Use case scenarios

<table> <thead> <tr> <th>Test Case ID</th> <th>UC1_TC1</th> </tr> </thead> <tbody> <tr> <td>

Description

</td> <td>

Verify that the system can successfully calculate GLEC Framework Scope 1 Emissions when all general information is provided

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Test Steps

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1. User requests Scope 1 emission calculation providing the following information during a Well-to-Wheel road transportation activity:

   - Gasoline Van using Gasoline/Ethanol 95/5 Blend and consuming 85364 `l`

   - 7.5 t Diesel Truck using Diesel/Biodiesel Blend 95/5 and consuming 127257 `l`

   - 40 t/Class 8 Truck using Diesel/Biodiesel Blend 95/5 and consuming 7486 `l`

2. User sends the request to the application

3. System accepts the request

4. System performs calculation

5. System responds with the following information:

   - Total of 666153 `kg of CO2-equivalent` emissions

   - Gasoline Van total of 239019 `kg of CO2-equivalent` emissions

   - 7.5 t Diesel Truck total of 403404 `kg of CO2-equivalent` emissions

   - 40 t/Class 8 Truck total of 23730 `kg of CO2-equivalent` emissions

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Expected Result

</td> <td>

The `kg of CO2-equivalent` produced by the fuel consumption given by the User

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<table>
<thead>
<tr>
<th>Test Case ID</th>
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<th>UC1_TC2</th>
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<tbody>
<tr>
<td>

**Description**

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<td>

Verify that the system can successfully calculate more detailed GLEC Framework Scope 1
Emissions when all detailed information is provided

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**Test Steps**

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<td>

1. User requests Scope 1 emission calculation providing a consumption of 374285 `l` of
diesel-biodiesel blend 95/5 during a a Tank-to-Wheel activity
2. User sends the request to the application
3. System detects that transportation type is missing
4. System responds with a missing transportation type

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**Expected Result**

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<td>

The `kg of CO2-equivalent` produced by the fuel consumption by each of the vehicles
given by the User

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</table>
```

<table> <thead> <tr> <th>Test Case ID</th> <th>UC1_TC3</th> </tr> </thead> <tbody> <tr> <td>

Description

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Verify that System returns an error when any of the required information fields are missing, which are: - The type of transport (Transport mode) - The fuel in kg or l used during transport - The type of fuel used during transport - Emission type (Well-to-Tank, Tank-to-Wheel, Well-to-Wheel)

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Test Steps

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1. User requests Scope 1 emission calculation missing one or more of the required information
2. User sends the request to the application
3. System detects that information is missing
4. System responds with a data missing error

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Expected Result

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System error informing of missing data during the calculation

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<thead>
<tr>
<th>Test Case ID</th>
<th>UC1_TC4</th>
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**Description**

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Verify that System returns an error when calculation can't be performed

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**Test Steps**

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<td>

1. User requests Scope 1 emission calculation providing a consumption of 374285 `l` of
orange juice blend 95/5 during a Tank-to-Wheel road transportation activity
2. User sends the request to the application
3. System accepts the request
4. System tries to perform such calculation but provided data is not correct
5. System responds with a calculation not possible error

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**Expected Result**

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<td>

System error informing of not possible to perform such calculation

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</table>

<table>
  <thead>
    <tr>
      <th>Test Case ID</th>
      <th>UC2_TC1</th>
    </tr>
  </thead>
  <tbody>
    <tr>
      <td>Description</td>
      <td>Verify that the system can successfully calculate Scope 2 Emissions when all
necessary information is provided.</td>
    </tr>
    <tr>
      <td>Test Steps</td>
      <td>
        <ol>
          <li>Authenticate as a regular user.</li>
          <li>Enter valid basic information required for Scope 2 Emissions
calculation.</li>
```

```
            <li>Send the request to the application.</li>
            <li>Verify that the system processes the request without errors.</li>
            <li>Check if the system sends the correct result back to the user.</li>
          </ol>
        </td>
      </tr>
      <tr>
        <td>Expected Result</td>
        <td>The system should calculate and return the correct Scope 2 Emissions
value.</td>
      </tr>
    </tbody>
</table>
```

<table> <thead> <tr> <th>Test Case ID</th> <th>UC2_TC2</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the system handles a scenario where the user does not provide all the necessary information.</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as a regular user. Enter incomplete or missing basic information required for Scope 2 Emissions calculation. Send the request to the application. Verify that the system detects the missing information. Check if the system provides an appropriate error message to the user. </td> </tr> <tr> <td>Expected Result</td> <td>The system should detect the missing information and provide a clear error message to the user.</td> </tr> </tbody> </table>

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<table>
  <thead>
    <tr>
      <th>Test Case ID</th>
      <th>UC2_TC3</th>
    </tr>
  </thead>
  <tbody>
    <tr>
      <td>Description</td>
      <td>Verify that the system restricts unauthorized users from accessing the Scope
2 Emissions calculation.</td>
    </tr>
    <tr>
      <td>Test Steps</td>
      <td>
        <ol>
          <li>Attempt to access the Scope 2 Emissions calculation without
authentication.</li>
          <li>Enter valid basic information.</li>
          <li>Send the request to the application.</li>
          <li>Verify that the system denies access and returns an unauthorized error
message.</li>
        </ol>
      </td>
    </tr>
```

```
    <tr>
      <td>Expected Result</td>
      <td>The system should deny access to unauthorized users and return an
appropriate error message.</td>
    </tr>
  </tbody>
</table>

<table>
<thead>
<tr>
<th>Test Case ID</th>
<th>UC3_TC1</th>
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**Description**

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<td>

Verify that the system can successfully calculate GLEC Framework Scope 3 Emissions
when all general information is provided

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**Test Steps**

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<td>

1. User requests Scope 3 emission calculation using the following information from a
road transport:
   - Vehicles using a Diesel/Biodiesel Blend consumed `374,285l` of fuel
   - Vehicles using a Gasoline/Ethanol Blend consumed `85,364l` of fuel
2. User sends the request to the application
3. System accepts the request
4. System performs calculation
5. System responds with the following information:
   - Emissions by first vehicle type `235,800 kg of CO2-equivalent`
   - Emissions by second vehicle type `42,682 kg of CO2-equivalent`
   - Total of `278,482 kg of CO2-equivalent` emissions

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**Expected Result**

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<td>

The `kg of CO2-equivalent` produced by the fuel consumption given by the User

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```

<table> <thead> <tr> <th>Test Case ID</th> <th>UC3_TC2</th> </tr> </thead> <tbody> <tr> <td>

Description

</td> <td>

Verify that the system can handle missing information when any of the required information fields are missing, which are: - The type of transport (Transport mode) - The fuel in kg or l used during transport - The type of fuel used during transport - Emission type (Well-to-Tank, Tank-to-Wheel, Well-to-Wheel)

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Test Steps

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1. User requests Scope 3 emission calculation using the following information from a road transport:

   ◦ Vehicles consumed 187,000l of fuel

2. User sends the request to the application

3. System detects that fuel type is missing

4. System responds with an error message indicating that fuel type is missing

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Expected Result

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An error informing the user what information is missing

</td> </tr> </tbody> </table>

Test Case ID	UC3_TC3
Description	Verify that System returns an error when there is no corresponding emission factor for the provided information
Test Steps	1. User requests Scope 3 emission calculation providing a consumption of 374285 `l` of rainbow blend 95/5 during a Tank-to-Wheel road transportation activity 2. User sends the request to the application 3. System detects that there is no emission factor for the provided fuel type 4. System responds with an error message indicating that there is no emission factor for the provided fuel type
Expected Result	System error informing of missing emission factor for the provided fuel type

```
    </tbody>
  </table>
```

<table> <thead> <tr> <th>Test Case ID</th> <th>UC3_TC4</th> </tr> </thead> <tbody> <tr> <td>

Description

</td> <td>

Verify that System can perform calculations using other possible input data

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Test Steps

</td> <td>

1. User requests Scope 3 emission calculation using the following information from an air transport activity:
   - Plane using Jet Fuel A assuming a standard emission intensity of `0.702 kg CO2e/tkm`
   - The total tonne-kilometers of the transport is `1,301 tkm`
2. User sends the request to the application
3. System accepts the request
4. System performs calculation
5. System responds with the following information:
   - Total emissions of that transport activity `913 kg of CO2-equivalent`

</td> </tr> <tr> <td>

Expected Result

</td> <td>

The `kg of CO2-equivalent` produced by the fuel consumption given by the User

</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC4_TC1</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the Administrator can successfully edit an emission factor to the database.</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as an Administrator Send a request to edit an emission factor with the new value Verify that the system processes the request Check if the system eidts the emission factor Confirm that the Administrator receives a success message </td> </tr> <tr> <td>Expected Result</td> <td>The emission factor should be edited in the application, and the Administrator should receive a success message</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC4_TC2</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the system handles a scenario where the emission factor being edited already has the same value</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as an Administrator Send a request to edit an emission factor with the new value Verify that the system detects that the new emission factor provided is the same as the old one Check if the system provides an appropriate error message to the Administrator </td> </tr> <tr> <td>Expected Result</td> <td>The system should notify the user that the new emission factor is the same as the old one</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC4_TC3</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the system handles a scenario where the Administrator inserts an invalid value for the emission factor</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as an Administrator Send a request to change the emisison factor to an invalid value Verify that the system detects the invalid value Check if the system provides an appropriate error message to the Administrator </td> </tr> <tr> <td>Expected Result</td> <td>The system should detect the invalid value and provide an error message to the Administrator</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC5_TC1</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the Administrator can successfully add an emission factor to the database.</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as an Administrator. Send a request to add a valid emission factor. Verify that the system processes the request. Check if the system adds the emission factor. Confirm that the Administrator receives a success message. </td> </tr> <tr> <td>Expected Result</td> <td>The emission factor should be added to the application, and the Administrator should receive a success message.</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC5_TC2</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the system handles a scenario where the emission factor being added already exists in the database.</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as an Administrator. Send a request to add an emission factor that already exists in the database. Verify that the system detects the existing emission factor. Check if the system provides an appropriate error message to the Administrator. </td> </tr> <tr> <td>Expected Result</td> <td>The system should detect the existing emission factor and provide an error message to the Administrator.</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC5_TC3</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the system handles a scenario where the Administrator inserts an invalid value for the emission factor.</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as an Administrator. Send a request to add an invalid emission factor. Verify that the system detects the invalid value. Check if the system provides an appropriate error message to the Administrator. </td> </tr> <tr> <td>Expected Result</td> <td>The system should detect the invalid value and provide an error message to the Administrator.</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC6_TC1</th> </tr> </thead> <tbody> <tr> <td>

Description

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Verify that the system can successfully remove emission factors

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Test Steps

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1. User requests to remove a certain emission factor by providing valid indormation such as the ID
2. System find the emission factor the User refers to
3. System removes the emission factor
4. System responds with a operation successful message

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Expected Result

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The emission factor is not longer available in the system

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<tr>
<th>Test Case ID</th>
<th>UC6_TC2</th>
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**Description**

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<td>

Verify that System returns an error when trying to delete a non existing emission
factor

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**Test Steps**

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<td>

1. User requests to remove a certain emission factor by providing valid indormation
such as the ID
2. System can't find the emission factor the User refers to
3. System responds with a cannot find the given emission factor error or not possible
to delete such emission factor error

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**Expected Result**

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<td>

System returns an error when is not possible to remove an emission factor

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<tr>
<th>Test Case ID</th>
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**Description**

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<td>

Verify that the system can successfully return emission factors

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**Test Steps**

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<td>

1. User requests to read all emission factors
2. System finds all emission factors
3. System returns all emission factors

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**Expected Result**

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<td>

The system returns all emission factors

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<table> <thead> <tr> <th>Test Case ID</th> <th>UC6_TC2</th> </tr> </thead> <tbody> <tr> <td>

Description

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Verify that System can return filtered emission factors

</td> </tr> <tr> <td>

Test Steps

</td> <td>

1. User requests to read emission factors for a specific transport mode

2. System finds emission factors for the specific transport mode

3. System returns emission factors for the specific transport mode

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Expected Result

</td> <td>

System returns emission factors for a specified set of filters like transport mode, fuel type, emission type

</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC8_TC1</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the User provided valid authentication credentials</td> </tr> <tr> <td>Test Steps</td> <td> Send the credentials to be verified Verify that the system responded with a success message </td> </tr> <tr> <td>Expected Result</td> <td>The user has been authenticated</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC8_TC2</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the User provided invalid credentials</td> </tr> <tr> <td>Test Steps</td> <td> Send the credentials to be verified Verify that the system responded with an error message </td> </tr> <tr> <td>Expected Result</td> <td>The system should detect the the invalid credentials and respond with an error message</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC9_TC1</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the User can successfully store the result of their calculation for later use and/or review.</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as a User. Complete an emission calculation. See the result of the calculation. Send a request to the system to save the calculation. Verify that the system processes the request. Check if the system stores the calculation result. Confirm that the system returns a success message to the User. </td> </tr> <tr> <td>Expected Result</td> <td>The calculation result should be successfully stored within the application, and the User should receive a success message.</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC9_TC2</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the system handles a scenario where the calculation fails, and the User attempts to store the result.</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as a User. Start an emission calculation that fails. Attempt to save the result of the failed calculation. Verify that the system detects the calculation failure. Check if the system provides an appropriate error message to the User. </td> </tr> <tr> <td>Expected Result</td> <td>The system should detect the calculation failure and provide an error message to the User.</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC9_TC3</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the system handles a scenario where communication to the database fails when the User attempts to store a calculation result.</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as a User. Complete an emission calculation successfully. See the result of the calculation. Send a request to the system to save

the calculation. Simulate a database communication failure during the storage process. Verify that the system appropriately handles the database communication failure. </td> </tr> <tr> <td>Expected Result</td> <td>The system should handle the database communication failure gracefully and provide an error message or notification to the User indicating the failure to store the calculation result.</td> </tr> </tbody> </table>

<table> <thead> <tr> <th>Test Case ID</th> <th>UC10_TC1</th> </tr> </thead> <tbody> <tr> <td>

Description

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Verify that the system can successfully provide all the past emissions calculations belonging to a certain user

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Test Steps

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1. User requests to view past emissions calculations
2. System finds past emissions calculations belonging to the User
3. System returns all the past emissions calculations that has found

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Expected Result

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All the past emissions calculations belonging to the User

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<tr>
<th>Test Case ID</th>
<th>UC10_TC2</th>
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**Description**

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```
Verify that the system returns empty list when no past emissions calculations exist
for a certain user

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**Test Steps**

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<td>

1. User requests to view past emissions calculations with or without providing filter
options
2. System can't find past emissions calculations belonging to the User
3. System returns an empty list

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**Expected Result**

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Empty list

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```

<table> <thead> <tr> <th>Test Case ID</th> <th>UC10_TC3</th> </tr> </thead> <tbody> <tr> <td>

Description

</td> <td>

Verify that the system returns past emissions calculations, matching certain filter conditions, belonging to a certain user

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Test Steps

</td> <td>

1. User requests to view past emissions calculations providing valid filter options like calculation

dates or period

2. System finds past emissions calculations matching filter conditions and belonging to the User

3. System returns the found past emissions calculations

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Expected Result

</td> <td>

The found past emissions calculations belonging to the User

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<tr>
<th>Test Case ID</th>
<th>UC10_TC4</th>
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<td>

**Description**

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<td>

Verify that System returns an error when an invalid filter is provided

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**Test Steps**

</td>
<td>

1. User requests to view past emissions calculations providing invalid filter options
like invalid dates
2. System can't parse the provided filter
3. System returns invalid filter error

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**Expected Result**

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<td>

System error informing of an invalid filter provided

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<table> <thead> <tr> <th>Test Case ID</th> <th>UC12_TC1</th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Verify that the API overview has been sent</td> </tr> <tr> <td>Test Steps</td> <td> Authenticate as a User of the system (Administrator/User) Send a request to view the API overview Verify that the system processes the request Check if the system returns the API overveiw Confirm that the User receives a success message </td> </tr> <tr> <td>Expected Result</td> <td>The API overview has been sent to the user</td> </tr> </tbody> </table>