

**iMaster NetEco  
V600R023C00**

# **Northbound Interface Reference- V7(SmartPVMS)**

**Issue**                    01  
**Date**                    2023-01-19



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# About This Document

## Purpose

This document provides auxiliary description for the northbound interface (NBI) function of the Smart PV Management System (SmartPVMS). This document describes the design and usage of the NBIs, and how authorized third-party users (applications) use the interfaces to obtain data within the authorization scope. In addition, it describes the function, URL, parameter format, and usage of each interface for third-party users to obtain related data.





## Intended Audience

This document is intended for:

- Development engineers
- Technical support engineers
- Maintenance engineers

## Symbol Conventions

The symbols that may be found in this document are defined as follows.

| Symbol  | Description   |
|---|---|
|  | Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.   |
|  | Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.  |
|  | Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.  |
|  | Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results.<br>NOTICE is used to address practices not related to personal injury. |

| Symbol | Description  |
|--------|--|
| ☐ NOTE | Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration. |

## Change History

| Issue | Release Date | Description                               |
|-------|--------------|---|
| 01    | 2023-01-19   | This issue is the first official release. |

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# 1 Overview

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## 1.1 Interface Description

### RESTful NBIs

RESTful NBIs are open interfaces based on the Representational State Transfer (REST) standard, facilitating quick integration of third-party systems.

Third-party systems can use RESTful NBIs to access the resources authorized by the SmartPVMS, such as access authentication, configuration, alarm, and performance data.

Interfaces can be used only after authorization and the access is secure. Only HTTPS access is supported.

The JavaScript Object Notation (JSON) data format is used for data interaction. The data format is simple, easy to read and write, and occupies less network traffic than XML.

### Application Scenario

The NBI is an open authentication mode. It uses asymmetric encryption technology to authenticate users, obtain resources, and share data between different platforms, enterprises, and entities.

To use the V7 interface, contact Huawei technical support engineers.

Currently, the NBI is open only to the company administrator. A maximum of five northbound accounts can be created. Owners cannot apply for northbound accounts.

#### NOTE

An installer account registered through **Installer Registration** on the login page is called the company administrator account.



## Interface Traffic Limiting

The system provides the interface traffic limiting mechanism to prevent system performance deterioration caused by improper interface invoking.

For example, the number of traffic limiting times for each northbound user is five times every 10 minutes. That is, each northbound user can invoke the login interface for a maximum of five times every 10 minutes. If the maximum number is exceeded, the interface cannot be invoked and error code 407 is returned.

---

### NOTICE

The traffic limiting mechanism may be modified without notice as the system evolves in the future. Users can obtain the latest interface documentation to view the mechanism.

---

## What Is REST?

REST, short for Representational State Transfer, is a design and development mode for network applications. It simplifies development and improves system scalability.

REST uses resources as its core, and resources are uniquely identified by a uniform resource identifier (URI), for example, `/rest/openapi/pvms/v1/plants`.

REST uses four types of standard operations to access resources: POST, GET, PUT, and DELETE.

- POST: creates resources.
- GET: queries resources.
- PUT: updates resources.
- DELETE: deletes resources.

The SmartPVMS provides external services using URIs. Users obtain SmartPVMS resources through URIs and obtain services.

## HTTP Status Codes

The first line of all HTTP responses is the status line, which contains the current HTTP version number, the status code consisting of three digits, and the phrase that describes the status, which are separated by spaces.

The first digit of the status code indicates the type of the current response.

- 1xx message: The request has been received by the server and continues to be processed.
- 2xx success: The request has been received, understood, and accepted by the server.
- 3xx redirection: This request can be completed only after subsequent operations are performed.
- 4xx request error: The request contains a syntax error or cannot be executed.

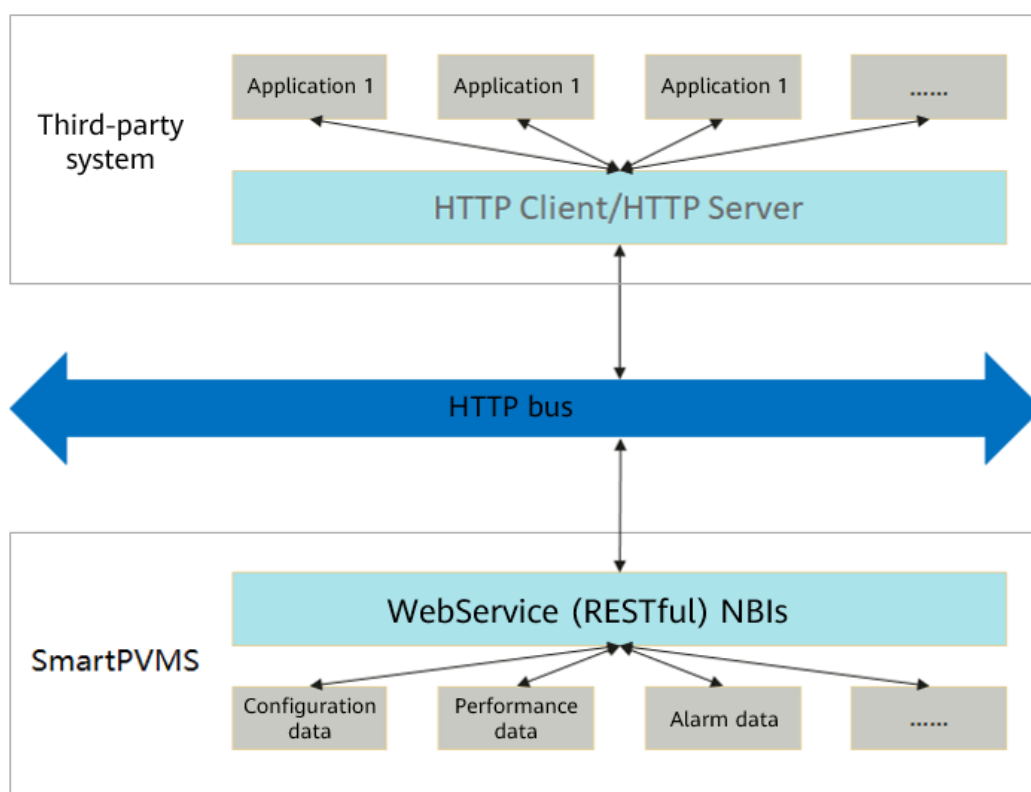
- 5xx server error: An error occurs when the server processes a correct request.

## 1.2 Interface Architecture

### Interface Architecture

The SmartPVMS provides a set of WebService interfaces for third-party systems and third-party developers, who can construct HTTPS requests to invoke APIs and obtain SmartPVMS resources and data.

Figure 1-1 WebService NBI architecture



## 1.3 Interconnection Method

### Access Format and Path

Access format: *https://Domain name of the management system:27200/specific API name+request parameter*

### Access Permission

The northbound API access permission must be applied for separately and assigned by the administrator. Perform the following steps:

- Step 1** Choose **System > Business Configuration > Northbound Management** from the main menu.

- Step 2** On the **Northbound Management** page, click **Add**.
- Step 3** On the displayed **Add** tab page, set basic information such as the system name, deadline, user name, and password.
- Step 4** Select the **Plant list** interface from the interface list, select the plant associated with the user, and bind the plant instance that the northbound API user has access to.
- Step 5** (Optional) Select the **Device list** interface from the interface list, select the device associated with the user, and bind the device instance that the northbound API user has access to.
- Step 6** (Optional) Select other interfaces from the interface list and select the required information as prompted.
- Step 7** Click **OK** to save the settings.

----End

## Traffic Limiting Policy

The number of northbound API users and the number of plants and devices managed by each northbound API user are increasing. To better meet user requirements, the northbound API traffic limiting policy is adjusted. The new traffic limiting policy dynamically limits the traffic based on the number of resources owned by northbound API users. A user who manages a larger number of plants and devices is allowed to initiate more northbound API calls in a unit time.

**Existing users:** For northbound API users created on June 30, 2022 or earlier, the original traffic limiting policy applies, and the allowed frequency of API calls cannot be increased.

**New users:** For northbound API users created after June 30, 2022, the new traffic limiting policy applies. If a user exceeds the allowed frequency of API calls defined in the new traffic limiting policy, rate limiting is performed, the API calls may fail, and the consequences shall be borne by the user.

To avoid improper API calls, a rate limiting threshold is configured. If the threshold is exceeded, an error message is returned, and the API call is blocked.

In this case, adjust your API call frequency based on the error code. Huawei shall not bear any responsibilities or consequences.

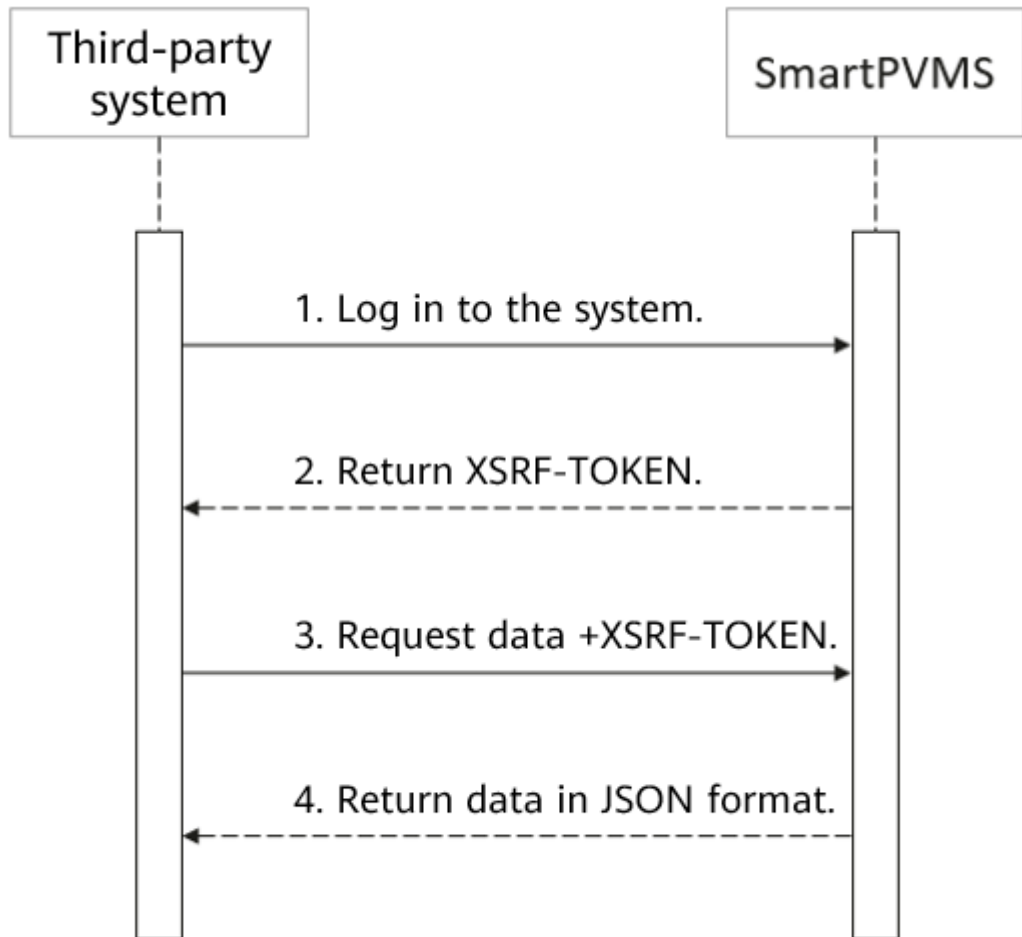
The system has two traffic limiting-related error messages:

**Error code 407:** The number of API calls of a single user exceeds the upper limit. For details about the limits on API calls, see "Access Restrictions" in the corresponding interface description. When this message is returned by an API, lower your frequency of calls to this API until the frequency drops to the allowed range.

**Error code 403 or 429:** When a large number of users initiate calls to the same API, the total number of calls to the API exceeds the upper limit at the system level. If this error message is received, wait for 1 minute and try again. If the error persists, wait for a longer time and try again. You can also minimize the number of calls.

## Communication Between a Third-party System and the SmartPVMS

Figure 1-2 Communication between a third-party system and the SmartPVMS



### NOTE

1. After the third-party system information is configured on the management system, use the username and password to log in to the management system from the third-party system.
2. After successful login, send requests to obtain data.
3. XSRF-TOKEN is a cross-site request token. After a user logs in to the system using the username and password, the system returns this token to the user. If the user adds the token to a subsequent request, it indicates that the request is initiated by a logged-in user.

## 1.4 Interface Change Description

- All new and modified APIs are described in the change description.
- APIs that are reaching the end of lifecycle will be declared in this document so that you can be prepared.

- New northbound users cannot invoke the APIs whose end-of-lifecycle is declared in this document. Otherwise, an error will be returned during the system upgrade.

# 2 Changes from iMaster NetEco V600R023C00SPC110 to iMaster NetEco V600R023C00SPC210

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## 2.1 New Interfaces

| Interface Name                                  | Interface Method and Path   | Description  |
|---|---|--|
| Loss Data                                       | https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/scanTask/pvResultList      | Queries the string diagnosis result and loss data based on the task ID.  |
| Interface for Delivering the Plant Default Task | https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/plantDefaultSetting       | Delivers tasks by default based on the plant code.   |
| Interface for Querying the Plant Default Task   | https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/plantDefaultSettingStatus | Queries the current execution status of a default task based on the task ID and plant code.                          |
| Interface for Querying Rated Plant Data         | https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/plantRatedData            | Queries the rated power of a plant based on the plant code.  |
| Interface for Querying Plant DRM Settings       | https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/drmStatus                 | Queries the current execution status of the plant DRM setting task based on the task ID corresponding to each plant. |

## 2.2 Deleted Interfaces

None

## 2.3 Modified Interfaces

None

# **3** Changes from iMaster NetEco V600R023C00SPC001 to iMaster NetEco V600R023C00SPC110

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## **3.1 New Interfaces**

None

## **3.2 Deleted Interfaces**

None

## **3.3 Modified Interfaces**

None



# **4** Changes from iMaster NetEco V600R022C00CP1202 to iMaster NetEco V600R023C00SPC001

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## **4.1 New Interfaces**

None

## **4.2 Deleted Interfaces**

None

## **4.3 Modified Interfaces**

None

# 5 Changes from iMaster NetEco V600R022C00 to iMaster NetEco V600R022C00CP1202

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## 5.1 New Interfaces

| Interface Name                  | Interface Method and Path   | Description   |
|---------------------------------|---|---|
| Historical Plant Data Interface | https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/plantHistoryKpi | Obtains 5-minute statistical counters of multiple plants. |

## 5.2 Deleted Interfaces

None

## 5.3 Modified Interfaces

| Interface Name                          | Interface Method and Path  | Description  |
|---|--|--|
| Interface for Power Plant List Querying | https://Domain name of the management system:27200/rest/openapi/pvms/v1/plants | Obtains the plant information corresponding to the plant name. |

# 6 Changes from V600R021C10 to V600R021C10SPC010

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## 6.1 New Interfaces

None.

## 6.2 Deleted Interfaces

None.

## 6.3 Modified Interfaces

The V6 query interface of device data supports LUNA 2000 residential battery and C&I, Utility ESS. The involved interfaces are as follows:

| Interface Name                  | Interface Method and Path   | Description  |
|---------------------------------|---|--|
| Real-Time Device Data Interface | https://Domain name of the management system/thirdData/getDevRealKpi              | Deleted "only LG batteries are supported" because devices of ID 39 support LUNA 2000. Added 41 device types to support C&I, Utility ESS. |
| 5-minute Device Data Interface  | https:// <i>Domain name of the management system</i> /thirdData/getDevFiveMinutes | Deleted "only LG batteries are supported" because devices of ID 39 support LUNA 2000. Added 41 device types to support C&I, Utility ESS. |

| Interface Name                | Interface Method and Path  | Description  |
|-------------------------------|--|--|
| Daily Device Data Interface   | https:// <i>Domain name of the management system</i> /thirdData/getDevKpiDay   | Deleted "only LG batteries are supported" because devices of ID 39 support LUNA 2000. Added 41 device types to support C&I, Utility ESS. |
| Monthly Device Data Interface | https:// <i>Domain name of the management system</i> /thirdData/getDevKpiMonth | Deleted "only LG batteries are supported" because devices of ID 39 support LUNA 2000. Added 41 device types to support C&I, Utility ESS. |
| Yearly Device Data Interface  | https:// <i>Domain name of the management system</i> /thirdData/getDevKpiYear  | Deleted "only LG batteries are supported" because devices of ID 39 support LUNA 2000. Added 41 device types to support C&I, Utility ESS. |

# **7** Changes from iMaster NetEco V600R022C00 to SmartPVMS V600R021C10SPC010

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## **7.1 New Interfaces**

None.

## **7.2 Deleted Interfaces**

None.

## **7.3 Modified Interfaces**

None

# 8 Changes from V500R007C00SPC200 to V600R021C10

## 8.1 New Interfaces

| Interface Name                              | Interface Method and Path   | Description   |
|---|---|---------------|
| Interface for Task List Querying            | POST https:// <i>Domain name of the management system</i> :27200/rest/openapi/pvms/v1/iv/tasks                      | New interface |
| Interface for Creating Diagnosis Tasks      | POST https://https:// <i>Domain name of the management system</i> :27200/rest/openapi/pvms/v1/iv/scanTask           | New interface |
| Interface for Canceling Diagnosis Tasks     | POST https://https:// <i>Domain name of the management system</i> :27200/rest/openapi/pvms/v1/iv/vokeTask           | New interface |
| Interface for Querying Task Status          | POST https://https:// <i>Domain name of the management system</i> :27200/rest/openapi/pvms/v1/iv/scanTask/status    | New interface |
| Interface for Fault List Querying           | POST https://https:// <i>Domain name of the management system</i> :27200/rest/openapi/pvms/v1/iv/scanTask/faultList | New interface |
| Interface for I-V Curve Details Querying    | POST https://https:// <i>Domain name of the management system</i> :27200/rest/openapi/pvms/v1/iv/scanTask/ivdata    | New interface |
| Interface for String Configuration Querying | POST https://https:// <i>Domain name of the management system</i> :27200/rest/openapi/pvms/v1/iv/pvConfig           | New interface |

| Interface Name                             | Interface Method and Path  | Description   |
|--|--|---------------|
| Interface for String Details Querying      | POST https://https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/pvConfig/detail          | New interface |
| Interface for String Details Configuration | POST https://https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/pvConfig/configuration   | New interface |
| Interface for PV Module Library Querying   | POST https://https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/pvConfig/modules         | New interface |
| Interface for PV Module Details Querying   | POST https://https:// <i>Domain name of the management system</i> :27200/rest/openapi/pvms/v1/iv/pvConfig/module | New interface |

## 8.2 Deleted Interfaces

None.

## 8.3 Modified Interfaces

None.

# 9 V7 Interface Reference

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## 9.1 Security Management Interfaces

### 9.1.1 Login Interface

#### Interface Description

This is the login interface for northbound management. You must log in to the system through the login interface before obtaining data. Contact Huawei technical support engineers to obtain the login user name and password.

#### Request URL

*https://Domain name of the management system:27200/rest/openapi/pvms/v1/login*

#### Request Mode

HTTP method: POST

#### Interface Invoking Suggestion

Each time you successfully log in to the system through this interface, a new XSRF-TOKEN message is returned, consuming a client login resource. The idle timeout interval of the XSRF-TOKEN message is 30 minutes. Therefore, if you need to reinvoke the Webservice interface for multiple times within 30 minutes, reuse XSRF-TOKEN. If XSRF-TOKEN is invalid, error 305 is returned.

If a user enters incorrect passwords for five consecutive times within 10 minutes, the user will be locked out for 30 minutes.

Number of traffic limiting times for each northbound user: five times every 10 minutes.

If the access frequency exceeds the limit, the interface returns error code 407.



## Request Parameters

| Parameter | Description                         | Data Type | Mandatory/Optional |
|-----------|-------------------------------------|-----------|--------------------|
| username  | User name of the third-party system | String    | Mandatory          |
| password  | Password of the third-party system  | String    | Mandatory          |

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional message  | String    | -                               |

### NOTICE

The header of the login success response contains the XSRF-TOKEN that must be retained. In subsequent data interface requests, this parameter and its value must be added to the request header and sent to the management system.

```

▼ Response Headers view source
access-control-allow-origin: *
Connection: keep-alive
content-encoding: gzip
Content-Type: application/json;charset=UTF-8
Date: Tue, 05 Jan 2021 12:41:39 GMT
Server: product only
set-cookie: JSESSIONID=42E06B57DCAB625E768CF58C3051F0A6; Path=/; Secure; HttpOnly,XSRF-TOKEN=x-9hrxi7xc62ksbpd809bvo908kc85h3uekgapfmmr45fzukaq1falk71d7vmkqks811c6s406pi
g4erlpk5ap61ddc7511ds73ydc1i3ucbe17ujzqq9jfwk5u1vu
strict-transport-security: max-age=31536000; includeSubDomains
Transfer-Encoding: chunked
x-content-type-options: nosniff
x-download-options: noopen
x-frame-options: SAMEORIGIN
x-xss-protection: 1; mode=block
xsrftoken: x-9hrxi7xc62ksbpd809bvo908kc85h3uekgapfmmr45fzukaq1falk71d7vmkqks811c6s406pi

```

## Example

Request example:

```
{  
  "username": "admin4",  
  "password": "Admin@1234"  
}
```

Response example:

Example 1: successful login

```
{  
  "success": true,  
  "failCode": 0,  
  "message": null  
}
```

Example 2: failed login

```
{  
  "failCode": 20001,  
  "message": "",  
  "success": false  
}
```

---

#### NOTICE

- The header of the login success response contains the XSRF-TOKEN that must be retained. In subsequent data interface requests, this parameter and its value must be added to the request header and sent to the management system.
  - The validity period of XSRF-TOKEN is 30 minutes. The time starts when the system receives the last interaction request.
- 

## 9.1.2 Logout Interface

### Interface Description

This is the interface used to log out a northbound user.

### Request URL

`https://Domain name of the management system:27200/rest/openapi/pvms/v1/logout`

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

If the XSRF-TOKEN is not used for a long time, you can invoke this interface to release the XSRF-TOKEN.

Number of traffic limiting times for each northbound user: five times every 10 minutes.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter | Description   | Data Type | Mandatory/Optional |
|-----------|---|-----------|--------------------|
| xsrftoken | XSRF-TOKEN returned in the response header after a third-party system successfully logs in through the login interface. | String    | Mandatory          |

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional message  | String    | -                               |

## Example

Request URL example:

```
{
  "xsrftoken": "x-
apepy1fpd2ptete1f7zuqimep7wuqen9hkb3xaourelbyrx9jio7s09hgk6ca2mdlksjdgldshjaklsdfhhdshahwedyuio
qwehjkd"
}
```

Response example:

Example 1: successful logout

```
{
  "success": true,
  "failCode": 0,
  "message": null
}
```

Example 2: failed logout

```
{
  "success": false,
```

```
"failCode": 20004,  
"message": null  
}
```

## 9.2 Configuration Management Interfaces

### 9.2.1 Interface for Power Plant List Querying

#### Interface Description

This interface is used to obtain the basic information about a power plant. Before opening other interfaces, you need to configure this interface.

#### Request URL

`https://Domain name of the management system/rest/openapi/pvms/v1/plants`

#### Request Mode

HTTP method: POST

#### Interface Invoking Suggestion

Number of traffic limiting times for each northbound user per day = Roundup  
(Number of plants/50) x 10 + 24

Only one concurrent request is supported per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

Example:

If a northbound user manages 20 plants: Number of traffic limiting times per day  
= Roundup (20/50) x 10 + 24 = 1 x 10 + 24 = 34

If a northbound user manages 120 plants: Number of traffic limiting times per day  
= Roundup (120/50) x 10 + 24 = 3 x 10 + 24 = 54

#### Request Parameters

| Parameter | Description             | Data Type | Mandatory/Optional   |
|-----------|-------------------------|-----------|--|
| pageNo    | Page No. of the results | Integer   | Optional. This parameter is mandatory when <b>plantNames</b> is empty. |

| Parameter  | Description  | Data Type | Mandatory/Optional   |
|------------|--|-----------|--|
| pageSize   | Number of results on each page. The value can be <b>50</b> or <b>100</b> .   | Integer   | Optional. This parameter is mandatory when <b>plantNames</b> is empty. |
| plantNames | Plant name. Multiple plant names are separated by commas (.). A maximum of 100 plant names are supported. Obtains the plant information corresponding to the plant name. | String    | Optional. This parameter is mandatory when <b>pageNo</b> is empty.     |

 **NOTE**

- After the plant list is obtained and the page No. and number of results or plant names on each page are specified, the backend obtains the plant resources of the user. If the returned data is incomplete, contact Huawei engineers to check whether the user is bound.
- The VPP user can register and bind a PV plant through the registration interface.
- Only logged-in users can obtain the plant list.
- This interface does not need to be invoked each time. It is recommended that the third-party system obtain the PV plant list once a day, update the PV plant list, and save the list to the third-party system.
- Deleted PV plants will not be displayed.

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional response message   | -         | -                               |

| Parameter             | Description  | Data Type | Remarks                   |
|-----------------------|--|-----------|---------------------------|
| data                  | Returned data, which contains the following information:                                   | Map       | -                         |
| > total               | Total number of results  | Long      | -                         |
| > pageCount           | Total number of pages  | Long      | -                         |
| > pageNo              | Page No. of the results  | Integer   | -                         |
| > pageSize            | Number of query results displayed on each page   | Integer   | -                         |
| > list                | Plant information list. The plant information is as follows:                               | List      | Plant information         |
| >> plantCode          | Plant ID, which uniquely identifies a plant.   | String    | -                         |
| >> plantName          | Plant name   | String    | -                         |
| >> plantAddress       | Detailed address of the plant  | String    | -                         |
| >> longitude          | Plant longitude  | Double    | -                         |
| >> latitude           | Plant latitude   | Double    | -                         |
| >> capacity           | Total string capacity  | Double    | kWp                       |
| >> contactPerson      | Plant contact  | String    | -                         |
| >> contactMethod      | Contact information of the plant contact, such as the mobile phone number or email address | String    | -                         |
| >> gridConnectionDate | Grid connection time of the plant, including the time zone                                 | String    | 2020-02-06T00:00:00+08:00 |

## Example

Request example:

```
{
  "pageNo": 1,
  "pageSize": 10,
  "plantNames": ""
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20004,
  "message": null
}
```

Example 2: The plant list is returned.

```
{
  "success": true,
  "data": {
    "list": [
      {
        "plantCode": "NE=12345678",
        "plantName": "NMplant1",
        "plantAddress": null,
        "longitude": null,
        "latitude": null,
        "capacity": 146.5,
        "contactPerson": "",
        "contactMethod": "",
        "gridConnectionDate": "2020-02-06T00:00:00+08:00"
      },
      {
        "plantCode": "NE=23456789",
        "plantName": "plant2",
        "plantAddress": null,
        "longitude": null,
        "latitude": null,
        "capacity": 123.3,
        "contactPerson": "",
        "contactMethod": "",
        "gridConnectionDate": "2020-02-06T00:00:00+08:00"
      }
    ],
    "pageCount": 1,
    "pageNo": 1,
    "pageSize": 10,
    "total": 2
  },
  "failCode": 0,
  "message": "get plant list success",
  "success": true
}
```

## 9.2.2 Interface for Device List Querying

### Interface Description

This interface is used to obtain basic device information. Before opening the device data interfaces, you must configure this interface. You can query device information by plant ID. A maximum of 100 plants can be queried at a time.

### Request URL

<https://Domain name of the management system:27200/rest/openapi/pvms/v1/devices>

### Request Mode

HTTP method: POST

## Interface Invoking Suggestion

Number of traffic limiting times for each northbound user per day = Roundup (Number of devices/50) x 10 + 24

Only one concurrent request is supported per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

Example:

If a northbound user manages 20 devices: Number of traffic limiting times per day = Roundup (20/50) x 10 + 24 = 1 x 10 + 24 = 34

If a northbound user manages 120 devices: Number of traffic limiting times per day = Roundup (120/50) x 10 + 24 = 3 x 10 + 24 = 54

## Request Parameters

| Parameter    | Description  | Data Type | Mandatory/Optional  |
|--------------|--|-----------|---|
| plantCodes   | Plant ID list. Plant IDs are separated by commas (,).                      | String    | Mandatory   |
| deviceTypeId | Device type ID. For details, see <a href="#">10 Device Type List</a> .     | Integer   | Optional. When the device type is specified, only devices of the specified type are returned. |
| pageNo       | Page No. of the results  | Integer   | Mandatory   |
| pageSize     | Number of results on each page. The value can be <b>50</b> or <b>100</b> . | Integer   | Mandatory   |

### NOTE

- Input parameters are required to obtain the device list under a plant. The background obtains the device resources of the third-party login user. If the returned data is incomplete, contact Huawei engineers to check whether the third-party user is bound.
- Only logged-in users can obtain the device list.
- This interface does not need to be invoked each time. It is recommended that the third-party system obtain the device list once a day, update the device list, and save the list to the third-party system.



## Response Packet

| Parameter       | Description   | Data Type | Remarks  |
|-----------------|---|-----------|--|
| success         | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag                                      |
| failCode        | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -  |
| message         | Optional message  | String    | -  |
| data            | Returned data, which contains the following information:  | Map       | -  |
| > total         | Total number of results   | Long      | -  |
| > pageCount     | Total number of pages   | Long      | -  |
| > pageNo        | Page No. of the results   | Integer   | -  |
| > pageSize      | Number of query results displayed on each page  | Integer   | -  |
| > list          | Device information list. The device information is as follows:  | List      | Device information   |
| >> plantCode    | Plant ID  | String    | -  |
| >> deviceTypeId | Device type ID. For details, see <a href="#">10 Device Type List</a> .  | Integer   | -  |
| >> dn           | Unique device ID in the system  | String    | -  |
| >> sn           | Device SN   | String    | -  |
| >> deviceName   | Device name   | String    | -  |
| >> dataItemMap  | The content of each data item is returned in the key-value format.<br>Map<String,Object>  | Map       | Basic device information, which varies depending on the device type. |

### Basic Device Information Dataset

| Device Type          | Device Type ID | key            | Item  | Unit       | Return Value Type |
|----------------------|----------------|----------------|---|------------|-------------------|
| MPPT                 | 20811          |                |   |            |                   |
| PV                   | 20812          |                |   |            |                   |
| PV module            | 20813          |                |   |            |                   |
| Optimizer            | 20814          |                |   |            |                   |
| Battery              | 20815          | model          | Battery model   | -          | String            |
|                      |                | ratedCapacity  | Rated capacity (Data of LG batteries cannot be obtained.)     | kWh        | Double            |
|                      |                | usableCapacity | Available capacity (Data of LG batteries cannot be obtained.) | kWh        | Double            |
|                      |                | dod            | Depth of discharge of the battery                             | Percentage | Double            |
| Meter                | 20816          |                |   |            |                   |
| Backup Box           | 20817          |                |   |            |                   |
| Safety box           | 20818          |                |   |            |                   |
| Communication module | 20819          |                |   |            |                   |
| SmartLogger          | 20821          |                |   |            |                   |
| Inverter             | 20822          | model          | Inverter model  | -          | String            |
|                      |                | ratedPower     | Rated power   | kW         | Double            |

| Device Type                         | Device Type ID | key             | Item                   | Unit | Return Value Type |
|-------------------------------------|----------------|-----------------|------------------------|------|-------------------|
|                                     |                | softwareVersion | Software version       | -    | String            |
|                                     |                | optimizerNumber | Quantity of optimizers | -    | Integer           |
| Environmental monitoring instrument | 20824          |                 |                        |      |                   |
| PID                                 | 20825          |                 |                        |      |                   |
| PLC                                 | 20826          |                 |                        |      |                   |
| Central inverter                    | 20827          |                 |                        |      |                   |
| DC combiner box                     | 20828          |                 |                        |      |                   |
| STS                                 | 20829          |                 |                        |      |                   |
| STS meter                           | 20830          |                 |                        |      |                   |
| AC combiner box                     | 20831          |                 |                        |      |                   |
| Communication management unit       | 20833          |                 |                        |      |                   |
| Energy storage container            | 20835          | model           | ESS model              | -    | String            |
|                                     |                | ratedCapacity   | Rated capacity         | kWh  | Double            |
|                                     |                | usableCapacity  | Available capacity     | kWh  | Double            |

## Example

Request example:

```
{
  "plantCodes": "NE=12345678,NE=23456789"
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20007,
  "message": null
}
```

Example 2: The device list is returned.

```
{
  "success": true,
  "data": [
    {
      "plantCode": "NE=12345678",
      "dn": "NE=33333",
      "sn": "5fbfk4",
      "deviceName": "5fbfk4",
      "deviceTypeId": 20822,
      "dataItemMap": {
        "model": "SUN2000L",
        "ratedPower": 12.0,
        "softwareVersion": "V100R001C00SPC333"
      }
    },
    {
      "plantCode": "NE=23456789",
      "dn": "NE=44444",
      "sn": "6fbfk11",
      "deviceName": "6fbfk11",
      "deviceTypeId": 20822,
      "dataItemMap": {
        "model": "SUN2000L",
        "ratedPower": 12.0,
        "softwareVersion": "V100R001C00SPC333"
      }
    }
  ],
  "failCode": 0,
  "message": null
}
```

## 9.3 Interfaces for Virtual Power Plants

The interfaces provide basic plant data query, battery charge/discharge task management, and remote shutdown management capabilities of the virtual power plants (VPPs).

## 9.3.1 Basic Plant Information Interface

### Interface Description

This interface is used to obtain basic plant information based on plant codes. Data of a maximum of 100 plant codes can be queried at a time.

The plant accessed through this interface must be a plant that is successfully registered through the plant registration interface or a plant bound to the system.

### Request URL

`https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/plants`

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Maximum number of northbound API calls per user per day = Roundup (Number of plants/100) x 10 + 24

Only one concurrent request is supported per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

Example:

If a user manages 20 plants, the maximum number of API calls per day = Roundup (20/100) x 10 + 24 = 1 x 10 + 24 = 34.

If a user manages 120 plants, the maximum number of API calls per day = Roundup (120/100) x 10 + 24 = 2 x 10 + 24 = 44.

### Request Parameters

| Parameter  | Description   | Data Type | Mandatory/Optional |
|------------|---|-----------|--------------------|
| plantCodes | Plant code list. Plant codes are separated by commas (,). | String    | Mandatory          |

## Response Packet

| Parameter                | Description   | Data Type | Remarks                         |
|--------------------------|---|-----------|---------------------------------|
| success                  | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag |
| failCode                 | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message                  | Optional message  | String    | -                               |
| data                     | Returned data, which contains all the device data, including the following information:   | List      | Device information              |
| > plantCode              | Plant ID  | String    | -                               |
| > address                | Plant address   | String    | -                               |
| > longitude              | Longitude   | Double    | -                               |
| > <u>latitude</u>        | Latitude  | Double    | -                               |
| > installationTime       | Plant creation time, including the time zone information  | String    | 2020-02-06T00:00:00+08:00       |
| > inverterPower          | Rated power of inverters. If multiple inverters exist, the value is the total rated power of all inverters.                               | Double    | watt                            |
| > capacity               | Installed capacity  | Double    | kWp                             |
| > inverterModel          | Inverter model. If multiple models of inverters exist, the models are separated by commas (,).  | String    | -                               |
| > batteryInstallCapacity | Rated battery capacity. If multiple batteries exist, the value is the total capacity of all batteries.                                    | Double    | kWh                             |

| Parameter               | Description   | Data Type | Remarks |
|-------------------------|---|-----------|---------|
| > batteryUsableCapacity | Available battery capacity (rated battery capacity x SOC x SOH). If multiple batteries exist, the value is the total available capacity of all batteries. | Double    | kWh     |
| > batteryModel          | Battery model. If multiple models of batteries exist, the models are separated by commas (,).   | String    | -       |

## Example

Request example:

```
{
  "plantCodes": "NE=12345678,NE=23456789"
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20007,
  "message": null
}
```

Example 2: The basic plant information is returned.

```
{
  "success": true,
  "data": [
    {
      "plantCode": "NE=12345678",
      "address": "xx Rai Dr, CRESTMEAD QLD xxx",
      "longitude": 153.069656,
      "latitude": -30.689608,
      "installationTime": "2020-02-06T08:10:05+08:00",
      "inverterPower": 5000,
      "pvPower": 7000.05,
      "inverterModel": "SUN2000-17KTL",
      "batteryInstallCapacity": 12.00,
      "batteryUsableCapacity": 12.00,
      "batteryModel": "HUAWEI-LUNA2000"
    },
    {
      "plantCode": "NE=23456789",
      "address": "xx Rai Dr, CRESTMEAD QLD xxxx",
      "longitude": 153.069656,
      "latitude": -30.689608,
      "installationTime": "2020-02-06T08:10:05+08:00",
      "inverterPower": 5000,
      "pvPower": 7000.05,
      "inverterModel": "SUN2000-17KTL",
    }
  ]
}
```

```
"batteryInstallCapacity": 12.00,  
"batteryUsableCapacity": 12.00,  
"batteryModel": "HUAWEI-LUNA2000"  
}  
],  
"failCode": 0,  
"message": null  
}
```

## 9.3.2 Interface for Real-time Plant Data

### Interface Description

This interface is used to obtain the real-time statistics of plants. You can query statistics by plant ID. A maximum of 100 plants can be queried at a time.

The plant accessed through this interface must be a plant that is successfully registered through the plant registration interface or a plant bound to the system.

### Request URL

`https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/plantRealtimeKpi`

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Number of traffic limiting times for each northbound user: Number of traffic limiting times every 5 minutes = Roundup (Number of plants/100).

If the access frequency exceeds the limit, the interface returns error code 407.

Example:

If a northbound user manages 20 plants: Number of traffic limiting times every 5 minutes = Roundup (20/100) = 1

If a northbound user manages 120 plants: Number of traffic limiting times every 5 minutes = Roundup (120/100) = 2

### Request Parameters

| Parameter  | Description  | Data Type | Mandatory/Optional |
|------------|--|-----------|--------------------|
| plantCodes | Plant ID list. Plants are separated by commas (,). | String    | Mandatory          |



## Response Packet

| Parameter     | Description   | Data Type | Remarks                         |
|---------------|---|-----------|---------------------------------|
| success       | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode      | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message       | Optional message  | String    | -                               |
| data          | The returned data includes the real-time data of each plant, including the following information:                                   | List      | -                               |
| > plantCode   | Plant ID  | String    | -                               |
| > dataItemMap | The content of each data item is returned in the key-value format.<br>Map<String,Object>  | Map       | Real-time plant data            |

## Real-time plant dataset

| key         | Item   | Unit | Return Value Type |
|-------------|--|------|-------------------|
| dayEnergy   | Daily energy yield   | kWh  | Double            |
| monthEnergy | Monthly energy yield   | kWh  | Double            |
| totalEnergy | Total energy yield   | kWh  | Double            |
| pVPower     | PV output power. The value 0 indicates that there is no PV power. If the value is greater than 0, the value is the solar output power. In the example figure, the output power of the PV string is 1.991 kW. | kW   | Double            |

| key          | Item   | Unit       | Return Value Type |
|--------------|--|------------|-------------------|
| meterPower   | Active power from the grid meter. On-grid power and consumed grid power The value 0 indicates no power, a value smaller than 0 indicates the power of electricity drawn from the grid, and a value greater than 0 indicates the power of electricity fed back to the grid. In the example figure, the power of electricity fed back to the grid is 0.817 kW. | kW         | Double            |
| batteryPower | Battery charge/discharge power. The value 0 indicates that the battery is not discharged or charged, or that no battery exists. A value greater than 0 indicates the battery discharge power. A value smaller than 0 indicates the battery charge power. In the example figure, the battery discharge power is 1.168 kW.                                     | kW         | Double            |
| loadPower    | Power consumed by the load. The value 0 indicates that there is no load power consumption. A value greater than 0 indicates that there is load power consumption. In the example figure, the load consumption power is 0.006 kW.   | kW         | Double            |
| batterySOC   | Plant-level battery SOC. In the example figure, -- % indicates that the SOC cannot be calculated. In this case, null is returned.  | Percentage | Double            |

| key        | Item   | Unit       | Return Value Type |
|------------|--|------------|-------------------|
| batteryDOD | Depth of discharge (DOD) of the battery. The value is calculated using the following formula:<br>charging cutoff SOC – end-of-discharge SOC. If multiple SOCs exist, the value is a weighted average value:<br>$\frac{[(\text{charging cutoff SOC1} - \text{end-of-discharge SOC1}) \times \text{rated battery capacity 1} + (\text{charging cutoff SOC2} - \text{end-of-discharge SOC2}) \times \text{rated battery capacity 2}]}{(\text{rated battery capacity 1} + \text{rated battery capacity 2})}$ If the SOCs cannot be calculated, null is returned. | Percentage | Double            |

| key         | Item                | Unit   | Return Value Type |
|-------------|---------------------|--|-------------------|
| healthState | Plant health status | 0:<br>healthy<br>1:<br>disconne<br>cted<br>2: faulty<br>Note:<br>Disconne<br>cted: All<br>devices<br>are<br>disconne<br>cted.<br>Faulty:<br>The<br>devices<br>are not<br>disconne<br>cted.<br>However,<br>major or<br>critical<br>faults<br>occur on<br>some<br>devices.<br>Healthy:<br>No<br>precedin<br>g<br>situation<br>s<br>occurred. | Integer           |

## Example

Request example:

```
{  
  "plantCodes": "NE=12345678,NE=23456789"  
}
```

Response example:

Example 1: An error code is returned.

```
{  
  "success": false,  
  "data": null,  
  "failCode": 20007,  
}
```

```
"message": null  
}
```

Example 2: Real-time plant data is returned.

```
{  
  "success": true,  
  "data": [  
    {  
      "plantCode": "NE=12345678",  
      "dataItemMap": {  
        "dayEnergy": 100,  
        "monthEnergy": 900.000,  
        "totalEnergy": 11900.000,  
        "pvPower": 7.000,  
        "pMeterPower": -1.000,  
        "batteryPower": 5.000,  
        "loadPower": 1.000,  
        "batterySOC": 90.1,  
        "batteryDOD": null,  
        "healthState": 3  
      }  
    },  
    {  
      "plantCode": "NE=23456789",  
      "dataItemMap": {  
        "dayEnergy": 100,  
        "monthEnergy": 900.000,  
        "totalEnergy": 11900.000,  
        "pvPower": 7.000,  
        "pMeterPower": -1.000,  
        "batteryPower": 5.000,  
        "loadPower": 1.000,  
        "batterySOC": 90.1,  
        "batteryDOD": 37.3,  
        "healthState": 3  
      }  
    }  
  ],  
  "failCode": 0,  
  "message": null  
}
```

## 9.3.3 Historical Plant Data Interface

### Interface Description

This interface is used to obtain 5-minute statistical counters of a maximum of 100 plants. You can query data by plant ID and time segment for a maximum of 288 5-minute (24 hours) data records at a time.

### Request URL

<https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/plantHistoryKpi>

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Number of traffic limiting times for each northbound user per day = Roundup (Number of plants/100) + 24

Only one concurrent request is supported per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

Example:

If a northbound user manages 20 plants: Number of traffic limiting times per day  
= Roundup (20/100) + 24 = 1 + 24 = 25

If a northbound user manages 120 plants: Number of traffic limiting times per day  
= Roundup (120/100) + 24 = 2 + 24 = 26

## Request Parameters

| Parameter  | Description  | Data Type | Mandatory/Optional |
|------------|--|-----------|--------------------|
| plantCodes | Plant ID. Multiple plant IDs are separated by commas (,).  | String    | Mandatory          |
| startTime  | Start time, in milliseconds<br>The background processes the time based on the time zone where the plant is located. The time is accurate to milliseconds.  | Long      | Mandatory          |
| endTime    | End time, in milliseconds<br>The background processes the time based on the time zone where the plant is located. The time is accurate to milliseconds.<br>The interval between the start time and end time cannot exceed 24 hours.<br>The data time must be in the following range: [startTime, endTime). | Long      | Mandatory          |

## Response Packet

| Parameter            | Description  | Data Type | Remarks   |
|----------------------|--|-----------|---|
| success              | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.  | Boolean   | Request success or failure flag   |
| failCode             | Error code   | Integer   | 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . |
| message              | Optional message   | String    | -   |
| data                 | Returned 5-minute plant data, which includes the following information:  | List      | 5-minute KPI data of all plants   |
| > plantCode          | Plant ID   | String    |   |
| > dataItem           | Information list of single-plant 5-minute data objects, including the following information:   | List      | 5-minute KPI data of a single plant   |
| >> dateTime          | Data time, including the time zone.  | String    | 2020-02-06T00:00:00+08:00   |
| >> gridABWireVoltage | A-B line voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected. | V         | Double  |

| Parameter               | Description  | Data Type | Remarks |
|-------------------------|--|-----------|---------|
| >><br>gridBCWireVoltage | B-C line voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected. | V         | Double  |
| >><br>gridCAWireVoltage | C-A line voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected. | V         | Double  |
| >><br>gridAPhaseVoltage | Phase A voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected.  | V         | Double  |
| >><br>gridBPhaseVoltage | Phase B voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected.  | V         | Double  |
| >><br>gridCPhaseVoltage | Phase C voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected.  | V         | Double  |



| Parameter          | Description   | Data Type | Remarks |
|--------------------|---|-----------|---------|
| >> inputEnergy     | Amount of power supplied from the grid, including the power consumed by devices and the power used for charging batteries. If there is no grid meter, the data cannot be obtained and the returned value is NULL. | kWh       | Double  |
| >> loadEnergy      | Power consumed by all the loads. If there is no grid meter, the data cannot be obtained and the returned value is NULL.   | kWh       | Double  |
| >> ongridEnergy    | Total amount of power fed back to the grid. If there is no grid meter, the data cannot be obtained and the returned value is NULL.  | kWh       | Double  |
| >> pvEnergy        | Total energy yield of all PV modules.   | kWh       | Double  |
| >> grid2loadEnergy | Total amount of power supplied from the grid to the loads. If there is no grid meter, the data cannot be obtained and the returned value is NULL.   | kWh       | Double  |

| Parameter             | Description  | Data Type | Remarks |
|-----------------------|--|-----------|---------|
| >> grid2batteryEnergy | Total amount of power supplied from the grid for charging batteries. If there is no grid meter, the data cannot be obtained and the returned value is NULL.  | kWh       | Double  |
| >> pv2loadEnergy      | Total amount of PV power consumed by loads. If there is no grid meter, the data cannot be obtained and the returned value is NULL.   | kWh       | Double  |
| >> batteryEnergy      | Total amount of power of batteries. If there is no battery, the returned value is NULL.<br><br>Amount of battery power = rated capacity of the parallel system x SOC of the parallel system x SOH of the parallel system | kWh       | Double  |
| >> chargeEnergy       | Total amount of power charged to batteries. This value cannot be obtained for LG batteries, battery containers, or battery cabinets.   | kWh       | Double  |

| Parameter             | Description   | Data Type  | Remarks |
|-----------------------|---|------------|---------|
| >><br>dischargeEnergy | Total amount of power discharged from batteries. This value cannot be obtained for LG batteries, battery containers, or battery cabinets. | kWh        | Double  |
| >> batterySOC         | Plant-level SOC. If there is no battery, the returned value is NULL.  | Percentage | Double  |

## Example

Request example:

```
{  
  "plantCodes": "NE=12345678, NE=12345678",  
  "startTime": 1501862400000,  
  "endTime": 1501891500000  
}
```

Response example:

Example 1: An error code is returned.

```
{  
  "success": false,  
  "data": null,  
  "failCode": 20007,  
  "message": null  
}
```

Example 2: 5-minute plant data is returned.

```
{  
  "success": true,  
  "data": [  
    {  
      "plantCode": "NE=12345678",  
      "dataItem": [  
        {  
          "dateTime": "2017-08-05T00:00:00.000+0800",  
          "gridVoltage": 0,  
          "inputEnergy": 0,  
          "loadEnergy": 0,  
          "ongridEnergy": 0,  
          "pvEnergy": 0,  
          "grid2loadEnergy": 0,  
          "grid2batteryEnergy": 0,  
          "pv2loadEnergy": 0,  
          "batteryEnergy": 0,  
          "chargeEnergy": 0,  
          "dischargeEnergy": 0,  
        }  
      ]  
    }  
  ]  
}
```

```
    "batterySOC": 0
  },
  {
    "dateTime": "2017-08-05T00:05:00.000+0800",
    "gridVoltage": 0,
    "inputEnergy": 0,
    "loadEnergy": 0,
    "ongridEnergy": 0,
    "pvEnergy": 0,
    "grid2loadEnergy": 0,
    "grid2batteryEnergy": 0,
    "pv2loadEnergy": 0,
    "batteryEnergy": 0,
    "chargeEnergy": 0,
    "dischargeEnergy": 0,
    "batterySOC": 0
  }
]
},
{
  "plantCode": "NE=12345679",
  "dataItem": [
    {
      "dateTime": "2017-08-05T00:00:00.000+0800",
      "gridVoltage": 0,
      "inputEnergy": 0,
      "loadEnergy": 0,
      "ongridEnergy": 0,
      "pvEnergy": 0,
      "grid2loadEnergy": 0,
      "grid2batteryEnergy": 0,
      "pv2loadEnergy": 0,
      "batteryEnergy": 0,
      "chargeEnergy": 0,
      "dischargeEnergy": 0,
      "batterySOC": 0
    },
    {
      "dateTime": "2017-08-05T00:05:00.000+0800",
      "gridVoltage": 0,
      "inputEnergy": 0,
      "loadEnergy": 0,
      "ongridEnergy": 0,
      "pvEnergy": 0,
      "grid2loadEnergy": 0,
      "grid2batteryEnergy": 0,
      "pv2loadEnergy": 0,
      "batteryEnergy": 0,
      "chargeEnergy": 0,
      "dischargeEnergy": 0,
      "batterySOC": 0
    }
  ]
}
],
"failCode": 0,
"message": null
}
```

## 9.3.4 Interface for Delivering Battery Charge and Discharge Tasks

### Interface Description

This interface is used to deliver battery charge and discharge tasks based on plant codes. A task can be delivered to a maximum of 100 plants at a time. If there are multiple ESSs in the power plant, the task is executed on every ESS.

### Request URL

https://Domain name of the management system/rest/openapi/pvms/v1/vpp/chargeAndDischarge

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: once per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter      | Description   | Data Type | Mandatory/Optional |
|----------------|---|-----------|--------------------|
| plantCodes     | Plant code list. Plant codes are separated by commas (,).   | String    | Mandatory          |
| dispatchSwitch | Charge/Discharge switch<br>0: stop forced charge and discharge<br>1: forced charge<br>2: forced discharge | Integer   | Mandatory          |

| Parameter     | Description  | Data Type | Mandatory/Optional   |
|---------------|--|-----------|--|
| controlType   | 1: SOC control. The target SOC is set in the forced charge/discharge command. Legacy versions may need an update to support SOC control.<br>2: duration control. The duration is set in the forced charge/discharge command. | Integer   | Optional for stopping forced charge/discharge.   |
| targetSOC     | Target SOC for charge/discharge, in percentage   | Double    | Optional. This parameter is mandatory for SOC control.   |
| dispatchTime  | Charge/Discharge duration in minutes. Value range: [0,1440]  | Integer   | Optional. This parameter is mandatory for time control.  |
| powerDispatch | Power of forced charge and discharge in watt. If the value exceeds the range, the maximum value is used. The value should be greater than 0 during forced charge and smaller than 0 during forced discharge.                 | Integer   | Optional. If this parameter is left blank, the default power is used for charge and discharge. |
| requestID     | Unique ID of the requested task  | Long      | Mandatory  |

**NOTICE**

- This interface will change the device running parameters. Exercise caution when invoking this interface.
- The value of requestID must be unique.
- The LG battery does not support SOC control.
- When a task is not complete (that is, the status bit is 1), the same signals cannot be sent to the device corresponding to the task.

**Response Packet**

| Parameter        | Description  | Data Type | Remarks                         |
|------------------|--|-----------|---------------------------------|
| success          | Request success or failure flag<br><b>true:</b> The request succeeded.<br><b>false:</b> The request failed.                | Boolean   | Request success or failure flag |
| failCode         | Error code<br>Value 0 indicates that the status is normal. For other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message          | Optional message   | String    | -                               |
| data             | Returned data for each request, including the following information:   | List      | -                               |
| > plantCode      | Plant ID   | String    | -                               |
| > sn             | Inverter SN  | String    | -                               |
| > dispatchResult | Charge/Discharge task delivery result  | Integer   | 0: succeeded<br>1: failed       |
| > remoteID       | Unique subtask ID  | String    | -                               |

**Interface Error Code List**

| No. | Error Code | Description  |
|-----|------------|--|
| 1   | 305        | You are not online and need to log in again.           |
| 2   | 401        | You do not have the related data interface permission. |
| 3   | 407        | The interface access frequency is too high.            |

| No. | Error Code | Description   |
|-----|------------|---|
| 4   | 20010      | The plant list cannot be empty.                                       |
| 5   | 20015      | A maximum of 100 plants can be queried at a time.                     |
| 6   | 20040      | The charge/discharge parameter value is invalid.                      |
| 7   | 20041      | The control type cannot be empty during forced charge and discharge.  |
| 8   | 20042      | The target SOC for charge/discharge is empty or invalid.              |
| 9   | 20043      | The charge/discharge duration is empty or invalid.                    |
| 10  | 20044      | The unique ID of a charge/discharge task cannot be empty.             |
| 11  | 20045      | Unauthorized PV plants exist in the input parameters.                 |
| 12  | 20047      | The forced charge/discharge power in the input parameters is invalid. |
| 13  | 20048      | Duplicate charge/discharge task ID.                                   |
| 14  | 20049      | Failed to deliver the charge/discharge task.                          |
| 15  | 20053      | There is no operable battery.   |

## Examples

Request example:

Example 1: time control

```
{  
  "plantCodes": "NE=12345678,NE=23456789",  
  "controlType": 2,  
  "dispatchTime": 600,  
  "dispatchSwitch": 1,  
  "powerDispatch": 5000,  
  "requestID": 432523532523  
}
```

Example 2: SOC control

```
{  
  "plantCodes": "NE=12345678,NE=23456789",  
  "controlType": 1,  
  "targetSOC": 100,  
  "dispatchSwitch": 1,  
  "powerDispatch": 5000,  
  "requestID": 432523532523  
}
```

Response examples:

Example 1: An error code is returned.

```
{  
  "success": false,  
}
```



```
"data": null,  
"failCode": 20007,  
"message": null  
}
```

Example 2: The system returns a message indicating that the time control is set successfully.

```
{  
  "success": true,  
  "data": [  
    {  
      "plantCode": "NE=12345678",  
      "sn": "5fbfk4",  
      "dispatchResult": 0,  
      "remotelD": "12345678"  
    },  
    {  
      "plantCode": "NE=23456789",  
      "sn": "6fbfk11",  
      "dispatchResult": 0,  
      "remotelD": "23456789"  
    }  
  ],  
  "failCode": 0,  
  "message": null  
}
```

Example 3: The system returns a message indicating that the SOC control is set successfully.

```
{  
  "success": true,  
  "data": [  
    {  
      "plantCode": "NE=12345678",  
      "sn": "5fbfk4",  
      "dispatchResult": 0,  
      "remotelD": "12345678"  
    },  
    {  
      "plantCode": "NE=23456789",  
      "sn": "6fbfk11",  
      "dispatchResult": 0,  
      "remotelD": "23456789"  
    }  
  ],  
  "failCode": 0,  
  "message": null  
}
```

## 9.3.5 Interface for Querying Battery Charge and Discharge Tasks

### Interface Description

This interface is used to query the execution status of battery charge and discharge tasks based on requestID. One task can be queried at a time.

### Request URL

<https://Domain name of the management system/rest/openapi/pvms/v1/vpp/chargeAndDischargeStatus>

## Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: once per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Mode

HTTP method: POST

## Request Parameters

| Parameter | Description                     | Data Type | Mandatory/Optional |
|-----------|---------------------------------|-----------|--------------------|
| requestID | Unique ID of the requested task | Long      | Mandatory          |

### NOTICE

- If the charging and discharging task information of the battery in the plant changes, the task is processed as an exception (**status** is **0**). The exception information is described in **message**.

## Response Packet

| Parameter | Description  | Data Type | Remarks                         |
|-----------|--|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                              | Boolean   | Request success or failure flag |
| failCode  | Error code<br>Value 0 indicates that the status is normal. For other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional message   | String    | -                               |
| data      | Returned data for each request, including the following information:   | Map       | -                               |

| Parameter            | Description  | Data Type | Remarks  |
|----------------------|--|-----------|--|
| > plantCode          | Plant ID   | String    | -  |
| > sn                 | Inverter SN  | String    | -  |
| > remoteID           | Unique subtask ID  | String    | -  |
| > status             | Event status. The execution status is updated every 3 minutes. If the task is not completed within 24 hours, the task times out. | Integer   | <b>0</b> : complete<br><b>1</b> : in progress<br><b>2</b> : timeout or failure |
| > chargedCapacity    | Amount of power that has been forcibly charged into batteries. If <b>dispatchSwitch</b> is not 1, null is returned.              | Double    | kWh  |
| > dischargedCapacity | Amount of power that has been forcibly discharged from batteries. If <b>dispatchSwitch</b> is not 2, null is returned.           | Double    | kWh  |
| > execStartTime      | Time when a task is received, including the time zone information  | String    | 2020-02-06T00:00:00+08:00  |
| > execEndTime        | Time when a task is completed, including the time zone information. If a task is not completed, null is returned.                | String    | 2020-02-06T00:00:00+08:00  |
| > message            | Task result description  | String    | -  |

## Interface Error Code List

| No. | Error Code | Description   |
|-----|------------|---|
| 1   | 305        | You are not online and need to log in again.              |
| 2   | 401        | You do not have the related data interface permission.    |
| 3   | 407        | The interface access frequency is too high.               |
| 4   | 20044      | The unique ID of a charge/discharge task cannot be empty. |
| 5   | 20050      | The charge/discharge task query parameter does not exist. |

## Examples

Request example:

```
{
  "requestID": 432523532523
}
```

Response examples:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20008,
  "message": null
}
```

Example 2: The task status data is returned.

```
{
  "success":true,
  "failCode":0,
  "message":null,
  "data":[
    {
      "plantCode":"NE=12345678",
      "sn":"5fbfk4",
      "remotelD":"12345678",
      "status":0,
      "chargedCapacity":1000,
      "message":null,
      "execStartTime":"2020-02-06T00:00:10+08:00",
      "execEndTime":"2020-02-06T00:01:10+08:00"
    },
    {
      "plantCode":"NE=23456789",
      "sn":"6fbfk11",
      "remotelD":"23456789",
      "status":0,
      "chargedCapacity":2000,
      "message":null,
      "startTime":"2020-02-06T00:00:00+08:00",
      "endTime":"2020-02-06T00:01:00+08:00"
    }
  ]
}
```

### 9.3.6 Battery DoD Setting Interface

#### Interface Description

This interface is used to deliver DoD settings to a maximum of 100 batteries at a time.

#### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/dod

#### Request Mode

HTTP method: POST

## Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: once per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter | Description   | Data Type | Mandatory/Optional |
|-----------|---|-----------|--------------------|
| dns       | List of unique IDs of battery devices. Multiple device IDs are separated by commas (,). A maximum of 100 device IDs can be set at a time. The device DN information (deviceTypeId: 20815) can be queried through the <a href="#">9.2.2 Interface for Device List Querying</a> . | String    | Mandatory          |
| dod       | Target DoD value. If the DoD value is out of range, the closest allowed DoD value will be used.   | Integer   | Mandatory          |

### NOTICE

- This interface will change the device running parameters. Exercise caution when invoking this interface.

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed. | Boolean   | Request success or failure flag |

| Parameter | Description  | Data Type | Remarks  |
|-----------|--|-----------|--|
| failCode  | Error code<br>Value 0 indicates that the status is normal. For other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -  |
| message   | Optional message   | String    | -  |
| data      | Returned data for each request, including the following information:   | -         | Returned information for requests  |
| > dn      | Unique ID of a battery device  | String    | -  |
| > result  | Setting result   | Integer   | 0: succeeded<br>1: failed  |
| > setDOD  | DoD value that has been successfully set (charging cutoff SOC – end-of-discharge SOC)                                      | Integer   | End-of-discharge SOC = 100% – DoD<br>Range of end-of-discharge SOC for LG batteries: [12,20]<br>Range of end-of-discharge SOC for Huawei batteries: [0,20] |

## Interface Error Code List

| No. | Error Code | Description   |
|-----|------------|---|
| 1   | 305        | You are not online and need to log in again.                          |
| 2   | 401        | You do not have the related data interface permission.                |
| 3   | 407        | The interface access frequency is too high.                           |
| 4   | 20011      | The device list cannot be empty.                                      |
| 5   | 20017      | A maximum of 100 devices can be queried at a time.                    |
| 6   | 20039      | The DoD value is empty or out of range. The allowed range is [0,100]. |
| 7   | 20046      | Unauthorized devices exist in the input parameters.                   |
| 8   | 20051      | Battery DoD setting failed.   |

## Example

Request example:

```
{
  "dns": "BA4372D08E0,5D02E8B40AD",
  "dod": 90
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20008,
  "message": null
}
```

Example 2: The parameter delivery result is returned.

```
{
  "success": true,
  "data": [
    {
      "dn": "BA4372D08E0",
      "result": 0,
      "setDOD": 90
    },
    {
      "dn": "5D02E8B40AD",
      "result": 0,
      "setDOD": 88
    }
  ],
  "failCode": 0,
  "message": null
}
```

## 9.3.7 Inverter Power-On/Off Interface

### Interface Description

This interface is used to deliver a startup or shutdown command to a maximum of 100 inverters at a time.

### Request URL

https://Domain name of the management system:27200/rest/openapi/  
pvms/v1/vpp/devOnOff

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: once per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter   | Description  | Data Type | Mandatory/Optional |
|-------------|--|-----------|--------------------|
| dns         | List of unique IDs of inverters. Multiple IDs are separated by commas (,). A maximum of 100 device IDs can be set at a time. The device DN information can be queried through the <a href="#">9.2.2 Interface for Device List Querying</a> . | String    | Mandatory          |
| controlType | Power-on/off control<br>1: on<br>2: off  | Integer   | Mandatory          |

### NOTICE

- This interface will change the device running status. Exercise caution when invoking this interface.

## Response Packet

| Parameter | Description  | Data Type | Remarks                         |
|-----------|--|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                              | Boolean   | Request success or failure flag |
| failCode  | Error code<br>Value 0 indicates that the status is normal. For other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional message   | String    | -                               |



| Parameter | Description  | Data Type | Remarks                           |
|-----------|--|-----------|-----------------------------------|
| data      | Returned data for each request, including the following information: | -         | Returned information for requests |
| > dn      | Unique device ID   | String    | -                                 |
| > result  | Setting result   | Integer   | 0: succeeded<br>1: failed         |

## Interface Error Code List

| No. | Error Code | Description  |
|-----|------------|--|
| 1   | 305        | You are not online and need to log in again.                                       |
| 2   | 401        | You do not have the related data interface permission.                             |
| 3   | 407        | The interface access frequency is too high.  |
| 4   | 20011      | The device list cannot be empty.   |
| 5   | 20017      | A maximum of 100 devices can be queried at a time.                                 |
| 6   | 20019      | The switch type parameter value is invalid (1 for switch-on and 2 for switch-off). |
| 7   | 20046      | Unauthorized devices exist in the input parameters.                                |
| 8   | 20052      | Failed to start or shut down the inverter.   |

## Example

Request example:

```
{
  "dns": "BA4372D08E0,5D02E8B40AD",
  "controlType": 1
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20008,
  "message": null
}
```

Example 2: The parameter delivery result is returned.

```
{
  "success": true,
```

```
"data": [  
  {  
    "dn": "BA4372D08E0",  
    "result": 0  
  },  
  {  
    "dn": "5D02E8B40AD",  
    "result": 0  
  }  
],  
"failCode": 0,  
"message": null  
}
```

## 9.3.8 Plant EMS Control Interface

### Interface Description

This interface is used to send EMS control requests to the SmartLoggers in the plant to change the EMS control mode.

### Request URL

https://Domain name of the management system:27200/rest/openapi/  
pvms/v1/vpp/ems

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: once per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter | Description                                    | Data Type | Mandatory/<br>Optional |
|-----------|--|-----------|------------------------|
| dn        | Plant DN. Enter one plant DN for each request. | String    | Mandatory              |

| Parameter   | Description   | Data Type | Mandatory/Optional |
|-------------|---|-----------|--------------------|
| controlType | EMS control type<br>0: no control (not supported)<br>2: maximum self-consumption (not supported)<br>4: fully fed to grid (not supported)<br>5: time-of-use price (TOU) (not supported)<br>6: scheduled charge/discharge | Integer   | Mandatory          |

#### NOTICE

- This interface will change the device running status. Exercise caution when invoking this interface.

## Response Packet

| Parameter | Description   | Data Type | Remarks                           |
|-----------|---|-----------|-----------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag   |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                                 |
| message   | Optional message  | String    | -                                 |
| data      | Returned data for each request, including the following information:  | -         | Returned information for requests |
| > name    | Name of the SmartLogger   | String    | -                                 |
| > message | Response message  |           |                                   |

| Parameter | Description   | Data Type | Remarks   |
|-----------|---|-----------|---|
| > success | SmartLogger request success or failure flag<br>true: The request succeeded.<br>false: The request failed. | Integer   | 0: succeeded<br>1: failed<br>2: partially succeeded |

## Example

Request example:

```
{  
  "dn": "NE=12345678",  
  "controlType": 6  
}
```

Response example:

Example 1: An error code is returned, indicating that the control type is not supported.

```
{  
  "success": false,  
  "data": null,  
  "failCode": 20117,  
  "message": "controlType error"  
}
```

Example 2: The parameter delivery result is returned.

```
{  
  "success": true,  
  "data": [  
    {  
      "name": "Logger-1",  
      "success": true,  
      "message": "Operation complete."  
    },  
    {  
      "name": "Logger-2",  
      "success": false,  
      "message": "The operation is not supported"  
    }  
  ],  
  "failCode": 0,  
  "message": "success to call emsControl api"  
}
```

## 9.4 Smart I-V Curve Diagnosis Interface

Interfaces for smart I-V curve diagnosis are provided for independent software vendors (ISVs) to deliver I-V diagnosis tasks and display I-V diagnosis results in the AI Boost scenario.

## 9.4.1 Interface for Task List Querying

### Interface Description

This interface is used to query the created I-V diagnosis tasks and view the total task status in pagination mode.

### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/tasks

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter | Description  | Data Type | Mandatory/Optional   |
|-----------|--|-----------|--|
| pageNo    | Page No. of the results  | Integer   | Mandatory  |
| pageSize  | Number of results on each page. The value can be 10, 20, 30, 50, or 100. | Integer   | Mandatory  |
| taskName  | Task name. Fuzzy matching is supported.                                  | String    | Optional   |
| startTime | Start time, in milliseconds  | Long      | Optional. The two parameters must be set at the same time.<br>The created task must be within the following range: [startTime, endTime). |
| endTime   | End time, in milliseconds  | Long      |  |

## Response Packet

| Parameter      | Description   | Data Type | Remarks                                      |
|----------------|---|-----------|--|
| success        | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag              |
| failCode       | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -  |
| message        | Optional message  | String    | -  |
| data           | Returned data, which contains the following information:  | Map       | -  |
| > total        | Total number of tasks   | Long      | -  |
| > pageCount    | Total number of pages   | Long      | -  |
| > pageNo       | Page No. of the results   | Integer   | -  |
| > pageSize     | Number of query results displayed on each page  | Integer   | -  |
| > list         | Detail list of each task  | List      | Device information                           |
| >> taskId      | Task ID, which is unique in the system.   | Long      | -  |
| >> taskName    | Task name   | String    | -  |
| >> startTime   | Task start time, in milliseconds.   | Long      | -  |
| >> endTime     | Task end time, in milliseconds.   | Long      | -  |
| >> faultCount  | Number of faulty units  | Integer   | -  |
| >> unitCount   | Total number of units   | Integer   | -  |
| >> deviceCount | Number of devices   | Integer   | -  |
| >> process     | Task progress (%)   | Double    | Percentage                                   |
| >> cleanStatus | PV module cleaning status   | Integer   | <b>0</b> : not cleaned<br><b>1</b> : cleaned |

| Parameter                       | Description  | Data Type | Remarks   |
|---------------------------------|--|-----------|---|
| >> environmentalParameters      | Environmental parameter setting status                                   | Integer   | <b>0</b> : automatic. The predicted PV module plane irradiance and backplane surface temperature are used.<br><b>1</b> : manual |
| >> modulePlaneIrradiance        | PV module plane irradiance (W/m <sup>2</sup> ), range [400.0, 1500.0]    | Double    | This parameter is returned when the environment parameter setting status is <b>1</b> .  |
| >> moduleBackSurfaceTemperature | Surface temperature of the PV module backplane (°C), range: [0.0, 100.0] | Double    | This parameter is returned when the environment parameter setting status is <b>1</b> .  |
| >> scanPointNum                 | Number of diagnosis scanning points                                      | Integer   | -   |
| >> taskStatus                   | Task status  | Integer   | <b>0</b> : incomplete<br><b>1</b> : complete<br><b>2</b> : canceled   |

## Example

Request example:

```
{
  "pageNo": 1,
  "pageSize": 10
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 401,
  "message": null
}
```

Example 2: The query result is returned.

```
{
  "success": true,
  "failCode": 0,

```

```
"message": null,
"data": {
  "total": 2,
  "pageCount": 1,
  "pageNo": 1,
  "pageSize": 10,
  "list": [
    {
      "taskId": -14921346228625,
      "taskName": "IVScanTask001",
      "startTime": 1604211570056,
      "endTime": 1604211730470,
      "faultCount": 8,
      "unitCount": 8,
      "deviceCount": 4,
      "process": 100.0,
      "cleanStatus": 2,
      "environmentalParameters": 0,
      "scanPointNum": 128,
      "taskStatus": 1
    },
    {
      "taskId": 126140505793022,
      "taskName": "IVScanTask002",
      "startTime": 1604225176502,
      "endTime": null,
      "faultCount": 0,
      "unitCount": 0,
      "deviceCount": 4,
      "process": null,
      "cleanStatus": 2,
      "environmentalParameters": 1,
      "modulePanelIrradiance": 401.0,
      "moduleBackSurfaceTemperature": 1.0,
      "scanPointNum": 128,
      "taskStatus": 0
    }
  ]
}
```

## 9.4.2 Interface for Creating Diagnosis Tasks

### Interface Description

This interface is used to create I-V diagnosis tasks. When creating a diagnosis task, you need to query the inverters that can be scanned through the interfaces for querying the plant list and device list.

### Request URL

https://Domain name of the management system/rest/openapi/pvms/v1/iv/  
scanTask

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.



For the same PV plant, do not invoke this interface repeatedly before a task is complete.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter                    | Description  | Data Type | Mandatory/Optional   |
|------------------------------|--|-----------|--|
| taskName                     | Task name  | String    | Mandatory  |
| dns                          | List of unique IDs of inverters. Multiple IDs are separated by commas (.). A maximum of 100 device IDs can be set at a time. The device DN information can be queried through the <a href="#">9.2.2 Interface for Device List Querying</a> . | String    | Mandatory  |
| cleanStatus                  | PV module cleaning status  | Integer   | Mandatory<br><b>0</b> : not cleaned<br><b>1</b> : cleaned  |
| environmentalParameters      | Environmental parameter setting status   | Integer   | Mandatory<br><b>0</b> : automatic. The predicted PV module plane irradiance and backplane surface temperature are used.<br><b>1</b> : manual |
| modulePlaneIrradiance        | PV module plane irradiance (W/m <sup>2</sup> ), range [600.0, 1500.0]  | Double    | Optional. This parameter is mandatory when the environment parameter setting status is <b>1</b> .  |
| moduleBackSurfaceTemperature | Surface temperature of the PV module backplane (°C), range: [0.0, 100.0]   | Double    |  |
| scanPointNum                 | Number of diagnosis scanning points. Currently, the maximum number is 128.   | Integer   | Mandatory  |

| Parameter          | Description  | Data Type | Mandatory/Optional |
|--------------------|--|-----------|--------------------|
| needQuantifyLosses | Whether to calculate the quantitative loss of PV strings<br>true: yes<br>false: no | Boolean   | O                  |

## Response Packet

| Parameter | Description   | Data Type | Remarks  |
|-----------|---|-----------|--|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag  |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -  |
| message   | Optional message  | String    | -  |
| data      | Returned data, which contains the following information:  | Map       | -  |
| > taskId  | Task ID, which is unique in the system.   | Long      | This parameter is returned only when the task is successfully created. |

## Examples

Request example:

```
{
  "taskName": "IVScanTask001",
  "dns": "NE=33554673,NE=33554671,NE=33554669,NE=33554667",
  "cleanStatus": 0,
  "environmentalParameters": 1,
  "modulePlaneIrradiance": 401.0,
  "moduleBackSurfaceTemperature": 1.0,
  "scanPointNum": 128
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20011,
  "message": null
}
```

Example 2: Failed to create the task. The irradiation may not meet the minimum diagnosis requirement.

```
{
  "success": true,
  "failCode": 20030,
  "message": "radiation is not satisfied",
  "data": null
}
```

Example 3: The task is created successfully and the task ID is returned.

```
{
  "success": true,
  "failCode": 0,
  "message": null,
  "data": {
    "taskId": 126140505793022
  }
}
```

## 9.4.3 Interface for Canceling Diagnosis Tasks

### Interface Description

This interface is used to cancel created I-V diagnosis tasks. A completed task cannot be canceled.

### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/revokeTask

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter | Description                             | Data Type | Mandatory/Optional |
|-----------|---|-----------|--------------------|
| taskId    | Task ID, which is unique in the system. | Long      | Mandatory          |

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional message  | String    | -                               |
| data      | Returned data   | -         | Returns <b>null</b> .           |

## Example

Request example:

```
{  
  "taskId": "126140505793022"  
}
```

Response example:

Example 1: An error code is returned.

```
{  
  "success": false,  
  "data": null,  
  "failCode": 20034,  
  "message": "Not found task"  
}
```

Example 2: The task is canceled successfully.

```
{  
  "success": true,  
  "failCode": 0,  
  "message": null,  
}
```

```
"data": null  
}
```

## 9.4.4 Interface for Querying Task Status

### Interface Description

This interface is used to query the execution status of a subtask based on the task ID. Pagination query is supported.

### Request URL

https://Domain name of the management system/rest/openapi/pvms/v1/iv/  
scanTask/status

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency. You are advised to invoke the interface every 5 to 10 seconds until the task progress reaches 100%.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter | Description  | Data Type | Mandatory/Optional |
|-----------|--|-----------|--------------------|
| taskId    | Task ID, which is unique in the system                                   | Long      | Mandatory          |
| pageNo    | Page No. of the results  | Integer   | Mandatory          |
| pageSize  | Number of results on each page. The value can be 10, 20, 30, 50, or 100. | Integer   | Mandatory          |

## Response Packet

| Parameter       | Description   | Data Type | Remarks  |
|-----------------|---|-----------|--|
| success         | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag                      |
| failCode        | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -  |
| message         | Optional message  | String    | -  |
| data            | Returned data, which contains the following information:  | Map       | -  |
| > total         | Total number of results   | Long      | -  |
| > pageCount     | Total number of pages   | Long      | -  |
| > pageNo        | Page No. of the results   | Integer   | -  |
| > pageSize      | Number of query results displayed on each page  | Integer   | -  |
| > process       | Task progress   | Double    | %  |
| > list          | Detail list of each task  | List      | Device information                                   |
| >> sequenceNo   | No.   | Integer   | -  |
| >> subTaskId    | Subtask ID  | Long      | -  |
| >> plantName    | Plant name  | String    | -  |
| >> inverterName | Inverter name   | String    | -  |
| >> inverterDN   | Unique inverter ID  | String    | -  |
| >> pvName       | PV string name  | String    | -  |
| >> startTime    | Start time, in milliseconds   | Long      | -  |
| >> endTime      | End time, in milliseconds   | Long      | This parameter is empty when the task is incomplete. |

| Parameter               | Description                        | Data Type | Remarks  |
|-------------------------|------------------------------------|-----------|--|
| >> status               | Task status                        | Integer   | <b>0</b> : succeeded, <b>1</b> : failed, <b>2</b> : canceled |
| >> failCause            | Scanning failure cause code        | Integer   | This parameter is returned when the task fails.              |
| >> failDesc             | Scanning failure cause description | String    | This parameter is returned when the task fails.              |
| >> failRepairSuggestion | Suggestion on scanning failure     | String    | This parameter is returned when the task fails.              |

## Examples

Request example:

```
{
  "taskId": 126140505793022,
  "pageNo": 1,
  "pageSize": 10
}
```

Response examples:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20034,
  "message": null
}
```

Example 2: The query result is returned.

```
{
  "success": true,
  "failCode": 0,
  "message": null,
  "data": {
    "total": 28,
    "pageCount": 3,
    "pageNo": 1,
    "pageSize": 10,
    "list": [
      {
        "sequenceNo": 1,
        "subTaskId": -11397254906132,
        "plantName": "PlantForTest",
        "inverterName": "21010754856TJC900319",
        "inverterDN": "NE=33554659",
        "pvName": "PV1",
        "startTime": 1604225176502,
        "endTime": 1604225270811,
        "status": 0,

```

```
"failCause": null,  
"failDesc": null,  
"failRepairSuggestion": null  
},  
{  
  "sequenceNo": 2,  
  "subTaskId": 141750463514382,  
  "plantName": "PlantForTest",  
  "inverterName": "21010754856TJC900319",  
  "inverterDN": "NE=33554659",  
  "pvName": "PV2",  
  "startTime": 1604225176502,  
  "endTime": 1604225270812,  
  "status": 0,  
  "failCause": null,  
  "failDesc": null,  
  "failRepairSuggestion": null  
}  
...  
]  
}  
}
```

## 9.4.5 Interface for Fault List Querying

### Interface Description

This interface is used to query the list of all faults by task ID. The fault list can be queried only after all subtasks are executed.

### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/  
scanTask/faultList

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter | Description                             | Data Type | Mandatory/Optional |
|-----------|---|-----------|--------------------|
| taskId    | Task ID, which is unique in the system. | Long      | Mandatory          |
| pageNo    | Page No. of the results                 | Integer   | Mandatory          |



| Parameter | Description  | Data Type | Mandatory/Optional |
|-----------|--|-----------|--------------------|
| pageSize  | Number of results on each page. The value can be 10, 20, 30, 50, or 100. | Integer   | Mandatory          |

 **NOTE**

- The returned message is in English by default.
- To set the language to Chinese (**zh-cn**), add the following information to the request header:
  - Cookie: locale=zh-cn

## Response Packet

The returned list does not display normal inverters and strings.

| Parameter   | Description   | Data Type | Remarks                         |
|-------------|---|-----------|---------------------------------|
| success     | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag |
| failCode    | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message     | Optional message  | String    | -                               |
| data        | Returned data, which contains the following information:  | Map       | -                               |
| > total     | Total number of tasks   | Long      | -                               |
| > pageCount | Total number of pages   | Long      | -                               |
| > pageNo    | Page No. of the results   | Integer   | -                               |
| > pageSize  | Number of query results displayed on each page  | Integer   | -                               |
| > list      | Detail list of each task  | List      | Device information              |

| Parameter              | Description                                     | Data Type | Remarks |
|------------------------|---|-----------|---------|
| >> plantName           | Plant name                                      | String    | -       |
| >> plantCode           | Plant ID, which uniquely identifies a plant     | String    | -       |
| >> plantAddress        | Plant address                                   | String    | -       |
| >> inverterName        | Inverter name                                   | String    | -       |
| >> inverterDN          | Inverter ID, which is unique in the system.     | String    | -       |
| >> inverterSN          | Inverter SN                                     | String    | -       |
| >> invertVersion       | Inverter version                                | String    | -       |
| >> invertModel         | Inverter model                                  | String    | -       |
| >> invertRatedPower    | Rated inverter power (kW)                       | Double    | -       |
| >> pvName              | PV string name                                  | String    | -       |
| >> pvIndex             | PV string n, starting from 1                    | String    | -       |
| >> stringTotalPEnergy  | Total energy yield of a PV string (kWh)         | Double    | -       |
| >> stringFillFactor    | Fill factor (FF) (%)                            | Double    | -       |
| >> stcStringFillFactor | Standard test conditions (STC)-converted FF (%) | Double    | -       |
| >> stringVoc           | String $V_{oc}$ (V)                             | Double    | -       |
| >> stcStringVoc        | STC-converted string $V_{oc}$ (V)               | Double    | -       |
| >> stringIsc           | String $I_{sc}$ (A)                             | Double    | -       |
| >> stcStringIsc        | STC-converted string $I_{sc}$ (A)               | Double    | -       |
| >> stringVm            | String $V_m$ (V)                                | Double    | -       |
| >> stcStringVm         | STC-converted string $V_m$ (V)                  | Double    | -       |
| >> stringIm            | String $I_m$ (A)                                | Double    | -       |
| >> stcStringIm         | STC-converted string $I_m$ (A)                  | Double    | -       |
| >> stringPm            | String $P_m$ (W)                                | Double    | -       |

| Parameter                | Description                     | Data Type | Remarks |
|--------------------------|---------------------------------|-----------|---------|
| >> stcStringPm           | STC-converted string $P_m$ (W)  | Double    | -       |
| >> stringVmVoc           | String $V_m/V_{oc}$             | Double    | -       |
| >> stringImIsc           | String $I_m/I_{sc}$             | Double    | -       |
| >> stringDegradationRate | String attenuation rate         | Double    | -       |
| >> faultCode             | Fault type                      | Integer   | -       |
| >> faultName             | Fault name                      | String    | -       |
| >> faultDetail           | Fault details                   | String    | -       |
| >> faultSuggestion       | Fault rectification suggestion  | String    | -       |
| >> scanTime              | Scanning time, in milliseconds. | Long      | -       |

## Examples

Request example:

```
{
  "taskId": 126140505793022,
  "pageNo": 1,
  "pageSize": 10
}
```

Response examples:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20034,
  "message": null
}
```

Example 2: The query result is returned.

```
{
  "success": true,
  "failCode": 0,
  "message": null,
  "data": {
    "total": 28,
    "pageCount": 3,
    "pageNo": 0,
    "pageSize": 50,
    "list": [
      {

```

```
"plantName": "PlantForTest",
"plantCode": "NE=33554664",
"plantAddress": "xx Road xx",
"inveterName": "21010754856TJC900319",
"inverterDN": "NE=33554659",
"inverterSN": "21010754856TJC900319",
"invertVersion": "V100",
"invertModel": "SUN2000-40KTL-M3",
"invertRatedPower": 446.0,
"pvName": "PV1",
"pvIndex": 1,
"stringTotalPEnergy": 340.05,
"stringFillFactor": null,
"stcStringFillFactor": null,
"stringVoc": null,
"stcStringVoc": null,
"stringIsc": null,
"stcStringIsc": null,
"stringVm": null,
"stcStringVm": null,
"stringIm": null,
"stcStringIm": null,
"stringPm": null,
"stcStringPm": null,
"stringVmVoc": null,
"stringImloc": null,
"stringDegradationRate": null,
"faultCode": 99999,
"faultName": "no data to scan",
"faultDetail": "no data to scan",
"faultSuggestion": "please wait...",
"scanTime": 1604226992032
},
{
"plantName": "PlantForTest",
"plantCode": "NE=33554664",
"plantAddress": "xx Road xx",
"inveterName": "21010754856TJC900319",
"inverterDN": "NE=33554659",
"inverterSN": "21010754856TJC900319",
"invertVersion": "V100",
"invertModel": "SUN2000-40KTL-M3",
"invertRatedPower": 446.0,
"pvName": "PV2",
"pvIndex": 2,
"stringTotalPEnergy": 1287.96,
"stringFillFactor": null,
"stcStringFillFactor": null,
"stringVoc": null,
"stcStringVoc": null,
"stringIsc": null,
"stcStringIsc": null,
"stringVm": null,
"stcStringVm": null,
"stringIm": null,
"stcStringIm": null,
"stringPm": null,
"stcStringPm": null,
"stringVmVoc": null,
"stringImloc": null,
"stringDegradationRate": null,
"faultCode": 10012,
"faultName": "PV not set",
"faultDetail": "PV not set",
"faultSuggestion": "please check params",
"scanTime": 1604226992032
}
...
]
```

```
}  
}
```

## 9.4.6 Interface for I-V Curve Details Querying

### Interface Description

This interface is used to query the I-V curve details based on the task ID, inverter DN, and number of PV routes.

### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/  
scanTask/ivdata

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter | Description  | Data Type | Mandatory/Optional |
|-----------|--|-----------|--------------------|
| taskId    | Task ID, which is unique in the system.                                  | Long      | Mandatory          |
| dn        | Inverter ID, which is unique in the system.                              | String    | Mandatory          |
| pageNo    | Page No. of the results  | Integer   | Mandatory          |
| pageSize  | Number of results on each page. The value can be 10, 20, 30, 50, or 100. | Integer   | Mandatory          |

## Response Packet

| Parameter   | Description   | Data Type | Remarks                         |
|-------------|---|-----------|---------------------------------|
| success     | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode    | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message     | Optional message  | String    | -                               |
| data        | Returned data, which contains the following information:  | Map       | -                               |
| >total      | Total number of results   | Long      | -                               |
| > pageCount | Total number of pages   | Long      | -                               |
| > pageNo    | Page No. of the results   | Integer   | -                               |
| > pageSize  | Number of query results displayed on each page  | Integer   | -                               |
| > list      | Detail list of each task  | List      | -                               |
| >> pvIndex  | PV string n, starting from 1  | Integer   | -                               |
| >> current  | Current of scanning points. Currently, currents of 128 scanning points are returned. The data records are separated by commas (,).  | String    | -                               |
| >> voltage  | Voltage of scanning points. Currently, voltages of 128 scanning points are returned. The data records are separated by commas (,).  | String    | -                               |

## Example

Request example:

```
{
  "taskId": 134048947373151,
```



## Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/pvConfig

## Request Mode

HTTP method: POST

## Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter    | Description   | Data Type | Mandatory/Optional |
|--------------|---|-----------|--------------------|
| pageNo       | Page No. of the results   | Integer   | Mandatory          |
| pageSize     | Number of results on each page. The value can be 10, 20, 30, 50, or 100.  | Integer   | Mandatory          |
| inverterName | Filter condition: inverter name. Fuzzy filter by inverter names is supported.   | String    | Optional           |
| configStatus | Filter condition: whether a device is configured. The filtering is performed based on the configuration status.<br>Default value: all<br>0: not configured<br>1: configured | Integer   | Optional           |
| plantCodes   | Filter condition: plant code list. Multiple plant codes are separated by commas (.). The specified plant codes are used for filtering.                                      | String    | Optional           |



## Response Packet

| Parameter       | Description   | Data Type | Remarks                            |
|-----------------|---|-----------|------------------------------------|
| success         | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag    |
| failCode        | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                                  |
| message         | Optional message  | String    | -                                  |
| data            | Returned data, which contains the following information:  | Map       | -                                  |
| > total         | Total number of tasks   | Integer   | -                                  |
| > pageCount     | Total number of pages   | Integer   | -                                  |
| > pageNo        | Page No. of the results   | Integer   | -                                  |
| > pageSize      | Number of query results displayed on each page  | Integer   | -                                  |
| > list          | Detailed configuration list of each inverter  | List      | Device information                 |
| >> dn           | Unique inverter ID  | String    | -                                  |
| >> sn           | Inverter SN   | String    | -                                  |
| >> plantName    | Plant name  | String    | -                                  |
| >> inverterName | Inverter name   | String    | -                                  |
| >> configStatus | String configuration status   | Integer   | 1: configured<br>2: not configured |
| >> pvNum        | Number of PV strings  | Integer   | -                                  |

## Example

Request example:

```
{
  "pageNo": 1,
  "pageSize": 10
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 401,
  "message": null
}
```

Example 2: The query result is returned.

```
{
  "success": true,
  "failCode": 0,
  "message": null,
  "data": {
    "total": 39,
    "pageCount": 4,
    "pageNo": 1,
    "pageSize": 10,
    "list": [
      {
        "dn": "NE=33554659",
        "plantName": "PlantForTest",
        "sn": "21010754856TGC900789",
        "inverterName": "21010754856TGC900789",
        "configStatus": 1,
        "pvNum": 8
      },
      {
        "dn": "NE=33554660",
        "plantName": "PlantForTest",
        "sn": "102060186010",
        "inverterName": "102060186010",
        "configStatus": 1,
        "pvNum": 8
      },
      {
        "dn": "NE=33554661",
        "plantName": "PlantForTest",
        "sn": "102060186007",
        "inverterName": "102060186007",
        "configStatus": 1,
        "pvNum": 8
      },
      {
        "dn": "NE=33554667",
        "plantName": "PlantForTest",
        "sn": "2101074662ESK8000001",
        "inverterName": "2101074662ESK8000001",
        "configStatus": 1,
        "pvNum": 12
      },
      {
        "dn": "NE=33554669",
        "plantName": "PlantForTest",
        "sn": "ES2030012895",
        "inverterName": "ES2030012895",
        "configStatus": 1,
        "pvNum": 20
      },
      {
        "dn": "NE=33554671",
        "plantName": "PlantForTest",
        "sn": "210107434610G9001119",
        "inverterName": "210107434610G9001119",
        "configStatus": 0,

```

```
"pvNum": 12
},
{
  "dn": "NE=33554673",
  "plantName": "PlantForTest",
  "sn": "21010754856TJC900319",
  "inverterName": "21010754856TJC900319",
  "configStatus": 0,
  "pvNum": 8
},
{
  "dn": "NE=33554677",
  "plantName": "xys08",
  "sn": "HV2030026316",
  "inverterName": "HV2030026316",
  "configStatus": 0,
  "pvNum": 2
},
{
  "dn": "NE=33554680",
  "plantName": "PlantForTest",
  "sn": "HV20A0016128",
  "inverterName": "HV20A0016128",
  "configStatus": 0,
  "pvNum": 2
},
{
  "dn": "NE=33554721",
  "plantName": "MK-10.160.190.156",
  "sn": "6T1999040972",
  "inverterName": "6T1999040972",
  "configStatus": 0,
  "pvNum": 18
}
]
}
```

## 9.4.8 Interface for String Details Querying

### Interface Description

Used to query the configuration details of configured strings connected to an inverter. This interface returns only the information of configured strings. **pvIndex** is used to determine the number of the string.

### Request URL

<https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/pvConfig/detail>

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter | Description        | Data Type | Mandatory/Optional |
|-----------|--------------------|-----------|--------------------|
| dn        | Unique inverter ID | String    | Mandatory          |

## Response Packet

| Parameter            | Description   | Data Type | Remarks                         |
|----------------------|---|-----------|---------------------------------|
| success              | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode             | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message              | Optional message  | String    | -                               |
| data                 | Returned data, which contains the following detailed information of configured strings:   | List      | String details list             |
| > dn                 | Unique inverter ID  | String    | -                               |
| > pvIndex            | PV string n, starting from 1  | Integer   | -                               |
| > devId              | String details configuration ID (unique index)  | Integer   | -                               |
| > moduleQuantity     | Number of PV modules in a string (piece/string)   | Integer   | -                               |
| > is2in1String       | Two-in-one string or not  | Integer   | <b>1</b> : yes<br><b>0</b> : no |
| > moduleManufacturer | PV module vendor  | String    | -                               |
| > moduleModel        | PV module model   | String    | -                               |

| Parameter                                  | Description  | Data Type | Remarks   |
|--|--|-----------|---|
| > moduleType                               | PV module type   | Integer   | 1: polycrystalline, 2: monocrystalline, 3: n-type monocrystalline, 4: PERC monocrystalline, 5: bifacial monocrystalline, 6: bifacial polycrystalline, 7: monocrystalline four-column 60-cell, 8: monocrystalline four-column 72-cell, 9: polycrystalline four-column 60-cell, 10: polycrystalline four-column 72-cell |
| > maxModulePower                           | Maximum power of a PV module ( $P_{max}$ , W)                        | Double    | -   |
| > optimalModuleOperatingVoltage            | Optimal PV module operating voltage ( $V_{mp}$ ) (V)                 | Double    | -   |
| > optimalModuleOperatingCurrent            | Optimal PV module operating current ( $I_{mp}$ ) (A)                 | Double    | -   |
| > moduleOpenCircuitVoltage                 | PV module open-circuit voltage ( $V_{oc}$ ) (V)                      | Double    | -   |
| > moduleShortCircuitCurrent                | PV module short-circuit current ( $I_{sc}$ ) (A)                     | Double    | -   |
| > maxPowerTemperatureCoefficient           | Temperature coefficient under the maximum power ( $P_{max}$ ) (%/°C) | Double    | -   |
| > openCircuitVoltageTemperatureCoefficient | Open-circuit voltage ( $V_{oc}$ ) temperature coefficient (%/°C)     | Double    | -   |

| Parameter                                   | Description   | Data Type | Remarks |
|---|---|-----------|---------|
| > shortCircuitCurrentTemperatureCoefficient | Short-circuit current ( $I_{sc}$ ) temperature coefficient (%/°C)     | Double    | -       |
| > cellQuantity                              | Number of PV cells on a PV module (piece/module)                      | Double    | -       |
| > moduleDegradationRateInFirstYear          | PV module attenuation rate in the first year (%/y)                    | Double    | -       |
| > moduleDegradationRateFromSecondYear       | PV module year-on-year attenuation rate (%/y)                         | Double    | -       |
| > fillFactor                                | FF (%)  | Double    | -       |
| > nominalModuleEfficiency                   | Nominal PV module conversion efficiency (%)                           | Double    | -       |
| > minWorkTemperature                        | Minimum operating temperature (°C)                                    | Double    | -       |
| > maxWorkTemperature                        | Maximum operating temperature (°C)                                    | Double    | -       |
| > gridConnectionDate                        | Grid connection date of the PV module (millisecond value of the date) | Long      | -       |

## Example

Request example:

```
{
  "dn": "NE=33554673"
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20008,
  "message": null
}
```

Example 2: The query result is returned.

```
{
  "success": true,
  "failCode": 0,
  "message": null,
  "data": [
    {
      "dn": "NE=33554673",
      "pvIndex": 1,
      "devId": 62,
      "moduleQuantity": 4,
      "is2in1String": 1,
      "moduleManufacturer": "Green Power PV",
      "moduleModel": "GPM260P-B-60-7",
      "moduleType": 1,
      "maxModulePower": 250.0,
      "optimalModuleOperatingVoltage": 30.1,
      "optimalModuleOperatingCurrent": 8.31,
      "moduleOpenCircuitVoltage": 37.2,
      "moduleShortCircuitCurrent": 8.62,
      "maxPowerTemperatureCoefficient": -0.48,
      "openCircuitVoltageTemperatureCoefficient": -0.33,
      "shortCircuitCurrentTemperatureCoefficient": 0.05,
      "cellQuantity": 60,
      "moduleDegradationRateInFirstYear": 2.5,
      "moduleDegradationRateFromSecondYear": 0.7,
      "fillFactor": 78.0,
      "nominalModuleEfficiency": 15.4,
      "minWorkTemperature": -40.0,
      "maxWorkTemperature": 85.0,
      "gridConnectionDate": 1604077219000
    },
    {
      "dn": "NE=33554673",
      "pvIndex": 4,
      "devId": 63,
      "moduleQuantity": 3,
      "is2in1String": 0,
      "moduleManufacturer": "Juli Solar",
      "moduleModel": "JLS60M(156mm)-4",
      "moduleType": 2,
      "maxModulePower": 280.0,
      "optimalModuleOperatingVoltage": 31.95,
      "optimalModuleOperatingCurrent": 8.77,
      "moduleOpenCircuitVoltage": 39.22,
      "moduleShortCircuitCurrent": 9.3,
      "maxPowerTemperatureCoefficient": -0.42,
      "openCircuitVoltageTemperatureCoefficient": -0.34,
      "shortCircuitCurrentTemperatureCoefficient": 0.06,
      "cellQuantity": 60,
      "moduleDegradationRateInFirstYear": 3.0,
      "moduleDegradationRateFromSecondYear": 0.7,
      "fillFactor": 76.82,
      "nominalModuleEfficiency": 17.11,
      "minWorkTemperature": -40.0,
      "maxWorkTemperature": 85.0,
      "gridConnectionDate": 1604077219000
    }
  ]
}
```

## 9.4.9 Interface for String Details Configuration

### Interface Description

Used to complete detailed configurations of the strings connected to an inverter. The configuration changes apply to all PV strings. The **pvIndex** parameter

specifies the IDs of the PV strings to be configured. The details of unconfigured PV strings are cleared automatically.

## Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/pvConfig/configuration

## Request Mode

HTTP method: POST

## Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter                       | Description   | Data Type | Mandatory/Optional |
|---------------------------------|---|-----------|--------------------|
| dn                              | Unique inverter ID  | String    | Mandatory          |
| pvNum                           | Number of PV strings  | Integer   | Mandatory          |
| configuration                   | Detailed configuration list, including the following information: | List      | Mandatory          |
| > pvIndex                       | PV string n, starting from 1                                      | Integer   | Mandatory          |
| > moduleQuantity                | Number of PV modules in a string (piece/string)                   | Integer   | Mandatory          |
| > is2in1String                  | Two-in-one string or not  | Integer   | Mandatory          |
| > moduleManufacturer            | PV module vendor  | String    | Mandatory          |
| > moduleModel                   | PV module model   | String    | Mandatory          |
| > moduleType                    | PV module type  | Integer   | Mandatory          |
| > maxModulePower                | Maximum power of a PV module ( $P_{max}$ , W)                     | Double    | Mandatory          |
| > optimalModuleOperatingVoltage | Optimal PV module operating voltage ( $V_{mp}$ ) (V)              | Double    | Mandatory          |



| Parameter                                   | Description  | Data Type | Mandatory/Optional |
|---|--|-----------|--------------------|
| > optimalModuleOperatingCurrent             | Optimal PV module operating current ( $I_{mp}$ ) (A)                 | Double    | Mandatory          |
| > moduleOpenCircuitVoltage                  | PV module open-circuit voltage ( $V_{oc}$ ) (V)                      | Double    | Mandatory          |
| > moduleShortCircuitCurrent                 | PV module short-circuit current ( $I_{sc}$ ) (A)                     | Double    | Mandatory          |
| > maxPowerTemperatureCoefficient            | Temperature coefficient under the maximum power ( $P_{max}$ ) (%/°C) | Double    | Mandatory          |
| > openCircuitVoltageTemperatureCoefficient  | Open-circuit voltage ( $V_{oc}$ ) temperature coefficient (%/°C)     | Double    | Mandatory          |
| > shortCircuitCurrentTemperatureCoefficient | Short-circuit current ( $I_{sc}$ ) temperature coefficient (%/°C)    | Double    | Mandatory          |
| > cellQuantity                              | Number of PV cells on a PV module (piece/module)                     | Double    | Mandatory          |
| > moduleDegradationRateInFirstYear          | PV module attenuation rate in the first year (%/y)                   | Double    | Mandatory          |
| > moduleDegradationRateFromSecondYear       | PV module year-on-year attenuation rate (%/y)                        | Double    | Mandatory          |
| > fillFactor                                | FF (%)   | Double    | Optional           |
| > nominalModuleEfficiency                   | Nominal PV module conversion efficiency (%)                          | Double    | Optional           |
| > minWorkTemperature                        | Minimum operating temperature (°C)                                   | Double    | Optional           |
| > maxWorkTemperature                        | Maximum operating temperature (°C)                                   | Double    | Optional           |

| Parameter               | Description   | Data Type | Mandatory/Optional |
|-------------------------|---|-----------|--------------------|
| ><br>gridConnectionDate | Grid connection date of the PV module (millisecond value of the date) | Long      | Mandatory          |

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional message  | String    | -                               |
| data      | Returned data   | -         | Returns <b>null</b> .           |

## Example

Request example:

```
{
  "dn": "NE=33555131",
  "pvNum": 8,
  "configuration": [
    {
      "pvIndex": 1,
      "moduleQuantity": 4,
      "is2in1String": 1,
      "moduleManufacturer": "Green Power PV",
      "moduleModel": "GPM260P-B-60-7",
      "moduleType": 1,
      "maxModulePower": 250.0,
      "optimalModuleOperatingVoltage": 30.1,
      "optimalModuleOperatingCurrent": 8.31,
      "moduleOpenCircuitVoltage": 37.2,
      "moduleShortCircuitCurrent": 8.62,
      "maxPowerTemperatureCoefficient": -0.48,
      "openCircuitVoltageTemperatureCoefficient": -0.33,
      "shortCircuitCurrentTemperatureCoefficient": 0.05,
      "cellQuantity": 60,
      "moduleDegradationRateInFirstYear": 2.5,
      "moduleDegradationRateFromSecondYear": 0.7,
    }
  ]
}
```

```
"fillFactor": 78.0,  
"nominalModuleEfficiency": 15.4,  
"minWorkTemperature": -40.0,  
"maxWorkTemperature": 85.0,  
"gridConnectionDate": 1604077219000,  
"isDefault": true  
},  
{  
  "pvIndex": 4,  
  "moduleQuantity": 3,  
  "is2in1String": 0,  
  "moduleManufacturer": "Juli Solar",  
  "moduleModel": "JLS60M(156mm)-4",  
  "moduleType": 2,  
  "maxModulePower": 280.0,  
  "optimalModuleOperatingVoltage": 31.95,  
  "optimalModuleOperatingCurrent": 8.77,  
  "moduleOpenCircuitVoltage": 39.22,  
  "moduleShortCircuitCurrent": 9.3,  
  "maxPowerTemperatureCoefficient": -0.42,  
  "openCircuitVoltageTemperatureCoefficient": -0.34,  
  "shortCircuitCurrentTemperatureCoefficient": 0.06,  
  "cellQuantity": 60,  
  "moduleDegradationRateInFirstYear": 3.0,  
  "moduleDegradationRateFromSecondYear": 0.7,  
  "fillFactor": 76.82,  
  "nominalModuleEfficiency": 17.11,  
  "minWorkTemperature": -40.0,  
  "maxWorkTemperature": 85.0,  
  "gridConnectionDate": 1604077219000,  
  "isDefault": true  
}  
]  
}
```

Response example:

Example 1: An error code is returned.

```
{  
  "success": false,  
  "data": null,  
  "failCode": 30017,  
  "message": "dn is illegal."  
}
```

Example 2: The returned message indicates that the setting is successful.

```
{  
  "success": true,  
  "failCode": 0,  
  "message": null,  
  "data": null  
}
```

## 9.4.10 Interface for PV Module Library Querying

### Interface Description

This interface is used to query the list of configured available PV modules and vendors.

### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/  
pvConfig/modules

## Request Mode

HTTP method: POST

## Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency. If the PV module library does not change, the returned result does not change.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

None

## Response Packet

| Parameter      | Description   | Data Type | Remarks                         |
|----------------|---|-----------|---------------------------------|
| success        | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode       | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message        | Optional message  | String    | -                               |
| data           | Returned data, which contains the following detailed information of configured strings:   | List      | String details list             |
| > id           | Unique code of the PV module library configuration  | Integer   | -                               |
| > manufacturer | PV module vendor  | String    | -                               |
| > moduleModel  | PV module model   | String    | -                               |

| Parameter     | Description     | Data Type | Remarks   |
|---------------|-----------------|-----------|---|
| > moduleType  | PV module type  | Integer   | 1: polycrystalline, 2: monocrystalline, 3: n-type monocrystalline, 4: PERC monocrystalline, 5: bifacial monocrystalline, 6: bifacial polycrystalline, 7: monocrystalline four-column 60-cell, 8: monocrystalline four-column 72-cell, 9: polycrystalline four-column 60-cell, 10: polycrystalline four-column 72-cell |
| > modulePower | PV module power | Double    | W   |

## Example

Request example:

```
{}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20004,
  "message": null
}
```

Example 2: The query result is returned.

```
{
  "success": true,
  "failCode": 0,
  "message": null,
  "data": [
    {
      "id": 180053,
      "manufacturer": "Green Power PV",
      "moduleModel": "GPM260P-B-60-7",
    }
  ]
}
```

```
"moduleType": 1,  
"modulePower": 250.0  
},  
{  
  "id": 140003,  
  "manufacturer": "Juli Solar",  
  "moduleModel": "JLS60M(156mm)-4",  
  "moduleType": 2,  
  "modulePower": 280.0  
}  
...  
]
```

## 9.4.11 Interface for PV Module Details Querying

### Interface Description

This interface is used to query details of a PV module.

### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/  
pvConfig/module

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter | Description  | Data Type | Mandatory/Optional |
|-----------|--|-----------|--------------------|
| id        | Unique code of the PV module library configuration | Integer   | Mandatory          |

## Response Packet

| Parameter      | Description   | Data Type | Remarks                         |
|----------------|---|-----------|---------------------------------|
| success        | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag |
| failCode       | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message        | Optional message  | String    | -                               |
| data           | Returned data, which contains the following detailed information of configured strings:   | Map       | String details                  |
| > id           | Unique code of the PV module library configuration  | Integer   | -                               |
| > manufacturer | PV module vendor  | String    | -                               |
| > moduleModel  | PV module model   | String    | -                               |
| > abbreviation | Abbreviation  | String    | -                               |

| Parameter                                  | Description  | Data Type | Remarks   |
|--|--|-----------|---|
| > moduleType                               | PV module type   | Integer   | 1: polycrystalline, 2: monocrystalline, 3: n-type monocrystalline, 4: PERC monocrystalline, 5: bifacial monocrystalline, 6: bifacial polycrystalline, 7: monocrystalline four-column 60-cell, 8: monocrystalline four-column 72-cell, 9: polycrystalline four-column 60-cell, 10: polycrystalline four-column 72-cell |
| > maxModulePower                           | PV module power  | Double    | W   |
| > optimalModuleOperatingVoltage            | Optimal PV module operating voltage ( $V_{mp}$ ) (V)                 | Double    | -   |
| > optimalModuleOperatingCurrent            | Optimal PV module operating current ( $I_{mp}$ ) (A)                 | Double    | -   |
| > moduleOpenCircuitVoltage                 | PV module open-circuit voltage ( $V_{oc}$ ) (V)                      | Double    | -   |
| > moduleShortCircuitCurrent                | PV module short-circuit current ( $I_{sc}$ ) (A)                     | Double    | -   |
| > maxPowerTemperatureCoefficient           | Temperature coefficient under the maximum power ( $P_{max}$ ) (%/°C) | Double    | -   |
| > openCircuitVoltageTemperatureCoefficient | Open-circuit voltage ( $V_{oc}$ ) temperature coefficient (%/°C)     | Double    | -   |



| Parameter                                   | Description   | Data Type | Remarks |
|---|---|-----------|---------|
| > shortCircuitCurrentTemperatureCoefficient | Short-circuit current ( $I_{sc}$ ) temperature coefficient (%/°C) | Double    | -       |
| > cellQuantity                              | Number of PV cells on a PV module (piece/module)                  | Double    | -       |
| > moduleDegradationRateInFirstYear          | PV module attenuation rate in the first year (%/y)                | Double    | -       |
| > moduleDegradationRateFromSecondYear       | PV module year-on-year attenuation rate (%/y)                     | Double    | -       |
| > fillFactor                                | FF (%)  | Double    | -       |
| > nominalModuleEfficiency                   | Nominal PV module conversion efficiency (%)                       | Double    | -       |
| > minWorkTemperature                        | Minimum operating temperature (°C)                                | Double    | -       |
| > maxWorkTemperature                        | Maximum operating temperature (°C)                                | Double    | -       |

## Examples

Request example:

```
{
  "id": 180053
}
```

Response examples:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20004,
  "message": null
}
```

Example 2: The query result is returned.

```
{
  "success": true,
  "failCode": 0,
  "message": null,

```

```
"data": {  
  "id": 180053,  
  "moduleManufacturer": "Green Power PV",  
  "moduleModel": "GPM260P-B-60-7",  
  "abbreviation": "GPPV",  
  "moduleType": 1,  
  "maxModulePower": 250.0,  
  "optimalModuleOperatingVoltage": 30.1,  
  "optimalModuleOperatingCurrent": 8.31,  
  "moduleOpenCircuitVoltage": 37.2,  
  "moduleShortCircuitCurrent": 8.62,  
  "maxPowerTemperatureCoefficient": -0.48,  
  "openCircuitVoltageTemperatureCoefficient": -0.33,  
  "shortCircuitCurrentTemperatureCoefficient": 0.05,  
  "cellQuantity": 60,  
  "moduleDegradationRateInFirstYear": 2.5,  
  "moduleDegradationRateFromSecondYear": 0.7,  
  "fillFactor": 78.0,  
  "nominalModuleEfficiency": 15.4,  
  "minWorkTemperature": -40.0,  
  "maxWorkTemperature": 85.0  
}
```

## 9.4.12 Interface for Loss Data

### Interface Description

This interface is used to query the string diagnosis result and loss data based on the task ID.

### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/iv/scanTask/pvResultList

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound API user for a maximum of 10 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter | Description                             | Data Type | Mandatory/Optional |
|-----------|---|-----------|--------------------|
| taskId    | Task ID, which is unique in the system. | Long      | Mandatory          |
| pageNo    | Page No. of the results                 | Integer   | Mandatory          |

| Parameter | Description  | Data Type | Mandatory/Optional |
|-----------|--|-----------|--------------------|
| pageSize  | Number of query results displayed on each page. The maximum value is 5000. | Integer   | Mandatory          |

## Response Packet

| Parameter           | Description   | Data Type | Remarks                         |
|---------------------|---|-----------|---------------------------------|
| success             | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag |
| failCode            | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message             | Optional message  | String    | -                               |
| data                | Returned data, which contains the following information:  | Map       | -                               |
| > total             | Total number of results   | Long      | -                               |
| > pageCount         | Total number of pages   | Long      | -                               |
| > pageNo            | Page No. of the results   | Integer   | -                               |
| > pageSize          | Number of query results displayed on each page  | Integer   | -                               |
| > list              | Detail list of each task  | List      | Device information              |
| >> communicateDevSN | Communication device SN   | String    | -                               |
| >> inverterSN       | Inverter SN   | String    | -                               |
| >> inverterName     | Inverter name   | String    | -                               |
| >> pvName           | PV string name  | String    | -                               |

| Parameter            | Description   | Data Type | Remarks |
|----------------------|---|-----------|---------|
| >> pvIndex           | PV No. of the results, starting from 1  | Integer   | -       |
| >> ivFaultCode       | Fault type  | Integer   | -       |
| >> quantifyingLosses | Quantified loss<br>(positive offset: 0; negative offset: actual value; invalid: -1) | Long      | -       |

## Examples

Request example:

```
{
  "taskId": 126140505793022,
  "pageNo": 1,
  "pageSize": 10
}
```

Response examples:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 30008,
  "message": null
}
```

Example 2: The query result is returned.

```
{
  "data": {
    "total": 24,
    "pageCount": 1,
    "pageNo": 1,
    "pageSize": 5000,
    "list": [
      {
        "communicateDevSn": "showCaseLogger_104",
        "pvIndex": 1,
        "pvName": "PV1",
        "ivFaultCode": 10000,
        "inverterName": "Inverter-1",
        "quantifyingLosses": null,
        "inverterSn": "showCaseInv_104"
      },
      {
        "communicateDevSn": "showCaseLogger_104",
        "pvIndex": 2,
        "pvName": "PV2",
        "ivFaultCode": 10000,
        "inverterName": "Inverter-1",
        "quantifyingLosses": null,
        "inverterSn": "showCaseInv_104"
      }
    ]
  }
}
```

```
"communicateDevSn": "showCaseLogger_104",
"pvIndex": 3,
"pvName": "PV3",
"ivFaultCode": 10012,
"inverterName": "Inverter-1",
"quantifyingLosses": null,
"inverterSn": "showCaseInv_104"
},
{
"communicateDevSn": "showCaseLogger_104",
"pvIndex": 4,
"pvName": "PV4",
"ivFaultCode": 10012,
"inverterName": "Inverter-1",
"quantifyingLosses": null,
"inverterSn": "showCaseInv_104"
},
{
"communicateDevSn": "showCaseLogger_104",
"pvIndex": 5,
"pvName": "PV5",
"ivFaultCode": 10012,
"inverterName": "Inverter-1",
"quantifyingLosses": null,
"inverterSn": "showCaseInv_104"
},
{
"communicateDevSn": "showCaseLogger_104",
"pvIndex": 6,
"pvName": "PV6",
"ivFaultCode": 10012,
"inverterName": "Inverter-1",
"quantifyingLosses": null,
"inverterSn": "showCaseInv_104"
},
{
"communicateDevSn": "showCaseLogger_104",
"pvIndex": 7,
"pvName": "PV7",
"ivFaultCode": 10012,
"inverterName": "Inverter-1",
"quantifyingLosses": null,
"inverterSn": "showCaseInv_104"
},
{
"communicateDevSn": "showCaseLogger_104",
"pvIndex": 8,
"pvName": "PV8",
"ivFaultCode": 10012,
"inverterName": "Inverter-1",
"quantifyingLosses": null,
"inverterSn": "showCaseInv_104"
},
{
"communicateDevSn": "showCaseLogger_104",
"pvIndex": 9,
"pvName": "PV9",
"ivFaultCode": 10012,
"inverterName": "Inverter-1",
"quantifyingLosses": null,
"inverterSn": "showCaseInv_104"
},
{
"communicateDevSn": "showCaseLogger_104",
"pvIndex": 10,
"pvName": "PV10",
"ivFaultCode": 10012,
"inverterName": "Inverter-1",
"quantifyingLosses": null,
```

```
"inverterSn": "showCaseInv_104"
},
{
  "communicateDevSn": "showCaseLogger_104",
  "pvIndex": 11,
  "pvName": "PV11",
  "ivFaultCode": 10012,
  "inverterName": "Inverter-1",
  "quantifyingLosses": null,
  "inverterSn": "showCaseInv_104"
},
{
  "communicateDevSn": "showCaseLogger_104",
  "pvIndex": 12,
  "pvName": "PV12",
  "ivFaultCode": 10012,
  "inverterName": "Inverter-1",
  "quantifyingLosses": null,
  "inverterSn": "showCaseInv_104"
},
{
  "communicateDevSn": "showCaseLogger_104",
  "pvIndex": 13,
  "pvName": "PV13",
  "ivFaultCode": 10012,
  "inverterName": "Inverter-1",
  "quantifyingLosses": null,
  "inverterSn": "showCaseInv_104"
},
{
  "communicateDevSn": "showCaseLogger_104",
  "pvIndex": 14,
  "pvName": "PV14",
  "ivFaultCode": 10012,
  "inverterName": "Inverter-1",
  "quantifyingLosses": null,
  "inverterSn": "showCaseInv_104"
},
{
  "communicateDevSn": "showCaseLogger_104",
  "pvIndex": 15,
  "pvName": "PV15",
  "ivFaultCode": 10012,
  "inverterName": "Inverter-1",
  "quantifyingLosses": null,
  "inverterSn": "showCaseInv_104"
},
{
  "communicateDevSn": "showCaseLogger_104",
  "pvIndex": 16,
  "pvName": "PV16",
  "ivFaultCode": 10012,
  "inverterName": "Inverter-1",
  "quantifyingLosses": null,
  "inverterSn": "showCaseInv_104"
},
{
  "communicateDevSn": "showCaseLogger_104",
  "pvIndex": 17,
  "pvName": "PV17",
  "ivFaultCode": 10012,
  "inverterName": "Inverter-1",
  "quantifyingLosses": null,
  "inverterSn": "showCaseInv_104"
},
{
  "communicateDevSn": "showCaseLogger_104",
  "pvIndex": 18,
  "pvName": "PV18",
```

```
    "ivFaultCode": 10012,  
    "inverterName": "Inverter-1",  
    "quantifyingLosses": null,  
    "inverterSn": "showCaseInv_104"  
  },  
  {  
    "communicateDevSn": "showCaseLogger_104",  
    "pvIndex": 19,  
    "pvName": "PV19",  
    "ivFaultCode": 10012,  
    "inverterName": "Inverter-1",  
    "quantifyingLosses": null,  
    "inverterSn": "showCaseInv_104"  
  },  
  {  
    "communicateDevSn": "showCaseLogger_104",  
    "pvIndex": 20,  
    "pvName": "PV20",  
    "ivFaultCode": 10012,  
    "inverterName": "Inverter-1",  
    "quantifyingLosses": null,  
    "inverterSn": "showCaseInv_104"  
  },  
  {  
    "communicateDevSn": "showCaseLogger_104",  
    "pvIndex": 21,  
    "pvName": "PV21",  
    "ivFaultCode": 10012,  
    "inverterName": "Inverter-1",  
    "quantifyingLosses": null,  
    "inverterSn": "showCaseInv_104"  
  },  
  {  
    "communicateDevSn": "showCaseLogger_104",  
    "pvIndex": 22,  
    "pvName": "PV22",  
    "ivFaultCode": 10012,  
    "inverterName": "Inverter-1",  
    "quantifyingLosses": null,  
    "inverterSn": "showCaseInv_104"  
  },  
  {  
    "communicateDevSn": "showCaseLogger_104",  
    "pvIndex": 23,  
    "pvName": "PV23",  
    "ivFaultCode": 10012,  
    "inverterName": "Inverter-1",  
    "quantifyingLosses": null,  
    "inverterSn": "showCaseInv_104"  
  },  
  {  
    "communicateDevSn": "showCaseLogger_104",  
    "pvIndex": 24,  
    "pvName": "PV24",  
    "ivFaultCode": 10012,  
    "inverterName": "Inverter-1",  
    "quantifyingLosses": null,  
    "inverterSn": "showCaseInv_104"  
  }  
] ,  
"failCode": 0,  
"message": null,  
"success": true  
}
```

## 9.5 To-Be-Offline Interfaces

The interfaces described in this section are about to go offline and are not recommended. Replace them with new interfaces in a timely manner.

### NOTICE

Users registered after June 30, 2022 cannot access the interfaces that are about to go offline. Use the new interfaces.

**Table 9-1** To-be-offline interfaces

| Interface Name                  | Request URL  | Estimated Offline Date | Offline Reason                  | New Interface   | Request URL  |
|---------------------------------|--|------------------------|---------------------------------|---|--|
| Historical Plant Data Interface | https://<br>Domain<br>name of<br>the<br>manageme<br>nt system:<br>27200/rest/<br>openapi/<br>pvms/v1/vp<br>p/<br>plantFiveM<br>inutesKpi | 2023-06-30             | The<br>function is<br>enhanced. | <a href="#">Historical<br/>Plant Data<br/>Interface</a> | https://<br>Domain<br>name of<br>the<br>manageme<br>nt system:<br>27200/rest/<br>openapi/<br>pvms/v1/vp<br>p/<br>plantHistor<br>yKpi |

### 9.5.1 Historical Plant Data Interface

#### Interface Description

This interface is used to obtain 5-minute statistical counters of a single plant. You can query data by plant ID and time segment for a maximum of 288 5-minute (24 hours) data records at a time.

The plant accessed through this interface must be a plant that is successfully registered through the plant registration interface or a plant bound to the system.

#### Request URL

https://Domain name of the management system:27200/rest/openapi/  
pvms/v1/vpp/plantFiveMinutesKpi

#### Request Mode

HTTP method: POST



## Interface Invoking Suggestion

Number of traffic limiting times for each northbound user per day = Roundup (Number of plants/100) + 24

Only one concurrent request is supported per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

Example:

If a northbound user manages 20 plants: Number of traffic limiting times per day = Roundup (20/100) + 24 = 1 + 24 = 25

If a northbound user manages 120 plants: Number of traffic limiting times per day = Roundup (120/100) + 24 = 2 + 24 = 26

## Request Parameters

| Parameter | Description  | Data Type | Mandatory/Optional |
|-----------|--|-----------|--------------------|
| plantCode | Plant ID   | String    | Mandatory          |
| startTime | Start time, in milliseconds<br>The background processes the time based on the time zone where the plant is located. The time is accurate to milliseconds.  | Long      | Mandatory          |
| endTime   | End time, in milliseconds<br>The background processes the time based on the time zone where the plant is located. The time is accurate to milliseconds.<br><br>The start time and end time must be on the same day.<br>The data time must be in the following range: [startTime, endTime). | Long      | Mandatory          |

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed. | Boolean   | Request success or failure flag |

| Parameter           | Description  | Data Type | Remarks                        |
|---------------------|--|-----------|--------------------------------|
| failCode            | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> .                    | Integer   | -                              |
| message             | Optional message   | String    | -                              |
| data                | Returned 5-minute plant data, which includes the following information:  | List      | 5-minute KPI data of the plant |
| > dateTime          | Data time, including the time zone.  | String    | 2020-02-06T00:00:00+08:00      |
| > gridABWireVoltage | A-B line voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected. | V         | Double                         |
| > gridBCWireVoltage | B-C line voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected. | V         | Double                         |
| > gridCAWireVoltage | C-A line voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected. | V         | Double                         |
| > gridAPhaseVoltage | Phase A voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected.  | V         | Double                         |
| > gridBPhaseVoltage | Phase B voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected.  | V         | Double                         |

| Parameter            | Description   | Data Type | Remarks |
|----------------------|---|-----------|---------|
| > gridCPhaseVoltage  | Phase C voltage of the power grid. Data is collected in real time. Therefore, data generated when the devices are disconnected will not be collected.   | V         | Double  |
| > inputEnergy        | Amount of power supplied from the grid, including the power consumed by devices and the power used for charging batteries. If there is no grid meter, the data cannot be obtained and the returned value is NULL. | kWh       | Double  |
| > loadEnergy         | Power consumed by all the loads. If there is no grid meter, the data cannot be obtained and the returned value is NULL.   | kWh       | Double  |
| > ongridEnergy       | Total amount of power fed back to the grid. If there is no grid meter, the data cannot be obtained and the returned value is NULL.  | kWh       | Double  |
| > pvEnergy           | Total energy yield of all PV modules.   | kWh       | Double  |
| > grid2loadEnergy    | Total amount of power supplied from the grid to the loads. If there is no grid meter, the data cannot be obtained and the returned value is NULL.   | kWh       | Double  |
| > grid2batteryEnergy | Total amount of power supplied from the grid for charging batteries. If there is no grid meter, the data cannot be obtained and the returned value is NULL.   | kWh       | Double  |
| > pv2loadEnergy      | Total amount of PV power consumed by loads. If there is no grid meter, the data cannot be obtained and the returned value is NULL.  | kWh       | Double  |

| Parameter         | Description  | Data Type  | Remarks |
|-------------------|--|------------|---------|
| > batteryEnergy   | Total amount of power of batteries. If there is no battery, the returned value is NULL.<br><br>Amount of battery power = rated capacity of the parallel system x SOC of the parallel system x SOH of the parallel system | kWh        | Double  |
| > chargeEnergy    | Total amount of power charged to batteries. This value cannot be obtained for LG batteries, battery containers, or battery cabinets.   | kWh        | Double  |
| > dischargeEnergy | Total amount of power discharged from batteries. This value cannot be obtained for LG batteries, battery containers, or battery cabinets.  | kWh        | Double  |
| > batterySOC      | Plant-level SOC. If there is no battery, the returned value is NULL.   | Percentage | Double  |

## Example

Request example:

```
{
  "plantCode": "NE=12345678",
  "startTime": 1501862400000,
  "endTime": 1501891500000
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": NULL,
  "failCode": 20007,
  "message": NULL
}
```

Example 2: 5-minute plant data is returned.

```
{
  "success": true,
  "data": [
    {
```

```
"dateTime": "2017-08-05T00:00:00.000+0800",  
"gridVoltage": 0,  
"inputEnergy": 0,  
"loadEnergy": 0,  
"ongridEnergy": 0,  
"pvEnergy": 0,  
"grid2loadEnergy": 0,  
"grid2batteryEnergy": 0,  
"pv2loadEnergy": 0,  
"batteryEnergy": 0,  
"chargeEnergy": 0,  
"dischargeEnergy": 0,  
"batterySOC": 0  
},  
{  
"dateTime": "2017-08-05T00:05:00.000+0800",  
"gridVoltage": 0,  
"inputEnergy": 0,  
"loadEnergy": 0,  
"ongridEnergy": 0,  
"pvEnergy": 0,  
"grid2loadEnergy": 0,  
"grid2batteryEnergy": 0,  
"pv2loadEnergy": 0,  
"batteryEnergy": 0,  
"chargeEnergy": 0,  
"dischargeEnergy": 0,  
"batterySOC": 0  
}  
],  
"failCode": 0,  
"message": null  
}
```

## 9.6 Interface with Restricted Access

### 9.6.1 Virtual Power Plant Interface

#### 9.6.1.1 Plant SN Registration Interface

##### Interface Description

This interface is used to register a power plant with no permission based on the device SN and authorize the plant to which the device belongs to the VPP.

##### Request URL

<https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/snEnrolment>

##### Request Mode

HTTP method: POST

##### Interface Invoking Suggestion

Invoke the interface as required. You do not need to register the plant that has been registered successfully.

Number of traffic limiting times for each northbound user: once per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter  | Description  | Data Type | Mandatory/Optional   |
|------------|--|-----------|--|
| devices    | Device ID list. A maximum of 1000 SNs can be registered at a time  | List      | Mandatory  |
| > sn       | Device SN, and SN of any inverter, SmartLogger, or Dongle in the plant. Only one SN in a plant needs to be registered. | String    | Mandatory  |
| > username | Owner who logs in to the SmartPVMS system  | String    | Mandatory<br>At least one of the three parameters must be set. |
| > email    | Verified email address of the owner in the SmartPVMS system  | String    |  |
| > phone    | Verified mobile phone number of the owner in the SmartPVMS system  | String    |  |

### NOTE

- At least one of username, email address, and phone number must be entered, and the user information must be associated with the corresponding plant in the SmartPVMS. Otherwise, the registration fails.

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed. | Boolean   | Request success or failure flag |

| Parameter   | Description   | Data Type | Remarks                                       |
|-------------|---|-----------|---|
| failCode    | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> .             | Integer   | -   |
| message     | Optional response message   | -         | -   |
| data        | The returned data contains the following device and plant registration status information:  | List      | -   |
| > sn        | Device SN   | String    | -   |
| > success   | Registration result:<br>true: succeeded (If different SNs of the same PV plant are registered, this message is also returned.)<br>false: failed | Boolean   | -   |
| > errorMsg  | Registration failure cause description  | String    | -   |
| > plantCode | Plant ID, which uniquely identifies a plant.  | String    | If the registration fails, the value is null. |
| > plantName | Plant name  | String    | If the registration fails, the value is null. |

## Example

Request example:

```
{
  "devices": [
    {
      "sn": "HV1920000027",
      "username": null,
      "phone": null,
      "email": "mark@email.com"
    },
    {
      "sn": "HV1920000028",
      "username": null,
      "phone": null,
      "email": "mark@email.com"
    }
  ]
}
```

```
}  
]  
}
```

Response example:

Example 1: An error code is returned.

```
{  
  "success": false,  
  "data": null,  
  "failCode": 20004,  
  "message": null  
}
```

Example 2: The plant registration result is returned.

```
{  
  "success": true,  
  "data": [  
    {  
      "sn": "HV1920000027",  
      "success": true,  
      "errorMsg": "",  
      "plantCode": "DN=822AB065017416F",  
      "plantName": "Mark's Palnt"  
    },  
    {  
      "sn": "HV1920000028",  
      "success": false,  
      "errorMsg": "No SN/username, email, or phone number is found",  
      "plantCode": null,  
      "plantName": null  
    }  
  ],  
  "failCode": 0,  
  "message": null  
}
```

## 9.6.1.2 Plant AC Registration Interface

### Interface Description

This interface is used to register a power plant with no permission based on the device authorization code (AC) and authorize the plant to which the device belongs to the VPP.

### Request URL

<https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/acEnrolment>

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface as required. You do not need to register the plant that has been registered successfully.

Number of traffic limiting times for each northbound user: once per minute.



If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter          | Description  | Data Type | Mandatory/Optional |
|--------------------|--|-----------|--------------------|
| authorizationCodes | List of authorization codes bound to the plant. A maximum of 1000 authorization codes can be registered at a time. Multiple authorization codes are separated by commas (,). | String    | Mandatory          |

### NOTE

- **authorizationCode** is the authorization code bound to the plant. The authorization code is entered and bound by the installer when the plant is created in the system.
- Ensure that the installer has correctly entered the AC.
- For VPPs in South Australia, the National Metering Identifier (NMI) that contains the parity bit and has a length of 11 bits is the authorization code.

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional response message   | -         | -                               |
| data      | The returned data contains the following device and plant registration status information:  | List      | -                               |

| Parameter           | Description  | Data Type | Remarks                                       |
|---------------------|--|-----------|---|
| > authorizationCode | Authorization code bound to the plant                                  | String    | -   |
| > success           | Registration result:<br><b>true</b> : success<br><b>false</b> : failed | Boolean   | -   |
| > errorMsg          | Registration failure cause description                                 | String    | -   |
| > plantCode         | Plant ID, which uniquely identifies a plant.                           | String    | If the registration fails, the value is null. |
| > plantName         | Plant name   | String    | If the registration fails, the value is null. |

## Example

Request example:

```
{
  "authorizationCodes": "20019857328,QAAAVZZZZZ3"
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20004,
  "message": null
}
```

Example 2: The plant registration result is returned.

```
{
  "success": true,
  "data": [
    {
      "authorizationCode": "20019857328",
      "success": true,
      "errorMsg": "",
      "plantCode": "DN=822AB065017416F",
      "plantName": "Mark's Palnt"
    },
    {
      "authorizationCode": "QAAAVZZZZZ3",
      "success": false,
      "errorMsg": "Not found authorization code",
      "plantCode": null,
      "plantName": null
    }
  ]
}
```

```
},  
"failCode": 0,  
"message": null  
}
```

### 9.6.1.3 Interface for Delivering the Plant Default Task

#### Interface Description

This interface is used to deliver the default task based on the plant code. This task enables the scheduled task and sets the default values for the maximum grid feed-in power and active power change gradient. A task supports a maximum of 100 PV plants.

#### Request URL

https://Domain name of the management system:27200/rest/openapi/  
pvms/v1/vpp/plantDefaultSetting

#### Request Mode

HTTP method: POST

#### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: 10 times per minute and 1000 times per day.

If the access frequency exceeds the limit, the interface returns error code 407.

#### Request Parameters

| Parameter   | Description   | Data Type | Mandatory/Optional |
|-------------|---|-----------|--------------------|
| tasks       | Default task list. A maximum of 100 PV plants can be set at a time. | List      | Mandatory          |
| > plantCode | Plant ID, which uniquely identifies a plant.                        | String    | Mandatory          |

| Parameter                         | Description   | Data Type | Mandatory/Optional |
|-----------------------------------|---|-----------|--------------------|
| ><br>maxFeedGridPower             | Maximum grid feed-in power. The value range is [-1000, Plant capacity]. Only three decimal places are allowed. If the value contains more than three decimal places, it will be rounded off. At least one of <b>maxFeedGridPower</b> and <b>activePowerVariationGradient</b> must be set. | Double    | O                  |
| ><br>activePowerVariationGradient | Active power change gradient. The value range is [0.100, 5000.000]. Only three decimal places are allowed. If the value contains more than three decimal places, it will be rounded off. At least one of <b>maxFeedGridPower</b> and <b>activePowerVariationGradient</b> must be set.     | Double    | O                  |

**NOTICE**

- This interface will change the device running status. Exercise caution when invoking this interface.

**Response Packet**

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag |
| failCode  | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                               |
| message   | Optional message  | String    | -                               |

| Parameter    | Description  | Data Type | Remarks                           |
|--------------|--|-----------|-----------------------------------|
| data         | Returned data for each request, including the following information:   | Map       | Returned information for requests |
| > requestId  | Unique ID of the requested task  | String    | -                                 |
| > tasks      | Requested tasks  | List      | -                                 |
| >> plantCode | Plant ID   | String    | -                                 |
| >> result    | Delivery result of default settings<br>Value 0 indicates that the delivery is successful. For other values, see the following:<br><a href="#">11 Error Code List</a> | Integer   | -                                 |

### Interface Error Code List

| No. | Error Code | Description   |
|-----|------------|---|
| 1   | 305        | You are not online and need to log in again.  |
| 2   | 401        | You do not have the related data interface permission.                              |
| 3   | 407        | The interface access frequency is too high.   |
| 4   | 20015      | The number of transferred PV plants exceeds 100.                                    |
| 5   | 20045      | The transferred PV plants contain PV plants that the user does not have permission. |
| 6   | 20607      | The task list is empty.   |
| 7   | 20608      | Duplicate plant IDs exist in the input parameters.                                  |
| 8   | 20609      | The plant networking is abnormal.   |
| 9   | 20610      | The plant does not support the default configuration.                               |
| 10  | 20611      | The values of input parameters exceed the valid range.                              |
| 11  | 20612      | The value of an input parameter is empty.   |
| 12  | 20613      | The default task fails to be sent for all plants.                                   |
| 13  | 20614      | The network communication is abnormal.  |
| 14  | 20615      | The same task is being executed in the current plant.                               |

| No. | Error Code | Description  |
|-----|------------|--|
| 15  | 20618      | The calls to API have reached the maximum number per user per day. |

## Examples

Request example:

```
{
  "tasks": [
    {
      "plantCode": "NE=33554434",
      "maxFeedGridPower": 1.2,
      "activePowerVariationGradient": 1.2
    },
    {
      "plantCode": "NE=33554454",
      "maxFeedGridPower": 1.1,
      "activePowerVariationGradient": 1.3
    },
    {
      "plantCode": "NE=33554459",
      "maxFeedGridPower": 1.2,
      "activePowerVariationGradient": 1.4
    }
  ]
}
```

Response examples:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20607,
  "message": "The Plant level default setting task list is empty."
}
```

Example 2: The delivery result of the default task is returned.

```
{
  "success": true,
  "data": {
    "requestId": "1299460682406572",
    "tasks": [
      {
        "plantCode": "NE=33554434",
        "result": 20612
      },
      {
        "plantCode": "NE=33554454",
        "result": 0
      },
      {
        "plantCode": "NE=33554459",
        "result": 0
      }
    ]
  },
  "failCode": 0,
  "message": "Plant default settings task sent successfully."
}
```

## 9.6.1.4 Interface for Querying the Plant Default Task

### Interface Description

This interface is used to query the current execution status of a default task based on the task ID and plant code. Only one task ID can be queried at a time.

### Request URL

https://Domain name of the management system:27200/rest/openapi/  
pvms/v1/vpp/plantDefaultSettingStatus

### Request Mode

HTTP method: POST

### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: 10 times per minute and 1000 times per day.

If the access frequency exceeds the limit, the interface returns error code 407.

### Request Parameters

| Parameter  | Description   | Data Type | Mandatory/Optional |
|------------|---|-----------|--------------------|
| requestId  | Unique ID of the requested task                           | String    | Mandatory          |
| plantCodes | Plant code list. Plant codes are separated by commas (,). | String    | O                  |

#### NOTICE

- If only **requestId** is transferred, the PV plant corresponding to the value of **requestId** is queried. If both **requestId** and **plantCodes** are transferred, the intersection of the PV plants corresponding to the values of **requestId** and **plantCodes** is used.

## Response Packet

| Parameter                      | Description   | Data Type | Remarks  |
|--------------------------------|---|-----------|--|
| success                        | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag                      |
| failCode                       | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -  |
| message                        | Optional message  | String    | -  |
| data                           | Returned data for each request, including the following information:  | List      | Returned information for requests                    |
| > plantCode                    | Plant ID  | String    | -  |
| > status                       | Task status   | String    | Task status (0: executing; 1: successful; 2: failed) |
| > maxFeedGridPower             | Maximum grid feed-in power  | Double    | -  |
| > activePowerVariationGradient | Active power change gradient  | Double    | -  |
| > receivedTime                 | Time when a task is received, including the time zone information   | String    | 2020-02-06T00:00:00+08:00                            |
| > appliedTime                  | Time when a task is completed, including the time zone information. If a task is not completed, null is returned.                         | String    | 2020-02-06T00:00:00+08:00                            |



## Interface Error Code List

| No. | Error Code | Description  |
|-----|------------|--|
| 1   | 305        | You are not online and need to log in again.                       |
| 2   | 401        | You do not have the related data interface permission.             |
| 3   | 407        | The interface access frequency is too high.                        |
| 4   | 20616      | The task ID is empty.  |
| 5   | 20617      | The query result of the default plant task is empty.               |
| 6   | 20618      | The calls to API have reached the maximum number per user per day. |

## Examples

Request example:

```
{  
  "requestId": "1709371607593720",  
  "plantCodes": "NE=33554434,NE=33554454,NE=33554459"  
}
```

Response examples:

Example 1: An error code is returned.

```
{  
  "success": false,  
  "data": null,  
  "failCode": 20617,  
  "message": "Get 0 records by this requestId and plantCodes"  
}
```

Example 2: The task execution status corresponding to the requested unique task ID and plant ID list is returned.

```
{  
  "success": true,  
  "data": [  
    {  
      "activePowerVariationGradient": 1.2,  
      "appliedTime": null,  
      "maxFeedGridPower": 1.2,  
      "plantCode": "NE=33554434",  
      "receivedTime": "2022-12-01T09:57:58+08:00",  
      "status": "2"  
    },  
    {  
      "activePowerVariationGradient": 1.3,  
      "appliedTime": null,  
      "maxFeedGridPower": 1.1,  
      "plantCode": "NE=33554454",  
      "receivedTime": "2022-12-01T09:57:58+08:00",  
      "status": "2"  
    },  
    {  
      "activePowerVariationGradient": 1.4,  
      "appliedTime": null,  
      "maxFeedGridPower": 1.1,  
      "plantCode": "NE=33554459",  
      "receivedTime": "2022-12-01T09:57:58+08:00",  
      "status": "2"  
    }  
  ]  
}
```

```
"maxFeedGridPower": 1.2,  
"plantCode": "NE=33554459",  
"receivedTime": "2022-12-01T09:57:58+08:00",  
"status": "2"  
}  
],  
"failCode": 0,  
"message": "Plant default setting task status query succeeded"  
}
```

### 9.6.1.5 Interface for Querying Rated Plant Data

#### Interface Description

This interface is used query the rated apparent power, rated active power, and stable reactive power (positive/negative) of a plant based on the plant code. A maximum of 100 plant codes can be queried at a time.

#### Request URL

https://Domain name of the management system:27200/rest/openapi/pvms/v1/vpp/plantRatedData

#### Request Mode

HTTP method: POST

#### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: 10 times per minute and 500 times per day.

If the access frequency exceeds the limit, the interface returns error code 407.

#### Request Parameters

| Parameter  | Description   | Data Type | Mandatory/Optional |
|------------|---|-----------|--------------------|
| plantCodes | Plant code list. Plant codes are separated by commas (,). | String    | Mandatory          |

## Response Packet

| Parameter              | Description   | Data Type | Remarks                           |
|------------------------|---|-----------|-----------------------------------|
| success                | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag   |
| failCode               | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -                                 |
| message                | Optional message  | String    | -                                 |
| data                   | Returned data for each request, including the following information:  | Map       | Returned information for requests |
| > total                | Number of plants that are successfully queried  |           | Integer                           |
| > plantRatedData       | Rated data of each plant  |           | List                              |
| >> plantCode           | Plant ID, which uniquely identifies a plant   |           | String                            |
| >> ratedActivePower    | Rated active power  | kW        | Double                            |
| >> ratedApparentPower  | Rated apparent power  | kVA       | Double                            |
| >> ratedReactivePowerP | Rated reactive power (positive)   | kVar      | Double                            |
| >> ratedReactivePowerN | Rated reactive power (negative)   | kVar      | Double                            |

## Interface Error Code List

| No. | Error Code | Description                                  |
|-----|------------|--|
| 1   | 305        | You are not online and need to log in again. |

| No. | Error Code | Description   |
|-----|------------|---|
| 2   | 401        | You do not have the related data interface permission.                              |
| 3   | 407        | The interface access frequency is too high.   |
| 4   | 20010      | The plant ID is empty.  |
| 5   | 20015      | The number of transferred PV plants exceeds 100.                                    |
| 6   | 20045      | The transferred PV plants contain PV plants that the user does not have permission. |
| 7   | 20609      | The plant networking is abnormal.   |
| 8   | 20618      | The calls to API have reached the maximum number per user per day.                  |

## Examples

Request example:

```
{  
  "plantCodes": "NE=33554434,NE=33554454"  
}
```

Response examples:

Example 1: An error code is returned.

```
{  
  "success": false,  
  "data": null,  
  "failCode": 20010,  
  "message": "Plant codes is null"  
}
```

Example 2: The rated data query result of the plant is returned.

```
{  
  "success": true,  
  "data": {  
    "plantRatedData": [  
      {  
        "plantCode": "NE=33554434",  
        "ratedActivePower": 6.001,  
        "ratedApparentPower": 8.0,  
        "ratedReactivePowerN": 9.001,  
        "ratedReactivePowerP": 8.001  
      },  
      {  
        "plantCode": "NE=33554454",  
        "ratedActivePower": 18.003,  
        "ratedApparentPower": 21.0,  
        "ratedReactivePowerN": 27.003,  
        "ratedReactivePowerP": 24.003  
      }  
    ],  
    "total": 2  
  },  
  "failCode": 0,  
}
```

```
"message": "Plants are successfully queried."  
}
```

### 9.6.1.6 Plant DRM Setting Interface

#### Interface Description

This interface is used to issue control commands to inverters to enable or disable the Demand Response Mode (DRM). The commands can be issued to a maximum of 200 inverters in a maximum of 100 PV plants at a time. This function is available only when the inverters are connected to the management system directly or via SDongles. This function is unavailable if SmartLoggers are connected to a plant.

#### Request URL

https://Domain name of the management system:27200/rest/openapi/  
pvms/v1/vpp/drm

#### Request Mode

HTTP method: POST

#### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: 10 times per minute and 1000 times per day.

If the access frequency exceeds the limit, the interface returns error code 407.

#### Request Parameters

| Parameter  | Description   | Data Type | Mandatory/Optional |
|------------|---|-----------|--------------------|
| plantcodes | Plant code list. Plant codes are separated by commas (,).   | String    | Mandatory          |
| drms       | DRM mode list. Currently, the system supports only drm0, drm1, and drm5.                                    | List      | Mandatory          |
| >drm0      | Specifies whether to shut down the inverter.<br>true: shuts down the inverter<br>false: starts the inverter | String    | Mandatory          |

| Parameter | Description   | Data Type | Mandatory/Optional |
|-----------|---|-----------|--------------------|
| >drm1     | Specifies whether to stop the inverter from consuming grid power.<br>true: stops the inverter from consuming grid power<br>false: allows the inverter from consuming grid power | String    | Mandatory          |
| >drm5     | Specifies whether to stop the output power of the inverter.<br>true: stops the output power of the inverter<br>false: allows the output power of the inverter                   | String    | Mandatory          |

**NOTICE**

- This interface will change the device running parameters. Exercise caution when invoking this interface.

**Response Packet**

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed. | Boolean   | Request success or failure flag |

| Parameter   | Description   | Data Type | Remarks  |
|-------------|---|-----------|--|
| failCode    | Request error code. If user authentication or parameter verification fails, the corresponding error code is returned. For the command output, see the value of <b>result</b> .<br><br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -  |
| message     | Optional message  | String    | -  |
| data        | Returned data for each request, including the following information:  | -         | Returned information for requests              |
| > remoteld  | Unique ID of the DRM setting task for each plant  | String    | -  |
| > plantcode | Unique plant ID   | String    | -  |
| > drm       | Character string consisting of all DRM switch settings  | -         | Switch settings are separated with commas (,). |
| > result    | Setting result  | Integer   | 0: succeeded<br>1: failed                      |

## Examples

Request example:

```
{
  "plantcodes": "BA4372D08E0,5D02E8B40AD",
  "drms": {
    "drm0": "true",
    "drm1": "true",
    "drm5": "true"
  }
}
```

Response examples:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
}
```

```
"failCode": 20008,  
"message": null  
}
```

Example 2: The parameter delivery result is returned.

```
{  
  "success":true,  
  "data":[  
    {  
      "remoteld":"5720350070339601",  
      "plantcode":"BA4372D08E0",  
      "drm":"drm0=true,drm1=true,drm5=true",  
      "result":0  
    },  
    {  
      "remoteld":"8137590146559513",  
      "plantcode":"5D02E8B40AD",  
      "drm":"drm0=true,drm1=true,drm5=true",  
      "result":0  
    }  
  ],  
  "failCode":0,  
  "message":"Operation success"  
}
```

### 9.6.1.7 Interface for Querying Plant DRM Settings

#### Interface Description

This interface is used to query the current execution status of plant DRM setting tasks based on the task ID corresponding to each plant. A maximum of 100 task IDs can be queried at a time.

#### Request URL

https://Domain name of the management system:27200/rest/openapi/  
pvms/v1/vpp/drmStatus

#### Request Mode

HTTP method: POST

#### Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

For the same PV plant, do not invoke this interface repeatedly before a task is complete.

Number of traffic limiting times for each northbound user: 10 times per minute and 1000 times per day.

If the access frequency exceeds the limit, the interface returns error code 407.



## Request Parameters

| Parameter | Description                    | Data Type | Mandatory/Optional |
|-----------|--------------------------------|-----------|--------------------|
| remotelds | Plant DRM setting task ID list | String    | Mandatory          |

## Response Packet

| Parameter           | Description   | Data Type | Remarks  |
|---------------------|---|-----------|--|
| success             | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.   | Boolean   | Request success or failure flag                      |
| failCode            | Error code<br>Value 0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   | -  |
| message             | Optional message  | String    | -  |
| data                | Returned data for each request, including the following information:  | List      | Returned information for requests                    |
| > remoteld          | Unique ID of the DRM setting task for each plant  | String    | -  |
| > plantCode         | Plant ID  | String    | -  |
| > devicesStatusInfo | Task status of devices in the plant   | List      | Task status information list of devices in the plant |
| >> dn               | Unique device ID  | String    | -  |
| >> receivedTime     | Time when a task is received, including the time zone information   | String    | 2020-02-06T00:00:00+08:00                            |
| >> appliedTime      | Time when a task is completed, including the time zone information. If a task is not completed, null is returned.                         | String    | 2020-02-06T00:00:00+08:00                            |

| Parameter | Description | Data Type | Remarks  |
|-----------|-------------|-----------|--|
| >> status | Task status | String    | Task status (0: executing; 1: successful; 2: failed) |

## Interface Error Code List

| No. | Error Code | Description  |
|-----|------------|--|
| 1   | 305        | You are not online and need to log in again.                       |
| 2   | 401        | You do not have the related data interface permission.             |
| 3   | 407        | The interface access frequency is too high.                        |
| 4   | 20616      | The task ID is empty.  |
| 5   | 20618      | The calls to API have reached the maximum number per user per day. |
| 6   | 20619      | The number of task IDs exceeds 100.                                |
| 7   | 20620      | The task ID does not exist.  |

## Examples

Request example:

```
{
  "remotelds": "1456031667450237,7770451712459653"
}
```

Response examples:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20620,
  "message": "Remotelds does not exist"
}
```

Example 2: The execution status of each task corresponding to the DRM setting task ID list of the plant is returned.

```
{
  "success": true,
  "data": [
    {
      "devicesStatusInfo": [
        {
          "appliedTime": "2022-12-13T15:43:47+08:00",
          "dn": "NE=33554439",
          "receivedTime": "2022-12-13T15:43:46+08:00",

```

```
        "status": "1"
      },
      {
        "appliedTime": "2022-12-13T15:43:48+08:00",
        "dn": "NE=33554437",
        "receivedTime": "2022-12-13T15:43:46+08:00",
        "status": "1"
      },
      {
        "appliedTime": "2022-12-13T15:43:47+08:00",
        "dn": "NE=33554436",
        "receivedTime": "2022-12-13T15:43:46+08:00",
        "status": "1"
      }
    ],
    "plantCode": "NE=33554434",
    "remoteld": "7770451712459653"
  },
  {
    "devicesStatusInfo": [
      {
        "appliedTime": "2022-12-13T15:43:47+08:00",
        "dn": "NE=33554447",
        "receivedTime": "2022-12-13T15:43:46+08:00",
        "status": "1"
      },
      {
        "appliedTime": "2022-12-13T15:43:47+08:00",
        "dn": "NE=33554446",
        "receivedTime": "2022-12-13T15:43:46+08:00",
        "status": "1"
      }
    ],
    "plantCode": "NE=33554444",
    "remoteld": "1456031667450237"
  }
],
"failCode": 0,
"message": "Plant DRM task status query succeeded"
}
```

## 9.6.2 PV Community Interfaces

Used to connect to the Huawei smart PV community (official website: <http://community.solar.huawei.com/>) to verify whether the device with a specific SN is associated with a plant.

### 9.6.2.1 SN Registration Query Interface

#### Interface Description

This interface is used to verify the relationship between the SN and installer using the entered username, email address or phone number, and device SN.

#### Request URL

<https://Domain name of the management system:27200/rest/openapi/pvms/v1/community/snlsRegister>

#### Request Mode

HTTP method: POST

## Interface Invoking Suggestion

Invoke the interface only when necessary to reduce the access frequency.

The interface can be accessed by a northbound user for a maximum of 100 times per minute.

If the access frequency exceeds the limit, the interface returns error code 407.

## Request Parameters

| Parameter | Description  | Data Type | Mandatory/Optional |
|-----------|--|-----------|--------------------|
| sns       | SNs of the devices to be queried. A maximum of 50 SNs can be queried at a time. Use commas (,) to separate multiple SNs. | String    | Mandatory          |
| account   | User used to log in to the management system. It can be a username, email address, or phone number.                      | String    | Mandatory          |

## Response Packet

| Parameter | Description   | Data Type | Remarks                         |
|-----------|---|-----------|---------------------------------|
| success   | Request success or failure flag<br>true: The request succeeded.<br>false: The request failed.                                       | Boolean   | Request success or failure flag |
| failCode  | Error code<br>0 indicates that the status is normal. For definitions of other error codes, see <a href="#">11 Error Code List</a> . | Integer   |                                 |
| message   | Access error message, which is optional   | String    |                                 |
| data      | Returned data. <b>data</b> contains the query result list, including the following information:                                     | Map       |                                 |
| > sn      | Device SN   | String    |                                 |

| Parameter         | Description   | Data Type | Remarks                   |
|-------------------|---|-----------|---------------------------|
| > result          | <p>0: The SN has not been registered in the system, the account does not have the management permission on the device of the SN (the SN must be bound to a non-shared plant or a company), or the account is an owner user.</p> <p>1: The SN has been registered in the system, the SN is not bound to a commissioning user, and the current account has the permission to manage the device of the SN.</p> <p>2: The SN has been registered in the system and bound to a commissioning user, who is not the current account.</p> <p>3: The SN has been registered in the system and bound to a commissioning user, who is the current account.</p> | Integer   |                           |
| > plantCreateTime | Plant creation time (grid-connection time of the plant). When the result is 0 or 2, null is returned.   | String    | 2020-02-06T00:00:00+08:00 |

 **NOTE**

Commissioning user: a bound user on the device connection screen, that is, an administrator user who logs in to the local app during local deployment commissioning.

Management permission: indicates whether the user has been bound to the plant where the device of the SN is deployed.

## Example

Request example:

```
{
  "sns": "BA4372D08E0,5D02E8B40AD,5D02E8BFFFF,5D02E8BEEEE",
  "account": "admin@qq.com"
}
```

Response example:

Example 1: An error code is returned.

```
{
  "success": false,
  "data": null,
  "failCode": 20004,
  "message": null
}
```

Example 2: The registration query result is returned, indicating that the user does not exist.

```
{
  "success": true,
  "data": null,
  "failCode": 20028,
  "message": "user does not exist"
}
```

Example 3: The query result is returned.

```
{
  "success": true,
  "data": [
    {
      "sn": "BA4372D08E0",
      "result": 0
    },
    {
      "sn": "5D02E8B40AD",
      "result": 1,
      "plantCreateTime": "2020-02-06T00:00:00+08:00"
    },
    {
      "sn": "5D02E8BFFFF",
      "result": 2
    },
    {
      "sn": "5D02E8BEEEE",
      "result": 3,
      "plantCreateTime": "2020-02-06T00:00:00+08:00"
    }
  ],
  "failCode": 0,
  "message": null
}
```

# 10 Device Type List

| No. | Device Type                         | Device Type ID | Supported Interface |
|-----|-------------------------------------|----------------|---------------------|
| 1   | MPPT                                | 20811          |                     |
| 2   | PV                                  | 20812          |                     |
| 3   | PV module                           | 20813          |                     |
| 4   | Optimizer                           | 20814          |                     |
| 5   | Battery                             | 20815          |                     |
| 6   | Meter                               | 20816          |                     |
| 7   | Backup Box                          | 20817          |                     |
| 8   | Safety box                          | 20818          |                     |
| 9   | Communication module                | 20819          |                     |
| 10  | SmartLogger                         | 20821          |                     |
| 11  | Inverter                            | 20822          |                     |
| 12  | Environmental monitoring instrument | 20824          |                     |
| 13  | PID                                 | 20825          |                     |
| 14  | PLC                                 | 20826          |                     |

| No. | Device Type                   | Device Type ID | Supported Interface |
|-----|-------------------------------|----------------|---------------------|
| 15  | Central inverter              | 20827          |                     |
| 16  | DC combiner box               | 20828          |                     |
| 17  | STS                           | 20829          |                     |
| 18  | STS meter                     | 20830          |                     |
| 19  | AC combiner box               | 20831          |                     |
| 20  | Communication management unit | 20833          |                     |
| 21  | Lithium battery cell          | 20843          |                     |



# 11 Error Code List

| No. | Error Code | Description  |
|-----|------------|--|
| 1   | 20001      | The third-party system ID does not exist.  |
| 2   | 20002      | The third-party system is forbidden.   |
| 3   | 20003      | The third-party system has expired.  |
| 4   | 20004      | The server is abnormal.  |
| 5   | 20005      | The device ID cannot be empty.   |
| 6   | 20006      | Some devices do not match the device type.   |
| 7   | 20007      | The system does not have the desired power plant resources.                              |
| 8   | 20008      | The system does not have the desired device resources.                                   |
| 9   | 20009      | Queried KPIs are not configured in the system.   |
| 10  | 20010      | The plant list cannot be empty.  |
| 11  | 20011      | The device list cannot be empty.   |
| 12  | 20012      | The query time cannot be empty.  |
| 13  | 20013      | The device type is incorrect. The interface does not support operations on some devices. |
| 14  | 20014      | A maximum of 100 plants can be queried at a time.  |
| 15  | 20015      | A maximum of 100 plants can be queried at a time.  |
| 16  | 20016      | A maximum of 100 devices can be queried at a time.                                       |
| 17  | 20017      | A maximum of 100 devices can be queried at a time.                                       |
| 18  | 20018      | A maximum of 10 devices can be operated at a time.                                       |

| No. | Error Code | Description   |
|-----|------------|---|
| 19  | 20019      | The switch type is incorrect. 1 and 2 indicate switch-on and switch-off respectively.   |
| 20  | 20020      | The upgrade package corresponding to the device version cannot be found.  |
| 21  | 20021      | The upgrade file does not exist.  |
| 22  | 20022      | The upgrade records of the devices in the system are not found.   |
| 23  | 305        | You are not in the login state. You need to log in again.   |
| 24  | 401        | You do not have the related data interface permission.  |
| 25  | 407        | The interface access frequency is too high.   |
| 26  | 20023      | The query start time cannot be later than the query end time.   |
| 27  | 20024      | The language cannot be empty.   |
| 28  | 20025      | The language parameter value is incorrect.  |
| 29  | 20026      | Only data of the latest 365 days can be queried.  |
| 30  | 20027      | The query time period cannot span more than 31 days.  |
| 31  | 20028      | The system does not have related user information.  |
| 32  | 20030      | Failed to create the I-V curve diagnosis task.  |
| 33  | 20034      | The task does not exist.  |
| 34  | 20035      | MPPT devices do not support backfeed current.   |
| 35  | 20036      | The backfeed current duration of the MPPT device exceeds the maximum limit.   |
| 36  | 20037      | The backfeed current of the MPPT device is out of range. The allowed value is (0, 15].  |
| 37  | 20038      | In the input parameters, the authorization code list is empty (null), or the number of authorization codes is out of range. The allowed range is [0, 1000]. |
| 38  | 20039      | In the input parameters, the DOD value is out of range. The allowed range is [0, 100].  |
| 39  | 20040      | The charge/discharge switch parameter value is invalid.   |
| 40  | 20041      | The control type cannot be empty for forced charge and discharge.   |
| 41  | 20042      | The target SOC for charge/discharge is empty or invalid.  |

| No. | Error Code | Description  |
|-----|------------|--|
| 42  | 20043      | The charge/discharge duration is empty or invalid.   |
| 43  | 20044      | The unique ID of a charge/discharge task cannot be empty.  |
| 44  | 20045      | Unauthorized PV plants exist in the input parameters.  |
| 45  | 20046      | Unauthorized PV plants exist in the input parameters.  |
| 46  | 20047      | The forced charge/discharge power in the input parameters is invalid.  |
| 47  | 20048      | Duplicate charging and discharging task ID   |
| 48  | 20049      | Failed to deliver the charging and discharging task.   |
| 49  | 20050      | The charging and discharging task query parameter does not exist.  |
| 50  | 20051      | Failed to set the battery DOD.   |
| 51  | 20055      | The plant list and device list parameters cannot be empty at the same time.  |
| 52  | 20116      | The inverter control parameter is incorrect. (The number of PV plants is greater than 100 or equal to 0, or the total number of inverters in the PV plants is greater than 200 or equal to 0.)   |
| 53  | 20200      | The system is busy. Try again later.   |
| 54  | 20400      | <ul style="list-style-type: none"> <li>● The username or password of the third-party system is incorrect.</li> <li>● The user is locked.</li> <li>● The password has expired.</li> <li>● The number of online sessions reaches the upper limit.</li> </ul> |
| 55  | 20403      | The login of the third-party system user is restricted.  |
| 56  | 20604      | The time parameter is incorrect. The start time cannot be later than or equal to the end time.   |
| 57  | 20605      | The time parameter is incorrect. The time parameter contains a negative value.   |
| 58  | 20606      | If only the start time is entered and the end time is empty, the start time cannot be later than or equal to the current time.   |
| 59  | 20607      | The task list is empty.  |
| 60  | 20608      | Duplicate plant IDs exist in the input parameters.   |
| 61  | 20609      | The plant networking is abnormal.  |
| 62  | 20610      | The plant does not support default configuration.  |

| No. | Error Code | Description  |
|-----|------------|--|
| 63  | 20611      | The values of input parameters exceed the valid range.               |
| 64  | 20612      | The value of an input parameter is empty.                            |
| 65  | 20613      | The default setting task fails to be sent for all plants.            |
| 66  | 20614      | The network communication is abnormal.                               |
| 67  | 20615      | The same task is being executed in the current plant.                |
| 68  | 20616      | The task ID is empty.  |
| 69  | 20617      | The query result of the default plant setting task is empty.         |
| 70  | 20618      | The calls to API have reached the maximum number per user per day.   |
| 71  | 20619      | The number of task IDs exceeds 100.                                  |
| 72  | 20620      | The task ID does not exist.  |
| 73  | 21000      | The basic information for the plant creation is empty.               |
| 74  | 21001      | The plant name is empty or in an incorrect format.                   |
| 75  | 21002      | The plant type is empty or incorrect.                                |
| 76  | 21003      | The grid connection time must be a positive number.                  |
| 77  | 21004      | The format of the contact name is incorrect.                         |
| 78  | 21005      | The format of the contact information is incorrect.                  |
| 79  | 21006      | The C&I plant and utility plant cannot be EV-charger-only plants.    |
| 80  | 21007      | The grid connection time cannot be set for an EV-charger-only plant. |
| 81  | 21008      | The string capacity cannot be set for an EV-charger-only plant.      |
| 82  | 21009      | The electricity price cannot be set for an EV-charger-only plant.    |
| 83  | 21010      | <b>&gt;pureChange</b> can only be set to <b>0</b> or <b>1</b> .      |
| 84  | 21011      | The plant name already exists.                                       |
| 85  | 22000      | No related data of connected devices was found.                      |
| 86  | 22001      | The device registration code is empty.                               |
| 87  | 22002      | The device is an unauthorized device.                                |
| 88  | 22003      | The device registration code is incorrect.                           |

| No. | Error Code | Description  |
|-----|------------|--|
| 89  | 22004      | You will be locked out for 5 minutes due to five consecutive incorrect registration codes.     |
| 90  | 22005      | Devices other than chargers are connected to an EV-charger-only plant.                         |
| 91  | 22006      | The device SN is empty.  |
| 92  | 22007      | The device has been bound to another plant.  |
| 93  | 22008      | The parameters of connected devices are empty.   |
| 94  | 23000      | The plant-level string capacity and PV-level string capacity cannot be empty at the same time. |
| 95  | 23001      | The format of the plant string capacity is incorrect.  |
| 96  | 23002      | The inverter SN does not exist.  |
| 97  | 23003      | The number of inverter SNs is incorrect.   |
| 98  | 23005      | The inverter PV string capacity is incorrectly set.  |
| 99  | 23006      | The inverter SN or PV string capacity is empty.  |
| 100 | 23007      | The quantity in the inverter PV string capacity setting is incorrect.                          |
| 101 | 24000      | The electricity price must be a positive number.   |
| 102 | 24001      | The electricity price date settings must cover a complete year and without overlapping.        |
| 103 | 24002      | The electricity price time segments must cover 24 hours of the day without overlapping.        |
| 104 | 24003      | The date range is invalid.   |
| 105 | 24004      | The time range is invalid.   |
| 106 | 24005      | The company electricity price is empty.  |
| 107 | 24006      | <b>&gt;useCompanyPrice</b> can only be set to <b>0</b> or <b>1</b> .                           |
| 108 | 25000      | Additional information configuration is empty.   |
| 109 | 25001      | The area code is empty or in an incorrect format.  |
| 110 | 25002      | The plant address is empty.  |
| 111 | 25003      | The longitude and latitude are empty or in incorrect format.                                   |
| 112 | 25004      | The safe running time of the plant must be a positive number.                                  |
| 113 | 25005      | The time zone is empty or the format is incorrect.   |

| No. | Error Code | Description  |
|-----|------------|--|
| 114 | 25006      | <b>loadStatus</b> can only be set to <b>0</b> or <b>1</b> .  |
| 115 | 25007      | The plant introduction can contain a maximum of 128 characters.  |
| 116 | 26000      | Failed to create plants.   |
| 117 | 26001      | A maximum of 1000 plants can be created in a day.  |
| 118 | 26002      | The company authorized by the northbound user does not exist.  |
| 119 | 30001      | The device ESN list cannot be empty.   |
| 120 | 30002      | The ESNs queried at a time cannot exceed 50.   |
| 121 | 30003      | The account cannot be empty in the input parameter.  |
| 122 | 30004      | The value of <b>pageNo</b> cannot be empty.  |
| 123 | 30005      | The value of <b>pageSize</b> cannot be empty.  |
| 124 | 30006      | The value of <b>pageSize</b> is out of range. The allowed range is {10, 20, 30, 50, 100}.  |
| 125 | 30007      | The values of <b>startTime</b> and <b>endTime</b> must be both provided or empty.  |
| 126 | 30008      | Failed to invoke the internal interface.   |
| 127 | 30009      | The value of <b>taskName</b> is empty.   |
| 128 | 30010      | The value of <b>nds</b> is empty.  |
| 129 | 30011      | The value of <b>cleanStatus</b> is empty or invalid.   |
| 130 | 30012      | The value of <b>environmentalParameters</b> is empty or invalid.   |
| 131 | 30013      | The value of <b>modulePanelIrradiance</b> or <b>moduleBackSurfaceTemperature</b> is empty when <b>environmentalParameters</b> is set to 1. |
| 132 | 30014      | The value of <b>scanPointNum</b> must be set to 128.   |
| 133 | 30015      | The value of <b>taskId</b> is empty.   |
| 134 | 30016      | The value of <b>dn</b> is empty.   |
| 135 | 30017      | The value of <b>dns</b> is invalid. The number of devices exceeds 100 or devices on which the user does not have permission exist.         |
| 136 | 30018      | The value of <b>taskName</b> is invalid (for example, null field).   |

| No. | Error Code | Description   |
|-----|------------|---|
| 137 | 30019      | The value of <b>moduleBackSurfaceTemperature</b> is out of range. The allowed range is [0.0, 100.0].  |
| 138 | 30020      | The value of <b>modulePlaneIrradiance</b> is out of range. The allowed range is [600.0, 1500.0].  |
| 139 | 30021      | The value of <b>pageNo</b> is smaller than 0.   |
| 140 | 30022      | The value of <b>timestamp</b> is empty.   |
| 141 | 30023      | The command type is invalid (for example, null).  |
| 142 | 30024      | The power supply duration is invalid.   |
| 143 | 30025      | The MPPT list is empty.   |
| 144 | 30026      | The value of <b>mppts</b> is empty.   |
| 145 | 30027      | The number of MPPTs connected to a single inverter exceeds the maximum limit (3), or the total number of MPPTs in a single task exceeds the maximum limit (32). |
| 146 | 30028      | The backfeed current input value is invalid.  |
| 147 | 30029      | Authentication failed.  |
| 148 | 30030      | The input parameter is incorrect.   |
| 149 | 30031      | A maximum of 10 devices can be queried at a time.   |
| 150 | 30032      | The time parameter is invalid. The query time segment cannot be longer than three days.   |
| 151 | 30033      | The task is in progress.  |
| 152 | 30034      | The returned list is empty.   |

# 12 Recommended Solutions for Error Codes

| No. | Error Code | Description   |
|-----|------------|---|
| 1   | 20607      | The task list is empty. You are advised to add the parameters for the task list in "Request Parameters" of the interface.   |
| 2   | 20608      | Duplicate plant IDs exist in the input parameters. You are advised to delete the duplicate plant IDs from "Request Parameters" of the interface.  |
| 3   | 20609      | The plant networking is abnormal. You are advised to check whether each plant has communications devices and whether each plant has only one communications device.                                 |
| 4   | 20610      | The plant does not support the default configuration.   |
| 5   | 20611      | The values of input parameters exceed the valid range. You are advised to check "Request Parameters" of the interface in this document to determine the value range of each input parameter.        |
| 6   | 20612      | The values of input parameters are empty. You are advised to add the values in "Request Parameters" of the interface.   |
| 7   | 20613      | The default setting task fails to be sent for all plants. You are advised to view the error code of each plant in "Response Packet" of the interface and rectify the fault based on the error code. |
| 8   | 20614      | The network communication is abnormal. You are advised to check whether the network connection is normal.   |
| 9   | 20615      | The same task is being executed in the plant. You are advised to wait for 3 minutes and try again.  |



| No. | Error Code | Description   |
|-----|------------|---|
| 10  | 20616      | The task ID is empty. You are advised to add the parameters for the task ID in "Request Parameters" of the interface.   |
| 11  | 20617      | The query result of the default plant setting task is empty. You are advised to check whether <b>requestId</b> and <b>plantCodes</b> are correctly set, and then check whether the plants corresponding to <b>requestId</b> contain the plants corresponding to <b>plantCodes</b> . |
| 12  | 20618      | The number of times that an API is called on a single day exceeds the limit. For details about the maximum number of northbound API calls, see "Access Restrictions" in the corresponding interface description in this document.   |
| 13  | 20619      | The number of task IDs exceeds 100. You are advised to reduce the number of task IDs transferred in a single request to less than 100.  |
| 14  | 20620      | The task ID does not exist. Check whether the entered task ID is correct.   |

# 13 FAQ

---

## 13.1 Failed to invoke the northbound interface

### 13.1.1 Importing a New Certificate When Certificate Verification Fails

#### Problem Description

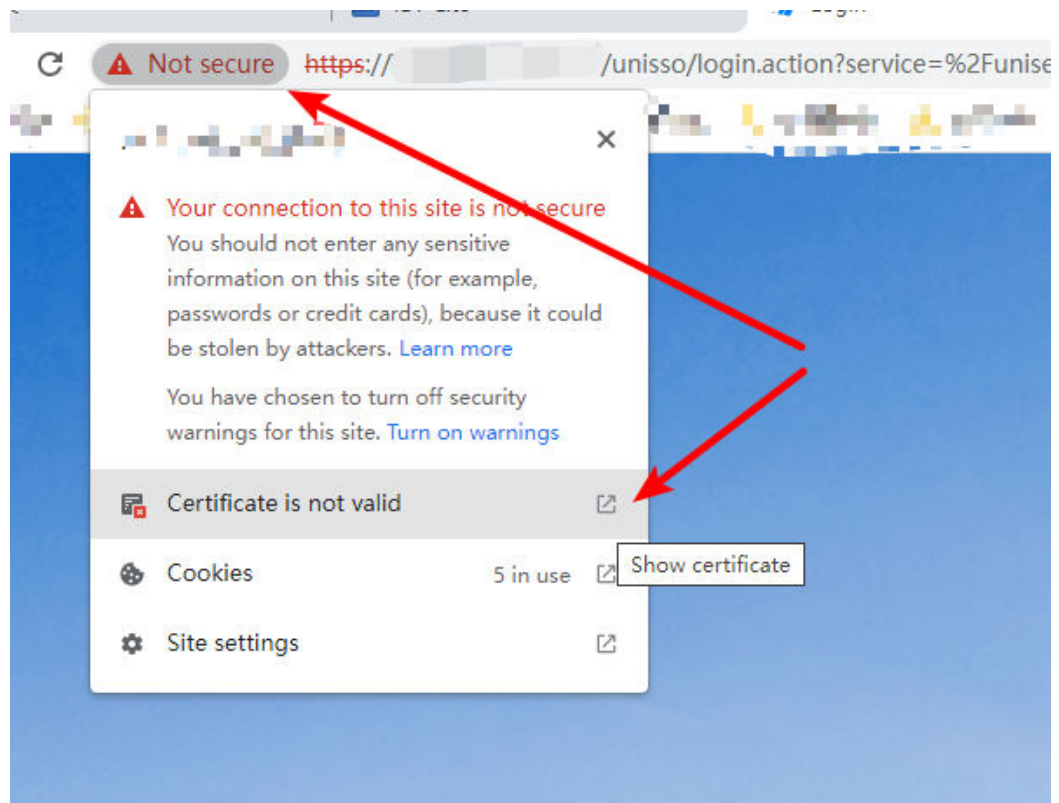
When a client accesses the northbound API of FusionSolar using HTTPS, the access fails because the server certificate cannot be verified.

#### Solution

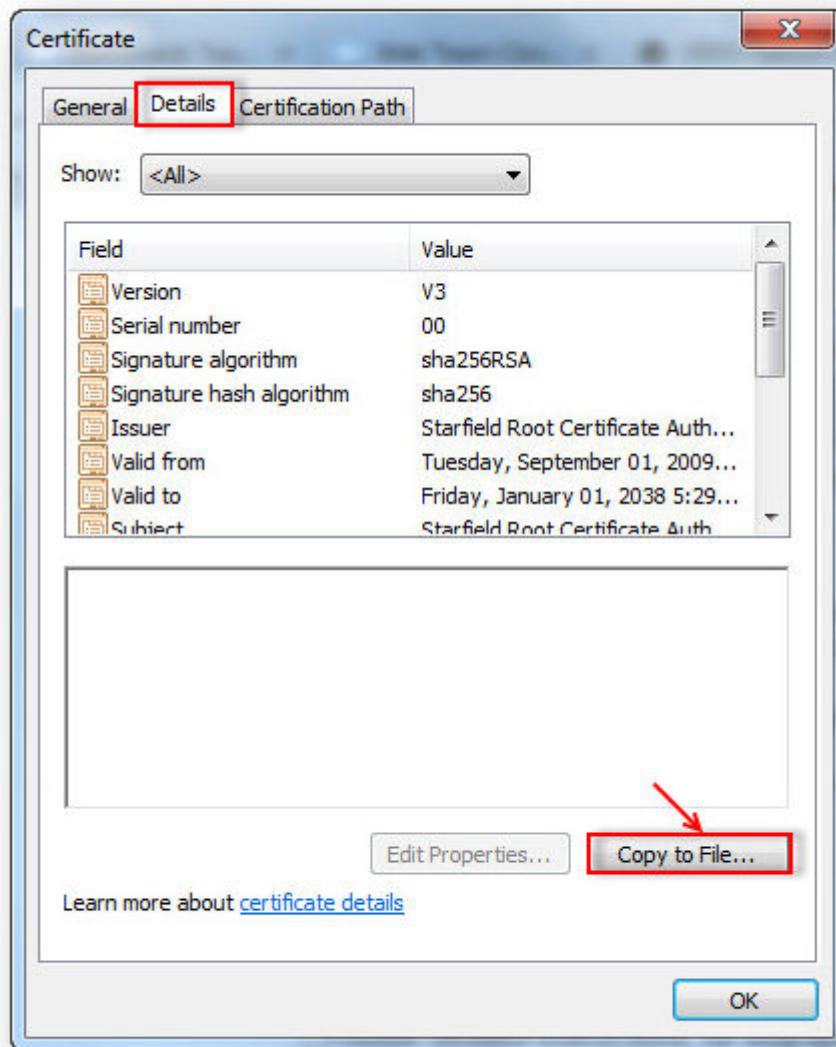
Import a trusted certificate again.

#### Procedure

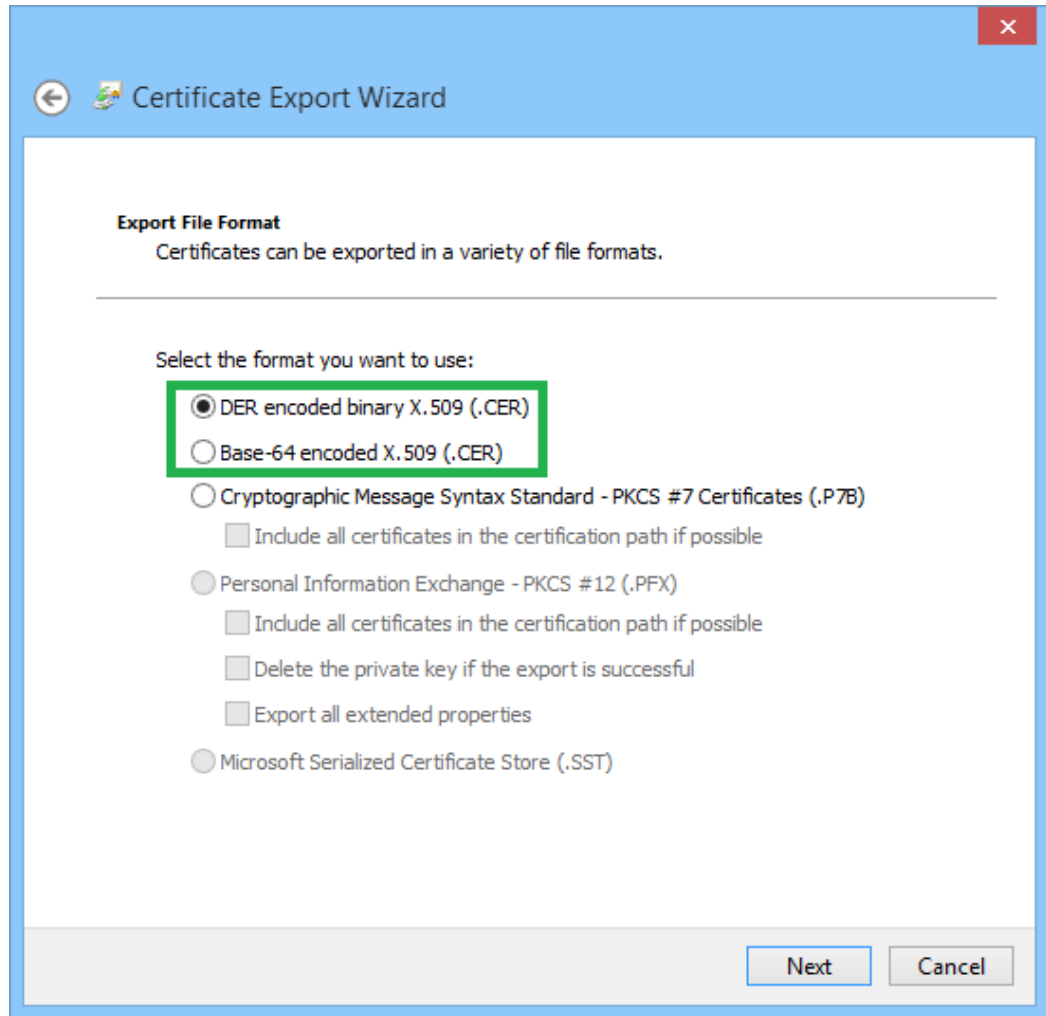
- Step 1** Obtain a new trusted certificate.  
Log in to the FusionSolar WebUI.

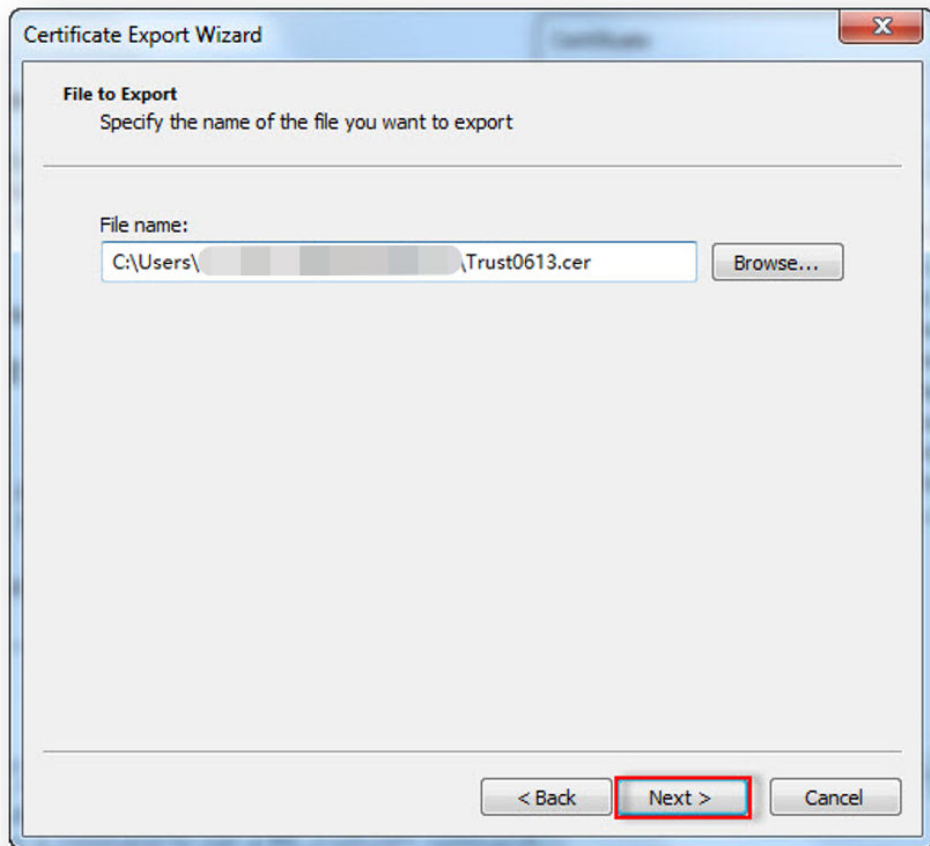


On the **Details** tab page of the certificate, click **Copy to File...** to download the new certificate.



Select **DER encoded binary X.509 (.CER)** to export and save the certificate.





**Step 2** Import the certificate.

The JRE environment is used as an example. Import the trusted certificate to the security directory of the JRE environment.

Run the **keytool -import -alias abc -keystore cacerts -file /opt/hd/Trust0613.cer** command.

Set the password of the certificate.

```
[root@dggphisprm07344 security]# keytool -import -alias abc -keystore cacerts -file /opt/hd/Trust0613.cer
Enter keystore password:
Owner: CN=*.fusionsolar.huawei.com, O="Huawei Technologies Co., Ltd", L=Shenzhen, ST=Guangdong, C=CN
Issuer: CN=Actalis Organization Validated Server CA G3, O=Actalis S.p.A., L=Ponte San Pietro, ST=Bergamo, C=IT
Serial number: 74743e222cf6f1819cf86c224ec223e4
```

When the system asks you whether to trust the certificate, enter **Y** and press **Enter**. The system displays a message indicating that the certificate has been added to the certificate library.

```
]
#5: ObjectId: 2.5.29.31 Criticality=false
CRLDistributionPoints [
  [DistributionPoint:
    [URIName: http://cr109.actalis.it/Repository/AUTHOV-G3/getLastCRL]
  ]]
#6: ObjectId: 2.5.29.32 Criticality=false
CertificatePolicies [
  [CertificatePolicyId: [1.3.159.1.19.1]
  [PolicyQualifierInfo: [
    qualifierID: 1.3.6.1.5.5.7.2.1
    qualifier: 0000: 16 24 68 74 74 70 73 3A 2F 2F 77 77 77 2E 61 63 .https://www.ac
0010: 74 61 6C 69 73 2E 69 74 2F 61 72 65 61 2D 64 6F talis.it/area-do
0020: 77 6E 6C 6F 61 64 wnload
  ] ]
  [CertificatePolicyId: [2.23.140.1.2.2]
  [ ] ]
]
#7: ObjectId: 2.5.29.37 Criticality=false
ExtendedKeyUsages [
  clientAuth
  serverAuth
]
#8: ObjectId: 2.5.29.15 Criticality=true
KeyUsage [
  DigitalSignature
  Key_Encipherment
]
#9: ObjectId: 2.5.29.17 Criticality=false
SubjectAlternativeName [
  DNSName: *.fusionsolar.huawei.com
  DNSName: fusionsolar.huawei.com
]
#10: ObjectId: 2.5.29.14 Criticality=false
SubjectKeyIdentifier [
  KeyIdentifier [
    0000: FF 98 3D 8B D1 F0 AD 48 C9 E5 E0 11 A4 62 87 B6 ..=...H....b..
    0010: 64 D8 1B CC d...
  ]
]
Trust this certificate? [no]: y
Certificate was added to keystore
[root@ggpniisprm07344 security]#
```

**Step 3** Access the interface again and check whether the server certificate verification is successful.

----End