RENEWABLE SELF-CONSUMPTION

Cheap and clean power at your doorstep

SolarPower Europe

Key messages

- **Self-consumption helps European consumers and businesses to control their energy bill.** In a context of increasing energy prices, households and businesses using solar electricity rely on a power source the cost of which will remain fixed for the decades to come. Self-consumption does not only provide cheap electricity to people; it also protects them against volatile energy prices.

- **Self-consumption increases retail competition and helps market transformation**. New business models to make on-site generation accessible to a larger number of consumers are emerging. In the new energy world, the relationship with the final consumer is the most important factor of differentiation between energy suppliers. The winners will be those retailers – incumbent or new entrants – able to deliver new services. Offering self-consumption solutions is an obvious pillar of such strategies.

- **Self-consumption makes consumers active players of the energy transition, a key objective of the Energy Union.** Distributed renewable generation is a fundamental contributor to a clean, resilient and competitive European power system. Self-consumption combines these two dimensions: it give consumers a real choice and support the transition towards a sustainable energy mix. Importantly, it attracts private capital from consumers who have lower expectations in terms of rate of return compared to pure financial investors, thus making the energy transition cheaper.

- **Self-consumption is a key driver for demand-side flexibility**. Because it leads to concrete economic benefits, making the best use of on-site generation will steer the development of solutions such as storage, smart appliances and more flexible contracts for consumers. These solutions will in turn reduce peaks of production and consumption for the benefit of grid operators. Self-consumption has also the potential to help grid operators by reducing congestion issues and bottlenecks.

How can the European Commission's guidance unlock this potential cost-efficiently?

- **Member States should ensure that consumers – residential and industrial - can freely use the energy they produce.** Regulatory barriers (e.g. obligations to inject electricity into the grid, requirements linked to the size of an installation, etc.) should be lifted. In order to steer the necessary evolutions or to avoid potential hurdles at national level, a right to self-generate and consume should be enshrined in the European Charter on the Rights of Energy Consumers. Prosumers should be able to freely enjoy the fruits of their own production: this means that - similarly to the energy saved via energy efficiency measures - self-consumed electricity should not be taxed. Since prosumers help Member States achieve their binding renewable energy targets via their own debt, self-consumed electricity should not be exposed to the payment of renewable surcharges either.

- **Self-consumption should be made easily accessible to a large number of consumers.** This can take the form of simplified procedures (such as simple notification) when prosumers want to connect to the grid. Member States should also encourage practices – such as joint

purchasing programmes or leasing models – which make on-site renewable generation accessible to a larger number of citizens.

- **Prosumers policies should facilitate the reduction of peaks and unlock demand-side flexibility.** Demand response enablers and storage in all forms should be used to exploit self-consumption to its full potential. Where necessary, specific programmes could be put in place in order to bring new technologies to the market. Standardization activities can facilitate the deployment of smart appliances.

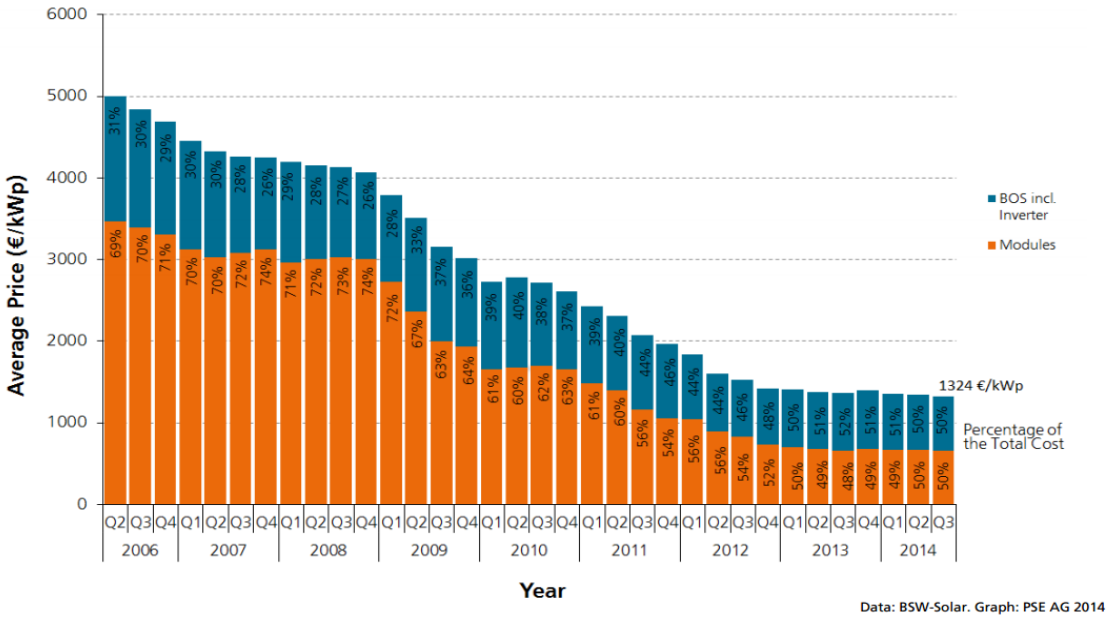
- **National regulators should design distribution grid tariffs fit for the energy transition.** Given the large variety of tariff models across the EU and given the differing starting points, there is no one size fits all solution. The different models (dynamic grid tariffs, critical load pricing, hybrid volume/capacity based tariffs, etc.) should be designed with a view to also support the energy transition by not hindering self-consumption and energy efficiency measures. Among the different models, national regulators could for instance explore mechanisms which give the prosumer the choice to freely contract a given peak load capacity, corresponding to a peak injection capacity as it is implemented today in Portugal. Finally, the investment framework for DSOs should evolve in order to unlock innovation, in particular by ensuring that they are able to procure services from the prosumers.

- **Market rules should ensure that the excess power is injected into the grid and properly remunerated.** National frameworks should in particular ensure that prosumers have access to aggregation services in an open and non-discriminatory manner in order to properly value their excess of generation and their flexibility. A free market for (smart) meters is also important to ensure that, besides the smart-metering roll-out obligations of Member States, consumers who want a smart meter are able to buy one. Finally, the energy system should be made more flexible in order to properly value renewable power when it is abundant. This would ensure that the excess renewable power can be remunerated on the basis of market-based pricing mechanisms.

1. Self-consumption helps European consumers and businesses to control their energy bill

The price of solar PV systems has decreased by 75% in only 8 years. A solar power rooftop-system in Germany (figure 1) for instance cost around 5000€/kWp in 2006. It is now below 1 350€/kWp. This impressive price development – quite unique in the power sector - resulted in highly competitive generation costs. Hence, residential and industrial consumers have now access to a low cost renewable power source on their doorstep.

Figure 1 - Average price for PV rooftop Systems in Germany (10kWp-100 Kwp)



Source: Fraunhofer Institute for Solar Energy systems ISE, Photovoltaics Report

More importantly, this low cost of generation is fixed for the decades to come[1]. In a context of increasing energy prices, consumers can rely on a power source which will always produce at the same cost. Already today, self-consumption helps households and businesses control their energy costs and protect them against volatile energy prices:

- With his solar system combined with a battery, Matthias Röschinger is saving € 875 every year (see Annex);
- The Bavarian furniture manufacturer Himolla is reducing its operating expenses by €150,000 per year (see Annex);
- Since 2014, the Italian car dealer Autostar Spa is covering 70% of its electricity needs with solar[2].

[1] PV systems 'manufacturers guarantee today that the system will produce at least 80% of its initial maximum output 25 years later. Field tests show that the technical lifetime of a solar PV system is however longer than that.
[2] For more information : https://www.q-cells.com/company/press/q-cells-news/news/article/Autohaendler-senkt-seine-Stromkosten-durch-Solaranlage-mit-Q-CELLS-Modulen.html

- In Sachsen-Anhalt, a housing association is providing tenants with low-cost electricity by using the solar power produced on their roof at very attractive terms[3].

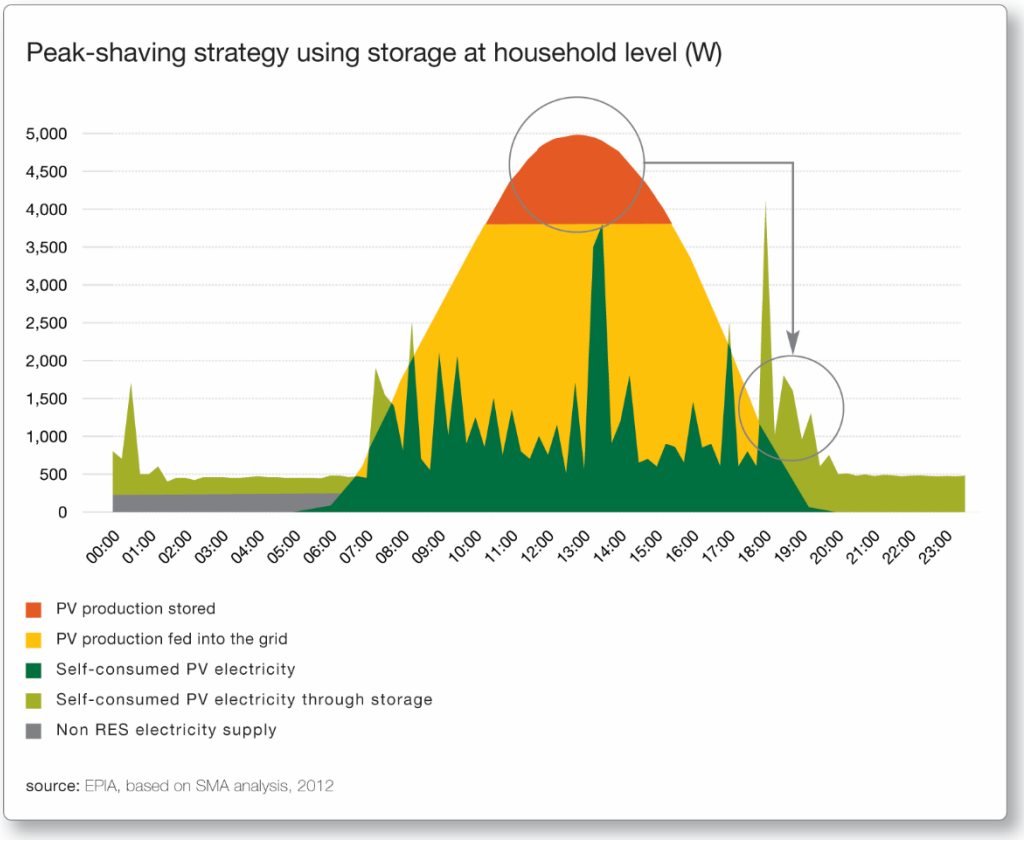
Box: What is self-consumption?

Self-consumption is a process by which a single prosumer – residential, commercial of industrial – uses on-site generation to partially or entirely cover its own electricity needs. Solar electricity is in that case used instantaneously, or in a deferred manner if it is stored, below the connection point with the grid.

2. Self-consumption is a key driver for demand-side flexibility

Because it leads to concrete economic benefits, making the best use of on-site generation - by maximizing the ratio of self-consumption - will steer the development of new solutions such as storage or smart appliances. These solutions will in turn reduce peaks of injection and consumption for the benefit of grid operators (figure 2).

Figure 2 – Example of peak-shaving strategy using storage

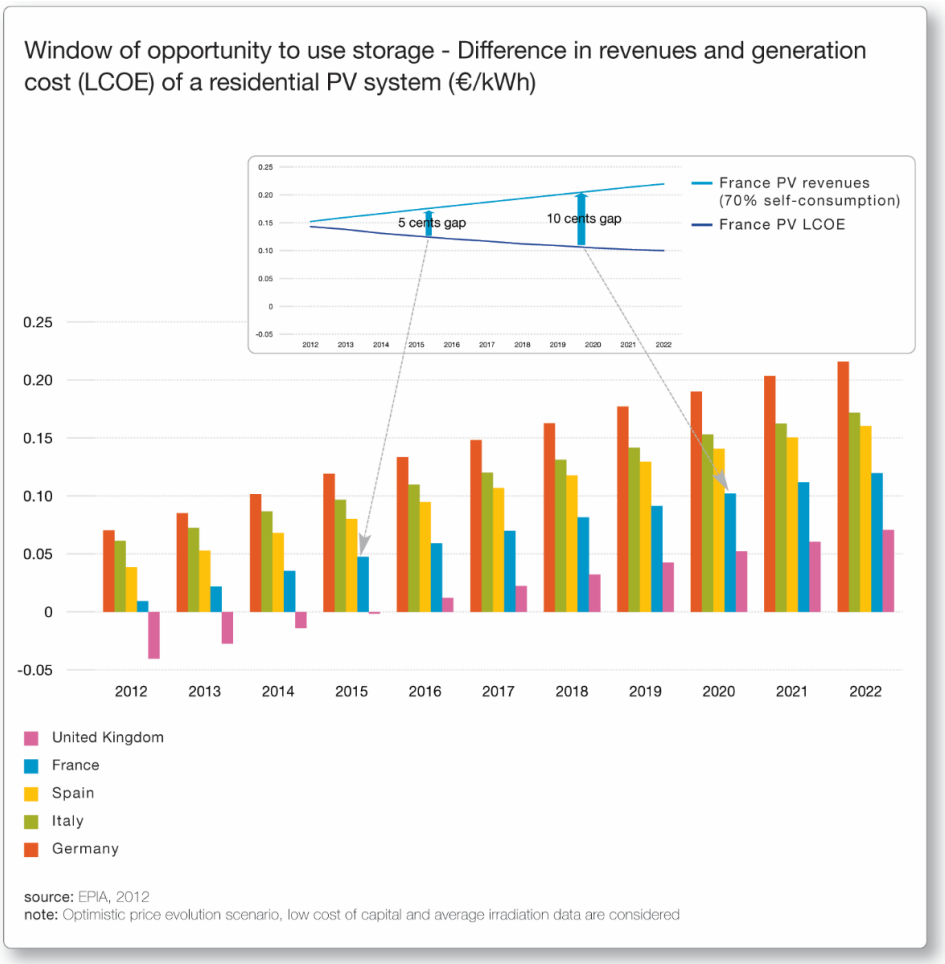


[3] For more information : https://www.q-cells.com/company/press/q-cells-news/news/article/Mieter-sparen-bei-ihrer-Stromrechnung-dank-Buerger-Solarkraftwerk-mit-Q-CELLS-Modulen.html

And this trend will grow stronger over time: while the cost of generating solar electricity will continue to decrease, it will become increasingly attractive to invest in different forms of storage or demand response (e.g. electricity, heating or cooling): At some point, the electricity bill savings generated by an increased ratio of self-consumption will outweigh the additional cost of storage, making the combination of solar and storage cost-competitive compared to the electricity from the grid. In other words, self-consumption is "freeing" money to invest in storage.

This trend is illustrated in the figure 3 below: The upper blue curve represents the net present value of revenues during the lifetime of a PV system with a 70% self-consumption ratio (achieved via storage or demand response). The lower blue curve represents the declining PV cost of generation. In this illustrative example, the arrow represent the time by when respectively 0.05 and 0.10 €/kWh can be invested in a storage system in France[4]. Recent announcements in the battery business show that this window of opportunity might appear earlier than expected. Electric vehicles will in particular play an increasing role as a mobile storage solution, making on-site generation a concrete way to decarbonize the road transport sector. Such a reasoning is also valid for smart appliances and home automation systems which are able to shift consumption over the day, in order to make the best use of cheap, renewable on-site generation.

Figure 3 – Self-consumption "freeing" money for investing in storage



[4] For an analysis of the US context, see *The Economics of Load Defection*, Rocky Mountain Institute, April 2015.

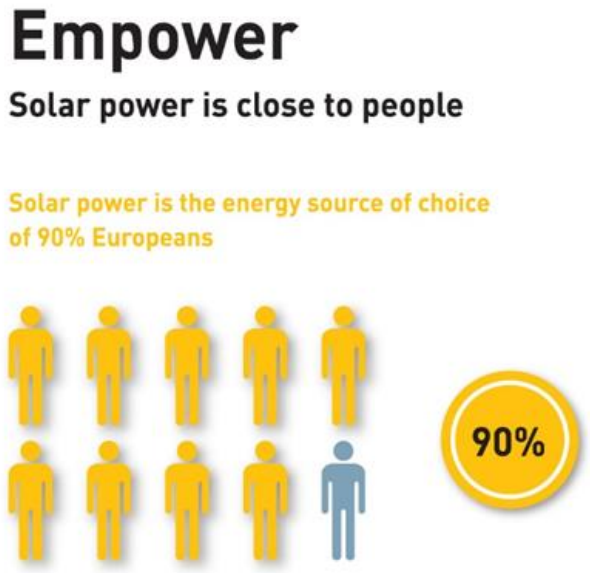
At the same time, increasing the ratio of self-consumption does not mean that consumers will be disconnected from the grid. On the contrary, in a system with increasing shares of decentralised renewable generation, solar prosumers (residential but also industrial) will become an increasing contributor to system services. Recent projects[5] indicate that distributed generation can provide a wide range of services to network operators, third parties (suppliers/aggregators) or even other consumers.

From an operational perspective, self-consumption – instantaneous or later during the day - is just another way of adapting consumers' load.

3. Self-consumption increases retail competition and helps market transformation

The simple fact that consumers are able to produce their own energy is reshaping the relationship between retailers and their customers. As put recently by Opower[6], "*with mass-market distributed generation on the horizon and energy storage technology steadily progressing, utilities have to create a sticky relationship with their customers today to stay relevant tomorrow*."

More than a threat, these developments represent new opportunities for incumbent players and new entrants to rethink the way the energy sector is interacting with consumers. Offering "self-consumption solutions" is an obvious pillar of these new strategies. The German utility E.ON for instance recently announced a new partnership with Sungevity[7] in order to help prosumers to regulate their on-site generation. Under this new partnership, consumers will be guaranteed a forecasted energy production over ten years. If the solar system is producing less than expected, the difference will be insured by E.ON.



Source: EPIA based on Eurobarometer 2011

Making on-site renewable generation accessible to a larger number of consumers is also leading to new forms of engagement: energy cooperatives, joint purchasing programmes, crowdfunding platforms or leasing make the retail electricity market more diversified and competitive.

[5] See for instance *REservices* and *META PV*.
[6] *The Value of Engaged Energy Consumers*, Opower, 2014.
[7] See http://www.pv-magazine.com/news/details/beitrag/eon--sungevity-announce-plans-for-german-solar-market_100019433/#ixzz3Zwi6FCbE

4. Self-consumption makes consumers active players of the energy transition

In February 2015, the European Commission published its new Energy Union strategy depicting a vision in which "*citizens take ownership of the energy transition, benefit from new technologies to reduce their bills, participate actively in the market*".

Besides a greater consumers' involvement, the energy transition will require much more renewables. This paradigm shift has already started: In 2014 and for the first time, renewables produced more power than nuclear in Europe[8]. And this trend will continue: according to the European Commission's forecasts, renewables will cover around 45% of our electricity demand by 2030[9] and their share is expected to grow to 60%-97% by 2050[10]. This represents a major opportunity to establish a clean, secure and resilient energy system on which our economy can grow.

In this context, renewable self-consumption will help to achieve these two objectives in parallel: it will very concretely empower consumers while facilitating a bottom-up deployment of renewables. More importantly, this consumer involvement contributes to the achievement of the binding national renewable targets by attracting private capital from actors – consumers - who have lower expectations in terms of rate of return compared to pure financial investors. This makes the energy transition cheaper.

Self-consumption also increases the public acceptance of renewables. In some countries, new large scale renewable energy plants may face space limitations or local opposition. Seamlessly integrating renewables by using existing roof space will help to increase the share of renewables while involving consumers in the development of the energy mix. Roof owners will be even more willing to offer or share their roof space if they are able to self-consume.

In fact, implementing the Energy Union vision requires adapting the surrounding frameworks to ensure that the largest number of citizens can produce and consume their own energy if they wish to do so.

5. How can the European Commission's guidance unlock this potential cost-efficiently?

The vision to which self-consumption contributes is clear. The benefits associated with it as well. The regulatory and operational frameworks need now to be adapted to ensure the potential of self-consumption is fully exploited.

- **Member States should ensure that consumers – residential and industrial - can freely use the energy they produce:**
    - Potential regulatory barriers such as obligations to inject the produced electricity into the grid or pre-qualification requirements linked to the size of the PV system should be lifted.
    - By enshrining a right to self-generate and consume in the European Charter on the Rights of Energy Consumers, the Commission could steer the necessary evolutions or help to avoid potential hurdles at national level.
    - Consumers should be able to freely enjoy the benefits of their on-site generation. Taxes on self-consumed electricity are going against this principle and would lead to double taxation issues since prosumers already paid VAT when purchasing their equipment. When self-consuming, prosumers are increasing the share of renewables via their own

[8] ENTSO-E data.
[9] Staff working document accompanying the Communication of the Commission concerning the Paris protocol (COM(2015)81 final).
[10] 2050 Energy Roadmap, "Diversified Supply Technologies" scenario.

debt and without relying on State Aid. Hence, the self-consumed electricity should not be exposed to renewable surcharge in order to encourage the achievement of the binding national renewable energy targets.

- **Self-consumption should be made easily accessible to all consumers:**
  - Simplified procedures (such as simple notification) for the grid connection has a high potential to reduce soft costs for prosumers and should therefore be implemented.
  - Member States should also encourage practices – such as joint purchasing programmes or leasing models involving third parties guarantee – which make on-site renewable generation accessible to a larger number of citizens. This would ensure that consumers with lower income can also control their energy costs via on-site generation.

- **Prosumer policies should facilitate the reduction of peaks and unlock demand-side flexibility:**
  - When specific remuneration mechanisms are deemed necessary to develop self-consumption, they should be designed in a way that facilitate the reduction of peaks.
  - Demand response and storage in all forms should be encouraged in order to exploit self-consumption to its full potential. Where necessary, specific programmes could be put in place in order to bring new technologies to the market.
  - In liaison with European standardization organizations, Member States should facilitate the deployment of smart appliances and facilitate the related standardization work.

- **National regulators should design distribution grid tariffs fit for the energy transition:**
  - Given the large variety of tariff models across the EU and given the differing starting points, there is no one size fits all solution. The different models (dynamic grid tariffs, critical load pricing, hybrid volume/capacity based tariffs, etc.) should be designed with a view to also support the energy transition by not hindering self-consumption and energy efficiency measures.
  - National regulators could for instance explore mechanisms which give the prosumer the choice to freely contract a given peak load capacity corresponding to a peak injection capacity, as it is implemented today in Portugal.
  - The investment framework for DSOs should evolve in order to unlock innovation: smart solutions should be prioritised over investments in traditional infrastructures, in particular by ensuring that DSOs are able to procure services from the prosumers.
  - Finally, the debate on grid tariffs should not hide the huge benefits associated with self-consumption which, given the cost dynamics at retail level, is set to develop in the years to come.

- **Market rules should ensure that the excess power is injected into the grid and properly remunerated:**
  - National frameworks should ensure that prosumers have access to aggregation services in an open and non-discriminatory manner.
  - A free market for (smart) meters is also important to ensure that, besides the smart-metering roll-out obligations of Member States, consumers who want a smart meter are able to buy one.
  - The Commission's guidance could make the link with the overall market design debate. The energy system should be made more flexible in order to properly value renewable and abundant power when it is available. This would ensure that the excess of renewable, variable power can be remunerated on the basis of market-based pricing mechanisms.

Paper developed by the *SolarPower Europe* Strategy Committee:
Chair: Simone Diodato Antonelli
Vice-Chairs: Debora Coll-Mayor, Andreas Wade

Contact in the *SolarPower Europe* team:

Alexandre Roesch – a.roesch@solarpowereurope.org
Head of Regulatory Affairs

Annex: Examples of benefits linked to self-consumption (source: SMA)

PV HOME SYSTEM
REFERENCE PLANT USER MATTHIAS RÖSCHINGER

Objectives	Implementation	Advantages
> Low electricity costs > High self consumption > Intelligent use of electricity	> System output: 4.7 kWp > Annual output: approx. 4,728 kWh > Inverter: - Sunny Boy 5000TL - Sunny Island 6.0H > Communication: - Sunny Home Manager > Battery capacity: 13.5 kWh	> Efficient consumption of own solar power > Reduction of purchased electricity from 6,500 kWh to approx. 2,500 kWh/year > Savings of electricity costs of approx. 875 Euros/year

COMMERCIAL PV SYSTEM
REFERENCE PLANT: THE HIMOLLA PROJECT

A lighthouse PV system with STP 20000/25000TL

Himolla is a Bavarian upholstered furniture manufacturer with 1,100 employees , now one of the largest manufacturers in Europe.

Because of rising operating expenses for electricity and reduced prices in the solar industry, they decided in favor of a system for self-consumption.

Roof surfaces oriented toward the south, east and west, 10-kV connection/interconnection point electrical substation, power consumption 6.8 million kWh

> A total of 945 kWp PV power

> 3700 Aleo S_18 Modules and 46 Sunny Tripower inverters

> Approximately 90% self-consumption => 1 million kWh/year saves the company approximately €150,000 per year

> Support for industrial electricians when connecting to the grid

SolarPower Europe

Rue d'Arlon 69-71

B-1040 Brussels – Belgium

Tel.: +32 2 709 55 10

Fax: + 32 2 725 32 50

solarpowereurope.org