Project Management for Implementing the Smart Grid

By Power System Engineering, Inc.

PM Methodology

Using a Repeatable Project Management Approach

Abstract

Project management solutions for the Smart Grid are based on an established Project Management Methodology supervised by a team of individuals comprising a Project Management Office (PMO). This paper illustrates the enterprise impact on a utility of implementing a Smart Grid system and the business need for establishing both project management methods and a PMO. A consistent project management methodology must be understood and practiced throughout the utility. The PMO provides the standards and defines the processes and templates needed for consistent project execution, as well as the documentation repository for future reference.

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Overview

Power System Engineering, Inc. (PSE) has successfully deployed utility automation applications such as Distribution Automation, SCADA, Advanced Metering Infrastructure (AMI), Demand Response (in-home automation and dynamic pricing), and Mobile Computing (data and voice), as well as provided Utility Strategic Business Planning and Assessment, and Utility Rate Modeling and Analysis.

These applications are integral to utility operations and a successful Smart Grid technology deployment. They support enterprise-wide and multi-functional business needs, rather than the single business needs of one department within the utility; the movement to Smart Grid technology impacts the entire utility. Critical real-time information is immediately available across the enterprise for decision making and control.
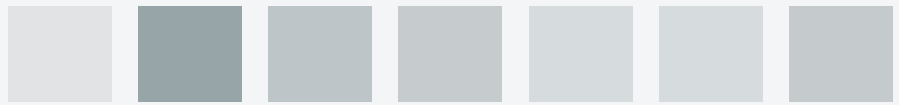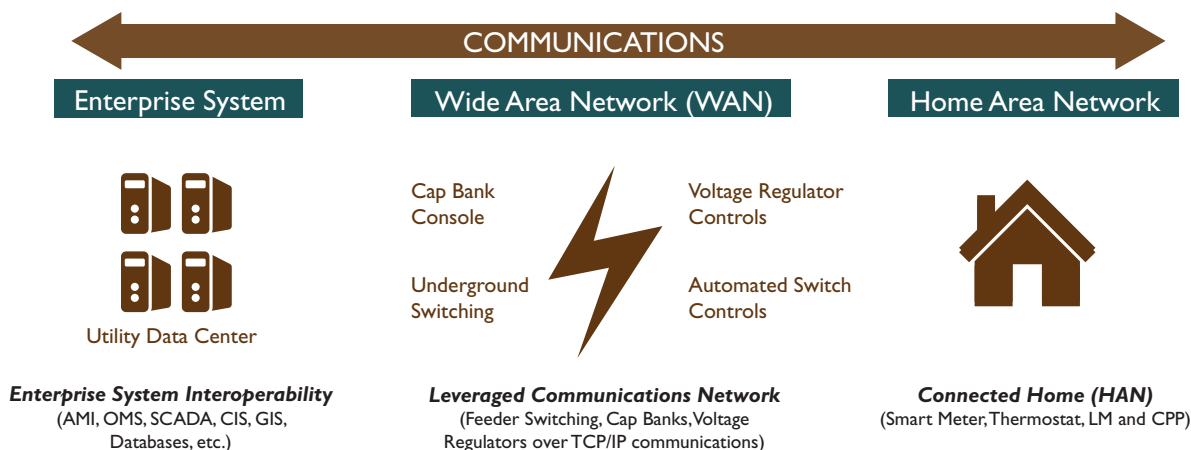
A Smart Grid project comprises three investment programs:

1. AMI (smart meters/modules, AMI server, Meter Data Management (MDM) and software, core AMI transport infrastructure and backhaul communications).

2. Demand Response (in-home automation and dynamic pricing).

3. Electric Distribution System (smart feeder switching, distribution peak demand reduction (DPDR), and conservation voltage reduction).

The relatively straightforward part of Smart Grid programs is putting meters and network components in the field and building the field area network (FAN). Substation updates are underway and new applications for distribution management, outage control, asset management, meter data management applications, mobile workforce, and GIS are seeing increases in deployments. But as the vision for Smart Grid technology moves from concept to reality, utilities worldwide are struggling. System-wide integration is being acknowledged, but operational integration is missing from many program plans. A move from "business as usual" is required; the move to a fully integrated smart grid, operationally and organizationally, is possible with proper planning and execution.

The illustration below highlights information flow and begins to show the complexity of resources and technologies needed to successfully deploy and benefit from Smart Grid technology.

COMMUNICATIONS

Enterprise System   Wide Area Network (WAN)   Home Area Network

Cap Bank Console   Voltage Regulator Controls

Underground Switching   Automated Switch Controls

Utility Data Center

Enterprise System Interoperability
(AMI, OMS, SCADA, CIS, GIS, Databases, etc.)

Leveraged Communications Network
(Feeder Switching, Cap Banks, Voltage Regulators over TCP/IP communications)

Connected Home (HAN)
(Smart Meter, Thermostat, LM and CPP)

Why Do Projects Fail?

A project's success can be measured by three critical factors, as shown below: performance, budget, and schedule.

Ultimately, a successful project delivers benefits and satisfies customers while meeting budget and schedule constraints.

Only 29% of projects are completed on time and within budget

One of the most commonly quoted sources of project failure statistics is the Chaos reports produced by the Standish Group. These reports find that only 29 percent of projects are completed on time and within budget, and meet stated business objectives.

Performance
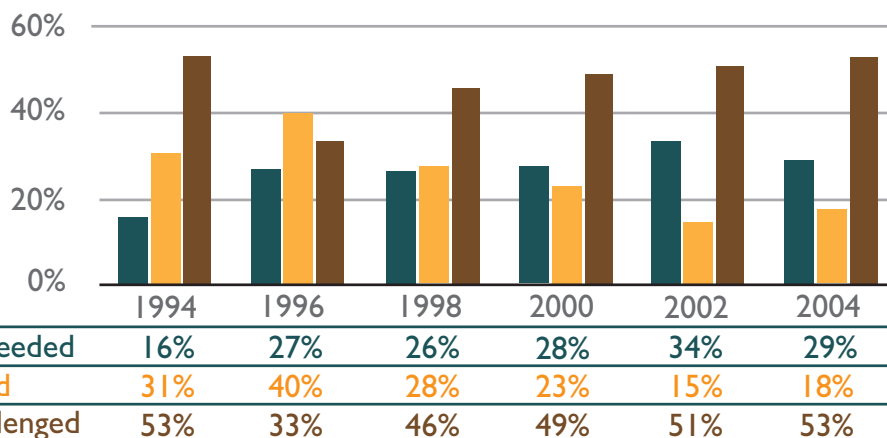(quality and results)

+

Budget

+

Schedule

	1994	1996	1998	2000	2002	2004
◆ Succeeded	16%	27%	26%	28%	34%	29%
◆ Failed	31%	40%	28%	23%	15%	18%
◆ Challenged	53%	33%	46%	49%	51%	53%

Source: The Standish Group study 2005

The Standish Group also found differences in success rates based on the project's cost. As shown in the figure below, less expensive projects meet the critical success criteria more often than more expensive projects. Only 2% of projects costing over $10 million met success criteria compared to 46% of smaller projects (costing $750K).
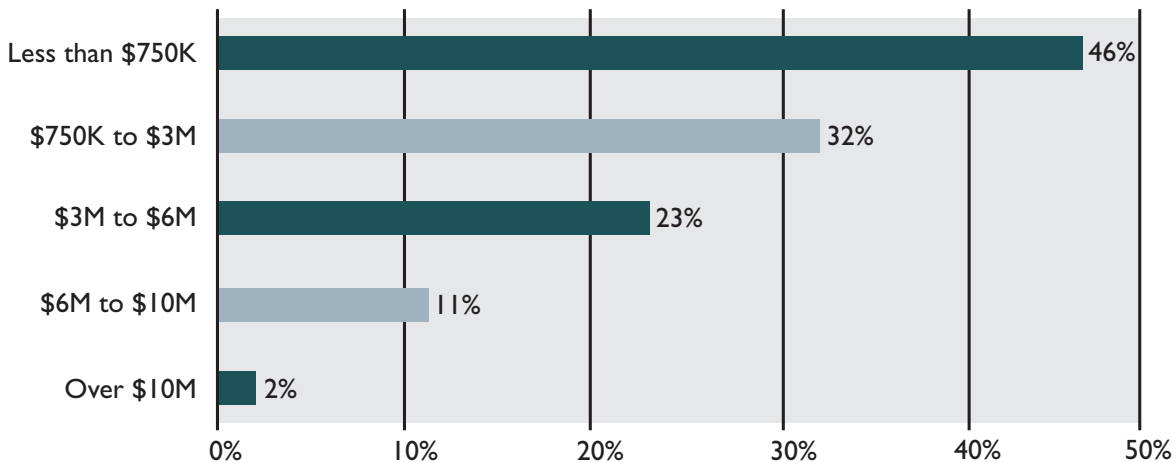
Source: The Standish Group study 2005

There are many reasons projects fail. In fact, the list is infinite. Assuming the Pareto principle (known as the "80/20 rule," which states that roughly 80% of the effects come from 20% of the causes), we can narrow the list of plausible reasons for project failure:

- Ill-defined goals and objectives

- Inadequate, vague, or incomplete requirements

- Lack of a solid project plan

- Inadequate project management plan, poor management, and/or lack of management commitment

- No user ownership and lack of user input

- Scope creep, and/or no change control system

- Poorly defined roles and responsibilities

- Lack of technology competent resources

- Stakeholder conflict

- Poor communications

- Limited or no risk identification and mitigation plan

As you can see, most of the items on the list represent an organization with limited or lack of project management and/or poor project management execution. If project planning and management are said to comprise 20% of a project, the success (or failure) of that planning and management can directly determine the success (or failure) of the project as a whole.
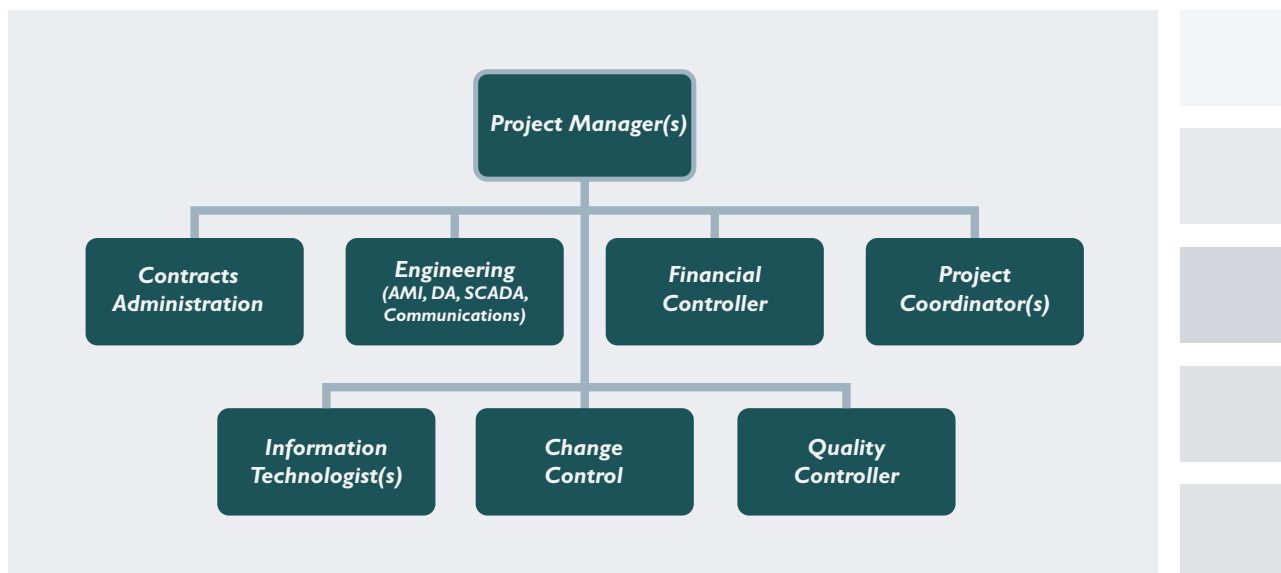
Project Management Methodology

One of the most important aspects of a Smart Grid implementation is a standard project methodology supervised by a centralized project management office (PMO) team. PSE's project management methodology is based on Project Management Institute's (PMI) recommended best practices, which define five steps in project management labeled process groups: project initiation, planning, executing, monitoring and controlling, and closing. The activities defined within each process group can be iterative. Not all activities have to be used during a project life cycle to be successful. Project size and complexity will correlate to the detail and repetition of activities used within process groups. The PSE project management methodology builds on the PMI model through incorporation of PSE's best practices to define a project management methodology and PMO for electric utility use.

> To have any degree of confidence in the outcome of a project you need to put in place the right people with the right combination of skills.

To have any degree of confidence in the outcome of a project you need to put in place the right people with the right combination of skills. They should work with the best practice processes and tools to make sure the project is properly defined and run. This needs to be in place before the work starts.

In a well-run project the level of activity is quite high. Routine project management processes require a combination of special skills and administrative resource. Rarely is it enough just to appoint a single project manager. To do the job properly requires time and resources. It is beneficial to put in place a team of individuals comprising a project management office (PMO) to deal with the administrative tasks of the project, freeing up the project leadership and resources to get on with their jobs. A project management office team might comprise roles such as project manager, project planner, progress tracker, financial controller, process administrator (change control, risks, issues, configuration, and documentation management), quality controller, communications manager, organizational change manager, and administrative support. The organizational structure below shows a PMO team organized to support a typical Smart Grid implementation project.

This PMO team supervises a standardized project management methodology that provides for managing quality, costs, schedules, cross-project dependencies, risks, change control, communication, stakeholder expectations, and documentation. It must also provide a document repository for information sharing and knowledge management. "Business as usual" must be replaced by project management standards, multi-project coordination, stakeholder communications, and management overview. Change control must encompass not only the projects in the smart grid program, but to be effective, must also include operational changes and system development lifecycle changes to applications that share data, processes, or business functions. Implementing a PMO-level decision process can be useful to formally document the various executive level decisions required in the Smart Grid program that cross organizational boundaries.

It is beneficial for the PMO to manage projects using an integrated set of support tools that allow project information to be shared among team members from a single data source. Modern tools enable effective communication through existing user interfaces such as web browsers and e-Mail. Typical uses would be to:

- Analyze and track interdependencies of projects,
- Make the detailed calculations concerning scheduling, costs, and progress, etc.,
- Publish progress information,
- Publish individuals' task details,
- Manage the workflow for submitting and handling changes, risks, and issues,
- Enforce controls, for example, in the "checking in" and "checking out" of documentation.

> "Business as usual" must be replaced by project management standards
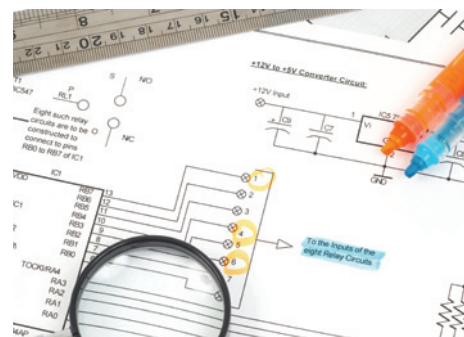
> Modern tools enable effective communication

Establish the Five

5

5 Project Management Process Groups

There are five Project Management Process Groups for any project. The activities defined for these process groups are required for managing any project. The illustration below shows the five process groups. Process groups III and IV titled project execution and project monitoring and control are shown together for illustration purposes only, and since they often occur concurrently.

The goal of **Process Group I, Project Initiation,** is to document the project definition and obtain authorization to start. Within this phase, the initial scope is defined and initial financial resources are committed. Internal and external stakeholders who influence the outcome of the project are identified. This information is captured in the project charter and stakeholder documentation.

This process group includes the following tasks:

| Group I | *Project Initiation* |

| Group II | *Project Planning* |

| Group III & IV | *Project Execution, Monitoring & Control* |

| Group V | *Project Closeout* |

The concept, objectives, approach, and justification of the project will be properly defined, agreed upon, and communicated.

Planned benefits will be assessed and monitored throughout the project; optimizing benefit should be the prime goal of the project manager.

The feasibility of the project may be established through a process of evaluating alternatives.

Involving customers (via surveys, focus groups, prototype reviews, etc.) or other stakeholders during initiation improves the probability of stakeholder ownership, scope communication, and customer acceptance.

Begin with a Clear Project Definition

Each project should begin with a proper definition; for example, objectives, budget, performance measures, accountabilities, and schedule. It should follow well-defined project management processes, designed to ensure that the project stays on track to deliver optimum benefit.

Clearly defining the project will ensure that your objectives are realistic, and it will help prevent surprises. It will ensure that everything is done to optimize the overall benefit to the organization, despite changes to the business, changes in the economy, and the inevitable snags along the way. In these uncertain times, utilities must be able to answer the following questions with assurance:

- Have I collected and validated the requirements necessary to design a solution?
- Do I have confidence in the schedule, costs, and net benefits?
- Do I understand all the risks?
- Am I certain that this is the best investment we can make with our resources?

Process Group II, Project Planning, consists of tasks associated with establishing the total scope of effort necessary to refine the objectives and develop the course of action to obtain those objectives. The planning process develops the project management plan and associated documents. The project management plan becomes the primary source of information for how the project will be managed, executed, monitored, and controlled. This process group includes the following tasks:

- The process of collecting requirements is initiated to define and document stakeholders' needs to meet the project objectives. Requirements include the quantified needs of the stakeholders. Several techniques may be employed for collecting requirements, including observations, interviews, group facilitation, surveys, and prototype efforts. Requirements are analyzed and validated.

- Project activities will be defined to identify specific actions to be performed to produce the project deliverables. Activities will be identified, sequenced, estimated, and scheduled, providing budget and timeline for project monitoring and control.

- The PMO maps out an overall management plan from which resources, acquisitions, and sub-contracts can be identified, budgeted, and put in place. The business case will be re-assessed to ensure that the original assumptions and justification hold true. At this stage, many of the detailed management processes will be defined and initiated.

- Quality requirements and approaches will be defined and agreed upon during the project start-up. Typically there will be rules that apply to the routine work of the team plus specified quality audits at regularly scheduled intervals.

- Risks will be identified and assessed. Contingency plans and risk responses will be defined as appropriate. The risk management process will proactively monitor risks throughout the project and modify processes as appropriate.

- The need to communicate outside the team with other parts of the organization, customers, suppliers, and other parties will be assessed. A communications plan will be defined.

- Large projects inevitably require a procurement and accounting plan to handle expenditures on subcontractors, equipment, software, and facilities. Project accounting will monitor and control expenditure, both as a routine management activity and as part of the overall focus on delivering optimum benefits.

The goal of **Process Group III, Project Execution,** is to complete the work defined in the project management plans to the satisfaction of the project specifications. This process group includes the following tasks:

- An effective team will be acquired, managed, and nurtured through appropriate initiation, training, communications, and social events. This team may be comprised of the PMO team, or may be a secondary team organized for this purpose.

- All participants will be encouraged to communicate potential issues for resolution. The issues management process will ensure that they are considered and addressed.

- Perform quality assurance by auditing the requirements and the results from quality control measures to ensure adequate quality standards are used.

- Relevant project information is distributed to project stakeholders.

- Conduct procurements as needed, in which seller responses are evaluated, a seller is selected, and a contract executed.

Process Group IV, Project Monitoring and Control consists of those processes required to collect, analyze, and regulate the performance of the project. Project performance is observed and measured regularly to identify any variances from the plan. This process group includes the following tasks:

- The scope of the project and specific changes to the solution will be controlled through a change management process that proactively control changes and recommends preventive action in anticipation of possible problems , focusing on achieving optimum overall benefit.

- Versions of all deliverables will be controlled (whether temporary working papers or permanent outputs) through a configuration management process.

- A documentation management process as defined in the communication plan will ensure all information is available to all those who require it, and is subject to careful control over authorship, reviews, and updates.

- Organizational change issues will be assessed early in the project, ensuring all affected parties are ready and willing to change.

- User acceptance testing as defined in the quality plan is executed until users agree that project objectives and requirements have been met.

- Project monitoring will be conducted, including status reporting, progress measurement, and forecasting. These reports provide information on the project's performance on meeting scope, schedule, cost, resources, quality and risks.

- Where sub-contractors are involved, a management process to agree and monitor contracts will be established and followed.

Process Group V, Project Closeout occurs when all process groups have formally completed and verified that the project meets defined objectives. This process group includes the following tasks:

- Users will sign off on the user acceptance plan, acknowledging that all requirements have been satisfied.

- After the live solution has settled down, it is normal to organize a Post-Implementation Review to measure the success of the project, assess whether further improvements can be made, and document lessons learned for future projects.

- At the end of the project, there will be several activities to transition work, processes, and deliverables to line operation. The team also needs to ensure that filing and documentation is in good order, leaving behind sufficient detail for the operation of the system, audits concerning the project, and as a baseline for future maintenance and development. People, equipment, and facilities need to be demobilized.

- Procurements are closed.

The Project Management Office (PMO)

The project management office (PMO), as defined by the Project Management Institute, is "an organizational body or entity assigned various responsibilities related to the centralized and coordinated management" of projects. The primary function of the PMO is to support project managers by:

Managing shared resources across all projects	Establishing project management methods, standards and best practices	Demonstrating leadership – coaching, training, and oversight
Monitoring compliance to established standards, policies and procedures	Establishing standardized tools, templates, and documentation repository	

Utilities seeking more efficiency and tighter monitoring of projects are establishing a project management office (PMO). For years, engineering and information technology (IT) departments have struggled to deliver projects on time and within budget.

But with today's emphasis on achieving greater functionality, both engineering and IT have to manage projects more closely than ever before. That challenge has led many utilities to turn to project management offices (PMOs) as a way to boost engineering and IT efficiencies, cut costs, and improve on project delivery in terms of product and service quality, on time and within budget.

> engineering and IT have to manage projects more closely than ever before

PMOs can help utilities better manage projects by providing the structure needed to standardize project management practices and facilitate engineering and IT project portfolio management, as well as determine methodologies for repeatable processes. Project managers can use their established PMO standards and best practices as a base for continuous process improvement and training for new project managers.

There is no uniform or standard solution for establishing a PMO. To be successful, it's most important that the PMO structure closely fits a utility's corporate culture. The utility can benefit from seeking the expertise of an experienced industry consultant, who will assess the organization's current practices and project managers' skills and capabilities. Working with operations management, engineering, and IT, the consultant will facilitate requirements needed to design an organizational project flow that best meets the utility's needs for project quality and control.

There are two basic models of PMOs:

1 One that acts in a consulting capacity, providing project managers in business units with training, guidance and best practices.

2 A centralized version, with project managers on staff who are loaned out to business units to work on projects.

How a PMO is organized and staffed depends on a myriad of factors, including targeted goals, size of the utility, traditional strengths, and organizational culture. When deployed in line with an organization's culture, PMOs will help deliver strategic engineering and IT projects that satisfy both management and internal users. Over time, PMOs can save organizations money by enabling better resource management, reducing project failures, and supporting those projects that offer the biggest payback.

How to Establish a Project Management Office

The purpose of a PMO is to bring people, processes, and technology together to consistently deliver quality results. But implementing a PMO can encounter organizational push-back, passive resistance, or getting the work done under the operational rather than project structure.

At the beginning of the PMO process, there is usually a small decrease in productivity followed by an increase in project completion time after the implementation is complete. During the initial slow-down, it is important to have champions at the project and application manager levels who understand this dynamic and are willing to accept a temporary drop in productivity in exchange for faster implementations in the future. Buy-in at the executive level is also paramount, so make it a point to understand key stakeholder wants and needs, and address them early in the rollout.

How should a utility start? The project management organization must develop a phased rollout plan for establishing and implementing the PMO, because a high-performing PMO does not take form overnight. While there is no preset order for executing against this plan, below are three suggested steps on how to best implement a PMO into your organization:

Step 1: Document the "as is" process. Include all users. Verify.
Step 2: Analyze process against goals. Document "to be" process.
Step 3: Implement and evaluate the new process. *Do not slip back!*

Step 1

Documenting the "as is" process, allows stakeholders the opportunity to express both positive and negative experiences about the established pocesses and standards. The project mangement goals and objectives for the organization should be agreed upon and documented. The process of determining organizational project management needs and processes will highlight problems and best practices with existing standards. This process will create awareness of problem areas the organization currently faces.

Step 2

Analyzing the process against the goals, involves evaluating the alternatives against the stated goals and objectives. This step answers the question, "Will the alternative solve the problem as identified by the goals or objectives stated?" This process includes thoughtful group analysis of how stated goals are being met. If multiple proposed alternatives are identified, a selection process will have to be performed to determine the best solution. During this step, a risk assessment of proposed changes is developed. Risks are identified and analyzed. Consider the short- and long-term implications of costs, support from stakeholders, and potential problems.

Step 3

Implementing and evaluating the new process, should involve identifying a pilot project to evaluate the newly defined management structure and best practices put into place. To create a PMO that is a good cultural fit, the utility should start out with a well-defined process flow that relies heavily on input from project managers in the utility. You have to really understand the culture, look at industry standards and best practices, and tailor them to the organization.

A process flow diagram illustrating process steps from project request and resource planning through delivery and project closing should be followed. Implemented technology should be equipped to support a variety of features, such as idea management, project initiation, and project management. Other features to request in a solution could include portfolio management, planning and balancing, electronic timekeeping, project-level cost tracking, and project "health" dashboards and status reports.