

iMaster NetEco V600R022C00

Northbound Interface Reference-V7 (SmartPVMS)

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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. 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	2022-06-16	This issue is the first official release.

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1 Overview

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- [1.2 System Architecture](#)
- [1.3 Interconnection Method](#)
- [1.4 Interface Change Description](#)

1.1 Interface Description

RETSful 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.

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.

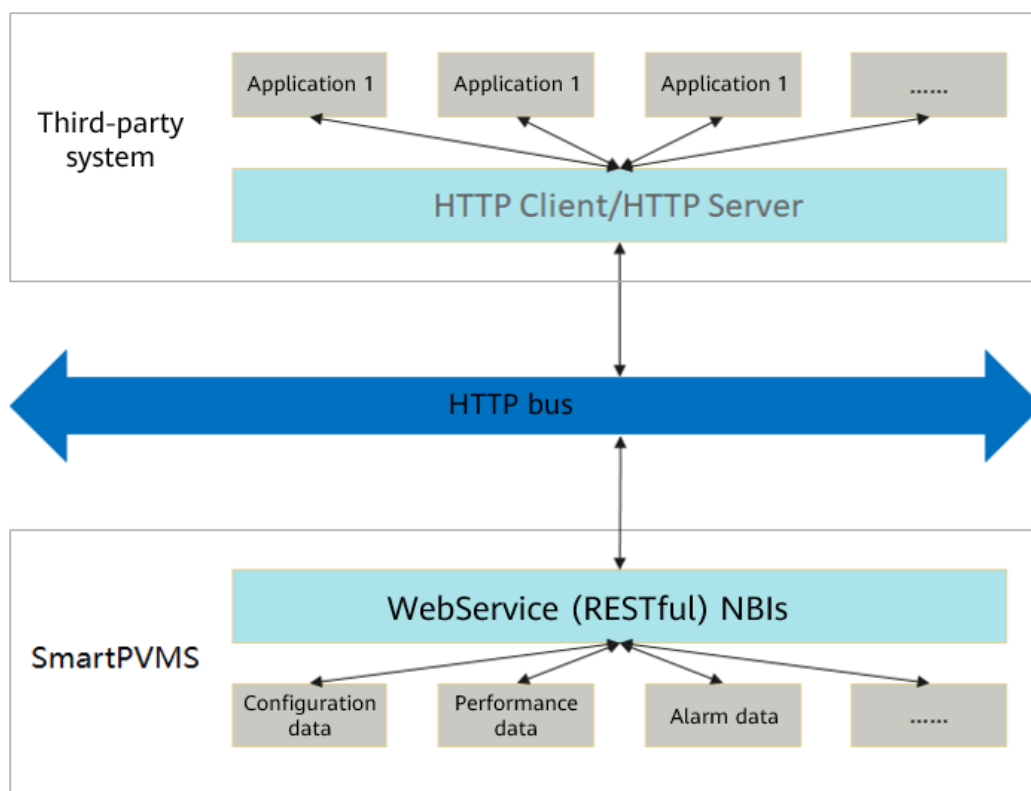
- 1xx message: The request has been received by the server and continues to be processed.
- 2xx success: The request has been received, understood, and accepted by the server.
- 3xx redirection: This request can be completed only after subsequent operations are performed.
- 4xx request error: The request contains a syntax error or cannot be executed.
- 5xx server error: An error occurs when the server processes a correct request.

1.2 System 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 or IP address 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 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 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

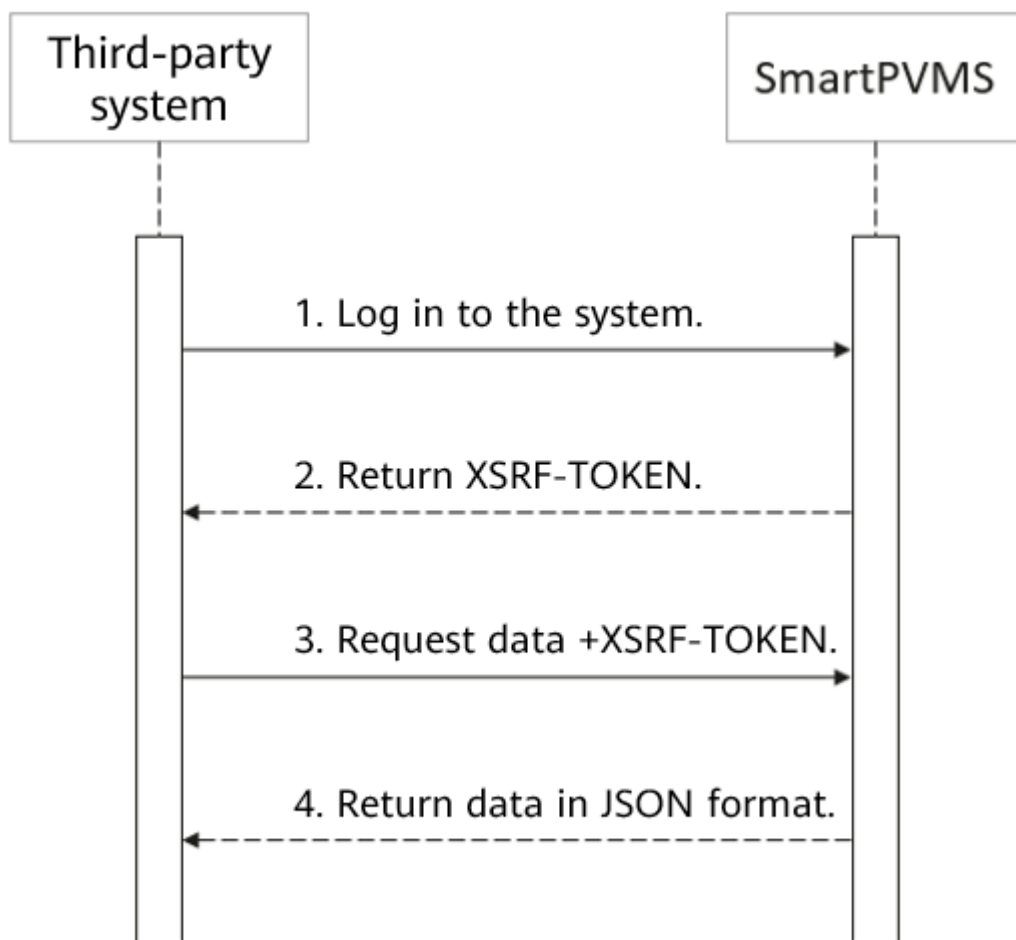
Traffic Limiting Policy

The number of northbound users and the number of plants and devices managed by each northbound user are increasing. To better meet user requirements, the northbound API traffic limiting policy is adjusted. The new traffic limiting policy is based on the number of resources owned by northbound users. A user with more plants and devices is allowed to send more API requests in a period of time.

Existing users: For northbound users created on June 30, 2022 or earlier, the original traffic limiting policy applies, and the allowed invoking frequency cannot be increased. **New users:** For northbound 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 traffic limiting policy, API invoking may fail, and the consequences shall be borne by the user.

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 user name 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 user name and password, the system returns this token to the user. If the user adds the token to a subsequent request, 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 V600R022C00 to iMaster NetEco V600R022C00CP1202

[2.1 New Interfaces](#)

[2.2 Deleted Interfaces](#)

[2.3 Modified Interfaces](#)

2.1 New Interfaces

Interface Name	Interface Method and Path	Description
Historical Plant Data Interface	<i>https://Management system domain name or IP address:27200/rest/openapi/pvms/v1/vpp/plantHistoryKpi</i>	Obtains 5-minute statistical counters of multiple plants.

2.2 Deleted Interfaces

None

2.3 Modified Interfaces

Interface Name	Interface Method and Path	Description
Interface for Power Plant List Querying	<i>https://Management system domain name or IP address:27200/rest/openapi/pvms/v1/plants</i>	Obtains the plant information corresponding to the plant name.

3 Changes from V600R021C10 to V600R021C10SPC010

[3.1 New Interfaces](#)

[3.2 Deleted Interfaces](#)

[3.3 Modified Interfaces](#)

3.1 New Interfaces

None.

3.2 Deleted Interfaces

None.

3.3 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	<i>https://Domain name or IP address of the management system/</i> 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.

Interface Name	Interface Method and Path	Description
5-minute Device Data Interface	https:// <i>Domain name or IP address 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.
Daily Device Data Interface	https:// <i>Domain name or IP address 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 or IP address 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 or IP address 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.

4 Changes from iMaster NetEco V600R022C00 to SmartPVMS V600R021C10SPC010

[4.1 New Interfaces](#)

[4.2 Deleted Interfaces](#)

[4.3 Modified Interfaces](#)

4.1 New Interfaces

None.

4.2 Deleted Interfaces

None.

4.3 Modified Interfaces

None

5 Changes from V500R007C00SPC200 to V600R021C10

[5.1 New Interfaces](#)

[5.2 Deleted Interfaces](#)

[5.3 Modified Interfaces](#)

5.1 New Interfaces

Interface Name	Interface Method and Path	Description
Interface for Task List Querying	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/tasks	New interface
Interface for Creating Diagnosis Tasks	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/scanTask	New interface
Interface for Canceling Diagnosis Tasks	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/revokeTask	New interface
Interface for Querying Task Status	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/scanTask/status	New interface
Interface for Fault List Querying	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/scanTask/faultList	New interface
Interface for I-V Curve Details Querying	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/scanTask/ivdata	New interface
Interface for String Configuration Querying	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/pvConfig	New interface

Interface Name	Interface Method and Path	Description
Interface for String Details Querying	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/pvConfig/detail	New interface
Interface for String Details Configuration	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/pvConfig/configuration	New interface
Interface for PV Module Library Querying	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/pvConfig/modules	New interface
Interface for PV Module Details Querying	POST https://x.x.x.x:27200/rest/openapi/pvms/v1/iv/pvConfig/module	New interface

5.2 Deleted Interfaces

None.

5.3 Modified Interfaces

None.

6 v7 Interface Reference

- [6.1 Security Management Interfaces](#)
- [6.2 Configuration Management Interfaces](#)
- [6.3 Interfaces for Virtual Power Plants](#)
- [6.4 Smart I-V Curve Diagnosis Interface](#)
- [6.5 PV Community Interfaces](#)
- [6.6 To-Be-Offline Interfaces](#)

6.1 Security Management Interfaces

6.1.1 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://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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=42E06857DCAB625E768CF58C3051F0A6; Path=/; Secure; HttpOnly,XSRF-TOKEN=x-9hrxl7xc62ksbpd809bvo9o8ak85h3uekgapfmmr45fzukaq1fa1k71d7vmkqks81ic6s4o6pi
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-9hrxl7xc62ksbpd809bvo9o8ak85h3uekgapfmmr45fzukaq1fa1k71d7vmkqks81ic6s4o6pi
```

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.

6.1.2 Logout Interface

Interface Description

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

Request URL

https://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag

Parameter	Description	Data Type	Remarks
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-

Example

Request URL example:

```
{  
  "xsrfToken": "x-  
apepji1f7zuqimep7wuqen9hkb3xaourelbyrx9jio7s09hgk6ca2mdlksjdgldshjaksdfhhdshahweduyio  
qwehjkd"  
}
```

Response example:

Example 1: successful logout

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

Example 2: failed logout

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

6.2 Configuration Management Interfaces

6.2.1 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://x.x.x.x:27200/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 plantNames is empty.
pageSize	Number of results on each page. The value can be 50 or 100 .	Integer	Optional. This parameter is mandatory when plantNames 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 pageNo 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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional response message	-	-
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	-

Parameter	Description	Data Type	Remarks
>> 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  
}
```

6.2.2 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://x.x.x.x: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 7 Device Type List .	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 50 or 100 .	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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-

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	Device information list. The device information is as follows:	List	Device information
>> plantCode	Plant ID	String	-
>> deviceTypeId	Device type ID. For details, see 7 Device Type List .	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. 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				

Device Type	Device Type ID	key	Item	Unit	Return Value Type
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
		softwareVersion	Software version	-	String
		optimizerNumber	Quantity of optimizers	-	Integer

Device Type	Device Type ID	key	Item	Unit	Return Value Type
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  
}
```

6.3 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).

6.3.1 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://x.x.x.x: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 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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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: true: succeeded (If different SNs of the same PV plant are registered, this message is also returned.) 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  
}
```

6.3.2 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://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional response message	-	-

Parameter	Description	Data Type	Remarks
data	The returned data contains the following device and plant registration status information:	List	-
> authorizationCode	Authorization code bound to the plant	String	-
> success	Registration result: true : success 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:

```
{
  "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": "QAAAVZZZZ3",
  "success": false,
  "errorMsg": "Not found authorization code",
  "plantCode": null,
  "plantName": null
},
"failCode": 0,
"message": null
}
```

6.3.3 Basic Plant Information Interface

Interface Description

This interface is used to obtain basic plant information based on plant codes. 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://x.x.x.x:27200/rest/openapi/pvms/v1/vpp/plants>

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 code list. Plant codes are separated by commas (,).	String	Mandatory

Response Packet

Parameter	Description	Data Type	Remarks
success	Request success or failure flag true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-
data	Returned data, which contains the all device data, including the following information:	List	Device information
> plantCode	Plant code	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  
}
```

6.3.4 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://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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. 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: charging cutoff SOC – end-of-discharge SOC. If multiple SOCs exist, the value is a weighted average value: [(charging cutoff SOC1 – end-of-discharge SOC1) x rated battery capacity 1 + (charging cutoff SOC2 – end-of-discharge SOC2) x rated battery capacity 2]/ (rated battery capacity 1 + 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: healthy 1: disconnected 2: faulty Note: Disconnected: All devices are disconnected. Faulty: The devices are not disconnected. However, major or critical faults occur on some devices. Healthy: No preceding situations 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  
}
```

6.3.5 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://x.x.x.x: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 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 The background processes the time based on the time zone where the plant is located. The time is accurate to milliseconds. The interval between the start time and end time cannot exceed 24 hours. 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 true: The request succeeded. 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 8 Error Code List .
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
>> 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
>> 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. 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
>> 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
}
```

6.3.6 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://x.x.x.x:27200/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 0: stop forced charge and discharge 1: forced charge 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. 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.

Response Packet

Parameter	Description	Data Type	Remarks
success	Request success or failure flag true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code Value 0 indicates that the status is normal. For other error codes, see 8 Error Code List .	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 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.
4	20010	The plant list cannot be empty.

No.	Error Code	Description
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.

Example

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 example:

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,  
      "remoteID": "12345678"  
    },  
    {  
      "plantCode": "NE=23456789",  
      "sn": "6fbfk11",  
      "dispatchResult": 0,  
      "remoteID": "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,  
      "remoteID": "12345678"  
    },  
    {  
      "plantCode": "NE=23456789",  
      "sn": "6fbfk11",  
      "dispatchResult": 0,  
      "remoteID": "23456789"  
    }  
  ],  
  "failCode": 0,  
  "message": null  
}
```

6.3.7 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://x.x.x.x:27200/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

Response Packet

Parameter	Description	Data Type	Remarks
success	Request success or failure flag true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code Value 0 indicates that the status is normal. For other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-
data	Returned data for each request, including the following information:	Map	-
> 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	0: complete 1: in progress 2: timeout

Parameter	Description	Data Type	Remarks
> chargedCapacity	Amount of power that has been forcibly charged into batteries. If dispatchSwitch is not 1, null is returned.	Double	kWh
> dischargedCapacity	Amount of power that has been forcibly discharged from batteries. If dispatchSwitch 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

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.

Example

Request example:

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

Response example:

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,  
      "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,  
      "startTime":"2020-02-06T00:00:00+08:00",  
      "endTime":"2020-02-06T00:01:00+08:00"  
    }  
  ]  
}
```

6.3.8 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://x.x.x.x: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 (deviceTypeld: 20815) can be queried through the 6.2.2 Interface for Device List Querying .	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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code Value 0 indicates that the status is normal. For other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-
data	Returned data for each request, including the following information:	-	Returned information for requests

Parameter	Description	Data Type	Remarks
> dn	Unique ID of a battery device	String	-
> result	Setting result	Integer	0: succeeded 1: failed
> setDOD	DoD value that has been successfully set (charging cutoff SOC – end-of-discharge SOC)	Integer	End-of-discharge SOC = 100% – DoD Range of end-of-discharge SOC for LG batteries: [12,20] 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
}
```

6.3.9 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://x.x.x.x: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 6.2.2 Interface for Device List Querying .	String	Mandatory
controlType	Power-on/off control 1: on 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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code Value 0 indicates that the status is normal. For other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-
data	Returned data for each request, including the following information:	-	Returned information for requests
> dn	Unique device ID	String	-

Parameter	Description	Data Type	Remarks
> result	Setting result	Integer	0: succeeded 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  
}
```

6.3.10 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://x.x.x.x: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: 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
drms	DRM mode list. Currently, the system supports only drm0, drm1, and drm5.	List	Mandatory

Parameter	Description	Data Type	Mandatory/Optional
>drm0	Specifies whether to shut down the inverter. true: shuts down the inverter false: starts the inverter	String	Mandatory
>drm1	Specifies whether to stop the inverter from consuming grid power. true: stops the inverter from consuming grid power false: allows the inverter from consuming grid power	String	Mandatory
>drm5	Specifies whether to stop the output power of the inverter. true: stops the output power of the inverter 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 true: The request succeeded. 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 result . 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-
data	Returned data for each request, including the following information:	-	Returned information for requests
> plantCode	Unique PV plant ID	String	-
> drm	Character string consisting of all DRM switch settings	-	Switch settings are separated with commas (,).
> result	Setting result	Integer	0: succeeded 1: failed 2: partially succeeded

Example

Request example:

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

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":[  
    {  
      "plantcode":"BA4372D08E0",  
      "drm":"drm0=true,drm1=true,drm5=true",  
      "result":0  
    },  
    {  
      "plantcode":"5D02E8B40AD",  
      "drm":"drm0=true,drm1=true,drm5=true",  
      "result":0  
    }  
  ],  
  "failCode":0,  
  "message":null  
}
```

6.3.11 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://x.x.x.x: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/Optional
dn	Plant DN. Enter one plant DN for each request.	String	Mandatory

Parameter	Description	Data Type	Mandatory/Optional
controlType	EMS control type 0: no control (not supported) 2: maximum self-consumption (not supported) 4: fully fed to grid (not supported) 5: time-of-use price (TOU) (not supported) 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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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 true: The request succeeded. false: The request failed.	Integer	0: succeeded 1: failed 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"  
}
```

6.4 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.

6.4.1 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://x.x.x.x: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. 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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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	0 : not cleaned 1 : cleaned

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

6.4.2 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://x.x.x.x:27200/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 6.2.2 Interface for Device List Querying .	String	Mandatory
cleanStatus	PV module cleaning status	Integer	Mandatory 0 : not cleaned 1 : cleaned
environmentalParameters	Environmental parameter setting status	Integer	Mandatory 0 : automatic. The predicted PV module plane irradiance and backplane surface temperature are used. 1 : manual
modulePlaneIrradiance	PV module plane irradiance (W/m ²), range [600.0, 1500.0]	Double	Optional. This parameter is mandatory when the environment parameter setting status is 1 .
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

Response Packet

Parameter	Description	Data Type	Remarks
success	Request success or failure flag true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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.

Example

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  
  }  
}
```

6.4.3 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://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-
data	Returned data	-	Returns null .

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  
}
```

6.4.4 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://x.x.x.x:27200/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 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
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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-

Parameter	Description	Data Type	Remarks
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	-
> 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.
>> status	Task status	Integer	0: succeeded, 1: failed, 2: 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.

Example

Request example:

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

Response example:

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
      }
    ]
  }
}
```

6.4.5 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://x.x.x.x: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
pageSize	Number of results on each page. The value can be 10, 20, 30, 50, or 100.	Integer	Mandatory

Response Packet

The returned list does not display normal inverters and strings.

Parameter	Description	Data Type	Remarks
success	Request success or failure flag true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag

Parameter	Description	Data Type	Remarks
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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
>> 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	-

Parameter	Description	Data Type	Remarks
>> 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	-
>> 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	-

Example

Request example:

```
{
  "taskId": 126140505793022,
```

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

Response example:

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,  
        "stringImIoc": 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": "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,  
        "stringImIoc": null,  
        "stringDegradationRate": null,  
        "faultCode": 99999,  
        "faultName": "no data to scan",  
        "faultDetail": "no data to scan",  
        "faultSuggestion": "please wait...",  
        "scanTime": 1604226992032  
      }  
    ]  
  }  
}
```

```
"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,  
"stringImIsc": null,  
"stringDegradationRate": null,  
"faultCode": 10012,  
"faultName": "PV not set",  
"faultDetail": "PV not set",  
"faultSuggestion": "please check params",  
"scanTime": 1604226992032  
}  
...  
]  
}  
}
```

6.4.6 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://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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	-

Parameter	Description	Data Type	Mandatory/Optional
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. Default value: all 0: not configured 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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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	-

Parameter	Description	Data Type	Remarks
> 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 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  
}  
]  
}  
}
```

6.4.8 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://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag

Parameter	Description	Data Type	Remarks
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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	1 : yes 0 : 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
    }
  ]
}
```

6.4.9 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://x.x.x.x: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
> 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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-
data	Returned data	-	Returns null .

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  
}
```

6.4.10 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://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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  
}  
...  
]
```

6.4.11 Interface for PV Module Details Querying

Interface Description

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

Request URL

<https://x.x.x.x: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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	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	-

Example

Request example:

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

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,  
  "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  
}
```

6.5 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.

6.5.1 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://x.x.x.x:27200/rest/openapi/pvms/v1/community/snIsRegister>

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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	
message	Access error message, which is optional	String	
data	Returned data. data 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
}
```

6.6 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 6-1 To-be-offline interfaces

Interface Name	Request URL	Estimated Offline Date	Offline Reason	New Interface	Request URL
Historical Plant Data Interface	https://x.x.x.x:27200/rest/openapi/pvms/v1/vpp/plantFiveMinutesKpi	2023-06-30	The function is enhanced.	Historical Plant Data Interface	https://x.x.x.x:27200/rest/openapi/pvms/v1/vpp/plantHistoryKpi

6.6.1 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://x.x.x.x: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 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 The background processes the time based on the time zone where the plant is located. The time is accurate to milliseconds. The start time and end time must be on the same day. 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 true: The request succeeded. false: The request failed.	Boolean	Request success or failure flag
failCode	Error code 0 indicates that the status is normal. For definitions of other error codes, see 8 Error Code List .	Integer	-
message	Optional message	String	-
data	Returned 5-minute plant data, which includes the following information:	List	5-minute KPI data of the plant
> dataTime	Data time, including the time zone.	String	2020-02-06T00:00:00+08:00

Parameter	Description	Data Type	Remarks
> 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
> 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

Parameter	Description	Data Type	Remarks
> 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
> batteryEnergy	Total amount of power of batteries. If there is no battery, the returned value is NULL. 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
> 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  
    }  
  ]  
}
```

```
"grid2loadEnergy": 0,  
"grid2batteryEnergy": 0,  
"pv2loadEnergy": 0,  
"batteryEnergy": 0,  
"chargeEnergy": 0,  
"dischargeEnergy": 0,  
"batterySOC": 0  
}  
],  
"failCode": 0,  
"message": null  
}
```

7 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	

8 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	20200	The system is busy. Try again later.
52	20400	The username or password of the third-party system is incorrect.
53	20403	The login of the third-party system user is restricted.
54	30001	The device ESN list cannot be empty.
55	30002	The ESNs queried at a time cannot exceed 50.
56	30003	The account cannot be empty in the input parameter.
57	30004	The value of pageNo cannot be empty.
58	30005	The value of pageSize cannot be empty.
59	30006	The value of pageSize is out of range. The allowed range is {10, 20, 30, 50, 100}.
60	30007	The values of startTime and endTime must be both provided or empty.
61	30008	Failed to invoke the internal interface.
62	30009	The value of taskName is empty.
63	30010	The value of nds is empty.
64	30011	The value of cleanStatus is empty or invalid.
65	30012	The value of environmentalParameters is empty or invalid.
66	30013	The value of modulePlanelrradiance or moduleBackSurfaceTemperature is empty when environmentalParameters is set to 1.

No.	Error Code	Description
67	30014	The value of scanPointNum must be set to 128.
68	30015	The value of taskId is empty.
69	30016	The value of dn is empty.
70	30017	The value of dns is invalid. The number of devices exceeds 100 or devices on which the user does not have permission exist.
71	30018	The value of taskName is invalid (for example, null field).
72	30019	The value of moduleBackSurfaceTemperature is out of range. The allowed range is [0.0, 100.0].
73	30020	The value of modulePlaneIrradiance is out of range. The allowed range is [600.0, 1500.0].
74	30021	The value of pageNo is smaller than 0.
75	30022	The value of timestamp is empty.
76	30023	The command type is invalid (for example, null).
77	30024	The power supply duration is invalid.
78	30025	The MPPT list is empty.
79	30026	The value of mppts is empty.
80	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).
81	30028	The backfeed current input value is invalid.
82	30029	Authentication failed.
83	30030	The input parameter is incorrect.
84	30031	A maximum of 10 devices can be queried at a time.
85	30032	The time parameter is invalid. The query time segment cannot be longer than three days.