

## Implementing GIS in the NEPA Process at FERC

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The Division of Gas-Environment and Engineering at the Federal Energy Regulatory Commission (FERC) receives hundreds of filings annually for authorization to construct various types of interstate natural gas pipeline facilities. As per Executive Order 13212, FERC was charged with the task of expediting reviews to authorize projects that would increase the production, consumption and conservation of energy, while completing a thorough review in an aggressive manner. With the abundance of applications and increasing workload on FERC staff, the logical solution was to disseminate an internal ArcIMS based application to manage the mass of technical and environmental data collected from applicants. The application allows users to view project data in one place, thereby expediting the NEPA review, scoping and monitoring processes, and eliminating the need to request a profusion of paper maps. The goal of this system is to provide a standard means by which FERC staff and applicants analyze data.

### **Who is FERC?**

The Federal Energy Regulatory Commission (FERC) regulates and oversees energy industries in the economic and environmental interest of the American public. FERC is an independent agency, officially organized as part of the Department of Energy, which regulates the interstate transmission of natural gas, oil, and electricity. FERC also regulates natural gas and hydropower projects while overseeing the environmental and public safety concerns of each proposed project.

The Office of Energy Projects (OEP) at FERC is responsible for the environmental and engineering review of natural gas and hydropower projects. Specifically, the Division of Gas-Environment and Engineering (DG2E) manages the environmental review of natural gas pipeline projects, compressor station projects, natural gas storage facilities and liquefied natural gas (LNG) projects across the United States. Environmental Impact Statements (EISs) and Environmental Assessments (EAs) are issued for public comment once the project managers and their teams conduct a thorough environmental review as dictated by the National Environmental Policy Act (NEPA) of 1969. NEPA requires the Commission and resource agency staff to analyze environmental impacts on proposed projects and alternatives to be considered and to provide appropriate mitigation measures.

In this process, FERC grants a Certificate of Public Convenience and Necessity to companies that allow them to build natural gas facilities. In order to get these permits, the companies must prove that they are going to take the environmental impact of their project into consideration. However, the Commission also has to consider the energy needs of the place where the natural gas pipeline or hydroelectric dam is being planned.

With respect to Natural Gas projects, FERC safeguards the environment by<sup>1</sup>:

- Disclosing, analyzing and minimizing impacts where it is feasible and reasonable to do so;
- Encourage applicants to communicate with relevant federal and state natural resources agencies, Indian tribes, and state water quality agencies, prior to submitting an application;
- Ensuring that all applicants perform the necessary studies to make an informed decision on the project;
- Issuing environmental assessments (EA) or draft and final environmental impact statement (EIS) for comment on most projects;
- Including requirements with any certificate issued to reduce environmental impacts; and
- Inspecting proposed project areas to determine the range of environmental issues requiring analysis and holding scoping meetings as appropriate.

## GIS at FERC

GIS has been in use by a small staff for very specific and special needs projects over the past 10 years. This system primarily satisfied needs for hydropower analysis and congressional inquiries with recent benefits being recognized for natural gas and liquefied natural gas (LNG) projects. In order to expand the system, FERC entered into a contract to develop an Enterprise GIS<sup>1</sup> for OEP which will save staff time in their environmental review in addition to satisfying the President's Electronic Government (eGov) Initiative and the Government Paperwork Elimination Act (GPEA). The Enterprise GIS Project (Project) began in September 2003 as a cost-effective way to accomplish these goals.

In the environmental review process, it is important for staff to view high resolution aerial images, overlaid with facility locational data, such as the pipeline centerline, LNG terminal footprint, and other various facilities to ensure that construction of the proposed application would not adversely affect surrounding landowners or any variety of environmental factors. Environmental factors that staff most commonly need to locate in many aspects of the review process are: field-delineated wetlands, cultural resource locations, land features, environmentally sensitive areas, and nearest noise sensitive areas (NSAs). If data were provided in digital format and disseminated to project managers via the Enterprise GIS, there would be a definite time savings realized in the environmental review process. Two big advantages would be realized: 1.) fewer data requests may need to be asked of the applicant; and 2.) FERC staff would be viewing and conducting analysis on the same data that the company uses in submitting their application, providing less room for discrepancies. Other advantages would include quicker response time to public inquiries and concerns and immediate analysis capabilities for staff at their desktop instead of relying on two GIS administrators to serve approximately 275 staff.

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<sup>1</sup> Enterprise GIS refers to a software program which is distributed to individual PC's, giving staff the ability to conduct high-level GIS analysis with the data that is filed with the Commission on their desktop.

Figure 1 illustrates how GIS is used for analysis in reviewing LNG applications. For each application to construct an LNG facility, about forty nine 1-2 meter resolution aerial images are downloaded from Microsoft Terra Server (<http://terraservice.net>) and geo-referenced in ArcCatalog for each project. A center point is created for the proposed location where the vessel would be unloading the LNG and then a buffer zone is created based upon engineering calculations to illustrate the thermal hazard area.



Figure 1. Thermal Hazard Areas surrounding an LNG import terminal.

Figure 2 below illustrates how GIS has been helpful in identifying alternative routes for a proposed pipeline based upon environmental concerns. In this example, several alternative routes were analyzed to mitigate impacts of the onshore portion of a pipeline route to the coral reef along the coast.



Figure 2. Potential on-shore alternative pipeline routes for a proposed off-shore pipeline.

The software and technology solutions that were available at the conception of the Project have advanced considerably, allowing for improved performance and functionality, namely ESRI's server side software. In December 2003, the original Enterprise system design failed the proof-of-concept due to poor performance, therefore, sign off was not completed. Consequently, FERC invested additional funds on advanced technology that would improve the system. Due to budget constraints, the original design utilized MS Access. Once it was determined that access would not be able to accommodate 3TB plus of data the Commission would be receiving, ArcSDE was utilized in conjunction with MS SQL Server.

Due to the changes that were made to the Enterprise GIS architecture midstream of the contract, previously unknown issues pertaining to data management arose; future data requirements and the need to archive extremely large data files were not taken into consideration and the database was not designed to manage data backups effectively. The current data backup system that FERC uses for the entire Commission's files is not equipped to handle the amount of anticipated GIS data and the size of the files, therefore, a more robust system is needed. As an example, it now takes over a day to back up our GIS data; in five years it will take over 5 days. This would compromise system reliability not only for the enterprise GIS but also for the entire Commission, which is unacceptable.

## Current Standing

Future planning for the system was not taken into consideration at the Project conception; therefore we are in the process of reverse engineering to take our future needs into account before the system rollout to ensure system reliability. FERC staff compiled a functional needs document with a supplemental requirements document in order to get a handle on exactly where FERC is going with GIS based upon our business needs. The compilation of these documents not only helped staff understand how OEP's business needs affected the Commission IT system as a whole, but also provide a basis for managers to make informed decisions regarding disbursement of funds for GIS.

Because our business needs were not conveyed completely to FERC network engineering staff at the forefront of the Project, they were not able to understand why storage space on the GIS servers was being filled so rapidly. Consequently, the GIS administrators were informed that backing up the data was becoming a major issue. Storage space and data back up are still issues today that we are trying to find resolve for within an extremely limited budget. It is anticipated that over the next 5 years, FERC will receive approximately 1 TB of data per year, therefore, our Enterprise GIS cannot be deployed to staff until there is a plan in place on how to best manage our data and ensure reliability to our users.

In order to obtain digital data, FERC has been and will continue to work with the Interstate Natural Gas Association of America (INGAA) to come up with digital data submission standards that provides the information FERC staff needs to conduct their analysis while not creating a significant burden for the industry. Ultimately, the goal is to create a rulemaking to mandate the submission of digital data with all applications.

## Lessons Learned

The establishment of an Enterprise GIS is no small task and most everyone, especially those with tight budget constraints, has experienced growing pains. The most valuable lessons that FERC has learned to date are:

- 1. Know your business needs.** Understand the *what* and *why* of your system requirements so that a scalable system architecture can be designed appropriately to meet your users needs.
- 2. Involve all potentially affected staff at the conception of the project.** Once your

needs have been documented, be sure to involve all appropriate in house staff and make provisions to hire expertise from outside contractors, if warranted. At a minimum, an Enterprise GIS team should include IT and network engineering staff, a DBA, data backup personnel, system security, enterprise system administrators, technical staff, a representative user group, and budget and procurement staff.

**3. Know your budget.** Be sure that the funds available satisfy all aspects of the system architecture and provide for a reliable and scalable system design.

**4. Research your options thoroughly.** It is important to select the best system and contractor to design your system, based upon your business needs.

**5. Develop a plan for implementation.** Develop a plan which outlines how to make the project happen. Be sure to incorporate the current network architecture.

**6. Assign a Project contact.** There should be at least one person who can be contacted at any given point for Project information and who keeps the team informed on a regular basis.

## Conclusion

The development of an Enterprise GIS at FERC has been and will continue to be a learning process for all involved. Several lessons were learned along the way which upon implementation, will make the system better in meeting our business needs and more reliable for the end users. Although the system is still in the development phase we are making good progress in advancing toward production.

## References:

1. <http://www.ferc.gov/industries/gas/enviro.asp>

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