Final Report
Southern Company Services, Inc.
600 North 18th St
Birmingham, AL 35291
Award # DE-FC26-07NT43183

Integrated Distribution Management System for Alabama
Principal Investigator – Joe E. Schatz

June 29, 2013

For Period October 01, 2007 to April 30, 2013

Executive Summary

Southern Company Services, under contract with the Department of Energy, along with Alabama Power, Alstom Grid (formerly AREVA T&D) and others moved the work product developed in the first phase of the Integrated Distribution Management System (IDMS) from "Proof of Concept" to true deployment through the activity described in this Final Report. This Project – Integrated Distribution Management Systems in Alabama – advanced earlier developed proof of concept activities into actual implementation and furthermore completed additional requirements to fully realize the benefits of an IDMS. These tasks include development and implementation of a Distribution System based Model that enables data access and enterprise application integration.

This phase of the IDMS project consists of further development of Advanced Applications for IDMS, deployment of previously developed prototype Advanced Applications for IDMS and the implementation of a Distribution Operator Training Simulator which incorporates the functionality (and future functionality) of the IDMS. All of these activities were required to realize the ultimate goal of a full implementation of IDMS encompassing all of the possible advanced application algorithms which demonstrate the true benefits of the distribution system of the future.

This project was a collaborative effort, working with Alstom, Alabama Power Company, other vendors, industry experts, the Electric Power Research Institute (EPRI) and other interested utility participants to speed the industry adoption of this tool. To give one component example of the magnitude of impact possible from this project, the Distribution Operator Training Simulator (DOTS) has been identified as a strong industry need for those participating in Smart Grid development and implementation. This DOTS activity alone meets a great industry-wide need, while the completion of the IDMS Concept displays a true "Grid of the Future".

The IDMS project has been delivered and the basic functionality deployed across the full state of Alabama in its five regional Distribution Operation Centers (DOC). The initial deployment took place on December 5, 2012. Plans are in process for expanding the deployment to other operating companies across Southern Company in upcoming years.

Overview

Southern Company Services, under contract with the Department of Energy, along with Alabama Power, Alstom Grid (formerly AREVA T&D) and others moved the work product developed in the first phase of the Integrated Distribution Management System (IDMS) from "Proof of Concept" to true deployment through the activity described in this Final Report. The original work was a competitively awarded project (DE-FC02-05CH11351) for developing and demonstrating many proofs of concept and prototype demos of an integrated and common user interface with the functions and activities associated with operating a modern distribution system. These applications include items such as Electronic Map Board and Switching Management, Outage Management, Advanced Applications including power flow calculations, contingency analysis, and Volt-VAR Control providing Feeder Loss Minimization and Demand Reduction. The Proof of Concept also incorporates the user interface associated with the Supervisory Control and Data Acquisition (SCADA) system.

The initial phase demonstrated the potential of deployment of some of these critical functions to indicate the feasibility and magnitude of benefit achievable from a fully integrated distribution management and operation system. This Project – Integrated Distribution Management Systems in Alabama – advanced these proof activities to actual implementation and furthermore defines additional systems - outside of that original project scope – which had to be completed to fully realize the benefits of an IDMS. These tasks include development and implementation of a Distribution System based Model that enables data access and enterprise application integration.

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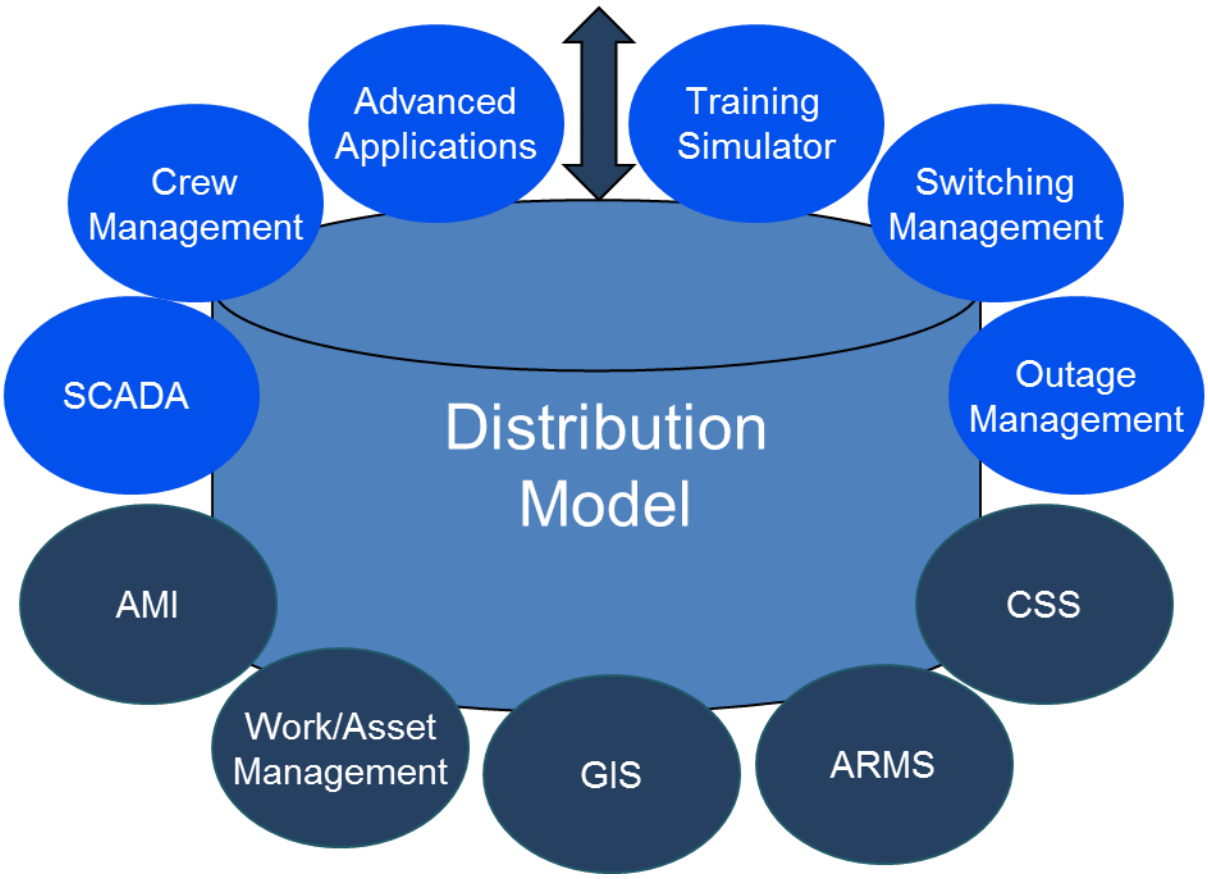
This project was a collaborative effort, working with Alstom, Alabama Power Company, other vendors, industry experts, the Electric Power Research Institute (EPRI) and other interested utility participants to speed the industry adoption of this tool. To give one component example of the magnitude of impact possible from this project, the Distribution Operator Training Simulator (DOTS) has been identified as a strong industry need for those participating in Smart Grid development and implementation. There are presently Operator Training Simulators for the Transmission industry, but not one for the distribution system and certainly not one that takes into account the many advanced applications and operating philosophy associated with an IDMS. This DOTS activity alone meets a great industry-wide need, while the completion of the IDMS Concept displays a true "Grid of the Future".

As shown in the following figure, the whole concept of the Integrated Distribution Management system functions around, and completely relies on, a Connected Distribution Model. The accuracy and definition of this GIS Based Connected model is imperative to the proper operation and management of the Distribution system and the safety of the field personnel.



Following is a list of the originally Planned Activities and Milestones associated with the overall IDMS project.

Documentation and Specifications

Prepare a development plan and specification documents for the Advanced IDMS Applications. The development plan and specifications will be developed jointly with subcontractors. The plan and specifications will be a dynamic document as the applications are developed and put into place for the Advanced Applications and DOTS. This should be completed in approximately 2 months from initiation.

Development of Specified Advanced Applications

Work will begin on the first phase of the Advanced IDMS Applications and will take approximately 6 months to complete. These applications will be deployed and in phases just as they are developed.

Applications will be developed around the specifications outlined for the IDMS project. Some of these applications will consist of user interface integration, work force display,

circuit configuration information, and protection verification upon reconfiguration. These applications will be demonstrated at the prototype level first if this level of demo has not been completed in the prior development.

Develop Initial Specifications of DOTS for the basic IDMS

Initial specifications will be developed for the Distribution Operator Training Simulator using the basic functionality of the Integrated Distribution Management System. This will include documentation necessary to go through the training procedure for a new operator. This activity should take approximately 4 months to complete

Programming and Development of DOTS and IDMS w/ Initial Applications

The specification and development activities will continue in the second budget period of this project. Further specifications will be developed for IDMS Advanced Applications and DOTS incorporating the Advanced Applications. This activity should take approximately 8 months to complete.

Deploy First Phase Prototype Advanced Applications

The prototype Advanced Applications for the first phase will be deployed and demonstrated on the IDMS platform. This will be completed on the hardware associated with IDMS and will be in place for the remaining duration of the project. This activity should take approximately 1 month to complete.

Prepare Specifications of Second Phase of Advanced Applications for IDMS

Specifications will be developed for the Phase 2 Advanced Applications for IDMS. These specifications will be developed jointly with subcontractors. The specifications will be an additional portion of the dynamic specification document as the applications are developed and put into place for the Advanced Applications and DOTS. This activity should take approximately 2 months to complete

Second Phase of Development of Advanced Applications

Additional Advanced Applications will be developed around the specifications outlined for the IDMS project. Some of these applications will consist of user interface integration, work force display, circuit configuration information, and protection verification upon reconfiguration. These applications will be demonstrated at the prototype level first if this level of demo has not been completed in the prior development. This activity should take approximately 7 months to complete.

Deploy Prototypes of Second Phase Advanced Applications

The prototype Advanced Applications for the first phase will be deployed and demonstrated on the IDMS platform. This will be completed on the hardware associated with IDMS and will be in place for the remaining duration of the project. This activity should take approximately 1 month to complete

Refine and Release Specifications of DOTS for IDMS Advanced Applications

Further specifications will be developed for the Distribution Operator Training Simulator using the Advanced Applications of the Integrated Distribution Management System.

This will include documentation necessary to go through the training procedure for a new operator.

Programming and Development of DOTS and IDMS w/ Advance Applications

The specification and development activities will continue in the third budget period of this project. Further specifications will be developed for IDMS Advanced Applications and DOTS incorporating the Advanced Applications. This activity should take approximately 6 months to complete.

IDMS Specification Workshops - Documentation and Specifications

Prepare a development plan and specification documents for the Advanced IDMS Applications. The development plan and specifications will be developed jointly with AREVA through the utilization of 6-10 workshops that are targeted to specific areas of functionality. The workshops will decompose high level work items to more detailed requirements and functional specifications to drive a targeted priority and functionality driven development schedule. This should be completed in approximately 2 months from initiation.

Delivery of and testing of Interim Release candidate 1

At the end of the Southern Company and Alstom workshops project, deliverables will consist of four (4) Interim Release Candidates and a Production Ready Candidate Release. The Interim Release Candidates are cooperatively agreed to releases of specific IDMS functionality suitable for testing. Alstom initiated Interim Release Candidate1 development in in the very early stages of this project. Additional Interim Release Candidates will be mentioned in the following paragraphs, but no additional descriptions will be given since they are all similar to this one.

Delivery of and testing of Interim Release candidate 2

The Interim Release Candidates are cooperatively agreed to releases of specific IDMS functionality suitable for testing. Receipt, testing and acceptance of Interim Release Candidate 2 were successful.

Develop Initial Specifications of DROP and Concept development

Phase 1 (a) Initial specifications were developed for the Distribution Resource Optimization Program (DROP) Phase 1, extending the basic functionality of the Integrated Distribution Management System. This phase will enhance the VVC solution engine to make use of customer voltage measurements. The following enhancements to VVC during this task item were proposed:

- Input of customer voltage measurements into the VVC solution (to simulate when brownout meter events occur.)
- Use of customer voltage measurements in the VVC solution for limit adjustment. These measurements will provide an “operating envelope” for VVC to work within. This should also include a safety margin to avoid excursion into the “brownout” zone.

- Estimating the transformer and regulator tap positions based upon available voltage measurements.

DROP as defined at APCo and SCS is similar to the industry activity being called Conservation Voltage Reduction, but does have some specific nuances.

Delivery, testing, and acceptance of Interim Release Candidates 3

The Interim Release Candidates are cooperatively agreed to releases of specific IDMS functionality suitable for testing. Receipt, testing and acceptance of Interim Release Candidate 3 were delayed slightly, but successful.

Delivery, testing, and acceptance of Interim Release candidate 4

The Interim Release Candidates are cooperatively agreed to releases of specific IDMS functionality suitable for testing.

Voltage Sag and Brown-Out Detection and Reporting through Integration of AMI Data

The Advanced Metering Infrastructure that is being implemented across Southern Company as a part of the going initiatives within the company promote and enhance the Smart Grid. The AMI system has capabilities to collect power quality events such as voltage sags and brown out conditions, but there is no infrastructure or architecture in place where that data is available for real time reporting and actionable responses. The additional scope that is being put into place will integrate the AMI data structure into the overall IDMS application and will give the Distribution Operators information that can be used to direct crews to problem areas and help in identification of issues – even before line crew personnel arrive for trouble shooting procedures.

Delivery, testing, and acceptance of the Production Release Candidate

The Production Release Candidate is the final Release Candidate of the overall IDMS Product before Factory Acceptance Testing.

Factory Acceptance Testing (FAT)

IDMS Factory Acceptance Testing consists of completing Factory Acceptance Test procedures, staging of FAT hardware, and integrated testing of complete IDMS functionality.

Site Acceptance Testing (SAT)

IDMS Site Acceptance Testing consists of building the IDMS onsite at Alabama incorporating all fixes found during FAT. SAT prove IDMS concept in customer environment.

Continued Development of DROP (Phase 1b) and Validation of Functional Concept

The objective of the phase 1b work was to evaluate the quality, effectiveness and performance of the VVC solution for DROP purposes, i.e. demand minimization while maintaining customer voltages within range. In this regard, the prototype can be used to evaluate different scenarios to determine the effectiveness of the VVC algorithm for DROP purposes.

Phase 2 Development of DROP

Phase 2 – AMI Integration, Automation and Triggering: The focus of the second phase will be building the infrastructure for VVC integration with the real-time closed-loop operations. The directions for Phase 2 were based upon the findings of Phase 1. Where the accuracy of the data models or accessibility of the AMI data does not allow a pure VVC algorithmic solution to be practical, a heuristic approach or hybrid-heuristic approach for VVC Drop will be implemented.

Development of Training Documentation & Training Schedule for IDMS

This task prepares training documentation, course work, and deployment training for the IDMS end user. It incorporates the Distribution Operator Training Simulator to provide a "realistic" training environment in an instructor led interactive training workshop.

Preparation of DOTS Training Classes and Training

The material, specification and development activities continued in the third budget period of this project. Preparation of the training material was completed and training conducted.

Implementation and Deployment of IDMS in a production environment

This task consists of defining and implementing a deployment strategy for IDMS at Alabama Power Company. The product will be installed and phased into operations across the Alabama Power Company operating territory beginning in Q4-2012 and going into 2013. Once in place, there were numerous presentations and demonstrations of the technology to industry and other interested parties. These industry presentations will continue as the value of the IDMS increases exponentially as more industry deployments take place.

Project Management and Final Reporting

This final report is prepared and delivered as a part of this project. All monthly, quarterly and final reports were completed and delivered. Additional deliverables such as industry demonstrations of these tools and applications have all been made available at various industry functions, conferences and review meetings. A list of presentations and publications is available in the Appendix C which describes these. There are also continuing opportunities for interested parties to visit the deployment to see first-hand demonstrations and uses of the IDMS in an actual DOC.

The IDMS project has been delivered and the basic functionality was deployed in all five regional Distribution Operation Centers (DOC) across the full state of Alabama. The initial deployment took place on December 5, 2012. Plans are in process for expanding the deployment to other operating companies across Southern Company in upcoming years.

Accomplishments

The activities and milestones detailed in the previous section have been completed as a part the DOE funded program of IDMS. The IDMS project has been delivered and the basic functionality deployed at all five regional Distribution Operation Center (DOC) across the full state of

Alabama. The initial deployment took place on December 5, 2012, with continued enhancements and updates considered an on-going activity. Plans are in process for expanding the deployment to other operating companies across Southern Company in upcoming years.

Following are some of the accomplishments recorded over the duration of the project and are listed in particular order. Areas where additional details and descriptions would be beneficial can be discussed with project participants.

- In the Q4 – 2012 period, most resources were focused on the statewide Distribution Management System deployment that was officially recorded on 12/05/12. Prior to this statewide deployment, upgrades to the SCADA system and parallel operation of SCADA, EMB, and the IDMS applications were required.
- Trained more than 100 operators and 50 operator assistance and reliability/automation engineers to support the statewide deployment, across all five APC control centers, of the production DMS system.
- Tagging issue associated with single phase operating SCADA devices discovered on 10/31/12 was corrected and regression testing of all functionality was completed. All tests verified the tagging issue has been corrected.
- Updated failover temporary solution from Alstom
- SCADA upgrade was completed 11/21/2012. This included fixes and a clean database setup. SCADA switching activity will be utilized in IDMS. SCADA display was no longer considered the official diagram.
- No issues from APC interface to source testing were found. IT stabilized the development environment for Biztalk. The crew and call server was successfully connected. ARMS trouble call and ARMS flow was completed.
- From 11/29/12 to 12/02/12, DOC's brought over abnormalities/dynamics to IDMS to match EMB electrically. DOCs continued geographic data verification. At the time, EMB map and Substation Single Lines were still considered Official Switching diagrams.
- On 12/05/12, DOCs discontinue use of EMB and IDMS becames Official Record.
- DOCs have been in production with DMS (Alstom's e-terra distribution 2.5.4 SP2 (DMS) as the Official Record of the System since 12/05/2012.
- Progress has been made with testing between the APCO IDMS Build and futher development.
- Alstom continues to focus on identified issues discovered during testing and since deployment. Updated builds have been, and will continue to be, delivered and tested.
- A new OMS UI was developed and presented by Alstom. Testing will continue on the new UI,
- AMI Meter Pings and Missing Meter IDs were corrected.
- Independent Compliance Audits by Deloitte in 2012 and 2013 for activities prior to and including 2011 and 2012 respectively, were completed and no findings were identified or reported. Both reports have been submitted to DOE.
- An IDMS Governance Audit was performed by Ernst &Young in March 2013 with the focus of audit being Strategic Planning, Performance Management, Risk Management, Decision Framework, Vendor Management, Compliance & Regulatory, Sustainability, Benefits Realization, and Support.

- Original plans were to deploy the initial roll-out in Birmingham DOC only, to b followed by the remaining DOCs in the following weeks. It was changed to a single state-wide roll-out so that only one environment would have to be operational and maintained.

Cost Status

The IDMS project for was originally funded through a DOE solicitation from 2007 with approval to expend funds not given until 2008. Following is a breakdown by year of the expenses associated with the IDMS project. All funds associated with this project have been expended on the project.

Year	Total
2008	$ 294,762
2009	$ 593,573
2010	$ 1,783,276
2011	$ 5,955,449
2012	$ 2,564,192
2013	$ 73,413
Total	**$ 11,264,665**

Total project expenditures through April 2013 was the complete $11,264,665 with the split between DOE funding and Southern funding being 49.7% DOE and 50.3% from Southern. All expenditures have been processed and submitted for approval and payment made for the complete project.

Schedule Status

The IDMS project as a whole had major increases in scope over the project years and subsequently had completion dates extended as a result, with most activities meeting the scope and milestones as planned. In late 2011, as the official deployment neared, it was seen that there were going to be delays with project finalization and efforts were put into place to seek a "No-Cost Extension" to the project of 9 months. With the critical nature of the operation of the distribution system and the requirement of near perfection of the IDMS, it was determined that it would be best to push the deployment date out so that the detailed initial run of IDMS would not be in conjunction with the local hurricane and primary tornado season. The final scope modification resulted in an expected project completion of June 2012. An extension was granted for the project to have a new completion date of April 30, 2013.

Demonstrations of the advancement of the project to DOE were completed on April 27, 2011 and Oct. 16, 2012 with overall positive feedback and direction of the project recommended to stay as described and detailed.

Throughout the fall of 2012, training of Operators, Operator Assistants and reliability/automation were completed. The training was completed using the DOTS and actual user workstations. For the period of November 29, 2012 to December 2, 2012, the EMB and DMS were running in a simultaneous operation mode. On December 5, 2012, the IDMS system was put into service as the official record of the system and the EMB was no longer the system of record.

Continued improvements and updates have taken place since the IDMS became the system of record and this environment will be involved in numerous upgrades, updates and system rollouts. In that respect, the whole procedure of IDMS is a living, dynamic application that will likely continue to grow in capabilities and functionality.

In addition to the Planned Activities and Milestones presented in the prior section above, there were continuing efforts required to make the existing applications, models, equipment and field devices ready and able to support the eventual release and deployment of the IDMS. These "Lessons Learned and Suggestions" are included to help those that plan to deploy a similar IDMS solution. A major effort was required to update/upgrade the SCADA system that was already in place, but was a completely separate activity from this project. Also, since IDMS is so heavily dependent and completely reliant on the Connected Distribution Model, much time and effort is required to develop and validate that the system model is exactly correct. Many prior applications that relied on a system model did not require the exacting detail that this modern IDMS requires for performing advanced functionality and verification.

Expected Changes or Problem Resolution

Even after the successful deployment of the IDMS at APC, there are still interfaces to source systems that require additional implementation and functional testing. Continued improvements and updates have taken place since the IDMS became the system of record and this environment will be involved in numerous upgrades, updates and system rollouts. In that respect, the whole procedure of IDMS is a living, dynamic application that will likely continue to grow in capabilities and functionality.

Other than planned upgrades and further integration of advanced applications and making them available to the operator, no major changes or problem resolutions are required.

Major Participants

Joe E. Schatz – SCS - Manager T&D Research, Research and Technology Management was the Principal Investigator for the overall IDMS project contractor. Responsibilities included overall organization of the reporting activities and meeting requirements associated with the federal funding. The PI worked closely with the Accounting Compliance group on the billing and invoicing activities and with the Government Contracting Compliance group on all other aspects related to the project.

Connie Conway – SCS - Project Manager – Information Technology - operated in the day to day role of project activity management and was the routine interface with all parties involved as contractors and subcontractors in the IDMS project. Conway provided project management and project management support for the implementation of information technology solutions supporting the Smart Grid and IDMS implementation at Alabama Power Company.

Bill Mintz – APC - Methods and Systems Manager - responsible for managing and leading a group of professionals dedicated to defining the technology strategy and implementation of the software systems in support of the business at Alabama Power Company. Managed the APC

Data Management Center responsible for all distribution data maintenance, asset management support, and support the APC Distribution Control Centers in utilizing technology to operate the business. Responsible for collaborating with Information Technology and the other operating companies of defining and implementing technology solutions to improve the operational efficiency while reducing cost at the Southern Company level.

Simon Bowen – APC - Real Time Systems & Services Manager directed activities related to communication and support of the real time systems in the SCADA and DA applications at Alabama Power Company. Bowen interaced with various programming and design personnel within all groups participating in the IDMS project and had responsibility for the security of the IDMS product as it was integrated into the day to day operations of Distribution Operations Center.

Mark Swindall – APC - Principal, Methods and Systems was responsible for the GIS representation of the distribution system and was ultimately interfacing with all team members in the overall design and appropriate representation of the "Distribution System Model".

George Larry Clark – APC - Principal Engineer, Methods and Systems had overall responsibility for the Electronic Mapboard functionality and the display of the networked distribution system. Clark participated in the IDMS project through appropriate definition of display and safety requirements associated with line crew personnel and the overall information display and interface with the operator.

There were also participants for Alstom and other vendors.

Next Steps

As mentioned in previous sections, the continual upgrade and attention to identified issues will be front and foremost in the immediate future. Major enhancements and production builds will be periodically deployed and expected for the life of the product. The other Operating Companies in Southern are continuing evaluations of IDMS for deployment within their systems. Gulf and Mississippi Power are the more likely candidates for deployment in the near term. Industry reports will be made as these decisions are advanced.

Conclusion

By all aspects associated with the Integrated Distribution Management System in Alabama project, this has been a huge success for all parties involved. The system has been deployed and remains the System of Record since deployment. IDMS is continuing to be evaluated for possible deployment at Gulf Power Company and Mississippi Power, which are other subsidiaries of Southern Company. System operators have been very excited about the new IDMS platform and the information that is now available through the single common interface.

Any utility or interested parties are encouraged to visit and observe the operations of the distribution system with the IDMS platform. Time should be arranged to observe the Distribution

Operator Training Simulator if a visit is set up. Many screenshots associated with the overall IDMS platform are include in Appendix A to help show the available interaction and ease of use of IDMS compared to traditional disparate systems.

Appendix A – Screen Shots of the Integrated Distribution Management System

Figure A1. IDMS Desktop Layout

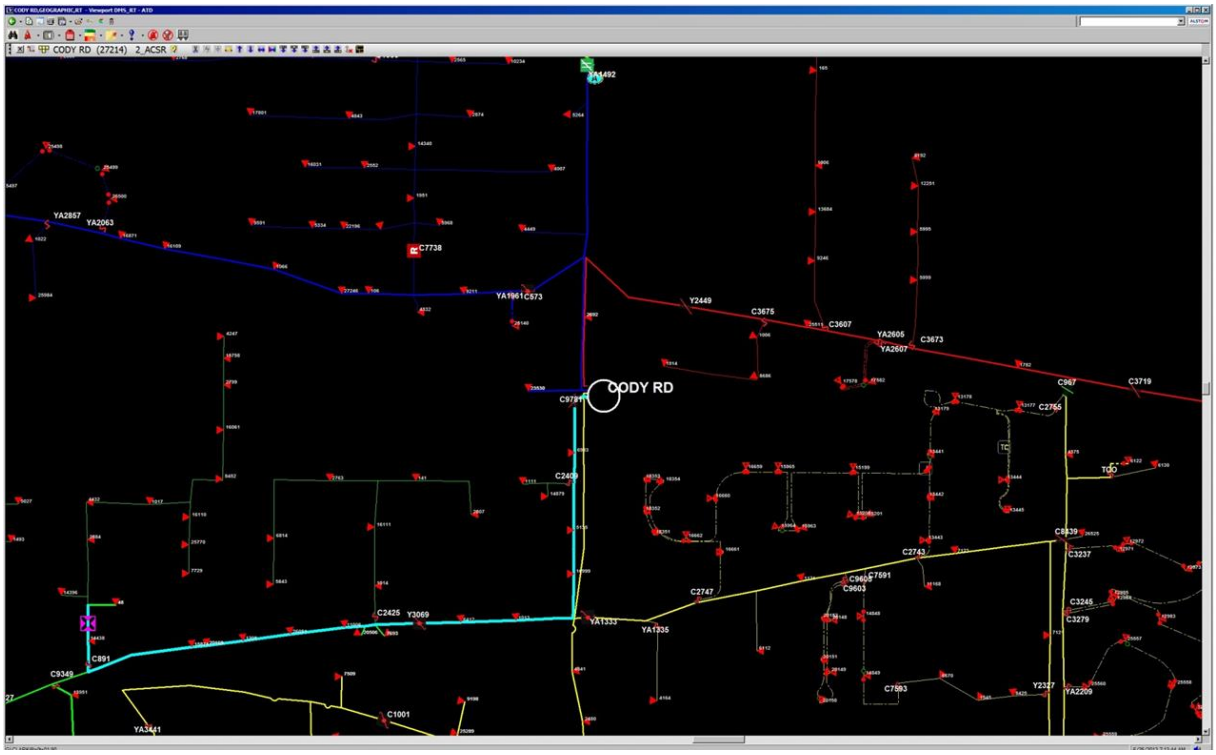


Figure A2. Demonstration of Tracing an Upstream Source

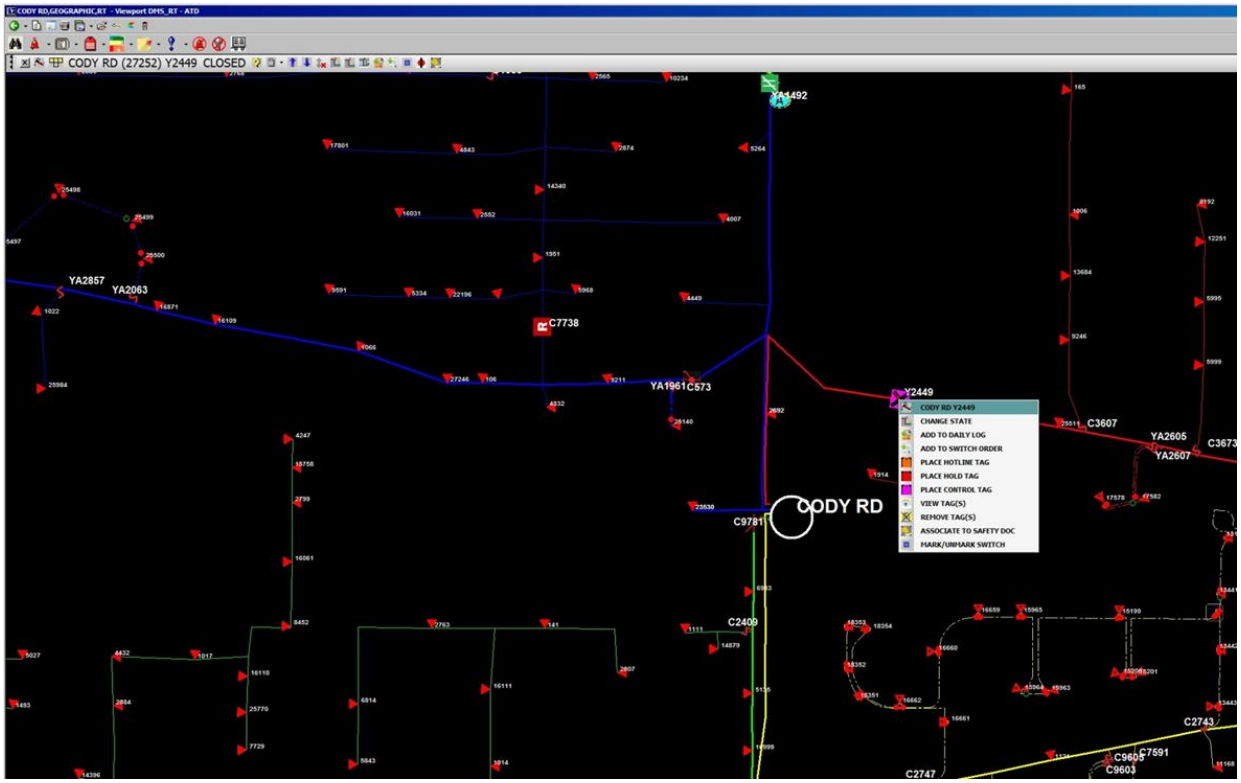


Figure A3. Demonstration of Device Right-Click Menu

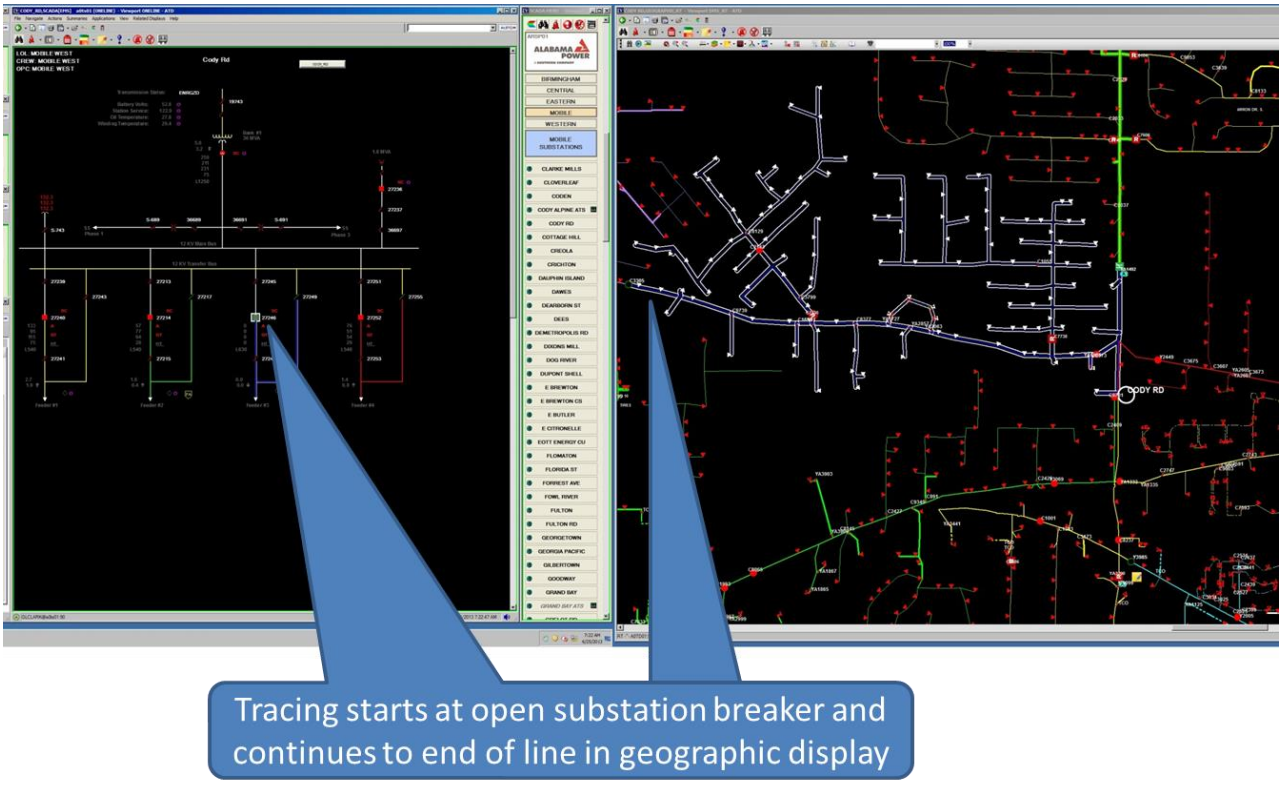


Figure A4. Demonstration of De-Energized Line Trace

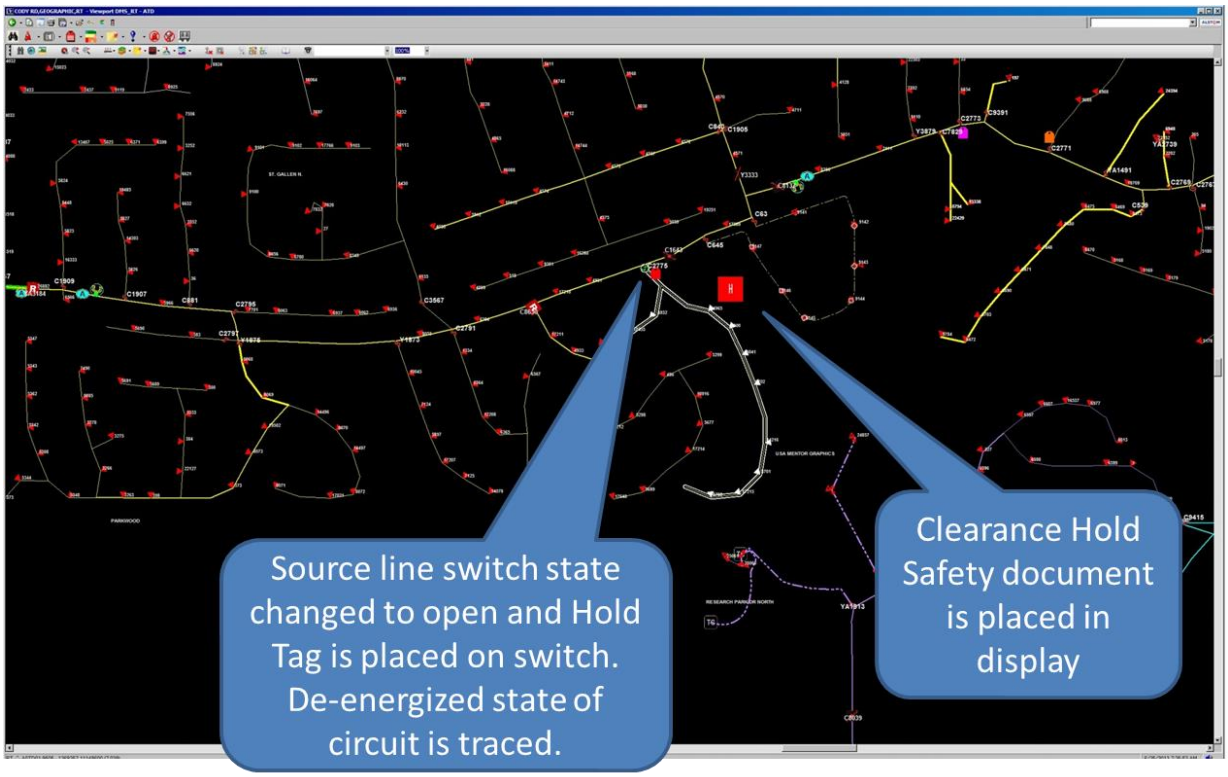


Figure A5. Demonstration of Clearance Hold Safety Document for De-Energized Line Work

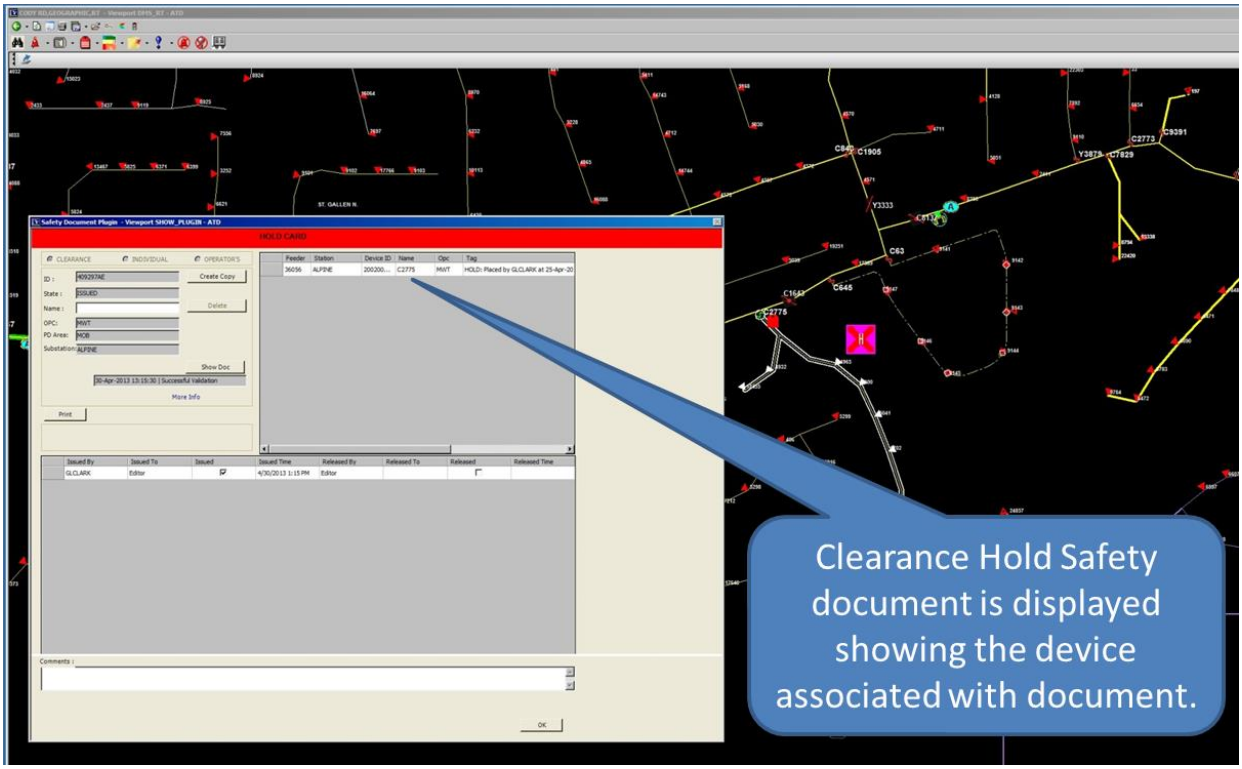


Figure A6. Demonstration of Clearance Hold Safety Document tied to Device

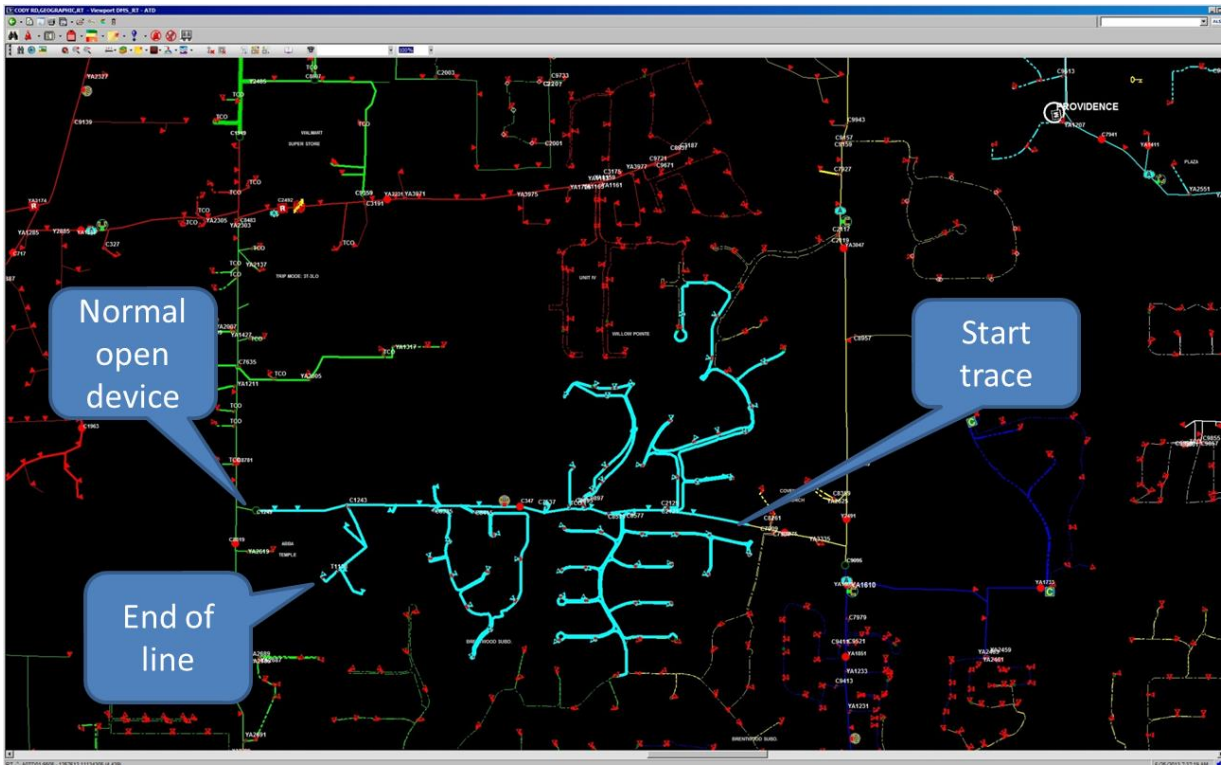


Figure A7. Demonstration of Line Trace to End of Line and Normal Open Points

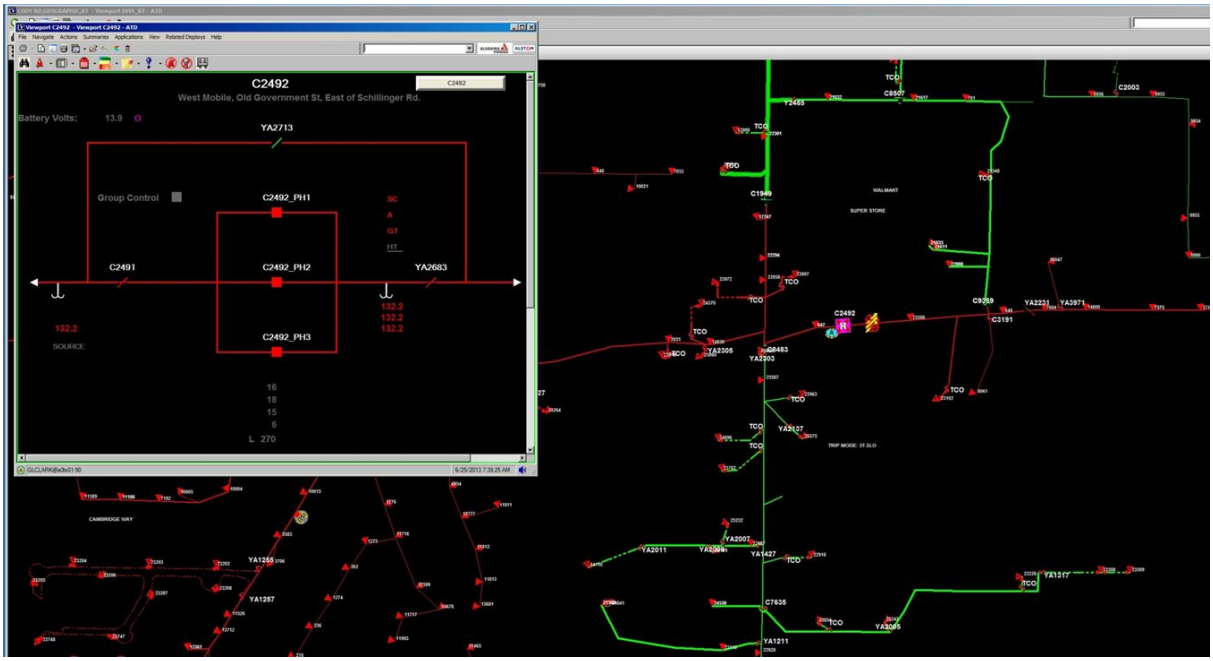


Figure A8. Demonstration of Picture-in-picture of SCADA Controlled Device

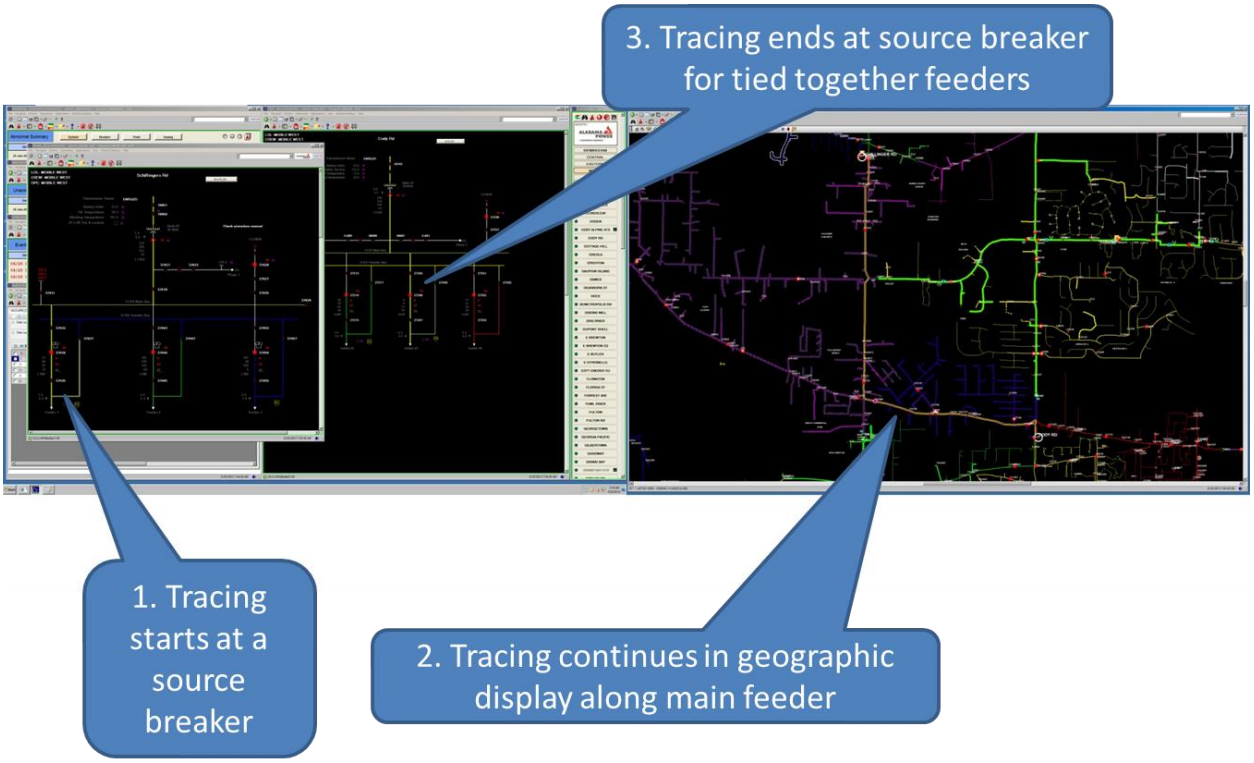


Figure A9. Tracing to Display Temporary Parallel Feeder Operation

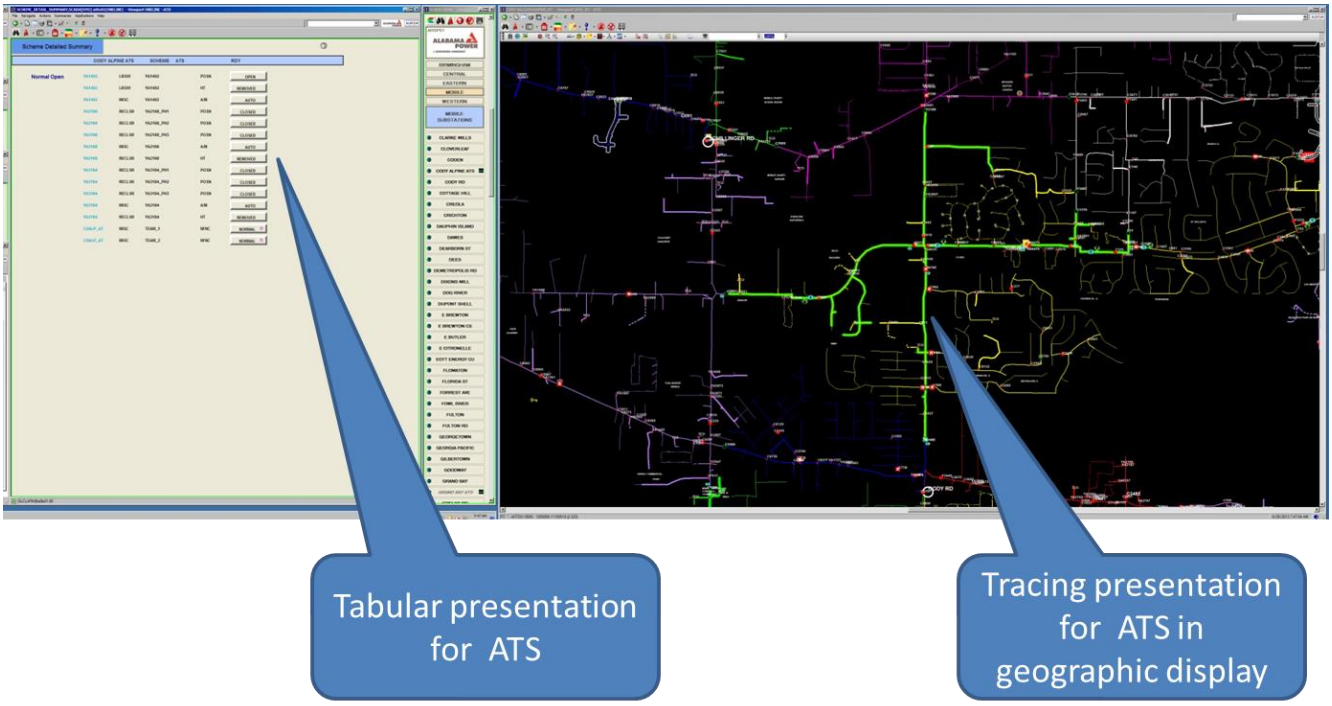


Figure A10. Demonstration of Tabular and Tracing Presentation of Automatic Transfer Scheme

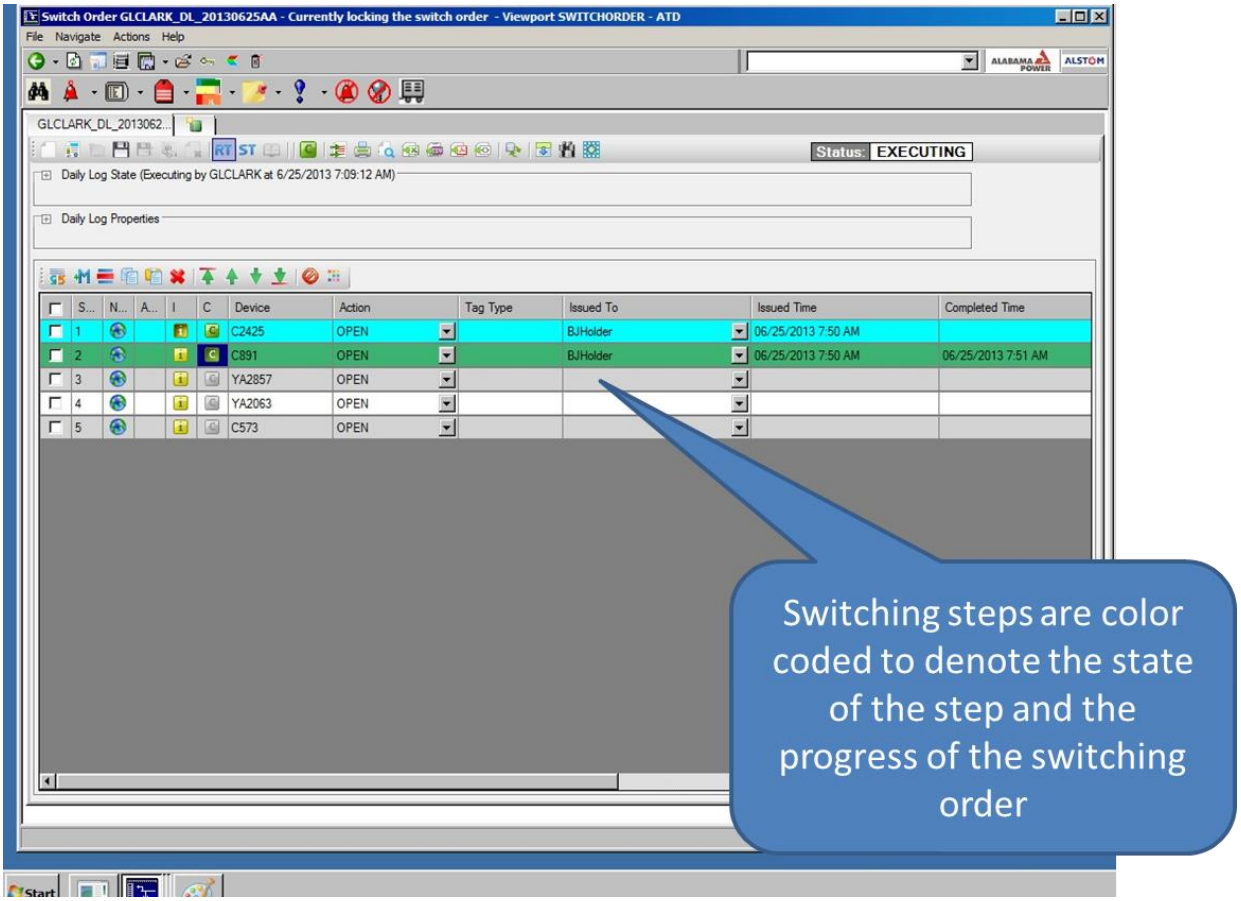


Figure A11. Demonstration of Switching Order and State of Operation

Appendix B - Table of Acronyms

AMI – Advanced Metering Infrastructure
APC – Alabama Power Company
ARMS – Automated Resource Management System
ATS – Automatic Transfer Scheme
COE – Center of Excellence
CSS – Customer Service Solution
DMS – Distribution Management System
DOES – Distribution Outage Estimation System
DOTS – Distribution Operator Training Simulator
DROP – Distribution Resources Optimization Program
EMB – Electronic Map Board
EPRI – Electric Power Research Institute
GIS – Geographic Information System
IDMS – Integrated Distribution Management System
IT – Information Technology
IVR – Integrated Voice Response
OMS – Outage Management System
OT – Operations Technology
SCADA - Supervisory Control and Data Acquisition (SCADA)
SCS – Southern Company Services
VAR – Volt Ampere Reactive

Appendix C - List of Presentations and Publications

Clark, G. Larry, "Smart Distribution facilitates Smart Operations in Control Center," EPRI Power Quality and Smart Distribution 2013 Conference and Exhibition, Westin Chicago River North Hotel, Chicago, IL June 18, 2013

Clark, G. Larry and Boardman, Ethan, "Utilizing advanced applications in the Distribution Operations Center," Alstom Grid North American Users Group Conference, Bellevue/Seattle, WA, June 5, 2013

Clark, Larry, "Smart Distribution Management System in Operation," i-PCGRID Workshop 2013, PG&E, San Francisco, CA, March 28, 2013

Clark, G. Larry, "Asset Management and Real Time Operations at Alabama Power," Asset Management Consortium, DNV KEMA, Katy, TX, March 15, 2013

Clark, Larry; Servas, Tom; Parisi, CJ, "Weather Emergencies: Getting the most out of your technology," EUCI Best Practices in Storm Planning and Response, Hyatt Regency New Orleans, New Orleans LA, February 26-27, 2013

Clark, G. Larry, "The Emerging Sophistication of the Distribution Operations Center," DistribuTECH 2013 Conference and Exhibition, San Diego, CA, January 29, 2013

Clark, G. Larry, "Switching Automation in the Smart Control Center," CEATI Smart Grid Task Force Webinar, Birmingham, AL, January 23, 2013

Clark, G. Larry, "Implementing an Integrated Distribution Management System," EPRI Power Quality and Smart Distribution 2011 Conference and Exhibition, Hilton Nashville Downtown Hotel, Nashville, TN, August 17, 2011

Clark, G. Larry, "Smart Distribution Technology," Smart Grid Primer, GridWeek 2010, Walter E. Washington Convention Center, Washington, DC, October 18-21, 2010

Clark, G. Larry, "Implementing and Integrating a Distribution Management System," EUCI Volt/Var Optimization for Distribution Systems Conference, Hyatt Regency Crystal City, Arlington, VA, September 16-17, 2010

Schatz, Joe E., “Smart Grid Demo” 2011 IEEE Innovative Smart Grid Technology Europe Conference – Manchester, UK - December 7, 2011

Schatz, Joe E., “Integrated Distribution Management System in Alabama” 2010 DOE Smart Grid Peer Review – Golden, CO

Schatz, Joe E., “Integrated Distribution Management System in Alabama” 2008 DOE Renewable and Distributed System Integration Peer Review – Red Bank, NJ - October 29 and 30th, 2008

Schatz, Joe E., Various Update Presentations to the Electric Power Research Institute Smart Grid Demonstration Project Participants - 2009 thru 2013