# Liberty Utilities Granite State and Energy North Information Technology Plan

# Table Of Contents

# 1 Introduction

The Liberty Utilities Granite State and Energy North Information Technology (“IT”) Plan is the governing instrument for all activities related to the deployment of IT services, systems, software and support requirements for Granite State and Energy North. The document is arranged by first discussing Liberty’s Application Architecture, and then discussing IT Risk Mitigation and Controls. More specifically, the Risk Mitigation and Control section discusses the Transition Management Process, Change Management Process, Vender Selection and Management Processes and a description of the technologies used. The IT Plan – and the processes subordinate to it – represents general responsibilities that Liberty Utilities will bear and will serve as the “baseline” for evaluating Liberty Energy’s IT capital expenditures and operating expenses in the future.

This document is intended to be read together with the Liberty Utilities IT Migration Plan, a document which describes the specific activities that are to be undertaken to complete the IT Transition for Granite State and Energy North.

# 2 Granite State and Energy North IT Plan Overview

This section provides a general overview of the IT Plan, the IT framework, and the governance model employed. The governance model is also described in greater detail in the IT Risk Mitigation and Controls section.

## 2.1 Information Technology Goals

Liberty Utilities (Canada) Corp.’s (“Liberty”) IT goal is to provide our customers, and employees a complete infrastructure solution that is:

a. Secure

b. Scalable

c. Reliable

d. Efficient

e. Automated

f. Integrated

At the core of its infrastructure, Liberty uses an “Application Architecture” that leverages Microsoft Dynamics Enterprise Resource Planning and its partners to meet Liberty’s business application needs. Liberty’s Application Architecture provides an overarching blueprint of Liberty’s IT system that shows how all of the various applications work together to create a seamless IT package for the individual utilities. Liberty also has technology standards, which are set forth below in the Technology Selection section, for all major technology categories.  Liberty uses the same Application Architecture and technology standards across all of its utilities.  It is Liberty's corporate philosophy to minimize customization to Liberty's Application Architecture to leverage efficient business process and to ensure the Application Architecture can grow to support Liberty's growth plans.  This philosophy ensures a scalable and upgradeable technology environment.

When Liberty acquires a new utility the applications currently in use in the utility are inventoried and compared functional to Liberty's Application Architecture.  Any missing functionality is identified and the Application Architecture is revised to include new functionality with additional technology and possible vendors. This process was used in NH and has resulted in applications that either a) have been proven to be effective within Liberty's current portfolio, or b) have been used by National Grid in the operation of Granite State or Energy North.  This process, including the inventory of applications, is documented in further detail in the IT Migration Plan.

## 2.2 IT Framework

Supporting the IT framework is a robust organization that is divided in to three major categories as described below.

Figure 1 - Liberty Utilities IT Framework

| Applications Management | Infrastructure Management | Services Management |
|---|---|---|
| 1. Enterprise Resource Planning<br>• Finance<br>• Work Management<br>2. Engineering and Operations<br>• Design<br>• Capacity Planning<br>• GIS<br>• Control Room<br>• Outage Management<br>3. Meter to Cash<br>• Customer Service<br>• Billing<br>• Metering | Data Centers<br>Network<br>Local IT Systems<br>Corporate IT<br>Change Management<br>Security | Application Delivery<br>IT Business Continuity/Disaster Recovery<br>• (Backup / Recovery)<br>Help Desk<br>Monitoring/Reporting<br>Quality Assurance<br>System Provisioning<br>Vendor Relations |

The following is a brief description of each major category:

*Applications Management:*

Liberty manages its IT applications through its documented Application Architecture (see section 3 below). This architecture is described further in section 3 and is updated based on new business needs as well as through review of business functions during the acquisitions process.

*Infrastructure Management*

Liberty manages its IT infrastructure though sound selection of hardware and network vendors, strong Change Management process and heighten security awareness programs. These are detailed in later sections of this report.

*Services Management:*

Liberty ensures that the quality of the IT services provided meet Liberty's needs by having a robust Quality Assurance process (see section 9 of report for more details), having a strong help desk with monitoring and reporting as well as an application delivery process (see IT Migration Plan for more details).

## 2.3 Transition Support

Liberty has established a comprehensive Planning and Governance Framework that falls under the responsibility of the Transition Management Office ("TMO"). The "TMO" has oversight over the integration of all new acquisitions including all IT Projects related to these acquisitions.

The "TMO" has developed project planning, reporting and governance standards and tools that all functional groups adhere to, including the IT group. These standards and tools ensure that projects are planned and executed in an efficient and effective manner.

In addition to assisting functional groups in developing detailed project plans the "TMO" also reviews progress, provides status reporting, conducts readiness assessments and coordinates the various Steering and Governance committees. The governance process also includes a transparent issue resolution process which has been documented and communicated to the organization.

The functions of the TMO and the governance process are described further in section 4.4 below.

## 2.4 Summary

Through its significant focus on Transition Management, the Application Architecture can be deployed using a standardized approach to ensure a seamless transition. By separating the IT framework into Applications, Infrastructure, and Services, Liberty is able to effectively and efficiently manage its IT operations. Further, through the resources of a dedicated TMO, Liberty ensures that transitions are managed effectively, with a focus on eliminating any customer impacts and minimizing costs.

# 3 Application Architecture

Liberty's Application Architecture provides an overarching blueprint of Liberty's IT system that shows how all of the various applications work together to create a seamless IT package for the individual utilities. Liberty's Application Architecture is based on the Microsoft Dynamics Enterprise Resource Planning offering and its associated certified Microsoft Dynamics Vendors.

The primary component of Microsoft Dynamics Enterprise Resource Planning is Microsoft Dynamics Great Plains ("Microsoft GP"). Microsoft GP has been in existence for over 25 years and has delivered the functionality, performance, and ease of use that powers 40,000 diverse businesses around the world. Microsoft GP's out of the box functionality can be adapted to meet unique needs, backed by industry-specific expertise and support from a worldwide, local ecosystem of Microsoft Certified Partners and ISVs (independent software vendors) such as WennSoft, which Liberty uses for work order management. WennSoft is a leader in providing operational solutions for organizations focused on work orders, asset management, installation, field service and maintenance across asset and equipment centric industries. WennSoft serves customers worldwide directly and through a global network of local partners. As Microsoft partner, the WennSoft products are certified for Microsoft Dynamics.

The Application Architecture at Liberty is broken down into three areas as identified in Figure 2:

1. Enterprise Resource Planning ("ERP") (clear label in Figure 2)
2. Engineering and Operations (blue label in Figure 2)
3. Meter to Cash (green label in Figure 2)

To increase efficiency and manageability, Liberty's Application Architecture is organized around the software module, not the user, which means that users from all three areas may access software in any particular category if the business need requires (i.e. not all users have access to all software; this is controlled by the IT department). Assigning the software module to a particular area is the first step. Next, Liberty determines whether the integration with existing applications will be accomplished by:

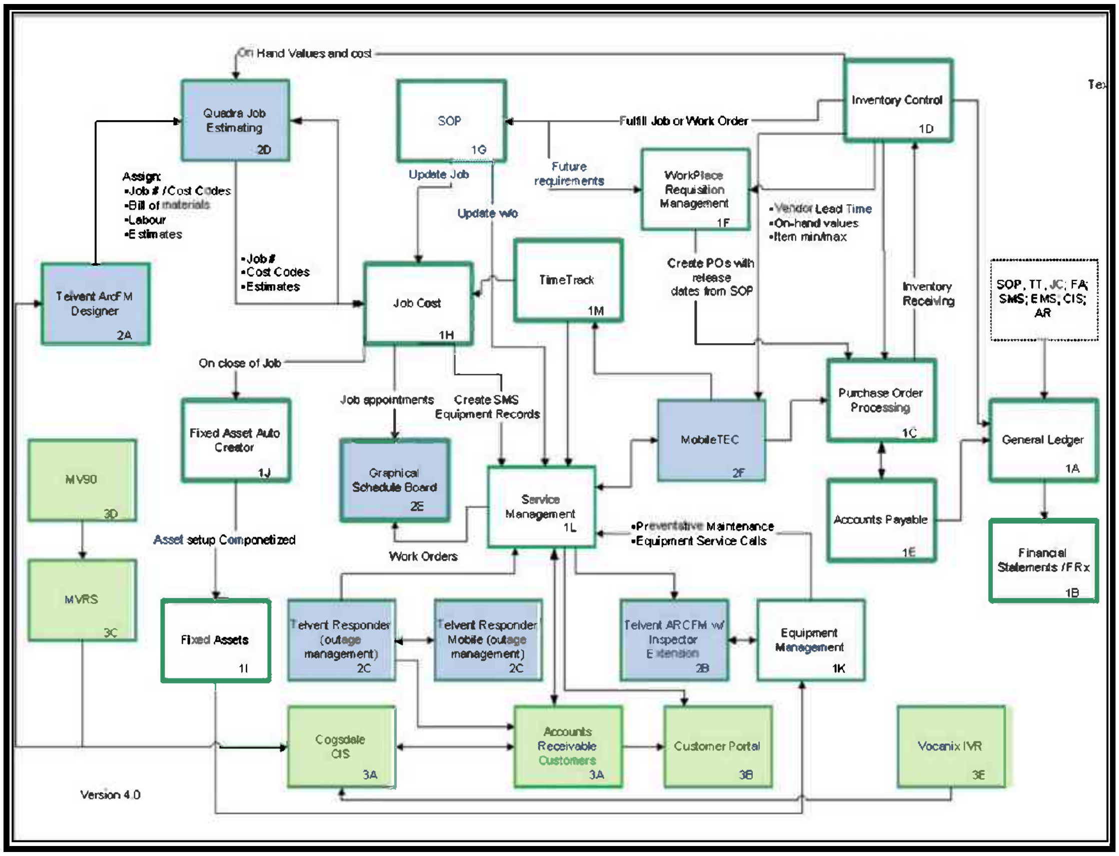
(i) using built in Dexterity code;

(ii) using Integration framework (SDK);or

(iii) building custom code. As discussed later, Liberty has tried to limit the number of custom coding in its environment allowing for all future developments to utilize the Microsoft GP release management strategy. This is a key distinction in Liberty's Application Architecture compared to other utility companies.

Figure 2 below outlines the Application Architecture that Liberty has developed to integrate EnergyNorth and Granite State into the overarching Liberty IT infrastructure. The diagram shows the major components/applications, which are represented by boxes, with the arrows representing the integration between the software modules. The integration is accomplished through a combination of Dexterity Code, native Dynamics, and SDK, vendor supported interfaces.

Figure 2 - Liberty Utilities Application Architecture



A more detailed look at the major components of the Application Architecture, cross referenced to Figure 2 is outlined below:

1) Enterprise Resource Planning

| | | | |
|---|---|---|---|
| General Ledger | Financial Statements/FRx | Purchase Order Processing | Inventory Control |
| Workplace Requisition Management | Accounts Payable | Sales Order Processing | Job Cost |
| Fixed Assets | Fixed Asset Auto Creator | Equipment Management Series | Service Management Series |
| Time Track | | | |

*1A General Ledger (i)*[1]*:*

This is a core component of the Microsoft GP solution. This is used by the finance department to setup the chart of accounts and the basis for the financial statements. There is no customization done to the G/L module but by its nature it becomes end destination for multiple transactions.

1B*FRx (i):*

This application is a Microsoft solution for financial statements and consolidated reporting so it follows Microsoft's release management strategy. Board filings as well as Profit and Loss and Balance Sheet statements are defined within FRx Report Designer. This application is used by the finance department

1C*Purchase Order Processing (i)*

This is a core component of the Microsoft GP solution. This module is used by the entire company for the creation of purchase orders ("PO(s)") (*e.g.*, material and/or sub-contractors purchase orders). This module itself is not customized but Workplace Requisition Management ("Workplace") will be integrated with this module. This places all the business processes, reviews, and approvals within Workplace while all downstream functions are covered by Microsoft GP.

1D*Inventory Control (i)*

This is a core component of the Microsoft GP solution. This is used by everyone involved in the procurement, receipt, transfers and maintenance of a warehouse. There are no customizations made to this module.

1E*Accounts Payables (i)*

This is a core component of the Microsoft GP solution. This module is used by the finance department. There are no customizations done to this module.

1F*Workplace Requisition Management (ii)*

This is a third party application created by Paramount. Workplace is a robust web-based procurement solution that allows Liberty's organization to automate the complete procurement cycle from product selection to requisitioning to approval. After approval, the requisition is converted to a PO within the Purchase Order Processing module and then follows the rest of

[1] This designates which integration method is being utilized, as defined on page 6.

the Microsoft GP flow. The integrations for this conversion are created using the tools from Microsoft and follow their release management strategy.

1G*Sales Order Processing (i)*

This is a core component of the Microsoft GP solution. You can use Sales Order Processing to enter and print quotes, orders, invoices, back orders, and returns individually or in batches. You also can use Sales Order Processing to complete the following tasks: transfer customer information from one document type to another; and transfer item information and quantities from one document type to another. This is the module used to issue material to jobs.

1H *Job Cost (i)*

This is a third party application created by WennSoft. Job Cost allows us to manage costs by closely tracking all components of projects, including subcontractor, labor, materials, equipment, and other defined costs. Job Cost also allows us to analyze current and past projects to improve efficiencies by: (1) comparing key performance indicators;(ii) seeing estimated, committed and actual costs for any project phase; and (iii) drilling down to detailed source documents. Lastly, Job Cost allows us to manage a high volume of vendors and subcontractors and easily connect subcontractors to specific jobs.

1I *Fixed Assets (i)*

This is a core component of the Microsoft GP solution. You can use Fixed Asset Management to set up, enter, and maintain asset records. When necessary, you can add insurance and user-defined information and create additional records for each asset. There are no customizations to this module but the First Asset Auto Creator ("FAAC") uses this module as its destination for the continuation of the Dynamics flow.

1J *Fixed Asset Auto Creator (iii)*

This is our only piece of custom code created by our VAR (value-added reseller) BDO. There is no product in the marketplace with the functionality to facilitate the complex migration of full costs into GP plant/fixed assets. Although this is a custom application created by BDO, it is not specific to our utility. There are over eight utilities in the market already using FAAC.

1K*Equipment Management Series (i)*

This is a third party application created by WennSoft. The Equipment Management Series ("EMS") (i) tracks complex "parent" and "child" relationships; (ii) streamlines invoicing;(iii) details revenue, fixed assets and depreciation tracking; and (iv) allows us to easily drill-down to source documents. This component improves the management of costs and profitability by providing detailed maintenance, repair, and transportation cost tracking. EMS increases efficiency and ensures safety and compliance by establishing automated preventive maintenance schedules based on meter readings and/or specified dates.1L*Service Management Series (i)*

This is a third party application created by WennSoft. The Service Management Series modules automatically integrate with Microsoft GP accounting modules during the installation. In an integrated system, the boundaries between modules are erased because information entered in one module is shared with other modules. An important benefit of integration is that cost transactions can be posted simultaneously to the Service Management Series and Microsoft GP accounting modules.

1M *Time Track (i)*

This is a third party application created by WennSoft. With WennSoft's Time Track, information entered once can be processed and used by multiple modules including Payroll, Payables Management, Job Cost, Service Management, Equipment Management and General Ledger. You can capture, track, review, approve and post expenses to various projects/jobs or service calls.

2) Engineering and Operations

| | | | |
|---|---|---|---|
| TelventArcFM Designer | TelventArcFM w/ Inspector Extension | Telvent Responder OMS | Telvent Responder Mobile OMS |
| Quadra Estimating | Graphical Schedule Board | MobileTEC | |

2A *TelventArcFM Designer (ii)*

This application is an extension of the ArcFM solution. TelventArcFMDesigner ("Designer") provides an integrated design solution for utilities of any size through an intuitive graphical user interface. Designer leverages on a unified solution platform, using a single, configurable, architecture. Building on the ArcGIS architecture, Designer is an integrated design solution that minimizes data redundancy, improves the accuracy and consistency of corporate data assets, and offers a range of functionality to support the diverse needs within a utility. Designer can be deployed for mobile use to allow designs and as-builds to be done in the field and incorporated into an overall workflow.

2B*TelventArcFM w/ Inspector Extension (ii)*

TelventArcFMwith Inspector Extension (“ArcFM”) is a complete Graphical Information System (“GIS”) utility solution for modeling, editing, maintaining, and managing facility asset data in an enterprise system. ArcFM comes with complete data architecture for defining feature behavior through one common, customizable methodology for the data model, data control, and interface. ArcFM provides configurable extensions such as feeder manager, pipe abandon tools, and network analysis. It includes tracing tasks to automate utility operations and an extensive set of editing tools, such as automated symbol rotation, complex feature and user favorite creation, and tools to quickly define and recall map sheet collections for map production. ArcFM is also mobile-enabled, so crews can support editing in the field.

2C *Telvent Responder OMS(ii) and Mobile (ii)*

This application is an extension of the ArcFM solution. TelventResponder OMS and Mobile (“Responder”) is a GIS-hosted Outage Management System (“OMS”) that leverages .NET and ASP technology to enable trouble call and outage incident management in a web-based, scalable, and configurable desktop environment. The Responder Trouble Call Analysis (TCA) Engine uses a sophisticated and iterative prediction algorithm to determine which interruptible network device caused an outage. High performance GIS display capabilities allow utility personnel to have a spatial view of the locations of trouble calls enabling analysis of outages and immediate dispatch of crews. The application also supports historical archiving and performance indices reporting.

2D *Quadra Estimating (ii)*

This is a third party application created by ERTH. The Quadra product will provide Liberty with job template creation, assembly (Work Units) creation, cost code mapping, markup control, reports such as bill of materials, progress reporting, estimating by location for easy GIS integration, quote generation and Microsoft GP/WennSoft integration.

2E *Graphical Schedule Board (i)*

This is a third party application created by WennSoft. The WennSoft Graphical Schedule Board allows dispatchers to easily sort, filter and schedule appointments using a visual representation of scheduled service, including assigned, unassigned and unscheduled appointments.

2F *MobileTEC (i)*

This is a third party application created by WennSoft. MobileTEC Laptop wirelessly connects remote technicians to a host system. Technicians can receive appointments as they are created on the host system. Appointment details such as estimated hours, description, location, and service call history are transmitted with the appointment. The technician can update the appointment with expense and resolution details.

3) Meter to Cash

| | | |
|---|---|---|
| Cogsdale CIS | Customer Portal | MVRS |
| MV90 | Vocantas IVR | |

3A *Cogsdale (CIS) (i)*

Customer information application vendor Cogsdale supports a range of services including water, sewage, electricity, and gas. Cogsdale CIS is a full featured, highly configurable system that has functionality as it relates to Customer Service, Billing, Credit and Collections, Meter, Meter Reading, Finance, and Cash. It is designed to integrate with other systems to support the transactions as it relates to the aforementioned functions.

3B *Customer Portal (ii)*

WEB is a third party solution that integrates with Cogsdale CIS to provide customers with self-service options over the web such as account information, payment, and bill presentment.

3C*MVRS (ii)*

3C MVRS is a meter reading software by ITRON that is used for data collection and route management by ITRON handheld computers, mobile collection systems, and optical and touch probes. Non interval meter reading files from MVRS are processed and billed by Cogsdale(CIS).

3D *MV90 (ii)*

3D MV90 is solution for interval meter data collection, management and analysis. The system collects data for complex metering devices typically used for large and commercial industrial customers. This meter reading information is then used by CIS for billing purposes.

3E*VOCANTAS (ii)*

3E Vocantas is an Interactive Voice Response ("IVR") self-service solution, which integrates with Cogsdale CIS. 3E Vocantas provides customers with self-service options over the phone such as account information, payment, and meter reading updates

# 4 Risk Mitigation and Control

This section describes the major components of IT Controls and Risk Mitigation in place to ensure that the Application Architecture can be deployed to effect a seamless transition.

## 4.1 Technology Selection Process

The goal of the technology selection process is to ensure that Liberty's technology platform is stable and efficient. For this reason, technology selection focuses on products with a proven track record. Liberty accomplishes this goal by purchasing from leading vendors who specialize in software solutions for mid-sized companies. Choosing products with a proven track record minimizes service interruptions and operational impacts to utility customers. Additionally, it is Liberty's corporate philosophy to minimize customization to Liberty's Application Architecture to leverage efficient business process and ensure the Application Architecture can grow to support Liberty's growth plans, thereby ensuring a scalable and upgradeable technology environment.

For the Granite State and Energy North acquisition, Liberty selected scalable, out of the box technology that is based on technology platforms that are currently in use and have been successfully implemented by Liberty and/or National Grid.

### 4.1.1 Networking

Cisco Systems ("Cisco") is Liberty's standard for switching, router and voice over IP provider. Cisco is a world leader in these areas and is used across the Liberty family as well as National Grid.

Cisco switches and routers were chosen for New Hampshire for the following reasons:

- They allow for standardization of interfacing with Cisco Phones, which are already in use at the Energy North locations.
- The Cisco Call Manager product supports the distributed call center requirements.
- Cisco is a world leader in the networking space and 70% of the networks rely on Cisco proven technology.
- The Cisco Integrated Services Router Technology product is modular. The Cisco router can be configured into a voice gateway, routing, switching, firewall, wireless system.
- Cisco has the premier technical support team (TAC). It is easy to find a certified resource, because CISCO has a world wide support team.
- Cisco is the only vendor with a complete end-to-end solution including but not limited to voice, data, video, collaboration, and wireless.
- CISCO training is easily available worldwide at either a CISCO Academy or through its certified training partners, such as Century Link

- Cisco continually advances the operating systems with enhanced features and functionality using the existing hardware
- Security is built into the product and the model is consistent across the technologies from wireless to LAN to WAN

### 4.1.2 Desktop

Dell is a world leader in desktop and laptop computer manufacturing and support. It is Liberty's standard for desktop and laptop computers and is used exclusively throughout the Liberty family. As it is Liberty's standard, it will be implemented at Granite State and Energy North.

Dell desktops and laptops were the chosen standard for Liberty five years ago and have remained the standard because:

- In Liberty's experience, Dell provides a higher quality of service than IBM or HP.
- Dell allows us to directly order computers from the manufacture, which is preferable because it eliminates the middleman.
- Dell's KACE desktop and laptop management solution is integrated with Dell which allows PC images to be kept in KACE, thus ensuring standardization across the company.
- KACE management system tracks service orders and updates performed on PCs. It can also send updates and programs to the PCs.

### 4.1.3 Server

Dell is a world leader in Intel-based server manufacturing and support. It is Liberty's standard for server technology, and Dell Servers are used exclusively throughout the Liberty family. As it is Liberty's standard, it will be implemented at Granite State and Energy North

### 4.1.4 Office Automation

The Microsoft Office 2010 suite and Microsoft SharePoint are Liberty's standard for office automation software. Liberty has chosen Microsoft for two reasons. First, Microsoft Corp. is the world's leading provider of office automation software. Second, the Microsoft Product Suite integrates with Microsoft GP, which Liberty's finance department uses, and Microsoft SharePoint integrates with Wennsoft and Cogsdale. Because it integrates with Liberty's other software modules, it is the best choice and thus will be implemented at Granite State and Energy North

### 4.1.5 Telephony

Cisco is also Liberty's standard for providing Voiceover IP (VoIP)for telephony equipment. As it is Liberty's standard it will be implemented at Granite State and Energy North.

The Cisco VoIP technology was selected because:

- It can be fully integrated into other Cisco product offerings. Additionally, it allows Liberty to reduce the number of vendor, which facilitates Liberty's vendor management.
- It is currently in use at Energy North.
- The CISCO network provides the ability for a distributed call center. Cisco has a full feature set for call centers and proven implementations with distributed environments.

Liberty's critical business applications for customer service and reliability are organized into 3 categories:

### 4.1.6 Enterprise Resource Planning (ERP) Systems

Liberty's ERP platform is Microsoft GP software. Microsoft GP (formerly Microsoft Great Plains) is a comprehensive business-management solution built on the highly scalable and affordable platform of Microsoft technologies.

Microsoft GP works with and like other Microsoft products that are well known throughout businesses worldwide, which makes them user friendly. Employees will be able to use Microsoft GP to access and communicate information managed within the system. It offers a cost-effective solution for managing and integrating:

- Finances
- E-commerce
- Supply Chain
- Manufacturing
- Project Accounting
- Field Service
- Customer Relationships
- Human Resources

Microsoft GPis primarily a financial system. Microsoft GP is one of the most popular ERP applications in the world. Liberty has been using Microsoft GP at its water utilities for over 10 years and is also using it at its electric utility.

WennSoft is a Microsoft GPsoftware partner that provides construction work order management software for the energy sector. It has complete integration with Microsoft GP and Cogsdale. Wennsoft has been used throughout the Liberty family for the last 10 years.

### 4.1.7 Engineering & Operations Systems

Telvent is a dominant information systems provider in the energy industry. Every energy company in the Fortune 100 relies on Telvent systems and information to manage their business. Telvent is also able to be used to manage water distribution systems.

The Telvent utilities suite is a fully integrated gas and electric application set that covers everything from design, grid/network operation, and control room operations to outage management. It consists of the following modules: Designer, GIS, OaSys SCADA and Responder Outage Management. Using GIS information as the foundation, the Telvent suite provides control room operators and engineers with a comprehensive toolset to design projects as well as assists in locating the source of service interruptions. Telvent software is currently in use throughout the Liberty family and has been used at Energy North for 10 years.

Telvent was selected as Liberty's vendor because:

- It provides design and operations modules for gas, electric, and water.
- It has a large suite of integrated products including: Outage Management, GIS, Designer, Meter Data Management, SCADA, and Distribution Management.
- The Telvent Responder Outage management system leverages GIS for trouble call analysis, reporting, and network management. This allows for centralized control, dispatch, and customer service for both gas and electric. Information is presented in graphical formats, which makes it easy to follow and troubleshoot problems
- It has integration into Microsoft Dynamics technical environment.
- It is the Energy North application standard, which reduces implementation risk in data conversion and business change.
- Reviews were performed on similar products (Oracle GIS, Survalent, SCADA , and ABB), and these systems were found to be less tightly integrated or too proprietary as well to be complex to integrate.
- The Telvent products are all Microsoft Server and Microsoft Sql database compatible. As Liberty's complete IT solution is based on Microsoft SQL 2008, this allows for easy integration with the existing applications.
- Telvent provides the ability to integrate with financial, work management and customer information systems through standard integration criteria. It supports Multi-Speak and the Common Interconnection Model.

### 4.1.8 Meter-to-Cash Systems

*Cogsdale:*

CogsdaleCSM is a complete customer information and billing management solution that can handle everything from the most complex multi-service utility billing requirements of electric, gas, water, cable, and sewer utilities through to local government changes of licenses, permits, and code enforcement. Cogsdale has been licensed to over 300 sites worldwide and is completely integrated and built within the Microsoft GP platform.

Cogsdale and Microsoft GP' technology offers easy customization features, which means Liberty does not have to incur costly source code changes. Cogsdale CSM leverages tools from Microsoft GP that allow staff members (with proper security rights) to easily change screen functionality. Cogsdale CSM is fully enabled with Modifier andVisual Basic for Applications, the industry-standard tool for adding functionality to software solutions. Modifier allows users to make any necessary screen modifications without changing the underlying source code. Because the source code is not changed, modifications are protected when system upgrades are applied.

Cogsdale was selected as Liberty's CIS vendor over 10 years ago because:

- It provides complex customer management, billing, and metering integration for water and sewer utilities.
- Cogsdale's target market was small to mid-size utilities, and its implementation costs were lower than competitors.
- It was fully integrated into Microsoft Dynamics technical environment

Cogsdale was reconfirmed two years ago for CalPeco and future utility acquisitions because:

- Cogsdale has a proven track record in our water utilities and is in use in hundreds of other electric and gas utilities.
- It provides support for water, electric and gas utilities.
- Cogsdale continues to seamlessly integrate into the Microsoft GP ERP.

*Itron*

Itron is the leading provider of energy and water resource management solutions for nearly 8,000 utilities around the world. Itron offers end-to-end solutions that include electricity, gas, water and thermal energy measurement and control technology; communications systems; software; and professional services. With the acquisition of Liberty's California electric utility in 2011, Liberty adopted Itron as its metering software standard. Itron works well with Liberty's Application Architecture, because Cogsdale has standard interfaces for Itron products. Itron was a logical choice for Granite State and EnergyNorth based on its use at EnergyNorth over the last ten years.

## 4.2 Vendor Selection Process

The Liberty IT department is focused on Liberty's overall goals of providing customers with excellent customer service and reliable access to water, gas and electricity. For this reason, Liberty's IT staff is focused on business application management and analyst and service management functions. Liberty has strategically not hired full-time permanent IT staff to focus on software development and construction, as this is not a core competency needed to achieve Liberty's overall goals. Instead, Liberty leverages third party vendors to perform this activity.

While many vendor selections are driven by the technology selection process (typically the provider of the technology is also the vendor), where there are multiple vendors available, the IT group has implemented the following procedures for selecting a vendor.  Leading vendors in the area are asked to respond to a set of questions that are designed to evaluate the:

Vendor Viability — The company's overall stability, experience in providing the required services, experience with the utility sector, nationwide presence and likelihood of being able to fulfill the contract.

Business Functionality — The company's understanding of Liberty's business requirements and their ability to meet those requirements.

Pricing — Transactional pricing and implementation costs.

IT Support — Post implementation support, business continuity and disaster recovery.

These categories are weighted based on relevance to the specific project. For example, a project may be weighed as follows:  Vendor Viability – 10%, Business Functionality – 50%, Pricing – 30% and IT Support – 10%. The vendors' responses are then scored from 1 – 5 with 1 generally meaning the candidate provided inadequate support and 5 meaning the candidate met all of Liberty's requirements. Grading of the responses to the questions is not comparative, meaning it was possible for more than one candidate to have a score of 5 if they met all of the criteria.  Pricing is scored in a similar fashion but in this case the scoring was comparative meaning the candidate offering the lowest price was given a score of 5, second lowest given a score of 4, and so on.

If a leading vendor emerges after the scoring, oral presentations of shortlisted vendors are not required.  However if there is not a leading vendor, the top contenders will be asked to make an oral presentation.  Once a top vendor is selected they will be brought in for a detailed review of the company's structure, their service offerings and their proposal to Liberty in order to validate their capability to deliver Liberty's requirements. Additionally, reference checks will be performed.

Appendix A provides an example of a recent vendor selection process that utilizes this methodology. It is Liberty's intention to use this type of process to select vendors for major initiatives/projects on a going forward basis.

Once a vendor is selected, the Vendor Management Process below is initiated.

## 4.3 Vendor Management Process

To ensure the quality of third party vendor deliverables, all third party contracts contain a description of the deliverables due under the contract and the cost for each deliverable.  Prior to releasing funds under the contract, the deliverable must satisfy Liberty's quality acceptance standard.

For all third party contract staff and consulting service providers who require access to Liberty's physical and/or technological resources, a security addendum (attached as Appendix B) is used to inform vendors of and help enforce Liberty's third party access policy.  These vendors must also conform to Liberty's Change and Quality Management processes.

## 4.4 IT Governance Structure

In order to ensure smooth, seamless integrations, Liberty has established a comprehensive Governance Approach that is used for managing all new acquisitions. Oversight of IT projects falls within this overall Governance Structure. Key elements of this approach include the following:

### 4.4.1 Transition Governance Committee

For each acquisition a Steering Committee made up of Senior Executives from Liberty Utilities and the selling organization is established. This group would generally meet on a bi-weekly basis and review Project Status, Progress, Issues and Risks. They are responsible for resolving issues and securing resources that cannot be resolved by the various project teams.

### 4.4.2 Transition Management Office

The TMO oversees the transition and integration of all new Liberty acquisitions. They work with the functional leads from Liberty and the selling organizations to ensure that each acquisition is transitioned in a smooth and seamless way. The group is responsible for ensuring that each transition is properly planned, that progress is monitored and that issues and risks are identified and resolved in a timely manner. For significant acquisitions, a full time Program Manager is assigned to support the various teams and committees. The TMO supports the broader organization in developing appropriate plans. They also collect and summarize weekly status reports, identify risks and issues, conduct 'readiness assessments' and they provide reports to the Governance and Steering Committees. The Governance Model and Project Management approach established by this group is applied to Day 1 planning, Day 'N' planning and IT planning.

### 4.4.3 IT Steering Committee

The IT Steering Committee is responsible for implementing the IT Applications and Infrastructure Plans. The Committee is made up of IT Executives and Senior Managers from both Liberty and the selling organization. These individuals control the resources and operations required to implement the IT plan or have the authority to secure additional resources that may be required during the lifecycle of their projects. The Liberty members of this group have management responsibilities for running Liberty's IT operation. On the selling side, the representatives support the IT Transition and work with Liberty to ensure that the IT projects are properly planned, staffed and executed. The TMO assigns a resource to support this committee and to ensure proper reporting of progress, issues and risks to the Transition Governance/Steering Group.

### 4.4.4 Security Compliance Process

In preparation for upcoming transitions and changes to the Liberty Application Architecture, Liberty has undergone a third party security assessment to evaluate Liberty's network security compliance with the

International Organization for Standardization ("ISO") Standard 2700-1 and Sarbanes Oxley ("SOX") requirements ("Baseline Assessment"). At such time as the New Hampshire IT Migration Plan is fully implemented, Liberty will conduct another third party security assessment. Any instances of non-compliance with ISO Standard 2700-1 identified by this second security assessment will be resolved. Liberty engaged world class security expert Price Waterhouse Coopers ("PWC") to perform its Baseline Assessment (see Appendix C for a signed Statement of Work). PWC has also been retained to advise Liberty on security threats as well as procedures to improve Liberty's security process.

## 4.5 IT Change Management Process

With the expected amount of new application implementation at Granite State and Energy North, the IT department needs to ensure that Liberty's infrastructure is reliable for Liberty's employees so that customer service levels can be maintained. For this reason, Liberty has a documented change management process to ensure that any change is reviewed and appropriately test before it is placed into production.

The review of changes includes a mandatory review by the Change Approval Board (CAB), which is made up of technology experts from across Liberty, to discuss the impact of any change. The change must be approved by both business and technology management as well. Please refer to Appendix D.

## 4.6 Quality Assurance and Acceptance

The goal of quality assurance and acceptance at Liberty is to improve end-user and customer satisfaction with business applications, as well as to eliminate business interruption during and after application implementation. During the Granite State and Energy North transition, Liberty will ensure that this goal is met by having all applications tested before they are moved into production.

Liberty will also have the following standard documentation in place:

- Program/Project Test Plans( See Appendix E for template) are documents that capture testing strategies, approaches, time-lines and resources, as well as acceptance methods. They will document the types of testing required and when they occur.
- Program/Project Test Cases is a documentation that describes the business transactions and flows that the Project/Program will effect within an application and/or across applications
- Program/Project Test Scenarios are the decomposition of "Test Cases" to determine the different forms of transactions and document them into procedural steps that can be repeated by testers. These scenarios are tracked and reported for program/project management reporting and final acceptance

The Program/Project Test Plans will include the following testing:

- Application is the running of documented test scenarios against an application to ensure quality of the application and acceptance. The sub-types of this testing are:
  - Unit which uses test scenarios to evaluate quality of code as it is received from the software vendor.
  - Configuration which uses testing scenarios to evaluate the quality of the configuration that has been entered into the software package by the program/project team
  - Data Conversion which tests the data that is loaded into the application from the historical application that it is replacing to ensure the quality of the information loaded.
- System Integration which test the interfaces and other integration across applications to ensure that the transaction cross application functions to specification.
- Performance and Capacity which tests the response time of the application as well as the appropriate thresholds of transaction volumes to ensure continued long term performance reliability of the application and/or interface.
- User Acceptancewhich enables the actual end-users/customers to use documented test scenarios and their own testing to facilitate the implementation approvals of the application(s).
- IT steering Committee will sign off on implementations to production presented to them after user acceptance.

## 4.7 IT Business Continuity

Reliable access to Liberty's technology infrastructure and business applications is essential for customer satisfaction as well as operating safe and reliable utility networks. For this reason, regional IT Business Continuity/ IT Disaster Recovery Plans are created and updated yearly (see Appendix G for an example).

Liberty builds reliability into its technology bythe use of utility industry standard hardware and software. Liberty's partnership with Century Link and Savvis establishes the design and deployment of network and data center infrastructure to support high level of service to prevent downtime and business interruptions.

A common set of applications across the electric , gas and water utility divisions ensures reliable customer service, operations and control, design and engineering, finance and work management systems, regulatory and reporting systems, environmental and safety management, metering and other critical applications within the management of utilities. The common set of applications allows for development of standard service levels, knowledge and training, redundancy and failover, and vendor support.

The hardware required to support all levels of business will follow standards in deployment to ensure: recovery time objectives are met, security of network and systems, fault tolerance, proactive and real time monitoring, logical separation of data communications, backup and recovery testing of critical applications, ability to fail over servers and systems, regular audits, and performance measures.

# 5 Conclusion

Through its significant focus on Transition Management, the Application Architecture can be deployed using a standardized approach to ensure a seamless transition. This is completed by focusing on IT Controls, including Quality, Change Management, and Business Continuity Planning.

The specific elements of this IT Plan are then used to develop the IT Migration Plan, which provides specific detail on a project by project basis, including timelines, testing plans, change management processes and quality assurance.

# 6 APPENDICES

# Appendix A

Vendor Selection Process Example

# Liberty Utilities:
# Bill Print, E-Bill and Lock Box Processing
# Vendor Selection

## Final Report and Recommendations

March 9, 2012

# Table of Contents

## Executive Summary

Liberty Utilities (Liberty) has determined that they wish to consolidate their bill printing services and choose a vendor which also harmonizes bill print with electronic bill presentation (ebill) and lock-box (payment) under a single third party service provider; the ability to support walk-in payment centres in nationwide locations such as Wal-Mart was also desirable. This decision was based on a desire to reduce cost through preferred pricing and lower exception costs from a single vendor solution. Additionally Liberty has stated a strategic desire to ensure consistency across its four regions and service issues with the incumbent service providers in some regions.

Kubra (Liberty Central incumbent to be), Captum (Liberty South and West incumbent), Best Practices and Fiserv were asked to provide proposals for supplying the required services. Their responses were evaluated based on Vendor Viability (10%), Business Functionality (50%), Pricing (30%) and IT Support (10%).

Fiserv emerged as the leading vendor in all four categories; assuming current volumes it is estimated that Liberty will reduce annual costs for bill printing by about $325,000.00 (all figures in US dollars) which represents a 33% saving. It is, therefore, recommended that Liberty begin more detailed evaluation and enters into negotiations with Fiserv.

## Objectives

Liberty had four objectives for moving to a single service provider:

1. Reduce costs.

   By moving to a single provider, Liberty sought to obtain preferred pricing for all three services. They further sought to reduce the cost of processing payment exceptions because the vendor will have access to the original bill files.

2. Ensure consistency across all regions.

   Liberty currently employs two print vendors (Captum and Kubra). They believe that a single vendor will allow them to easily create a similar look and feel for bills and ebill presentation across the organization. A single vendor will also ensure that service levels across all regions are identical.

3. Address service issues

   Liberty's Southern region has been dissatisfied with their current lock-box service and were investigating the possibility of performing this service internally; the costs for such a move would be prohibitive and selecting a new third party vendor is a more feasible solution. Additionally, their contract for lock-box processing in their Western region expires July 1, 2012 and a new service provider was urgently required.

4. Walk In payment centres

   Liberty has a nationwide presence and much of its customer base is located in rural areas. Moreover, part of Liberty's mission is to maintain a local presence and be part of the communities that they serve. It was important, therefore, that the service provider be partnered with national and/or large regional retailers that provide walk in payment services.

## Methodology

Liberty engaged the services of Sky Energy Consulting to consolidate the pricing and service offerings from Kubra, Captum, Best Practices and Fiserv. The Sky consultants reported to Liberty project sponsors: David Carleton, Director, Information Technology and Katy Cook, Director, Customer Care Strategy who were kept informed of project status regularly throughout the project and who accepted all project deliverables. Sky Energy was also asked to act as a liaison with the four candidates to ensure that all proposals were based on a common understanding of Liberty's business requirements.

In conjunction with Liberty, Sky Energy developed an evaluation matrix in which each candidate was rated in the following categories;

Vendor Viability — The company's overall stability, experience in providing the required services, experience with the utility sector, nationwide presence and likelihood of being able to fulfill the contract.

Business Functionality — The company's understanding of Liberty's business requirements and their ability to meet those requirements.

Pricing — Transactional pricing and implementation costs.

IT Support — Post implementation support, business continuity and disaster recovery.

These categories were weighted as: Vendor Viability – 10%, Business Functionality – 50%, Pricing – 30% and IT Support – 10%.

Each company was asked to provide responses to nineteen questions related to the above areas as well as to provide transactional and implementation pricing for all required services.

Their responses were scored from 1 – 5 with 1 generally meaning the candidate provided inadequate support and 5 meaning the candidate met all of Liberty's requirements. Grading of the responses to the questions was not comparative, meaning it was possible for more than one candidate to have a score of 5 if they met all of the criteria. For example, if two vendors provided full web-hosting services they would both receive a score of 5.

Pricing was scored in a similar fashion but in this case the scoring was comparative meaning the candidate offering the lowest price was given a score of 5, second lowest given a score of 4, and so on.

Only Captum provided tiered pricing therefore reduced prices as volumes increase was not a consideration; Captum was scored on their most favourable pricing level.

Pricing for bill print was evaluated based on per bill costs for black and white duplex printing, cost of inserts and messaging, return envelopes, other stationary (stock, window envelopes, etc.) and file processing costs.

Pricing for ebill was evaluated based on per bill costs for web presentation, image retention, customer notification (email, mobile, etc.), cost for e-payments, delivery to third party consolidators and file processing costs.

Lock box pricing was evaluated based on costs for processing a simple case scenario where a payment is defined as one cheque with a matching stub/coupon. Costs for exception processing were not generally available from the candidates as the number and type exceptions cannot be fully determined at this stage of the discussions and were, therefore, not considered in the evaluation.

Upfront costs for implementation were considered as standalone items.

Further analysis was performed to determine the total costs (transactional plus fixed) over the expected five year life of the contract. This was done to determine if lower transactional costs would offset higher implementation fees over the term of the contract. Two models were created to support this analysis; the first assumed a 75/25 split between printed bills and ebills with no change in Liberty's customer base of approximately 330,000 customers over the five year period. The second assumed the split between print and ebill but further assumed growth in the customer base at an annual rate of 15% commencing in the second year.

Since there was a clear cut leading vendor, oral presentations of shortlisted vendors was not required. Instead, Fiserv was brought in for a detailed review of the company's structure, their service offerings and their proposal to Liberty in order to validate their capability to deliver Liberty's requirements.

Additionally reference checks on the leading vendor were performed by Sky, utilizing a questionnaire that was ratified by the Liberty sponsors.

Satisfied that Fiserv was the optimum choice, Sky turned over the final discussions and the contract negotiations to Liberty.

## Results

Below is a summary of the overall results;

| Vendor | Category | WEIGHTING | MAX POINTS | Vendor Points | Vendor % | Vendor Ranking |
|---|---|---|---|---|---|---|
| **Fiserv** | Vendor Viability | 10.00% | 30 | 27 | 9% | 1 |
| | Business Functionality | 50.00% | 35 | 33 | 47% | 1 |
| | Pricing | 30.00% | 40 | 36 | 27% | 1 |
| | IT Support | 10.00% | 20 | 15 | 8% | 1 |
| | **Total** | **100.00%** | **125** | **111** | **91%** | **1** |
| | | | | | | |
| **Best Practices** | Vendor Viability | 10.00% | 30 | 24 | 8% | 3 |
| | Business Functionality | 50.00% | 35 | 30 | 43% | 2 |
| | Pricing | 30.00% | 40 | 36 | 27% | 1 |
| | IT Support | 10.00% | 20 | 15 | 8% | 1 |
| | **Total** | **100.00%** | **125** | **105** | **85%** | **2** |
| | | | | | | |
| **Kubra** | Vendor Viability | 10.00% | 30 | 27 | 9% | 1 |
| | Business Functionality | 50.00% | 35 | 29 | 41% | 3 |
| | Pricing | 30.00% | 40 | 32 | 24% | 3 |
| | IT Support | 10.00% | 20 | 15 | 8% | 1 |
| | **Total** | **100.00%** | **125** | **103** | **82%** | **3** |
| | | | | | | |
| **Captum** | Vendor Viability | 10.00% | 30 | 23 | 8% | 4 |
| | Business Functionality | 50.00% | 35 | 26 | 37% | 4 |
| | Pricing | 30.00% | 40 | 28 | 21% | 4 |
| | IT Support | 10.00% | 20 | 11 | 6% | 4 |
| | **Total** | **100.00%** | **125** | **88** | **71%** | **4** |

These results indicate that Fiserv emerged as the clear leader in most categories. It should be noted that Fiserv, Best Practices and Kubra all received the same score for IT support; all provided 24X7 post implementation support at no additional cost and indicated they have robust Business Continuity and Disaster Recovery processes in place and it was not possible to differentiate between the three based on the information available; Captum was downgraded in this area because their post implementation support was quoted on a time and materials basis.

Fiserv scored higher in Business Functionality partly due to its Walk-In Payments Centres at a number of store chains across the country, including Wal-Mart, Kmart and Raley's. No other vendor was able to provide this service.

The following chart shows the total transactional and implementation costs for bill print and ebill, extended over the life of a five year contract, with the results annualized as well. Liberty's customer base is assumed to be 330,000 and their split between print and ebill is assumed to be 75/25. Current estimated costs are presented for comparison purposes and are based on Captum's least favourable rate which is representative of Liberty's current pricing.

| No Growth | Total (5 yrs) | Annual | Rank |
|---|---|---|---|
| | | | |
| Fiserv | $3,277,500 | $655,500 | 1 |
| Best Practices | $3,647,655 | $729,531 | 2 |
| Kubra | $4,375,800 | $875,160 | 3 |
| Captum | $4,606,500 | $921,300 | 4 |
| Estimated Current Costs | $4,909,440 | $981,888 | |
| | | | |
| **15% Customer/Year Growth** | **Total** | **Annual** | **Rank** |
| | | | |
| Fiserv | $4,419,631 | $883,926 | 1 |
| Best Practices | $4,918,776 | $983,755 | 2 |
| Kubra | $5,900,662 | $1,180,132 | 3 |
| Captum | $6,211,756 | $1,242,351 | 4 |
| Estimated Current Costs | $6,620,263 | $1,324,053 | |

Captum's costs were estimated using their best rate although that rate would not currently apply to Liberty.

Based on these estimates by switching to the lowest cost vendor, Liberty could reduce their costs for printing and ebill services by approximately $1.7 million over a five year period if their customer base remains at its current size and $2.2 million with 15% annual growth.

On March 8, three of Fiserv's current clients were contacted for reference checks; two of these clients use Fiserv for bill printing and web presentation; the third receives lock-box payment processing from them. All three companies were very satisfied with the service they have received from Fiserv; they indicated their level of support has been excellent, that changes are completed on schedule and with few post-implementation issues. Fiserv was described as being pro-active in terms of alerting their clients of potential issues, such as shortages of stock, as well as in terms of suggesting improvements to the client. One client indicated that estimates for change requests were sometimes slow and suggested that a Service Level Agreement on turnaround for estimates should be part of any contract with Fiserv; it should also be noted that this client said the delays were not impactful and that the subsequent changes were always delivered on schedule once the estimates were provided.

## Recommendation

The results of the evaluation process showed Fiserv as the clear leader in all four key areas. Additionally, based on the pricing information provided by Fiserv there are significant potential cost savings for Liberty, as seen in the above projections. Lastly, Fiserv offers the full range of integrated services and it was the only vendor with local Walk-In payment centres at large retailers such as Wal-Mart.

It is therefore recommended that Liberty engage in further discussions to confirm that Fiserv completely understand Liberty's requirements and that they are fully capable of delivering the services required; if acceptable then Liberty should reach a contractual agreement. We further recommend that the contract with Fiserv include a specific service level agreement with penalties for not meeting defined standards or performance levels.

# APPENDIX-B
# Third Party Security Framework

# 3$^{rd}$ Party Service Provider Security Contact Addendum

**Access Control**

Use of Liberty Utilities (LU) Assets
(company) will limit access to LU assets to only authorized staff that LU approves.

Usernames and Passwords
Any username or password supplied by Liberty Utilities to the (company) for the purpose of accessing any Liberty Utilities system, application or part of the Liberty Utilities network are provided for the sole purpose of that individual and must not be shared or divulged to any other person.

Privileged Access
When privileged access (e.g... root or 'super user' level access) is granted to systems that handle Liberty Utilities data, such access should be granted to a limited duration and must be fully logged. Any remote privileged access must only occur over encrypted links.

**Audit and Investigation Independent**

Security Assessments
On-going independent security assessments (e.g. penetration tests and security audits) must be performed on a regular basis or when there is significant change to the system. These tests must be performed by an independent agency, commissioned through joint agreement with Liberty Utilities and the results must be reviewed by Liberty Utilities

Investigation Cooperation
The external service provider must cooperate fully with any investigation relating to their operations and personnel providing supplier services under the contract

**Data Security**

Access to Data
Liberty Utilities data must not be disclosed to any non-Liberty Utilities party for any purpose unless authorized by Liberty Utilities. Liberty Utilities data must only be handled and stored at the agreed contractor sites and backup storage sites

Encryption
Liberty Utilities data must be encrypted, using approved encryption technology whenever stored on portable media without physical access protection, transmitted over the internet or transmitted over third party networks (e.g. shared backbones)

Copying of Liberty Utilities Data
Where remote access is given to Liberty Utilities production data, the contractor must not copy, download or store Liberty Utilities' production data on any desktop, server or other device at the contractors' premises or in the contractor's possession

Security Standards
(company) will comply with good practices for information security by adhering to ISO27001 standard.

**Information Security**

Data Integrity
Documented agreements should be established that require outsource providers to protect the integrity of information used in the course of work (i.e. to ensure it is complete, accurate and valid).

Data Availability
(company) to ensure the availability of information and systems to Liberty Utilities from 7 am EST to 9 pm EST. The response time should be faster than 2 second average screen refresh.

Regulatory Compliance
(company) will meet legal and regulatory requirements that include but are not limited to data protection legislation as part of the NERC, FERC, IESO, OEB standards and regulations.

Links to other networks
Liberty Utilities must approve the use of onward links to other services or networks, including mobile, remote and external access

**Non-Disclosure Agreement**

(Company) must maintain the confidentiality of information gained through this agreement.

**Physical Security**

Background Checks
All (company) staff appointed to work at Liberty Utilities locations must be submitted to appropriate vetting/background checks. These checks must be made available to Liberty Utilities on request

Jurisdictional Regulatory Compliance
Access to Liberty Utilities assets, and in particular, access to Customer Data must be in accordance with local legal and regulatory requirements for, trade and business secrecy and data privacy and protection.

**Right to Audit**

Liberty Utility has the right to audit the (company)'s activities, details of licensing arrangements; and the ownership of intellectual property rights and information. Liberty Utilities has the ability to conduct tests deemed appropriate to validate whether the requirements of the contract are being met. This include but is not limited to: secure application development processes, data protection & handling procedures, general IT Security controls, Business Continuity Management processes. (company) must cooperate fully with any internal or external audit and agree to implement any recommendations that may result from any audits in an agreed timeframe.

**Security Incident Management & Escalation**

Computer Security Incident Response Plan

(company) to immediately provide information about information security incidents that may in any way affect the operation, confidentiality, availability or integrity of Liberty Utilities data (or backed up data).

Documented Incident Management
Liberty Utilities required a document process from (company) that demonstrates effective information security incident management.

Relationship Manager
(company) will contact David Carleton, Liberty Utilities Director of Information Technology david.carleton@libertyutilities.com immediately regarding any security issues.

**Security Logging and Monitoring**

Access Attempts
(company) will keep records of system or application access attempts such as log-on, log-off and failed attempts plus any additional inform that the  (company) tracks regarding access attempts and failures on a monthly basis.

Log Retention
Logs must be retained for at least twelve months (unless required for longer due to any local regulatory or legal purpose). During this period, logs must be secured so they cannot be modified, and can be read only by authorized persons

Monitoring and Analysis
(company) is responsible for active monitoring and analysis must be designed to record breaches, anomalies and unauthorized actions as well as compliance with security policies and practices. Systems handling Liberty Utilities data must have all transactions and system configuration changes monitored in real time, with alerts escalated to 24x7 personnel.

Network monitoring
Network traffic must be monitored for unusual activity (e.g.. abnormal combinations of connections, deliberate probing or attacks)

**System and Network Environment**

Change Control
(company) will provide proof of and their ability to follow a change management process.

# APPENDIX – C
# PwC Security Assessment Statement of Work

STRICTLY PRIVATE & CONFIDENTIAL

December 14, 2011

Mr. David Carleton
Director, Information Technology
Liberty Utilities
2865 Bristol Circle
Oakville, Ontario
L6H 6X5

Dear David,

**Reference: High Level Network Security Assessment**

We are pleased to have this opportunity to assist you with your Information Security needs and appreciate your continued confidence in PwC. We feel we have the expertise and experience you're looking for to help in your objective to understand your organization's external security posture.

As requested, this statement of work is prepared given our understanding of the scope, timing and depth of analysis required. Based on our conversations with you, we understand that Liberty Utilities would like to identify vulnerabilities in the Utilities network and the threats associated with these weaknesses to allow you to make informed decisions to enhance your security posture.

If you have any questions regarding this statement of work, please feel free to reach me at 416 687 8522. Thank you for giving us this opportunity to work with your team.

Yours truly,

Brian Poth

Brian Poth
Power & Utilities Practice Leader

# *Contents*

This proposal contains information that is proprietary and confidential to PricewaterhouseCoopers LLP, and shall not be disclosed outside the recipient's company or duplicated, used or disclosed in whole or in part by the recipient for any purpose other than to evaluate this proposal. Any other use or disclosure in whole or in part of this information without the express written permission of PricewaterhouseCoopers LLP is prohibited.

This proposal to provide services is contingent on successful completion of PwC's client and engagement acceptance process.

# Introduction

The purpose of this proposal is to confirm our understanding of your requirements for an information security assessment. We understand that you are looking to work with an external firm to conduct a security assessment of your Utilities network and its associated systems that form your security infrastructure. This assessment will evaluate from an information security perspective, threats and vulnerabilities to the hosts, servers and devices.

## Scope of our Services

The main objective of this engagement is to identify security vulnerabilities that could be used by an unauthorized user to gain access to the Liberty Utilities network, or impact the availability of Liberty Utilities services. The scope of this assignment will focus on the security of the following:

- Conduct a configuration assessment for a selection of key network devices, security systems and hosts.
- Conduct a vulnerability assessment for a representative sample of systems in the Utilities network environment, using a risk-based selection method.
- Conduct a network architecture and design assessment, including security system placement in network zones and geographic locale.

## Approach

We propose a phased approach that includes the following key activities:

- Phase 1: Engagement start-up and kick-off meeting;
- Phase 2: Engagement execution; and
- Phase 3: Engagement wrap-up.

To conduct this assessment, we will use our PwC Threat and Vulnerability Assessment Methodology as the basis for the work to be performed against the above noted scope.

Below is a summary of the activities in each phase:

### Phase 1: Engagement start-up and kick-off meeting

The objective of this phase is to introduce the Liberty Utilities and PwC project team members who will be collaborating together throughout the engagement. This phase is also used to handle administrative details necessary to begin the project.

The tasks to be undertaken in this phase are:

- Begin the project with a project initiation meeting;
- Agree on the progress reporting process, location and frequency;
- Identify potential risks that may be encountered during the project and strategies that will be used to mitigate the risk of occurrence;

- Finalize the in-scope network ranges, systems, and devices connected to the Utilities network;
- Obtain any relevant supplementary documentation, including but not limited to indemnifications as outlined in this document; contracts in place, non-disclosure documents, etc., and
- Determine the testing schedule and escalation protocols.

## *Phase 2: Engagement execution*

This phase will consist of three sub-phases: a configuration assessment for a selection of key network devices, security systems and hosts, a vulnerability assessment of a representative sample of systems in the Utilities network environment, and a network architecture and design assessment, including security system placement in network zones and geographic locale for the infrastructure as defined in the section: Scope of our Services.

Through these assessments, we will identify and validate vulnerabilities that could pose threats to Liberty Utilities security posture. Recommendations will be developed to help address the root cause issues of these vulnerabilities and allow prioritization of the remediation activities which matter most to Liberty Utilities.

### Phase 2A: Configuration Assessment

The key activities of this phase include:

- Information gathering related to device configurations for a sample selection of key systems;
- Perform an assessment of the system configurations (i.e. password strength, lockout controls, unnecessary services/accounts, etc.) against good security practice ; and
- Document the findings and provide recommendations to help prioritize and remediate the findings.

### Phase 2B: Vulnerability Assessment

The key activities of this phase include:

- Information gathering related to the Utilities network and the unique types of systems and devices in scope for testing;
- Determine a sample selection of systems and devices to be assessed using a risk-based approach;
- Performing security scanning to identify the potential weaknesses and vulnerabilities on the target Liberty Utilities systems and devices; and
- Analysis and validation of the weakness and vulnerabilities that have been detected during the security scanning activities.

### Phase 2C: Architecture Assessment

Key activities of this phase include:

- Assess documentation from Liberty utilities including network diagrams, architecture diagrams and workshops to note any gaps that could affect the security posture of Liberty Utilities network;
- Assess network architecture designs, including network zones, segmentation and geographic locations;
- IDS/IPS high level sensor deployment and integration principles; and
- Determine the attack surfaces and points, assess the threats, and evaluate the security solutions and controls in place.

## *Phase 3: Engagement wrap-up*

During this phase we will present our findings from our assessment to Liberty Utilities key stakeholders.  We will highlight the key risks and impact to the organization, its associated infrastructure, and strategies that could assist in resolving the findings.

# Out of Scope

- Denial of Service (DoS), including distributed denial of service (DDoS) attacks
- Application architecture assessment;
- Application vulnerability assessments and penetration testing;
- Systems, applications or devices hosted at 3rd party service providers;
- Code review.

# Deliverables

Our final deliverable will be a management-level report that includes the following sections:

- An Executive Summary, including a summary of key findings ranked by risk level and our recommendations to management for mitigation;
- A Detailed Report, including validated current state analysis identifying key findings, risks, areas for improvements, strengths and other key considerations; and
- Short and long term recommendations to address regulatory requirements, aligned to the IT compliance matrix.

# Key Assumptions

- PwC will not knowingly perform any tests associated with denial of service or DDOS activities as these tests can cause disruption to IT operations;
- Where Liberty Utilities is using third parties in connection with the Services to be provided in accordance with this proposal, Liberty Utilities will ensure that Liberty Utilities has appropriate agreements with them to enable this activity and **to obtain and confirm receipt of indemnifications from their third parties** to hold PwC harmless from any results of testing done on Liberty Utilities behalf;
- If additional testing on internally located systems is required, Liberty Utilities will provide a secured VPN access to its systems in order to allow us to perform tests remotely, or allow our testing systems to be deployed onto the Liberty Utilities-owned networks where required;
- If a high or unusual number of vulnerabilities are identified, they will be summarized into categories for remediation;
- PwC will not accept any liability associated to potential network disruptions that could result from the assessment;
- Should we identify major vulnerabilities that may lead to the access of highly sensitive areas or information, we will advise immediately – a client contact must be provided for this purpose; and
- Proposed PwC staffing is based on current availability of project relevant resources. Actual staffing may differ if the projected start date is modified by the client or other events require us to.

## Core Team

- **David Craig** – Lead partner will oversee the engagement and ensure quality of our deliverable.
- **Akil Bishop** – Engagement Director, will be the primary contact for this engagement and provide leadership to the team conducting the engagement.
- **Bryson Tan** – Threat and Vulnerability Lead, will provide ongoing subject matter expertise and guidance
- **Ivica Popovic** –Threat and Vulnerability Specialist, will lead the technical work and be responsible for day to day activities. Ivica will be supported by other PwC Security Specialists as required.

## Liberty Utilities' responsibilities

- Liberty Utilities will nominate an authorized Point of Contact within your organization to act as the central individual for day to day activities, escalation and incident management.
- Liberty Utilities shall provide PricewaterhouseCoopers with all information relevant to the Services and any reasonable assistance as may be required to properly perform the Services in a timely manner. Liberty Utilities represents and warrants to PricewaterhouseCoopers that all such information will be accurate and complete in all material respects. The overall definition and scope of the work to be performed, and its adequacy in addressing Liberty Utilities needs, is Liberty Utilities responsibility.
- Liberty Utilities has notified (if applicable) any outsourced vendors of this project and their expected participation and approximate start date as well as obtained written agreement from the vendors in advance of the project start date to ensure proper level of participation and document production.

Liberty Utilities shall perform all management functions and make all management decisions in connection with the Services, and shall assign competent individuals to oversee the Services. Liberty Utilities is also responsible for the implementation of actions identified in the course of this engagement and results achieved from using any Services or Deliverables (as defined below).

Where Liberty Utilities is using third parties in connection with the Services to be provided in accordance with this proposal, Liberty Utilities will ensure that Liberty Utilities has appropriate agreements with them to enable this activity and to hold PwC harmless from any results of testing done on Liberty Utilities behalf. Unless agreed otherwise in this letter, Liberty Utilities will be responsible for the management of those third parties and the quality of their input and work. Any timing or fee estimate we have provided for this engagement takes into account the agreed-upon level of assistance from Liberty Utilities and commitment of Liberty Utilities resources.

PricewaterhouseCoopers has not been engaged to, nor will PricewaterhouseCoopers provide any management functions or make management decisions for Liberty Utilities under this proposal. It is Liberty Utilities responsibility to establish and maintain its internal controls.

## Timetable and Fees

Our proposed timelines for this engagement is approximately **4 weeks**, starting on January 9, 2012, or at a date that satisfies Liberty Utilities. PricewaterhouseCoopers will use all reasonable efforts to perform the Services in accordance with the timeframe set out herein, however, dates are targets used for planning purposes and, depending on circumstances and Liberty Utilities cooperation may need to be adjusted.

Our fees for this engagement are estimated to be **$29,500**, exclusive of taxes and out-of-pocket expenses, which will be charged at cost after prior approval from Liberty Utilities.

In the event that Liberty Utilities would like us to return after our initial report is complete and conduct incremental network security assessment work, we will look to do so in an efficient manner and where possible, focus on changes and new scope added to the network (for example, an additional site or a new network). These additional phases of network security assessments are estimated to be **$10,000 - $12,000** and can be conducted after new networks are connected to Liberty Utilities. Our estimate is based on a defined scope of incremental work, which would likely include: a sample selection of systems and devices to be assessed using a risk-based approach for configuration and vulnerability assessments and a high level architecture review of the additional networks including an assessment of network diagrams, architecture diagrams and workshops to note any gaps that could affect the security posture of Liberty Utilities network. If we deem that changes are more significant and additional work is required, we would consult with your team and agree on a go-forward strategy before proceeding.

Please note that our fees exclude the Harmonized Sales Tax (HST) and will be impacted by out-of-pocket and administrative expenses. The out-of-pocket charges will be billed as incurred on an actual basis. Our fees presented herein take into account the agreed-upon level of preparation and assistance from your personnel. We will advise you forthwith if your management is not providing the required information or resources, or should any other circumstances arise which can cause the actual time required to complete each phase of this engagement or which otherwise can cause our fees to exceed the amounts specified herein. If, during the course of our work, it appears that our fees may exceed the amounts specified herein or that the actual time required to complete the engagement will exceed the amounts herein, we will advise you immediately and provide you with reasons for the delay in completing the Services and we will provide you with justification for our request for additional fees.

Although we will take reasonable precautions to minimize any risks, and provided we have not acted negligently or with wilful misconduct, we do not accept any responsibility for any loss of data or damage to the network arising from our scans or any tests. Except for any wilful misconduct or negligence by us, you agree to indemnify us to the fullest extent permitted by law against all liabilities, losses, claims, demands and reasonable expenses asserted by third parties (collectively, the "Claims"), including but not limited to legal fees and expenses and internal management time and administrative costs, in connection with or arising out of any scanning or testing pursuant to this engagement letter.

| **Activities** | **Fees** |
|---:|---:|
| *High Level Network Assessment* | |
| Configuration Assessment | $ 10,500 |
| Vulnerability Assessment | $ 8,700 |
| Architecture Assessment | $ 10,300 |
| **Total Estimated Fees** | **$ 29,500** |

### Key Dates and Timelines

| Activity | Activity Date |
|---|---|
| Start of Testing Activities | 1-24-2012 |
| Target Finish of Testing Activities | 2-17-2012 |
| Interim Report of Findings | 2-17-2012 |
| Delivery of Draft Final Report | 2-24-2012 |
| Additional Network Security Assessment #2 | 2-12-2012 |
| Additional Network Security Assessment #3 | 3-26-2012 |

# Confirmation of Terms of Engagement

Having read both the Engagement Letter and the Standard Terms and Conditions, we agree to engage PricewaterhouseCoopers LLP upon the terms set out therein.

**Liberty Utilities**

By: David Carlt

David Carleton

Director IT

(Title)

Liberty Utilities

South 1/3

# Appendices

# Appendix A
# Limitations over scanning of third party networks and penetration testing

Where we are required to scan and test networks in relation to services provided within the scope of this engagement,  Liberty Utilities Investments Limited hereby represents to PwC that it has obtained all consents, to the extent such consents may be required (a) by any third party service providers, including without limitation, an Internet Service Provider; (b) to access confidential information and personal information in connection with the Services; and (c) the collection, use and disclosure by and to us of such information in connection with the Services, including such consents as may be required under applicable privacy legislation, in each case prior to such access, collection, use and disclosure by and to PwC.

Liberty Utilities Investments Limited will respond to any individuals' request, inquiry or complaint regarding such personal information as and when required by applicable law. PwC will hold strictly confidential and in compliance with our Privacy Statement and all applicable laws, all personal information you provide to us (if any), and will use and disclose such information only for the purpose of performing the Services in accordance with this proposal.

As a safeguard PwC will discuss with Liberty Utilities Investments Limited any risks associated with scanning and testing prior to the particular scan or test. Prior to the testing, Liberty Utilities Investments Limited and PwC will agree on whether this and any other testing will be carried out by PwC Canada in Toronto or Ottawa.  We understand some of the information in Liberty Utilities systems is highly critical and sensitive in nature. In providing our services, in particular web application and network penetration testing, we will not knowingly perform and will take all reasonable steps to prevent disabling or destructive testing against your systems or applications such as Denial-of-Services (DoS) attacks. We will only perform disabling or destructive testing against your systems or applications such as DoS with your written consent. PwC will not knowingly access, download or remove any client data while undertaking these tests, without express permission from Liberty Utilities.

Should we identify material potential vulnerabilities that may impact Liberty Utilities IT components; we will discuss these with you, highlighting the risks involved in further exploitation of identified vulnerabilities. At this stage a decision will be made by a competent and duly authorized Liberty Utilities Investments Limited representative whether to proceed.  The decision to proceed must be in writing. If  consent to proceed is given, we assume that Liberty Utilities Investments Limited will have assessed potential risk, impact and communicated this with appropriate parties (including but not limited to, the business and any such Liberty Utilities Investments Limited owned and/or operated entity or third party as appropriate). Liberty Utilities Investments Limited is responsible for making any and all such provisions to recover from, any outages or other such service disruptions as may result directly or indirectly from such further testing.

Before we conduct such further testing, we will require a knowledgeable, technically competent and duly authorized Liberty Utilities Investments Limited staff member to be available at all times during such further testing.  This individual must be authorized to make all decisions (and gain any required consent to do so) prior to progressing further. Under no circumstances will we add or remove files as evidence of successful exploitation of vulnerabilities and rely on the Liberty Utilities Investments Limited representative to take any such action to provide evidence of the success or otherwise of such further testing.

Although we will take reasonable precautions to minimize any risks, and provided we have not acted negligently or with wilful misconduct, we do not accept any responsibility for any loss of data or damage to the network arising from our scans or any tests.  Except for any wilful misconduct or negligence by us, you agree to indemnify us to the fullest extent permitted by law against all liabilities, losses, claims, demands and reasonable expenses asserted by third parties (collectively, the "Claims"), including but not limited to legal fees and expenses and internal management time and administrative costs, in connection with or arising out of any scanning or testing pursuant to this engagement letter.

Except for any wilful misconduct or negligence by us, Liberty Utilities Investments Limited hereby releases, waives, discharges and covenants not to sue PwC Canada, and its respective partners, officers, directors, employees and agents from any and all Claims caused or alleged to be caused in whole or in part by the PwC Canada in connection with any scanning or testing performed pursuant to this engagement letter.

# *Appendix B Standard Terms and Conditions*

The Standard Terms and Conditions attached as a separate document are an integral part of this Agreement. This Engagement Letter should be read in conjunction with the Standard Terms and Conditions. In the event of conflict or inconsistency between the terms and conditions set forth in this Engagement Letter and the Standard Terms and Conditions, the terms and conditions set forth in this Engagement Letter shall take precedence.

The firms of the PwC network provide industry-focused assurance, tax and advisory services to enhance value for their clients. More than 161,000 people in 154 countries in PwC firms across the PwC network share their thinking, experience and solutions to develop fresh perspectives and practical advice. In Canada, PricewaterhouseCoopers LLP (www.pwc.com/ca) and its related entities have more than 5,700 partners and staff in offices across the country.

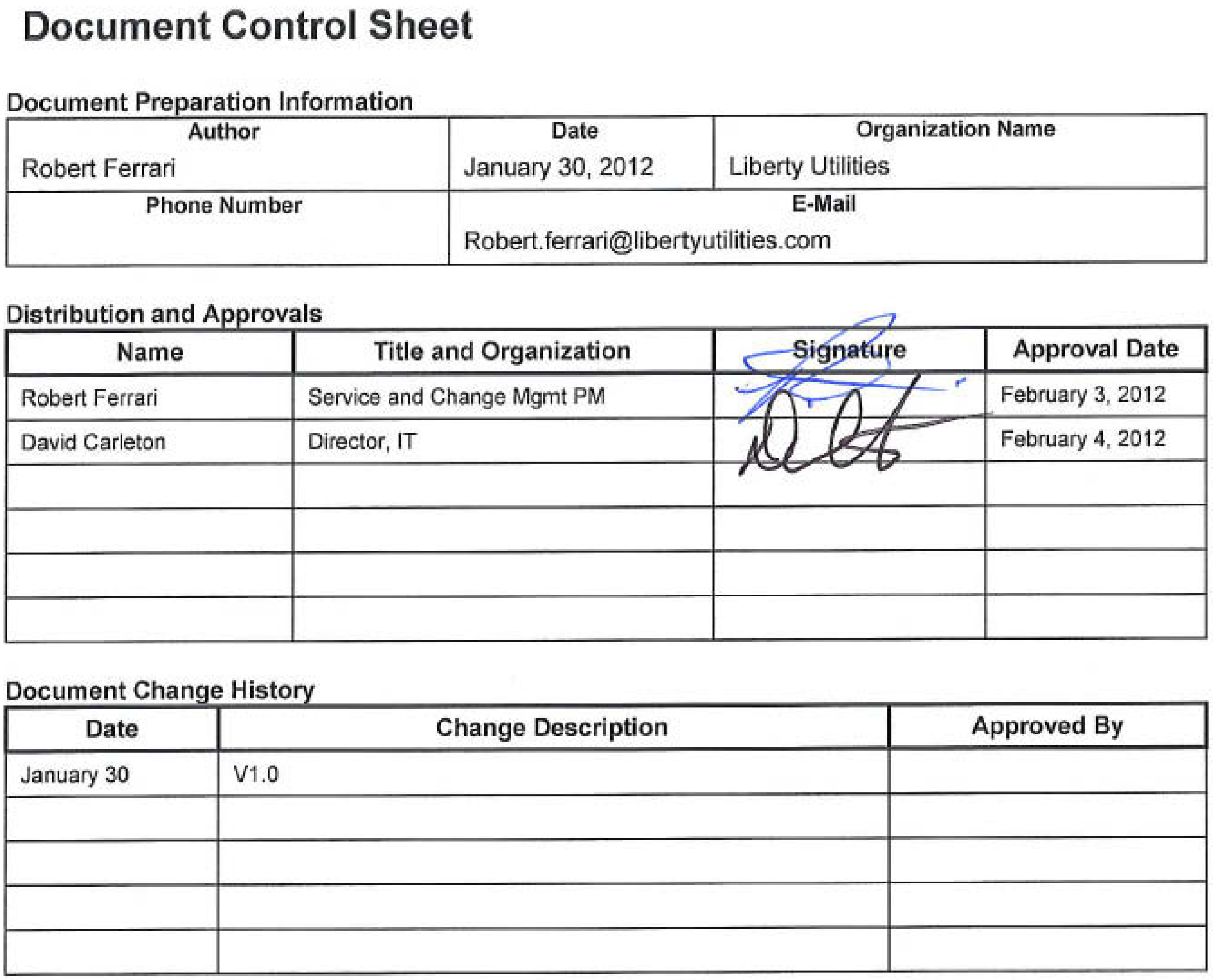
# *Creating a distinctive client experience*

Our clients have said that they want to work with people who invest in building strong relationships and who share and collaborate with them. They also want to work with people who can see issues from their perspective and who focus on adding value.

The foundation of our client service approach (the "PwC Experience") rests upon a consistent demonstration of these behaviours within our organization. We strive to engage, motivate, and inspire our people to deliver a distinctive client experience. We believe that if we get it right with our own people, we will get it right with you.

# APPENDIX -D
# IT Change Management Process

# Liberty Utilities IT Change Management Process



## Document Control Sheet

### Document Preparation Information

| Author | Date | Organization Name |
|---|---|---|
| Robert Ferrari | January 30, 2012 | Liberty Utilities |
| Phone Number | E-Mail | |
| | Robert.ferrari@libertyutilities.com | |

### Distribution and Approvals

| Name | Title and Organization | Signature | Approval Date |
|---|---|---|---|
| Robert Ferrari | Service and Change Mgmt PM | | February 3, 2012 |
| David Carleton | Director, IT | | February 4, 2012 |
| | | | |
| | | | |
| | | | |
| | | | |

### Document Change History

| Date | Change Description | Approved By |
|---|---|---|
| January 30 | V1.0 | |
| | | |
| | | |
| | | |
| | | |

## 1. Introduction

The Information Systems department of Liberty Utilities operates multiple complex technology environments. The environments include development, assurance, user acceptance (UAT), production and other specialized instances.

The Information Systems department is responsible for providing system availability in support of various initiatives, including approved projects and necessary system and infrastructure changes. This responsibility includes responsibility to implement upgrades, enhancements, extensions and other changes to hardware and software in order to maintain and extend reliable information systems services.

It is important that changes to the computing environment are executed in a controlled manner in order to mitigate the risk of interruptions to service during prime access hours and in order to maintain a repository of knowledge about the current configuration and status of the computing environment.

This document defines the policies and procedures that the Information Systems department will use to control changes to the computing environment.

## 2. Objectives

The objectives of the Change Management Policy document are:

1. To protect the computing environment from uncontrolled changes.
2. To restrict service disruptions caused by necessary changes to defined low-use hours.
3. To minimize the occurrence of unintended affects during the implementation of necessary changes.
4. To document in scope changes in order to maintain a detailed audit trail of change requests, risk assessments, test results and approvals.
5. To maintain a record of each systems configuration, including software versions, patch revisions and hardware architecture.

## 3. Scope

The Change Management Policy applies to the Production, Assurance, UAT and Development environments.

The Change Management Policy applies to the following areas:

1. System Configuration
   - Configuration changes are non-programmatic changes generally made by a systems administrator that affect system functionality
2. System and Infrastructure Changes, for example:
   - anything requiring a server reboot,
   - upgrades, including software and operating system patches,
   - disk swaps and/or other redundant parts required to be replaced,
   - print queues with a new driver not currently installed,
   - addition of a new server to the domain/network,
   - changing or adding access to any of the production web servers, application servers, or database servers,
   - rollouts of desktop applications,
   - changes to production applications, including configuration changes,
   - changes to web links to production applications,
   - network or router changes

The Change Management Policy does not apply to:

- day-to-day operational activities such as adding new users, print queues, or creating or changing user groups,
- changes to a “sandbox” or “test bed” environment.

## 4. Audience

The audience for this Change Management Policy and Procedures Document is all Liberty Utilities temporary and full-time employees, management, contract and consulting staff, vendor representatives and any other person or organization that has authorized access to Liberty Utilities computer resources or infrastructure.

## 5. Roles and Responsibilities

In order to facilitate the Change Management Policy, a number of key roles must be defined and staffed, including:

| Role | Description | Responsibilities |
|---|---|---|
| **Requestor** | An system user requiring a change or improvement to a system | Use appropriate channels to request change(s) including:<br>• Help Desk<br>• Project Team Leads |
| **Change Owner** | An Information Systems staff member who has been assigned responsible for a change request. | Documents the change requirements, completes the CR form and participates in the CAB meeting to be the subject matter expert for the change.<br>Responsible for completing all documentation required to promote changes through the development, assurance, UAT and production environments. |
| **Change Advisory Board (CAB) member** | A senior business or I.T. manager. | Attends all CAB meetings and participates in the decision making process of CR approvals/rejections and scheduling. |
| **Change Advisory Board (CAB)** | A small group of key individuals working as a team selected based their technical and business expertise.<br>Contains voting members and non-voting subject matter experts (SMEs). | Approves, rejects or defers change requests (CRs).<br>Validates the change will not cause unplanned service outages.<br>Assists the Change Manager in scheduling resourcing the change implementation. |
| **Change Management Process Lead (Change Manager)** | The Information Systems manager responsible for defining, implementing and enforcing the Change Management Policy. | Chairs the CAB meetings or assigns a delegate.<br>Documents the CAB meeting outcomes/decisions. |

| | | |
|---|---|---|
| **Project Managers** | Individuals assigned to manage approved projects. | Person responsible for the first review of a project initiated CR.<br>Ensures the test plan, test results, risk assessment and back-out strategy is carefully and accurately documented in the CR. |
| **Implementer** | Implementation of changes to the computing environment may involve one or a group of individuals. The Implementer(s) cannot be part of the development or test/assurance teams. Assignment of resources is based on staff availability, applicable knowledge and skills. | Implements the physical change requests only after the CR is approved by the CAB. |

6. Definition of a Change

A change is any installation, alteration or modification of hardware, system software, firmware, applications, networks, environmental facilities, voice, procedures and policies related to the delivery of the existing service(s) and the implementation of new services.

7. Defining Change Categories

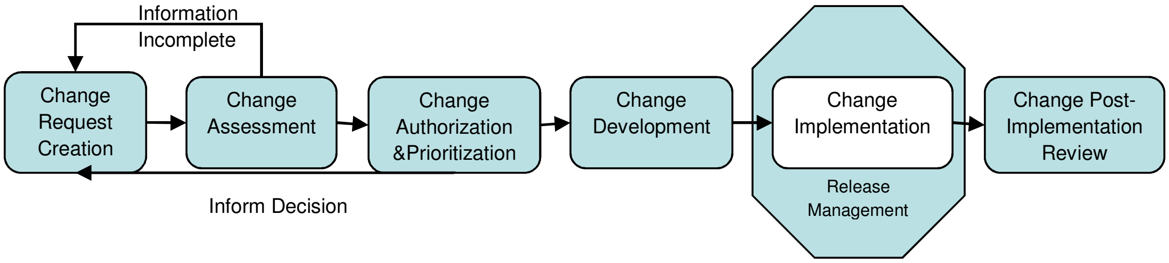
Change categories are defined to standardize the business impact from potential unacceptable risk associated with a change. In general, the greater the risk potential, the more reviews and scrutiny are required to minimize the risk. In order to manage changes, the following categories have been summarized as follows:

| Category Name | Description |
|---|---|
| **Normal** | • Introduction of new technologies to improve business productivity<br>• An addition(s) of new functionality to an existing application<br>• Expanding the enterprise into new business areas, acquisitions or mergers<br>• Respond to changing business and technical environment<br>• Address capacity and performance concerns associated with increase in business activity volumes<br>• To correct and malfunctioning equipment/resources |
| **Emergency** | • Introducing a fix to address a problem situation or prevent a potential problem<br>• Introducing a permanent fix for a known error |
| **Urgent** | • The need to respond to a legal, legislative/regulatory or management request that has urgency and priority |
| **For Information Only (Reactive)** | • During the recovery effort of an incident, the recovery team discovered that a change has to be made to the infrastructure to stabilize the service to prior to the point of failure |

8. Defining the Change Management Process

The Change Management Process involves:

- Documenting change requests.
- Assessing the impact, cost, benefits, and risk of requested changes.
- Providing approval or rejection.
- Overseeing the change implementation.
- Monitoring and reporting the status of change.
- Closing change requests and conducting post-implementation reviews.



**Process Description**

Each change request will follow these steps:

1. **Change request creation**. The requestor fills out a Change Request (CR) form to document the change request and submits it to the change manager. The change manager supports the requestor during this step by resolving questions about how to accurately complete the CR form.

2. **Change assessment**. If applicable, the Project Manager reviews the CR for completeness and accuracy. The Project Manager then forwards the CR to the Change Manager. If no Project Manager is assigned, the requestor submits the CR directly to the Change Manager. The change manager receives the CR and reviews it for completeness. If some important information is missing, the change manager returns the CR to the requestor. Once the CR is properly documented, the change manager performs an initial assessment of the CR, and negotiates with the requestor to assign a Change Category to the CR.

   As part of this step, the change manager also assesses the impact of the CR and categorizes it. Possible categories include:

| Impact Category | Explanation |
|---|---|
| Major | • A change that impacts a massive group of users or a mission critical system (e.g. ERP system)<br>• The change involves downtime of the system or service<br>• Failure would be visible to all users<br>• Backing out of the change may be difficult or impossible |
| Significant | • A change that affects a high percentage of users (e.g., a change affecting a group within a department or a specific group of users)<br>• The change may involve downtime of an important system or service<br>• Backing out of the change would be complicated but not difficult or impossible |

| | |
|---|---|
| Visible | • In the event of failure, this would be a visible change<br>• Backing out the change would be achieved quickly and effectively |
| Minimal | • Minimal one-time documented change handled between the requestor and implementer<br>• These changes do not require CAB approval and can be approved by the Change Manager<br>• These changes have the following characteristics:<br>– Low impact<br>– Routine<br>– No training required<br>– Same day implementation and closure |

3. **Change authorization and scheduling**. At this point, the organization needs to determine a course of action for the CR (i.e. approve, reject, or defer). Who makes this decision depends upon the priority and the impact category of the change:

   - If the CR is an Emergency, the change manager must escalate it as soon as possible to the CAB for urgent evaluation.
   - If the CR is categorized as Minimal, the change manager can evaluate and decide without involving anyone else.
   - All other CRs must be addressed by the CAB during its weekly meeting.

   Once decisions are made, the change manager is responsible for updating the Change Log and for communicating the decision to the initial requestor.

   If the CR is approved, the CAB needs to decide when the CR will be developed and when it will be implemented in production.

4. **Change development**. In this step, the CR enters the development phase. The IT management team (applications or/and infrastructure) assigns resources to develop the change.

5. **Change implementation.** Once the change is developed and tested, the change manager will work with the implementer and the CAB to schedule the implementation. All of the following activities must be completed before introducing a Major, Significant or Visible change in production:

- Technical and Functional tests performed and signed off (e.g. Integration test, system acceptance test (SAT)).
- User acceptance test (UAT) completed and signed off.
- The CAB has approved the implementation of the change in the production environment.
- Business owner(s) of the system has/have approved the implementation of the change in the production environment.
- End-user training completed, if necessary
- Support personnel training completed, if necessary.
- Service level agreements (SLA) have been properly modified, if necessary.
- End user and technical documentation have been properly modified, if necessary.
- Assessment of impact on business continuity and contingency plans.

Once an implementation date and time has been determined, the change manager must update the Change Schedule and communicate it to the enterprise (e.g. post it on the Intranet, email).

6. **Post-implementation review**. The change manager will perform a post-implementation review one month after the change implementation. This review will evaluate the following aspects of the change:

   - Did the change meet its objectives?
   - Are users satisfied with the results?
   - Has the change created any unexpected side-effects to existing applications or infrastructure?
   - Did the implementation plan work correctly? Was the implementation completed on time and within budget?
   - If the back-out plan was utilized, did it work correctly?
   - What are the lessons learned from this implementation?

   Upon completion of the review, the change manager will document findings and report back to the CAB if required.

# APPENDIX -E
# IT Test Plan Template

# LU-Project Name Test Plan

## Document Control

| Revision Number. | Date of Issue | Reviewed By: | Brief Description of Change |
|---|---|---|---|
| V 1.0 | | | Create Initial Draft |

## Distribution History

| Revision Number. | Date of Issue | Recipients |
|---|---|---|
| V1.0 | | |

## 1. (enter your Business Area)

| Department/ Business Area | Team Leaders | Participants | Responsibilities |
|---|---|---|---|
| | | | Create test plan |
| | | | Walk through test plan |
| | | | Sign-off Mini  Test Plan |
| | | | Manage Integration Testing |
| | | | Manage System Testing |
| | | | Manage User Acceptance Testing |
| | | | Set up test environment |
| | | | Create and document test scenarios and cases |
| | | | Walk through test scenarios and cases |
| | | | Create automated test scripts |
| | | | Create test data |
| | | | Run tests |
| | | | Walk through test results |
| | | | Sign-off test results |

# Table of Contents

# Introduction

- This document is to describe test strategy and approach taken for <*project name*>
- Test types used are as follow:

| Test Type | Description / Objectives | Applies to Y/N | Code drop |
|---|---|---|---|
| Batch Testing | One type of the Integration Testing and the objective is to test batch job or process. A Batch Testing can be an Internal or External. A Batch Testing is an external testing if it has interactions with other systems. | enter your Business area | CD1.<br>CD3<br>… |
| External Integration Testing | One type of the Integration Testing. It is required when the system has interactions with other systems. The objective is to test integration between system and system. | | |
| Functional Testing | Functional testing is based on requirements and functionality. It is not based on any knowledge of internal design or code. This type of testing should be done by testers. | | |
| Integration Testing | The objective of Integration Testing is to combine individual software parts and test them as a group. This test proves that all areas of the system interface with each other correctly and that there are no gaps in the data flow. Successful completion of Integration Testing proves that system works as an integrated unit. Integration Testing can be categorized as Internal Integration Testing, External Integration Testing and Batch Testing. | | |
| Internal Integration Testing | One type of the Integration Testing. It usually includes Unit to Unit, Unit to Module, Module to Module and Module to System tests. The objective is to test the combined software modules without the interactions with other systems. 9ususally done by development) | | |
| Negative Testing | Negative testing tries to determine if a module or a system does anything it is not supposed to do. Negative testing tests the opposite of the operating limits of the application. | | |
| Operating Limits | Operating limits are boundaries intended to be incorporated in the application. e.g. Time sheet cannot have more than 24 hours a day. | | |
| Performance Testing | The objective of performance testing is to establish a baseline relation between the expected system load and acceptable application response time. This type of testing to be done by the performance group | | |
| Regression Testing | The objective of regression testing is to confirm that the source code changes made to achieve new functionality did not impact existing system functionality in an un-desired manner. | | |
| Security Testing | Security testing is usually done in the format of an audit. System is evaluated for security vulnerability, logical and physical system access and permissions. | | |

| | | | |
|---|---|---|---|
| Stress Testing | The objective of stress testing is to establish the system's limits or breaking points by overwhelming its resources or by taking resources away from it. System passes stress testing if it can successfully recover from the break-point failure. This type of testing to be done by the performance group | | |
| Assurance Testing | The objective of System Testing is to ensure that each element of the system as well as system as a whole meets the functional requirements. In addition, it ensures that the system operates as expected and is suitable for the purposes intended. | | |
| Unit Testing | The objective of Unit Testing is to validate that each individual unit of the system works properly. Unit testing is integral part of the development phase. As such it is an on-going and final task during development cycle and a pre-requisite for System Testing. | | |
| User Acceptance Testing (UAT) | UAT is a final verification of the required business functionality and correct functioning of the system. It simulates real-world conditions. The objective of is to obtain confirmation by the owner of the production system that it meets the functional requirements. | | |
| Volume (Load) Testing | Volume testing is an extension of performance testing during which the system is exposed to gradually increased load, usually using an automated testing tool. The objective is to determine the highest load the system can sustain while still functioning properly. | | |
| Production Acceptance Testing (PAT) | Testing of certain functions after go live to ensure the production data is correct for job runs post implementation for a period decided | | |

## 2. Testing Tasks

This section lists high level testing work breakdown structure. Timelines are defined in Section 6 – Schedules.

- Stage 1 – Preparation
    - Formulate test strategy
    - Define in-scope and out-of-scope items
    - Complete requirements for all modules and subsystems
    - Prepare test cases
    - Define accountability for problem reporting and bug resolution
- Stage 2 - Execution
    - Execute test cases
    - Defect tracking and management
    - Test status report

- Stage 3 – Closing
  - Complete all types of testing
  - Lessons learned
  - Final report for the project team

# 3. Testing Scope

## 3.1. In Scope

- List the most high-level testing requirements.
- Complete the detailed testing requirements in Quality Center Requirements module.

| Code Drop | Business Area | In Scope Main Functionality |
|---|---|---|
| Code Drop 1 | | |
| Code Drop 2 | | |
| Code Drop 3 | | |
| Code Drop 4 | | |
| Code Drop 5 | | |
| Code Drop 6 | | |

## 3.2. Out of Scope

- List items out of scope for testing.

| Code Drop | Business Area | Out of Scope Main Functionality |
|---|---|---|
| Code Drop 1 | | |
| Code Drop 2 | | |
| Code Drop 3 | | |
| Code Drop 4 | | |
| Code Drop 5 | | |
| Code Drop 6 | | |

# 4. Testing Strategy

The objective of testing is to ensure that the release/implementation of <*project name*>meet the business objective and requirements.

The types of testing that should be normally performed are outlined below. The test cases are to be developed within the Quality Center Test Plan module. Defects found during testing will be logged in the Quality Center Defects module.

## 4.1. Testing tools

List of Tools to be used for testing

## 4.2. Unit Testing

- Unit testing is usually an integral part of the development phase and is not tracked in Quality Center. It is a pre-requisite for integration testing and subsequent testing phases.
- High-level timelines are given in Section 7.

## 4.3. Assurance Testing

- System testing tests a complete integrated system to evaluate the system's compliance with its specified functional requirements. The test focus is functionality and performance. It should require no knowledge of the inner design of the code or logic.
- Types of testing that should be considered during system testing:

  Functional testing  
  Performance, volume and stress testing  
  Security testing  
  Regression testing
- List the types of testing required in the table below.

| System Testing Type | |
|---|---|
| Batch Testing | One type of the Integration Testing and the objective is to test batch job or process. A Batch Testing can be an Internal or External. A Batch Testing is an external testing if it has interactions with other systems. |
| Batch Testing with External Systems | One type of the Integration Testing and the objective is to test batch job or process. A Batch Testing can be an Internal or External. A Batch Testing is an external testing if it has interactions with other systems. |
| External Integration Testing with Interfacing Systems | One type of the Integration Testing. It is required when the system has interactions with other systems. The objective is to test integration between system and system. |
| Functional Testing | Functional testing is based on requirements and functionality. It is not based on any knowledge of internal design or code. This type of testing should be done by testers. |
| Integration Testing | The objective of Integration Testing is to combine individual software parts and test them as a group. This test proves that all areas of the system interface with each other correctly and that there are no gaps in the data flow. Successful completion of Integration Testing proves that system works as an integrated unit. Integration Testing can be categorized as Internal Integration Testing, External Integration Testing and Batch Testing. |
| Internal Integration Testing | One type of the Integration Testing. It usually includes Unit to Unit, Unit to Module, Module to Module and Module to System tests. The objective is to test the combined software modules without the interactions with other systems. |
| Negative Testing | Negative testing tries to determine if a module or a system does anything it is not supposed to do. Negative testing tests the opposite of the operating limits |

| | |
|---|---|
| | of the application. |
| Operating Limits | Operating limits are boundaries intended to be incorporated in the application. e.g. Time sheet cannot have more than 24 hours a day. |
| Performance Testing | The objective of performance testing is to establish a baseline relation between the expected system load and acceptable application response time. |
| Regression Testing | The objective of regression testing is to confirm that the source code changes made to achieve new functionality did not impact existing system functionality in an un-desired manner. |
| Security Testing | Security testing is usually done in the format of an audit. System is evaluated for security vulnerability, logical and physical system access and permissions. |
| Stress Testing | The objective of stress testing is to establish the system's limits or breaking points by overwhelming its resources or by taking resources away from it. System passes stress testing if it can successfully recover from the break-point failure. |
| Assurance Testing | The objective of System Testing is to ensure that each element of the system as well as system as a whole meets the functional requirements. In addition, it ensures that the system operates as expected and is suitable for the purposes intended. |
| Unit Testing | The objective of Unit Testing is to validate that each individual unit of the system works properly. Unit testing is integral part of the development phase. As such it is an on-going and final task during development cycle and a pre-requisite for Integration Testing. |
| User Acceptance Testing (UAT) | UAT is a final verification of the required business functionality and correct functioning of the system. It simulates real-world conditions. The objective of is to obtain confirmation by the owner of the production system that it meets the functional requirements. |
| Volume (Load) Testing | Volume testing is an extension of performance testing during which the system is exposed to gradually increased load, usually using an automated testing tool. The objective is to determine the highest load the system can sustain while still functioning properly. |
| Production Acceptance Testing (PAT) | Testing of certain functions after go live to ensure the production data is correct for job runs post implementation for a period decided |

### 4.3.1. *Functional Testing*

- Functional testing is mandatory
- List business scenarios or processes that will be tested for Functional Testing.
- Create detailed Functional Testing test cases in Quality Center tool Test Plan module. Link to test requirements in Requirements module. Functional Testing test cases should cover all the business functional requirements and user interface requirements.
- Negative testing tests the opposite of the operating limits of the application and is normally performed during the functional testing.
- Create test sets in Quality Center tool Test Lab module for the identified business scenarios or processes.
- Specify the Test Scenarios and Test cases to be executed

### 4.3.2. *Performance, Volume and Stress Testing (performance team/person)*

- *Complete this section if the Performance, Volume and Stress Testing is identified as required in section 4.5*
- List business scenarios or processes that will be used for Performance, volume and stress testing.
- Create detailed test cases in Quality Center tool Test Plan module and link test cases to test requirements in Requirements module.  Indicate which values to monitor, measure and use to evaluate the test
- *Example:*
  - *Number of transactions per hour*
  - *Number of files transferred per hour*
  - *Number of simultaneous users in the system*
- Create test sets in Quality Center tool Test Lab module for the identified business scenarios or processes.
- Testing result should be included where appropriate if the performance testing tool is used.

### 4.3.3. *Security Testing*

- *Complete this section if the Security Testing is identified as required in Section 4.5*
- Provide a brief description of the test scenarios and audits to be used during security testing.
- Describe how will the results be communicated and used by the project team.
- Create detailed Security Testing test cases in Quality Center tool Test Plan module. Link to test requirements in Requirements module.
- Create test sets in Quality Center tool Test Lab module for the identified business scenarios or processes.

### 4.3.4. *Regression Testing*

- *Complete this section if Regression Testing is identified as required in Section 4.5*
- List test scenarios to be tested for regression testing and indicate if they will be automated.
- Create automated test scripts using QTP tool if automation is required and save tests in Quality Center or create manual test cases in Quality Center.
- Create test sets in Quality Center tool Test Lab module for the identified business scenarios or processes.

## 4.4. User Acceptance Testing

- User Acceptance Testing is NOT optional and should be performed by business end users.
- List business scenarios or processes that will be tested for UAT.
- Create detailed UAT test cases in Quality Center tool Test Plan module. Link to test requirements in Requirements module.

- Create test sets in Quality Center tool Test Lab module for the identified business scenarios or processes.

### 4.5. Test Environment

### 4.6. Infrastructure

- Describe the infrastructure of the system used during testing

### 4.7. Installed Software and Correct Version for Hardware

- Describe the required setup of the workstation to be used for testing
- List the required operating system(s) and other applications
- For browser based applications list supported browsers
- List any other special requirement

### 4.8. Test Scenarios and Test Data

## 5. Control Procedures

### 5.1 Defect Logging/Escalation Procedures

- Quality Center has been selected as the standard tool for test scenarios/scripts repository and defect tracking. Defect details, Defect Severity & Priority levels, Defect Status and Defect Tracking Workflow have been customized to THC standard in Quality Center Defects module.
- Standard definition of Defect Severity and Priority are given below. Any deviation from this definition is not permitted.
- Defect Severity is defined for both Testing and Production environments as follows:

<u>**Defect Severity levels**</u>

| Severity level | Description | |
|---|---|---|
| | Testing | Production |
| | | |
| 1. Showstopper | Cannot use any part of the system until the defect is fixed." Unable to proceed with test execution. The application (or system) may abend, or hang repeatedly, or there may be an unrecoverable data loss. An immediate fix is needed. | Core business function cannot be performed and there's no workaround. |
| 2. Critical/ High | Can use the system, but a by-pass is required." Test or development is severely restricted due to a defect encountered for which there is no acceptable circumvention. | Particular business function cannot be performed using the system, however an agreed upon workaround is available and acceptable by the business. |

| Severity level | Description | |
|---|---|---|
| | The application executes but wrong results are encountered, or defects are discovered which would significantly affect production operation. A fix is required in order to proceed with this function. | |
| 3.Medium | Functionality impacted, but testing can proceed." Able to proceed with limited functionality not crucial to test or development. There may be discrepancies between product operation and the product documentation. Additionally, any defect that is caused by extreme or unlikely circumstances, environments or operator sequences, provided a straightforward workaround exists and there is no unrecoverable data loss. | Manageable loss of productivity when performing a particular business function. |
| 4.Low | Minor issue, impact is low and limited to that particular test case. | Little or no business impact. |

**Defect Priority Levels**

| Defect Priority | Priority Definition | Turnaround (days) |
|---|---|---|
| Priority 1 | Highest Priority - defect needs to be fixed ASAP<br>-fix must be delivered with the next Code Drop | 1 day |
| Priority 2 | Medium priority<br>-fix must be delivered with the next Code Drop | 2-3 days |
| Priority 3 | Low Priority<br>-fix can be postponed | Lowest priority |

**Defect Status**

| Status | Meaning |
|---|---|
| Open | Defect raised by the Test Analyst. |
| Assigned | Defect assigned for resolution to developer/Vendor/DRP/SME/Business. |
| Fixed | Defect fixed by developers/Vendor/DRP but code is not deployed yet for retest in Test Environment |
| Ready for Retest | Defect is fixed and fix is deployed in Test environment for Retest. Assigned back to the tester who originally logged the defect (or to the Test Lead ) |

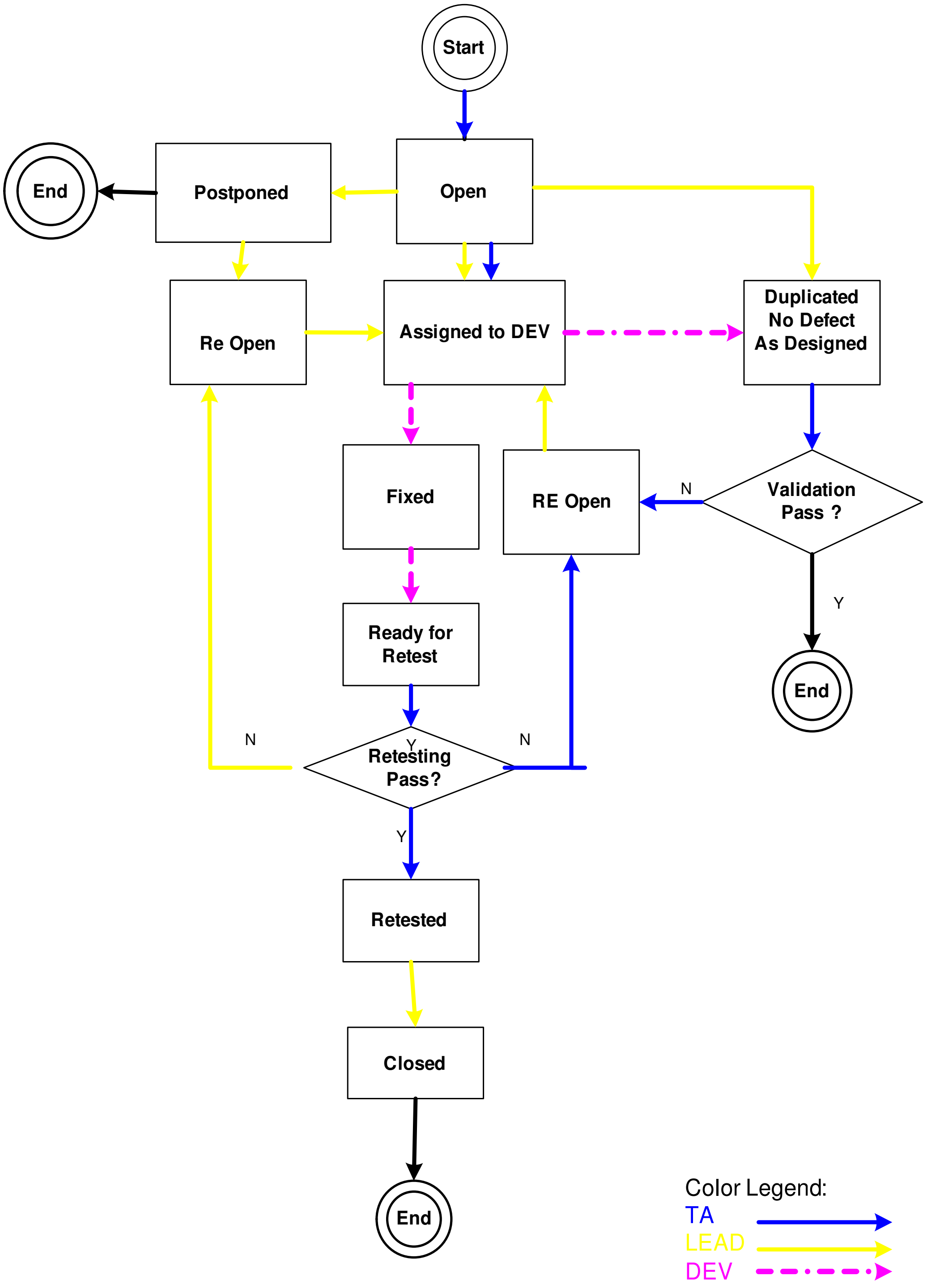
| | |
|---|---|
| Retested | Tester retested successfully. |
| Postponed | Non-serious. Decision made to be left as is |
| Closed | Defect retested successfully and deemed to be closed |
| Duplicated | Defect already raised. |
| No Defect | Not a defect and assign to Test Analyst |
| Re-Open | Retest failed |

## QC Roles

| User Group | From | To |
|---|---|---|
| **Developer** | Assigned | Fixed |
| | Assigned | Duplicated |
| | Assigned | No Defect |
| | Assigned | As designed |
| | Fixed | Ready for Retest |
| **QA Tester** | Ready for Retest | Retested |
| | Open | Assigned |
| | Duplicated | Retested |
| | No Defect | Retested |
| | Ready for Retest | Re-Open |
| | Duplicated | Re-Open |
| | No Defect | Re-Open |
| | As designed | Re-Open |
| **Test Lead** | Open | Assigned |
| | Open | Duplicated |
| | Open | No Defect |
| | Open | Postponed |
| | Assigned | Postponed |
| | Assigned | No Defect |
| | Assigned | Duplicated |
| | Ready for Retest | Retested |

| | | |
|---|---|---|
| | Retested | Closed |
| | Ready for Retest | Re-Open |
| | Duplicated | Retested |
| | Postponed | Re-Open |
| | As designed | Re-Open |
| | As designed | Closed |
| | As designed | Postponed |

## Defect State Transition Workflow



## 5.2 Entrance and Exit Criteria for Testing

This section defines the entrance and exit criteria for each testing type.

**Integration testing**

Entrance Criteria

- Unit testing has been successfully completed, documented and signed off by the Development teams,
- No severity 1 or 2 defects in the system.
- Test scenarios and test cases for Integration testing have been defined in Quality Center.
- Infrastructure, installation and administration teams completed systems and data for testing.
- Environment Shakedown has been successfully completed.

Exit Criteria

- No severity 1 or 2 defects in the system.
- All test scenarios passed or an agreed upon workaround exists.
- Test results and defects are logged in Quality Center.

**System Testing**

Entrance Criteria

- Integration testing has been successfully completed.
- No severity 1 or 2 defects in the system.
- Test scenarios and test cases for System Testing have been defined in Quality Center.
- Infrastructure, installation and administration teams completed systems and data for testing.

Exit Criteria

- No severity 1 or 2 defects in the system.
- All test scenarios passed or an agreed upon workaround exists.
- Test results and defects are logged in Quality Center; Performance Testing result should be included where appropriate.

**User Acceptance Testing**

Entrance Criteria

- System Testing has been successfully completed and documented.
- No severity 1 or 2 defects in the system.
- User Acceptance Test cases and test scenarios have been defined in Quality Center.
- Infrastructure, installation and administration teams completed systems and data for testing.

Exit Criteria

- No critical or high severity defects in the system.
- No severity 1 or 2 defects in the system.
- All UAT test cases passed or an agreed upon workaround exists.
- Test results and defects logged in Quality Center.
- UAT Report signed-off by business user.

## 5.3 Testing Status Reporting

The following two reports have been defined in Quality Center to track and analyze the test results.

Report 1. Test Execution by Tester Summary Report.
The format is as below. The report can be run from Quality Center Test Lab module.

| | Failed | No Run | Not Completed | Passed | <total> |
|---|---|---|---|---|---|
| Tester 1 | | | | | |
| Tester 2 | | | | | |
| Tester 3 | | | | | |
| Tester 4 | | | | | |
| <total> | | | | | |

Report 2. Defect Status by Severity Summary Report.
The format is as below. The report can be run from Quality Center Defects module.

| SEV | Open | Assigned | Fixed | Ready for Retest | Re-open | Retested | Postponed | Closed | Duplicate | No Defect | <total> |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Showstopper | | | | | | | | | | | |
| Critical | | | | | | | | | | | |
| Medium | | | | | | | | | | | |
| Low | | | | | | | | | | | |
| <total> | | | | | | | | | | | |

## 5.4 Change Control

The project change control process and approach should be applied to the testing.

# 6 Schedules

- Define detailed tasks and activities during testing based upon work breakdown structure described in section 2 and provide timelines.
- Identify milestones and dependencies.

# 7 Risks and Assumptions

## 7.1 Risks & Mitigation Plan

The results of the risk analysis during testing can be used to assist in identifying high-risk applications, which must be tested more thoroughly and identify error-prone components within the application, which must be tested more rigorously.
The risk analysis of testing should be completed and captured in the risk register for the project.

## 7.2 Assumptions

- ❖ List all the assumptions made before or during the testing that are important for successful completion of the testing phase.

  - ➢ Oracle will conduct an onsite test of all code drops in project environment prior to hand off to the project team

# 8 Approvals

Name:
Title:
Project Role: Business System Owner

Signature: ______________________________________________

Date: ______________________________________________

Name:
Title:
Project Role: Project Leader

Signature: ______________________________________________

Date: ______________________________________________

# 9 Appendix A

Definitions of different testing types:

| Test Type | Description / Objectives |
|---|---|
| Batch Testing | One type of the Integration Testing and the objective is to test batch job or process. A Batch Testing can be an Internal or External. A Batch Testing is an external testing if it has interactions with other systems. |
| External Integration Testing | One type of the Integration Testing. It is required when the system has interactions with other systems. The objective is to test integration between system and system. |
| Functional Testing | Functional testing is based on requirements and functionality. It is not based on any knowledge of internal design or code. This type of testing should be done by testers. |
| Integration Testing | The objective of Integration Testing is to combine individual software parts and test them as a group. This test proves that all areas of the system interface with each other correctly and that there are no gaps in the data flow. Successful completion of Integration Testing proves that system works as an integrated unit. Integration Testing can be categorized as Internal Integration Testing, External Integration Testing and Batch Testing. |
| Internal Integration Testing | One type of the Integration Testing. It usually includes Unit to Unit, Unit to Module, Module to Module and Module to System tests. The objective is to test the combined software modules without the interactions with other systems. |
| Negative Testing | Negative testing tries to determine if a module or a system does anything it is not supposed to do. Negative testing tests the opposite of the operating limits of the application. |
| Operating Limits | Operating limits are boundaries intended to be incorporated in the application. e.g. Time sheet cannot have more than 24 hours a day. |
| Performance Testing | The objective of performance testing is to establish a baseline relation between the expected system load and acceptable application response time. |
| Regression Testing | The objective of regression testing is to confirm that the source code changes made to achieve new functionality did not impact existing system functionality in an un-desired manner. |
| Security Testing | Security testing is usually done in the format of an audit. System is evaluated for security vulnerability, logical and physical system access and permissions. |
| Stress Testing | The objective of stress testing is to establish the system's limits or breaking points by overwhelming its resources or by taking resources away from it. System passes stress testing if it can successfully recover from the break-point |

| | |
|---|---|
| | failure. |
| System Testing | The objective of System Testing is to ensure that each element of the system as well as system as a whole meets the functional requirements. In addition, it ensures the system operates as expected and is suitable for purposes intended. |
| Unit Testing | The objective of Unit Testing is to validate that each individual unit of the system works properly. Unit testing is integral part of the development phase. As such it is an on-going and final task during development cycle and a pre-requisite for Integration Testing. |
| User Acceptance Testing<br>(UAT) | UAT is a final verification of the required business functionality and correct functioning of the system. It simulates real-world conditions. The objective of is to obtain confirmation by the owner of the production system that it meets the functional requirements. |
| Volume (Load) Testing | Volume testing is an extension of performance testing during which the system is exposed to gradually increased load, usually using an automated testing tool. The objective is to determine the highest load the system can sustain while still functioning properly. |

# APPENDIX -F
# User Acceptance Test Plan Template

# LU-Project Name User Acceptance Test

UA Test Plan

### Document Details

| | |
|---|---|
| Document Id | LU – Project Name |
| Document title | UA Test of LU – Project Name |
| Document subtitle | UA Test Plan |
| Document version | 0.01 – Draft for Review |
| Version date | 9 August, 2010 |
| Document file name | UA Test Plan_LU_ Project Name |
| Template name | UA Test Plan.doc |
| Print date | Friday, 23 March 2012 |

### Document Authorisation

| | Name | Signature | Date |
|---|---|---|---|
| Written by | | | |
| Reviewed by | | | |
| Authorised by | | | |

### Document History

| Version | Date | Author | Description |
|---|---|---|---|
| 0.1 Draft | | | Initial Draft |
| | | | |
| | | | |

Liberty Utilities
WATER | GAS | ELECTRIC

# Table of Contents

## 1.0 UA Test Plan Identifier

LU – Project Name.

## 2.0 Purpose of Project

Note the purpose of the project being tested including critical business outcomes and which systems are affected,

## 3.0 Project Success Criteria

Note what success means for this project. Key success factors may include critical timing, reductions in effort, increases in the quality of information, compliance with regulation or lack of impact on customers.

## 4.0 Test Scope at a High Level

Note at a high level what are the critical test results that are needed to implement this project.

## 5.0 Roles and Responsibilities

### 5.1 Responsibilities

The roles of the User Acceptance Team are detailed below.

#### 5.1.1 Stake Holders

-

#### 5.1.2 User Acceptance Test Lead

(name)

#### 5.1.3 Supporting User Acceptance Testing Team Members

(name1, name2…)

| Tester Name | Department/Area Representing | Area of Testing Focus |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

#### 5.1.4 QA Analyst

(name)

## 6.0 Schedule and Cost Allocation

All upgraded functionality and test data will be migrated to the test environment prior to the start of user acceptance testing.

| Activity | Lead Responsibility | Date |
|---|---|---|
| Identify and select testers for UAT | | |
| Develop test scenarios and scripts/cases | | |
| Validate participants availability for testing | | |
| Review scenarios/scripts for accuracy, completeness and sequence (confirm test data is correct) | | |
| Ensure UAT Lab desktops configured for testing | | |
| UAT environment validation | | |
| Testing by UAT participants | | |

Costs for User Acceptance testing for this project will be charged as follows: Business Resources are charging costs to their home department. IT resources are charging time to their home department.

## 7.0 Features Tested

| (Project Name) | |
|---|---|
| Type | Description |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

## 8.0 Test Scenarios

| (Project Name) | |
|---|---|
| Type | Description |
| | |
| | |
| | |
| | |

## 9.0 Test Environment and Environment Requirements

## 10.0 Test Scripts and Test Progress and Test Reporting

Test scripts, testing results, defects and defect resolution are tracked in HPQC. Regular meetings with stakeholders are held to review test progress and results.

## 11.0 Purpose of User Acceptance Testing

The overall purpose of testing is to ensure the {name of application} application performs at an acceptable level for the customer. This document outlines the detailed plan for user acceptance testing of this application.

This test plan will be used to record the customer's sign off of the documented scenarios. Detailed test scripts/cases have been developed and will be used to record the results of user testing. This document is a high level guide, and is not intended as a replacement for any specific user acceptance testing procedures that individual areas might have.

The User Acceptance Testing of the Project Names will commence on the September 13th 2010, and is scheduled to take 6 week.

## 12.0 User Acceptance Testing Approach

User Acceptance testing will ensure that the Project Name processes are tested against the functional requirements, in an environment as close as practicable to the live environment. The following is the general User Acceptance Testing Approach that will be employed:

1. User Acceptance Testing will be conducted in association with expertise provide Finance, and Customer Services;
2. Acceptance Testing will be undertaken against this user Acceptance Testing Plan documented by the Quality Assurance Analyst;
3. User Acceptance testing will be undertaken in a dedicated environment that is as close as practicable to the agreed live environment; this includes a full set of production data;
4. User Acceptance testing will be undertaken on Standard LU desktop workstations;
5. A specific set of test cases will exist for each test scenario;
6. User Procedures, batch processes, periodic processes and controls will be tested;

# 13.0 Role Definitions

## 13.1 Stake Holders

The Stakeholders make decisions on the scope of testing, approve test results and work-arounds and assign resources and budgets to the testing teams.

## 13.2 User Acceptance Test Lead

1. Manage the User Acceptance testing and coordinate User Acceptance Testing activities;
2. Request the necessary User Acceptance Test resources;
3. Assign User Acceptance Test verification tasks;
4. Manage the identification of required User Acceptance Test Data;
5. Request the compilation of, and access to User Acceptance Test Data;
6. Liaise with QA Coordinator and Support Testing Resources;
7. Oversee the development of Test cases, based on business requirements as detailed in the LPC Calculation of Account spread sheet documentation;
8. Ensure that user Acceptance Tests are completed to the agreed schedule;
9. Manage and liaise/communicate with stakeholders regarding change requests and test issues;
10. Undertake tests;
11. Ensure tests are repeated where necessary;
12. Record and report successful completion of Tests and document problems in HP QC;
13. In the event of serious problems, determine whether to recommend suspension or cancellation of user Acceptance Testing;
14. Liaise with the QA Coordinator to ensure the availability of User Acceptance Testing environments and data within same;
15. Requesting modifications to the UAT environments, including back up and refresh schedule.

## 13.3 **Supporting User Acceptance Testing Team Members**

1. Develop test cases;
2. Assist in the Identification of the required test data;
3. Undertake tests;
4. Liaise with the User Acceptance Test Lead;

## 13.4 **QA Analyst**

1. Prepare the User Acceptance test plan and test procedures.
2. Assist in the loading of test scripts into HP QC.
3. Coordinate the preparation of the UAT Environment, such as backup, refresh and loading of patches into the environment.
4. Preparation of Reports out of HP QC; defect report, test results, testing status, etc.
5. Employ agreed application release processes and verify their operation.

## 14.0 Sign Off and Acknowledgement

I understand that by agreeing to participate in this testing through the execution of the testing plan, I approve of the activities defined and authorize my department to participate as documented for the successful implementation of this application in our department.

___________________________________ Date: ___/___/___

**Resource Name**

**Title or Responsibility**

___________________________________ Date: ___/___/___

**Resource Name**

**Title or Responsibility**

___________________________________ Date: ___/___/___

**Resource Name**

**Title or Responsibility**

___________________________________ Date: ___/___/___

**Resource Name**

**Title or Responsibility**

___________________________________ Date: ___/___/___

**Resource Name**

**Title or Responsibility**

# APPENDIX – G
# IT Regional Disaster Recovery Procedure (Liberty Utilities West)

## Table of Contents

# 1.0 How to Use This Document

That you have opened this document means that:

- You are likely a member of the Disaster Recovery Team
- Your are either making updates to this DRP

OR

- **Liberty Energy has befallen some disaster, and needs your help to recover**

If you are in the midst of a disaster, please start reading the next section, **Recovering From A Disaster.**

## 1.1 Recovering From a Disaster

If you are currently experiencing a disaster scenario, you are in the right place.

To provide you a context of what you are experiencing, you will find it helpful to read the Executive Summary. This may take 5 minutes to complete.

Secondly, it will be important to for you understand your, and other peoples', roles and responsibilities during this recovery process. Reading the section on DRP Roles and responsibilities will help you understand who else is involved, and who you should be working with. This may take 1 minute to read.

Lastly, once you and your colleagues understand what kind of disaster has occurred, turn to the Scenario section that most readily applies to your situation. The recovery scenarios cover the following situations:

1. Great Plains failure, other systems normal…………page 17
2. System Operations, OMS, other systems normal....page 23
3. SCADA failure, other system normal………………..page 28
4. Email Failure, other systems normal…………………page 32
5. Control Room inaccessible……………………………page 36
6. Office Building operational but not accessible………page 38
7. Data Center Damage, and/or inaccessible…………page 41
8. Office Building destroyed/damaged…………………page 45
9. Telecommunication system failure……………………...page 47
10. Liberty Energy Transistion Services Agreements…….page 48

These sections cover, in detail, what you will need to do, who else will be working with you, and what procedures you and the rest of you team will need to follow to recover from this disaster.

The Appendices included will also provide you with additional helpful information including:

- Appendix A - Contact information of others involved in the Disaster Recovery activities
- Appendix B - Technical Environment Diagrams to provide a context of what is being recovered

- Appendix C – Liberty Energy Application Portfolio, including “critical” systems you are trying to recover
- Appendix D-  Liberty Energy Transition Services Agreements with Nevada Power

## 1.2 Updating this document

If you are updating this document, you are also in the right place. Please complete the following log, including the IT Manager's signature, approving the change.

| Pages Updated | Date Updated | What Changed | Author | IT Dir. Approval |
|---|---|---|---|---|
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

All DRP updates / changes must be made to the official electronic version of the DRP stored in **MIS folder**

All DRP manual holders must be notified of any changes to the DRP, so that they familiarize themselves with the changes, and can:

- Print off a hard copy of the DRP for ease of reference and use
- Copy an electronic version of this document, to be stored on their PC at home

The DRP manual holders are made up off

|  |  |
|---|---|
| the Core Disaster Recovery Team, |  |
| Gerald Tremblay | VP of Finance and Administration |
| David Ormsby | Information Systems Manager |
| Steve Antolos | Business Systems Analyst |
| Brian Mottershead | Network Administrator |
| Lisa Goritschinig | Systems Administrator |
| Matthew Macedo | Technical Support / Web Programmer |
| Alexey Karyakin | Technical Support |
| Gary Baugh | Information Systems Support , Arizona |
| Todd Gee | GIS Systems , California |
| Markus Mueller | Senior Network Designer , California |

## 1.3 Storage of the Plan

The IT Manager, as DRP Lead, must have multiple versions of the DRP, including:

- The electronic DRP stored on the network, which can be printed
- Available on local drive , CD

As well, each DRP Team Member has been provided with the location of the electronic version of the DRP, which can be printed, stored on their office and/or home PCs.

Lastly, both hard copy and CD versions of the DRP are stored in various off site locations, including:

- Hardcopy and CD stored at the File Bank

When updates are made these versions of the DRP must also be upgraded.

# 2.0 Executive Overview

## 2.1 Introduction

The purpose of this Disaster Recovery Plan (DRP) is to provide the reader with the information needed to participate in recovery of business operation after a disaster or crisis has befallen Liberty Energy. It is this document that provides the who, what, where, when, and how, to recover gracefully from a disaster and restore business operations.

The business scope addressed in this DRP includes Liberty Energy

## 2.2 Business Analysis

### *2.2.1 Locations*

There are primarily two locations impacted by this Disaster Recovery Plan. Liberty Energy Blink Data Center main facility , and Oakville Bristol Circle

1. Liberty Energy Blink Data Center:  
   Blink Data Center  
   861 Redwood Square  
   Oakville, ON  
   L6J 5E3  
   www.blink.ca

2. Algonquin Power and Utilities , Oakville Office  
   2845 Bristol Circle  
   Oakville, ON  
   L4Y-OB1

### *2.2.2 Current Environment*

Both Algonquin Power and Liberty Energy utilize various applications and IT infrastructure in support of their business needs, and include:

- An infrastructure that provides both network access and email to all employees
- Voice communications via Bell Canada
- Archival Storage and Tape Backup Systems
- Blink fibre communication circuits

Liberty Energy California Pacific Electric (CALPECO) has specific applications:

    - Customer Services and Billing  using Vertex Hosted Platform (3$^{rd}$ party)
    - Meter Data Systems – under TSA with NVE
    - Microsoft Exchange 2010 Email System
    - Great Plains and Wennsoft Work Management Systems
    - SCADA – Control Room, within Operations- under a TSA with NVE
- Other applications specific to the Utilities environment

All Liberty Energy systems owned systems are located at the Blink Data Center, in Oakville, ON, Canada with connectivity to the 2845 and 2865 Bristol Circle, Oakville locations , North and South Lake Tahoe Offices in California.

The Data Center location at Blink provide a high availability for Liberty Energy "critical" infrastructure and applications, as identified in :
Appendix C – Application Portfolio for a list of "critical" and non-critical systems/applications.

*Further to the Blink Data center , Liberty Energy is underway with a new data center build at Qwest / Savvis data center for Hot Standby.  Savvis will be primary data center and Blink will be backup/DR.  This is scheduled for completion in Q4 of 2011.*

### *2.2.2 Business Impact Analysis*

Liberty Energy has identified three high level business drivers, by which it measures its success, including:
- Providing continuous power to customers (keeping the lights on)
- Ensuring the health and safety of Liberty Energy customers and employees
- Maintaining financial performance

As a consequence of these drivers, the following business functions, within Liberty Energy, have been identified as critical business functions to recover should a disaster or crisis occur.
- Operations
    - The Control Room
        - Minimizing power outages
            - Operating automated switches to restore power
            - Dispatching crews, when needed, to restore power
        - Rerouting power to ensure crews can safely make necessary repairs
    - Repair crews who utilize vehicles and materials to carry out the need repairs

- Financials/Administrative Services
    - Warehousing
        - Locating and issuing materials to repair crews
        - Reordering materials as required
    - Customer Service and Billing
        - Ensuring customer queries are appropriately addressed
        - Fast tracking customer outage reports to the control room
        - Recording customer power consumption (collecting meter readings)
        - Billing customers for power consumption

- Accounts Receivables
  - Ensuring customers pay for their power consumption
- Purchasing and Accounts Payable
  - Ensuring needed materials are ordered from Liberty Energy suppliers
- Ensuring Liberty Energy suppliers are paid appropriately
  - Ensuring staff are paid appropriately

This document addresses how these critical business functions will be able to withstand and recover from a potential disaster, and continue to deliver business services during the recovery period.

## 2.3 Business Continuity Requirements:

This section summarizes the “critical” business functions that have specific business continuity requirements.

### *2.3.1 Control Room*

The SCADA system is a critical system utilized by the control room staff in monitoring the power distribution network.

*For California Pacific Electric please reference Transistion Services Agreements with Nevada Power*

### *2.3.2 Customer Service / Billing*

The Customer Service group is the customer focal point for Liberty Energy. Typically, customers call Customer Service to request assistance with bills, rates, hook ups, and other administrative support. As well, customers will call Customer Service to report power outages, which, in turn, will be expedited to the Control Room for resolution.

Liberty Energy is dependent on the telephone system in communicating with external customers, suppliers, and other stakeholders, and as a result, a telephone backup process has been implemented.

During business hours, AT&T and Qwest Telecommunications is the provider for calls to Liberty Energy for normal day to day business communications. Should the Liberty Energy telephone switch go down during businesses hours,
California Pacific Electric calls are routed to customer call center at Nevada Power.  This arrangement is covered under the transition service agreement.   Should Liberty Energy’s telephone system go down during non-business hours, the calls are automatically forwarded to Nevada Power’s dispatch after hour’s service.
The billing system is currently hosted by 3rd party Vertex, if the Vertex solution is not available customer service calls the Vertex help desk to setup a ticket.

- First, given that Vertex hosted platform is Liberty Energy’s billing system, generating revenues for the company, it was estimated that billings could be delayed for up to 2 weeks before cash flow issues would seriously impact Liberty Energy.

- Secondly, and more restrictively, the meter reading system (tracking interval meter readings) retains up to 10 days of meter reading data, after which meter readings would be overwritten, preventing true consumption billing.

As a result, for the purposes of this DRP, it was accepted that the business could continue to operate, in a disaster scenario, for up to 10 days without serious implications from a cash flow basis. However, customer relations may be negatively impacted.

### *2.3.3 Warehousing, Receivables, Purchasing, Accounts Payable*

Great Plains is the system that the financial organization is dependent on to carry out its normal business functions. If Great Plains is inaccessible, the financial group needs to record their business transactions manually, until such time the system is recovered. Once Great Plains becomes available, the manually recorded transactions need to be keyed into the system in the appropriate sequence to properly reflect Liberty Energy's business activity on the books.

Even though the financial group can continue with the bulk of its business manually, it is accepted that tracking transactions manually, on paper, will become too burdensome and too prone to error to be effective.

The Financial group has however, has committed to having the capacity to operate manually, without Great Plains for a 1 week period without significant degradation of service to customers, suppliers and employees.

### *2.3.4 Payroll*

Liberty Energy is committed to ensuring their employees are paid when due. The time hourly workers spend on a particular assigned task is recorded in Great Plain and Wennsoft  which tracks the number of hours (including overtime) against specific projects. In the case of most salaried staff, Great Plains houses the salary information. With both hourly and salaried employees, their pay information is transmitted to Ceridian which in turn issues pay stubs the employees.

If Great Plains is unavailable, overtime the data needed by Ceridian to calculate employee pay would be unavailable. The possibility of tracking work hours manually has been considered, but it is perceived that manual tracking would quickly become overly burdensome, and prone to error.

The preferred process for ensuring employees were properly paid, is to work with Ceridian to issue employee salaries without overtime, after which overtime pay could be assigned once Great Plains and Wennsoft was up and running. However, actual work hours worked would have to be collected manually by the operation, and keyed into the Great Pains and Wennsoft once it was up and running.

## 2.4 Threats and Risks

The threats and/or risks that have been identified as even remotely possible in generating a disaster scenario to Liberty Energy, include:

- Natural Disasters: including earthquakes, hurricanes, snow storms
- Fire

- Malicious Intent, including terrorists and disgruntled employees,
- Accidental destruction of facilities: eg. Plane crash into the facilities
- Pandemic: inadequate staff to operate the facilities
- Toxic Spill eg. tank truck spill, train car spill
- IT systems failure eg. virus attack, power outages

In order to understand the impacts of certain disasters, an outcomes approach has been taken.
The disaster scenarios appear to fall into 4 broad categories

1. No facilities damage, but critical systems outages
   a. Infrastructure, including Email
   b. Phone and radio systems
   c. Applications, including: SCADA, Great Plains, Customer Information Systems
2. Partial destruction of facilities possibly caused by fire, malicious intent, accident, or natural disaster
   a. Computer Room
   b. Control Room
3. Total destruction of facilities possibly caused by natural disaster, fire, malicious intent, or accident,
4. Facilities in place but not accessible, possibly caused by, toxic spill, malicious intent, or natural disaster

In considering these threats and risks, it is believed that the majority of possible disaster scenarios have been covered.

## 2.5 Not in Scope of this DRP

The scope of this DRP has been limited to only those functions and associated systems that have been identified as “CRITICAL”. This DRP has **not** been extended to include non-critical functions and associated systems, including:

- Desktop applications , other applications not listed in the DRP documents from
  - Engineering planning, design, budgeting, and project management
  - HR and Regulatory functions
  - Operations (other than Control Room functions)

However, the majority of the organization utilizes Great Plains, and will be requested to participate with the recovery from a Great Plains disaster.

Additional items **not** included in the scope of this DRP include:

- Telecommunications equipment utilized to operate line switches and RTU’s.

## 2.6 Recovery Time Objectives

The Recovery Time Objective (RTO) specifies how soon an organization will be up and running after a disaster has occurred. Organizations may have multiple RTO's depending on the data involved. For example one RTO may specify how long before the major functions of the enterprise are back on line while a second, longer, RTO will determine how long until everything is fully recovered.

Within this DRP, the RTO is used to define the length of time, from the time the disaster is declared until the business group is able to utilize their systems to carry out its normal business functions. This does not include the time required to return the systems to full production mode, with all repairs completed. At this time this will be left to the best efforts of the Disaster Recovery Team to determine.

| System Name | RTO |
|---|---|
| User Access to SCADA from Control Room | 0 |
| User Access to SCADA without Control Room | < 1 Hour |
| Phone System | < 1 Hour |
| Remote User Access to Production Systems | < 1 Hour |
| Email + Active Directory | < 4 Hours |
| Great Plains and Wennsoft System | < 4 Hours |
| Ceridian Payroll | < 4 Hours |
| CIS System – Vertex Hosted Solution | < 4 hours |
| Meter Reading System | < 4 Hours |
| GIS Systems | < 4 Hours |
| Other applications | < 24 Hours |

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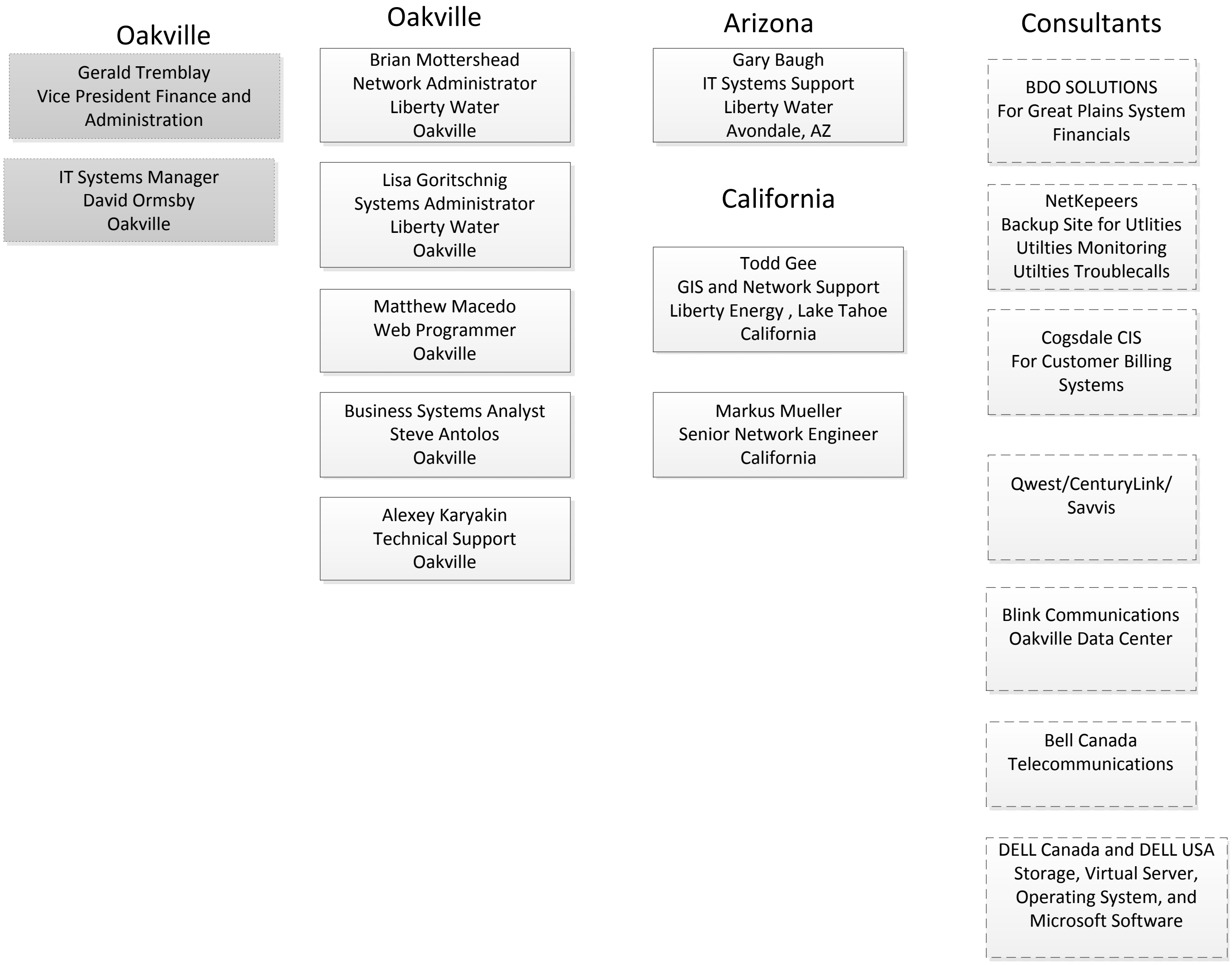
# 3.0 High Level Role and Responsibilities

## 3.1 DRP Organization Chart

The following Disaster Recovery Core Team organization chart identifies three levels of generic roles, including:

- Disaster Recovery Lead
- Business Lead
- IT Team Member

The chart below identifies these roles, and who currently is filling this role for the associated systems. Detailed contact information can be found in Appendix A – Contact List.



Oakville

Gerald Tremblay
Vice President Finance and Administration

IT Systems Manager
David Ormsby
Oakville

Oakville

Brian Mottershead
Network Administrator
Liberty Water
Oakville

Lisa Goritschnig
Systems Administrator
Liberty Water
Oakville

Matthew Macedo
Web Programmer
Oakville

Business Systems Analyst
Steve Antolos
Oakville

Alexey Karyakin
Technical Support
Oakville

Arizona

Gary Baugh
IT Systems Support
Liberty Water
Avondale, AZ

California

Todd Gee
GIS and Network Support
Liberty Energy , Lake Tahoe
California

Markus Mueller
Senior Network Engineer
California

Consultants

BDO SOLUTIONS
For Great Plains System Financials

NetKepeers
Backup Site for Utlities
Utilties Monitoring
Utilties Troublecalls

Cogsdale CIS
For Customer Billing Systems

Qwest/CenturyLink/
Savvis

Blink Communications
Oakville Data Center

Bell Canada
Telecommunications

DELL Canada and DELL USA
Storage, Virtual Server, Operating System, and Microsoft Software

Figure #1

To be sure that a Disaster Recovery team can be assembled should a disaster occur, alternates have been identified for each core member of the team. Below is a table that lists both core and alternate members of the team with their associated phone numbers.

| Core Team Member | Cell Phone | Alternate Contact | |
|---|---|---|---|
| Gerald Tremblay | 416 970-3145 | David Bronicheski(CFO) | |
| David Ormsby | 905-464-2057 | Steve Antolos | |
| Brian Mottershead | 905-531-8165 | David Ormsby | |
| Steve Antolos | | David Ormsby | |
| Lisa Goritschnig | 905-691-2790 | Brian Mottershead | |
| Gary Baugh (AZ) | 623-262-2817 | David Ormsby | |
| Markus Mueller (CA) | 530-214-9046 | David Ormsby | |
| Todd Gee | (775) 772-1735 | Markus Mueller | |
| | | | |

Table #1

As well, IT utilizes numerous vendors to augment their existing staff for many of the applications. These vendors would typically be contacted by IT should a Disaster be proclaimed to assist IT in bringing back any downed systems.

| Systems Supported | IT Contact | Vendor Name | Vendor Contact | Vendor Phone |
|---|---|---|---|---|
| Great Plains | Steve Antolos | BDO | Steve Payne | |
| Cogsdale | David Ormsby | Cogsdale | | |
| SCADA | David Ormsby | Telvent | | |
| Email System | Brian Mottershead | Microsoft/Netkeepers | | |
| Telephones | David Ormsby | Bell / Qwest/ Shoretel /Cisco | Qwest | |
| Servers and Storage | David Ormsby | Netkeepers , Dell and Storage | Netkeepers | |
| Hosting Providers and Colocation | David Ormsby | Blink Data Center<br>Qwest<br>Netkeepers<br>Vertex | | |
| | | | | |

## 3.2 Disaster Recovery Roles and Responsibilities

This section describes the responsibilities for each of the DRP roles identified. More specific steps are outlined with each of the disaster scenarios identified in Section 4 of this document.

### DRP Lead Role:

| Disaster Status | Responsibilities |
|---|---|
| Pre- Disaster | • Ensure DRP addresses critical business needs<br>• Ensure DR Plan updated as needed.<br>• Ensure DR plan, and any updates are distributed to the entire recovery team<br>• Appoint recovery team members and alternates as required.<br>• Train DR Team in regard to the plan.<br>• Work with IT team to ensure that this plan is up to date and comprehensive so that all critical systems can be recovered. |
| Post-Disaster | • Assist in assessing the extent of damage to enterprise facilities.<br>• Provide initial notification of disaster declaration to the recovery team.<br>• Coordinate all recovery team tasks.<br>• Coordinate the recall of the system backups and required software media.<br>• Make necessary travel and hotel arrangements as needed.<br>• Authorize purchases.<br>• Report to senior management on status of recovery.<br>• Update the existing DR site with the most current status, plans, and action items.<br>• Communicate status to internal organization utilizing<br>o DR site updates<br>o IT call centre message directing users to DR web site<br>o Emailing all users directing them to DR website<br>o Network broadcast directing users to DR website<br>o Walk about<br>• Should customers or other external stakeholders potentially become impacted by the Disaster, notify the CEO and Customer Service as customer communication required. |
| Business Resumption | • Develop and/or approve business resumption plans, with appropriate business leads and IT members<br>• Monitor and lead systems recovery and business resumption activities |
| Return to | • Develop and/or approve return to production plans |

| | |
|---|---|
| Production | - Monitor and/or lead return to production plans<br>- Report to senior management on status of recovery. |

## Business Lead Role:

| | |
|---|---|
| Pre- Disaster | - Identify critical systems to be included in this DRP<br>- Identify Recovery Time Objectives<br>- Develop needed manual procedures, if required<br>- Participate in DRP testing, as required<br>- Update DRP with issued updates |
| Post-Disaster | - Participate with IT in Incident Assessment<br>- Ensure staff informed of situation<br>- Invoke any business procedures required<br>- Work with DRP Lead and IT team members to define whether disaster scenario exists and invoke this DRP<br>- Insure impacted external stakeholders are provided adequate information regarding Liberty Energy's status and actions to be taken |
| Business Resumption | - Participate in business resumption planning<br>- Communicate plans and actions with systems users and external stakeholders, as needed<br>- Coordinate with IT action plans |
| Return to Production | - Participate in back to production plans<br>- Coordinate users activities with IT during return to production<br>- Ensure staff and management are informed of full recovery<br>- Ensure external stakeholders are informed of status |

## IT Member Role:

| | |
|---|---|
| Pre- Disaster | - Notify Team Lead of any changes to DRP<br>- Participate in DRP testing, as required<br>- Update DRP with issued updates |
| Post-Disaster | - Carry out Incident Assessment<br>- Work with DRP Lead and Business Lead(s) to define whether disaster scenario exists |
| Business Resumption | - Participate in business resumption planning<br>- Enable Disaster Recovery site<br>- Re-route user connections to utilize DR Site<br>- Communicate plans and actions with Business Lead(s)<br>- Update DRP Lead as to Business Resumptions status |
| Return to Production | - Repair production fault<br>- Finalize plans to return system(s) to Computer Room<br>- Move data collected at DR site to production system in |

| | |
|---|---|
| | Computer Room<br>• Re-route users connections to computer room<br>• Communicate user actions required to business team Lead(s) |

## 3.2 Disaster Recovery Plan – Testing Schedule

It is up to the DRP lead to determine when and how frequently aspects of the DRP should be tested / simulated. Selective testing of the DRP allows for:

- Verifying whether aspects the plan is as complete as to needs to be to assure success
- Applying the learning of a small test to other areas of the DRP
- Minimal impact on current business activities

It is recommended that small aspects of the DRP are tested on a monthly basis. The objective of these selective tests is to verify IT ability to recover the critical systems, and to ensure completeness of the DRP documentation. These mini tests are not meant to be a full simulation of a disaster, but to stress test each of the small components of the DRP.

Once there is confidence in IT's ability to execute a more comprehensive test of the DRP, a full disaster simulation may be warranted. This larger test would engage the full cycle of the test from disaster detection to users fully operational at the DR site, and then ultimately recovered back to normal production.

| Test No | Name | Test Objectives | Target Date | Actual Date | Corrections Made |
|---|---|---|---|---|---|
| 1 | Great Plains Database restore | - restore live database to test/backup database | July 2011 | July 2011 | |
| 2 | Scada System | Under transition services agreement with Nevada Power | | | |
| 3 | Email Failure | - Store and Forward System working, can fail over to redundant servers | June 2011 | June 2011 | |
| 4 | Netkeepers backup systems | - Can access all systems from offsite internet | July 2011 | July 2011 | |
| 7 | Great Plains Recovery | - Can restore GP to new server in virtual environment | September 2011 | | |
| 8 | CIS System | Vertex Hosted CIS | | | |
| 9 | Data Center | - ensure monitoring systems, virtual servers and storage system redundancy is functional | July 2011 | July 2011 | |

## 4.0 Disaster Scenarios and Recovery Plans

## 4.1 Disaster Scenario #1 – Great Plains / Wennsoft Outage

**Disaster Description**
Great Plains has become inoperable across the organization, and all other systems appear to be working normally.

**Organizations Impacted**

- Financial and Administration
  - Purchasing
  - Accounts Receivable
  - Accounts Payable
  - Shipping
  - Receiving
  - Inventory Management
  - Financial Reporting
- Engineering
  - Project Management
  - Budget Management
- Operations
  - Time Reporting
  - Cost Tracking

**Recovery Plan Summary**

This recovery plan is based on the fact that Great Plains is primarily a transaction processing and financial reporting system, and requires accurate transaction data to represent the company activities on the corporate books of account. Should Great Plains become unavailable, the organizations using Great Plains would be required track their business activities manually until such time system was once again available. Once available, the system users would then be required to coordinate the input of the manually documented transactions to ensure that Great Plains' data was accurate and current.

It is perceived that tracking business transactions manually on paper, and then keying these transactions in, in the correct sequence into the system once available, would be very burdensome to the organization, causing errors and re-work. As a result, the current DRP has been designed to recover Great Plains in timeframe so as to minimize the manual tracking of any business transactions.

**Recovery Time Objective (RTO):**

For the purposes of this DRP, the RTO for Great Plains is **4 hour after an emergency is declared**. This means that business will be able to utilize Great Plains on the Disaster Recovery site within 4 hours after the declaration.

Repairing the production hardware, synchronizing the data from the backup location to the production version in the data center, and reconnecting the users to this production version will be planned and timed so as to minimize the possibility of any data integrity issues, and minimize the impact on the organization.

**Recovery Site:**

Liberty Energy's Blink Data Center and Netkeepers backup systems.

**Recovery Procedure Description:**

Currently, there is essentially a backup of Great Plains system at Netkeepers online storage system site.

Should a Great Plains failure be declared, IT will access the backup server and restore to the production version of Great Plains in the Blink Data Center.
IT will then proceed with repairing the production version of the system. Once operational, IT will move the required data from the DR version of Great Plains to the production version and reroute the users to once again access the production version of Great Plains.

| **Business Resumption Steps**<br>**Great Plains Target – 4 Hours** | | |
|---|---|---|
| | | |
| | **Great Plains DRP Team** | o **IT Manager, DRP Lead: David Ormsby**<br>o **Business Systems Analyst: Steve Antolos**<br>o **IT Team Member: Brian Mottershead** |
| | | |
| **Step** | **Responsibility** | **Action** |
| **1.** | **DRP Lead** | o Ensure the appropriate IT resources are contacted and in place<br>o Ensure Great Plains Recovery Team are appraised of status<br>o Ensure BDO is contacted |
| **2.** | **IT Team Member** | o Complete  damage assessment<br>o Develop preliminary action plans<br>o Convene Great Plains Recover Team to finalize action plans<br>  o DRP Lead<br>  o Business Lead |
| **3.** | **DRP Lead** | o Determine whether Disaster situation exists<br>o Apprise Liberty Energy President of situation<br>o Declare Disaster and invoke DRP<br>o Communicate Situation and Plans to internal organization available communications; see DRP roles and responsibilities, page 13. |
| **4.** | **Business Lead** | o Communicate situation and action plans to business users of system<br>  o VP Finance and Admin<br>  o Finance and Admin Staff<br>  o Director Engineering<br>  o Director of Operations<br><br>- Determine whether Disaster situation exists<br>- Communicate to External organizations if Required, utilizing:<br>  o Internet site updates<br>  o Central phone messages<br>  o Etc |
| **5.** | **IT Team Member** | **Great Plains Cutover Steps**<br>o **DATABASE RESTORE:** |

| | | |
|---|---|---|
| | | - Using SQL Studio Manager, connect to (Great Plains Server Recovery Server)<br>- Restore the required database<br>- Right click each database and restore the most recent transaction log from the log shipping directory ("Restore with Recovery" mode must be used).<br>- If the SQL user logins do not exist on SQL Server, run the query located in the file "logins restore.txt". This file can be found on the server backup directory.<br>On Citrix Servers change the ODBC connector to point to the recovery GP server |
| **6.** | **IT Team Member** | o Reroute users to great Plains at DR site<br>o Have users log out of network and log back on to re-run their login scripts, allowing their access to the Great Plains DR implementation. |
| **7.** | **IT Team Member** | o Notify DRP Lead and Business Lead of Great Plains availability and accessibility |
| **8.** | **Business Lead** | o Communicate to Great Plains users of availability and accessibility<br>o Ensure external communications, if used, are updated |

| **Return to Production** | | |
|---|---|---|
| | | |
| **Step** | **Responsibility** | **Action** |
| **1.** | **IT Team Member** | o Diagnose and repair Great Plains production system |
| **2.** | **IT Team Member** | o Develop production cutover plan |
| **3.** | **IT Team Member** | o Convene Great Plains Recover Team to finalize/coordinate cut over plans |
| **4.** | **Business Lead** | o Communicate situation and action plans to business users of system |
| **5.** | **IT Team Member** | **Cut over to Great Plains production environment**<br>- Setup new virtual server<br>- Configure OS and SQL (use the same name the original production server had).<br>- Backup databases on DR server.<br>- Restore to new production server.<br>- Create logins on new production server.<br>- Transfer MBS share to new production server.<br>- Rename the original login script.<br>- Change the ODBC to point to new production server<br>- Once users log back onto network, new server will be accessed |
| **6.** | **IT Team Member** | o Notify Business Lead and Team Lead of completion |
| **7.** | **Business lead** | o Communicate Recovery to Business Users |
| **8.** | **DRP Lead** | o Review and improve process |

## 4.2 Disaster Scenario #2 –Customer Information System Outage

**Disaster Description**
Vertex Hosted CIS has become inoperable, while all other systems appear to be working normally.

**Organizations Impacted**

- Customer Service & Billing
- Meter Department

**Recovery Plan Summary**

This recovery plan is based on the fact that the meter department is responsible for capturing accurate power consumption data that is passed onto the Customer Service group via the Vertex system for billing purposes.

Customer Service & Billing also responds to customer inquiries dealing with account status, billing rates, invoicing issues, etc.

If the Vertex system was inoperable, Customer Service & Billing Depts' ability to respond to current customer queries regarding their account will be seriously impacted. As well, if the metering system is not working, nor integrated with Vertex, Liberty Energy will not be able to issue bills based on actual consumption.

It is perceived that customers would tolerate reduced service from Liberty Energy for numerous days, after which customer frustration would begin to create a distraction for the Customer Service & Billing group. As a result, the current DRP has Vertex Customer System and metering systems, recovered as quickly as reasonably possible.

**Recovery Time Objective (RTO):**

For the purposes of this DRP, the RTO for Vertex and Meter System is **24 hours after an emergency is declared**. This means that the meter systems are collecting customer power consumption data, and that Customer Service is able to bill customers for actual power consumption, answering customer queries regarding their account status. Repairing the production hardware, synchronizing the data from the backup site to the production version in the computer room, and reconnecting the users to this production version will be based on a best efforts basis.

**Recovery Location:**

Vertex Data Center

**Recovery Procedure Description:**

Should a Vertex CIS failure be declared, Vertex will be engaged to bring services back online.

| | | |
|---|---|---|
| **Business Resumption Steps**<br>**Vertex Target – 24 Hours**<br>**Meter Systems – 24 hours** | | |
| | | |
| | **Customer Information Systems**<br>**DRP Team** | o **IT Manager, DRP Lead: David Ormsby**<br>**Hosting Provider: Vertex ECIS**<br>o **Customer Service& Billing: Jeanne Matthews and Janine Irwin**<br>o **IT Team Members: Shawn Bundy, Todd Gee, Markus Mueller**<br>**Meter Systems: NVE Transistion Services** |
| | | |
| **Step** | **Responsibility** | **Action** |
| **1.** | **DRP Lead** | o Ensure the appropriate IT resources are contacted and in place<br>o Ensure appropriate Vertex resources in place<br>o Ensure Vertex Recovery Team are appraised of status<br>o Ensure Meter Team are appraised of status |
| **2.** | **IT Team Leads** | o Complete damage assessment<br>o Develop preliminary action plans<br>o Convene Vertex and Meter Recover Teams to finalize action plans<br>o DRP Lead<br>o Business Leads<br>o Other IT Team Members<br>o Vertex |
| **3.** | **DRP Lead** | o Determine whether Disaster situation exists<br>o Apprise Liberty Energy President of situation<br>o Declare Disaster and invoke DRP, if required<br>o Communicate Situation and Plans to internal organization |

| **RETURN TO PRODUCTION** | | |
|---|---|---|
| | | |
| **Step** | **Responsibility** | **Action** |
| **1.** | **IT Team Lead** | Work with Vertex on restoration |
| **2.** | **IT Team Lead** | Develop production cutover plan |
| **3.** | **IT Team Lead** | Convene Vertex Recover Team to finalize cut over plans |
| **4.** | **Business Lead** | Communicate situation and action plans to business users of system |
| **5.** | **IT Team Lead** | - **Work with Vertex on recovery of systems** |
| **6.** | **IT Team Lead** | Notify Business Lead and Team Lead of completion |
| **7.** | **Business lead** | Communicate Recovery to Business Users |
| **8.** | **Team Lead** | Review and improve process |

## 4.3 Disaster Scenario #3 - SCADA Server Failure

**Disaster Description**
A SCADA production server has failed, but is still operational. Given the hardware configuration of the SCADA system, it is unlikely that a SCADA systems crash would ever reach a Disaster proposition. However, the recovery process has been outlined below.

*For California Pacific Electric the SCADA System is under a transition service agreement with Nevada Power*

**Organizations Impacted**

- Operations and Control Room staff
- Linesmen / trouble men

**Recovery Plan Summary**

For California Pacific Electric this is under the Nevada Power TSA

**Recovery Time Objective (RTO):**

**Recovery Location:**

**Recovery Procedure Description:**

| | | |
|---|---|---|
| | **BUSINESS RESUMPTION**<br>**SCADA Target - 0 Hours** | |
| | | |
| | **SCADA DRP Team** | o **IT Manager, DRP Lead: David Ormsby**<br>o **Business Lead: Gerald Tremblay**<br>o **IT Team Member: Markus Mueller, Todd Gee** |
| **Step** | **Responsibility** | **Action** |
| **1.** | **DRP Lead** | o Ensure the appropriate IT resources are contacted and in place<br>o Ensure appropriate Scada resources are contacted and in place<br>o Ensure SCADA Recovery Team are appraised of status |
| **2.** | **IT Team Member** | o Complete damage assessment<br>o Develop preliminary action plans<br>o Convene SCADA Recover Team to finalize action plans<br>    o Team Lead<br>    o Scada team member |
| **3.** | **DRP Lead** | o Determine whether Disaster situation exists<br>o Communicate situation and action plans to business users of system<br>    o Director Engineering<br>    o Director of Operations<br>    o P&C Manager<br>    o Control Room Staff |
| **4.** | **IT Team Member** | o Contact SCADA team member to define plan to recover production server<br>o Develop server repair action plans<br>o Complete needed repairs |
| **5.** | **Team Lead** | o Communicate situation and action plans to business users of system<br>    o Director Engineering<br>    o Director of Operations<br>    o P&C Manager<br>    o Control Room Staff |

## 4.4 Disaster Scenario #4 - Email Failure

**Disaster Description**
Email is inaccessible or inoperable by Liberty Energy staff, all other systems seem to be operating normally.

**Organizations Impacted**

- All Liberty Energy staff

**Recovery Plan Summary**

This recovery plan is based on the fact that email is probably the most widely used communication media for the internal organization. If available, email would be the tool used by the internal organization to organization and respond to various critical situations including: a disaster scenario, power outages, action plans, etc. Without email, the organization's ability to communicate and organize would be severely impacted.

As well, email is also utilized for communicating to external stakeholders. If unavailable for an extended period, communications with the external world would be hampered..

Given, that email is the communication channel for the internal organization on a day-to-day basis, only limited down time could be tolerated.

**Recovery Time Objective (RTO):**

For the purposes of this DRP, the RTO for email is **4 hours after an emergency is declared.** This suggests that the email system may be inaccessible for half of a day, but would certainly be up and running the following day.

**Recovery Location:**

Liberty Energy's Blink Data Center, Netkeepers Store and Forward.

**Recovery Procedure Description:**

Currently, Email Virtual Servers and Storage System , Exchange 2010 is located at the Blink Data Center, use of a Baracuda Firewall for filtering , Netkeepers is retained as a store and forward host if the Blink Data Center or email system goes offline..

Should an Email failure be declared, Netkeepers will become the store and forward host. IT would then focus on diagnosing and resolving the issues encountered by the production versions of the system, after which the necessary repairs will be made, and the users will once again be reconnected to the production version of email system.

## Business Resumption Steps

**Email Target – 4 Hours**

| | | |
|---|---|---|
| | | |
| | **Email DRP Team** | o **DRP Lead: David Ormsby**<br>o **IT Member: Brian Mottershead, Markus Mueller, Lisa Goritschnig**<br>**Hosting: Netkeepers** |
| | | |
| **Step** | **Responsibility** | **Action** |
| **1.** | **DRP Lead** | o Ensure the appropriate IT resources are contacted and in place<br>o Ensure Email Recovery Team are appraised of status |
| **2.** | **IT Team Member** | o Complete damage assessment<br>o Develop preliminary action plans<br>o Convene Email Recover Team to finalize action plans |
| **3.** | **DRP Lead** | o Determine whether Disaster situation exists<br>o Apprise Liberty Energy President of situation<br>o Communicate status, plans and actions |
| **4.** | **IT Team Member** | o **Initiate Email Cutover Steps**<br>- Contact Netkeepers about system failure , ensure store and forward system is operational |
| **5.** | **IT Team Member** | o **Reroute users to Email at DR site**<br>- If production server is not able to come back-online , build new server and route traffic to new exchange email server |
| **6.** | **IT Team Member** | o Notify DRP Lead of Email availability and accessibility |
| **7.** | **DRP Lead** | o Communicate to Email users of availability and accessibility |

Return to Production

| | | |
|---|---|---|
| **Step** | **Responsibility** | **Action** |
| **1.** | **IT Team Member** | Diagnose and repair email production system |
| **2.** | **IT Team Member** | Develop production cutover plan |
| **3.** | **IT Team Member** | Convene Email Recover Team to finalize cut over plans |
| **4.** | **DRP Lead** | Communicate situation and action plans to organization |
| **5.** | **IT Team Member** | Cut over to Email production environment<br>- Bring new production exchange server online.<br>- Migrate mailboxes to new mailbox stores.<br>- No configuration required to outlook clients so long as DR exchange server remains available. |
| **6.** | **IT Team Member** | Notify Team Lead  of completion |
| **7.** | **Team Lead** | Communicate Recovery to Business Users |
| **8.** | **Team Lead** | Review and improve process |

## 4.5 Disaster Scenario #5 - Control Room Inaccessible

**Disaster Description**
The Control Room has been damaged or made inaccessible.

**Organizations Impacted**

- Control Room
- Operations

**Recovery Plan Summary**

*For Liberty Energy California Pacific Electric Co, Operations and Control is under a transition services agreement*

**Recovery Time Objective (RTO):**

**Recovery Location:**

**Recovery Procedure Description:**

## Business Resumption Steps

**SCADA Access from Other Room Target – 0 Hours**

| | | |
|---|---|---|
| | | |
| | **Control Room RP Team** | |
| | | |
| **Step** | **Responsibility** | **Action** |
| **1.** | **Business Lead** | o Complete  damage assessment<br>o Develop preliminary action plans |
| **2.** | **Business Lead** | o Second an office with a SCADA workstation<br>o Inform staff and management of situation |
| **3.** | **Business Lead** | o Follow Liberty Energy Emergency Operating Procedures |

## 4.6 Disaster Scenario #6 - Office Building Operational But Not Accessible

**Disaster Description**
The main office building is operational, but access to the building has been denied.

**Organizations Impacted**

- All Liberty Energy staff

**Recovery Plan Summary**
This recovery plan is based on the fact that even though the building is inaccessible, all systems in the computer room are functioning normally.

For Liberty Energy to continue to carry on business as usual until the facilities are once again accessible, requires key user access to the certain critical systems. It is currently feasible for users to access the Liberty Energy systems via the internet, either from home or other designated area as long as the user has a configured PC and access to the internet. The Emergency Operation Procedures will specify what locations will need to be utilized in this type of disaster scenario.

**Recovery Time Objective (RTO):**

For the purposes of this DRP, the RTO for this disaster scenario is not applicable, given the existing IT infrastructure already exists to utilize the internet to access the Liberty Energy systems. Configured PC's and locations with internet access would be required to provide user access to the Liberty Energy systems.

**Recovery Location:**

**Oakville Office location**

**Recovery Procedure Description:**

Access the needed Liberty Energy systems from a remote location.

## Business Resumption Steps

### No Access to Building, Data Center Running – 0 Hours

| | | |
|---|---|---|
| **Step** | **Building Computer Access DRP Team** | **DRP Lead: David Ormsby**<br>**IT Team Member: Brian Mottershead, Markus Mueller, Todd Gee, Steve Antolos , Lisa Goritschnig** |
| **1.** | **DRP Lead** | o Ensure the appropriate IT resources are contacted and in place<br>o Meet with Liberty Energy's Emergency Operations Team<br>- Identify PC needs and locations<br>- Initiate PC acquisition process |
| **2.** | **DRP Lead** | o Complete damage assessment<br>o Develop preliminary action plans<br>o Develop actions plans with IT Team Member<br>o Communicate Situation and Plans to internal organization available communications |
| **3.** | **Business Leads** | o Communicate to external organizations utilizing<br>- Internet site<br>- Phone messaging system |
| **4.** | **IT Team Member** | o Coordinate user support at designated recovery locations. |

## 4.7 Disaster Scenario #7 – Data Center Damaged / Inaccessible

**Disaster Description**
Liberty Energy’s Data Center at Blink , Netkeepers (Telus Data Center) ,

**Organizations Impacted**

- All Liberty Energy Staff

**Recovery Plan Summary**

For the purposes of this document, it has been assumed that only the identified systems identified as critical would be recovered.

**Recovery Time Objective (RTO):**

For the purposes of this DRP, the RTO’s for the Computer Room is for the critical systems is equivalent to the RTO of the individual systems, namely:

| | |
|---|---|
| Great Plains/Wennsoft | 4 hours |
| Vertex CIS | 24 hours |
| Email | 4 hours |
| SCADA | 0 hours |
| Phones | 0 hours |

**Recovery Location:**

Liberty Energy’s Blink Data Center , Netkeepers , Vertex Data Center

**Recovery Procedure Description:**

In Summary, the recovery of the Data Center will be carried out in a manner consistent with covering each of the systems separately and with the hosting providers service level agreements . As well, once the Data Center is recovered, the data captured by the systems, while in use at the recovery site, will need to be migrated back to the primary data center, and user access need to be rerouted back to the production environment.

## Business Resumption Steps

| | | |
|---|---|---|
| | | |
| | **Data Center DRP Team** | **DRP Lead: David Ormsby**<br>**Business Leads:**<br>- **Great Plains – Steve Antolos**<br>- **Vertex– David Ormsby, Markus Mueller, Todd Gee**<br>- **SCADA – Under TSA Nevada Power**<br>- **Email – Brian Mottershead**<br>**IT Team Members:**<br>- **Great Plains – Steve Antolos**<br>- **Vertex – David Ormsby**<br>- **Email – Brian Mottershead**<br>**IT Infrastructure Lead – David Ormsby** |
| | | |
| **Step** | **Responsibility** | **Action** |
| **1.** | **DRP Lead** | o Ensure the appropriate IT resources are contacted and in place<br>o Ensure Computer Room Recovery Team is appraised of status<br>o Vertex, and BDO notified |
| **2.** | **IT Team Members** | o Complete damage assessments<br>o Develop preliminary action plans for individual system recoveries |
| **3.** | **DRP Lead** | o Determine whether Disaster situation exists<br>o Apprise Liberty Energy President of situation<br>o Convene Computer Room Recovery Team to develop integrated action plan<br>o Apprise rest of organization status, plans and actions required, as per roles and responsibilities |
| **4.** | **Business Leads** | o Communicate situation and action plans to business management<br>o VP Finance and Admin<br>o Finance and Admin Staff<br>o Director Engineering<br>o Director of Operations<br>o Communicate to external organizations utilizing<br>- Internet site<br>- Central phone messaging |
| **5.** | **IT Infrastructure Lead** | o Reroute users to DR site for:<br>1. Great Plains<br>2. Vertex Customer Information System |

| | | |
|---|---|---|
| | | 3. Email<br>4. SCADA<br><br>As per documented scenarios for these systems |
| 6. | IT Team Members | o Initiate DR Cutover Steps for:<br>1. Great Plains<br>2. Vertex Customer Information System<br>3. Email<br>4. SCADA<br><br>As per documented scenarios for these systems |
| 7. | IT Team Members | o Notify Team Lead as to progress |
| 8. | DRP Lead | o Communicate to Business Leads current situation and plans |
| 7. | Business Leads | o Communicate to their business constituency |

## Return To Production

| Step | Responsibility | Action |
|---|---|---|
| 1. | IT Team Members | o Diagnose and repair production systems and infrastructure |
| 2. | IT Infrastructure Lead | o Develop production cutover plan with IT Team Members |
| 3. | DRP Lead | o Convene Computer Room recovery Team to finalize cut over plans<br>o Communicate Status to Organization |
| 4. | Business Leads | o Communicate situation and action plans to business users of system |
| 5. | IT Team Members<br>+ Infrastructure Lead | Cutover systems to Computer Room for:<br>1. Great Plains<br>2. Vertex Customer Information System<br>3. Email<br>4. SCADA<br>As per documented scenarios for these systems |
| 6. | IT Team Members | Notify Business Leads and Team Lead of completion |
| 7. | Business leads | o Communicate Recovery to Business Users<br>Update external communications if required |

| | | |
|---|---|---|
| **8.** | **DRP Lead** | Review and improve process |

## 4.8 Disaster Scenario  #8 - Office Building Destroyed/Damaged

**Disaster Description**

Liberty Energy’s office building is damaged or inaccessible, and systems are down (likely Computer Room damage).

**Organizations Impacted**

All Liberty Energy Staff

**Recovery Plan Summary**

TheLiberty Energy sites will need to be readied to run Liberty Energy’s critical applications, and user access to the recovery site will be enabled through internet access from various locations as specified in the company’s Emergency Operating Procedures.

**Recovery Location:**

Liberty Energy in California has two office:

1. North Lake Tahoe
2. South Lake Tahoe

Both offices can run independent of each other and access the Blink Data Center over the Qwest MPLS Network. Further if both office locations are not operational , Internet access to the Data Center from a temporary , disaster recovery location can be established.
Liberty Energy Oakville Office location is connected to the Blink Data Center with fibre through the Algonquin Power building as well a second fibre is run direct into our Liberty Utilities corporate office.

## 4.9 Disaster Scenario #9 - Telecommunication Systems Down

**Disaster Description**
The Bell , AT&T,  Qwest Telecommunications Systems are not operational

**Organizations Impacted**

- All

**Recovery Plan Summary**
This recovery plan is based on the fact that ongoing telephone communications are required to carry out even the most routine of business activities. As well, the telephone system is the single most important system in enabling customers contact Liberty Energy. Should a power outage, or potentially a more serious situation occur, the customer's first recourse to pass this information to Liberty Energy would be through the phones system.

As a result, some form of backup telephone service must be made available to Liberty Energy customers.

Liberty Energy, has put in place a contracted service that is offered by Qwest for our Liberty Energy California offices.   Should Liberty Energy's telephone switch go down, Qwest  will re-route all calls to a pre-defined phone number that will be answered currently by Nevada Power Customer Service and Dispatch under the Transistion Services Agreement.

**Recovery Time Objective (RTO):**

This service would be implemented within minutes of the phone system outage.

**Recovery Location:**

**Recovery Procedure Description:**

The IT department will work with Qwest to bring back online the voice or data circuits , or telephone equipment.

# Appendices

## Appendix A – Contact List

**Recovery Team Contact List.xls**

# Appendix B – Technical Environment

## Items of Note

### Remote Access

Liberty Energy employees can remotely access corporate resources through Citrix Secure Gateway Portal

### Citrix MetaFrame

Citrix MetaFrame allows users to remotely access applications over the Internet with a browser. Users can only access applications specifically published for them. The connection between the remote workstation and the Citrix server is encrypted by Secure Socket Layer (SSL), the same technology used for Internet banking.

Within a Citrix session, the application is actually running at the Citrix server. The remote workstation simply sends keystrokes and mouse clicks to the Citrix server and receives screen updates from the Citrix server. As a result, users experience fast response even over a slow link such as dial-up connection. Also, the application keeps on running even the network connection drops.

The following diagram illustrates how users from the trucks access published applications over Bell's 1X wireless network using laptops.

### System Architecture Diagrams

Appendix B Technical Enviorment.pdf

## Voice Communications Network

Liberty Energy California Pacific Electric:
The voice system consists of the following components:

- Shoretel VOIP Telephone System
- Qwest MPLS Circuits
- Shoretel IVR
- Cisco routers and switches

Refer to diagram : Liberty Energy California Voice Communication Network.vsd

## Systems Architecture Diagrams

### Appendix B Technical Environment.pdf

## Appendix C – Liberty Energy’s  Application Portfolio

Liberty Energy Application Listing.xls

## Appendix D – Liberty Energy California Pacific Electric TSA listing

Transistion Services Agreements with Nevada Power

TSA 003 for Billing Operations.pdf
TSA 004 for Dispatch.pdf
TSA 005 for Billing Back-office.pdf
TSA 006 for Credit and Collections.pdf
TSA 009 for System Control.pdf
TSA 010 for Mobile Radios and RTU Support.pdf
TSA 011 for Electric Meter Operations.pdf
TSA 014 for Call Center Support-Customer Support.pdf