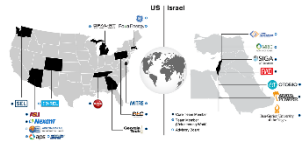


Commercialization - ASU Topology Processor Engine



```
print("Extracting Connectivity from OpenDSS models")
# os.chdir("APS_model/")
exec(open('1connectivity_extract.py'.encode('utf-8')).read())

print("Extracting Grouped Loads Features from OpenDSS models")
os.chdir("..")
exec(open('2grouped_loads_features_extract.py'.encode('utf-8')).read())

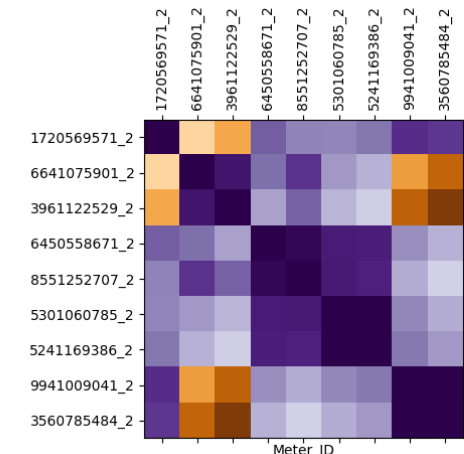
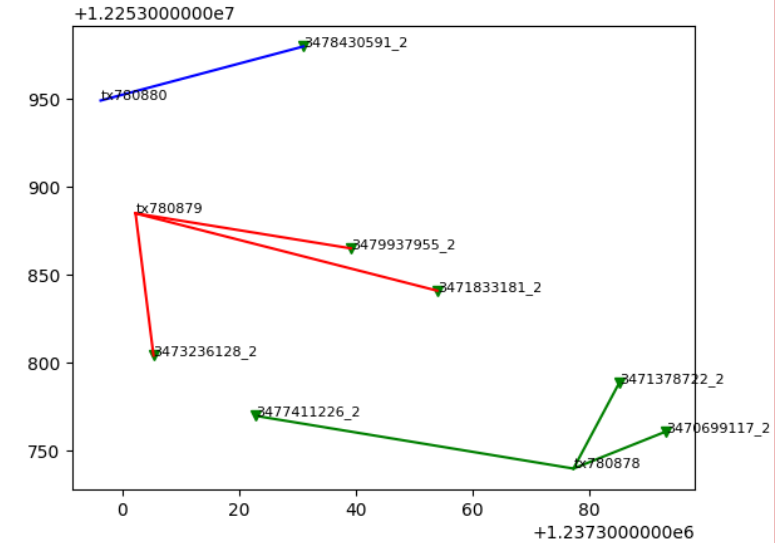
print("Creating Distance Features")
os.chdir("..")
exec(open('3distance_features.py'.encode('utf-8')).read())

print("Generate Voltage Data using Connectivity and Consumption data and Extract it")
os.chdir("..")
exec(open('4vpu_extract.py'.encode('utf-8')).read())

print("Spectral Clustering to obtain clusters of meters corresponding to transformers")
os.chdir("..")
exec(open('5spectral_cluster_multiview_regular_merged2 - Confidence_Metric.py'.encode('utf-8')).read())

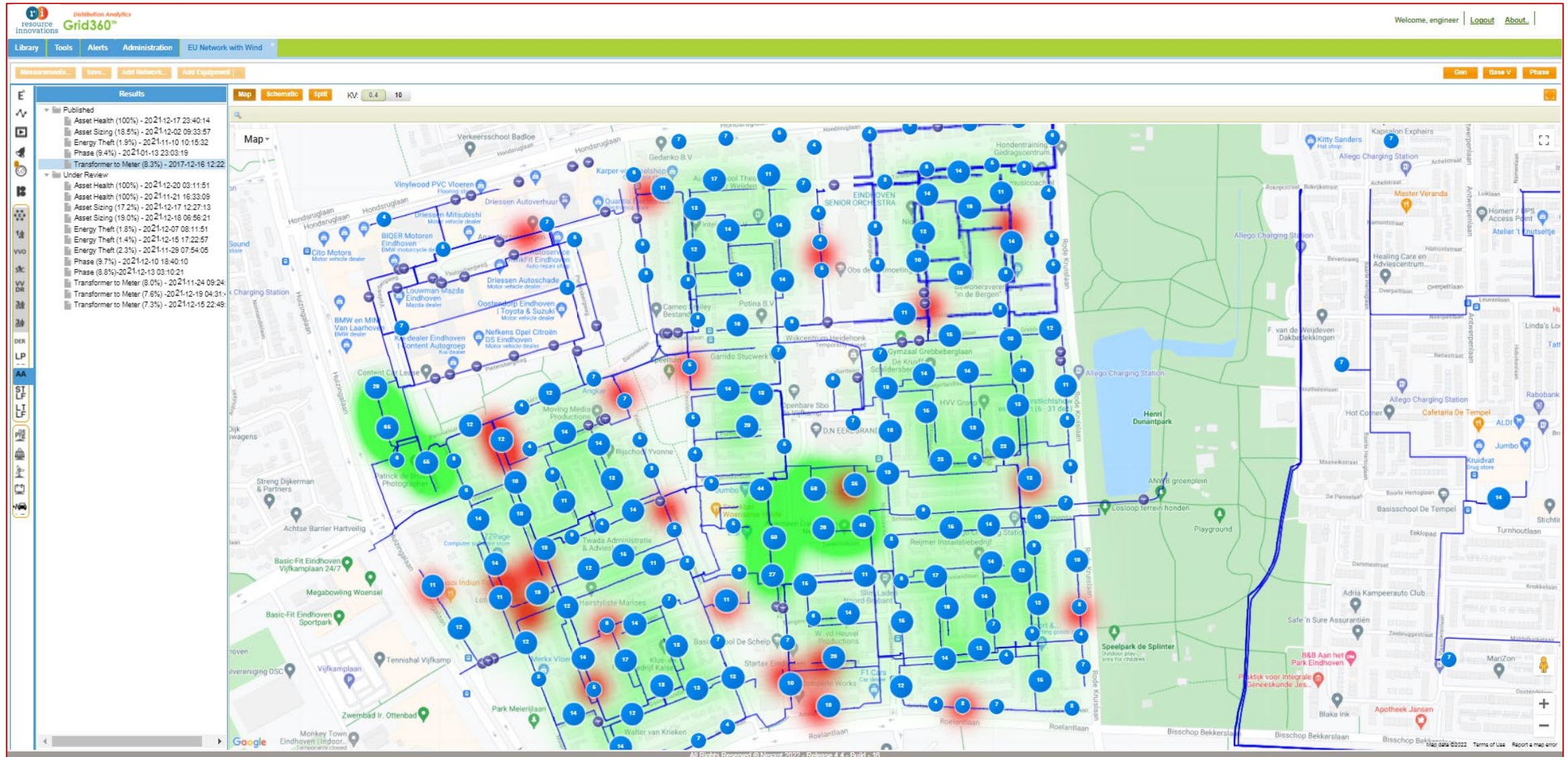
print("Computation of Accuracy and Generation of Complete Plot")
os.chdir("..")
exec(open('6spectral_cluster_accuracy_confidence_matrix.py'.encode('utf-8')).read())

elapsed=(time.time() - t)
print('Total time for execution: %s seconds' %elapsed)
```



OUTPUT:

Total Number of Correctly Predicted Connections = 1514
Total Number of Incorrectly Predicted Connections = 70
Total Number of Connections = 1584
Total Accuracy [%]= Correct\Total * 100 = 95.5808
Total time for execution: 263.06036 seconds

[illegible]

/networks/device/cybermetrics/cybermetricsData

Parameters

Cancel

Name	Description
cybermetrics * required string (body)	cybermetrics Edit Value Model

```
<div class="x-panel x-box-item x-panel-default x-tree-panel x-tree-arrows x-grid" style="height: 359px; left: 0px; top: 0px; margin: 0px; width: 482px;" role="treegrid" aria-hidden="false" aria-disabled="false" aria-readonly="false" aria-multiselectable="true" id="piAttributeGrid-1795">  
  <div id="piAttributeGrid-1795-bodyWrap" data-ref="bodyWrap" class="x-panel-bodyWrap" role="presentation">  
    <div class="x-grid-header-ct x-docked x-grid-header-ct-default x-docked-top x-grid-header-ct-default-docked-top x-box-layout-ct x-scroller x-unselectable" style="border-width: 1px; overflow: hidden; width: 482px; left: 0px; top: 0px;" role="rowgroup" aria-hidden="false" aria-disabled="false" id="headerContainer-1796" data-exttouchaction="14">  
      <div id="headercontainer-1796-innerCt" data-ref="innerCt" role="row" class="x-box-inner" style="width: 480px; height: 29px;>  
        <div id="headercontainer-1796-targetEl" data-ref="targetEl" class="x-box-target" role="presentation" style="width: 480px;>  
          <div class="x-column-header-x-column-header-align-left x-box-item x-column-header-default x-unselectable x-column-header-first" style="border-width: 1px; left: 0px; margin: 0px; width: 160px; top: 0px;" role="columnheader" aria-hidden="false" aria-disabled="false" aria-readonly="true" id="treecolumn-1798" tabindex="0" data-componentid="treecolumn-1798">  
            <div id="treecolumn-1798-titleEl" data-ref="titleEl" role="presentation" class="x-column-header-inner x-leaf-column-header">  
              <div id="treecolumn-1798-textContainerEl" data-ref="textContainerEl" role="presentation" class="x-column-header-text-container">  
                <div role="presentation" class="x-column-header-text-wrapper">  
                  <div id="treecolumn-1798-textEl" data-ref="textEl" role="presentation" class="x-column-header-text">  
                    <span id="treecolumn-1798-textInnerEl" data-ref="textInnerEl" role="presentation" class="x-column-header-text-inner">Attribute/Equipment</span>  
                  </div>  
                  <span id="treecolumn-1798-dirty-cell-text" class="x-hidden-offsets">Cell value has been edited</span>  
                </div>  
              </div>  
            </div>  
          </div>  
        </div>  
      </div>  
    </div>  
  </div>
```

Cancel

Parameter content type
application/json

networkId * required integer(\$int64) (query)	networkId <input type="text" value="1001"/>
rdfId * required string (query)	rdfId <input type="text" value="_07790_RMUT1_TXT1"/>
riskFactor * required number(\$double) (query)	riskFactor <input type="text" value="3.6"/>
userId * required integer(\$int64) (query)	userId <input type="text" value="1"/>

Execute

Clear

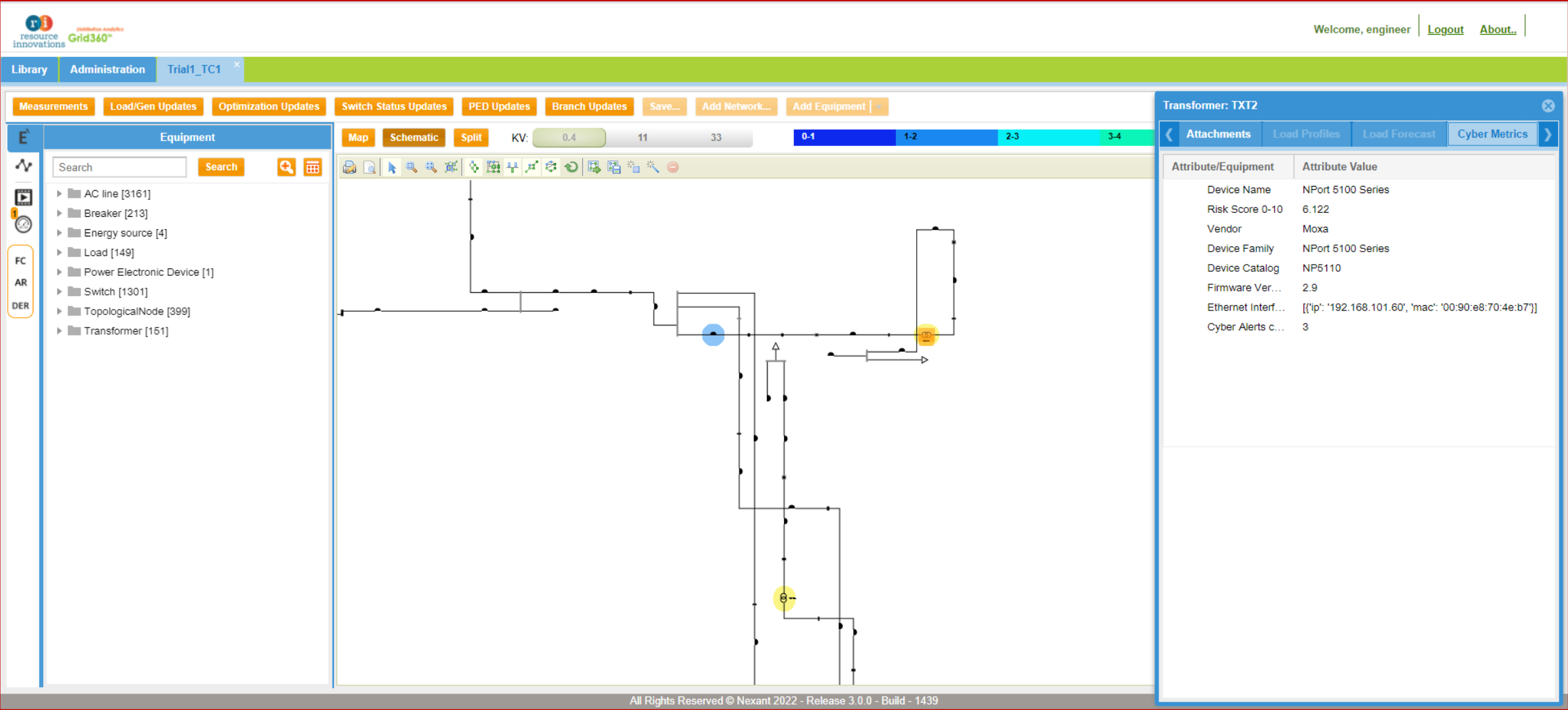
Responses

Response content type */*

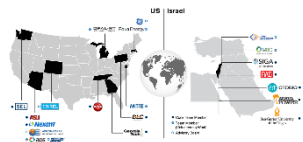
Curl

```
curl -X POST "https://dev01-grid360.nexant-dev.com/networks/device/cybermetrics?networkId=1001&rdfId=_07790_RMUT1_TXT1&riskFactor=3.6&userId=1" -H "accept: */*" -H "Content-Type: application/json" -d "  
<div class="x-panel x-box-item x-panel-default x-tree-panel x-tree-arrows x-grid" style="height: 359px; left: 0px; top: 0px; margin: 0px; width: 482px;" role="treegrid" aria-hidden="\false"  
aria-disabled="\false" aria-readonly="\false" aria-multiselectable="\true" id="piAttributeGrid-1795">  
  <div id="piAttributeGrid-1795-bodyWrap" data-ref="bodyWrap" class="x-panel-bodyWrap" role="presentation"  
role="presentation">  
    <div class="x-grid-header-ct x-docked x-grid-header-ct-default x-docked-top x-grid-header-ct-default-docked-top x-box-layout-ct x-scroller x-unselectable" style="border-width: 1px; overflow: hidden; width: 482px; left: 0px; top: 0px;" role="rowgroup" aria-hidden="\false" aria-disabled="\false" id="headerContainer-1796" data-exttouchaction="14"  
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      <div id="headercontainer-1796-innerCt" data-ref="innerCt" role="row" class="x-box-inner" style="width: 480px; height: 29px;">  
        <div id="headercontainer-1796-targetEl" data-ref="targetEl" class="x-box-target" role="presentation" style="width: 480px;">  
          <div class="x-column-header-x-column-header-align-left x-box-item x-column-header-default x-unselectable x-column-header-first" style="border-width: 1px; left: 0px; margin: 0px; width: 160px; top: 0px;" role="columnheader" aria-hidden="\false" aria-disabled="\false" aria-readonly="\true" id="treecolumn-1798" tabindex="0" data-componentid="treecolumn-1798"  
componentid="treecolumn-1798">  
            <div id="treecolumn-1798-titleEl" data-ref="titleEl" role="presentation" class="x-column-header-inner x-leaf-column-header">  
              <div id="treecolumn-1798-textContainerEl" data-ref="textContainerEl" role="presentation" class="x-column-header-text-container">  
                <div role="presentation" class="x-column-header-text-wrapper">  
                  <div id="treecolumn-1798-textEl" data-ref="textEl" role="presentation" class="x-column-header-text">  
                    <span id="treecolumn-1798-textInnerEl" data-ref="textInnerEl" role="presentation" class="x-column-header-text-inner">Attribute/Equipment</span>  
                  </div>  
                  <span id="treecolumn-1798-dirty-cell-text" class="x-hidden-offsets">Cell value has been edited</span>  
                </div>  
              </div>  
            </div>  
          </div>  
        </div>  
      </div>  
    </div>  
  </div>
```

Commercialization - Cyber Metrics Visualization



Commercialization - Alert Dashboard



resource innovations

Distribution Analytics

Grid360™

Library

Tools

Alerts

Administration

IEEE13_ES100K *

Welcome, sargi | [Logout](#) | [About](#)

Delete Alert

Alert Name	Case	Area	Event Time	Alert Status
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-02-04 15:58:20.0	Warning
No of Violations	EuropeanNetwork	European	2019-02-04 16:01:57.0	Warning
No of Violations	IEEE13_ES100K	Fremont	2019-03-14 12:52:53.0	Warning

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Displaying 1 - 16 of 16

Commercialization - Violation Reports



Grid360™

resource innovations

LibraryToolsAlertsAdministrationIEEE13_ES100K

MeasurementsSaveAdd NetworkAttachmentsAdd Equipment

OverlayImportGenBase VPhase

Results

Unbalanced Power Flow DRIDER

Shopping Center + Solar DG + SUMMER+Sc...

Shopping Center + SUMMER+Scale Load10...

Storage + SUMMER+Scale Load100+15-07-...

Base+summer+ScaleLoad100+15-07-2019 1...

Solar DG + Storage + SUMMER+Scale Load...

Solar DG + SUMMER+Scale Load100+03-07...

Solar DG + SUMMER+Scale Load100+02-07...

Solar DG + SUMMER+Scale Load100+02-07...

Solar DG + SUMMER+Scale Load100+02-07...

Test DR.1 + Solar DG + EVCS + SUMMER+...

Test DR.1 + Solar DG + EVCS + SUMMER+...

Restaurant HVAC + Solar DG + Storage + E...

Storage Farm + SUMMER+Scale Load100+2...

Solar DG + Storage + EVCS + SUMMER+Sc...

Storage + EVCS + SUMMER+Scale Load10...

00:00 Storage(0.00KWH)+EVCS(0KWH)

01:00 Storage(3.50KWH)+EVCS(0KWH)

02:00 Storage(3.50KWH)+EVCS(0KWH)

03:00 Storage(3.50KWH)+EVCS(0KWH)

04:00 Storage(3.50KWH)+EVCS(0KWH)

05:00 Storage(2.60KWH)+EVCS(0KWH)

06:00 Storage(2.00KWH)+EVCS(0KWH)

07:00 Storage(2.00KWH)+EVCS(0KWH)

09:00 Storage(0.00KWH)+EVCS(0KWH)

10:00 Storage(-5.50KWH)+EVCS(0KWH)

11:00 Storage(-5.50KWH)+EVCS(28.4KWH)

12:00 Storage(-5.50KWH)+EVCS(28.4KWH)

13:00 Storage(-3.50KWH)+EVCS(28.4KWH)

14:00 Storage(-0.60KWH)+EVCS(0KWH)

Storage + EVCS + SUMMER+Scale Load10...

Base+summer+ScaleLoad14+31-01-2019 00...

Base+summer+ScaleLoad1+31-01-2019 00...

Base+summer+ScaleLoad100+30-01-2019 2...

Shopping Center + Solar DG + Storage +SU...

All Generators Summary

Branch Current Unbalance Index

Branch Flow

Bus Section Data

Bus Voltage

Convergence

EV

EV Summary

Error Execution

Generator

Load

Load Aggregate

Load Summary

Loss Summary

Parameter

Regulator

Sequence Voltage

Shunt

Shunt Summary

Storage

Storage Summary

Summary for Visualization

System Input

System Summary

Transformer

Violation

Voltage Unbalance Index

Device		From		To		Phase	Value	Rating	Unit	Condition	Violation (%)
Type	Name	Bus Section	Substation	Bus Section	Substation						
TopologicalNo...	Bus3_650	Bus3_650				B	2.1899	2.2817	kV	Under V	4.0248
TopologicalNo...	Bus2_692	Bus2_692				A	2.1528	2.2817	kV	Under V	5.6506
TopologicalNo...	Bus2_692	Bus2_692				B	2.2768	2.2817	kV	Under V	0.2154
TopologicalNo...	Bus2_692	Bus2_692				C	2.1162	2.2817	kV	Under V	7.2533
TopologicalNo...	Bus1_633	Bus1_633				A	2.1608	2.2817	kV	Under V	5.3000
TopologicalNo...	Bus1_633	Bus1_633				B	2.2579	2.2817	kV	Under V	1.0431
TopologicalNo...	Bus1_633	Bus1_633				C	2.2171	2.2817	kV	Under V	2.8324
TopologicalNo...	Bus5_675	Bus5_675				A	2.1374	2.2817	kV	Under V	6.3240
TopologicalNo...	Bus5_675	Bus5_675				C	2.1112	2.2817	kV	Under V	7.4724
TopologicalNo...	Bus9_670	Bus9_670				A	2.1863	2.2817	kV	Under V	4.1804
TopologicalNo...	Bus9_670	Bus9_670				B	2.2552	2.2817	kV	Under V	1.1623
TopologicalNo...	Bus9_670	Bus9_670				C	2.1903	2.2817	kV	Under V	4.0043
TopologicalNo...	Bus8_634	Bus8_634				A	0.2445	0.2633	kV	Under V	7.1441
TopologicalNo...	Bus8_634	Bus8_634				B	0.2556	0.2633	kV	Under V	2.9077
TopologicalNo...	Bus8_634	Bus8_634				C	0.2508	0.2633	kV	Under V	4.7328
TopologicalNo...	Bus10_680	Bus10_680				A	2.1528	2.2817	kV	Under V	5.6506
TopologicalNo...	Bus10_680	Bus10_680				B	2.2768	2.2817	kV	Under V	0.2154
TopologicalNo...	Bus10_680	Bus10_680				C	2.1162	2.2817	kV	Under V	7.2533
TopologicalNo...	Bus12_646	Bus12_646				B	2.2242	2.2817	kV	Under V	2.5189
TopologicalNo...	Bus12_646	Bus12_646				C	2.2256	2.2817	kV	Under V	2.4601
TopologicalNo...	Bus14_684	Bus14_684				A	2.1495	2.2817	kV	Under V	5.7940
TopologicalNo...	Bus14_684	Bus14_684				C	2.1125	2.2817	kV	Under V	7.4168
TopologicalNo...	Bus15_671	Bus15_671				A	2.1528	2.2817	kV	Under V	5.6506
TopologicalNo...	Bus15_671	Bus15_671				B	2.2768	2.2817	kV	Under V	0.2154
TopologicalNo...	Bus15_671	Bus15_671				C	2.1162	2.2817	kV	Under V	7.2533
TopologicalNo...	Bus7_652	Bus7_652				A	2.1396	2.2817	kV	Under V	6.2253
TopologicalNo...	Bus4_611	Bus4_611				C	2.1088	2.2817	kV	Under V	7.5758
TopologicalNo...	Bus13_RG...	Bus13_RG...				B	2.1899	2.2817	kV	Under V	4.0248
TopologicalNo...	Bus11_645	Bus11_645				B	2.2274	2.2817	kV	Under V	2.3785
TopologicalNo...	Bus11_645	Bus11_645				C	2.2293	2.2817	kV	Under V	2.2969
TopologicalNo...	Bus16_632	Bus16_632				A	2.2027	2.2817	kV	Under V	3.4638
TopologicalNo...	Bus16_632	Bus16_632				B	2.2471	2.2817	kV	Under V	1.5141
TopologicalNo...	Bus16_632	Bus16_632				C	2.2320	2.2817	kV	Under V	2.1789
Transformer	Reg1	Bus3_650		Bus13_RG...		A	0.0000	121.00...	V	Under Controlle...	100.0000
Transformer	Reg1	Bus3_650		Bus13_RG...		B	0.0000	121.00...	V	Under Controlle...	100.0000
Transformer	Reg1	Bus3_650		Bus13_RG...		C	0.0000	121.00...	V	Under Controlle...	100.0000

Page 1 of 2

Name:

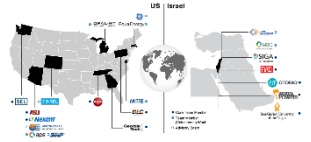
From:

To:

FilterReset

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Commercialization - Industry Advisory Board



Form Industry Advisory Board

Board member organizations from previous collaboration of Nexant with ASU:
ComED, Entergy, Oncor, PSEG, Salt River Project, San Diego Gas & Electric Company,
Southern California Edison, Southern Company, UK Power Networks

Future Industry Advisory Board will include Arava Power, Duquesne Light Company,
and Arizona Public Service plus many other utility companies

Commercialization - Software Deployment



Add developed software as “engines” inside of Grid360

Create commercial grade engines to be embedded in Energy Management Systems (EMS), Distribution Management Systems (DMS), and Supervisory Control and Data Acquisition (SCADA) systems, similar to Nexant’s current work with ABB, GE, Toshiba, and Smarter Grid Solutions