THE IMPACT OF THE REFORMATION OF THE ITALIAN ELECTRIC TARIFF IN AN "ALL ELECTRIC" HOUSEHOLD

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ABSTRACT

This paper explains the details of the reformation process of the electric tariff for residential end users which has been undertaken by the Italian Authority for Electricity, Gas and Water (AEEGSI) and shows how it fits in the process of making the Italian energy system more efficient.

INTRODUCTION

The reformation of the electricity tariff for domestic end users carried out by the Italian Authority for Electricity, Gas and Water (AEEGSI) has several objectives, including:

- overcome the progressive structure with respect to consumption of the current consumption rate, adjusting the various components of the cost of its services according to criteria of gradualism;
- encourage end users' virtuos behavior by the adoption of the electric vector in place of or as an alternative to traditional liquid or gaseous fuels, thus achieving the energy efficiency goals. This reform involves the tariff components under the control of the AEEGSI, i.e. the tariff components remunerating network services (transmission, distribution and measurement) and covering general system charges. On the contrary, taxes (called "Accise") maintain a progressive structure, but the regulation of them falls outside the remit of the Authority.

The reform of the residential electricity tariff was initiated by the AEEGSI resolution 204/2013/R/EEL [1] that provided the guidelines for the implementation of the reform. It was followed by the consultation document DCO 34/2015/R/EEL [2] which presented the different tariff options, evaluating them in a comparative way with respect to the objectives of the reform and providing an assessment of the possible impacts on the costs paid by residential customers.

INTRODUCTION

Starting from the content of the documents mentioned in the previous paragraph, RSE has evaluated the possible impact of the new tariff structure (both in terms of the annual cost of the energy consumption and in terms of primary energy savings and greenhouse gases emissions) for a residential end user who decides to renovate his home without recurring to fossil fuels, thus going from a "traditional" home to a new "all electric" one. In particular, the comparison is made between the following two situations:

- "all electric" situation: an house in which electricity is used to satisfy all energy demands in an efficient way; heating, cooling and hot water demand is satisfied by a heat pump belonging to a class of energy efficiency which is higher than the market average, while the cooking demand is satisfied by induction plates;
- "traditional" situation: a house in which a part of the energy demand is satisfied by fossil fuel (e.g. natural gas for the services of heating, cooking and hot water), while electricity is used to satisfy cooling demand.

The default consumption for lighting, electric appliances (washing machine, refrigerator, etc.) is the same in the two previous situations. The following cases have been selected:

	Description	**Heating demand** [kWh/year]	**Cooling demand** [kWh/year]	**Hot water demand** [kWh/year]	**Cooking demand** [kWh/year]
A	One member family (50 m^2 studio apartment in medium condominium)	5,750	627	679	200
B	Two members family (100 m^2 detached house)	18,500	1,254	1,358	450
C	Four members family (80 m^2 apartment in medium condominium)	9,200	1,003	2,716	600
D	Holiday house (70 m^2 detached house)	12,950	878	1,018	150

Table 1: details of the analyzed cases with the respective heating, cooling, hot water and cooking demands.

All the households are located in Milan. For example, the details of the comparison between "traditional" situation" and "all electric" situation" for case A is reported in Figure 1.
D2 and D3 are the old tariffs, which have a "progressive structure", i.e. the more you consume, the higher the price of the kWh; T0, T1, T2 and T3 are the new options proposed by the AEEGSI and they a have a flat structure, i.e. the price of the kWh paid by the customer is independent of his/her annual consumption.

Figure 1: comparison of running costs between "traditional" situation and "all electric" situation in case A.

As you can see, the "traditional" situation is cheaper than the "all electric" situation with the old tariffs, while the opposite situation occurs with the new proposed tariff options: the saving ranges from about 105 €/year up to about 167 €/year, as you can see in Table 2.

Description		"Traditional" situation [€/year]		"All electric" situation [€/year]		Δcosts [€/year]
A	One member family (50 m² studio apartment in medium condominium)	D2	746.9	D3	999.3	-252.5
		T0	814.6	T0	710.1	+104.5
		T1	874.2	T1	735.4	+138.8
		T2	840.4	T2	673.4	+167.0
		T3	821.0	T3	668.7	+152.2

Table 2: comparison of the running costs between "traditional" situation and "all electric" situation in case A.

It is interesting to calculate the percentage savings with respect to the old tariff: the results are displayed in Table 2.

Description		"Traditional" situation [€/year]			"All electric" situation [€/year]		
A	One member family (50 m² studio apartment in medium condominium)	D2	100%	-	D3	100%	-
		T0	109%	**+9%**	T0	71%	**-29%**
		T1	117%	**+17%**	T1	74%	**-26%**
		T2	113%	**+13%**	T2	67%	**-33%**
		T3	110%	**+10%**	T3	67%	**-33%**

Table 3: percentage comparison of the running costs between "traditional" situation and "all electric" situation in case A.

As you can see, the new tariffs would cause an increase ranging from 9% to 17% for the "traditional" situation, while for the "all electric" situation" there would be a cost reduction ranging from 26% to 33%.
For further information, an analysis is made taking also installation costs into consideration through the entire technical life (assumed to be 15 years [3] [4]). The results are shown in Figure 2.

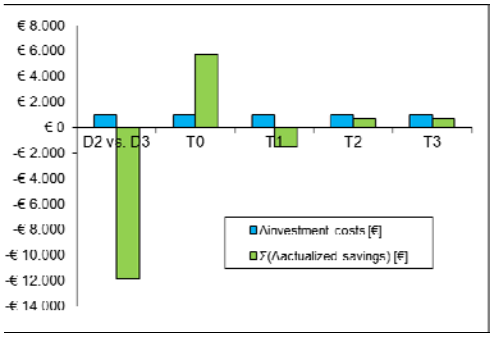

Figure 2: comparison between Δ investment costs and Δ annual savings between "traditional" situation and "all electric" (actualized over the whole technical life) in case A.

As you can see, the investment is not profitable with the old tariffs (D2 *vs.* D3), while in the remaining cases (T0, T1, T2 e T3) the higher installation costs of the "all electric" situation with respect to the "traditional" situation are compensated by the lower running costs of the former one with respect to the latter one, thus determining a positive value for the NPV at the end of technical life.

Table 4 shows the pay back times for each comparison in case A.

Description		"Traditional" situation [€/year]	
A	One member family (50 m² studio apartment in medium condominium)	D2 *vs.* D3	Longer than technical life
		T0	< 9
		T1	< 7
		T2	< 6
		T3	< 7

Table 4: pay back time of the "traditional" situation *vs* the "all electric" situation in case A.

As you can see, the pay back times are all shorter than the technical life: this means that the investment "all electric" situation *vs* "traditional" situation is profitable.

The details of the comparison between "traditional" situation" and "all electric" situation" for case B is reported in Figure 3.

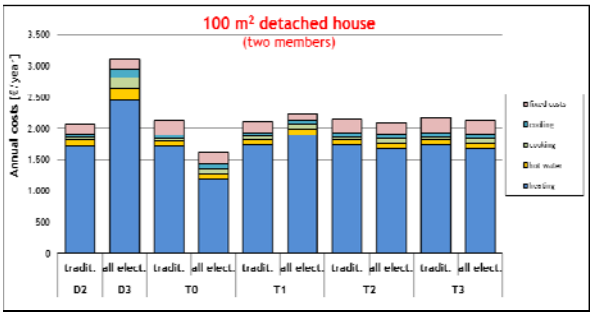

Figure 3: comparison of running costs between "traditional" situation and "all electric" situation in case B.

As you can see, the "traditional" situation is cheaper than the "all electric" situation with the old tariffs, while the opposite situation occurs with the new proposed tariff options: the saving ranges from about 327 €/year up to about 596 €/year, as you can see in Table 5.

Description		**"Traditional" situation** [€/year]		**"All electric" situation** [€/year]		**Δcosts** [€/year]
B	Two members family (100 m² detached house)	D2	2,061.0	D3	3,105.5	-1,044.5
		T0	2,134.5	T0	1,806.6	+327.9
		T1	2,153.3	T1	1,585.3	+567.9
		T2	2,119.5	T2	1,523.3	+596.1
		T3	2,115.1	T3	1,609.4	+505.7

Table 5: comparison of the running costs between "traditional" situation and "all electric" situation in case B.

The percentage savings would cause an increase ranging from 2% to 5% for the "traditional" situation, while for the "all electric" situation" there would be a cost reduction ranging from 42% to 51%.

For further information, an analysis is made taking also installation costs into consideration through the entire technical life (assumed to be 15 years [3]). The results are shown in Figura 4.

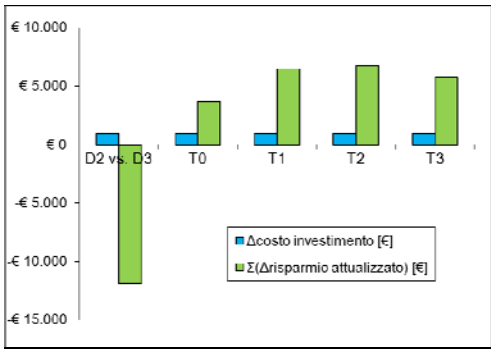

Figura 4: comparison between Δ investment costs and Δ annual savings between "traditional" situation and "all electric" (actualized over the whole technical life) in case study B.

As you can see, the investment is not profitable with the old tariffs (D2 *vs* D3), while in the remaining cases (T0, T1, T2 e T3) the higher installation costs of the "all electric" situation with respect to the "traditional" situation are compensated by the lower running costs of the former one with respect to the latter one, thus determining a positive value for the NPV at the end of technical life.
Table 6 shows the pay back times for each comparison in case B.

Description		**"Traditional" situation** [€/year]	
B	Two members family (100 m² detached house)	D2 *vs* D3	Longer than technical life
		T0	< 4
		T1	< 2
		T2	< 2
		T3	< 3

Table 6: pay back time of the "traditional" situation *vs* the "all electric" situation in case B.

As you can see, the pay back times are all shorter than the technical life: this means that the investment "all electric" situation *vs* "traditional" situation is profitable.

In the remaining cases (C and D) the results are similar to the ones obtained in cases A and B.

Other climate zones of the Italian territory are considered, in order to repeat the profitability analysis in different contexts: the results are always similar to the ones of the cases A and B.

CONCLUSIONS

The results of the analysis show that, with the proposed new tariff options, the "all electric" situation (heat pump and induction cooking) is economically more convenient than the "traditional" situation (gas condensing boiler and gas cooking plates and air conditioner), regardless of the climate zone where the dwelling is placed in Italy: the comparison of these two solutions was made considering both the operating costs (taxes and VAT included) and the investment costs (purchase and installation costs and VAT included), extending the analysis of cost effectiveness to the entire technical life of the equipment.

The new tariff options, therefore, reach the goal of making the "all electric" situation more convenient with respect to the "traditional" situation for residential households, thus promoting the diffusion of the electric vector and the fuel-switching among this type of customer, with an overall increase in the energy efficiency on the country level.

REFERENCES

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