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1. Brief Introduction

1.1 Purpose

AiSWEI cloud API supply access to get data of PV plant, you can get data from AiSWEI cloud by this API, and embed them in your application or website, to customize your personalized presentation.

This document will explain how to use the APIs, for developer and maintainer.

1.2 Abbreviations and Definitions

AiSWEI cloud --Visual monitoring system for customer's PV plant supplied by AiSWEI

API -- Application Programmer's Interface

JSON -- JavaScript Object Notation

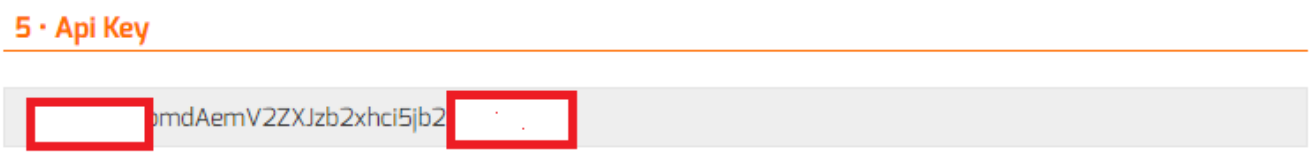
HTTP -- Hypertext Transfer Protocol

RFC -- Request for Comment

RPC -- Remote Procedure Call

APP key， APP secret

NMI National Metering Identifier。It is used to identify the request id of the plant. You can find in on the web page of the AiSWEI cloud.（Navigation bar: "Configuration" -> "Plant Configuration" –>"5. Api Key"）



1.3 Disclaimer

AiSWEI API is supplied by AiSWEI, which is a free value-added service. You have to bear your own risk and loss associated with using this service.

There may be different between the content this document describe and actual use, because of version updating. We may update the version without prior notice, please pay your attention to our website. In use process, you can contact with us if any question.

1.4 Reference

- RFC 4627 :The application/json Media Type for JavaScript Object Notation (JSON)

- JSON-RPC 1.1 Working Draft August 2006http://json-rpc.org/wd/JSON-RPC-1-1-WD-20060807.html
- Introducing JSONhttp://www.json.org/

1.5 Limits

- API traffic limit : 100 times per minute

2. API Description

2.1 Request

2.1.1 Request Path

http://e710888d3ccb4638a723ff8d03837095-cn-qingdao.aliapi.com/demo/post

2.1.2 Request Method

POST

2.1.3 Request Body

FormParam1=FormParamValue1&FormParam2=FormParamValue2

2.1.4 Request Head

- **Host**: e710888d3ccb4638a723ff8d03837095-cn-qingdao.aliapi.com
- **Date**: Mon, 22 Aug 2016 11:21:04 GMT
- **User-Agent** : Apache-HttpClient/4.1.2 (java 1.6)
- **Content-Type** : application/x-www-form-urlencoded; charset=UTF-8

  // request body type, please set according to the actual request body content.
- **Accept**: application/json

  // Request response type, part of the API can be based on the specified response type to return to the corresponding data format, it is recommended to manually specify the request header, if not set, part of the HTTP client will set the default value * / *, resulting in a signature error.
- **X-Ca-Request-Mode**: debug

//Whether to open the Debug mode, case insensitive, do not set the default off, the general API debugging phase can open this setting.

- **X-Ca-Version**: 1

// API version number, all APIs currently only support version number "1", you can not set this request header, the default version number is "1".

- **X-Ca-Signature-Headers**: X-Ca-Request-Mode,X-Ca-Version,X-Ca-Stage,X-Ca-Key,X-Ca-Timestamp

//The client will participate in the signature of the custom request header, the server will be based on this configuration to read the request header to sign, where the settings do not contain Content-Type, Accept, Content-MD5, Date request header, these request head has been included in the basic signature In the structure, refer to the request signature documentation for details.

- **X-Ca-Stage**: RELEASE

// Request the API of the Stage, currently supports TEST, PRE, RELEASE three Stage, case insensitive, API providers can choose to release to which stage, only published to the designated stage after the API can be called, otherwise it will prompt the API can not find Or Invalid Url.

- **X-Ca-Key**: 60022326

// Request the AppKey, please go to the API Gateway console generated, only access to API authorization can be called after the cloud through the market and other channels to buy the API has been granted acquiescence APP, Ali cloud all cloud products share a set of AppKey system, remove ApppKey Please be careful to avoid affecting other cloud products that have already been opened.

- **X-Ca-Timestamp**: 1471864864235

// The timestamp of the request is the number of milliseconds of the current time, that is, from January 1, 1970 to the present time, the time stamp is valid for 15 minutes.

- **X-Ca-Nonce**:b931bc77-645a-4299-b24b-f3669be577ac

// Request unique identifier, within 15 minutes AppKey + API + Nonce can not be repeated, combined with the timestamp to play a role in anti-replay.

- **X-Ca-Signature**: FJleSrCYPGCU7dMlLTG+UD3Bc5Elh3TV3CWHtSKh1Ys=

// Request signature.

- **CustomHeader**: CustomHeaderValue

// Custom request header, here only as an example, the actual request can be set according to the API definition of multiple custom request header.

2.2 Response

2.2.1 Status Code

- 400

// Response status code, greater than or equal to 200 less than 300 means successful; greater than or equal to 400 less than 500 for the client error; greater than 500 for the server error.

2.2.2 Response Head

- **X-Ca-Request-Id**: 7AD052CB-EE8B-4DFD-BBAF-EFB340E0A5AF

// Request the unique ID, the request once the API gateway application, the API gateway will generate the request ID and return to the client through the response header, the proposed client and back-end services are recorded this request ID, can be used for troubleshooting and tracking.

- **X-Ca-Error-Message**: Invalid Url

// The API gateway returns an error message that the API gateway returns the error message to the client through the response header when an error occurs.

- **X-Ca-Debug-Info**: {"ServiceLatency":0,"TotalLatency":2}

// When you open the Debug mode will return to the Debug information, this information may be changed later, only for the FBI phase reference

When you call the API, you need to include the signature information in the request, whether you are using HTTP or the HTTPS protocol. AppKey is used to identify you, AppSecret is the key used to encrypt the signature string and the server-side validation signature string. For details on how to encrypt a signed signature, see the document 4.request signature.

3. API List

NO	Grouping	Key pair	API name	Description
1	OLDAPI	Please contact with the salesman or service.	planlist	Obtain the list of power stations according to the user token
2			getPlantOverview	Obtain data on power generation and benefit
3			getPlantOutput	Obtain the data of all inverters (one day, month, year) under the power station according to the query type
4			getPlantEvent	Obtain the information of power station events
5			getInverterOverview	Obtain data of inverter power generation and benefit reduction
6			devicelist	Obtain the list of all equipment under the power station
7			getInverterData	Query the data of all inverters under the power station in a certain period

- Traffic Control:

  1） OLDAPI： 100 times/Minutes

3.1 planlist

- Request Path: https://eu-api-genergal.aisweicloud.com/planlist
- HTTP Method:Get
- Request Parameters

Name	Type	Description	Must
token	String	token	Y
order	Integer	0-order by last updated time default:0 1-order by create time 2-order by plant status	N
page	Integer	The current page number, default:1	N
size	Integer	The size of each page, default:20	N

- Response Type: JSON (application/json;charset=utf-8)
- Response Parameters

Name	Type	Description
data	Jsno	
totalcount	Integer	The apikey of plant
pagesize	Integer	
page	Integer	latitude
list	List	Daily power generation
country	Integer	Country code
totalpower	String	The total power

apikey	String	The apikey of plant
city	String	city
ludt	String	Last update time
etoday	double	Daily power generation
etotal	double	Annual power generation
wd	double	latitude
jd	double	longitude
createdt	String	The create time of plant
imgurl	String	Product pictures
province	Integer	province
name	String	The name of plant
status	Integer	0-offline 1-normal 2-warning 3-error

- Response Example


```
{
    "data": {
        "totalcount": 62,
        "pagesize": 1,
        "page": 1,
        "list": [
            {
                "country": 61,
                "totalpower": 6.4,
                "apikey": "xxx70a9a0bb40589977xxx",
                "city": "Monteagle",
                "ludt": "2022-06-02 15:44:57",
```

```
                "etoday": 8.1,
                "createdt": "2019-08-23 12:43:39",
                "wd": 0,
                "etotal": 18595.93,
                "imgurl": "https://www.zevercloud.com/upload/station/defultBg.jpg",
                "province": 1,
                "name": "Denis (Performance Commercial Glazing)",
                "jd": 0,
                "status": 1
            }
        ]
    }
}
```


3.2 getPlantOverview

- Request Path : https://eu-api-genergal.aisweicloud.com/getPlantOverview
- HTTP Method: GET
- Request Parameters:

Name	Type	Description	Must
key	String	Plant key	Y

- Response Type:JSON
- Response Parameters:

Name	Type	Description
key	String	Plant key
E-Today	String	Electricity generation today
E-Month	String	Monthly power generation

E-Total	String	Electricity generation today
TotalYield	String	Yield coefficient
CO2Avoided	String	Carbon dioxide emission reduction
ludt	String	Last update time
Power	String	Total power
status	String	The status of plant 0-offline 1-normal 2-warning 3-error

- Response Example


```
{
    "key": xxxxx,
    "ludt": "2022-03-03 14:59:57",
    "status": "1",
    "E-Today": {
        "unit": "KWh",
        "value": 39.5
    },
    "E-Month": {
        "unit": "KWh",
        "value": 104.3
    },
    "E-Total": {
        "unit": "MWh",
        "value": 54.65
    },
    "TotalYield": {
        "unit": "$",
        "value": 53561.51
```

```
    },
    "CO2Avoided": {
        "unit": "T",
        "value": 43.72
    },
    "Power": {
        "unit": "KW",
        "value": 5.95
    },
    "E-Year": {
        "unit": "MWh",
        "value": 1.72
    }
}
```


3.3 getPlantOutput

- Request Path： https://eu-api-genergal.aisweicloud.com/getPlantOutput
- HTTP Method: GET
- Request Parameters:

Name	Type	Description	Must
key	String	Plant key	Y
period	String	Values: bydays、bymonth、byyear、bytotal	Y
date	String	When period is bydays, date format: yyyy-MM-dd When period is bymonth, date format: yyyy-MM When period is byyear, date format: yyyy When period is bytotal, date is null	N

- Response Type:JSON
- Response Parameters

Name	Type	Description
dataunit	String	Numerical unit
key	String	Plant key
data	Json	

- Response Example:

  - bydays

```
{
   "key":"xxx",
   "dataunit":"KW",
   "data":
   [
      {"time":"00:00","no":"0","value":"0.0"},
      {"time":"00:20","no":"2","value":"0.0"},
      {"time":"00:40","no":"4","value":"0.0"},
      {"time":"01:00","no":"6","value":"0.0"},
      {"time":"01:20","no":"8","value":"0.0"},
      {"time":"01:40","no":"10","value":"0.0"},
      ……
      {"time":"23:40","no":"142","value":"0.0"}
   ]
}
```

  - bymonth

```
{
     "dataunit":"KWh",
     "key":"xxx",
     "data":
     [
```

```
{"time":"2014-04-01","no":"1","value":"0.0"},
{"time":"2014-04-02","no":"2","value":"0.0"},
{"time":"2014-04-03","no":"3","value":"0.0"},
...
{"time":"2014-04-28","no":"28","value":"0.0"},
{"time":"2014-04-29","no":"29","value":"0.0"},
{"time":"2014-04-30","no":"30","value":"0.0"}
]
}
```


- byyear


```
{
"dataunit":"KWh",
"key":"xxx",
"data":
[
{"time":"2014-01","no":"1","value":"0.0"},
{"time":"2014-02","no":"2","value":"0.0"},
{"time":"2014-03","no":"3","value":"0.0"},
{"time":"2014-04","no":"4","value":"0.0"},
...

{"time":"2014-11","no":"29","value":"0.0"},
{"time":"2014-12","no":"30","value":"0.0"}
]
}
```


- bytotal


```
{
"dataunit":"MWh",
"key":"xxx",
"data":
[
{"time":"2012","no":"1","value":"4.069"},
{"time":"2013","no":"2","value":"0.308"}
]
}
```

3.4 getPlantEvent

- Request Path: https://eu-api-genergal.aisweicloud.com/getPlantEvent
- HTTP Method: GET
- Request Parameters:

Name	Type	Description	Must
key	String	Plant key	Y
sdt	String	Start time, format:yyyy-MM-dd	Y
edt	String	End time, format:yyyy-MM-dd (No more than 7 days)	Y

- Response Type: JSON
- Response Parameters:

Name	Type	Description
key	String	Plant key
ssno	String	Equipment serial number
eventCode	String	Event code
eventType	String	1-message 2-warning 3-error
eventTime	String	Time of occurrence

- Response Example

```
{
    "data":[
        {
            "eventCode":"35",
            "ssno":"SZ002000xxxxx",
            "eventTime":"2023-03-02 11:01:23",
            "eventType":"3"
        }
    ],
    "key":"xxxx"
}
```


3.5 getInverterOverview

- Request Path: https://eu-api-genergal.aisweicloud.com/getInverterOverview
- HTTP Method: GET
- Request Parameters:

Name	Type	Description	Must
key	String	Plant key	Y
date	String	Query date, format: yyyy-MM-dd	N

- Response Type:JSON
- Response Parameters:

Name	Type	Description

isno	String	The code of inveter
e_today	String	Daily power generation
e_month	String	Monthly electricity generation
e_total	String	Annual power generation
co2	String	Carbon dioxide emission reduction
yield	String	yield
recvdate	String	Last update time

- Response Example


```
{
    "data": [
        {
            "e_total": "24497.20",
            "e_month": "52.100",
            "co2": 19597.76,
            "yield": 9063.96,
            "isno": "SZ0020001xxxxxxx",
            "recvdate": "2023-03-03 15:42:14.0",
            "e_today": "28.30"
        }
    ],
    "key": "xxxxx"
}
```

3.6 devicelist

- Request Path: https://eu-api-genergal.aisweicloud.com/devicelist
- HTTP Method: GET
- Request Parameters

Name	Type	Description	Must
key	String	Plant key	Y

- Response Type: JSON (application/json;charset=utf-8)
- Response Parameters

名称	类型	描述
psn	String	Pmu serial number
pstate	Integer	The state of pmu 0-offline 1-normal 9- not active
inverters	List	
isn	String	Inverter serial number
ludt	String	Last communication time
istate	Integer	The state of inverter 0-offline 1-normal 2- cache

- Response Example

```
{
    "data": {
        "list": [
            {
```

```
                "pstate": 1,
                "inverters": [
                    {
                        "isn": "TA0040002xxxxxx",
                        "ludt": "2023-03-13 10:21:42",
                        "istate": 1
                    }
                ],
                "psn": "B9100A2Bxxxxx"
            }
        ]
    }
}
```


3.7 getInverterData

- Request Path: https://eu-api-genergal.aisweicloud.com/getInverterData
- HTTP Method:Get
- Request Parameters

Name	Type	Description	Must
apikey	String	Plant key	Y
starttime	String	Query start time format yyyy-MM-dd HH:mm:ss	Y
endtime	String	Query end time format yyyy-MM-dd HH:mm:ss	Y
sn	String	Inverter serial number	Y

- Response Type: JSON (application/json;charset=utf-8)
- Response Parameters

Name	Type	Description	Data precision
code	Integer	200	
data	Json		
isno	String	Inverter serial number	
dataList	List		
tu	String	U phase temperature	0.1℃
tv	String	V phase temperature	0.1℃
tmstp	String	time stamp	
tw	String	W phase temperature	0.1℃
insdt	String	Warehousing time	
fac	String	frequency	0.01Hz
psn	String	Collector serial number	
pac	String	Active power	1W
bv	String	Bus voltage	0.1V
etd	String	Daily power generation	0.1kwh
sac	String	Apparent power	1W
smp	String	sampling frequency	
ia1~3	String	AC current	0.1A
tim	String	Update time	

sn	String	Inverter serial number	
cb	String	Boost temperature	0.1℃
prc	String	Reactive power	1W
eto	String	Total power generation	0.1kwh
hto	String	Grid connection duration	1H
cf	String	Heat sink temperature	0.1℃
va1~3	String	AC voltage	0.1V
i1~3	String	MPPT electric current	0.01A
S1~3	String	String current	0.1A
itv	String	Minutes	
er	String	ERROR code	
pf	String	power factor	0.01
v1~3	String	MPPT Voltage	0.1V
wn1	String	Warning code	

- Response Example


```
{
    "code": 200,
    "data": [
        {
            "dataList": [
                {
                    "csq": "31",
                    "tu": "167",
```

```
"tv": "167",
"tmstp": "1678659952000",
"tw": "167",
"insdt": "2023-03-13 06:25:52",
"fac": "4998",
"pac": "0",
"etd": "0",
"ia1": "0",
"tim": "2023-03-13 06:25:52",
"ia3": "0",
"ia2": "0",
"s1": "0",
"s2": "0",
"prc": "0",
"s3": "0",
"eto": "96108",
"s4": "0",
"s5": "0",
"s6": "0",
"itv": "385",
"er": "0",
"wn0": "0",
"wn2": "0",
"wn1": "0",
"wn4": "0",
"wn3": "0",
"wn6": "0",
"wn5": "0",
"wn8": "0",
"wn7": "0",
"wn9": "0",
"psn": "B9100Axxxxx",
"bv": "4724",
"sac": "0",
"smp": "5",
```

```
                "sn": "TA0040002xxxxxx",
                "cb": "167",
                "hto": "944",
                "cf": "173",
                "va2": "2368",
                "va1": "2374",
                "i1": "0",
                "i2": "0",
                "va3": "2377",
                "i3": "0",
                "pf": "0",
                "v1": "1963",
                "v2": "1961",
                "v3": "1961"
            }
        ],
        "isno": "TA0040002xxxxxx"
    }
  ]
}
```


4. Request a signature

4.1 Domain Name

- Each API belongs to an API group, and each API group has a unique domain name. These independent domain names are bound by the service provider. API Gateway uses a domain name to locate an API group.
- The domain name is in the format of **www.[Independent domain name].com/[Path]?[HTTPMethod].** At the public beta stage, the API user needs to obtain this domain name offline from the API service provider.
- Alibaba Cloud API Gateway uses the domain name to locate a unique API group, and then locate the unique API through Path+HTTPMethod.

- You must obtain API documentation in the deprecation environment from the API service provider. This documentation must include necessary parameter information, such as the domain name and path.

4.2 System level header

- [Required] X-Ca-Key: AppKey
- [Required] X-Ca-Signature: Signature string
- [Optional] X-Ca-Timestamp: The time stamp in milliseconds passed by the API caller, that is, the milliseconds of the time from January 1, 1970 until now. By default, it is valid within 15 minutes.
- [Optional] X-Ca-Nonce: The UUID generated by the API caller. This header is used with the time stamp to prevent replay.
- [Optional] Content-MD5: When the request body is not a Form, calculate the MD5 value of the body and send that value to the cloud gateway for checking.
- [Optional] X-Ca-Stage: The stage where the requested API belongs. Only test and release are supported, and the default value is release.

4.3 Signature verification

4.3.1 Prepare APPKey

Appkey, call the API identity, you can contact the service provider to apply

4.3.2 The organization participates in the signature calculation of the string

```
String stringToSign=
HTTPMethod + "\n" +
Accept + "\n" +
Content-MD5 + "\n"
Content-Type + "\n" +
Date + "\n" +
Headers +
Url
```

Each letter of the HTTPMethod value must be capitalized.

If Accept, Content-MD5, Content-Type, and Date are empty, add a linefeed (\n). If Headers is empty, a linefeed (\n) is not required. The specified Headers includes a linefeed (\n). For more information, see the headers organization method described as follows.

Content-MD5:

Content-MD5 indicates the MD5 value of the body. MD5 is only calculated when the body is not a Form. The calculation method is as follows:

```
1. String content-MD5 = Base64.encodeBase64(MD5(bodyStream.getbytes("UTF-8")));
```

The **bodyStream** indicates the byte array.

Headers:

Headers indicates the keys and values of the headers involved in signature calculation. Note that X-Ca-Signature and X-Ca-Signature-Headers are excluded in Headers signature calculation.

Headers organization method:

Rank the keys of all Headers involved in signature calculation in lexicographic order and then splice them in the following method:

```
1. String headers =
2. HeaderKey1 + ":" + HeaderValue1 + "\n"\+
3. HeaderKey2 + ":" + HeaderValue2 + "\n"\+
4. ...
5. HeaderKeyN + ":" + HeaderValueN + "\n"
```

Url

URL indicates the Form parameter in the Path+Query+Body. The organization method is as follows:

Rank the keys of Query+Form in lexicographic order and then splice them in the following method. If Query or Form is empty, the URL is equal to Path, and a question mark (?) is not required to be added.

```
1. String url =
2. Path +
3. "?" +
4. Key1 + "=" + Value1 +
5. "&" + Key2 + "=" + Value2 +
6. ...
7. "&" + KeyN + "=" + ValueN
```

Note that Query or Form may have multiple values. If multiple values exist, use the first value for signature calculation.

4.3.3 Calculate the signature

```
1. Mac hmacSha256 = Mac.getInstance("HmacSHA256");
2. byte[] keyBytes = secret.getBytes("UTF-8");
3. hmacSha256.init(new SecretKeySpec(keyBytes, 0, keyBytes.length, "HmacSHA256"));
4. String sign = new String(Base64.encodeBase64(hmacSha256.doFinal(stringToSign.getBytes("UTF-8")),"UTF-8"));
```

The **secret** indicates the key corresponding to an app..

4.3.4 Pass the signature

Put the calculated signature in the Header of the Request. The key is X-Ca-Signature.

Separate the keys of all Headers involved in signature calculation by commas and put them in the Header of the Request regardless of the order. The key is X-Ca-Signature-Headers.

For more information about the demo of signature calculation, click here.

4.3.5 Signature error detection method

When the signature verification fails, the API gateway will be the server's StringToSign into the HTTP Response Header to return to the client, Key: X-Ca-Error-Message, only the local calculation of the StringToSign and the server back to the StringToSign To be able to find a problem;

If the server is consistent with the client's StringToSign, check that the key used for the signature calculation is correct;

Because the HTTP Header can not represent a newline, the string break in StringToSign is filtered out, and the line breaks are ignored when compared.

4.3.6 Signature demo

Signature demo detailed demo (JAVA).

Please refer to the link: https://github.com/aliyun/api-gateway-demo-sign-java.

5. Event Code Description table

Error Code	Error Description

101	SCI Fault
102	EEPROM R/W Fault
103	RLY-Check Fault
104	DC INJ. High
105	AUTO TEST FAILED
106	High DC Bus
107	Ref.Voltage Fault
108	AC HCT Fault
109	GFCI Fault
110	Device Fault
111	M-S version unmatched
112	Reserve
132	Reserve
133	Fac Fault
134	Vac Fault
135	Utility Loss
136	Ground fault
137	PV Over voltage
138	ISO Fault
139	Reserve
140	Over Temp.
141	Vac differs for M-S
142	Fac differs for M-S
143	Groud I differs for M-S
144	DC inj. differs for M-S
145	Fac,Vac differs for M-S
146	High DC Bus
147	Consistent Fault
148	Average volt of 10 minutes Fault
149	Reserve
150	Reserve
151	
152	Fuse Fault

153	ISO check: before enable constant current，ISO voltage> 300mV
154	ISO check: after enable constant current，ISO voltage out of range （1.37v +/- 20%）
155	ISO check: N P relay change，ISO voltage sudden below 40mV
156	GFCI protect fault :30mA lever
157	GFCI protect fault :60mA lever
158	GFCI protect fault :150mA lever
159	PV1 string current abnormal
160	PV2 string current abnormal
161	DRED Communication Fails（S9 open）
162	Operate the disconnection device（S0 close）

country name	country code	province code	province name
China	86.00	1	Anhui
China	86.00	2	Beijing
China	86.00	3	Chongqing
China	86.00	4	Fujian
China	86.00	5	Gansu
China	86.00	6	Guangdong
China	86.00	7	Guangxi
China	86.00	8	Guizhou
China	86.00	9	Hainan
China	86.00	10	Hebei
China	86.00	11	Heilongjiang
China	86.00	12	Henan
China	86.00	13	Hong Kong

China	86.00	14	Hubei
China	86.00	15	Hunan
China	86.00	16	Jiangsu
China	86.00	17	Jiangxi
China	86.00	18	Jilin
China	86.00	19	Liaoning
China	86.00	20	Macau
China	86.00	21	Inner Mongolia
China	86.00	22	Ningxia
China	86.00	23	Qinghai
China	86.00	24	Shandong
China	86.00	25	Shanxi
China	86.00	26	Shanxi
China	86.00	27	Shanghai
China	86.00	28	Sichuan
China	86.00	29	Taiwan
China	86.00	30	Tianjin
China	86.00	31	Tibet
China	86.00	32	Sinkiang
China	86.00	33	Yunnan
China	86.00	34	Zhejiang