. But although these are different in many ways, progressive tariff schemes seem to operate, if there is a certain regulative frame limiting competition.

EVALUATION OF THE POLICY MIX, POTENTIALS, LIMITATIONS AND TRANSFER QUESTIONS

For the policy mix used to induce electricity savings with progressive electricity rates the results are mixed. Certainly, the goal to support low income households with progressive tariffs, which was one of the driving forces of their introduction, is difficult to achieve. Therefore California and recently also Italy introduced bonus programs for households with low income and special needs. Progressive tariffs alone are not a good social policy instrument, although the social argument prevented the abolishment in Italy and reinforced the higher progressive rates in California. Regarding the energy efficiency goal, different lines of arguments have to be discussed. In Italy and California, a comprehensive regulative frame was necessary reducing competition and making the overall tariff design compulsory for all actors. Certainly the consumer environment, electricity producers and distributors have been addressed successfully with regulative instruments. If economic and informational instruments reached consumers is not totally clear. First of all it has to be mentioned again, that several other influential factors like income, number of persons per household, size of the dwelling, climate or number of household appliances have an impact on the overall electricity consumption. But studies to shed more light on the different links between those factors and progressive electricity are rarely available and are out of the scope of this study. Therefore, the influence of the progressive electricity price on the total consumption could be only assumed as accurate as possible. On the other hand, the number of households with the cheaper 3 kW capacity contracts in Italy (93,85 % in 2008) and the mid-term changes of their consumption levels due to changes of the electricity prices showed that lower electricity consumption was and is always linked to rising costs. In California, the impact on electricity savings is also

not clear, but there have been some indications that even in the short term progressive tariffs have an effect.

On the one hand, it is hard to say, if progressive electricity tariffs are any kind of *energy efficiency instrument*. The interviewed experts in Italy and California stated and also the environmental policy review showed, that they are at least officially not regarded as any kind of those instruments. One problem remains with the incentive for energy distributors to reduce overall electricity consumption of their household customers. In California, where the IOUs want to make their profits in certain limits set by the regulator, the incentive to sell less electricity is rather low, especially the high consumption customers are attractive customers in terms of revenues. Only if the progressivity is decoupled from the price for electricity production and distribution, like it is the case in Italy now, the incentive to sell more electricity than less vanishes (Pagliano et. al 1999). Then adjustments in the progressivity can be used to set signals for sensible consumptions, like the AEEG in Italy did in 2009 with their tariff D3, as one interviewee stated. Although this is not the official position of the AEEG, it illustrates the potential of progressive tariffs as energy-efficiency instrument. Another option to promote much more the efficient use of electricity is to link progressive financial incentives much more with information about electricity saving options in households, communicative interventions and active promotion of other instruments like bonus programs for energy-efficient cooling appliances in an overall policy mix (Krömker and Dehmel 2011, Hamenstädt and Fuchs 2011).

On the other hand, the question is still open, if progressive electricity tariffs can be regarded as any kind of a *energy sufficiency instruments*, because they set certain limits. Regardless if the consumption levels and the corresponding rates are set politically or economically, it poses the discussion about certain limits of consumption and how to find them. The already raised question, if progressive electricity tariffs are more efficiency or more sufficiency instruments can be broadened to the question if certain strict limits should be "implemented" into those policy instruments. The overall question is, why should not governments set certain limits to domestic electricity consumption, at least using a progressive price mechanism: low electricity consumption is rather cheap, high consumption is much more expensive. Although not intended primarily, in both cases between 50-70 % of the electricity consumption is rather cheap. This social argument could be easily translated into an argument of environmentally appropriate and affordable electricity consumption, a question about normative thresholds. It is then more a political than an economical question, a question about redistribution of resources and certain limits of consumption, the cases presented here offer different entry points to this questions, which are worth to think about regarding the transfer of progressive electricity tariffs to Germany. First, progressive tariffs should be compulsory for all households, like it is already the case in Italy and in California. The difference between the cases is, that in Italy households can choose their energy distributor on the free market, which is at the moment not the case in California. Second, progressivity can be introduced in all parts of the electricity price, depending on the regulatory frame. In Italy the progressivity is linked to the non competitive elements in the electricity price

(transmission fees, general system costs, taxes), while in California only the more competitive production and distribution price elements are progressive. These discussions also touch the question, how to finance a progressive tariff scheme. If it is compulsory for all households a redistribution system for the different revenues can be installed. If a progressive tariff scheme is not compulsory and distributor can decide if they offer those tariffs or not and households can choose their electricity distributor, those with high consumption are likely to change their contractor. Third, the consumption limits must be set in accordance to individual needs of households (social, medical needs) and other factors like climate, average consumption and season like it is done already in California. In Italy the height of the progressivity rate is much more politically set, while in California the production price for electricity and average electricity consumption are also taken into account for the baseline calculation. And fourth, also capacity limitation, like in Italy, is an option to limit electricity consumption with a progressive mechanism. At least some research institutes and consultants are trying to model the effects of capacity limitations on electricity savings, they seem to be an option for the future (Ecofys, EnCT, BBH 2009).

Finally, in times of energy crisis progressive tariffs became a viable option to address financial problems for both, consumers and the electricity industry in Italy and California, but with different outcomes on the progressive design. But even without a energy crisis like in Italy and respectively after the energy crisis in California, governments and regulation authorities kept the progressive schemes, although no systematic study about the impact of progressive tariffs on electricity consumption has been conducted so far. It looks that they are more and more regarded as energy efficiency instruments and the multiplicity of single results from this study supports the positive effect by progressive tariffs towards electricity savings, especially if they are not seen as a single instrument, but as a important pillar in a mix of energy saving instruments.

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Acknowledgements

This paper is based on research conducted in the frame of the transdisciplinary research project TRANSPOSE founded by the Federal Ministry of Education and Research (BMBF) in Germany. I would like to thank a number of people who have encouraged my work: Doris Fuchs, Tobias Gumbert, Ul-

rich Hamenstädt, Daniel Kaiser, Tabea Bergold and Kristina Schulte for the excellent support during the research process and editing of the results and also Kerstin Tews and Sophie Attali for many helpful comments on earlier versions of the paper.