

GIS-CAD Integration via ArcGIS Online

A Case Study

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GIS Administrators have long been dealing with how to get their GIS data into CAD environments, be it AutoCAD, Bentley or some other CAD system. PECO Energy Company faced this issue with their ArcGIS and Bentley systems. Headquartered in Philadelphia, Pennsylvania, PECO services about 1.6 million electric and over 511,000 natural gas customers. PECO is the largest combination utility company in Pennsylvania and has a franchise utility service area of 2,100 square miles with a population of 3.8 million people. Much of PECO's electric and gas data resides in their ArcGIS enterprise GIS for visualization and analysis, while their gas construction drawings are produced in their Bentley CAD system by their Designers. Having been GIS users for over 10 years, PECO's GIS is extremely robust, up-to-date and contains information that appears on their construction drawings. The issue of how to transfer GIS data to their CAD group was important because it made no sense to have their Designers duplicate existing digital information.

To facilitate the transfer of GIS data to the CAD system, PECO decided on a solution which utilized ArcGIS Online, a custom geoprocessing service and the CEDRA-DxfExport software. The goal of the GIS data transfer was to export the ArcGIS data, preserving point feature symbology, line styles, annotation and layering into a format that their Bentley system could process. Furthermore, the transfer had to be accomplished with as little user interaction as possible.

After completing a review process, it was decided that a DXF format provided the most efficient means for providing editable vector data to their Designers. It was also decided that ArcGIS Online provided the most conducive environment for performing the extraction in that ArcGIS Online was widely available throughout the PECO work place and that its intuitive user interface and staff familiarity with ArcGIS Online would make the extraction process as easy as possible.

With the overall approach in place the next step was to actually implement the proposed system. Towards this end, PECO contracted with The CEDRA Corporation to provide their CEDRA-DxfExport software, and to assist in the integration of the software with the ArcGIS Online Web Mapping application that PECO's GIS department would be developing. Work for this project began in late December 2016 with a scheduled deployment of the application set for late January 2017. A tight time schedule to say the least.

The beginning of the project involved two development efforts occurring simultaneously. The first effort, the development of the ArcGIS Online Web Application, was performed by PECO. The second effort was the testing of the CEDRA-DxfExport software to ensure that PECO's point feature symbology, line styles, annotation and layering were being properly exported.

The development of the ArcGIS Online application was interesting in that it involved the interaction of two servers. The ArcGIS Online Web Application, which the end user would be using in the extraction process, resided on one server, while the other server contained the CEDRA-DxfExport software, which would produce the DXF and/or PDF files. A Python based geoprocessing service was created and added to the ArcGIS Online application. This service provided the means for the user to: (a) identify the area to be extracted, (b) specify the name of the DXF file to be created, (c) specify the desired output scale, (d) select whether a DXF, PDF or both formats were to be created and (e) specify the email address to which a confirmation message of the extraction's completion should be sent. Figure 1 illustrates the dialog box with which the user performing an extraction interacts.

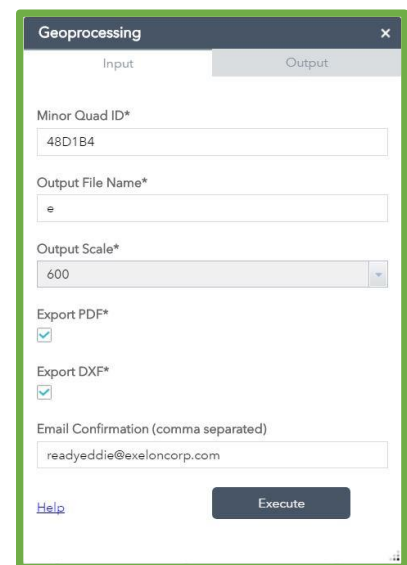


Figure 1 Geoprocessing Service Dialog Box

The testing of the CEDRA-DxfExport software as stated above involved ensuring that the quality of the DXF file was sufficient for PECO Designer's to use in developing their construction drawings. As part of the testing CEDRA used two map packages containing typical PECO GIS data that would be exported. The biggest challenge in the testing phase was the line styles that PECO used in their ArcMap document files. It was extremely critical that the line symbols that were used, especially the line symbols with arrow heads at the end points, were properly transferred to the Bentley system. A good deal of effort was expended to ensure that the ArcMap Marker and Cartographic Line Symbols were properly exported.

Once these two development efforts were completed the third phase was undertaken to integrate the creation of the DXF and/or PDF with the ArcGIS Online Web Application. The option to create a PDF was implemented to give the Designer an exact image of what the GIS image looked like at the time of extraction. To make the extraction of the GIS data as easy as possible the amount of information required by the user was kept to the information shown in Figure 1. As such, the creation of the DXF and/or PDF files had to be done in the background and with no user interaction. To accomplish this, configuration files were used to specify the CEDRA-DxfExport parameter settings to be used in the generation of the file(s). In so doing, once the user selected the Execute button on the geoprocessing service dialog box all the user sees at that point is a progress bar indicating that processing is underway.

Upon completion of the extraction an e-mail is sent to the user indicating that the file(s) have been created and the location where the files can be accessed. PECO's Designers can then take the DXF file and begin their work using the GIS data as the starting point for their work. All of the CAD work is done in a State Plane coordinate system or Model Space as it is sometimes referred. It should be noted that in bringing the GIS data into the Bentley system the layers that were present in the CAD system corresponded to the classification names in ArcGIS. The symbology assigned to the classifications was also maintained. This included: color, point symbols and line styles such as lines with arrow heads at the end points and lines with character markers along the line denoting water lines, electric lines, telephone lines and so forth.

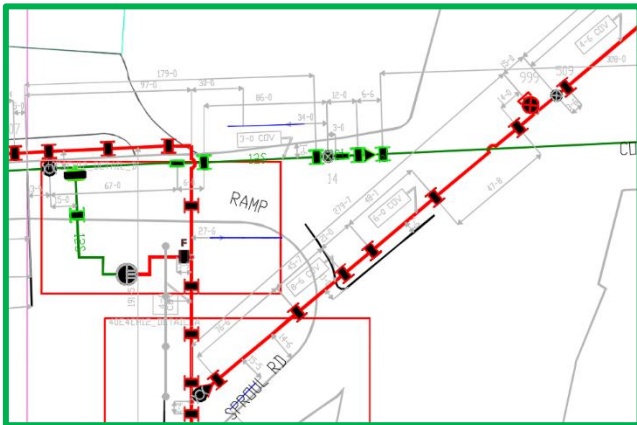


Figure 2 Image of ArcMap Display

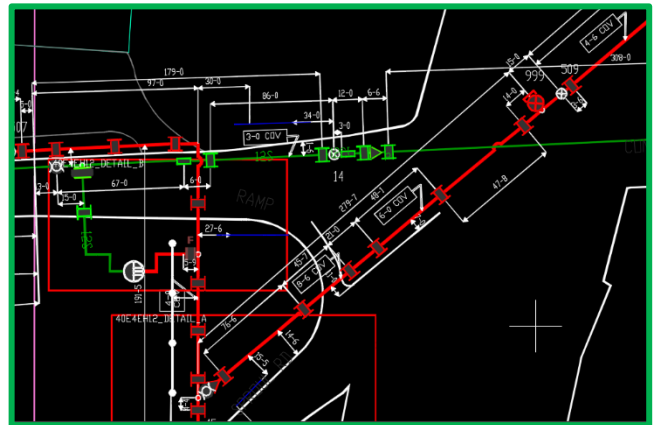


Figure 3 Image of Bentley Display

Shown in Figure 2 is an area within ArcMap that was exported using the above process. Figure 3 illustrates how the ArcMap data appears in the Bentley system. It can be seen that the vast majority of information has come across properly. Since the information is in vector format, PECO Designers can modify the extracted information as desired. Note that ArcMap point symbology is exported as block entities and polygons as hatches. Prior to implementing the ArcGIS Online Web Mapping Tool, PECO Designers used a schematic landbase as their base map. With the new Web Mapping Application, PECO Designers are able to streamline their work flow and utilize the valuable GIS data that is available.

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