**Constraint Analyzer Project**

**Source code location:**

* **Location of all the files mentioned in this document:**
* **S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Code Files**

**Code files Description -**

**File Number – 1:**

* File Name – ConstraintContingencyUniquePairCreation.py
* Purpose – This file is created to extract unique constraint-contingency pair from historical constraint data (2014-2019)
* Input File Used –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Constraint Data\constraint14.xls, sheet\_name = ‘Sheet0’

(**Must read** - source of this file described in DataSource\_Documentation.doc file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Constraint Data\constraint15.xls, sheet\_name = ‘Sheet0’

(**Must read** - source of this file described in DataSource\_Documentation.doc file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Constraint Data\constraint16.xls, sheet\_name = ‘Sheet0’

(**Must read** - source of this file described in DataSource\_Documentation.doc file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Constraint Data\constraint17.xls, sheet\_name = ‘Sheet0’

(**Must read** - source of this file described in DataSource\_Documentation.doc file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Constraint Data\constraint18.xls, sheet\_name = ‘Sheet0’

(**Must read** - source of this file described in DataSource\_Documentation.doc file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Constraint Data\constraint19.xls, sheet\_name = ‘Sheet0’

(**Must read** - source of this file described in DataSource\_Documentation.doc file)

* Output File Generated –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019.xlsx (**Must read:** further changes are done in this file which are done manually and are described in DataSource\_Documentation.doc file)

**File Number – 2:**

* File name – ConstraintContingencyMapping.py
* Purpose – this file is created to format the constraint-contingency file such that ‘code’ column values are changed by removing all the special characters and similarly special characters are removed from auction mapping file’s ‘op\_eqode’ column as well to make the mapping easier i.e. the constraints can be mapped with their respective From Bus Number and To Bus Number.
* Input Files Used –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019.xlsx, sheet\_name= ‘Constraint-Contingency’ (**Must read:** pre-processing is required before giving it as input and the details of the same are given in DataSource\_Documentation.doc file)
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019.xlsx, sheet\_name= ‘AuctionMapping2019SEP’

* Output File Generated –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019Changed.xlsx (**Must read:** further processing is done on this file which is described in the DataSource\_Documentation.doc file)

**File Number – 3:**

* File Name – ConstraintContingencySeparation.py
* Purpose – This file is created to separate the mapped constraints, mapped contingency, unmapped constraints, unmapped contingency and create a list of both mapped constraints and contingencies.
* Input File Used –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019Changed.xlsx, sheet\_name=’Constraint-Contingency’ (**Must read** -processing is required on this excel file before using it as input and the same is described in DataSource\_Documentation.doc file)

* Output File Generated –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019Separation.xlsx (**Must read:** further processing on this file which is done manually is described in DataSource\_Documentation.doc file)

**File Number – 4:**

* File name – UnmappedConstraintsApproximateStringMatching.py
* Purpose – this file is created to compare the columns of the unmapped constraints sheet which is obtained as an output by the above-mentioned code file with the mapping document of September 2019 using approximate string matching to check if constraints can be mapped.
* Input Files Used –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019Separation.xlsx, sheet\_name=’unmappedConstraints’ (**Must read:** some changes are made to this sheet and the details given in DataSource\_Documentation.doc file)
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Mapping Documents\2019.SEP.Monthly.Auction.MappingDocument.xlsx

* Output File Generated –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\UnmappedConstraintsApproximateStringMatching.xlsx (**Must read:** changes are made to this sheet manually and the details given in DataSource\_Documentation.doc file)

**File Number – 5:**

* File name – ConstraintContingencyFinal.py
* Purpose – this file is created to generate a final separated list of the mapped constraints, mapped contingency, unmapped constraints, unmapped contingency and also create a list of both mapped constraints and contingencies.
* Input Files Used –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019Separation.xlsx, sheet\_name = ‘mappedConstraints’
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019Separation.xlsx, sheet\_name =’mappedBoth’
3. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019Separation.xlsx, sheet\_name = ‘mappedContingency’
4. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\uniquePairList2014-2019Separation.xlsx, sheet\_name = ‘unmappedContingency’
5. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\UnmappedConstraintsApproximateStringMatching.xlsx, sheet\_name = ‘All’

* Output File Generated –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueConstraintContingencyPair\Constraint-ContingencyFinal.xlsx

**File number 1,2,3,4 and 5 should be executed in order to obtain results as output of one file is used as input of next file.**

**File Number – 6:**

* File name – TransmissionOutagesMapping.py
* Purpose – this file is created to format the transmission outages file (input file) such that ‘to’ column values are changed by removing all special characters and similarly, special characters are removed from auction mapping file’s (another sheet of input file) ‘op\_eqcode’ column as well to make the mapping easier i.e. the transmission lines can then be mapped with their respective From Bus Number and To Bus Number.
* Input File –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages\ERCOT\_TransmissionOutage\_2014-01-01\_to\_2014-12-31.xlsx (**Must Read:** Preprocessing is required before giving it as input – how preprocessing is done is explained in DataSource\_Documnetation.docx file)
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages\ERCOT\_TransmissionOutage\_2015-01-01\_to\_2015-12-31.xlsx (**Must Read:** Preprocessing is required before giving it as input – how preprocessing is done is explained in DataSource\_Documnetation.docx file)
3. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages\ERCOT\_TransmissionOutage\_2016-01-01\_to\_2016-12-31.xlsx (**Must Read:** Preprocessing is required before giving it as input – how preprocessing is done is explained in DataSource\_Documnetation.docx file)
4. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages\ERCOT\_TransmissionOutage\_2017-01-01\_to\_2017-12-31.xlsx (**Must Read:** Preprocessing is required before giving it as input – how preprocessing is done is explained in DataSource\_Documnetation.docx file)
5. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages\ERCOT\_TransmissionOutage\_2018-01-01\_to\_2018-12-31.xlsx (**Must Read:** Preprocessing is required before giving it as input – how preprocessing is done is explained in DataSource\_Documnetation.docx file)
6. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages\ERCOT\_TransmissionOutage\_2019-01-01\_to\_2019-07-24.xlsx (**Must Read:** Preprocessing is required before giving it as input – how preprocessing is done is explained in DataSource\_Documnetation.docx file)
7. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Mapping Documents\2019.SEP.Monthly.Auction.MappingDocument.xlsx, sheet\_name=’Lines’
8. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Mapping Documents\2019.SEP.Monthly.Auction.MappingDocument.xlsx, sheet\_name= ‘Autos’

* Output File –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2014.xlsx

(**Must read:** further processing must be performed on this file which is explained in DataSource\_Documnetation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2015.xlsx

(**Must read:** further processing must be performed on this file which is explained in DataSource\_Documnetation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2016.xlsx

(**Must read:** further processing must be performed on this file which is explained in DataSource\_Documnetation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2017.xlsx

(**Must read:** further processing must be performed on this file which is explained in DataSource\_Documnetation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2018.xlsx

(**Must read:** further processing must be performed on this file which is explained in DataSource\_Documnetation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2019.xlsx

(**Must read:** further processing must be performed on this file which is explained in DataSource\_Documnetation.docx file)

**File number – 7:**

* File name: UniqueTransmissionOutagesConcat.py
* Purpose: file is developed to create a super-list of transmission outages i.e. combine unique transmission outages of all years into one file which are mapped (data is only of line and transformer facilities)
* Input Files:

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Data\UniqueTransmissionOutagesMapped2014.xlsx

(**Must read:** final file with further processing done on it which is explained in DataSource\_Documentation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Data\UniqueTransmissionOutagesMapped2015.xlsx

(**Must read:** final file with further processing done on it which is explained in DataSource\_Documentation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Data\UniqueTransmissionOutagesMapped2016.xlsx

(**Must read:** final file with further processing done on it which is explained in DataSource\_Documentation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Data\UniqueTransmissionOutagesMapped2017.xlsx

(**Must read:** final file with further processing done on it which is explained in DataSource\_Documentation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Data\UniqueTransmissionOutagesMapped2018.xlsx

(**Must read:** final file with further processing done on it which is explained in DataSource\_Documentation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Data\UniqueTransmissionOutagesMapped2019.xlsx

(**Must read:** final file with further processing done on it which is explained in DataSource\_Documentation.docx file)

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Mapping Documents\2019.SEP.Monthly.Auction.MappingDocument.xlsx, sheet\_name=’Lines’
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Mapping Documents\2019.SEP.Monthly.Auction.MappingDocument.xlsx, sheet\_name= ‘Autos’

* Output file –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2014-2019.xlsx

**File number 8 –**

* File name: MapppedOutagesVerification.py
* Purpose: this file is created to verify the mapping which was carried out using vlookup in the excel sheet. Verification is done using approximate string matching.
* Input Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages Verification\MappedOutagesVerification.xlsx

* Output Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages Verification\MappedOutagesVerificationResult.xlsx

**File number 9 –**

* File name: MapppedOutagesVerificationHistogram.py
* Purpose: this file is created to plot the results of verification of mapped transmission outages in the form of a histogram to get a better visualization.
* Input Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages Verification\MappedOutagesVerificationResult.xlsx

* Output Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages Verification\from\_matching.png
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\Transmission Outages Verification\to\_matching.png

**File number 10 –**

* File name: ApproximateMatchingUnmappedTransmissionOutages.py
* Purpose: this file is created to perform approximate string matching of the unmapped transmission outages with the ‘operations\_name’ and ‘op\_eqcode’ columns of autos and lines sheets respectively of the auction mapping excel file.
* Input Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2014-2019.xlsx, sheet\_name= ‘Unmapped’ (**Must read:** pre-processing needed before giving as input which is explained in DataSource\_Documentation.docx file)
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2014-2019.xlsx, sheet\_name= ‘AuctionMapping2019SEP\_LINES’
3. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2014-2019.xlsx, sheet\_name= ‘AuctionMapping209SEP\_AUTOS’

* Output Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UnmappedTransmissionOutagesAprroximateStringMatch.xlsx

**File number 11 –**

* File name: SeparationOfUnmappedTransmissionOutages.py
* Purpose: this file is created to separate the mapped and unmapped outages from the unmapped transmission outages file. Also, verify the mapped outages by approximately matching the ‘fromstation’ and ‘tostation’ with the ‘from\_bus\_name’ and ‘to\_bus\_name’ of the mapping document.
* Input Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UnmappedTransmissionOutagesAprroximateStringMatch.xlsx, sheet\_name=’ unmappedAll
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2014-2019.xlsx, sheet\_name= ‘AuctionMapping2019SEP\_LINES’
3. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2014-2019.xlsx, sheet\_name= ‘AuctionMapping209SEP\_AUTOS’

* Output Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UnmappedTransmissionOutagesAprroximateSeparation.xlsx

**File number 12 –**

* File name: TransmissionOutagesFinal.py
* Purpose: this file is created to generate a final list of mapped outages and unmapped outages.
* Input Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UniqueTransmissionOutagesMapped2014-2019.xlsx, sheet\_name=’mapped’
2. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UnmappedTransmissionOutagesAprroximateSeparation.xlsx, sheet\_name= ‘mapped’
3. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\UnmappedTransmissionOutagesAprroximateSeparation.xlsx, sheet\_name= ‘unmapped’

* Output Files –

1. S:\asset ops\GO\_Group\Interns\2019\Anubha\Constraint Project\Constraint-Project\Data\TransmissionOutagesFinal.xlsx