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ENERGY USER SYSTEMS

Between past, present and future



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Gruppo Professione Energia - The Energy Professionals (GPE) is the integrated consulting firm founded and managed by Marco Pezzaglia, a graduate in electrical engineering from the Polytechnic of Milan in 1993, began his career in the field of modeling and studies of electrical systems in a liberalized environment at the Italian Experimental Electrotechnical Centre (CESI www.cesi.it). In 2001 he joined the Authority for Electricity and Gas (now Regulatory Authority for Energy, Networks and the Environment – ARERA www.arera.it) where, in 2003, he was appointed Head of the Electricity Networks unit, dealing in particular with the terms and conditions for accessing to the electricity networks of production and consumption plants (connection and rules for dispatching) and the use of the interconnection network with foreign countries. On 1st January 2007, he took up the position of Head of the Renewable Sources, Energy Production and Environmental Impact Unit within the Markets Department, where he was actively involved in issues relating to assessments of the development of renewable sources, production and consumption systems and access to the system and the electricity market for electricity production and self-production/self-consumption systems. Since the beginning of 2010, he has been providing strategic consultancy and services in the energy sector both to private customers and to numerous sector associations, with particular reference to technical-regulatory and market issues. Expert in Energy Management certified EN 11339.

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The Short paper product is part of a series of specific studies on particular topics of interest to the energy sector and regulation. The articles are made available by the author on request, either from www.enusyst.eu (Energy User Systems) or on his own LinkedIn page. For further requests or further information, please contact GPE.

The information contained in this document is purely reconnaissance: to this end, some technical details for the benefit of the narrative have been omitted. The author does not assume responsibility for any choices and actions that market operators may make on the basis of the information contained in the document. It should be noted that the application of the regulations on user systems must be duly analysed in relation to each specific case.

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Energy user systems Between past, present and future

1. Introduction

The issue of user systems and private networks is becoming increasingly important in recent times; these objects, initially seen as the main tools for the development of particular forms of electricity production, are assuming an increasingly important role in the development of new models of use of local energy and new market models. To this must be added the fact that the new provisions at European level contain guidelines aimed at promoting new ways of developing and using renewable energy and efficiency also by linking production and consumption initiatives established at local level so as to contribute to the achievement of the objective of a decarbonized energy system.

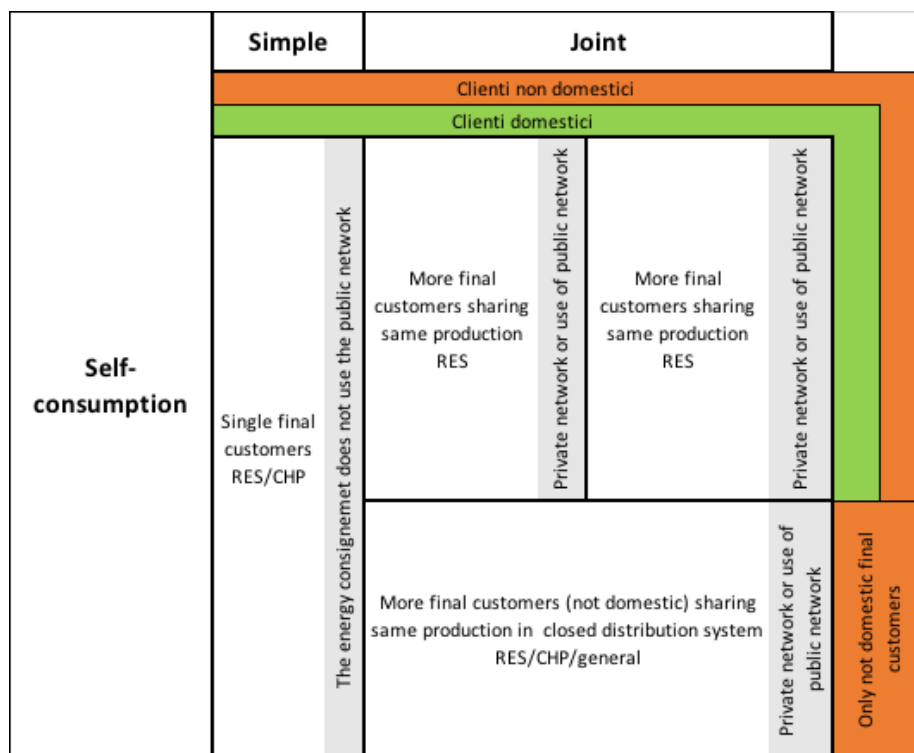
The issue of user systems has been widely debated and regulated since the first years of the start of the process of liberalization of the electricity system. There have been several acts that have followed each other both at the level of primary legislation and at the technical-regulatory level. All of this has led to a stratification of standards, which makes it appropriate to rationalise them with a view to the orderly development of user systems and private networks.

2. Which systems and which models ?

The recent publication at the end of 2018 of some directives deriving from the process launched by Europe in November 2015 (Winter package) brings to light the defining issue of user systems. Which self-consumption systems can be set up and what European legislation provides for in this regard? As is well known, the legislation on user systems has been very stratified over time and very often has concerned existing realities, not envisaging the creation of new systems, with the exception of so-called efficient user systems (systems with a single customer and a single producer from renewable sources or high-efficiency cogeneration). The new European course would appear to place the energy user system as a founding element of the new efficient and decarbonised energy system. The possibilities allowed under existing European legislation appear to be as follows:

- self-consumption of renewable energy in individual or collective form
- closed distribution systems
- renewable energy communities

The definitions, although fundamental, are not sufficient in themselves to give a definitive picture of what the operational configuration of the user systems will be; however, an overview of the elements underlying the configuration can be drawn (see fig. 1).



RES = production and self-consumption only of renewable electricity
 FER/CAR = production and self-consumption only of CHP electricity
 General = every type of production

Figure 1: Overview of self-consumption

Going further into the details of the definitions, it is noted that the Directive 2018/2001 (EU) defines:

- “self-consumption of renewable energy” means a final customer who, operating on his own sites located within defined boundaries or, if permitted by a Member State, on other sites, produces renewable electricity for his own consumption and may store or sell self-produced renewable electricity provided that, for a self-consuming consumer of renewable energy other than private households, these activities do not constitute his main commercial or professional activity;
- “self-consumption renewable energy users acting collectively” means a group of at least two self-employed renewable energy users acting collectively within the meaning of point 14 (definition of self-consumer) and located in the same building or block of flats.
- “Renewable Energy Community” means a legal entity:
 - (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous and effectively controlled by shareholders or members located in the vicinity of the renewable energy installations owned and developed by the legal entity concerned;
 - (b) whose shareholders or members are natural persons, SMEs or local authorities, including municipal authorities;
 - (c) whose primary objective is to provide environmental, economic or social benefits at community level to its shareholders or members or to the local areas in which it operates, rather than financial benefits.

It should be stressed that it is not clear from the above definitions that the concept of self-consumption and the benefits associated with it can be extended to forms of self-consumption carried out at the level of the energy communities (although this is not to be excluded). Both the possibility of operating "in other sites" by a self-consumer as well as the concept of "proximity" inherent in renewable energy communities are all principles that will have to be declined punctually, as well as the actual extent of attributable benefits that will have to be objectively graduated in relation to the type of architecture adopted considering that the role of the networks will remain an element of fundamental importance for the development of competition in energy markets.

It is worth remembering that, at present, the Italian system boasts one of the most developed regulations in terms of user systems which, although susceptible to significant rationalisation and simplification,

already contains many useful elements for the definition and regulation of the various possible models. The regulation of efficient user systems (SEU - Integrated text of simple production and consumption systems - Resolution 578/2013/R/eel), closed distribution systems (SDC - Integrated text of closed distribution systems - Resolution 539/2015/R/eel) and energy cooperatives (Integrated text of energy cooperatives - Resolution 46/2012/R/eel) represent a consistent working basis with the aim of developing new user systems.

3. The benefits and the issue of social acceptability

With regard to the imposition of network charges and other system charges, Directive 2018/2001 (EU) stipulates that consumers do not have to pay for their own consumption:

- (i) in relation to the electricity from the system they consume or feed into, discriminatory or disproportionate procedures and charges and network charges that do not take account of costs;
- (ii) in relation to renewable electricity produced from renewable sources which remains available to them, discriminatory or disproportionate procedures and charges or tariffs.

This provision entails an economic benefit attributable to the energy supply according to the various feasible models. At the national Italian level, it is currently Law No 19 of 27 February 2017 that establishes the general regime for the payment of network charges and system charges for self-consumed energy, which must be applied only to the withdrawal of electricity from the grid regardless of the system of production and consumption considered. The overall economic benefit that can be associated with own consumption is the sum of the energy share of the fees for access to and use of the electricity system (see Figure 2) expressed in quantitative terms by the USSI (IRSU) index - User system savings index (see Figure 3).

Grid access and use of system charges		
Fixed quota	Power quota	Energy quota (not applicable to self consumed energy)
euro/connection point/year	euro/kW per year	euro/kWh
Distribution		
System charges (e.g. renewables support)		
Transmission		
Balancing(*)		

Figure 2: Fees for access to and use of the electrical system

INDICE RISPARMIO SISTEMI DI UTENZA - IRSU (cent euro/kWh)	#	1°t 2018	2°t 2018	3°t 2018	4°t 2018	1°t 2019
Utenze in bassa tensione di illuminazione pubblica	1	8,21	8,60	7,62	7,77	8,59
Utenze in bassa tensione per alimentazione delle infrastrutture di ricarica pubblica per veicoli elettrici	2	12,58	13,18	10,84	10,99	13,85
Utenze bt per potenze impegnate inferiori o uguali a 1.5 kW	3	7,03	7,36	6,77	6,92	7,16
Utenze bt per potenze impegnate superiori a 1.5 kW e inferiori o uguali a 3 kW	4	7,03	7,36	6,77	6,92	7,16
Utenze bt per potenze impegnate superiori a 3 kW e inferiori o uguali a 6 kW	5	7,03	7,36	6,77	6,92	7,16
Utenze bt per potenze impegnate superiori a 6 kW e inferiori o uguali a 10 kW	6	7,03	7,36	6,77	6,92	7,16
Utenze bt per potenze impegnate superiori a 10 kW	7	7,03	7,36	6,77	6,92	7,16
Altre utenze in bassa tensione con potenza disponibile superiore a 16,5 kW	8	6,68	7,02	6,42	6,57	6,82
Utenze in media tensione di illuminazione pubblica	9	8,10	8,46	7,68	7,84	8,34
Altre utenze in media tensione con potenza disponibile fino a 100 kW	10	6,50	6,83	6,26	6,41	6,61
Altre utenze in media tensione con potenza disponibile superiore a 100 kW e inferiore o uguale a 500 kW	11	6,49	6,82	6,25	6,40	6,60
Altre utenze in media tensione con potenza disponibile superiore a 500 kW	12	6,48	6,80	6,24	6,39	6,59
Utenze in alta tensione	13	5,55	5,85	5,48	5,63	5,51
Utenze in altissima tensione, con tensione inferiore a 380 kV	14	5,51	5,81	5,44	5,59	5,46
Utenze in altissima tensione, con tensione uguale o superiore a 380 kV	15	5,51	5,80	5,44	5,59	5,46

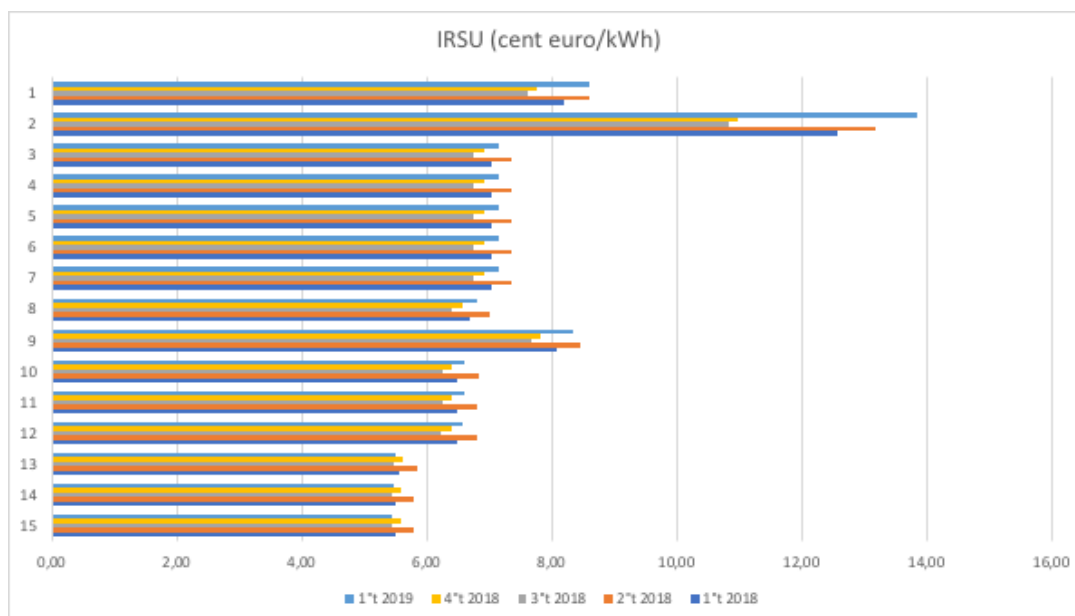


Figure 3 - User system savings index

The savings index shown above quantifies the benefit in terms of avoided charges (distribution, transmission, dispatching, system charges). It is quite clear that this benefit is equivalent to a form of support which, however, unlike classically defined incentives (explicit incentives) is characterized by variability (certainly at least monthly) and a high regulatory risk.

On the other hand, it is quite clear that, since network and system charges must continue to be covered, the exemptions granted to own consumption involve a redistribution of charges among users. The fundamental question for the evolution of user systems is not, therefore, only the models, but the ability of the system to withstand high amounts of self-consumption in terms of acceptability of the redistributive effect induced by self-consumption. Alongside the development of the various models, an effective monitoring and control function for this redistributive effect must therefore be developed.

4. The relationship with the network and the infrastructure issue

Another key element, as already mentioned, is the relationship between collective user systems and the electricity grid. European legislation has repeatedly referred to the need to evolve towards a single market, based on the development of market contestability. This contestability is achieved by guaranteeing free access to the electricity system. The principle of free access is to be understood as the right of an individual to freely choose his supplier through access to the electricity network. But if the principles of the directives are those of allowing the widest possible contestability of the market, in a system of users where, by its nature, a physical connection is typically made that establishes in fact a form of exclusivity of supply, the question arises of how to continue to guarantee said contestability. For the purposes of the relationship between the evolution of the markets and the evolution of the user systems, this is a question that must be seriously taken into account and that leads us to think that the availability of the public network to be "present" is a characteristic element of the role of the networks in the new structure that is emerging.

At the same time, the self-consumption of electricity is a very important element in the context of the development of the energy system towards the objectives of decarbonizing the system. In order to achieve these objectives it is necessary to use also renewable energy that by its nature is widespread in the territory (think of the solar source or biomass that is not convenient to be transported over certain distances). Distributed generation and local consumption of this production (by means of self-consumption arrangements) are becoming an increasingly widespread model. Their role of active participation of the users in the development of a new infrastructural model of the electric system, the awareness of the consumer towards a conscious and efficient use of energy, as well as the creation of new market models are only some of the elements favoured by self-consumption.

5. What to do?

In such an important moment for the evolution of the energy system, it is absolutely essential that the past experience is used for a rationalization and simplification of the new energy structure that places in the systems of users and in self-consumption one of the pillars for the evolution of the energy system towards decarbonizing. In this direction goes Energy User Systems - www.enusyst.eu, the initiative of Gruppo Professione Energia (www.gpenergia.biz) to make available to the sector the experience gained in twenty years of experience on the subject, first as an active subject to the regulatory authority and then as an expert subject operating in the energy sector. Through the portal, studies and analyses on the subject of user systems and private networks are made publicly available. The aim is to collect comments and contributions for the evolution of user systems.