

jmcollin78 Merge pull request #48 from jmcollin78/issue46-add-battery 70 Commits

.devcontainer	Add battery management	last month
.github	FIX github actions	last month
.vscode	HA_2024.7, Python 3.12	last month
config	- ajout du paramètre duration_stop_m...	last year
custom_components	Merge pull request #48 from jmcollin7...	last month
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CONTRIBUTING-fr.md	Add README (En) and CONTRIBUTI...	last year
CONTRIBUTING.md	Add README (En) and CONTRIBUTI...	last year
LICENSE	Initial commit	last year
README-fr.md	Add battery management	last month
README.md	Add battery management	last month
hacs.json	HA_2024.7, Python 3.12	last month
requirements.txt	HA_2024.7, Python 3.12	last month
requirements_dev.txt	HA_2024.7, Python 3.12	last month
setup.cfg	With first working testu	last year

About The Solar Optimizer integration for Home Assistant starts and stops your equipments depending on the Solar net production

#energy #integration #solar #home-assistant #optimisation

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Add solar battery management Latest on Jul 19

+ 30 releases

Packages No packages published

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RELEASE **V1.7.0** COMMIT ACTIVITY **25/YEAR** LICENSE **MIT** HACS **CUSTOM** BUY ME A BEER \$5



This integration allows you to optimize the use of your solar energy. It controls the switching on and off of your equipment, the activation of which is deferred over time depending on production and current electricity consumption.

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News

- **release 1.7.0:**
- added battery management. You can specify a percentage type entity that gives the state of charge of the battery (soc). On each device you can specify a `battery_soc_threshold` parameter: the battery threshold below which the device will not be usable.
- **release 1.3.0:**
 - added the parameter `duration_stop_min` which allows to specify a minimal duration of deactivation to distinguish it from the minimal delay of activation `duration_min`. If not specified, this parameter takes the value of `duration_min`.
 - restores the state of the `enable` switches when the integration starts.
 - starts a calculation immediately after starting Home Assistant
- **release 1.0:** first operational version. Control of equipment based on switches, power control (Tesla) and configuration via `configuration.yaml`.

What is Solar Optimizer?

This integration will allow you to maximize the use of your solar production. You delegate to it the control of your equipment whose activation can be deferred over time (water heater, swimming pool pump, electric vehicle charge, dishwasher, washing machine, etc.) and it takes care of launching them when the power produced is sufficient.

It constantly tries to minimize the import and export of energy by starting, stopping and modifying the power allocated to equipment.

2 types of equipment are managed:

1. equipment controlled by a switch (a service in general) which has a fixed and pre-determined power consumption,
2. equipment whose power consumption is adjustable (Tesla, Robotdyn). By adjusting the power allocated to this equipment, Solar Optimizer aligns consumption as closely as possible with production.

The ideal is to have at least one piece of equipment whose power is adjustable in the list of equipment managed by Solar Optimizer.

How does it work?

The operation is as follows:

1. at regular intervals (configurable), the algorithm simulates modifications to the states of the equipment (on / off / allocated power) and calculates a cost for this configuration. Overall the cost is the $a * imported_power + b * exported_power$. The coefficients a and b are calculated according to the cost of electricity at the time of calculation,
2. the algorithm keeps the best configuration (the one with a minimum cost) and looks for other solutions, until a minimum is reached.
3. the best configuration is then applied.

The algorithm used is a simulated annealing type algorithm, a description of which you will find here:

https://fr.wikipedia.org/wiki/Recuit_simul%C3%A9

Anti-flickering

To avoid the effects of flickering from one cycle to another, a minimum activation delay can be configured by equipment: `duration_min`. For example: a water heater must be activated for at least one hour for the ignition to be useful, charging an electric car must last at least two hours, ... Similarly, a minimum stop duration can be specified in the `duration_stop_min` parameter.

Usability

Each configured device is associated with a switch-type entity that authorizes the algorithm to use the device. If I want to force the heating of the hot water tank, I put its switch to off. The algorithm will therefore not look at it, the water heater switches back to manual, not managed by Solar Optimizer.

In addition, it is possible to define a usability rule for equipment. For example, if the car is charged at more than 90%, the algorithm considers that the equipment which controls the charging of the car must be switched off. This rule is defined in the form of a configurable template which is True if the equipment is usable.

If a battery is specified when configuring the integration and if the threshold `battery_soc_threshold` is specified, the equipment will only be usable if the soc (percentage of battery charge) is greater than or equal to the threshold.

These 3 rules allow the algorithm to only order what is really useful at a given time. These rules are re-evaluated each cycle.

How do we install it?

HACS installation (recommended)

1. Install [HACS](#). This way you get updates automatically.
2. Add this Github repo as a custom repo in HACS settings.
3. Find and install "Solar Optimizer" in HACS and click "Install".
4. Restart Home Assistant.
5. Then you can add the Solar Optimizer integration in the integration page. You can only install one Solar Optimizer integration.

Manual Install

Manual installation is possible. It is not recommended and therefore it will not be described here.

The configuration

Configure integration

When adding the Solar Optimizer integration, the following settings page opens:

You must specify:

1. the sensor which gives the instantaneous net consumption of the dwelling (it must be negative if production exceeds consumption). This figure is indicated in Watt,
2. the sensor which gives the instantaneous photovoltaic production in Watt too,
3. a sensor or input_number which gives the cost of the imported kwh,
4. a sensor or input_number which gives the price of the exported kwh (depends on your contract),
5. a sensor or input_number which gives the applicable tax on the exported kwh (depends on your contract)

These 5 pieces of information are necessary for the algorithm to work, so they are all mandatory. The fact that they are sensors or input_number allows to have values that are re-evaluated at each cycle. Consequently, switching to off-peak hours can modify the calculation and therefore the states of the equipment since the import becomes less expensive. So everything is dynamic and recalculated at each cycle.

Configure equipment

Controllable devices are defined in the configuration.yaml file as follows:

- add the following line in your configuration.yaml:

```
solar_optimizer: !include solar_optimizer.yaml
```

- and create a file at the same level as the configuration.yaml with the following information:

```
algorithm:
  initial_temp: 1000
  min_temp: 0.1
  cooling_factor: 0.95
  max_iteration_number: 1000
devices:
  - name: "<equipment name>"
    entity_id: "switch.xxxxx"
    power_max: <max power consumed>
    check_usable_template: "{{ <the template which is True if the equipment is usable> }}"
    duration_min: <the minimum activation duration in minutes>
    duration_stop_min: <minimum stop duration in minutes>
    action_mode: "service_call"
    activation_service: "<service name>"
    deactivation_service: "<service name>"
    battery_soc_threshold: 30
```

Note: parameters under `algorithm` should not be touched unless you know exactly what you are doing.

Under `devices` you must declare all the equipment that will be controlled by Solar Optimizer as follows:

attribute	valid for	meaning	example	comment
<code>name</code>	all	The name of the equipment	"VMC basement"	-
<code>entity_id</code>	all	the entity id of the equipment to order	"switch.vmc_basement"	-
<code>power_max</code>	all	the maximum power consumed by the equipment	250	-
<code>check_usable_template</code>	all	A template that is True if the equipment can be used by Solar Optimizer	"{{ is_state('cover.porte_garage_garage', 'closed') }}"	In the example, Sonar Optimizer will not try to control the "VMC basement" if the garage door is open
<code>duration_min</code>	all	The minimum duration in minutes of activation	60	The basement VMC will always turn on for at least one hour

attribute	valid for	meaning	example	comment
<code>duration_stop_min</code>	all	The minimum duration in minutes of deactivation. Is <code>duration_min</code> if not specified	15	The basement VMC will always turn off for at least 15 min
<code>action_mode</code>	all	the mode of action for turning the equipment on or off. Can be "service_call" or "event" (*)	"service_call"	"service_call" indicates that the equipment is switched on and off via a service call. See below. "event" indicates that an event is sent when the state should change. See (*)
<code>activation_service</code>	only if <code>action_mode="service_call"</code>	the service to be called to activate the equipment in the form "domain/service"	"switch/turn_on"	activation will trigger the "switch/turn_on" service on the entity "entity_id"
<code>deactivation_service</code>	only if <code>action_mode="service_call"</code>	the service to call to deactivate the equipment in the form "domain/service"	"switch/turn_off"	deactivation will trigger the "switch/turn_off" service on the entity "entity_id"
<code>battery_soc_threshold</code>	tous	minimal percentage of charge of the solar battery to enable this device	30	

For variable power equipment, the following attributes must be valued:

attribute	valid for	meaning	example	comment
<code>power_entity_id</code>	variable power equipment	the <code>entity_id</code> of the entity managing the power	<code>number.tesla_charging_amps</code>	The power change will be done by calling the <code>change_power_service</code> service on this entity
<code>power_min</code>	variable power equipment	The minimum power in watts of the equipment	100	When the power setpoint falls below this value, the equipment will be switched off by calling the <code>deactivation_service</code>
<code>power_step</code>	variable power equipment	The power step	10	-
<code>change_power_service</code>	variable power equipment	Service called to change power	"number/set_value"	-
<code>convert_power_divide_factor</code>	variable power equipment	The divisor applied to convert power to value	50	In the example, the "number/set_value" service will be called with the <code>power setpoint / 50</code> on the entity <code>entity_id</code> . For a Tesla on a three-phase electrical installation this parameter should be set to 660 (220 x 3), to convert power to amperes. For mono-phase installation, set it to 220.

Complete and commented example of the device part:

```

devices:
  - name: "Reservoir pump"
    # The switch that controls the tank pump

```



```

entity_id: "switch.tank_pump_socket"
# the power of this pump
power_max: 170
# Always usable
# check_usable_template: "{{ True }}"
# 15 min minimum activation
duration_min: 15
# 5 min deactivation minimum
duration_stop_min: 5
# On enable/disable via a service call
action_mode: "service_call"
# The service enabling the switch
activation_service: "switch/turn_on"
# The service to deactivate the switch
deactivation_service: "switch/turn_off"
# We authorize the pump to start if there is 10% battery in the solar installation
battery_soc_threshold: 10

- name: "Tesla Recharge"
entity_id: "switch.cloucloute_charger"
# The minimum load power is 660 W (i.e. 1 Amp because convert_power_divide_factor=660 too)
power_min: 660
# The minimum load power is 3960 W (i.e. 5 Amp (= 3960/600) )
power_max: 3960
# the step of 660 or 1 Amp after division by convert_power_divide_factor
power_step: 660
# Usable if the charging mode is "Solar" and the car is plugged into the charger and it is charged at less
than 90% (so it stops by itself at 90%)
check_usable_template: "{{ is_state('input_select.charge_mode', 'Solar') and
is_state('binary_sensor.tesla_wall_connector_vehicle_connected', 'on') and is_state('binary_sensor.tesla_charger',
'on') and states('sensor.tesla_battery ') | float(100) < states('number.cloucloute_charge_limit') | float(90) }}"
# 1 hour minimum charge
duration_min: 60
# 15 min minimum stop charge
duration_stop_min: 15
# The entity that drives the load amperage
power_entity_id: "number.tesla_charging_amps"
# 5 min minimum between 2 power changes
duration_power_min: 5
# activation is done by a service call
action_mode: "service_call"
activation_service: "switch/turn_on"
deactivation_service: "switch/turn_off"
# the power change is done by a service call
change_power_service: "number/set_value"
# the factor used to convert the set power into Amps (number.tesla_charging_amps takes Amps)
convert_power_divide_factor: 660
# We do not start a charge if the battery of the solar installation is not at least 50% charged
battery_soc_threshold: 50
...

```

Any change in the configuration requires a stop / restart of the integration (or of Home Assistant) to be taken into account.

Available entities

The integration, once properly configured, creates a device that contains several entities:

1. a sensor named "total_power" which is the total of all the powers of the equipment controlled by Solar Optimizer,
2. a sensor named "best_objective" which is the value of the cost function (see how the algorithm works),
3. a switch per equipment named `switch.enable_solar_optimizer_<name>` declared in the configuration.yaml. If the switch is "Off", the algorithm will not consider this equipment for the calculation. This allows you to manually remove equipment from the list without having to modify the list. This switch contains additional attributes which make it possible to follow the internal state of the equipment seen by the algorithm.

In addition

In addition, the following Lovelace code is used to control each declared device:

```

# To put at the beginning of the front-end page
decluttering_templates:
  managed_device_power:
    default: null
    card:
      type: custom:expander-card
      expanded: false
      title-card-button-overlay: true
      title-card:
        type: custom:mushroom-template-card
        primary: "{{ state_attr('[[device]]', 'friendly_name') }}"
        secondary: "[[secondary_infos]]"
        icon: "[[icon]]"
        badge_icon: >-
          {% if is_state_attr('[[device]]', 'is_enabled', True) %}mdi:check{%
          else %}mdi:cancel{% endif %}
        badge_color: >-
          {% if is_state_attr('[[device]]', 'is_usable', True) and
          is_state_attr('[[device]]', 'is_enabled', True) %}green {% elif
          is_state_attr('[[device]]', 'is_enabled', False) %}red {% elif
          is_state_attr('[[device]]', 'is_waiting', True) %}orange {% elif

```



```

    is_state_attr('[[device]]', 'is_usable', False) or
    state_attr('[[device]]', 'is_usable') is none %}#A0B0FF{% else
    %}blue{% endif %}
entity: "[[device]]"
icon_color: >-
    {% if is_state('[[device]]', 'on')%}orange{% else %}lightgray{% endif
    %}
tap_action:
    action: toggle
hold_action:
    action: more-info
double_tap_action:
    action: none
cards:
- type: custom:mushroom-chips-card
  chips:
    - type: entity
      entity: "[[enable_entity]]"
      double_tap_action:
        action: more-info
      tap_action:
        action: toggle
      hold_action:
        action: more-info
      icon_color: green
      content_info: name
    - type: markdown
      content: >-
        **Prochaine dispo** : {{ ((as_timestamp(state_attr('[[device]]',
        'next_date_available')) - as_timestamp(now())) / 60) | int }}
        min<br> **Prochaine dispo puissance** : {{
        ((as_timestamp(state_attr('[[device]]',
        'next_date_available_power')) - as_timestamp(now())) / 60) | int }}
        min<br> **Utilisable** : {{ state_attr('[[device]]', 'is_usable')
        }}<br> **Est en attente** : {{ state_attr('[[device]]',
        'is_waiting') }}<br> **Puissance requise** : {{
        state_attr('[[device]]', 'requested_power') }} W<br> **Puissance
        courante** : {{ state_attr('[[device]]', 'current_power') }} W
        title: Infos
managed_device:
default: null
card:
type: custom:expander-card
expanded: false
title-card-button-overlay: true
title-card:
type: custom:mushroom-template-card
primary: "{{ state_attr('[[device]]', 'friendly_name') }}"
secondary: >-
    [[secondary_infos]] (max. {{ state_attr('[[device]]', 'power_max') }}
    W)
icon: "[[icon]]"
badge_icon: >-
    {% if is_state_attr('[[device]]', 'is_enabled', True) %}mdi:check{%
    else %}mdi:cancel{% endif %}
badge_color: >-
    {% if is_state_attr('[[device]]', 'is_usable', True) and
    is_state_attr('[[device]]', 'is_enabled', True) %}green {% elif
    is_state_attr('[[device]]', 'is_enabled', False) %}red {% elif
    is_state_attr('[[device]]', 'is_waiting', True) %}orange {% elif
    is_state_attr('[[device]]', 'is_usable', False) or
    state_attr('[[device]]', 'is_usable') is none %}#A0B0FF{% else
    %}blue{% endif %}
entity: "[[device]]"
icon_color: >-
    {% if is_state('[[device]]', 'on')%}orange{% else %}lightgray{% endif
    %}
tap_action:
    action: toggle
hold_action:
    action: more-info
double_tap_action:
    action: none
cards:
- type: custom:mushroom-chips-card
  chips:
    - type: entity
      entity: "[[enable_entity]]"
      double_tap_action:
        action: more-info
      tap_action:
        action: toggle
      hold_action:
        action: more-info
      icon_color: green
      content_info: name
    - type: markdown
      content: >-
        **Prochaine dispo** : {{ ((as_timestamp(state_attr('[[device]]',
        'next_date_available')) - as_timestamp(now())) / 60) | int }}
        min<br> **Utilisable** : {{ state_attr('[[device]]', 'is_usable')
        }}<br> **Est en attente** : {{ state_attr('[[device]]',
        'is_waiting') }}<br> **Puissance requise** : {{
        state_attr('[[device]]', 'requested_power') }} W<br> **Puissance
        courante** : {{ state_attr('[[device]]', 'current_power') }} W
enable_template:

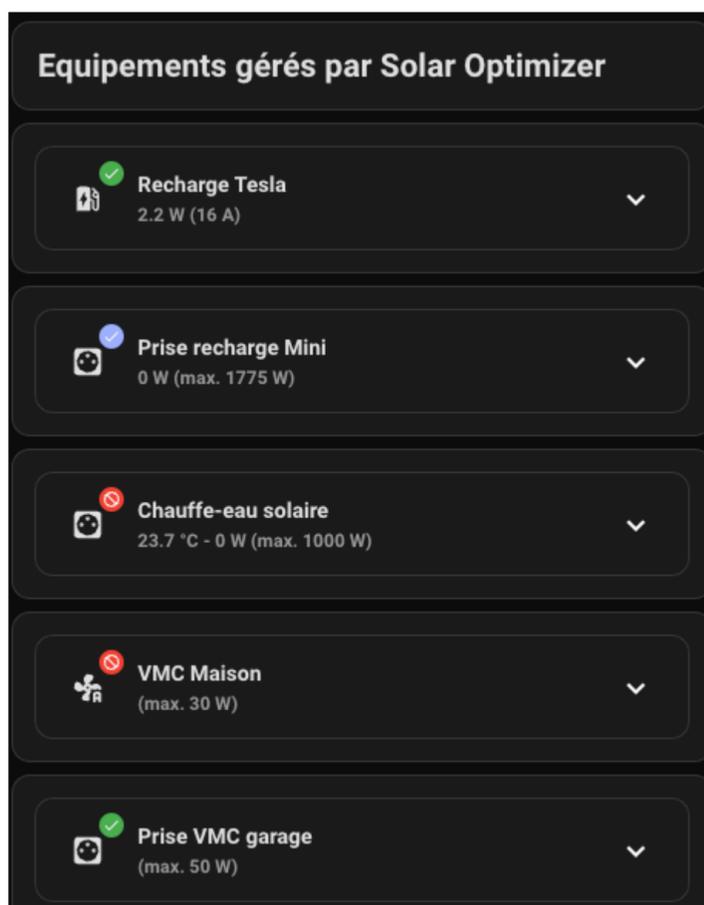
```

```
default: null
card:
  type: custom:mushroom-chips-card
  chips:
    - type: entity
      entity: '[[enable_entity]]'
      double_tap_action:
        action: more-info
      tap_action:
        action: toggle
      hold_action:
        action: more-info
      icon_color: green
      content_info: none
```

then use as follows:

```
- type: vertical-stack
  cards:
    - type: custom:decluttering-card
      template: managed_device_power
      variables:
        - device: switch.solar_optimizer_recharge_tesla
        - secondary_infos: >-
            {{ states('sensor.total_puissance_instantanee_twc_w') }} W
            ({{ states('number.tesla_charging_amps')}} A)
        - icon: mdi:ev-station
        - enable_entity: switch.enable_solar_optimizer_recharge_tesla
    - type: custom:decluttering-card
      template: managed_device
      variables:
        - device: switch.solar_optimizer_prise_recharge_voiture_garage
        - secondary_infos: '{{ states('sensor.prise_garage_voiture_power') }} W'
        - icon: mdi:power-socket-fr
        - enable_entity: >-
            switch.enable_solar_optimizer_prise_recharge_voiture_garage
```

You will then get a component to interact with the equipment that looks like this:



Contributions are welcome!