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Application note 2

RD244/2019 zero injection

Injection regulation

1. Introduction

This application note describes how to configure and parameter the WebdynSunPM product in the specific case of zero injection on a photovoltaic energy production site in compliance with the Spanish RD 244/2019 standard. The purpose is to generally explain how zero injection works using an example that has been validated by the CERE certification body. Using the zero injection script requires a paid license. For any license purchase, please contact the Webdyn sales department (https://www.webdyn.com/contact).

2. Expression of needs

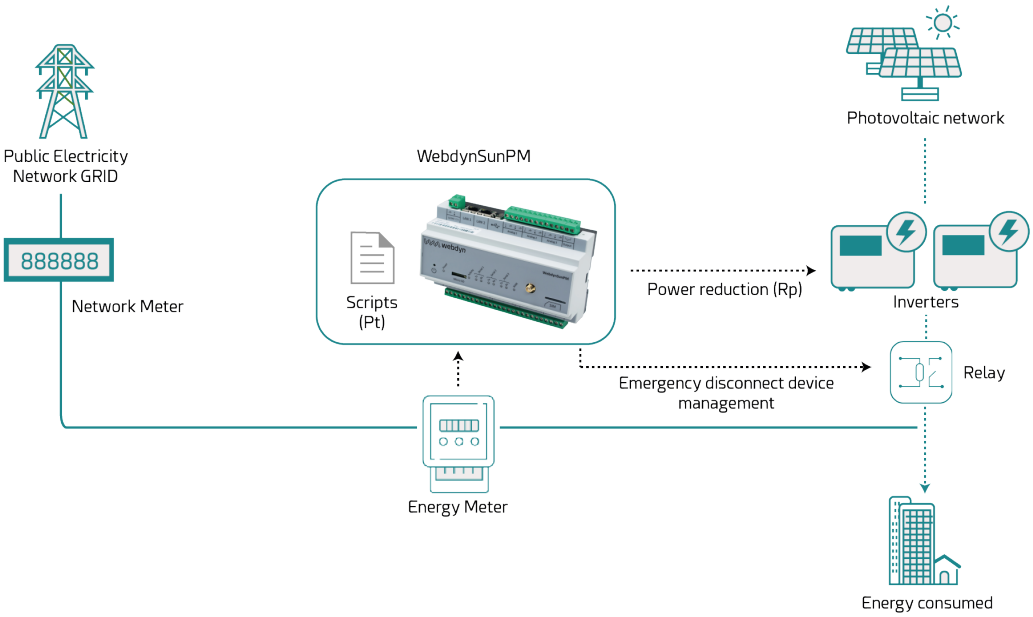
A zero injection site is one of which renewable energy production is strictly for local use. No energy must be injected into the public electricity grid, all that is produced must be used (100% self-consumption) by the local electricity installations or the solar plant power must be limited.

The objective is therefore to be able to reduce photovoltaic production depending on the energy consumption of an industrial site.

2.1 Synopsis

The WebdynSunPM product is used to control renewable energy production depending on the site's actual energy consumption. Production control is local using an LUA scenario that:

- Analyses site consumption read from an electric meter.
- Analyses energy production by querying the power inverters.
- Reduces or increases this energy production depending on actual consumption.



2.2 Power regulation management

The power reduction factor is calculated according to the maximum solar plant power value configured in the scenario, and the power measured at the injection point.

The WebdynSunPM script sends active power set points in a dynamic control loop and adapts the photovoltaic plant's power limitation to the customer site's energy needs.

When an inverter or the customer site is disconnected from the installation, the injection of excess solar power to the grid is automatically reduced.

If the power withdrawn from the grid is higher than the predefined tolerance threshold (5% by default, or entered value), the photovoltaic production is considered insufficient. The inverter production is increased as a result.

If the power withdrawn from the grid is below the predefined tolerance threshold (5% by default, or entered value), photovoltaic production is considered too high. The inverter production is decreased as a result

For unbalanced phases in three-phase operation, the WebdynSunPM script takes into account the power of the lowest phase.

The script is only functional for three-phase installations.

2.3 Specific operation

When the script starts, the inverters are set to 0% and the script gradually increases the solar power injection.

When the script stops, it stops the inverters.

In the event of loss of communication with a device (inverter or energy meter), the script triggers the opening of the power contactor control relay. When the fault disappears, the script automatically closes the power contactor control relay without human intervention.

3. Prerequisite

The regulation is done by a scenario which is an LUA script integrated in the WebdynSunPM from version 4.2.10 (a manual import of the script is possible). To use, understand and/or configure the injection regulation script, it is essential to:

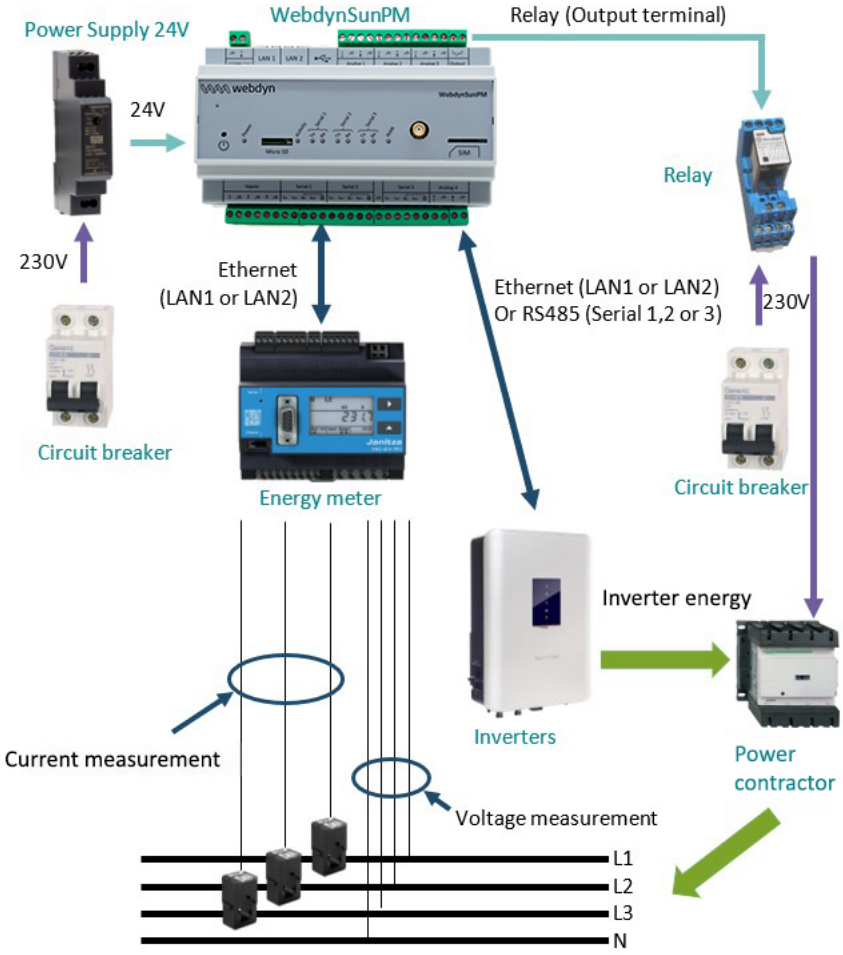
- Have a webdynSunPM with a license that is marketed by the Webdyn sales department (https://www.webdyn.com/contact).
- A functional installation including an energy meter, a power contactor, inverters and a configured WebdynSunPM concentrator,
- The WebdynSunPM user manual,
- The WebdynSunPM Lua script user manual.

Zero injection regulation is achieved by coupling the inverters using a LUA scenario.

Proprietary ".luaw" scripts designed specifically by Webdyn which include the acquisition of a webdyn licence are available. In that case, please contact the Webdyn sales department, which will be able to advise you and redirect you to the relevant contacts: contact@webdyn.com.

4. Typical wiring

Implementation of zero injection according to RD 244/2019 includes a set of products and specific wiring. The following wiring around the WebdynSunPM is compliant with the standard.



This wiring must use the following elements or equivalent and be adapted to your solar installation including a WebdynSunPM:

- 24V power supply (Sens'Power Supply ref: AC0103-00-DR15)
- Energy meter (Janitza UMG604-PRO)
- 3 current transformers (Janitza KUW2/40)
- 1 relay support + relay (Finder 4.74SMA + Finder 55.32.9.024.0000)

- Power contactor (Schneider Electric LC1D115004P7)
- 2 two-pole circuit breakers
- Inverters (Sungrow SG110CX)

The energy meter is often delivered without the current transformers. Do not forget to take current transformers in line with the current of your installation.

5. Lua script explanation

The script is to be adapted according to your site and your equipment. You can import the script using the web interface (see section 3.2.3.1: “Script” in the WebdynSunPM manual) or using the remote server (see section 3.1.2.1.4: “File “ _scl.ini” “ and section 4.1.6: “ “SCRIPT” scripts” in the WebdynSunPM manual).

Script log files are available on the concentrator. It may be useful to use them to monitor the zero injection control evolution. (see section 4.1.8.2: “script log” in the WebdynSunPM manual).

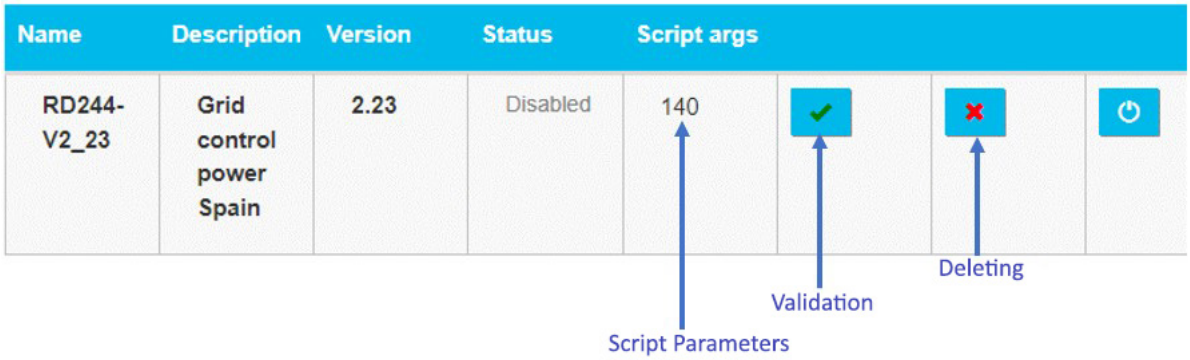
5.1 Configuration depending on the installation

5.1.1 Configuring the maximum site power (in kW) and/or tolerance threshold in the LUA script

The maximum power in kW of the solar plant must be entered when using a Webdyn zero injection script.

The tolerance threshold in kW of the installation used for power control can be entered, this threshold can only be positive. If the tolerance threshold is not entered, then the script will default to 5% of the maximum site power.

In that case, the maximum power value must be passed in the "SCRIPT_Args" variable. (see WebdynSunPM manual section 3.1.2.1.4: “ “<uid_sc.ini>” file”).



Example of arguments for a site with a maximum power of 140kW and a tolerance threshold of 10kW:

SCRIPT_Args[0]=140;10

Parameters can be passed to the script, just enter the "Script args" field and validate by clicking the green "Validation" check box so that the script takes them into account when it is enabled. To delete the current parameter modification, click the red "Delete" checkbox.

5.2 Energy meter configuration

The Meter equipment connected to the concentrator must be identified in the concentrator acquisition file (DAQ) to be able retrieve its data. Set the Meter Name field (“Name” field, column 3) of the device to "Main Meter".

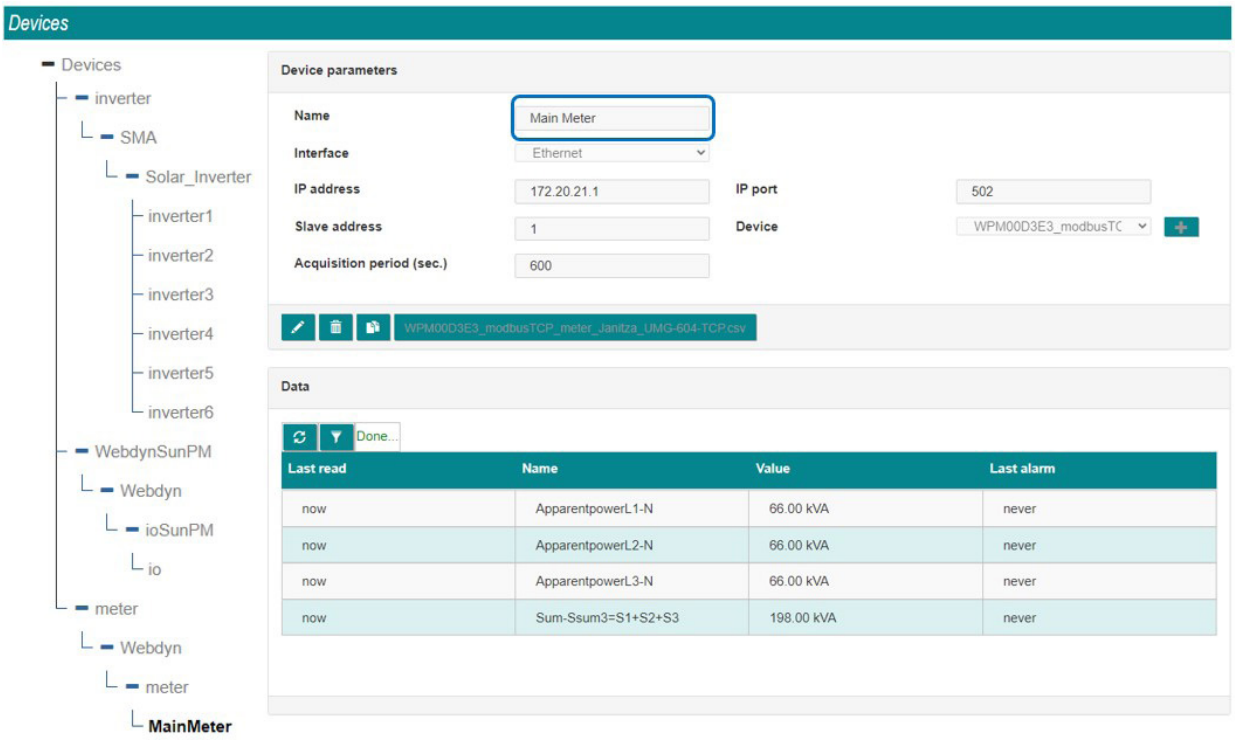
This step is normally already carried out when the inverter is in Modbus and uses a definition file automatically generated by the WebdynSunPM.

Example of equipment configuration taken from an acquisition file (DAQ):

```
mtx.smsSend("+34666123456","my message");
```

```
index;interface;name;address;acqPeriod(s);timeout(ms);serialNumber;parameters;manufacturer;model;defFile
IO;;Io;;36000;;;;Webdyn;WebdynSunPM;WPM00C75B _IO.csv
TIC1;;;;600;;041676011381;9600;;;WPM00C75B _TIC_LINKY.csv
0;192.168.0.1:502;inverter1;126;600;5000;;1;inverter;Solar_Inverter;WPM00C75B_Inverter1.csv
1;192.168.0.2:502;inverter2;127;600;5000;;1;inverter;Solar_Inverter;WPM00C75B_Inverter2.csv
2;192.168.0.3:502;inverter3;128;600;5000;;1;inverter;Solar_Inverter;WPM00C75B_Inverter3.csv
3;192.168.0.4:502;inverter4;129;600;5000;;1;inverter;Solar_Inverter;WPM00C75B_Inverter4.csv
4;192.168.0.5:502;inverter5;130;600;5000;;1;inverter;Solar_Inverter;WPM00C75B_Inverter5.csv
5;192.168.0.6:502;inverter6;131;600;5000;;1;inverter;Solar_Inverter;WPM00C75B_Inverter6.csv
6;192.168.0.10:502;Main Meter;9;600;2000;;;Webdyn;meter;WPM00C75B_meter.csv
```

Example of equipment configuration using the local HMI:



Variables “ActivePow1kW”, “ActivePow2kW” et “ActivePow3kW”:

In the definition file (DEF) for the Meter device connected to the concentrator, the power variables must be identified and the following tags assigned to them using the device manufacturer's manual:

- Active power of phase L1 in kW: “ActivePow1kW” tag
- Active power of phase L2 in kW: “ActivePow2kW” tag
- Active power of phase L3 in kW: “ActivePow3kW” tag

The "Tag" fields are available in column 7 of the device.

Example of power tags taken from a Meter definition file (DEF):

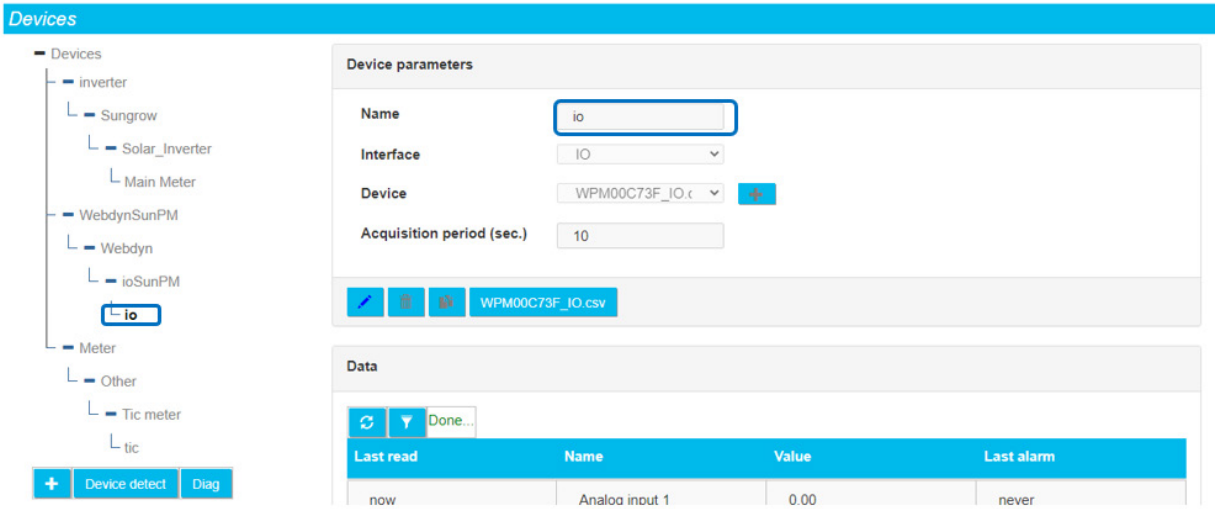
```
modbusTCP;meter;Janitza;UMG-604-TCP
1;4;19020;F32;;Real power L1-N;ActivePow1kW;0.001000;0.000000;kW;4
2;4;19022;F32;;Real power L2-N;ActivePow2kW;0.001000;0.000000;kW;4
3;4;19024;F32;;Real power L3-N;ActivePow3kW;0.001000;0.000000;kW;4
```

5.3 Relay configuration

This step is normally already carried out if you have not modified the default configuration of the WebdynSunPM.

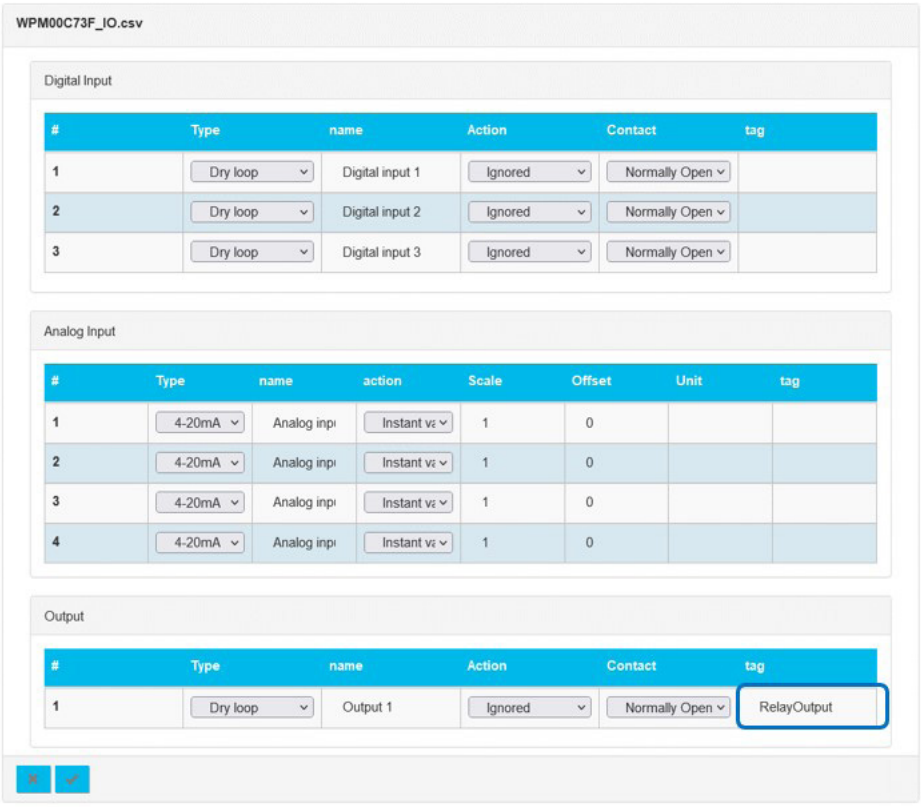
A tag must be added to the internal relay which is part of the WebdynSunPM’s default "ioSunPM" device.

To edit the “ioSunPM” device, first select the device to edit:



Check that the device name is "io". If not, the device will need to be edited to change its name.

Then click the device definition file:



Add the "RelayOutput" tag to the "Output 1" output and validate the modification.

5.4 Inverter configuration

This step is normally already carried out when the inverter is in Modbus and uses a definition file automatically generated by the WebdynSunPM.

In the definition file (DEF) for every inverter connected to the concentrator, enter the following tags:

"Inverter" tag:

In the inverter definition file header, the category name must be entered, which must be identical for all the inverters. The category in the header ("Category" field in column 2) for the device must be called "Inverter".

"cmdPwrPercent" tag:

The power reduction variable must be identified In the inverter definition file. The power reduction variable tag ("Tag" field in column 7) for the device must be called

"cmdPwrPercent".

This tag must be identical for all the inverters. If that is not the case, they must be modified so that they are all identical.

"WMaxLim_Ena" tag (optional):

The control variable for activating the power change must be identified in the inverter definition file. The power change activation command variable tag ("Tag" field in column 7) for the device must be called "WMaxLim_Ena".

This tag must be identical for all the inverters. If that is not the case, they must be modified so that they are all identical.

" VArPct_Mod " tag (optional):

The control variable for activating the power limitation mode must be identified in the inverter definition file. The power limitation mode activation command variable tag ("Tag" field in column 7) for the device must be called "VarPct_Mod".

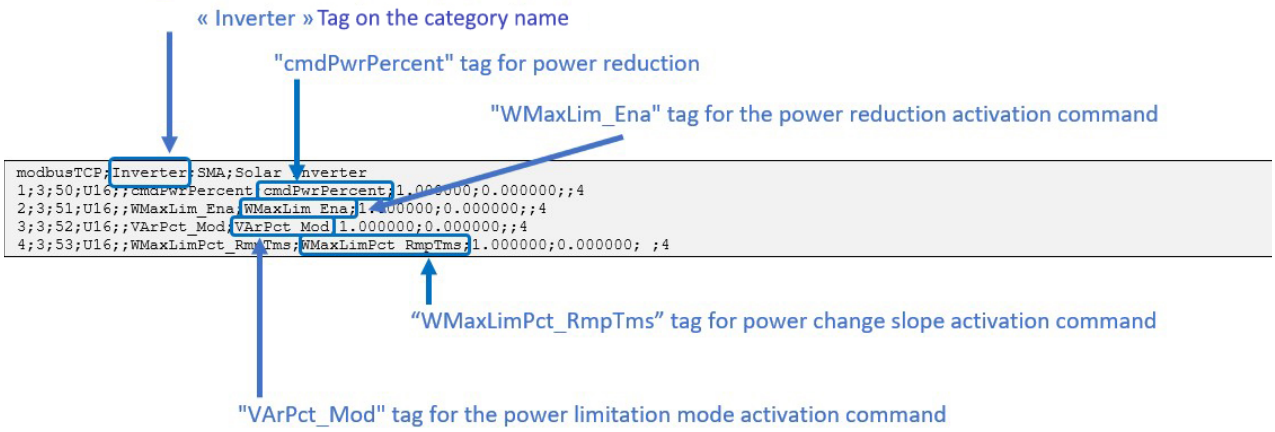
This tag must be identical for all the inverters. If that is not the case, they must be modified so that they are all identical.

"WMaxLimPct_RmpTms" tag (optional):

The control variable for activating the power change ramp must be identified in the inverter definition file. The power modification change ramp activation command variable tag ("Tag" field in column 7) for the device must be called "WMaxLimPct_RmpTms".

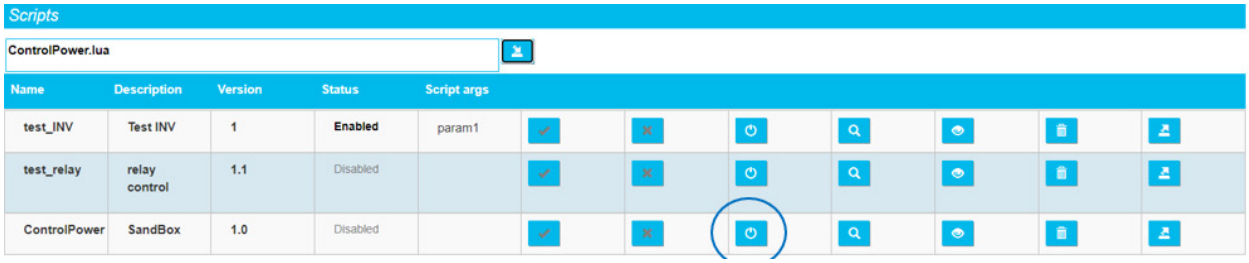
This tag must be identical for all the inverters. If that is not the case, they must be modified so that they are all identical.

Example of category and inverter tags taken from an inverter definition file (DEF):



5.5 Enable the script

A specific button is used to enable and disable:



When the script is disabled, its status is greyed out and “Disabled” is displayed.

When the script is enabled, its status is black and “Enabled” is displayed.

If the script remains "Disabled", an error message is displayed in the script description.

If a "No licence for RD244" error message is displayed, the licence must be added to be able to enable the script. See importing a license in the WebdynSunPM manual, chapter 3.1.2.1.5: “File “<uid>_licence.ini”” or chapter 3.2.3.1.1: “Importing a script or a license”” .

Webdyn cannot be held liable for possible damage caused by use of the script.