2011

POLICY PAPER

SMALL-SCALE SUSTAINABLE ELECTRICITY PROVISION

PRESCRIPTIONS ON BEHALF OF THE CONNECTION OF INSTALLATIONS FOR NON-INDUSTRIAL GENERATION OF SUSTAINABLE ELECTRICITY AT THE PUBLIC TRANSPORTATION- AND DISTRIBUTION NETWORK OF CURAÇAO WITH A VIEW TO RETRO-SUPPLY OF ELECTRICAL CURRENT

SMALL GREEN CONNECTION

7 NOVEMBER 2011

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1 INTRODUCTION

1.1. Policy background

The Policy Paper on Regulating Electricity Supply Curaçao 2011-2015 (ñthe Policy Paperò) was determined on 16 February 2011 by the Council of Ministers of Curaçao. In the Policy Paper the general objective of the policy regarding the electricity supply comes down to providing an efficient and sustainable electricity supply of high quality on behalf of the business community and the private households.

In order to make the general objective of the policy regarding the electricity supply operational, a new market model has been introduced, with has for its point of departure multiple producers of electricity and one network company for transportation, distribution and supply of the current generated by the producers.

Furthermore, based on the new market model, the regulation of the electricity supply aims at realizing six concrete policy objectives in connection with the energy supply, among which are a more sustainable supply of energy for the medium to long term. Respective to this objective, in view of connecting small producers of sustainable energy to the transportation- and distribution network, in the Policy Paper the prospect of a new regime has been held out for small-scale sustainable electricity production for oneôs own use. In this Policy Paper this new regime is under discussion.

1.2 The two main objectives of the new regime

The advantages of sustainable energy (in this case cleaner energy for the environment, the use of sources of energy such as the sun and the wind, which are abundantly available locally and replacement of the scarce and thus ever more expensive fossil fuels) are self-evident. Furthermore the role of the private sector in small-scale applications of sustainable energy, is growing, although still insufficient. These were the most important reasons, in the framework of the policy regarding the regulation of the energy supply in Curaçao, to look for ways to (further) stimulate the generation of sustainable energy. This is the first objective of the new regime.

In order to prevent uncontrolled proliferation and unsafe applications, stimulating sustainable energy must go hand in hand with the necessary official regulation, through government intervention, especially as far as connection of small-scale generating units for sustainable energy from private and business end-users on the public transportation and distribution network are concerned. Although formulating a policy to stimulate the application of sustainable energy, is necessary in this respect, apart from that it must also be ensured that the realization of the long term objectives of the energy policy, among which the inception of a more robust system, are also permanently safeguarded. This is the second objective.

1.3 Points of departure of the policy.

Whenever there is a question of generating current with a view to supplying same to third parties, pursuant to Section 1, first sub-section of the National Ordinance on Electricity Concessions (Official Gazette / P.B. 1963, no.64) a(n) (assignment, permit or) concession is required from the government. In principle no concession is required for generating current for own use, or, as the case may be, conducted exclusively through cables running on private grounds.

The foregoing becomes different, however, when there is a producer of own current who will subsequently supply current to the net. Then there may be a situation in principle whereby it is a question of generating in order to supply to a third party. This will be the case whenever there is substantial (retro-)supply to the net, even though the production takes place exclusively on private grounds held in private ownership. In that case a concession is required, because it is assumed that the generation of electricity takes place with a view to supplying same to third parties.

Contrary thereto small-scale production of electricity for private use, in fact comes down to generating a small amount of electricity for non-industrial goals. This might be generating a small amount of electricity for oneôs own company or own home, or a so-called ñclosed circleò and without the use of cables running on public grounds.

Pursuant to Section 1, second sub-section of the National Ordinance on Electricity Concessions (Official Gazette / P.B. 1963, no.64), no concession is required from the government for generating electricity for non-industrial purposes (in this case strictly for private use), regardless of the quantity. Whenever a limited amount of the current produced, is supplied to the net, there is still no obligation to obtain a concession, because it is assumed that the primary objective is production for oneôs own use and not supply to third parties.

It is indeed appreciated from the viewpoint of the policy and therefore promoted by the government, that small-scale producers of sustainable energy for their own use (i.e. without a concession) are enabled to a (retro-)supply of their excess production to the net. Thereby small-scale production of sustainable electricity in combination with a connection to the net, has to be properly directed, in order to prevent undesirable consequences for the public net.

Although no concession is required pursuant to the law for the production of their electricity, the connection of such installations to the public transportation- and distribution net, does require an access system (to the net) for the above-mentioned reasons, which has been further detailed in the policy on connections as inserted in Chapter 2.

1.4 Important definitions

In this document the following concepts are to be interpreted according to the thereby given meaning**:**

a.	the applicant**:**	the private or business end-user who wants to obtain a connection to the public transportation- and distribution network for his generating unit
b.	the Minister**:**	the minister in charge of energy-related matters
c.	the supervisor**:**	the Bureau Telecommunication and Post
d.	the network- or distribution company**:**	Integrated Utility Holding N.V. (Aqualectra)

2 THE CONNECTION POLICY FOR INSTALLATIONS FOR NON-INDUSTRIAL GENERATION OF SUSTAINABLE ELECTRICITY

2.1 Introduction

This document gives a further detailing of the connection policy regarding *installations for non-industrial generation of sustainable electricity*. The installations referred to are defined as follows**:**

> ñ*Installations which generate a small amount of sustainable electricity for own use or for the use of a limited circle of (legal) persons, whereby the conducts are located within or on grounds privately owned"* .

The objective of the connection policy is to promote the generation of clean or sustainable energy as much as possible. Point of departure is therefore that the network company (in this case the sole concessionaire of electricity distribution) is under obligation to connect each installation for non-industrial *sustainable* generation to the transportation- and distribution network, to the extent that such connection complies with the further prescriptions.

The connection referred to hereinbefore, is effected on the basis of a connection agreement with the network company, which originates from the connection policy laid down in this paper. The connection policy consists of terms and conditions for the connection and the further general and technical prescriptions which have to be observed at the connection of aforementioned installations to the transportation- and distribution network, through which these installations are enabled to effect (retro-)supply of sustainable electricity to the net.

2.2 Terms and conditions for the connection

Based on the above, the rule of thumb for the connection policy is that installations without a concession for the production of sustainable electricity, may qualify for connection to the transportation- and distribution network of the network company, if the applicant meets the following requirements**:**

a. being in possession of a *Declaration of No Objection (D.N.O.)* from the supervisor on the electricity sector and
b. complying with the terms and conditions for connection and the further prescription of the network company, all this subject to the approval of the Minister in charge of energy-related matters.

2.3 Application for a declaration of no objection from the supervisor

A declaration of no objection (to be referred to hereinafter as a DNO), which may be subject to conditions, is issued by the supervisor if the installation meets the following requirements**:**

- the electricity generated derives from a sustainable source (in this case the production is sustainable);

- the sustainable production is primarily intended for own use or for the use of a closed circle of users, whereby conducts are used which are exclusively located on (or within) grounds, held in private ownership (in this case the production is non-industrial);

- it concerns an installed (nominal) power output not exceeding 1MVA[1] (in this case the production takes place on a small-scale);

- the applicant is in possession of the required building permits and environmental licenses[2] (in this case the installation meets the requirements of the legislation on construction and the Nuisance Act);

- the applicant is in possession of an installation certificate[3] for the relevant installation(s), not older than 6 months and issued by a certified installer, registered with the supervisor, evidencing that the generating unit complies with the requirements thereto established relative to quality, proper functioning and safety (in this case the installation is deemed safe) and

- there exists a firm intention to enter into a subscription agreement or a network connection agreement with the network company for the connection of the generating unit to the transportation- and distribution net, in which the technical (among which inspection and periodic re-inspection), procedural, legal and financial requirements have been laid down for a connection to the net with retro-supply.

2.4 Application for a connection to the net with the network company.

The applicant is connected to the transportation and distribution network by the network company, unless such is rejected on valid grounds, provided that**:**

[1] At a voltage completely in phase with the current 1 MVA equals 1MW
[2] Reference is hereby made to paragraph 4.4.
[3] Reference is hereby made to paragraph 4.5.

- the applicant is in possession of a DNO, as referred to hereinbefore, not older than ninety days;

- the applicant is in possession of a certificate of inspection from the government agency in charge of Public Works (to be referred to hereinafter as ñDOWò→***Dutch acronym***), a division of the Department of Traffic, Transportation and Environmental Planning, evidencing that the generating unit is in compliance with all the requirements for the installation of same, which are applicable to household- or business installations;

- the maximum number of connections with ñretro-supplyò has not yet been reached[4] in the supply region concerned;

- the generating unit of the applicant is in compliance with the rules relative to a network-connection (in this case the conditions of the connection and the further prescriptions of the network company based on the connection policy as approved by the Minister) and

- a subscription agreement or a network connection agreement with the network company for the connection of the generating unit to the transportation- and distribution net, in which the technical (among which inspection and periodic re-inspection), the procedural, legal and financial conditions have been laid down for a connection to the net with retro-supply.

[4] Sometimes there may only be a temporary limitation of the transportation. In such a case the network company will have to ensure that within a reasonable period of time the network is made suitable to facilitate the intended connection to the net.

3 SIGNIFICANT CRITERIA FOR NON-INDUSTRIAL GENERATION AND RETRO-SUPPLY OF SUSTAINABLE ELECTRICITY

3.1 Production of sustainable electricity

The method of generating electricity is limited to photovoltaic[5] solar panels and small-scale wind power. Herewith are also included hybrid systems such as a combination between solar boilers (sun thermic) and solar PV. The Minister might decide to adapt or expand the permitted methods of generation of electricity in the event that there is cause for same.

By means of photovoltaic solar panels, which are mostly placed on the roof of a building or a home, private persons and businesses are able to generate electricity by themselves for their own use. With the aid of these solar panels thus, through solar cells, (solar) energy is converted into electrical energy. This electrical energy is converted through a converter into alternating current, which is immediately used by the private or business end-users in a home, respectively building. Electricity may also be generated for oneôs own use by means of special windmills, so-called ñwind turbinesò.

3.2 Non-industrial production of electricity

3.2.1 Elements of non-industrial production

Generating energy for non-industrial objectives is production of electricity which is intended for own use for the greater part. This might be generating electricity for oneôs own company, the own home or a so-called ñclosed circleò, or whenever exclusively conducts are used which run in or on grounds held in private ownership.

In order to qualify for a connection as referred to in paragraph 1.3. for non-industrial production the amount of sustainable electricity generated must furthermore be in reasonable proportion to the average real consumption for own use. This implies that, as a rule, for a period of a whole year the amount of generated electricity is smaller than or equal to the actual own use. The electricity privately generated may exceed the amount needed for own use in one or more invoicing periods during the year. In that case electricity is supplied (back) to the net.

[5] In English: ñphotovoltaicò (PV) solar panels.

3.2.2 Maximum production capacity for private households and for business end-users

However, the difference in the purpose of electricity production for own use between the private users (primarily for the household) and the business end-users (primarily for operational activities in companies) requires, *as to capacity* for each of those market segments, a different interpretation of the concept of ñnon-industrial sustainable productionò.

Relative to private households the maximum permitted production capacity (nominal power) has been determined at 10kW, whereas for business end-users this limitation has been determined at 100 kVA. This concerns the so-called set up (?) (installed) power and not the operational power or the number of kWh which may be generated by it. With this simply verifiable limitation, the number of kWh to be generated per time unit, is also limited of course.

3.2.3 Very big business end-users.

There is, however, a small number of business end-users in Curaçao, who (might) exceed the maximum limit of 100kVA based on the actual own electricity consumption for the generating capacity. If a business end-user wants to bring a sustainable installation into use, which is greater than 100kVA, but smaller than 1000kVA[6], then such will be assessed on a ñ*case-by-case*ò basis by the supervisor and the network company. In that context two additional requirements have to be met. These are**:**

a. Additional requirement relative to the connection on the net for an installation greater than 100kVA, but smaller than 1000kVA**:**

The network company will facilitate a connection of such installation to the distribution net to the extent possible, but will first execute (or cause to be executed) an extensive analysis of the effects of the installation on the distribution net prior to connecting same to the net. Thereby mostly the loads are involved and the strain on the voltage household. The procedures therewith connected are an integrated part of the terms and conditions of the connection and the further prescriptions of the network company

[6]Installations with a generating capacity exceeding 1000kVA, are considered to be industrial generation for the purpose of supplying to third parties, in view of the local circumstances. Such installations are under obligation to acquire a concession.

b. Additional requirement in connection with the reliability of the total energy provision, for an installation connected to the net, which is greater than 100kVA, but smaller than 1000kVA**:**

Due to the size of the installation and the possible negative consequences of the loss thereof for part of the electricity provision and the planning of the network company, it will be determined which additional requirements the generating unit must meet during its lifetime in order to be able to keep on functioning within reasonable limitations. These additional requirements at any rate shall consist in a periodic mandatory inspection and the obligation to have data on real-time production and performance available.

The generating unit also must be able to promote to the stability of the network by the active power and the supply of reactive power. This must be remote controlled by means of (an) appropriate communication network(s). The maximum values for same (ñleadingò and ñlaggingò), as well as the rules of application, shall be determined by or on behalf of the Minister. These requirements will be inserted in the connection agreement with the network company.

3.3 Retro-supply of sustainable electricity

When the end-user of solar or wind energy is also connected to the transportation- and distribution net of the distribution company, he may ñsupplyò the excess electricity not used by him to the electricity net, with due observance of the terms and conditions of the connection and the further prescriptions. This is called ñretro-supplyò.

Then a compensatory settlement takes place between the retro-supply and the supply from the public net. This is called ñnet meteringò, to be referred to hereinafter as balancing.

The points of departure applicable to the settlement of retro-supplied electricity and the tariffs to be thereby applied are an integrated part of the tariff procedure approved by the Minister and the terms and conditions of the connection and further prescriptions of the distribution company.

PART II:

TECHNICAL AND ADMINISTRATIVE PRESCRIPTIONS

4 PRESCRIPTIONS AND POINTS FOR ATTENTION FOR THE INSTALLATION OF A UNIT FOR NON-INDUSTRIAL GENERATION OF SUSTAINABLE ELECTRICITY

4.1 Responsibility for the selection of a system and an installer

The applicant himself bears the responsibility for the choice of a specific system for generating sustainable energy (to be referred to hereinafter as**:** ñsystemò, ñproduction systemò or ñgenerating unitò) and he himself shall see to the implementation of same, to engage a certified installer to take care of the generating unit. Thereby the requirements and standards inserted in this paper are used as points of departure.

A certified installer may be of great use to the applicant in making a definite choice for a generating unit with the appropriate size suitable for the end-user, and in compliance with the requirements and standards. See paragraph 4.5 on certification.

4.2 Determination of the maximum production capacity of the system

At the realization of a new production system the determination of the capacity of the installation is an important first step. In table 4.1 two calculation models are shown to illustrate how to determine the capacity of the generating unit to provide for oneôs own use. This is done for a generating unit which uses solar panels for a private household A, as well as for a business end-user B.

Table 4.1: Calculation model maximum production capacity for solar panels

Neccesary variables	Private household A	Business end-user B
Average use per month[7]	350kWh	2000kWh
Average use per day (divided by 30) (= G)	12kWh	65kWh
Average number of sun-hours per day (= Z)[8]	5	5
Efficiency of installation (assumption) (= E)[9]	75%	75%
Maximum production capacity (X= G/Z*E)	3,2 kWp[10]	18 kW

In aforementioned calculation model an average use of 350kWh per month is calculated back to an average daily use of 12kWh. In the event that solar panels are used, an approximate of 5 sun-hours per day must be taken into account, calculated over the whole year.

For solar panels 1 Wp-power is considered indicative for being able to produce 5Kwh on average per day. A system for sustainable production, however, has an indicative loss of 25% by the use of cable conducting, converters and the like. This might even be higher by a steep incline of the roof or by a less favorable direction of the roof. All this means that (with these indicator numbers) in a generating unit with solar panels of 3.2 KWp each month approximately 350kWh electricity may be produced.

4.3 Purchasing and retro-supply depending on production and need

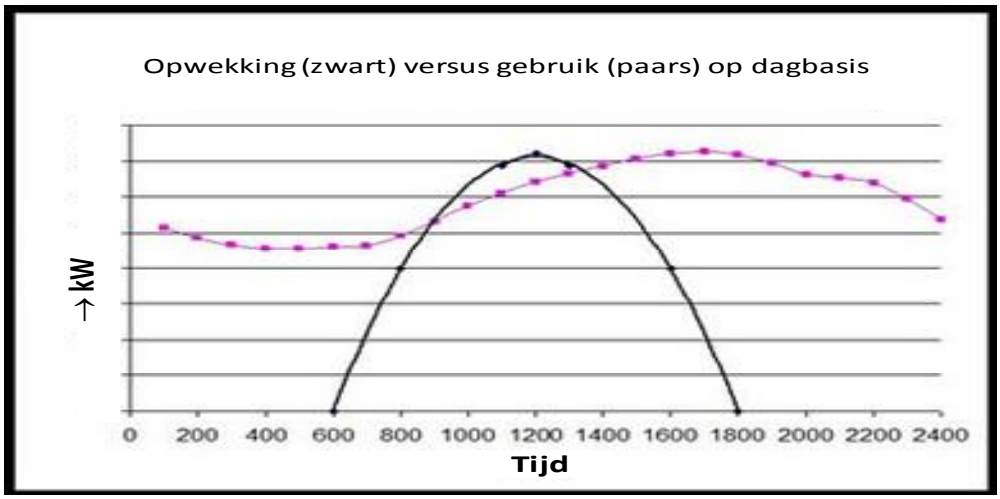
In practice end-users will mostly opt for installing a production system, which only partially provides for own need of electricity. Then there is a shortfall in capacity. The deficit is then supplied to the end-user by the network company through the distribution net.

Seemingly there is no need for retro-supply to the net by the end-user then. However, this need not be the case, for the need of electricity is not constant during the day, as a result of which the end-user nevertheless might supply back to the net, whenever his need is lower than his generation. Figure 2 (= Figure 4.1 ?) displays how all this takes place .

[7]Average use based on consumption data of Aqualectra. In practice the invoices for electricity are consulted for this purpose.
[8]The number of kWh that might be produced by solar panels is mostly determined by the number of sun-hours (for Curaçao approximately 5 hours per day averagely per year) and for wind turbines primarily by the average wind speed (is greatly dependent on the spread of wind speed, height and obstacles).
[9] Through the equipment and cable conducting part of the produced kWh gets lost (here indicatively 25% is taken as point of departure).
[10]With solar panels the concept of ñWatt peakò (Wp) is used , this is equal to Watt (W) in ideal circumstances.

The production and use of electricity might, for instance, appear as depicted in figure 2. (= Figure 4.1 ?) In this figure is to be seen that during the hours of highest production, more output is produced than consumed. Then there is retro-supply. During most of the time, especially in the evening and during the night, however, the consumption exceeds the production. Then the end-user is ñpulled untoò the distribution net, so to speak.

Figure 4.1: Example of a daily pattern of generating versus own use.



The connection to the net may thus effect purchasing of electricity, as well as supply of electricity during the whole day. Hereby the network functions potentially as a medium for storing, with which the efficiency of sustainable generation increases.

4.4 Building permit and environmental licence

In the event of smaller solar PV installations which meet a number of standard conditions, there will be an exemption from a building permit. The exact terms and conditions are determined by the sector Environmental Planning, a division of the Department of Traffic, Transportation and Environmental Planning (to be referred to hereinafter as**:** òDROVò)

In the event of construction of a generating unit for which a building permit is required, the applicant has to comply with the operative prescriptions, of course. With this purpose in mind, the applicant has to submit a request to obtain a building permit from DROV. During the construction of the generating unit, the applicant strictly observes the conditions and further requirements for implementation of small-scale solar and wind energy, as stated in the building permit.

In a number of cases an environmental license may also be required. This will be true, at any rate, if a generating unit based on wind power has been chosen. An application of an

environmental license has to be submitted to the Environmental Agency, a division of the Department of Health, Environment and Nature.

4.5 Installation

Installing a generating unit is a very specialist job and should therefore be carried out by specialists who dispose of sufficient know-how and experience to be able to accomplish such an installation in a professional and safe manner, and who moreover are well acquainted with the applicable technical standards and further prescriptions as discussed in this paper.

The generating unit must therefore be installed by an installer who has been certified on a personal basis. When the installer evidently disposes of the required skills stated for the certification, he will at his own request be inserted in a register by the supervisor, in proof of recognition of his certification. In the register are also recorded the names and data of independent certifying institutes.

When the installation has been accomplished, the owner of the generating unit receives a proof of installation by a certified and registered installer.

5 INTERNATIONAL SAFETY AND QUALITY STANDARDS AT THE APPLICATION OF VARIOUS TYPES OF TECHNOLOGY FOR THE GENERATION OF SUSTAINABLE ENERGY

5.1 Introduction

In the event that a private or business end-user of electricity in his own right purchases an installation for the generation of sustainable energy and for that purpose, with a view to retro-supply of sustainable electricity, seeks a connection to the public transportation- and distribution network, the applicant must then meet the following categories of safety and quality standards**:**

a. technical prescriptions *relative to the type of technology* (such as sun or wind) that is used in the generation of sustainable energy. These prescriptions are stipulated in order to ensure that the basic quality of the generating unit will be in line with the international standards in this field and

b. safety and quality requirements *relative to the connection (coupling)* of the generating units to the transportation- and distribution network. These prescriptions aim at preventing that installations of an inferior quality may endanger the safety of the public network.

In principle all generating units must comply with the requirements stipulated sub (a), while the requirements sub (b) are also applicable for end-users who request a connection to the net (in view of retro-supply). In the event of a connection to the net, it is therefore a question of a two-stage rocket. The first category of prescriptions will be discussed in this chapter and the second category in the next following chapter.

5.2 The basic rule for the technical prescriptions

From the foregoing it follows that the basic rule of the technical prescriptions for a safe and reliable network is that only generating units and equipment (in this case components of the installation) which are in compliance with the most customary international standards, may be admitted to the public transportation- and distribution network. Proof of same is submitted by the international hallmarks displayed on same or by the certifying documentation respective thereto.

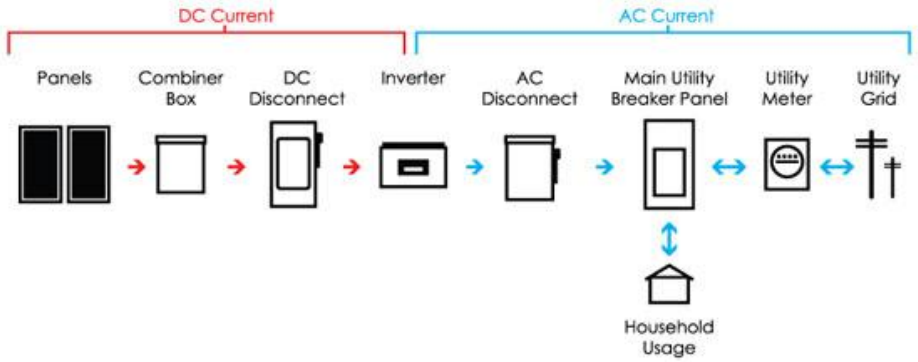
In the next following paragraphs the most relevant international standards for each type of technology for generating sustainable electricity are identified.

5.3 Solar PV-systems

In this paragraph the most important components for a solar PV-system are identified. Subsequently an inventory is given of the requirements stated for same.

A solar PV-system generally consists of the components as reflected in figure 3. (= Figure 5.1 ?)

Figure 5.1: Diagram of a Solar PV system



The solar panels[11] constitute the basis for a solar PV-system (ñsolar panelsò).
Mostly more than one panel is used which are all interconnected by a combiner box (ñcombiner boxò). This combiner box combines the DC outputs to one DC output. A direct current switch (the so-called ñDC disconnectò) is an important component for the safety of the system. It sees to switching off the solar panels if there is cause for same.

The converter (ñinverterò) takes care of the conversion of direct current (DC) to alternating current (AC) and also for the voltage and frequency synchronization of the alternating current with the distribution network. An AC switch (a so-called ñAC disconnectò) is a second important component for the safety of the system. This AC switch sees to switching off the solar panels at the AC side if there is cause for such action, for example if the voltage of the net falls away.

[11]For small-scale applications only conventional solar panels are considered in this document. These are the solar panels which are generally used worldwide with private and business end-users. These panels consist in three types. The two most common are standard solar panels and ñthin filmò modules. Furthermore there also exists a so-called concentrated photovoltaic solar-energy (also called ñConcentrating Photo Voltaicsò or ñCPVò). Since this last type of panel is not (yet) interesting cost-wise on a small-scale at the moment, they are left out of consideration for the time being.

Through a central switch box (ñmain utility breaker panelò) the current is now supplied to a private or business end-user. If the generating of current (supply) exceeds the need (demand), the surplus will be automatically supplied or be retro-supplied on (or fed into) the distribution network.

The meter (ñutility meterò) finally takes care of the registration of the number of kWh supplied. With a so-called ñFerrarisò reverse rotating meter only the net supplied kWh may be registered. Contrary thereto, depending on the type, with a digital meter the electricity supply may be registered separately in both directions by individual counting-devices in the meter.

5.3.1 Standards for solar panels

For the quality of solar panels there is not one single umbrella international standard. Throughout the years the necessary standards have come into being within a number of renowned organizations involved in standardization. The International Electrotechnical Commission (IEC)[11] is by far the most important of such organizations in this respect. Apart from that the American Underwriters Laboratories (UL)[12] as independent certifying organization for product safety also saw to so-called ñ*de facto*ò standards

In view of the work of both organizations in connection with relevant standards for solar PV-systems, in the framework of this paper the following basic standards are used as points of departure for the safety and quality of solar panels.

- **IEC 61215**
  Cristalline silicium photovoltaic modules for application on earth - Design classification and type approval: this standard only concerns conventional solar - PV modules. The tests involve qualification of the design, performance, sustainability, safety and sturdiness.

- **IEC 61646**
  Thin-film photovoltaic (PV) modules for application on earth - Design classification and type approval: this standard only concerns thin film PV modules. The tests involve qualification of the design, performance, sustainability, safety and sturdiness.

- **IEC 62108**

[12] The International Electrotechnical Commission (http://www.iec.ch)
[13] Underwriters Laboratories (http://www.ul.com)

Concentrator photovoltaic (CPV) modules and compositions: this standard only and exclusively concerns concentrator PV modules. The tests involve qualification of the design and type approval.

- **IEC 61730**
  Safety qualification of photovoltaic (PV) modules.

- **UL 1703**
  Flat-Plate Photovoltaic Modules and Panels: this standard primarily concerns safety requirements of solar panels, but partly also performance requirements and tests with which the panels must comply. The standard is somewhat overlapping the IEC 61730 and still needs to be harmonized with it.

- **IEC 60364**
  Protective measures - Protection against excess current.

- **IEC 61701**
  Salt spray corrosion proofing of photovoltaic (PV) modules.

The application of above-mentioned standards for the various types of solar panels in Curaçao is as follows:

Table 5.1: International standards for each PV category

PV category Standard	Conventional PV	Thin film PV	Concentrator PV
IEC 61215	Mandatory	Not applicable	Not applicable
IEC 61646	Not applicable	Mandatory	Not applicable
IEC 62108	Not applicable	Not applicable	Mandatory
IEC 61730	Mandatory	Mandatory	Mandatory
UL 1703	Mandatory	Mandatory	Mandatory
IEC 60364	Mandatory	Mandatory	Mandatory
IEC 61701	Mandatory	Mandatory	Mandatory

5.4 Certification of hallmarks

Internationally there exist (small) differences in the application of the standards for sustainable production systems, for example, between Europe and the United States. In Europe there exists the ñCEò hallmark for compliance with all mandatory standards. In the United States, for instance, solar panels must be provided with a hallmark of a so-called NRTL[14] test laboratory.

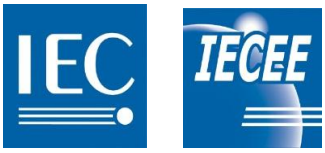
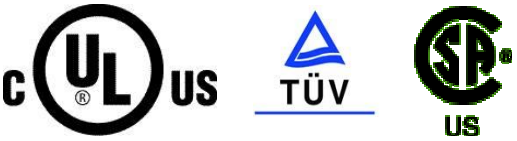
Because there is no umbrella standard which covers all the state-of-the-art quality, as well as safety aspects, manufacturers of sustainable production systems are obliged to cause multiple certification programs to be executed against the various standards. This takes place through independent certifying institutes. In the meantime the market for sustainable generating units has developed to the extent that there are sufficient independent certifying institutes who are accredited to carry out inspections for all the standards mentioned in this paper and to issue the therewith related hallmarks. Some examples of such institutes are**:**

- TÜV Rheinland Photovoltaic Testing Laboratory LLC;
- Underwriters Laboratories Inc. (UL) and
- CSA international (CSA).

If, for instance, a private person or a company, or, as the case may be, an institution purchases solar panels or has them installed, then the supplier will have to prove that the solar panels originate from a manufacturer who has been certified by an institution accredited relative to the standards referred to in Table 3 (= Table 5.4 = 5.2 ?). This must always be recognizable from the markings on the panels. This might be by way of**:**

- a symbol of the relevant standards;
- a European characteristic and
- a characteristic of a certifying institution, such as UL, TÜV or CSA.

Table 5.4 (= Table 5.2 ?): Overview international standards, hallmarks and certifying institutes

SYMBOLS	
IEC standards	
European hallmark	
Certifying institutes (not exhaustive)	

In case of doubt the client (that is the applicant) always has to try to ascertain the official certifying documents of the producer from the supplier. In these the exact contents of the certification and the standards applied, have been [= are ??] laid down.

5.5 Small-scale wind energy

In this paragraph the most important components for a small-scale wind system are identified. Subsequently an inventory follows of the requirements applicable to same.

There is a wide range of wind turbines[15] on the market. In this paper, however, only the so-called micro wind turbines are dealt with (to be referred to hereinafter as wind turbines). These are wind turbines with a small output, which are mostly purchased with the intention to generate electricity for own use. Furthermore wind turbines are built with a vertical (rotation) axis (VAWT) or a horizontal axis (HAWT)[16].

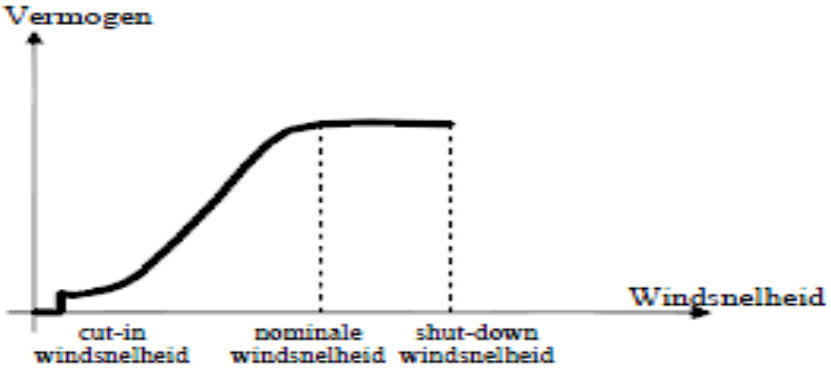
An important property of a VAWT-wind turbine is the fact that it does not matter from which direction the wind may impact the turbine. As a result of this a VAWT is also able to generate power from a turbulent wind stream, which renders this type better suitable for use in built up (urban) regions, or regions with many obstacles. Because of this with a VAWT there is no need for a cross (coupling ?) system[17] which turns the turbine into the wind.

Such a cross system is necessary indeed with HAWT-wind turbines, in order to turn their vanes to the wind. A HAWT must therefore always be placed on a high mast, where the air stream runs in a more linear direction.

The disadvantage of a VAWT is that it cannot start up automatically when the wind impacts on it. Because the blades of the turbine need an initial speed. With a HAWT this is not the case. As soon as there is sufficient wind, the wind turbines start up by themselves. Thatôs why the majority of the wind turbines in the world are of the HAWT type. They consist of a high mast, an electrical generator and 2, 3 or more vanes. The turbines are only capable of converting linear airstreams into energy and must always be oriented to the wind.

Each wind turbine will supply more power according as the wind speed is greater. The kinetic energy present in the windstream is proportionate to the wind speed to the third degree. This implies that with a twice as high wind speed, there is eight times as much energy present in the wind. Figure 5 (= Figure 5.2 ?) shows that the power graph of a wind turbine displays the relationship between the generated power and the wind speed.

Figure 5.2: Power graph of a wind turbine



The energy produced by a wind turbine therefore depends on the wind speed. The greater the kinetic energy in the wind, the greater power the wind turbine is capable of generating. The turbine only starts to supply (current) power, however, from the so-called ñcut-inò wind speed. At increasing wind speed, the generated power increases until the nominal power has been reached. At small windmills the profile of the streaming generally sees to it that after the ñshut downò point, the generated power no longer increases.

For the rest, the system configuration of a small-scale wind turbine is reasonably comparable to a solar PV-system. A difference, however, is that due to the variable wind speed a wind turbine generates alternating current (AC) with a highly variable frequency and amplitude. Most smaller wind turbines are therefore fitted with an electrolytic rectifier which produces a direct current (DC) with a voltage of 12/24/48V. A converter may be fed with this. For wind turbines without a rectifier there are converters which are capable of converting the ñdirtyò alternating current (AC) into ñneatò alternating current.

5.5.1 Standards for small wind turbines

The international standards for small wind turbines are under-developed in comparison with solar PV-systems, because the development of this type of sustainable generation of electricity did not advance as rapidly during the past decennium.

The basic standard for a small wind turbine is the IEC 61400. The following components are applicable to small wind turbines**:**

- **IEC 61400-2, ed.2**
  Design requirements of small wind turbines.

- **IEC 61400-11, ed.2**
  Measuring techniques for acoustic sound.

- **IEC 61400-12-1, ed.1**
  Generator systems for wind turbines.

In various countries which take small-scale sustainable energy based on wind technology seriously, prominent national organizations by themselves have developed a standard based on the IEC 61400 standard for wind turbines. Examples are**:**

- North American Small Wind Certification Council (U.S)
  Small Wind Turbine Performance and Safety Standard[18] (U.K.)

[17]This system sees to it that the rotor is straight into the wine (or is turned into the wind)
[18]See for more information**:** http://www.smallwindcertification.org/standard.html

- British Wind Energy Association (U.K.)
  Small Wind Turbine Performance and Safety Standard. Herewith there exists a program for certification, the so-called Micro-generation Certification Scheme (MCS)[19] which provides for certifying wind turbines against this standard.

The basic rule for the quality of small-scale wind turbines is therefore that small wind turbines in Curaçao have to comply with the stated components of the IEC 61400 standard. Small-scale wind turbines which meet the two aforementioned certification requirements will also be in compliance with the above-mentioned standard.

5.6 Converters and the standards for same

The converter sees to the conversion of direct current (DC) into alternating current (AC) and also to the synchronization of the voltage and frequency of the alternating current with the alternating current that is supplied by the distribution network.
The converter is therefore a very crucial element in the total system and has to comply with strict safety standards. The standard which is prescribed for this purpose in the U.S. and which has also been harmonized in the meantime with the general standard IEEE 1547 is**:**

- ***UL 1741***
  Standard for Safety Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources: the range of this standard comprises converters for PV installations, as well as converters for small wind turbines, fuel cells and small generators.

The UL 1741 standard does make an explicit distinction between a converter which is connected to the public distribution net and a converter which works ñstand-aloneò. Since in the latter case the set of requirements is less heavy, it might happen that a converter is UL 1741 approved, but still may not be used in combination with a connection to the net. This, because only converters which are in compliance with the standard inclusive of the connection to the net, are permitted.

A point for attention is, however, that not all these converters also facilitate the 50Hz option. In order to redress this shortcoming an end-user may purchase a converter which is oriented to the European market, and which does work on 50Hz, but is not certified in accordance with the UL 1741 standard. In such case the following conditions have to be met**:**

[19]See for more information**:** http://www.microgenerationcertification.org

- **"CE" hallmark and DIN VDE 0126 Certificate**

  - **CE hallmark:**
    This hallmark among other things covers safety and EM-compatibility according to the customary IEC standards and

  - **DIN VDE 0126 Certificate:**
    This certification is issued also on behalf of a proper functioning of the automatic security system (among other things when the voltage of the network falls away).

Most modern converters also dispose of manual switch off systems, apart from automatic ones for the direct current voltage, as well as for the alternating current voltage. These are mostly situated underneath the converter or on the front by way of a clearly visible safety button. These switches must be (a) clearly visible and (b) easy to handle. In the event that the switches are in compliance herewith, the application of separated safety switches, as indicated in figure 5.1 (AC and DC disconnect) is no longer necessary. For larger systems separated switches are to be recommended, however.

There also exist so-called micro-converters in the market, whereby it is possible for each individual solar panel to convert from direct current into alternating current. In that case a DC disconnect is not necessary, due to the relatively low voltage and the limited reach of the converters which are situated in the close vicinity of the solar panels.

5.7 Battery systems and the standards for same

It is possible when generating electricity with the aid of solar panels or wind turbines, to save the produced electricity with the aid of batteries (accumulators). A system with batteries can also work as a ñstand aloneò, thus without a connection to the distribution net. In such configuration there is no possibility of retro-supply to the network and it stands to reason that respective thereto no additional requirements are stipulated for the system.

When the end-users opt for saving electricity in combination with a connection to the net, electricity supply from the batteries to the end-user is achieved whenever the voltage of the net falls away. These batteries function as a ñback-upò facility through which all critical equipment (such as alarm installations and 24/7 continuous working computers) are able to continue functioning when the voltage of the net falls away.

The utilization of batteries is not to be recommended, however, from the concept of sustainability and it is therefore not encouraged either by the policy. Batteries contain chemical substances and they have a limited life span (and are therefore costly) and have an intrinsic danger. As far as application of battery systems is concerned in the generation of solar energy, the following international standard is used for battery systems in combination with solar PV-systems.

IEC 61427

Rechargeable cells and batteries for photovoltaic solar-energy systems - General requirements and testing methods.

6 TECHNICAL CONDITIONS AND FURTHER PRESCRIPTIONS FOR THE REALIZATION OF A CONNECTION OF A GENERATING UNIT TO THE PUBLIC TRANSPORTATION- AND DISTRIBUTION NETWORK

6.1 The connection to the net and the terms and conditions of the connection

An important element for generating units is the safety. A series of interconnected solar panels might have a voltage of hundreds of volts direct voltage. By means of a converter (ñinverterò) the direct voltage is converted into alternating voltage, which coincides with the regular alternating voltage of the distribution network. Windmills initially generate ñdirtyò alternating voltage, which is first converted into direct voltage in order to be subsequently converted by an inverter into the ñcleanò alternating voltage.

In both cases (in this case the production of solar and wind energy) it is true that if a net connection is made, there has to be an automatic security device on the side of the generating unit, as well as on the side of the transportation- and distribution net. In the event that something goes wrong on one side with a wind turbine or solar panel, these must be immediately switched off, and in the event that on the other side, something goes wrong with the transportation- and distribution network (for instance the voltages drops away by some interference or the like) then the connection to the net must immediately be disconnected. These so-called ñDCò and ñACò security devices are mostly built into the inverter. All this may also be discerned in the following figure.

Figure 6.1: Basic components for connection to the net

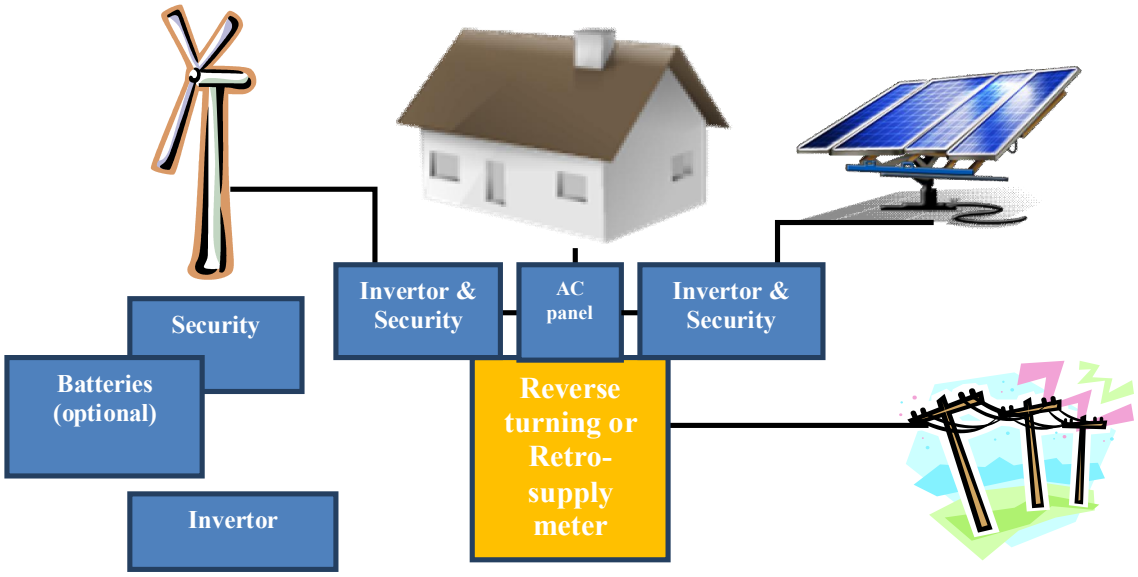


Figure 6.1 shows the basic components for the connection of a generating unit to the transportation- and distribution network and the security of same. The terms and conditions of the connection and further prescriptions of the network company stipulate other requirements for the connection to the net.

The operative text of the terms and conditions of the connection and further prescriptions, which constitute the basis for the connection agreement with the applicant, are determined by the Minister and are obtainable from the supervisor of the network company.

6.2 System requirements respective to the net-connection

An important principle for the technical conditions which are stipulated for the connection of a generating unit to the transportation- and distribution network is that at all times the quality and safety of the provision of electricity is ensured, on the side of the end-user, as well as from the side of the network company.

The operative standard for connecting generating units spread all over the country to the distribution net is**:**

- **the IEEE 1547 series**:
  ñStandard for Interconnecting Distributed Resources with Electric Power Systemsò.[20] This standard is the technical basic standard with which all small-scale installations for generating electricity in combination with a connection to the net must be in compliance. The IEEE 1547 series has been supplemented in the course of the years with a number of prescriptions and guidelines for elaboration and further elucidation of the basic standard. These are**:**

- **IEEE 1547.1 2005**
  Standard for Conformance Tests.

- **IEEE 1547.2 2008**
  Application Guide.

- **IEEE 1547.3 2007**
  Guide for Monitoring, Information Exchange and Control.

The converter (ñinverterò) constitutes, as stated before, the link between the generating unit and the distribution net. Therewith the inverter is crucial to comply with the safety- and quality prescriptions, which are stipulated by the IEEE 1547.

In this respect it is not permitted to small end-users who supply current back to the net, in view of a stable and safe provision of electricity by the network company, to connect generators of alternating current (in this case generators) directly to the net without an inverter.

6.3 Further requirements for large installations

As indicated in paragraph 3.2.3 at the application for an installation of more than 100 kVA two additional tests take place, namely a test for the possible effects on the distribution network and a test for the reliability of the entire provision of electricity.

[20]See for a complete overview of the standard (IEEE 1547 series): http://grouper.ieee.org/groups/scc21/1547/1547_index.html

Particularly the test on the possible effects of a generating unit to be newly installed on the distribution network, will take place by the network company. Therewith especially the loads and the voltage households are significant.
The network company will facilitate such installation in principle and if necessary it will realize the required adaptations to the transportation- and distribution network. In the event that one thing and the other take longer, or threaten to take longer than expected, the prescriptions respective to subscription of the generating unit with the network company as referred to in paragraph 7.2 shall apply.

6.4 Standards for the electrical installation

The basic standard for the quality and safety of the electrical installation is**:**

- **the NEN-EN 1010**
  This standard is already prescribed for normal household installations and is oriented to the safety of electrical installations in general.

All this implies that at the inspection of a system for sustainable generation of electricity and the integration of this system with the household installation the NEN-EN 1010 is taken as point of departure.

6.5 Prescriptions respective to the maintenance of the stability of the transportation- and distribution network

A private or business end-user who operates with a small-scale generating unit parallel to the electricity network constitutes an integrated part of the total electricity infrastructure. The end-user therefore has to comply, likewise as all others, with the requirements stipulated to ensure the quality and stability of the transportation- and distribution network. The end-user is therefore, among other things, responsible for electricity supply with a voltage and frequency regulation which do not interfere with the stability of the transportation- and distribution network.

The Minister determines further guidelines in a so-called ñnet codeò, respective to the quality requirements for the sustainable, as well as non-sustainable generating units connected to the net. The most important prescriptions in this regard are therefore laid down in**:**

- **The NETCODE**

The feeding of electricity by each producer (big or small) is effected with due observance of the relevant provisions of the net code, being the technical, operational and administrative prescriptions relative to the manner in which the network company, the connected electricity producers and the end-users conduct themselves respective to the use of the electricity net, to providing a connection to the net and to carrying out the transportation of electricity over the net.

6.6 Prescriptions relative to balancing and placing meters

6.6.1 Net consumption, net production and balancing

In the event that an end-user disposes of a generating unit for sustainable energy in combination with a connection to the net with the possibility for retro-supply, there will be a question of two-way traffic, by which in a given period the electricity supplied to the net seldom or never will be equal to the electricity drawn from the net.

In the event that in a given period less electricity is produced by the end-user than needed by him, the net will provide for the shortfall (then there is a case of net consumption). In the event that on the other hand the generating unit produces more electricity for the end-user than is needed by him, the surplus will be supplied to the net via the network connection (this is net production).

In the first case the end-user then only pays the net consumption by means of the balancing method (in this case the positive balance of consumption minus production) of electricity during the measuring and invoicing period (of approximately one month). In the second case there is net production (in this case the negative balance of consumption minus production) whereby in fact the end-user gets a financial claim on the distribution company. The points of departure herewith applied are as follows**:**

a) In the event of net consumption during the invoicing period such will be invoiced accordingly by the distribution company.

b) In the event of net production during the invoicing period, the number of kWh will be parked (kWh credits) and during the subsequent invoicing period it will be deducted from the use.

c) In the event that starting from the month in which the generating unit was connected to the net, after twelve consecutive invoicing periods there is still a matter of surplus kWh credits, then these shall be balanced at a tariff in accordance with a tariff procedure, to be determined by the Minister. After expiration of a six month period, a new six month period will commence every time.

d) In the event that there is a matter of a large installation (10kW-1000kVA) of a business end-user, there will be no balancing based on kWh in case of net production, but a settlement based on retro-supply tariffs agreed upon. These retro-supply tariffs for big business end-users will be based on a tariff procedure to be determined by the Minister.

6.6.2 Balancing and settlement

At the moment many regular connections to the net are still equipped with a rotating disc or a Ferraris meter, being an analogous meter with a horizontal rotary disc without a security device against rotating in reverse. When electricity is retro-supplied, the meter will turn in reverse and in so doing it will automatically perform the balancing based on kWh. The reverse rotating mechanism, however, does not provide an insight into the split between the supplied and the retro-supplied electricity.

More recently digital meters with multiple counting devices were also placed with the end-users by the distribution company. These do give a separate measuring of kWh electricity supplied and kWh retro-supplied, which may be used to reach a financial settlement. In so doing the same tariff may be applied or a different one.

6.6.3 Rules in connection with the use of various (existing and new) types of meters to enable balancing and settlement

As part of the generated electricity is immediately consumed in the home, it is not possible to ascertain by means of the meter of the distribution company how many kWh are actually produced by the generating unit. In order to keep a proper outlook on the total production volume and the data on consumption, each installation will have to register gross volume figures of the production. This may be achieved by means of separate production meters. In many instances the converter disposes of a functionality to keep track of the number of kWh produced and to register same.

Relative to the use of existing or new types of meters for settlement of the production in case of non-industrial generation of sustainable electricity by private and business end-users, the rules to be observed are as follows**:**

- if the private or business end-user disposes of an *analogous meter*, then it will be replaced free of charge by a bi-directional digital meter in order to enable the separate measuring of the supply and the retro-supply of electricity;

- if the private or business end-user disposes of a *digital meter,* then it will be kept in place, provided that it disposes of two counting devices for separate registration of supply and retro-supply and

- in the cases not provided for by above-mentioned rules, further understandings will be reached each time between the end-user and the network company. Point of departure will then be that the understandings should be in line with the applicable aforementioned balancing and settlement principles, to the extent possible.

6.7 Prescriptions on tariffs

The tariffs for retro-supply (the so-called ñ*feed-in tariffs*ò), as well as the settlement system which will be applicable at the retro-supply of electricity to the net, constitute an integrated component of the tariff procedure, approved by the Minister and the terms and conditions for a connection and further prescriptions of the network company.

The objective of the so-called ñ*feed-in tariffs*ò is to give producers of sustainable electricity a compensation based on adequate costs for the green energy generated by them and supplied to the net. Apart from that, by offering these producers a reasonable ñreturn on investmentò, the development of a diversity of clean technologies for generating energy is being stimulated.

7 APPLICATION, INSPECTION AND PUTTING INTO OPERATION OF AN INSTALLATION

Before a generating unit may be connected to the net, the applicant has to announce himself to the supervisor and the network company.

7.1 Announcement to the supervisor

Within six months after acquiring an installation certificate from a certified and registered installer, the applicant shall announce himself to the supervisor. The announcement is effected by submitting an application form to obtain a VvGB (DNO) as referred to in paragraphs 2.2 and 2.3 of this paper.

The application form, including the list of required documentation to obtain a DNO, is obtainable from and may be submitted after having been filled out, at the office of the supervisor or on its website, respectively e-mail address**:**

BUREAU TELECOMMUNICATION, POST AND UTILITIES
Beatrixlaan 9
Curaçao
www.btpu.org
info@btnp.org

The subsequent procedure goes as follows**:**

1. The supervisor shall get in touch with the applicant within ten workdays if data are lacking, if something is not clear, or to arrange an on-site visit.

2. In the event that an application may not be implemented within the term mentioned hereinbefore, the supervisor will inform the applicant accordingly in writing within ten workdays, inclusive of the notification of a reasonable term for the final processing.

3. Within twenty workdays after all the requirements have been met, as referred to in paragraph 2.3 the supervisor issues a DNO to the applicant.

   In said document, among other things, reference is made to the prescriptions that have been met. The DNO is furthermore made out in the name of the applicant, is non-transferable and valid for three months. The DNO is registered in the name of the applicant by the supervisor.

4. The applicant is under obligation to announce himself to the network company within three months for an application to be connected to the transportation- and distribution network with the possibility of retro-supply.

7.2 Announcement to the network company

Within three months after obtaining a DNO from the supervisor, the applicant of a net connection for a generating unit, shall announce himself to the network company. The announcement is effected by submitting an application form to obtain a connection to the transportation- and distribution network as referred to in paragraphs 2.2 and 2.4 of this paper.

The application form, including a standard connection agreement is obtainable at the office of the network company or its website**:**

AQUALECTRA DISTRIBUTION
Rector Zwijsenstraat 1
Curaçao
www.aqualectra.com

The application form, the standard connection agreement, the DNO and the further documents required, shall be sent by registered mail by the applicant to the aforementioned address of the network company, stating ñ*application for connection of a generating unit for sustainable electricity with retro-supply*ò.

The subsequent procedure goes as follows**:**

1. The network company shall get in touch with the applicant within ten workdays if data are lacking, if something is not clear, or to arrange an inspection (see paragraph 7.3.2).

2. The network company, if applicable, shall make the analysis as referred to in paragraph 3.2.3 in principle within a term of fifteen workdays. The applicant, as well as the supervisor, shall be informed about implementation of the requested connection to the net.

3. In the event that there exist limitations in the local network with the applicant, which might lead to unsafe situations in the entire transportation- and distribution network, adaptations may be necessary, through which it is not possible to implement the requested net connection within the normal period needed to effect same.

   In such instance, the network company shall inform the applicant in writing within ten workdays and stating reasons inclusive of a reasonable term within which these limitations will have been rescinded.

4. After the application a connection agreement follows within twenty workdays, unless the applicant obviously does not meet the requirements relative to a connection to the net of a generating unit, as referred to in this paper. In such instance the network company shall inform the supervisor of the refusal within five workdays.

5. In the event that processing the application cannot be completed within the period stated hereinbefore, the network company shall inform the applicant accordingly in writing within ten workdays, inclusive of the notification of a reasonable term to finalize processing.

6. In the event that after twenty workdays there was no reaction from the network company, the application shall be deemed accepted for implementation.

7.3 Inspection and putting the system into operation

When the production system, with due observance of the standards thereto applicable, is installed, an inspection has to be carried out in order to ascertain whether the system is in compliance with all the requirements thereto. This inspection will be oriented to the installation requirements applicable to a household installation or to an industrial one (among other things NEN1010), as well as to the requirements for the connection of such installation to the net.

7.3.1 Inspection of the household- or business installation

After installation of the system it will be inspected by DOW. DOW inspects the generating unit regarding the correct implementation relative to the installation requirements which are applicable to a household- or business installation. After approval of the installation an inspection letter or inspection certificate will be issued to the end-user by DOW. The costs of an inspection are for the account of the applicant.

7.3.2 Inspection at an application for a connection to the net

In the framework of the application for the connection to the transportation- and distribution network the network company itself is responsible for the inspection of the generating unit, to wit to carry out investigation on adherence to the requirements stipulated respective to the connection of a generating unit to the transportation- and distribution net.

The inspection will be carried out within a reasonable period after the application for admission to the transportation- and distribution net. This will be effected by means of an inspection list, based on the requirements which are stipulated in or by virtue of this paper.

When the inspection is carried out, the applicant has to submit at least the following documentation to the inspectors of the network company**:**

- a blueprint of the pertinent location;
- a sketch of the generating unit;
- an electric diagram of the installation;
- the system specifications and the instructive manuals of the installation;
- the installation certificate from the certified installer and
- the inspection certificate from DOW.

On approval of the generating unit, an inspection letter or inspection certificate will be handed to the applicant by, or on behalf of, the network company.

The inspection certificate remains valid for a maximum period of twenty-four months. After this period the generating unit will have to undergo periodic re-inspections. The frequency of same shall be determined by the network company. The purpose of a re-inspection is to ascertain eventual impairment and corrosion of the external installation, the proper functioning of the generating unit and/or if possible alterations have been implemented which are subject to prior permission. The costs of an inspection are for the account of the applicant.

7.3.3 Realizing the connection to the net

After successfully passing the inspections and concluding the connection agreement with the network company, the generating unit may be connected to the transportation- and distribution net and put into operation in combination with the connection to the net.

8 RIGHTS AND OBLIGATIONS OF THE APPLICANT AND SETTLEMENT OF DISPUTES

8.1 Rights and obligations of the applicant

Pursuant to the concession resolution of the network company, it is under obligation, at the request of, or on behalf of, the owner of a generating unit for non-industrial generation of electricity to offer a connection of the unit to the transportation- and distribution network in the event that**:**

a. the installation is in compliance with the operative technical prescriptions;
b. the installation generates sustainable energy;
c. the installation is capable of retro-supply of a substantial quantity of sustainable energy to the concessionaire, such that as a result of this there is a serious offer of sustainable electricity and
d. the installation is completely in compliance with the terms and conditions for the connection approved by the Minister and the further prescriptions relative to the retro-supply.

The applicant may furthermore depend on it that the concessionaire will make the transportation- and distribution network suitable, if necessary, to enable the retro-supply referred to sub c. and d. hereinbefore.

The connection to the transportation- and distribution network, as referred to hereinbefore, will be effected in principle within the terms stated in this paper, after the applicant has complied with the terms and conditions of the connection approved by the Minister and the further prescriptions relative to the retro-supply.

8.2 Settlement of disputes

In the event that the network company rejects an application from an applicant for a connection of a generating unit to the transportation- and distribution network, or if, in the opinion of the applicant, the period to effect the connection is unreasonably long, the latter may lodge a substantiated objection with the concessionaire, or he may directly lodge an appeal with the Minister. The concessionaire or the Minister shall then issue a decree within thirty days after receipt of the written objection, respectively the appeal. The decree from the Minister is subject to appeal in the framework of the National Ordinance on Administrative Justice (LAR).

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