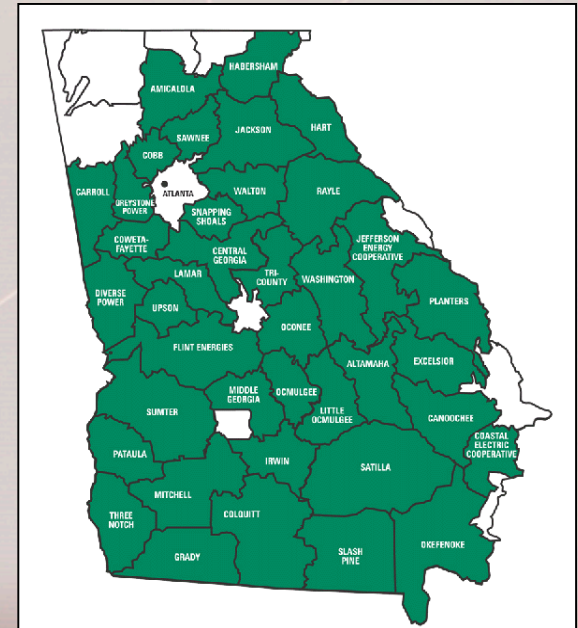# About Georgia Transmission Corporation (GTC)

- Transmission-only, not-for-profit cooperative
- Formed in March 1997 from the restructuring of Oglethorpe Power Corporation (OPC)

  – GTC provides network transmission services to 38 Member EMCs in Georgia

  – GTC provides point-to-point service to other customers

GTC involvement with the EPRI OpenXDA and PQ Dashboard software

- A presentation at the 2014 Georgia Tech Fault Analysis Conference by Grid Protection Alliance (GPA) on Open Source Software started GTC's interest in the OpenXDA and PQ Dashboard. This led to GTC issuing a contract with GPA in late 2014 and a task release for work in early 2015. This was the initial development and application of the OpenXDA and PQ Dashboard at GTC.

- Dominion Virginia Power – Developed 5 methods of single ended fault distance calculations and double ended fault distance calculations for OpenXDA. GTC liked their approach and GPA included this in the PQ Dashboard in 2015.
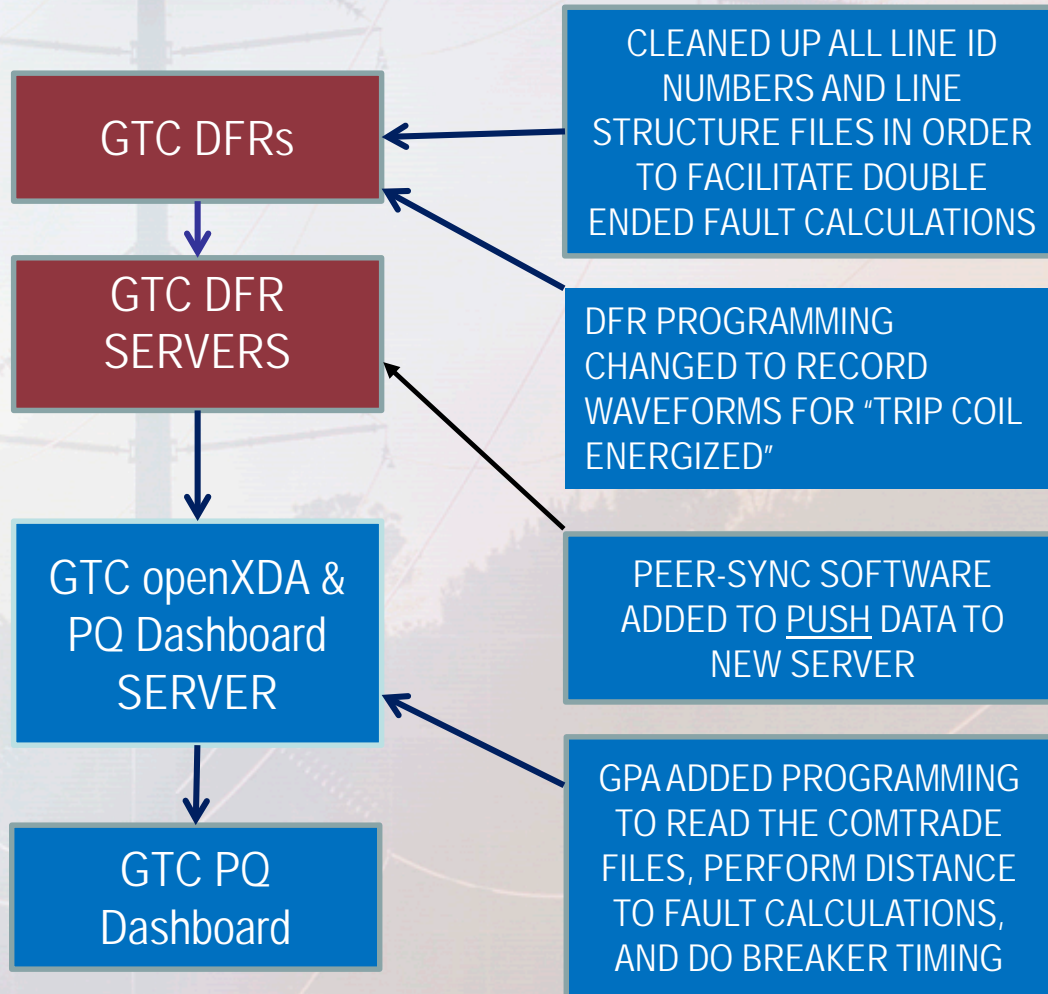
GTC 2015 Goals for the PQ Dashboard Project

1. Use the PQ Dashboard, with records from the Digital Fault Recorders (DFR), to look at trip events (Faults) and non-trip events (Voltage and Current Sags and Swells) that were recorded.
2. Using DFR data to perform automatic single and double ended fault location calculations and send out email.
3. Using the DFR data to monitor breaker trip times for all operating breakers.

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In 2015 GTC applied the PQ Dashboard

1. Worked with USI and APP to modify the line files. Added the breaker number in order to link to MAXIMO.

2. Cleaned up line file numbers in the DFRs to match the STOMP data base. Lots of files were brought up to date.

3. Added non-line breakers added to the DFR line files for breaker timing.

4. Large data clean up effort with the MAXIMO data. Added breaker operate time to database.

5. Created a database with thermal line rating for each line.

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GTC's Additions in 2015

GTC DFRs → **GTC DFR SERVERS** → **GTC openXDA & PQ Dashboard SERVER** → **GTC PQ Dashboard**

CLEANED UP ALL LINE ID NUMBERS AND LINE STRUCTURE FILES IN ORDER TO FACILITATE DOUBLE ENDED FAULT CALCULATIONS

DFR PROGRAMMING CHANGED TO RECORD WAVEFORMS FOR "TRIP COIL ENERGIZED"

PEER-SYNC SOFTWARE ADDED TO PUSH DATA TO NEW SERVER

GPA ADDED PROGRAMMING TO READ THE COMTRADE FILES, PERFORM DISTANCE TO FAULT CALCULATIONS, AND DO BREAKER TIMING

Georgia**Transmission**

- In 2015 line ID's were audited and corrected to match the ITS numbering and the DFR manufactures were requested to add fields for breaker numbers.

APP   Modified:09/09/2015-06:40:08

Recorder ID: R08:North Commerce 115_46_25kV

Line Name : NORTH COMMERCE - GCB 662 - HOMER 46KV LINE   Add Delete Edit

Line ID: 2131   Breaker 1 ID: 210662   Breaker 2 ID:

APP DFR LINE ID

Edit Line-Group Record (File: D:\USIMaster\\R131Lines.inf)

Georgia Transmission

Remote ID: R131 (W.MARIETTA 230KV (Combo))

Line Name : WEST MARIETTA - VILLA RICA 230KV LINE

Add Line   Delete Line   Edit Line Name

Line ID	Breaker 1	Breaker 2
00000814	174218	

USI DFR LINE ID

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2016 PQ Dashboard / OpenXDA Improvements

A. Modify the current PQ Dashboard to use the logic equations used in the DFR/SER to determine the specific faulted Transmission line. This logic includes the use of breaker status point, relay outputs and current or voltage triggers as defined in the DFR/SER logic equation.

B. Improvements were made to the Breaker Timing logic. Logic was created to handle ring bus and breaker and a half substation configurations. Additional logic was created to cover breakers which did not have currents being monitored by the DFR. For those cases a breaker status point change was used for timing.

Breaker Timing Logic Diagram

Breaker Timing Logic
P.Q. Dashboard
Sept 16, 2016
Marlin Browning
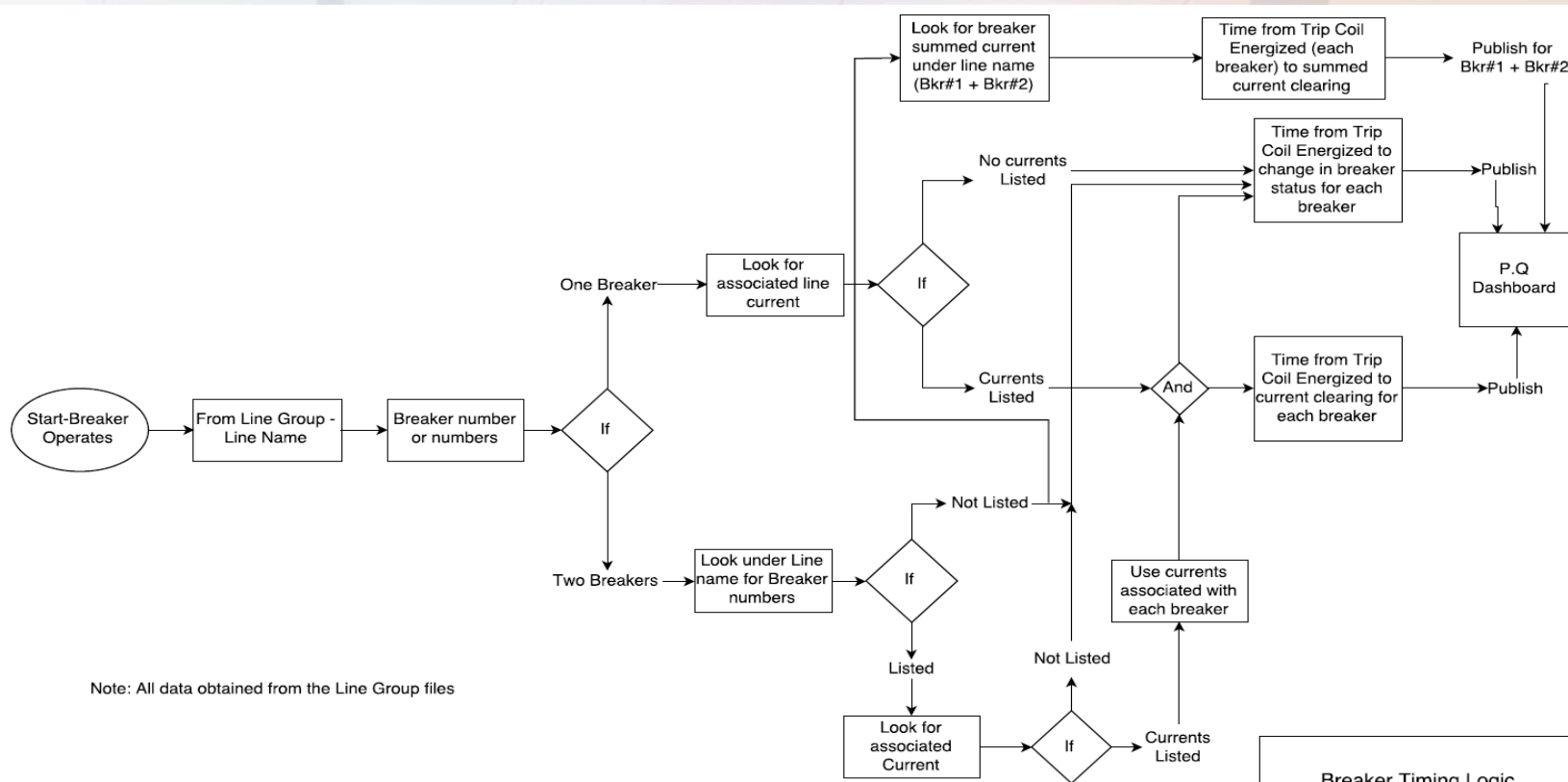
Note: All data obtained from the Line Group files

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2017 PQ Dashboard / OpenXDA Improvements

A. Developed a method to prevent failed breaker timing calculations due to the DC offset of the current. Highlighted in the PQ Dashboard cases of waveforms having DC offset.

B. Developed an indication for breaker status chatter within the breaker information in the PQ Dashboard and its timing report. Highlighted in the PQ Dashboard.

C. Created an interface from the GTC Outage system to the OpenXDA database which imports cause codes for each outage to be displayed as part of the PQ Dashboard.

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2018 PQ Dashboard / OpenXDA Improvements

A. Add the ability to add notes to Breakers and Disturbances in the PQ Dashboard.

B. Add the ability to take a Fault or Sag that has been identified at a given DFR location with day and time, and search for all triggered Events (Sag) that are associated. The Events not only show up on lines out of the station having the faulted line, but on other DFRs. DFRs in the surrounding area also trigger and record. Depending on the magnitude of the fault it is possible to see the Sag several busses away on many DFRs.

C. Add the ability to search (All Sites) for a specific day and time range (adjustable **+/-** minutes) to identify all Faults and Events that are related across multiple DFR sites.

D. Add the ability to add the same note to all Faults and Sags that either of the search methods above produce.

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Lightning over Georgia

PQ Dashboard User Group Meeting – GTC Reports Generated

- Fault Interrupt Rating Report

Transmission Line	Date	Fault Breaker	# Times Breaker Operated	Fault Phase	Fault Current (A)	Manufacturer CB Interrupt Rating (A)	% of Fault Interrupt Rating	Timing of breaker (# of cycles)	Manufacturer CB Interrupt Time (# of cycles)	Timing Operation of Breaker
Post Road - Fairplay 115kV	3/19/2018	919828	5	AN	12,562	40,000	31.41%	2.46	3	Normal
East Social Circle - Simon Solar 115kV	3/20/2018	142340	1	AN	21,874	40,000	54.69%	2.45	3	Normal
Post Road - Fairplay 115kV	3/20/2018	919828	3	None	7,555	40,000	18.89%	0	3	Indeterminate
Jefferson Rd - Winder 115kV Line	3/25/2018	920518	1	CN	3,144	40,000	7.86%	1.84	3	Normal
Big Shanty - South Acworth 230kV	4/4/2018	204228	1	AN	13,362	40,000	33.41%	1.75	3	Normal

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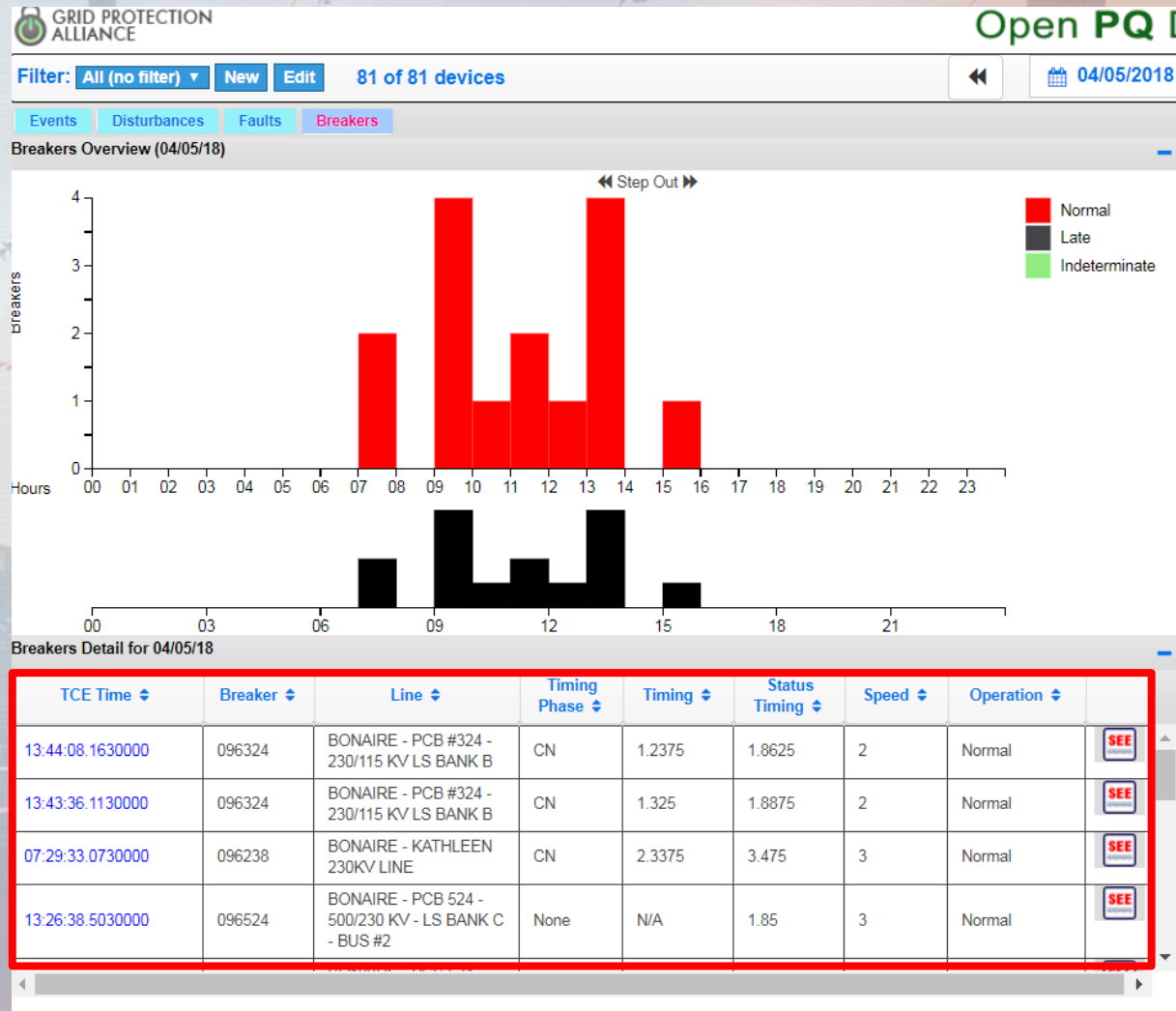
PQ Dashboard User Group Meeting – GTC Reports Generated

- Data from all breaker operations, containing the information shown in the header below, plus the voltage and current RMS values.
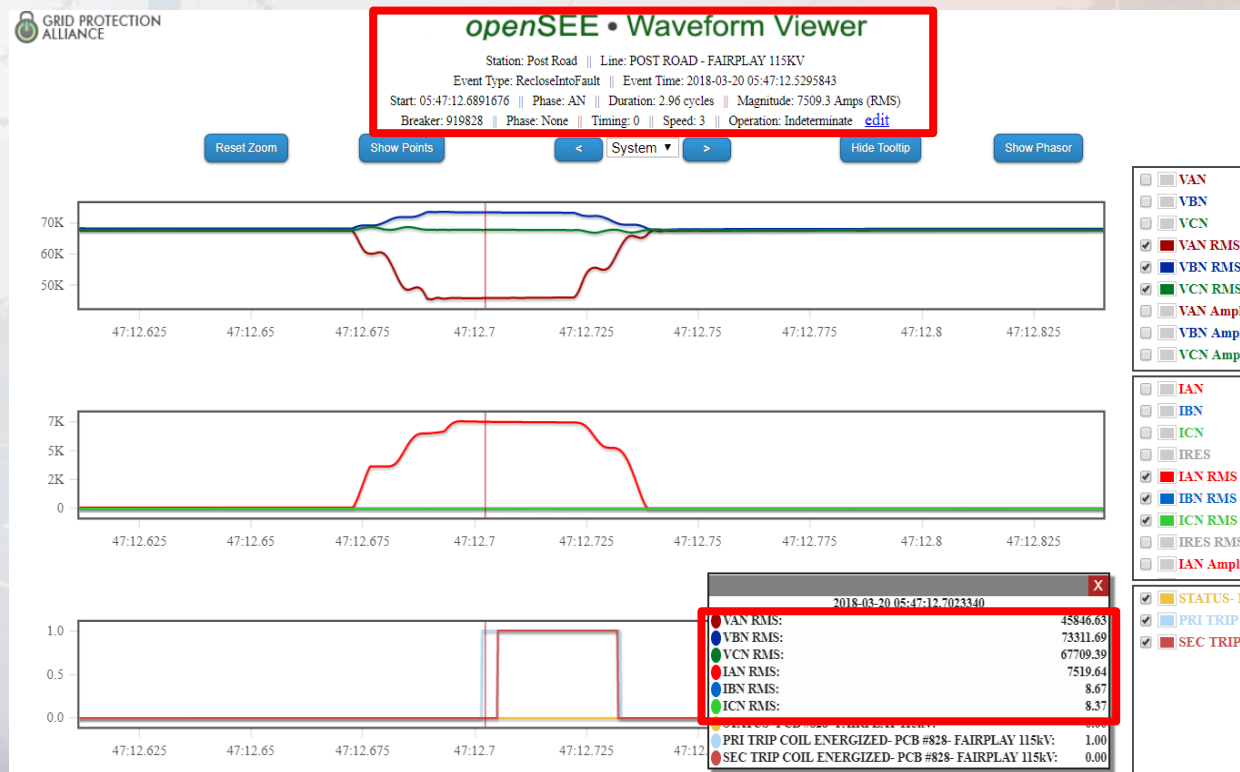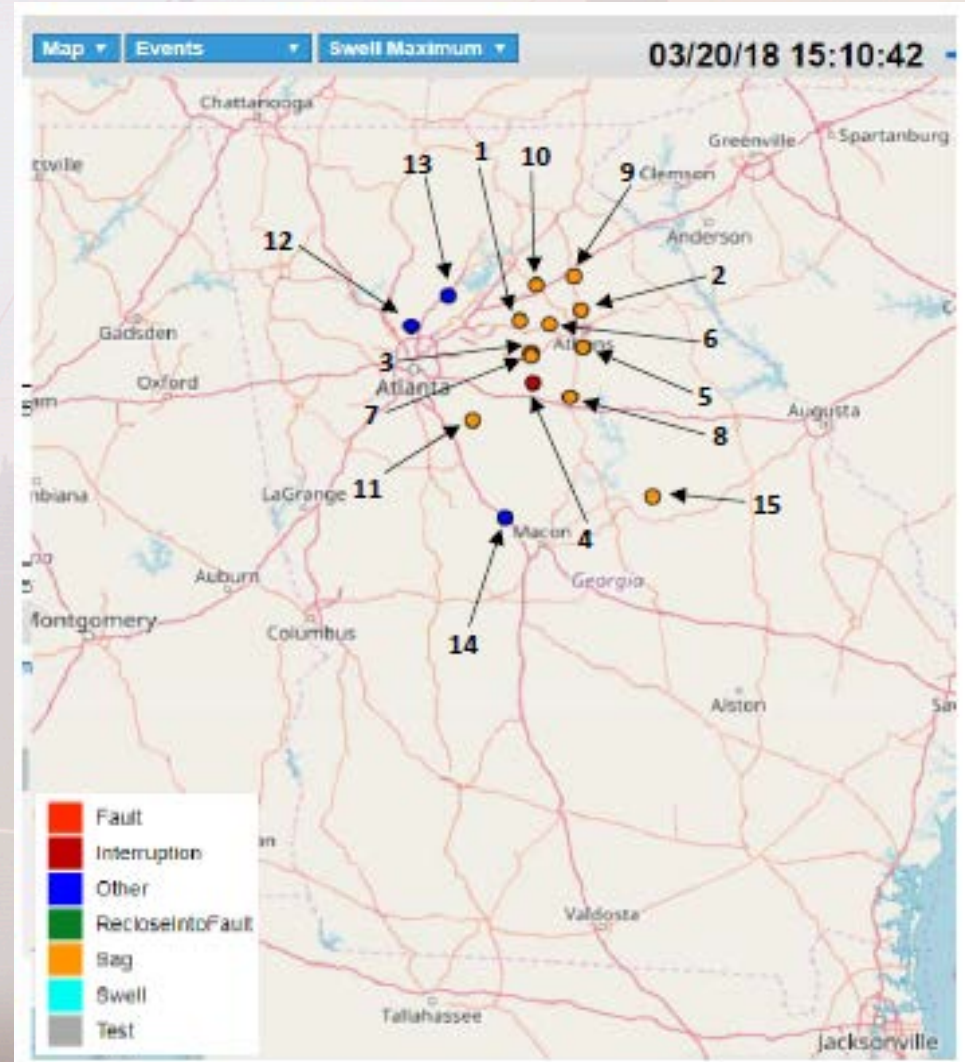
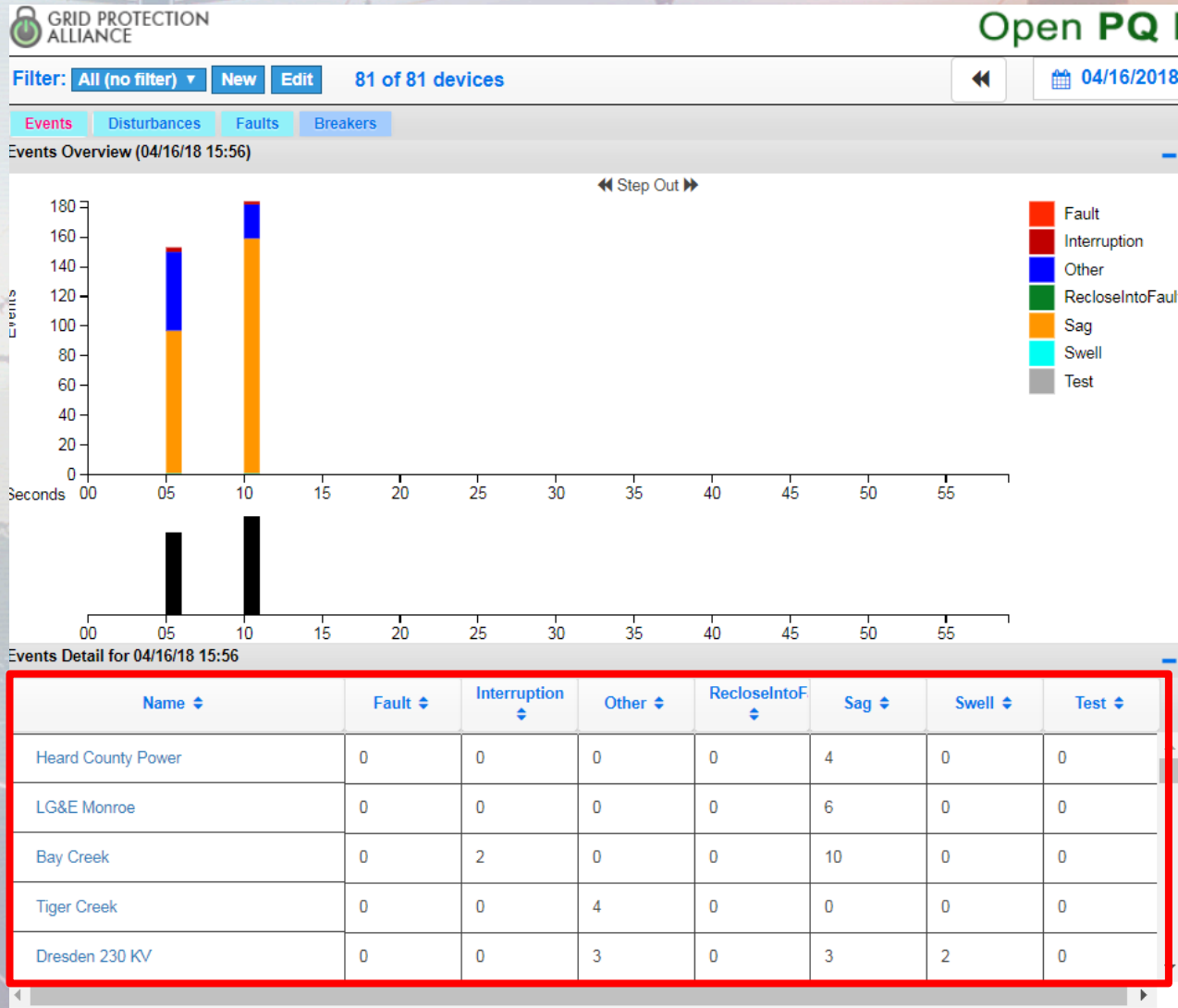# PQ Dashboard User Group Meeting – GTC Reports Generated

- Fault Impact Study

	Voltage (kV)	Fault	Other	Sag	Voltage Sag to % of nominal
1	230			1	81.8%
2	230			6	82.5%
	115			5	81.3%
3	230			2	73.0%
	115			2	46.8%
4	230			5	63.9%
	115	1		4	14.5%
5	230			3	75.2%
	115			3	77.7%
6	115			3	78.1%
7	230			3	72.5%
8	115			2	24.1%
	46			2	25.7%
9	46			2	81.5%
10	46			3	88.0%
11	230			1	86.8%
	115			3	84.9%
12	230		2		92.4%
	115		2		92.2%
13	230		1		91.4%
	115		2		90.9%
14	115		2		93.0%
15	230			4	88.6%

0-25%	
26-50%	
51-75%	
76-90%	
91-100%	

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PQ Dashboard User Group Meeting – GTC Reports Generated

PQ Dashboard User Group Meeting – GTC Reports Generated

- Future Report Requests
  - Breaker trip time report
  - Breaker operations – maintenance report
  - Calculation of i^2t
  - Data from DFRs on breaker restrikes
  - Trending for breaker timing, written timing report suitable for NERC compliance records
  - Fault magnitude/duration for distribution transformers (once SEL data is available)

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Questions?

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