# **OASIS API User Guide**

**Revision 04** 

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# **Purpose**

The purpose of this document is to explain how to access PJM's OASIS Application Programming Interface (API) by using both HTTP requests and the PJM Command Line Interface (CLI) tool to invoke Standards and Communication Protocol (S&CP) templates as specified by the North American Energy Standards Board (NAESB).

### Resources

- PJM's Browserless Authentication Guide
- PJM's Command Line Interface Tool Command Line Interface Java 8+ (zip)
  - Can be downloaded from PJM's Tools Information
  - o The zip file contains:
    - CLI user guide docs/CLI\_User\_Guide.pdf
    - XSD docs/xsdx/oasis.xsd
    - Examples examples/OASIS/
- NAESB Wholesale Electric Quadrant Business Practice Standards
  - NAESB WEQ-002: Standards and Communication Protocol (www.naesb.org)
  - NAESB WEQ-003: Data Dictionary (<u>www.naesb.org</u>)

# **Creating OASIS Template Requests**

## **OASIS Template Overview**

NAESB, via the Wholesale Electric Quadrant (WEQ) Business Practice Standards, specifies the templates which may be used to interact with an OASIS node.

- NAESB WEQ Business Practice Standards
  - WEQ-002: Standards and Communication Protocol
    - The PJM OASIS supports Versions 2.0, 2.1, 2.2, and 3.3
  - WEQ-003: Data Dictionary
    - The PJM OASIS supports Versions 2.0, 2.1, 2.2, and 3.3

#### How to get support?

Access to the WEQ Business Practice Standards may be requested via NAESB at www.naesb.org.



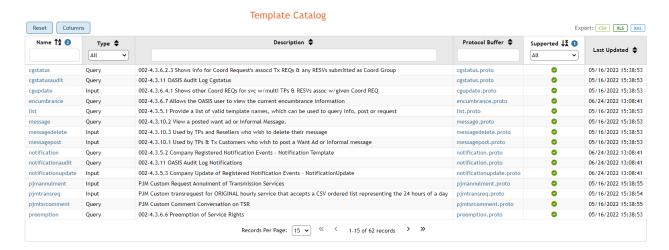
## **OASIS Template Tools**

Although PJM is not permitted to reproduce the contents of the applicable NAESB Business Practice Standards, several tools have been made available to assist users and software developers in crafting well-formed template requests for the purpose of interacting with the PJM OASIS.

### **PJM Template Catalog**

The PJM Template Catalog is available from within the PJM OASIS application and it provides a comprehensive list of all NAESB templates and PJM custom templates.

From the OASIS left-hand navigation menu, the Template Catalog can be found in the Templates group.



Clicking on a template name will open the associated template in PJM's Template Builder.

Clicking on a template Protocol Buffer link will download a plain-text .proto file.

The Supported column indicates whether an individual template is supported by the PJM OASIS. Unsupported templates cannot be used to input or query data and are further explained in the Unsupported NAESB Templates section of this document.



### **PJM Data Dictionary**

The PJM Data Dictionary represents the PJM implementation of the NAESB WEQ-003 Data Dictionary plus any custom Data Elements added by PJM. The Data Dictionary is available in HTML and TXT formats:

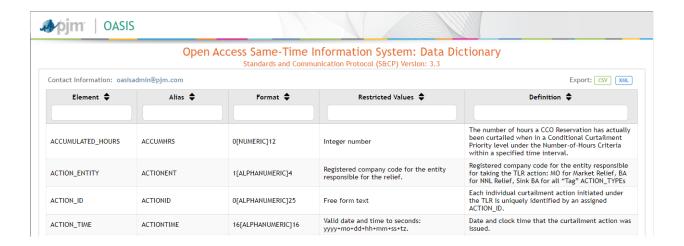
#### **OASIS Training Environment**

- https://oasistrain.pjm.com/OASIS/PJM/datadic.htm
- https://oasistrain.pjm.com/OASIS/PJM/datadic.txt

#### **OASIS Production Environment**

- https://pjmoasis.pjm.com/OASIS/PJM/datadic.htm
- https://pjmoasis.pjm.com/OASIS/PJM/datadic.txt

PJM also makes the Data Dictionary available from within the OASIS application. From the OASIS left-hand navigation menu, the Data Dictionary can be found in the Templates group.



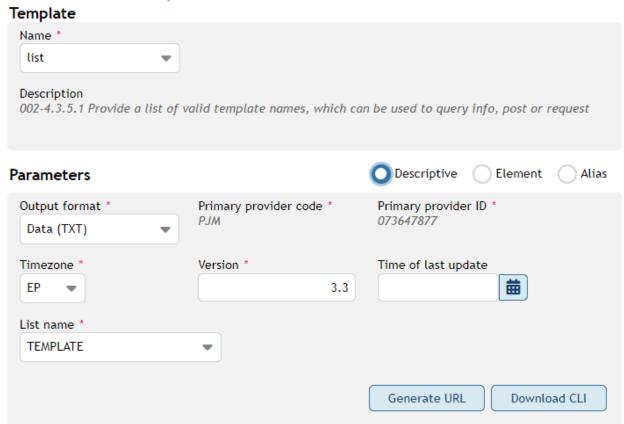
## **PJM Template Builder**

The PJM Template Builder is a tool designed to assist users and software developers in crafting well-formed template URLs and template .txt files for use with PJM's CLI. The Template Builder is available



from within the OASIS application by opening the Template group of the OASIS left-hand navigation menu.

# Template Builder



#### **Template Section**

As different templates are chosen from the Name list, the Parameters section will reload to show the relevant input parameters associated with the selected template. The full list of available templates can be viewed via the Template Catalog.

#### **Parameters Section**

The parameters listed for each template are specified in NAESB WEQ-002. For certain templates, PJM also makes optional input parameters available. Parameters with restricted values will list the full range of valid choices; however, the Template Builder will not verify that the selected combination of user-specified parameter values is valid. The Template Builder is only meant to guarantee correct syntax.

#### **Parameter Notes**



- Users may choose between three different parameter labels
  - Descriptive an informal, but more descriptive label
  - o **Element** the official Element as listed in the PJM Data Dictionary
  - Alias the official Alias as listed in the PJM Data Dictionary
- Parameters marked with a red asterisk (\*) are required fields
- Users may choose to receive template results in a variety of Output Formats
  - Comma Separated (CSV)
  - o Data (TXT)
  - Extensible HTML (XHTML)
  - Extensible Markup (XML)
  - Google ProtoBuf (PROTO)
  - Hypertext (HTML)
  - Javascript (JSON)
  - Microsoft Excel (XLSX)
- Users may choose from Atlantic, Eastern, Central, Mountain, Pacific, and UTC time zones. In addition to Standard and Daylight options, a Prevailing option is available to automatically account for the switch between Standard Time and Daylight Time.

When input parameter data entry has been completed by the user, two options are available:

- Generate URL this button will combine all parameters into a single template URL with a syntax that conforms to the NAESB WEQ-002 specification. The URL will be displayed in the URL section immediately below the Parameters section.
- Generate CLI this button will combine all parameters into a text file for use with PJM's CLI tool. The file will be downloaded by the user's browser
  - Query/Response Templates the text file will contain the formatted REST call plus the query parameters needed to interact with the CLI. The generated file will contain several variables that are specified in the oasisdownload.cmd example file included in PJM's CLI .zip. These variables may be customized or replaced as needed.
  - Input/Response Templates the text file will contain a CSV-style template request that can be uploaded directly instead of specifying input parameters

The URL section of the Template Builder allows a user to directly copy the URL into their clipboard so that it can easily pasted into another application. If the template is defined in the Template Catalog with a Type of Query, the Template Builder will also allow for the immediate execution of the template request via the user's OASIS session. Query results will be returned in the Output section.



#### **Output Section**

By default, parsed template results will be returned in a data table. Users also have the option of switching to Raw Output which contains the unparsed template response. Lastly, users can directly download a file that corresponds to their chosen Output Format.

# **Uploading OASIS Template Requests**

## Using a Browser

NAESB WEQ-002 requires OASIS nodes to accept templates submitted via the HTTP protocol. As such, the simplest form of submitting a template is as follows:

- 1. Successfully log in to the PJM OASIS application's web interface
- 2. Paste a properly formatted template URL into the browser address bar and press the Enter key
- 3. The OASIS will render the results in the user's browser window

#### **OASIS Training Environment**

https://oasistrain.pjm.com/

#### **OASIS Production Environment**

• <a href="https://pjmoasis.pjm.com">https://pjmoasis.pjm.com</a>

#### **Browserless Submission**

Submitting templates via a web browser can be very useful, but it is also simplistic and comes with limitations; primarily, the user authentication and session creation must be manually performed. The Resources section of this document contains a link to PJM's Browserless Authentication Guide which is intended to assist software developers with authenticating programmatically via PJM's Single Sign On (SSO) interface. Once an application has successfully authenticated with the SSO and obtained a session token, it can then directly upload templates to the PJM OASIS without the use of a browser.

The general steps per the Browserless Authentication Guide are:

- 1. Successfully authenticate with PJM SSO and obtain a Token ID
- Referencing the Token ID, utilize an HTTP call to send a properly formatted template to the OASIS
- 3. Capture the response



#### 4. Referencing the Token ID, call the SSO logout action

This authentication scheme opens up numerous ways in which programmatic solutions can be created to interface with the PJM OASIS; however, PJM also recognizes that many customers have a need to access multiple PJM tools via their custom software packages. In order to reduce the need for multiple API implementations, PJM has also extended the unified Command Line Interface tool to include programmatic communication with the OASIS. If utilizing the CLI tool is preferred, this section can be skipped.

#### **Template URLs**

#### **OASIS Training Environment Base URL**

https://oasistrain.pjm.com/OASIS/PJM/data/

#### **OASIS Production Environment Base URL**

https://pjmoasis.pjm.com/OASIS/PJM/data/

#### **HTTP Methods**

The following information is covered more extensively by:

- NAESB WEQ-002-4.2.4 Query/Response OASIS Template Requirements
- NAESB WEQ-002-4.2.5 Input/Response OASIS Template Requirements
- NAESB WEQ-002-4.2.6 Query Variables
- NAESB WEQ-002-4.2.7 CSV Format

#### **Query/Response Templates**

Query templates can be submitted to the PJM OASIS by using the HTTP protocol to send query parameters in the form of name/value pairs.

#### **GET**

When using the GET method, append a question mark (?) to the OASIS URL and follow it with the required "name=value" pairs. Query parameters should be separated by an ampersand. (&)



Required Header	Content-type: text/plain
<b>URL Format</b>	<pre><oasis base="" url=""><template< pre=""></template<></oasis></pre>
(remove <> brackets)	name>? <name1=value>&amp;<name2=value>&amp;<name3=value></name3=value></name2=value></name1=value>

#### **POST**

When using the POST method, the query parameters are not included in the URL and are instead passed in via the body of the HTTP request.

Required Header	Content-type: application/x-www-form-urlencoded
URL Format	<pre><oasis base="" url=""><template name=""></template></oasis></pre>
(remove <> brackets)	

#### Input/Response Templates

Input templates can be submitted to the PJM OASIS by using the HTTP protocol to send query parameters in the form of name/value pairs or by uploading a CSV message.

#### GET

When using the GET method, append a question mark to the OASIS URL and follow it with the required "name=value" pairs. Input parameters should be separated by an ampersand. (&)

Required Header	Content-type: text/plain
URL Format	<pre><oasis base="" url=""><template< pre=""></template<></oasis></pre>
(remove <> brackets)	name>? <name1=value>&amp;<name2=value>&amp;<name3=value></name3=value></name2=value></name1=value>

#### **POST**

When using the POST method, the input parameters are not included in the URL and are instead passed in via the body of the HTTP request.

Required Header	Content-type: application/x-www-form-urlencoded
<b>URL Format</b>	<pre><oasis base="" url=""><template name=""></template></oasis></pre>
(remove <> brackets)	

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#### **PUT**

When using the PUT method to upload a CSV file, the input parameters are not included in the URL and are instead passed in via the file.

Required Header	Content-type: text/x-oasis-csv
<b>URL Format</b>	<pre><oasis base="" url=""><template name=""></template></oasis></pre>
(remove <> brackets)	

#### PJM Command Line Interface

The Command Line Interface, or CLI, is a Java-based API which enables the transfer of specifically formatted files to and from PJM applications. The CLI is flexible enough that it can be utilized directly by an end user or as a component in custom third-party software designed to interact with PJM's various tools.

The CLI .zip file can be downloaded from the pjm.com website as mentioned in the Resources section of this document. The documentation included within the .zip can be used as a guide to configuring the CLI tool to work in the user's specific computer environment. Once in a working state, the CLI can be utilized to interact with the OASIS per the instructions below.

Assistance with general CLI questions can be requested via the PJM Member Relations at 610-666-8980 or custsvc@pjm.com.

#### **CLI URLs**

#### **OASIS Training Environment CLI URL**

https://oasistrain.pjm.com/OASIS/

#### **OASIS Production Environment CLI URL**

https://pjmoasis.pjm.com/OASIS/

#### **CLI Action**

/rest/secure/<template name>



#### **Template Requests**

The oasis-download.cmd and oasis-upload.cmd files included in the CLI .zip provide a good starting point for crafting valid template requests. In general, the two basic types of interaction with the OASIS will be Parameter-Based Requests and File Upload Requests which are described below.

#### **Parameter-Based Requests**

For most template requests, utilizing the CLI tool is similar to executing an HTTP POST in that the name=value parameters are listed separately from the URLs. Each name/value pair must be individually preceded by the "-q" switch, which is used by the CLI to append query parameters to the URL.

#### **Example:**

```
%CLIENT% --serviceUrl https://oasistrain.pjm.com/OASIS/ --action
/rest/secure/pjmtransreq --output pjmtransreq.txt -q
TEMPLATE=PJMTRANSREQ -q OUTPUT_FORMAT=DATA -q PRIMARY_PROVIDER_CODE=PJM
-q PRIMARY_PROVIDER_DUNS=073647877 -q RETURN_TZ=EP -q VERSION=2.1 -q
CAPACITY_REQUESTED_LIST=50 -q CAPACITY_MINIMUM_LIST=0 -q
POINT_OF_RECEIPT=CIN -q POINT_OF_DELIVERY=PJM -q PRECONFIRMED=YES -q
PRODUCT_NAME=hour-SPOT_IN -q SOURCE=MISO -q SINK=MISO -q
START_TIME=20181208000000EP -q STOP_TIME=20181208010000EP
```

#### File Upload Requests

If a file needs to be uploaded, utilizing the CLI tool is similar to executing an HTTP PUT in that a specific Content Type must be specified in the header and a filename included for upload.

#### **Example:**

```
%CLIENT% --serviceUrl https://oasistrain.pjm.com/OASIS/ --mimeType
text/x-oasis-csv --action /rest/secure/pjmtransreq --file
.\upload\pjmtransreq.txt --output pjmtransreq.txt
```



# OASIS Templates

# Supported NAESB Templates

Name	Description	Additional Parameters	<b>Default Input Values</b> (if not supplied by user)
cgstatus	Query Coordinated Group Status	n/a	START TIME = current hour  STOP TIME = current hour + 1 day
cgstatusaudit	Audit Coordinated Group Status	n/a	START TIME = current hour  STOP_TIME = current hour + 1 day
cgupdate	Update Coordinated Group	n/a	n/a
encumbrance	Query Managed Encumbrance Data (introduced in NAESB WEQ v3.3)	n/a	n/a
list	Query Lists	n/a	n/a
message	Query Posted Messages	n/a	START TIME = current time  STOP TIME = current time + 90 days
messagedelete	Delete Posted Messages	n/a	n/a
messagepost	Post Messages	n/a	n/a
notification	Query Notification Data (introduced in NAESB WEQ v3.3)	n/a	n/a
notificationaudit	Audit Notification Updates (introduced in NAESB WEQ v3.3)	n/a	n/a
notificationupdate	Update Notification Data (introduced in NAESB WEQ v3.3)	n/a	n/a
preemption	Query Preemption Results (introduced in NAESB WEQ v3.2)	n/a	n/a
preemptionaudit	Audit Preemption Results (introduced in NAESB WEQ v3.2)	n/a	n/a
reduction	Query Usage Impacting a TSR (new input parameter introduced in NAESB WEQ	Input: ASSIGNMENT_REF_LIST (optional)	<u>START_TIME</u> = current hour



Name	Description	Additional Parameters	<b>Default Input Values</b> (if not supplied by user)
	v3.3)		STOP_TIME = current hour + 1 day
rofrrequest	Submit a TSR-specific Right of First Refusal profile (introduced in NAESB WEQ v3.2)	n/a	n/a
rofrstatus	Query TSR-specific Right of First Refusal profiles (introduced in NAESB WEQ v3.2)	n/a	START TIME QUEUED = current day  STOP TIME QUEUED =
rofrstatusaudit	Audit TSR-specific Right of First Refusal profiles (introduced in NAESB WEQ v3.2)	n/a	current day + 1 day  START_TIME_QUEUED = current day  STOP_TIME_QUEUED = current day + 1 day
rollover	Query Renewal Details for a TSR (new parameters introduced in NAESB WEQ v3.3)	Input: ASSIGNMENT_REF_LIST (optional)  Output: RENEWAL_ACKNOWLEDGED	START TIME = current hour  STOP TIME = current hour + 1 day
rolloverupdate	Update Rollover Notification (introduced in NAESB WEQ v3.3)	n/a	n/a
scheduledetail	Query Transmission Schedules and Curtailments (new optional input parameter introduced in NAESB WEQ v3.3)	Input: ASSIGNMENT_REF_LIST (optional)	TIME_OF_LAST_UPDAT <u>E</u> = current time - 30 days
scheduledetailaudit	Audit Transmission Schedules and Curtailments	n/a	TIME OF LAST UPDAT <u>E</u> = current time - 30  days
security	Query Security Events	n/a	TIME OF LAST UPDAT <u>E</u> = current time - 30 days
securityaudit	Audit Security Events	n/a	TIME_OF_LAST_UPDAT <u>E</u> = current time - 30 days
securitydetail	Query Security Event Details	n/a	TIME OF LAST UPDAT <u>E</u> = current time - 30  days
securitysummary	Summarize Security Events	n/a	TIME OF LAST UPDAT <u>E</u> = current time - 30  days
systemdata	Query Transmission System Data	n/a	<u>START_TIME</u> = current time
			STOP TIME = current



Name	Description	Additional Parameters	<b>Default Input Values</b> (if not supplied by user)
			time + 31 days
systemdataaudit	Audit Transmission System Data	n/a	START_TIME = current time
			STOP TIME = current time + 31 days
transassign	Reassign TSR Capacity (optional parameters introduced in NAESB WEQ	Inputs: BID_PRICE (optional)	BID_PRICE = OFFER_PRICE
	v3.2 to accommodate Consolidations)	PRECONFIRMED (optional) (always ignored – defaults override user input)	<u>PRECONFIRMED</u> = NO for Resales, YES for Consolidations
		SELLER_CODE (optional)	SELLER CODE = template submitter's
		SELLER_DUNS (optional)	Company Code for Resales, PJM for
		Ouputs: BID_PRICE	Consolidations
		PRECONFIRMED  SELLER_CODE  SELLER_DUNS	SELLER DUNS = template submitter's DUNS for Resales, PJM's DUNS for
transcust	Change TSR Status	n/a	Consolidations n/a
transoffering	Query ATC Postings	n/a	START_TIME = current
ti dinsoriering	Query Are Fostings	.,, c	hour  STOP_TIME = current hour + 1 day
transofferingaudit	Audit ATC Postings	n/a	START TIME = current hour
			STOP TIME = current hour + 1 day
transpost	Post Service for Resale	n/a	n/a
transrequest	Purchase Transmission Service (optional parameters include both PJM custom parameters	Inputs: CAPACITY_MINIMUM (optional)	CAPACITY MINIMUM = CAPACITY_REQUESTED if PRECONFIRMED=NO; otherwise,
	and parameters introduced in NAESB WEQ v3.2 to	LINKED_RESOURCES (optional)	CAPACITY_MINIMUM must be explicitly specified
	accommodate Preemption)	PREEMPTION_WAIVED (optional)	эреспіец
		Ouputs:  CAPACITY_MINIMUM  LINKED_RESOURCES	
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Name	Description	Additional Parameters	<b>Default Input Values</b> (if not supplied by user)
transsell	Respond to Resale as Seller	n/a	n/a
transserv	Query Transmission Service Product Information	n/a	n/a
transstatus	Query TSR Details (new optional input parameters introduced in NAESB WEQ v3.3)	Input: ASSIGNMENT_REF_LIST (optional)  REASSIGNED_REF_LIST (optional)  RELATED_REF_LIST (optional)	START_TIME = current hour  STOP_TIME = current hour + 1 day
transstatusaudit	Audit Transmission Service Request Status	n/a	START_TIME = current hour  STOP_TIME = current hour + 1 day
transupdate	Modify Resale Posting	n/a	n/a



# **Unsupported NAESB Templates**

PJM does not support the following NAESB Templates. While the PJM OASIS will accept a template request from the list below, for the reasons listed, a meaningful response will not be provided.

Template	Reason
ancassign	PJM does not offer Ancillary Services via the OASIS and instead
	operates the Synchronized Reserve Market, the Non-Synchronized
	Reserve Market, the Day-Ahead Scheduling Reserve Market and the
	Regulation Market.
anccust	Same as ancassign.
ancoffering	Same as ancassign.
ancofferingaudit	Same as ancassign.
ancpost	Same as ancassign.
ancrequest	Same as ancassign.
ancsell	Same as ancassign.
ancserv	Same as ancassign.
ancstatus	Same as ancassign.
ancstatusaudit	Same as ancassign.
ancupdate	Same as ancassign.
ссо	As an RTO with a Real-time Energy Market, PJM does not offer the
	Conditional Curtailment Option
discretion	This is an optional template PJM has chosen not to implement.
discretionaudit	This is an optional template PJM has chosen not to implement.
encumbranceaudit	PJM manages encumbrances for Transmission Customers
encumbrancerequest	PJM manages encumbrances for Transmission Customers
encumbrancestatus	PJM manages encumbrances for Transmission Customers
redispatchgen	PJM does not offer third-party redispatch services
redispatchgenaudit	Same as redispatchgen
redispatchgenpost	Same as redispatchgen
redispatchoffering	Same as redispatchgen
redispatchofferingaudit	Same as redispatchgen
redispatchpost	Same as redispatchgen
personnel	This is an optional template PJM has chosen not to implement.
personnelaudit	This is an optional template PJM has chosen not to implement.
stdconduct	This is an optional template PJM has chosen not to implement.
stdconductaudit	This is an optional template PJM has chosen not to implement.



## **PJM Custom Templates**

PJM has implemented several custom templates that cannot be found in the NAESB WEQ-002 Standards and Communication Protocol. These templates have names prefixed with "pjm" and are described in detail below.

## pjmannulment

#### **Request Annulment of Transmission Service Reservation**

This is the template equivalent of the Annulment Requests page on the OASIS web interface. The proper use of this functionality is described in the OASIS User Guide. The parameters below are defined in the Data Dictionary.

**Type:** Input/Response

Inputs	Outputs
	RECORD_STATUS
ANNULMENT_REASON	ANNULMENT_REASON
ASSIGNMENT_REF	ASSIGNMENT_REF
REASSIGNED REF	REASSIGNED REF
	STATUS
	ERROR_MESSAGE

#### pimtransreq

#### **Request ORIGINAL Hourly Service**

This template was created to streamline the submission of ORIGINAL hourly requests. When using the transrequest template, profiled hourly service must be submitted via the use of multiple continuation records. The pimtransreq template, on the other hand, accommodates the same submission in a single record via the use of CSV-style ordered lists that represent the hours between the START\_TIME and STOP\_TIME values. The parameters below are defined in the Data Dictionary.

Type: Input/Response

Inputs	Outputs
	RECORD_STATUS
	ASSIGNMENT_REF



Inputs	Outputs
CAPACITY_REQUESTED_LIST	CAPACITY_REQUESTED_LIST
CAPACITY_MINIMUM_LIST	CAPACITY_MINIMUM_LIST
CUSTOMER_COMMENTS	CUSTOMER_COMMENTS
POINT_OF_RECEIPT	POINT_OF_RECEIPT
POINT_OF_DELIVERY	POINT_OF_DELIVERY
PRECONFIRMED	PRECONFIRMED
PREEMPTION_WAIVED	PREEMPTION_WAIVED
PRODUCT_NAME	PRODUCT_NAME
SOURCE	SOURCE
SINK	SINK
START_TIME	START_TIME
STOP_TIME	STOP_TIME
	ERROR_MESSAGE

## pjmtsrcomment

#### **PJM Custom Comment Conversation on TSR**

Whereas the normal TSR Comment fields included in the Data Dictionary are limited to 255 characters, PJM has implemented a more flexible commenting system. A given TSR's individual comments may be up to 2000 characters and an unlimited number of comments can be associated with each TSR. For this reason, a custom template has been created to download the entire comment conversation associated with a TSR.

Type: Query/Response

Inputs	Outputs
ASSIGNMENT_REF	ASSIGNMENT_REF
	MODIFYING_NAME
TSR_COMMENT_ROLE	TSR_COMMENT_ROLE
	TSR_COMMENT
	TIME_OF_LAST_UPDATE



# **Revision History**

**2018.12.19** – Initial Publication

2019.06.21 - Minor administrative edits

**2021.04.09** – Added new templates related to the NAESB v3.2 Business Practice Standards

**2023.01.27** – Added new templates related to the NAESB v3.3 Business Practice Standards