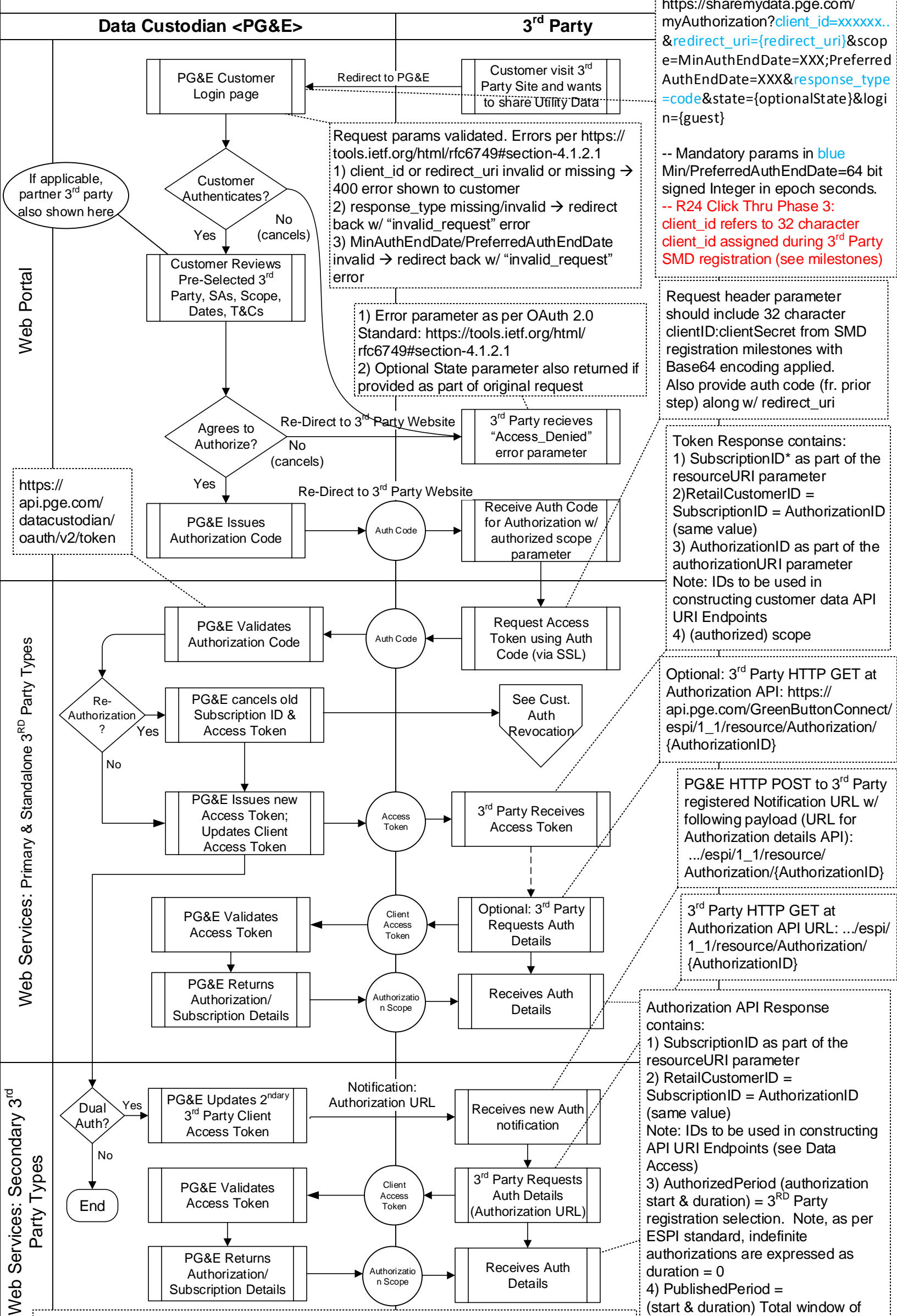


Phase 2 Online Customer Authorization (detailed): 3rd Party Initiated



Redirect to authorizationServer
 AuthorizationEndpoint URI with
 request params: GET
https://sharemydata.pge.com/myAuthorization?client_id=xxxxxx.&redirect_uri={redirect_uri}&scope=MinAuthEndDate=XXX;PreferredAuthEndDate=XXX&response_type=code&state={optionalState}&login={guest}

-- Mandatory params in blue
 Min/PreferredAuthEndDate=64 bit
 signed Integer in epoch seconds.
 -- R24 Click Thru Phase 3:
 client_id refers to 32 character
 client_id assigned during 3rd Party
 SMD registration (see milestones)

Request params validated. Errors per <https://tools.ietf.org/html/rfc6749#section-4.1.2.1>
 1) client_id or redirect_uri invalid or missing → 400 error shown to customer
 2) response_type missing/invalid → redirect back w/ "invalid_request" error
 3) MinAuthEndDate/PreferredAuthEndDate invalid → redirect back w/ "invalid_request" error

1) Error parameter as per OAuth 2.0
 Standard: <https://tools.ietf.org/html/rfc6749#section-4.1.2.1>
 2) Optional State parameter also returned if
 provided as part of original request

Request header parameter
 should include 32 character
 clientID:clientSecret from SMD
 registration milestones with
 Base64 encoding applied.
 Also provide auth code (fr. prior
 step) along w/ redirect_uri

Token Response contains:
 1) SubscriptionID* as part of the
 resourceURI parameter
 2) RetailCustomerID =
 SubscriptionID = AuthorizationID
 (same value)
 3) AuthorizationID as part of the
 authorizationURI parameter
 Note: IDs to be used in
 constructing customer data API
 URI Endpoints
 4) (authorized) scope

Optional: 3rd Party HTTP GET at
 Authorization API: https://api.pge.com/GreenButtonConnect/espi/1_1/resource/Authorization/{AuthorizationID}

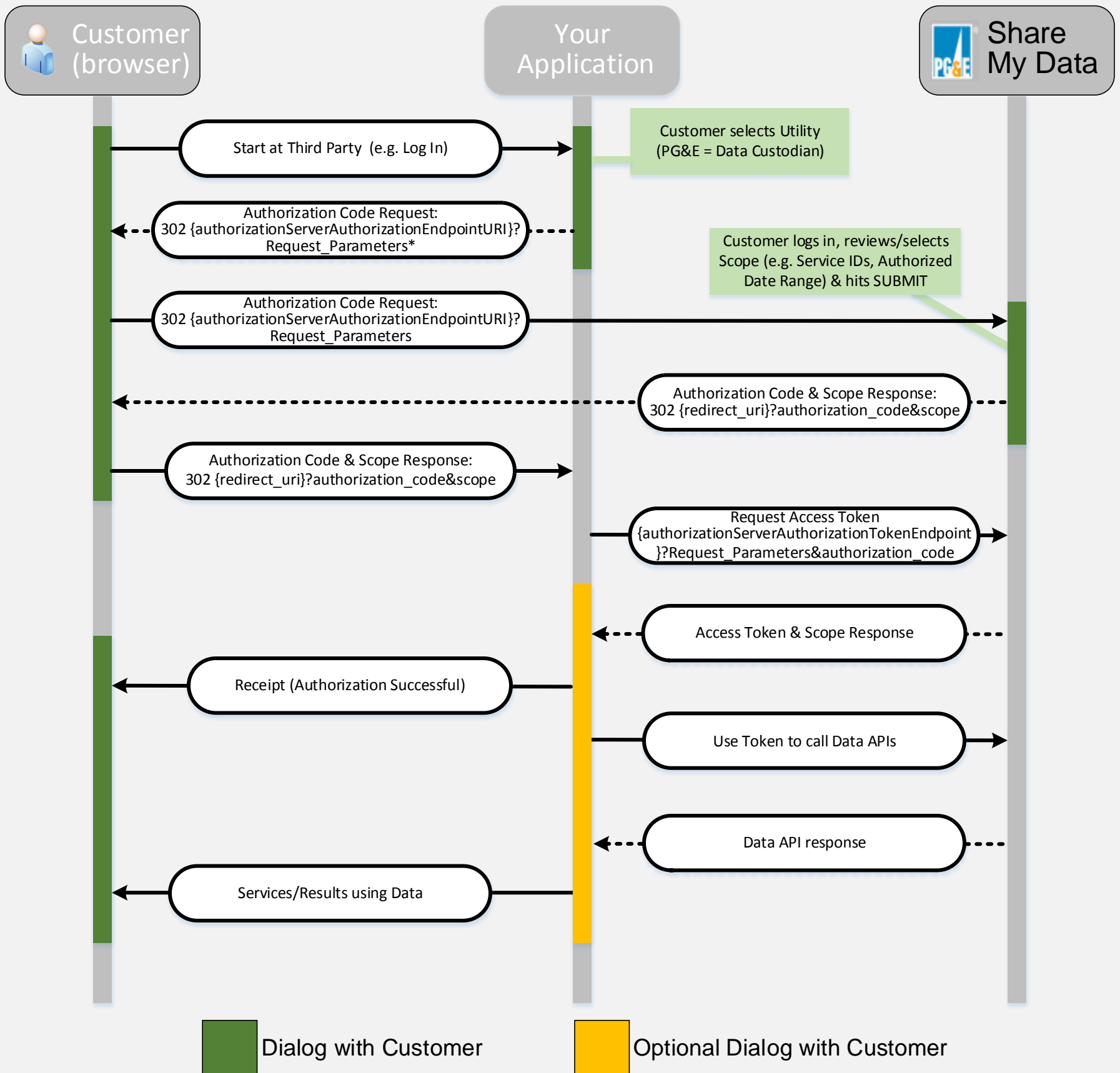
PG&E HTTP POST to 3rd Party
 registered Notification URL w/
 following payload (URL for
 Authorization details API):
 .../espi/1_1/resource/
 Authorization/{AuthorizationID}

3rd Party HTTP GET at
 Authorization API URL: .../espi/
 1_1/resource/Authorization/
 {AuthorizationID}

Authorization API Response
 contains:
 1) SubscriptionID as part of the
 resourceURI parameter
 2) RetailCustomerID =
 SubscriptionID = AuthorizationID
 (same value)
 Note: IDs to be used in constructing
 API URI Endpoints (see Data
 Access)
 3) AuthorizedPeriod (authorization
 start & duration) = 3RD Party
 registration selection. Note, as per
 ESPI standard, indefinite
 authorizations are expressed as
 duration = 0
 4) PublishedPeriod =
 (start & duration) Total window of
 data that can be requested going
 back to publishedPeriod/start.
 5) Status: 1 = active authorization; 0
 = revoked authorization
 6) (authorized) scope

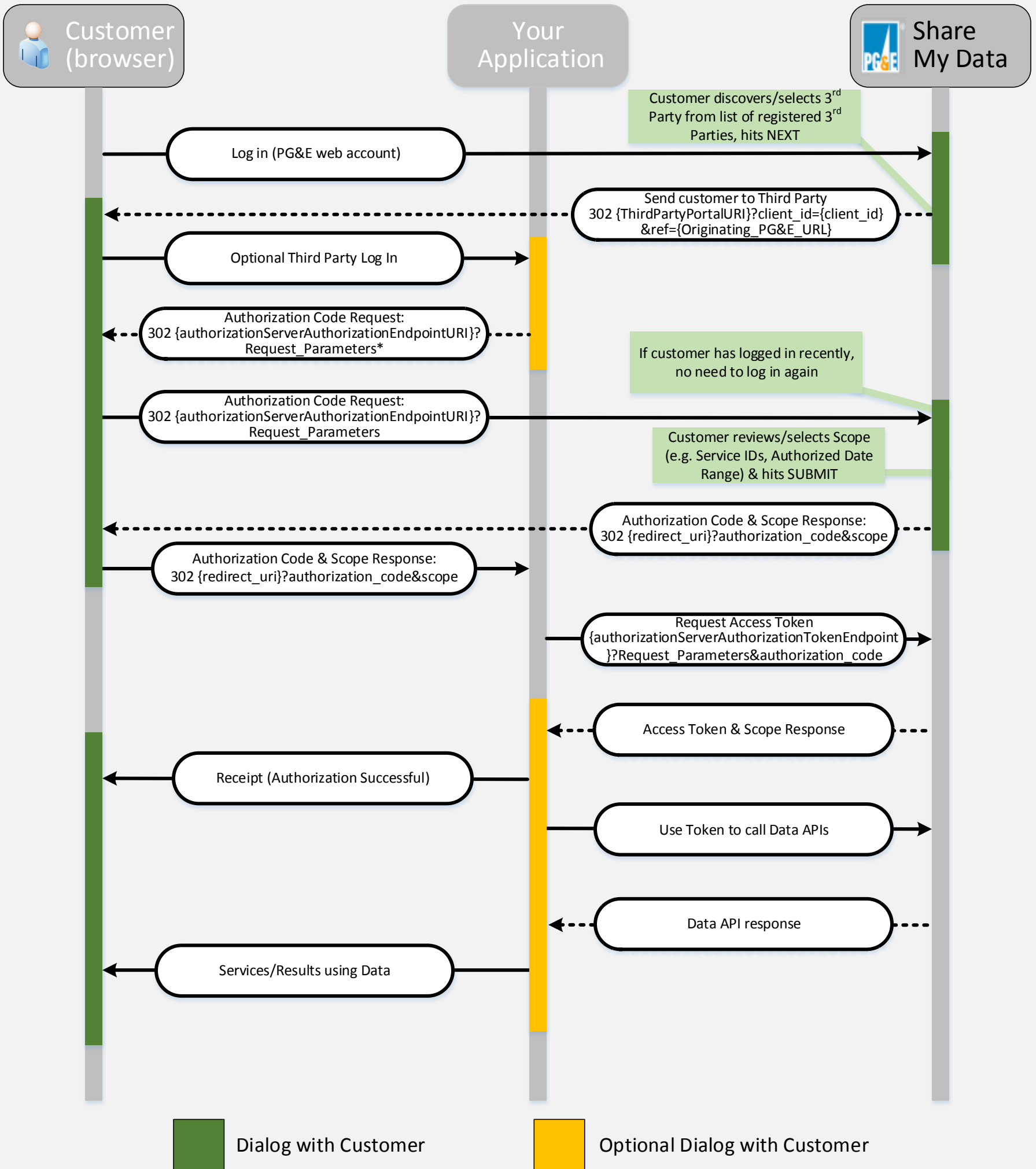
*Note: As a customer web account can have multiple Service Agreements associated to it, an online authorization may result in one Subscription ID mapping to multiple authorized Service Agreements (i.e. 'Usage Points').

AUTHORIZATION INITIATED AT THIRD-PARTY SITE (High Level Overview)



*R24 Click Thru Ph3 enhancement allows defaulting to guest access tab on customer authentication page by redirecting with the following request parameter appended to redirect URL: "login=guest". All other values (e.g. no login parameter or login=blank) will default to MyAccount sign-in tab. For example: https://sharemydataqa.pge.com/myAuthorization?client_id=XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX&response_type=code&redirect_uri=https://thirdpartyredirect.com&login=guest

AUTHORIZATION INITIATED AT PG&E (High Level Overview)

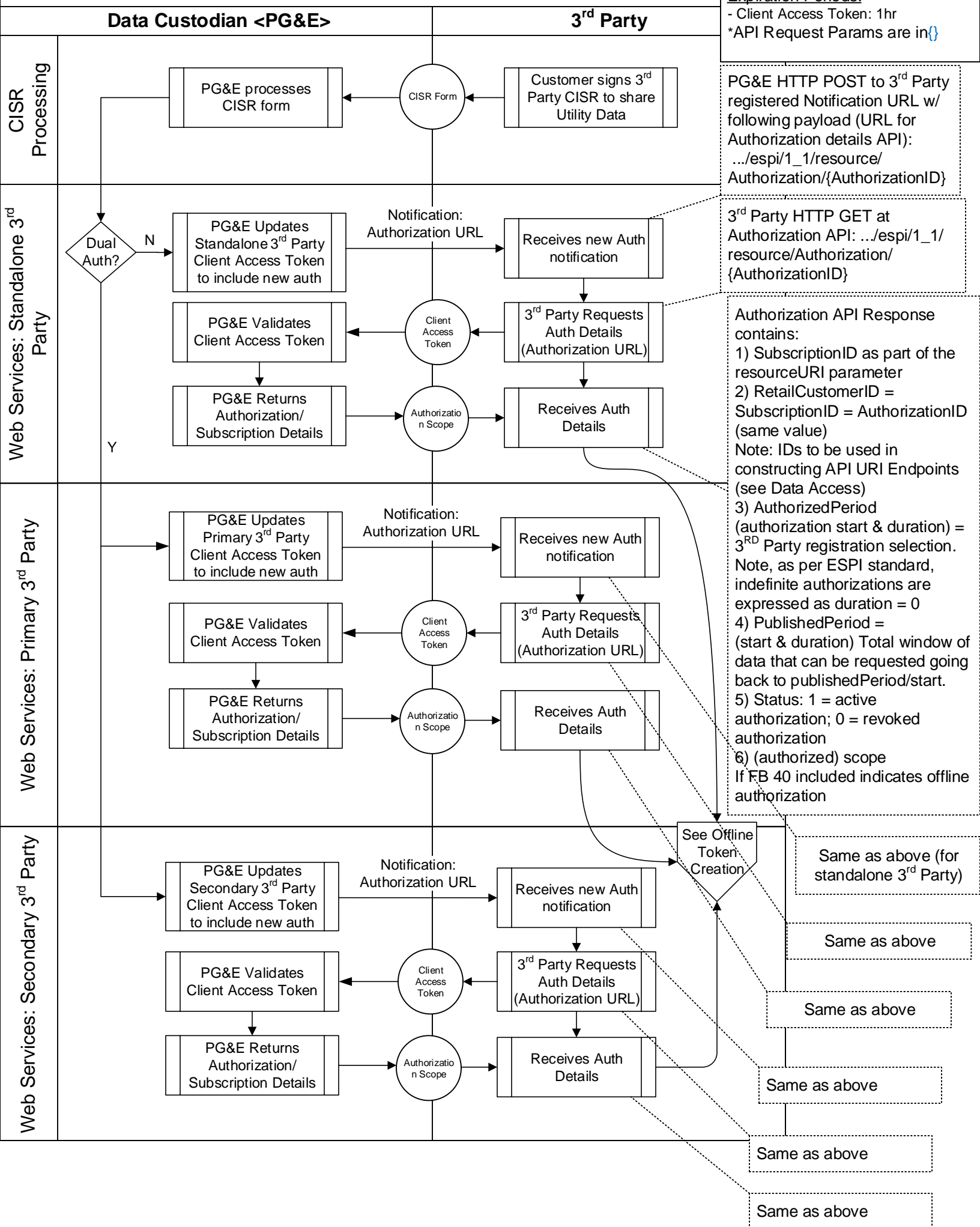


*R24 Click Thru Ph3 enhancement allows defaulting to guest access tab on customer authentication page by redirecting with the following request parameter appended to redirect URL: "login=guest". All other values (e.g. no login parameter or login=blank) will default to MyAccount sign-in tab. For example: https://sharemydataqa.pge.com/myAuthorization?client_id=XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX&response_type=code&redirect_uri=https://thirdpartyredirect.com&login=guest

Offline Customer Authorization:

(PGE API URL Prefix: <https://api.pge.com/GreenButtonConnect...>)

*Prior to below API requests, 3P must first request new Client Access Token using client credentials.
Expiration Periods:
 - Client Access Token: 1hr
 *API Request Params are in {}



PG&E HTTP POST to 3rd Party registered Notification URL w/ following payload (URL for Authorization details API):
 .../espi/1_1/resource/Authorization/{AuthorizationID}

3rd Party HTTP GET at Authorization API: .../espi/1_1/resource/Authorization/{AuthorizationID}

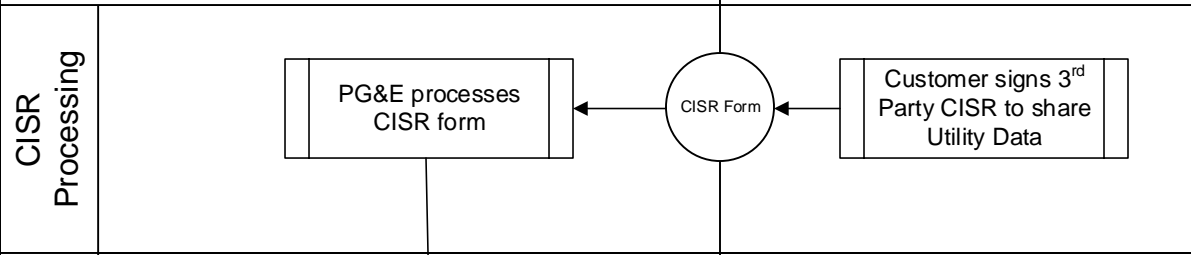
Authorization API Response contains:
 1) SubscriptionID as part of the resourceURI parameter
 2) RetailCustomerID = SubscriptionID = AuthorizationID (same value)
 Note: IDs to be used in constructing API URI Endpoints (see Data Access)
 3) AuthorizedPeriod (authorization start & duration) = 3rd Party registration selection. Note, as per ESPI standard, indefinite authorizations are expressed as duration = 0
 4) PublishedPeriod = (start & duration) Total window of data that can be requested going back to publishedPeriod/start.
 5) Status: 1 = active authorization; 0 = revoked authorization
 6) (authorized) scope
 If FB 40 included indicates offline authorization

Offline Token Creation: Offline CISR-DRP forms only

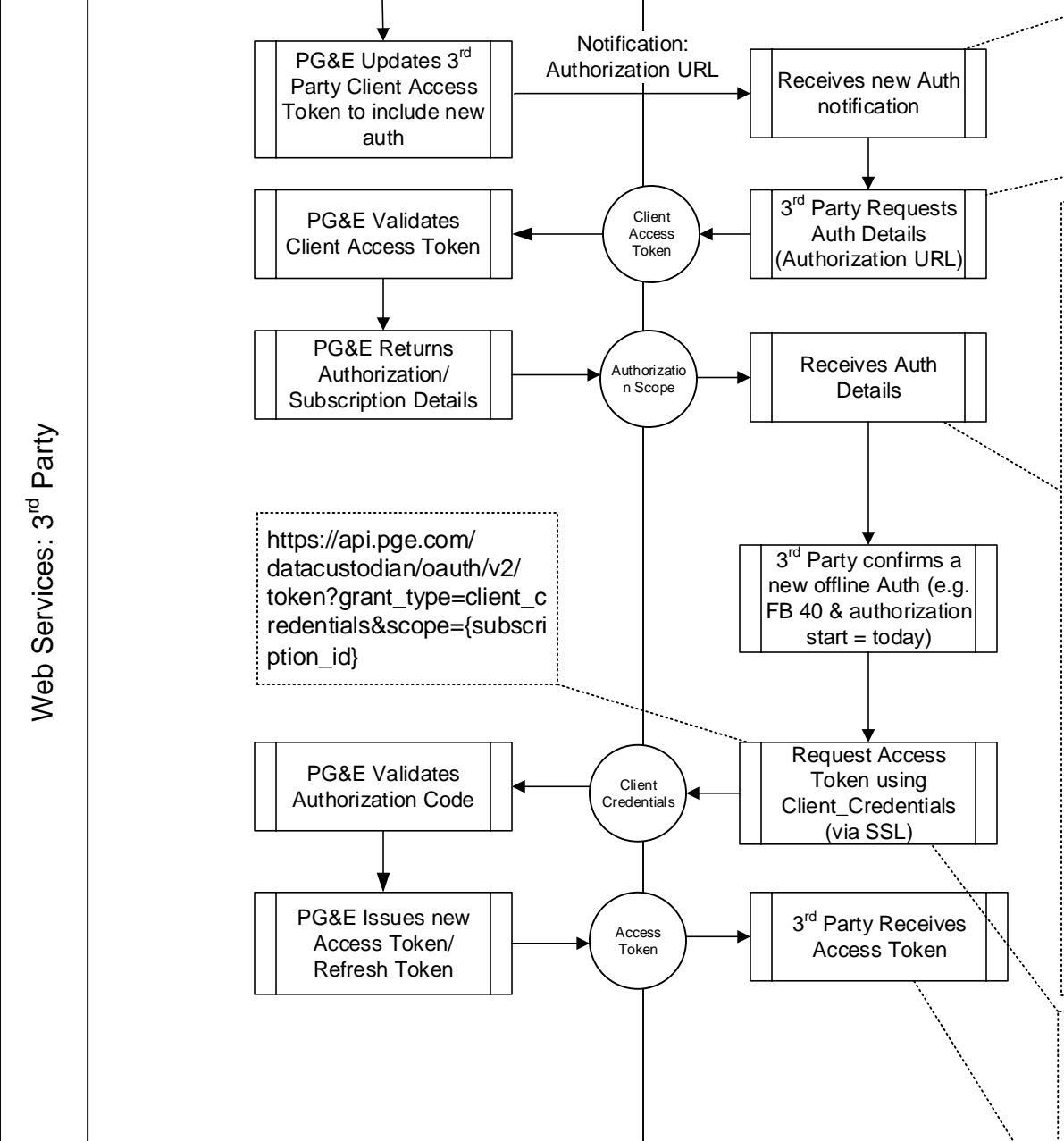
(PGE API URL Prefix: <https://api.pge.com/GreenButtonConnect...>)

*Prior to below API requests, 3P must first request new Client Access Token using client credentials
Expiration Periods:
 - Client Access Token: 1hr
 *API Request Params are in {}

Data Custodian <PG&E> 3rd Party



PG&E HTTP POST to 3rd Party registered Notification URL w/ following payload (URL for Authorization details API):
`.../espi/1_1/resource/Authorization/{AuthorizationID}`



3rd Party HTTP GET at Authorization API: `.../espi/1_1/resource/Authorization/{AuthorizationID}`

Authorization API Response contains:

- 1) SubscriptionID as part of the resourceURI parameter
- 2) RetailCustomerID = SubscriptionID = AuthorizationID (same value)
 Note: IDs to be used in constructing API URI Endpoints (see Data Access)
- 3) AuthorizedPeriod (authorization start & duration) = 3RD Party registration selection.
 Note, as per ESPI standard, indefinite authorizations are expressed as duration = 0
- 4) PublishedPeriod = (start & duration) Total window of data that can be requested going back to publishedPeriod/ start.
- 5) Status: 1 = active authorization; 0 = revoked authorization
- 6) (authorized) scope
 If FB 40 included indicates offline authorization

Request header parameter should include 32 character clientID:clientSecret from SMD registration milestones with Base64 encoding applied.

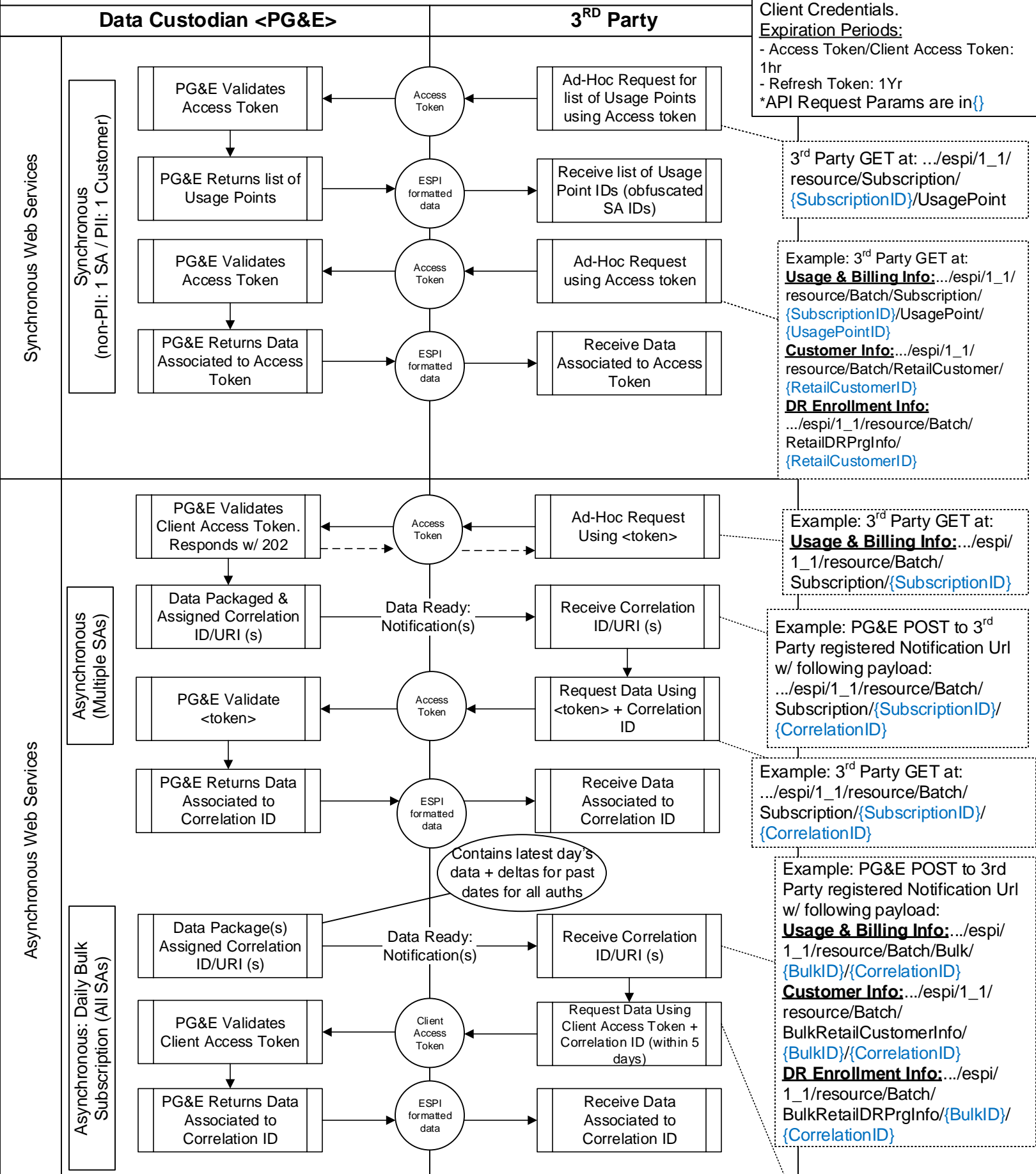
Token Response contains:

- 1) SubscriptionID* as part of the resourceURI parameter
- 2) RetailCustomerID = SubscriptionID = AuthorizationID (same value)
- 3) AuthorizationID as part of the authorizationURI parameter
 Note: IDs to be used in constructing customer data API URI Endpoints
- 4) (authorized) scope

API Data Access*

(PGE API URL Prefix: <https://api.pge.com/GreenButtonConnect...>)

*Prior to all data request, 3P must first request either new Access + Refresh Token pair or new Client Access Token using Refresh Token/ Client Credentials.
 Expiration Periods:
 - Access Token/Client Access Token: 1hr
 - Refresh Token: 1Yr
 *API Request Params are in {}



3rd Party GET at: `.../espi/1_1/resource/Subscription/{SubscriptionID}/UsagePoint`

Example: 3rd Party GET at:
Usage & Billing Info: `.../espi/1_1/resource/Batch/Subscription/{SubscriptionID}/UsagePoint/{UsagePointID}`
Customer Info: `.../espi/1_1/resource/Batch/RetailCustomer/{RetailCustomerID}`
DR Enrollment Info: `.../espi/1_1/resource/Batch/RetailDRPrgInfo/{RetailCustomerID}`

Example: 3rd Party GET at:
Usage & Billing Info: `.../espi/1_1/resource/Batch/Subscription/{SubscriptionID}`

Example: PG&E POST to 3rd Party registered Notification Url w/ following payload:
`.../espi/1_1/resource/Batch/Subscription/{SubscriptionID}/{CorrelationID}`

Example: 3rd Party GET at:
`.../espi/1_1/resource/Batch/Subscription/{SubscriptionID}/{CorrelationID}`

Example: PG&E POST to 3rd Party registered Notification Url w/ following payload:
Usage & Billing Info: `.../espi/1_1/resource/Batch/Bulk/{BulkID}/{CorrelationID}`
Customer Info: `.../espi/1_1/resource/Batch/BulkRetailCustomerInfo/{BulkID}/{CorrelationID}`
DR Enrollment Info: `.../espi/1_1/resource/Batch/BulkRetailDRPrgInfo/{BulkID}/{CorrelationID}`

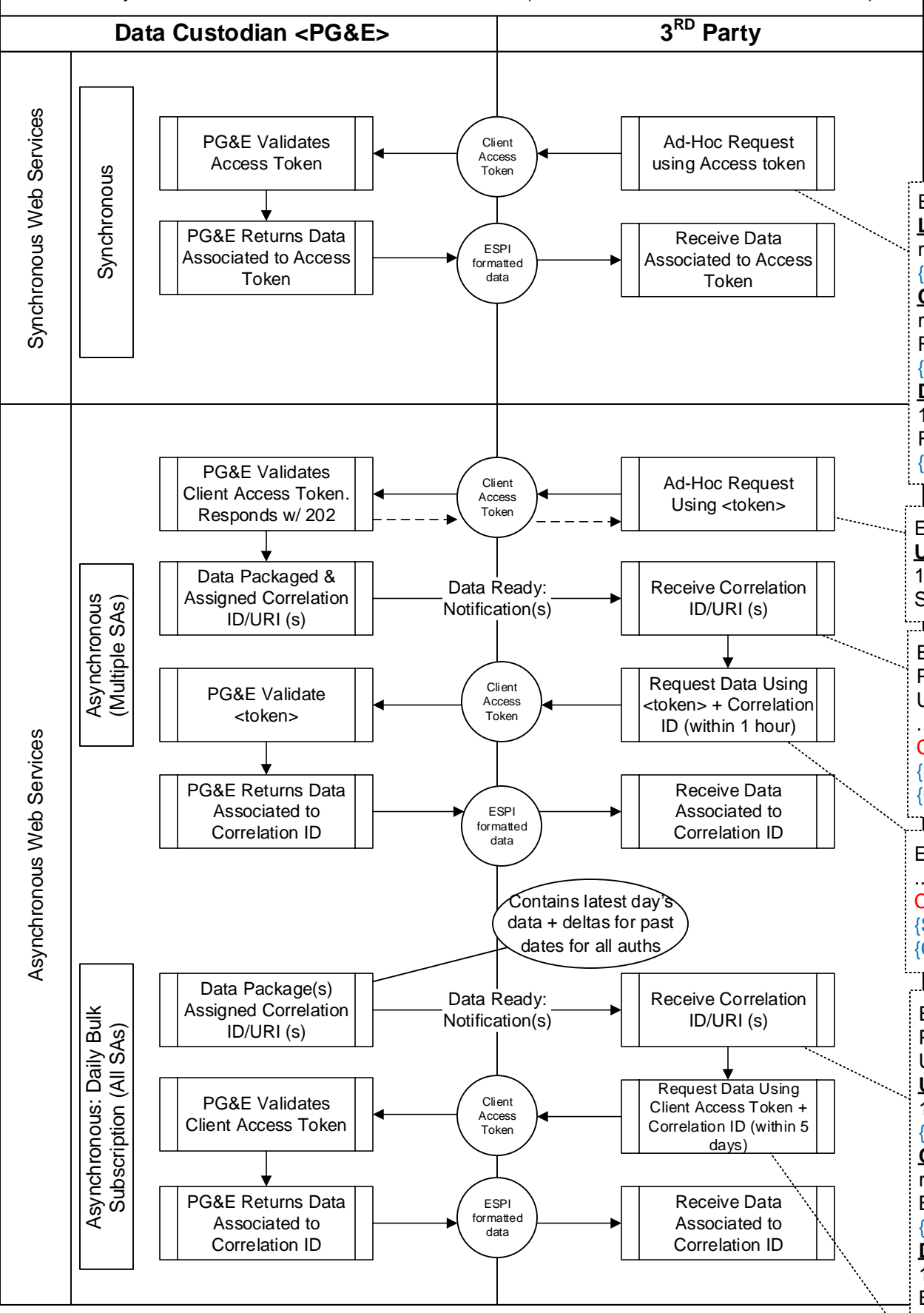
Example: 3rd Party GET at:
`.../espi/1_1/resource/Batch/Bulk/{BulkID}/{CorrelationID}`

*Note: For subsequent requests of on-going data, PG&E strongly advises using asynchronous API requests where possible. PG&E's SMD/Green Button Connect platform is a free service supporting millions of customers and hundreds of 3rd parties. Malicious or unintentional redundant API requests (especially synchronous) can potentially impact the 'click through' experience for new customer authorizations, may be throttled, and/or reported to appropriate regulatory bodies for abuse as necessary.

Legacy API Data Access – Offline Auths & Secondary 3Ps*

(PGE API URL Prefix: <https://api.pge.com/GreenButtonConnect...>)
 *To eventually be retired in a future communicated release (see offline Token Creation mechanism)

*Prior to all data request, 3P must first request either new Access + Refresh Token pair or new Client Access Token using Refresh Token/Client Credentials.
Expiration Periods:
 - Access Token/Client Access Token: 1hr
 - Refresh Token: 1Yr
 *API Request Params are in {}



Example: 3rd Party GET at:
List of Usage Pts: .../espi/1_1/resource/Subscription/Custom/{SubscriptionID}/UsagePoint
Customer Info: .../espi/1_1/resource/Batch/Custom/RetailCustomer/{RetailCustomerID}
DR Enrollment Info: .../espi/1_1/resource/Batch/Custom/RetailDRPrgInfo/{RetailCustomerID}

Example: 3rd Party GET at:
Usage & Billing Info: .../espi/1_1/resource/Batch/Custom/Subscription/{SubscriptionID}

Example: PG&E POST to 3rd Party registered Notification Url w/ following payload:
 .../espi/1_1/resource/Batch/Custom/Subscription/{SubscriptionID}/CorrelationID

Example: 3rd Party GET at:
 .../espi/1_1/resource/Batch/Custom/Subscription/{SubscriptionID}/CorrelationID

Example: PG&E POST to 3rd Party registered Notification Url w/ following payload:
Usage & Billing Info: .../espi/1_1/resource/Batch/Bulk/{BulkID}/{CorrelationID}
Customer Info: .../espi/1_1/resource/Batch/BulkRetailCustomerInfo/{BulkID}/{CorrelationID}
DR Enrollment Info: .../espi/1_1/resource/Batch/BulkRetailDRPrgInfo/{BulkID}/{CorrelationID}

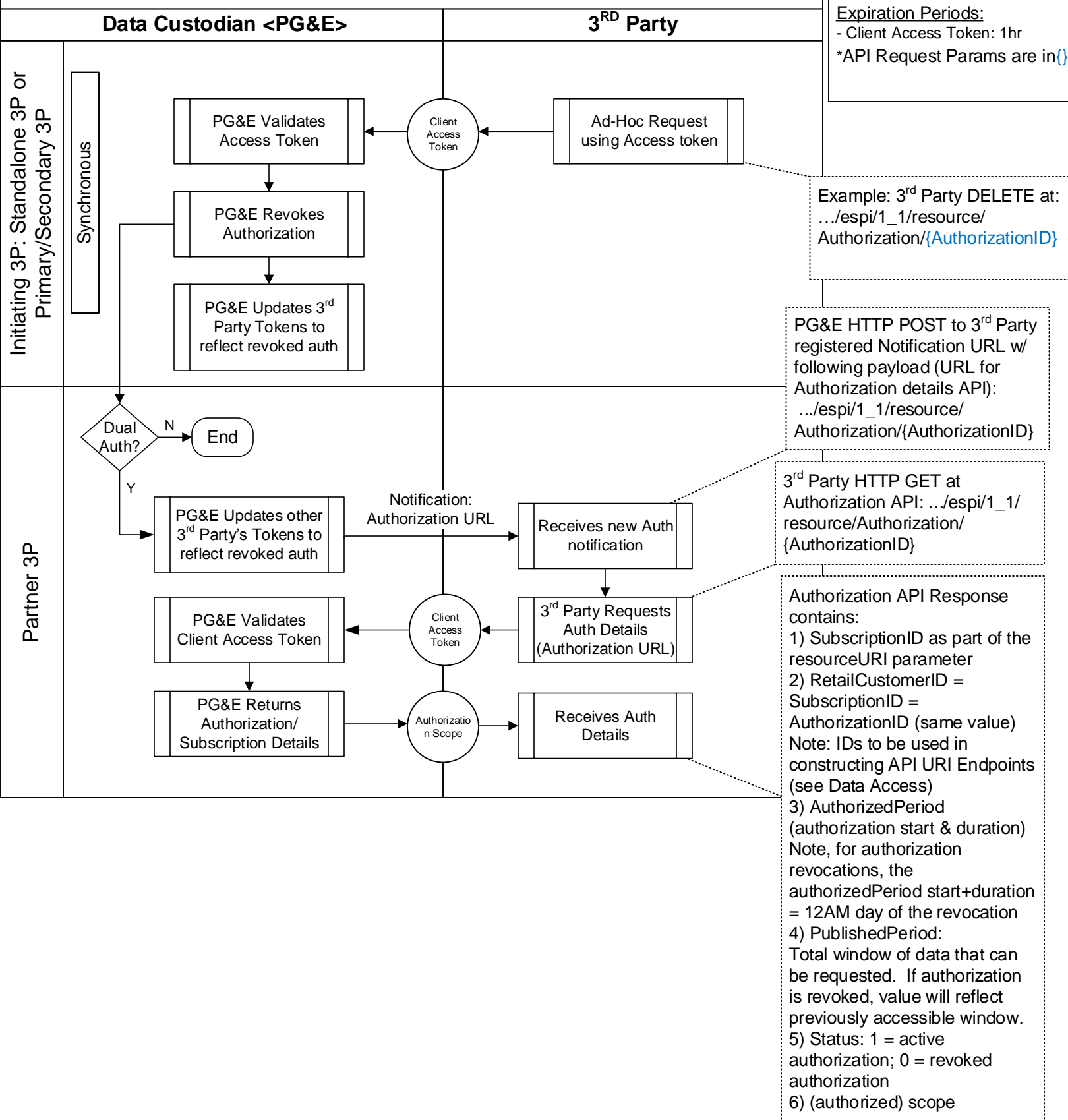
Example: 3rd Party GET at:
 .../espi/1_1/resource/Batch/Bulk/{BulkID}/{CorrelationID}

*Note: For subsequent requests of on-going data, PG&E strongly advises using asynchronous API requests where possible. PG&E's SMD/Green Button Connect platform is a free service supporting millions of customers and hundreds of 3rd parties. Malicious or unintentional redundant API requests (especially synchronous) can potentially impact the 'click through' experience for new customer authorizations, may be throttled, and/or reported to appropriate regulatory bodies for abuse as necessary.

API Authorization Revocation by 3Ps*

(PGE API URL Prefix: <https://api.pge.com/GreenButtonConnect...>)

*Prior to below API requests, 3P must first request new Client Access Token using client credentials
Expiration Periods:
 - Client Access Token: 1hr
 *API Request Params are in {}



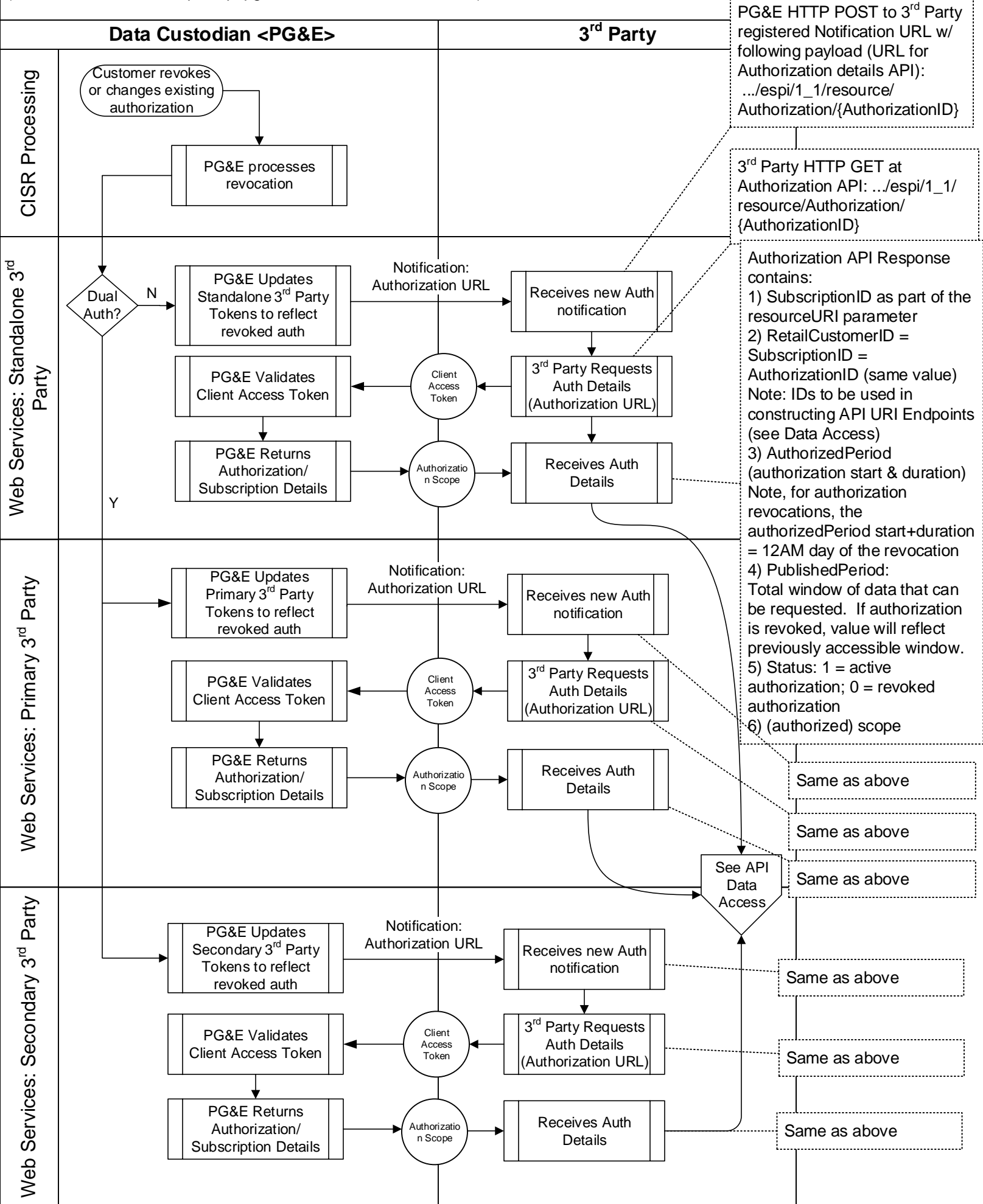
3rd Party HTTP GET at Authorization API: .../espi/1_1/resource/Authorization/{AuthorizationID}

Authorization API Response contains:

- 1) SubscriptionID as part of the resourceURI parameter
- 2) RetailCustomerID = SubscriptionID = AuthorizationID (same value)
 Note: IDs to be used in constructing API URI Endpoints (see Data Access)
- 3) AuthorizedPeriod (authorization start & duration)
 Note, for authorization revocations, the authorizedPeriod start+duration = 12AM day of the revocation
- 4) PublishedPeriod: Total window of data that can be requested. If authorization is revoked, value will reflect previously accessible window.
- 5) Status: 1 = active authorization; 0 = revoked authorization
- 6) (authorized) scope

Customer Initiated Revocations/Changes w/ PG&E:

(PGE API URL Prefix: <https://api.pge.com/GreenButtonConnect...>)



Note: This notification mechanism is used for notifying 3rd parties of customer initiated authorization changes (extending auth end date etc.) and cancellations done on PG&E side regardless of whether the changes is for an online or offline authorization and regardless of 3rd party type (Primary/Secondary/Standalone).