NEPOOL GIS External Interface Specification

Version 1.2

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1. Revision History

Revision	Date		Description	Updated By
1.0	8/03/2016	⌡	Initial Version	Adam Barrett
1.1	08/09/2016	⌡	Made updates to the Authentication Protocol Section	John Shewchuk
1.2	11/07/2016	⌡	Add "Previous Owner" to Get Transferable Positions request (7.2, 7.2.2)	Devon Walton
		⌡	Add "Certificate Serial Number", "Jurisdiction" and "Date Initiated" to Get Pending Transfers request (7.3, 7.3.2)	
		⌡	Add "Jurisdiction" to Get Inter-Account Transfer Report request (7.5, 7.5.2)	
		⌡	Add "City" and "Status" to Get Generator Information request (7.4, 7.4.2)	
		⌡	Add all generators associated with an account to the Get Generator Information request (7.4)	
1.2	12/07/2016	⌡	Added API status codes for Get Generator Information to Appendix D	Adam Barrett

2. Summary

This document describes the programmatic interfaces (APIs) for the NEPOOL-GIS Registry from a business user perspective. This document will explain how to create an API Login for your account, the rules governing the use of the API, the performance expectations, and validations that occur on incoming data and request parameters.

This document also contains basic instructions on how to use Swagger to get the technical details for each API, including all input parameters and output data set structures.

3. Creating an API Login

NEPOOL-GIS Accounts will have dedicated logins for accessing the APIs. Regular user logins will not be able to authenticate through the API.

API Logins can be created by the designated Account Manager through the NEPOOL-GIS Interface.

3.1 API Login Creation Interface

1. Account Manager logs in to GIS website.
2. In the Account Management module on the left-hand side, click the link for "API Management." This will take the user to the APX Management interface.
3. Enter a Login Name and Password, and Confirm Password, then click the "Save" button. At this point the API Login will be saved, but not activated. The GIS Administrator will be notified and will proceed with the activation process.
    - Passwords must be at least 6 characters long, contain at least one alphabetic character, one numeric character, and one special character. The following special characters are allowed: @ + - $ * # % ~ = _ !
    - Login name conforms to formatting rules and is available (not already in use).
4. Account Holders must submit IP Addresses and Subnet Masks for the machines which will be accessing the API. Account Holder may enter up to 10 IP Addresses, but these must be approved by the GIS Administrator before the machines may access the API. The GIS Administrator is notified when IP Addresses are added.
    - IP Address and Subnet Mask support IPv4 and IPv6. Inputs must be correctly formatted for one of those versions.

4. General API Information

4.1 Authentication

The API user will authenticate with the API Login Name and Password.

4.2 Acceptable Use

The initial Acceptable Use Policy will be four calls per endpoint per IP Address per minute. Endpoints are Get Positions, Get Transfers (pending), Get Generators, Get Transfer Logs, Post Transfers, and Post Transfer Actions. Violation of the acceptable use policy will result in an error being returned to API caller (HTTP 429) indication that the acceptable use policy has been violated.

4.3 Auxiliary/Reference Data

Some of the data sent and received through the API uses codes to represent certain field values. These codes and what they represent must be communicated to API users.

- **Account IDs** – Available through the "GIS Account Holders" public report
- **Fuel Type Codes** – Appendix C
- **NEPOOL GIS Programs** – Appendix A
- **NEPOOL Project Status** – Appendix D

4.4 Automated Emails

Accounts with an active API login will not receive email notifications for transfers/actions that they initiate.

The current email behavior for actions initiated by a counterparty will not change. Currently, counterparty actions (transfers/confirms/rejects/withdraws), generate one email per action. When a user takes any single action that involves multiple blocks of instruments, the Registry sends a single email associated with the action, and not individual emails for the constituent instrument blocks. This will also be the case for accounts that use the API.

4.5 Event Logging

Event Logging for user actions performed through the API should be the same as performing those actions through the User Interface.

Specifically, initiating Transfers and acting on Transfers (Confirming, Rejecting, Withdrawing) will be logged and will be accessible to the User in My Event Log.

5. Swagger Technical API Specification

NEPOOL GIS uses the Swagger specification to describe the integration API endpoints available to consumers. Provided is a swagger.json file (available on registry website; see links below) that contains the definitions of the endpoints that will allow you to become familiar with the requests and responses provided. You can follow the steps outlined below to get started. There is also a Swagger page available through the registry website (see links below)

Swagger.json file: Production | UAT (Links inactive as of 2016-08-10; contact Registry Admin for more info)

Swagger UI Page: Production | UAT (Links inactive as of 2016-08-10; contact Registry Admin for more info)

5.1 View GIS APIs on Swagger

1. Go to swagger website. This site is the community site that describes the swagger specification and has demonstrations and downloads available
2. Go to the "demo" area. This will take you to a hosted solution where you can view the definitions and generate servers and clients in many mainstream languages. You will need to create the client code for consumption of the endpoints. The server generated code can be used to create stubs to simulate interactions with the live endpoint.
3. Upload the GIS_Swagger_API.json file (see links, above) to the swagger editor
   a. Go to "File" menu item
   b. Go to the "Import File" menu item
   c. Navigate to the file location
   d. Upload the file
4. You can now view the GIS API definitions in the right hand pane. (The "Warnings" can be ignored as they are alerting you to a non-standard description field that is generated)

5.2 Generate Client for GIS APIs

1. Perform the "View GIS APIs" as described above.
2. Select the "Generate Client" menu item.
3. Select your language of choice and download the SDK
   a. This will download an SDK in your language of choice. Please note that you may need to make modifications to the toolkit (e.g. Username / Passwords, Endpoint URL changes, et al).
   b. This can serve as a starting point to setting up your code to consume the GIS APIs.

5.3 Generate Server for GIS APIs

1. Perform the "View GIS APIs" as described above.
2. Select the "Generate Server" menu item.
3. Select your language of choice.
   a. This will download an SDK in your language of choice. Please note that you may need to make modifications to the toolkit (e.g. Username / Passwords, Endpoint URL changes, et al).
   b. This can serve as a starting point to setting up the server APIs stub.

6. Authentication Protocol

Client API consumers will authenticate against an OAuth2 endpoint exposed by the client API (see endpoint URLs below). The OAuth2 endpoint acts as the authorization server for your client and will provide the granted credentials for access to the API Endpoints. This Authorization API POST request will return a short-lived JSON Web Token that will be provided in calls to the application endpoints exposed by the API.

Production Authentication Endpoint: https://www1.nepoolgis.com/clientapi/oauth2/token

UAT Authentication Endpoint: https://gis-app-uat01.apx.com/clientapi/oauth2/token

6.1.1 Parameters

Field	Description
Username	Client API Service User Name
Password	Client API Service Password
grant_type	Value: password This is associated with the OAuth2 password credentials scenario

6.1.2 Results

Field	Description
access_token	This is the token to be used in the "bearer" value of the HTTP Authorization header
token_type	The type of the token to be used in the API Requests. This value returned will be "Bearer"
expires_in	Duration in which the token will expire and a subsequent authentication request will need to be made if time expires.

Attempts to call application endpoints without a valid token will result in an HTTP error message being returned.

6.1.3 Status Codes

HTTP Status Code	Status	Status Message
200	SUCCESS	Successfully authenticated
401	ERROR	Bad Request Invalid Login ID or Password

6.2 Get / Post Security

In order to successfully call into the APIs the below authorization header will need to be presented.

6.2.1 Headers

Key	Value	Description
Authorization	Bearer {access_token}	The access_token that is returned from the authentication request will be inserted into the value field.

7. Get APIs

7.1 General GET API Behavior
- If no data is found for request, empty dataset is returned AND a Success code (HTTP 200).
- Result sets/Responses limited to 60,000 lines. If over 60k, an error will be returned (HTTP 400).

7.2 Get Transferrable Positions
A request to retrieve the list of certificate blocks that are eligible for bilateral transfer. This includes all of the certificates belonging to the API user that are Transferable, Banked, or on the Bulletin Board.

7.2.1 Parameters

Parameter	Description	Data Type	Required?
Vintage Year	[YYYY]	Int	No (Required if Vintage Month is provided)
Vintage Month	[MM]	Int	No (Required if Vintage Year is provided)

If no input parameters are provided, all vintages will be returned.

7.2.2 Results

Field	Description	Data Type
Unit ID	GIS Unit ID	Varchar
Generator Name	Concatenation of "Plant Name" + " - " + "Unit Name", e.g. "Plant1 – Unit4"	Varchar
Jurisdiction	State or Province, e.g. "MA", "CT"	Varchar
Fuel Type Code	Code for fuel type (See Appendix C)	Varchar
Vintage Year	YYYY	Int
Vintage Month	MM	Int
Certificate Serial Numbers	Serial Number sequence created by GIS, e.g. "599730 - 1 to 100"	Varchar
Quantity	Quantity of Certificates	Int
Eligible Programs	Delimited list of programs for which the certificate(s) are eligible **(see list in Appendix A)**	Varchar
Previous Owner	Account ID of previous Certificate owner	Int

7.2.3 Response Codes

HTTP Status Code	Status	Status Message
200	SUCCESS	
401	ERROR	Login ID must be passed.
401	ERROR	Invalid login ID or password.
400	ERROR	Results exceed 60,000 records.
400	ERROR	Vintage Year/Vintage Month improperly formatted.
400	ERROR	Vintage Month not provided with Vintage Year.
400	ERROR	Vintage Year not provided with Vintage Month.

500	ERROR	EXCEPTION MESSAGE

7.3 Get Pending Certificate Transfers

A request to retrieve all pending certificate transfers, both incoming and/or outgoing. These are the transfers initiated by a counterparty (incoming) or account holder (outgoing) that are waiting on the account holder to confirm, reject, or withdraw.

7.3.1 Parameters

Parameter	Description	Data Type	Required?
Direction	"I" or "O" for incoming or outgoing	Varchar (1)	No

If no input parameters are provided, both Incoming and Outgoing Transfers will be returned.

7.3.2 Results

Field	Description	Data Type
Transferor	Transferor Account ID	Int
Transferee	Transferee Account ID	Int
Direction	"I" for incoming pending transactions or "O" for outgoing pending transactions.	Varchar
Quantity	Quantity of Certificates	Int
Certificate Serial Numbers	Serial Number sequence of pending Certificates, e.g. "599730 - 1 to 100"	Varchar
Unit ID	GIS Unit ID	Varchar
Generator Name	Concatenation of "Plant Name" + " - " + "Unit Name", e.g. "Plant1 – Unit4"	Varchar
Jurisdiction	State or Province, e.g. "MA", "CT"	Varchar
Fuel Type Code	Code for fuel type (See Appendix C)	Varchar
Vintage Year	YYYY	Int
Vintage Month	MM	Int
Transfer ID	System-generated ID for the transfer	Varchar
Eligible Programs	Delimited list of programs for which the certificate(s) are eligible (see list in Appendix A)	Varchar
Date Initiated	Date and time the pending transfer was initiated, e.g. "6/5/2008 17:53"	Datetime

7.3.3 Response Codes

HTTP Status Code	Status	Status Message
200	SUCCESS	
401	ERROR	Login ID must be passed.
401	ERROR	Invalid login ID or password.
400	ERROR	Results exceed 60,000 records.
400	ERROR	Invalid direction input.
500	ERROR	EXCEPTION MESSAGE

7.4 Get Generator Information

A request to retrieve data for all generators associated with the account, regardless of a project's status. Data is based on the State Regulator Reports' GIS Generators (including all generator info) download.

7.4.1 Parameters

Parameter	Description	Data Type	Required?
Unit ID	GIS Unit ID	Varchar	No

Multiple Unit IDs may be provided. If no input parameters are provided, information for all generators will be returned.

7.4.2 Results

Field	Description	Data Type
Unit ID	GIS Unit ID	Varchar
Generator Name	Concatenation of "Plant Name" + " - " + "Unit Name", e.g. "Plant1 – Unit4"	Varchar
City	City	Varchar
Jurisdiction	State or Province, e.g. "MA", "CT"	Varchar
Vintage Year	YYYY	Int
Vintage Month	MM	Int
Name Plate Capacity	Unit's name plate capacity	Decimal
Fuel Type Code	Code for fuel type (See Appendix C)	Varchar
GIS Registration Date	MM/DD/YYYY HH:mm	Datetime
Eligible Programs	Delimited list of programs for which the generator is eligible **(see list in Appendix A)**	Varchar
Status	Current status of the Generator (See Appendix D)	Varchar

7.4.3 Response Codes

HTTP Status Code	status	Status Message
200	SUCCESS	
401	ERROR	Login ID must be passed.
401	ERROR	Invalid login ID or password.
400	ERROR	Results exceed 60,000 records.
400	ERROR	Invalid Unit ID passed.
500	ERROR	EXCEPTION MESSAGE

7.5 Get Inter-Account Transfer Report

A request to retrieve the InterAccount Transfer report data.

7.5.1 Parameters

Parameter	Description	Data Type	Required?
From Activity Date	[YYYY-MM-DD]	Date	Yes
To Activity Date	[YYYY-MM-DD]	Date	Yes
Action	Transfer, Confirmed, Rejected, Withdrawn	Varchar (10)	No

Only one Action parameter may be provided. When no Action parameter is provided, all actions within the activity dates will be returned.

7.5.2 Results

Returns data for transfers that occurred within the date range specified in the request. Transfer data includes information on transfer initiation, as well as when transfers are Confirmed/Rejected/Withdrawn. As such, Confirmed/Rejected/Withdrawn transfers will have multiple rows of data.

The following information will be provided in the request response:

Field	Description	Data Type
Vintage Year	YYYY	Int
Vintage Month	MM	Int
Unit ID	GIS Unit ID	Varchar
Generator Name	Concatenation of "Plant Name" + " - " + "Unit Name", e.g. "HOOSAC - HOOSAC WIND" ("HOOSAC"=Plant Name, "HOOSAC WIND"=Unit Name)	Varchar
Jurisdiction	State or Province, e.g. "MA", "CT"	Varchar
Fuel Type Code	Code for fuel type (See Appendix C)	Varchar
Certificate Serial Numbers	Serial Numbers of transferred certificates, e.g. "599730 - 1 to 100".	Varchar
Quantity	Quantity of Certificates	Int
Activity Date	Date and time that transfer was executed, e.g. "6/5/2008 17:53"	Datetime
Transferor	Account ID of selling Account	Varchar
Transferee	Account ID of Buying Account	Varchar
Login Name	Login name of user taking action, e.g. "ptoomey". May be an Account Holder user, or a counterparty user	Varchar
Action	Type of Transfer Action: ⎰ Confirm ⎰ Reject ⎰ Transfer ⎰ Withdraw	Varchar
Transfer ID	System-generated ID for the transfer	Varchar
Eligible Programs	Delimited list of programs for which the generator is eligible (see list in Appendix A)	Varchar

7.5.3 Response Codes

HTTP Status Code	Status	Status Message
200	SUCCESS	
401	ERROR	Login ID must be passed.

401	ERROR	Invalid login ID or password.
400	ERROR	Results exceed 60,000 records.
400	ERROR	Invalid status passed.
400	ERROR	Both FromDate and ToDate must be passed.
400	ERROR	ToDate must be greater than or equal to FromDate.
500	ERROR	EXCEPTION MESSAGE

8. Post APIs

8.1 General POST API Behavior

⟩ If any data within a post data set fails validation, the entire file will be rejected.

⟩ Posts limited to 10,000 lines; post over that threshold will be rejected.

8.2 Post Transfer Certificates

This API is for initiating Transfers to another participant of certificates that are Transferable, Banked, or on the Bulletin Board.

8.2.1 Parameters

Parameter	Description	Data Type
Row ID	External ID provided by the user, to be used when returning the method results to identifying specific Transfers ("collections"). Will not persist with data.	Varchar
Certificate Serial Number Range	Serial Number sequence created by GIS, e.g. "599730 - 1 to 100". User may not consolidate adjacent certificate serial numbers—If there are two Certificate blocks with consecutive serial numbers, they must be submitted as separate rows.	Varchar
Quantity	Quantity of Certificates. Must be within the range of Serial Numbers	Int
Buyer Account ID	Buyer Account ID	Int

Note: The Certificate Serial Number Range is not something that can be manipulated by the API user. Only serial number ranges provided by the API should be used by the API user when communicating transfer instructions.

8.2.2 Success Results

Field	Description	Data Type
Row ID	External ID provided by the user when submitting	Varchar
Certificate Serial Number Range	Serial Numbers submitted, e.g. "599730 - 1 to 100"	Varchar
Quantity	Quantity of Certificates	Int
Buyer Account ID	Buyer Account ID	Int
Transfer ID	System-generated ID for the transfer	Varchar

Remaining Certificate Serial Number Range	The subset of Certificate Serial Numbers that remain in the user's account after the Transfer. If the same serial numbers are submitted for multiple transfers in a single batch, this field should reflect the Remaining Numbers after all Transfers. If no serial numbers remain, this field will read "None".	Varchar

8.2.3 Error Results

If one of the requests fails validation, then no transfers are initiated within the system, and a dataset is returned with all rows that failed validation. That return set includes the following:

Field	Description	Data Type
Row ID	External ID provided by the user when submitting	Varchar
Certificate Serial Number Range	Serial Numbers submitted, e.g. "599730 - 1 to 100"	Varchar
Quantity	Quantity of Certificates submitted	Int
Buyer Account ID	Buyer Account ID	Int
Error Code	Code corresponding to the specific error encountered	Varchar

8.2.4 Response Codes

HTTP Status Code	status	Status Message
200	SUCCESS	
401	ERROR	Login ID must be passed.
401	ERROR	Invalid login ID or password.
413	ERROR	Input file exceeds 10,000 records.
400	ERROR	Missing/invalid Row Identifier.
400	ERROR	Missing/incorrect Certificate Serial Numbers.
400	ERROR	Missing/invalid quantity.
400	ERROR	Quantity greater than available certificates.
400	ERROR	Sum of quantity greater than available certificates.
400	ERROR	Missing/incorrect Buyer Account Id.
500	ERROR	EXCEPTION MESSAGE

8.3 Post Pending Certificate Transfer Actions

This API is for acting on Certificates in a Pending state (either incoming or outgoing). Note that actions for incoming and outgoing transfers can be included in the same submission.

8.3.1 Parameters

Parameter	Description	Data Type
Transfer ID	System-generated ID for the transfer	Varchar
Action	Action to take on the Transaction: ⌋ Withdraw (Outgoing transfers only) ⌋ Confirm (Incoming transfers only)	Varchar

8.3.2 Success Results

If all action requests pass validation and were successfully executed, a success code will be returned. There will be no dataset.

8.3.3 Error Results

If one of the requests fails validation, then no transfers are initiated within the system, and a data set is returned with all rows that failed validation. That return set includes the following:

Field	Description	Data Type
Transfer ID	System-generated ID for the transfer	Varchar
Action	Action to take on the Transaction: ⎫ Withdraw (Outgoing transfers only) ⎫ Confirm (Incoming transfers only) ⎫ Reject (Incoming transfers only)	Varchar
Error Code	Code corresponding to the specific error encountered	Varchar

8.3.4 Response Codes

HTTP Status Code	Status	Status Message
200	SUCCESS	
401	ERROR	Login ID must be passed.
401	ERROR	Invalid login ID or password.
413	ERROR	Input file exceeds 10,000 records.
400	ERROR	Missing/invalid Transfer ID.
400	ERROR	Invalid Action.
400	ERROR	Invalid Action for Transfer ID.
400	ERROR	Duplicate Transfer ID passed.
500	ERROR	EXCEPTION MESSAGE

9. Appendix A: NEPOOL GIS Programs

The following programs are currently returned as columns when running reports for Transferable and Pending Certificate Transfers. These may be represented in the API by programs codes.

Program Name
CT Class I
CT LREC
CT Class II
CT Class III
CT CEO
MA RPS Class I Renewable Generation Unit
MA Solar Carve-Out I Unit
MA Auction Solar Carve-Out I Unit
MA Solar Carve-Out II Unit
MA Auction Solar Carve-Out II Unit
MA RPS Class II Renewable Generation Unit
MA RPS Class II Waste Energy Generation Unit
MA APS Alternative Generation Unit
Eligible MA NOx Allowances
ME Ren/Eff Energy Source
ME Class I
ME Class II
ME Community Based Renewable Energy
ME CO2 Netting
RI New Renewable Resource
RI Existing Renewable Resource
NH Class I
NH Class I Thermal
NH Class II
NH Class III
NH Class IV
Green-E
Low Impact Hydro Institute

10. Appendix C: Fuel Type Codes

Fuel Type Code	Short Description	Description	Is Active
BO1	Biodiesel1	100% neat	TRUE
BO2	Biodiesel2	Less than 100% neat	TRUE
CO1	Coal	Coal	TRUE
CP1	Composite	Composite	TRUE
DI1	Diesel	Diesel	TRUE
DG1	Digester gas	Digester gas	TRUE
ER1	Efficient Resource (Maine)	Efficient Resource (Maine)	TRUE
ET1	Ethanol	Ethanol	TRUE
GE1	Geothermal	Geothermal	TRUE
JET	Jet	Jet	TRUE
LG1	Landfill gas	Landfill gas	TRUE
MT1	Methanol	Methanol	TRUE
NG1	Natural Gas	Natural Gas	TRUE
NU1	Nuclear	Nuclear	TRUE
OC1	Ocean Thermal	Thermal	TRUE
OC2	Ocean Wave	Wave	TRUE
OC3	Ocean Tidal	Tidal	TRUE
OIL	Oil	Oil	TRUE
PS1	Pumped Storage	Pumped Storage	TRUE
SO1	Solar Thermal	Thermal	TRUE
SO2	Solar Photovoltaic	Photovoltaic	TRUE
TE1	Trash-to-energy	Trash-to-energy	TRUE
WO1	Waste Oil	Waste Oil	TRUE
WND	Wind	Wind	TRUE
WOD	Wood	Wood	TRUE
BIM	Biomass	Biomass	TRUE
FLC	Fuel cell	Fuel cell	TRUE
H2O	Hydroelectric/Hydropower	Hydroelectric/Hydropower	TRUE
MSW	Municipal solid waste	Municipal solid waste	TRUE
LEC	Low Emission (Connecticut)	Low emission advanced renewable energy conversion technologies	TRUE
CLM	CLM	Conservation and Load Management	TRUE
DRP	DRP	Curtailment-based Demand Response	TRUE
OC4	Ocean1	Movement or the latent heat of the ocean	TRUE
OC5	Ocean2	Ocean Current	TRUE
GA1	Gasification	Gasification	TRUE

EN1	Energy Efficient Steam	Energy Efficient Steam	TRUE
EN2	Energy Storage	Energy Storage	TRUE
HY1	Hydrokinetic	Hydrokinetic	TRUE
PA1	Paper-derived	Paper-derived	TRUE
WA1	Waste Energy	Waste Energy	TRUE
ASH	Air-source heat pump	Air-source heat pump	TRUE
GWH	Ground- and Water-source heat pump	Ground- and Water-source heat pump	TRUE
DGH	Deep geothermal heat exchange	Deep geothermal heat exchange	TRUE
BIG	Biogas	Biogas	TRUE
LBL	Liquid biofuels	Liquid biofuels	TRUE

11. Appendix D: Status Names

API Status Code	Status Name
ACT	Approved
INA	Inactive
NIN	Need Info
PEN	Pending
REJ	Rejected