RAPPAHANNOCK ELECTRIC COOPERATIVE SYSTEM INTEGRATION PROJECT

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Rappahannock Electric Cooperative (REC) is a member-owned, non-stock corporation. Our history dates to 1938 when a predecessor co-op constructed the first REA financed line in Virginia. Today, REC has 85,000 connections in a service territory extending through portions of 16 counties. With corporate offices in Fredericksburg, Virginia and district offices in Bowling Green and Culpeper, REC has 11,147 miles of line and serves 7.6 customers per mile.

Since the early 90's, REC has grown 3 – 4% each year. With the high growth Interstate 95 corridor through the middle of the system, the growth originates from DC to the north and Richmond to the south. In addition, some of our territory is very sparsely populated with very little, if any, growth.

Systems Integration Overview

The genesis of REC's System Integration Project was the desire to improve our outage management. 1994 was a very bad year for outages at REC; there were two major ice storms only several weeks apart resulting in a major part of the electric system on the ground. Once we repaired and rebuilt the system, the District Operations staff reflected on their experiences. Their conclusion was we needed a better way to manage and analyze outages. The initial research led them to conclude the outage system developed in house was inadequate and commercially available software would give better results.

Further discussions determined the basic technology of the co-op would not support the improvements we desired in the outage system. All of our IT systems were developed in house starting on an IBM System38 and then a succession of AS/400's. The basic problem was the insular nature of our systems. The financial system did not communicate with any other system. In fact, our financial system was actually an outgrowth of a budgeting system that really was not a full-featured accounting system – we could not run a trial balance! The project management system only communicated marginally with the financial system. The billing system was adequate for existing needs, but any changes to the bill required significant hours in both MIS and the Customer Service Departments. Finally, there was no real geographic information system to provide the electric system information to an outage system.

If we were to provide better information to our member/owners during outages, reduce the number of highly skilled workers "directing traffic" in the dispatch center(s) to put them in the field and finally, send the right repair crews to the correct location to maximize their results, it was mandatory we upgrade the technology at REC. This was further justified by the desire to have an integrated information system that required data be entered only once to feed the entire system. Finally, there was the matter of Y2K; we did not want to remediate the legacy systems.

This “Integrated Utility Information System” had several guiding principals:

- Packaged Software – we would not design and build the software, but we would acquire it from industry leading companies.
- “Best of Breed” – we will select the best package that suits our needs and then integrate/interface the disparate packages.
- Open architecture – selected systems will run on industry standard platforms, both hardware and software, including the database.
- Seamless integration – data would flow freely and accurately across the individual applications.
- Fully networked – no “islands of information” or personnel keeping separate records.
- Adapt processes – we will avoid modifying the software, we will always first modify our procedures and processes.

This plan was fully developed and approved for implementation by our Board of Directors in the fall of 1997. Now came the real challenge. Changing all of our information systems from legacy to best of breed, ***AT THE SAME TIME***! We identified the core as the enterprise resource (ERS), work management (WMIS), customer (CIS) and geographic information (GIS) systems. As close as possible, these would be changed simultaneously.

At REC, our culture is to involve people early in projects to not only get their support, but to effectively use their knowledge of the electric and information systems. Therefore, we created a large team of employees to address the Systems Integration Project. Each core system had a sub-group working to identify the requirements broken down into “Must Have” and “Nice to Have.” These teams were working on the original plan to present to the Board, then became the teams charged to select the right software for each application and finally, they were the teams to implement the new software.

The Core Systems:

Enterprise Resource (ERS)

This system originally started as financials – general ledger, accounts payable, cash ledger, and accounts receivable. The basic list was expanded to include human resource, procurement and inventory control. Possible vendors were identified as SAP, PeopleSoft, JDEdwards and Lawson. Lawson was selected due to the system abilities as well as the relative ease of implementation. While the financial information is used throughout REC, only the Finance & Accounting Department inputs information and creates the reports for the other departments to use. Therefore, this implementation would affect a small group and also give us some experience before undertaking the larger systems. Implementation began early in 1998 and the project was completed in stages: financials in January 1999; human resources in May 1999; and procurement in June 1999.

Work Management Information (WMIS)

This system is the basis for maintaining and updating the facilities information as work orders are initiated and the work is completed over time. Logica was selected by the team and implemented. Extensive integration with the inventory system is required to maintain the proper materials list in both ERS and WMIS. The resulting "as-built" projects are then converted to dollars by ERS as labor, contractors and materials are expended on the individual projects.

As part of WMIS, we also implemented a fixed asset accounting system. After the projects are closed in WMIS and ERS has converted to dollars, the assets information is sent to PowerPlant (a fixed assets accounting application) for tracking and depreciation. The depreciation expense then returns to ERS on a monthly basis. PowerPlant allows us to depreciate using standard groups and also unit depreciation for our general plant.

The final piece of the work management project was the maintenance management system. Cascade was selected to help us track and schedule maintenance. As preventative maintenance is performed, the records are updated and future work is scheduled.

Work on the WMIS suite began in the fall of 1998. Logica was implemented in September 1999, PowerPlant in October 1999, and Cascade in March 2000.

Geographic Information (GIS)

REC had begun to implement a mapping system in the late 1980's. The vendor went out of business and the system was not supported. Even the hardware was outdated and was no longer supported by its manufacturer. Less than 40% of our electric system was modeled in this mapping system. GIS must integrate with CIS, WMIS, outage management, engineering planning, maintenance management, and SCADA. As a result of these factors, we knew GIS would be very time consuming to bring on-line due to the large field data collection effort, and planned it to be the last core system to reach production.

The team evaluated several vendors – ESRI, SmallWorld, Vision and Intergraph – and selected Intergraph. The software was installed and the electric model was defined in 1999. Collection of field data began as soon as the model was set. This process required more time than planned, and completion was not concluded until September of 2002.

Customer Information (CIS)

CIS is the most pervasive system at REC – it touches every area. Not only the basic customer information, but the service addresses, service types, rate schedules, meter information, historical usage, patronage capital history and billing information are all performed within CIS. By far, this is the largest and most complex system and required extraordinary effort from many people within REC.

Even today, the customer information system is the most recently developed application in the marketplace. There are few implemented systems to evaluate. We selected a vendor and proceeded to implement the system with a target of October 1999. It was soon evident to our team members the software was not just untested; it was non-existent. Even after pushing the

implementation target back 18 months and re-mediating the legacy billing system for Y2K in the process, the software was not ready. The only decision possible was to abandon the implementation and start a short list search for a new CIS.

In October 2001 we selected SPL CorDaptix™ as the new CIS. Work immediately began to transfer as much of our experience from the aborted attempt. The aggressive schedule was to implement the last weekend of September 2002. Due to time constraints, training issues and available resources, this was eventually moved to the first weekend of November. Despite the enormity of the task and the limited time to accomplish it, the new CIS was in production by 11-4-2003. We encountered no major problems, but we certainly had our share of small issues requiring immediate attention. Many of these related to billing causing a one-week delay in mailing the first bills. As each week passed, fewer problems were left. By February, we had made the transition from implementation to maintenance.

Beyond the Core Systems

Our initial study identified several systems – beyond the core systems – that would require significant improvement.

Infrastructure

There was no network connecting the few PCs. The hardware and software to create the network between all three offices had to be in place before any new system was to be available. Switches, hubs and cables were installed as the first project. Fredericksburg was the first to upgrade to the Ethernet network, followed by the two district offices.

The communication system between the locations was based on an old analog microwave radio. This was adequate for the level of traffic in the old world, but the new systems required much higher capacity. On an interim basis, we leased a T-1 to each district. The long-term solution was a new digital microwave link between all three offices. Fredericksburg and Bowling Green both had adequate towers to support the new radio, but the Culpeper district required a much higher tower. Two years later a monopole tower was constructed and the microwave link was complete. This digital link has an ultimate capacity of 28 T-1 lines; our communication bottleneck has been solved.

Moving from the AS/400 environment required PCs to be installed throughout the organization. We replaced the terminals and the conglomeration of miscellaneous makes and models of stand-alone PCs with current industry standard models. Subsequently we have replaced each PC as part of a regular technology re-fresh program.

Most of our employees were proficient using OfficeVision on the 400. Now we were using MS Office and Outlook. We conducted 95 training classes ranging from “Introduction to the PC” to “Advanced Excel.” This rapid departure from the AS/400 based office tools to the MS environment prepared our employees for the coming changes to their comfortable world!

Outage Management

As GIS progressed, we initiated the project to implement a new outage management system; this was the system that started the entire upgrade. As with the other systems, we were looking for the most robust Outage Management system that matched our needs: graphical based that used the GIS system as a primary input; predictive capabilities that would help us quickly identify the most likely source of the outage; accurate statistical reporting; and analysis capabilities that would help us identify trouble spots on the electric system that require improvements.

We selected Centricity by CES International as our OMS, now commonly referred to as TCA or the "Trouble-Call Analysis" system. As the geographical information was the very basis for the OMS, the GIS had to be fully operational before OMS. Completion of the field data collection was not on schedule and, therefore, affected the OMS schedule. The OMS was operational one week after GIS in September 2002.

Automated Meter Reading

With low density and over 11,000 miles of line, meter reading is a significant expense for REC. The four billing cycles were driven by the 22 meter readers completing all the reads in 16 days each month. We have known since the early 90's Automated Meter Reading would eventually be implemented throughout the electric system. After testing several technologies and vendors, we determined a power line carrier system would best fit our needs and TWACS by DCSI was selected. We began replacing all 75,000 residential meters in January 2001 and were completely AMR on residential customers in November 2002.

We are discovering benefits beyond merely reading meters. When a member calls to report an outage, we are able to verify the problem is with the electric system. After pinging the meter and if the meter responds with the correct voltage reading, the dispatch center can advise the member the meter is receiving voltage. Therefore, the problem exists beyond the meter. This saves the co-op from making an unnecessary trip to the meter location. We can also ping selected meters after an outage has been restored to ensure all customers beyond the work site are indeed receiving service. AMR capabilities will continue to increase, benefiting REC and its members.

Miscellaneous

To completely abandon the AS/400 platform, many additional systems must be replaced:

- Time Entry – implemented CTEC in 2000.
- Plant Accounting (CPRs) – PowerPlant in 1999
- Maintenance Records – Cascade in 2000
- Budget & Planning – Pillar in 2000
- Engineering – Milsoft upgrade in 2002
- Automatic Call Distribution – Symposium in 2003

The largest system left on the AS/400 is the line design program, created internally in 1992. We have not found a suitable replacement that provides the desired functionality at a reasonable cost. By the end of 2004, we will either buy or build a line design program. Six years after starting the process, the AS/400 will no longer be part of REC's information infrastructure!

Lessons Learned

Management

The management of REC initiated this project because of our concern over the future requirements of IT. Cecil Viverette, the CEO at the time, was not only committed, but also enthusiastic about the project. His concern was not how could we afford to undertake this project, but in the long term, how could we afford not to do it! This commitment was projected throughout REC's entire management and supervisory staff. Without the complete dedication of this group, the employees would never accept the challenge.

Attempting to lower the costs associated with this project, REC joined forces with two other electric cooperatives in the area – Northern Virginia Electric Cooperative (NOVEC) and Southern Maryland Electric Cooperative (SMECO). The plan was to select identical systems for each cooperative and have similar implementations. Vendors would be negotiating with a larger customer, rather than three small entities. To facilitate the joint project, each cooperative outsourced its IT function to Intellisource. This new company was responsible for providing technical resources as well as running the IT operations on a daily basis. Intellisource was ultimately sold to ACS, a much larger IT organization that had the resources to deliver on the original plan. Ultimately, the vision of a "joint solution" did not reach completion as one of the cooperatives rejected the GIS selection and two decided to abandon the original CIS vendor (ultimately selecting two different solutions that have been implemented). While we did not achieve the level of savings anticipated, there have been some savings realized. However, this did come at the price of increased complexity in selecting and implementing some of the systems.

After commitment, the most important thing for management to do was to continuously provide encouragement. Recognition of the extraordinary effort on the part of the employees made them feel appreciated. Providing food, rest and relaxation breaks, group activities and de-compression time away from the project made the employees feel management understood their efforts. Positive words were vital to their continued commitment. Cheerleading becomes the most important work for management.

There were several times, especially during the CIS project, when the teams were dejected. It appeared as if the goal of project completion was slipping further away, rather than getting closer. This is when management had to go beyond cheerleading. Everyone was uneasy about the work left to complete in the allotted time. The wrong answer would have been to delay the conversion date. The team had to understand how much they had accomplished. After climbing for months we were in sight of the summit and we simply could not fall back now! If we waited until every aspect was perfect, conversion would never occur.

Management must stay involved. The employees must know management is aware of the problems being faced and the effort required. Supervisors, directors, managers, and executives must always ask what the employees need. Asking is important, but following through and fulfilling as many requests as possible is key. Then again, do not under-estimate the importance of sweets – chocolate was the great elixir.

Employee Involvement

The REC employees were involved early. Key users of each system were identified and they became the core team for that system. They were responsible for creating the Requests for Proposals, evaluating responses, interviewing vendors and site visits to evaluate production systems. Each of the core teams became evangelists to help the other employees become interested in, excited, about, and ultimately enthusiastic about the new systems.

The effort required by some of the systems was truly astounding. The first system, Lawson financials, was implemented by three employees devoted to the system. Devotion does not convey the effort they expended. In addition to configuring, testing and implementing the system, they continued to produce the regular output required of the Finance Department.

Each successive system had its own heroes. Perhaps the CIS core team expended the greatest effort. Three of these employees began the work on the initial RFP in 1998 and continued to work on the project tirelessly through the aborted project. They were then instrumental in the selection of the replacement system. Fortunately, some of the work on the aborted project was applicable to the new. Even with this head start, the number of employees dedicated to the implementation of CIS continued to grow. At the peak, there were four trainers, seven testers, two system administrators and seven subject matter experts working full time on this implementation. Many weekends and late nights tested the commitment of this entire group. Even though there were rough moments, and many tears, this group continued to produce and was focused on the goal – a successful implementation.

Training

With each successive system, the training requirements grew. The financial system had few non-accountants using the system on a regular basis. Those few did require training on how to reach the information they needed. WMIS provides information to a larger audience. Therefore, the training had to be tailored to not only the regular, but also the casual users. Classes were scheduled and the team developed and provided the training.

Finally came CIS. This system touches every facet of the cooperative. The trainers had to learn the system, design the training, develop materials, prepare a test database, schedule classes, and deliver the training. These tasks alone required dedicated effort on the part of the training staff; for six months the trainers focused on preparing the upcoming classes. Users were broken into three groups: heavy users, who received 152 hours of training; moderate users, who received 60 hours; and casual users, who received 25 hours. In total, 103 people were trained over a 2½-month period.

Communications

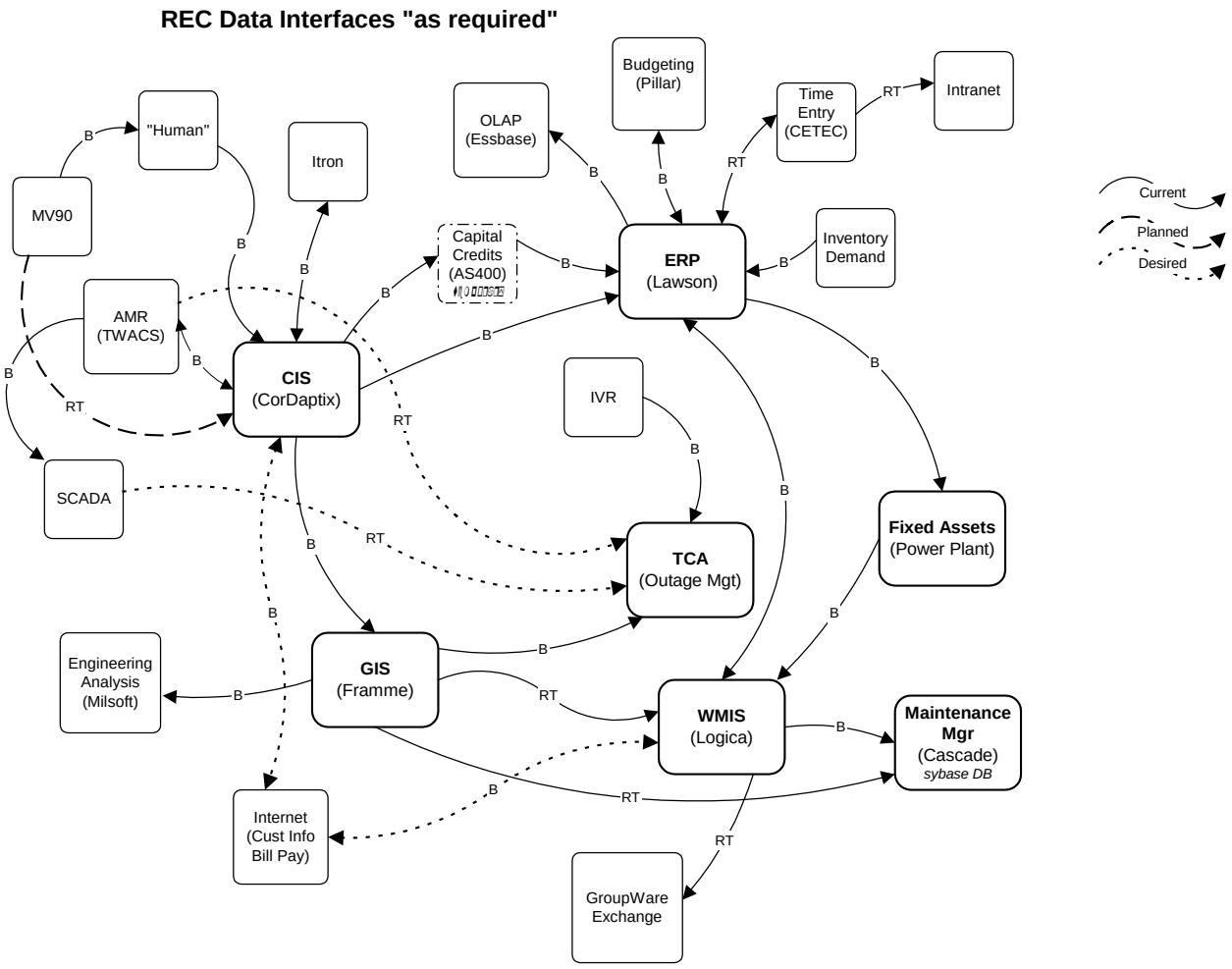
Keeping everyone informed about the progress of each individual project is vital to the success of the overall effort. We instituted a monthly update meeting to communicate to key people on each project the status of the overall effort. This helped us reduce the potential for conflict between the projects as well as the potential for overlooking aspects of each implementation. This monthly meeting served as the stimulus to create small working groups focused on specific tasks that developed between individual projects. This also served as the vehicle to provide senior management with the necessary project updates.

Next Steps

Integration, Integration, Integration!

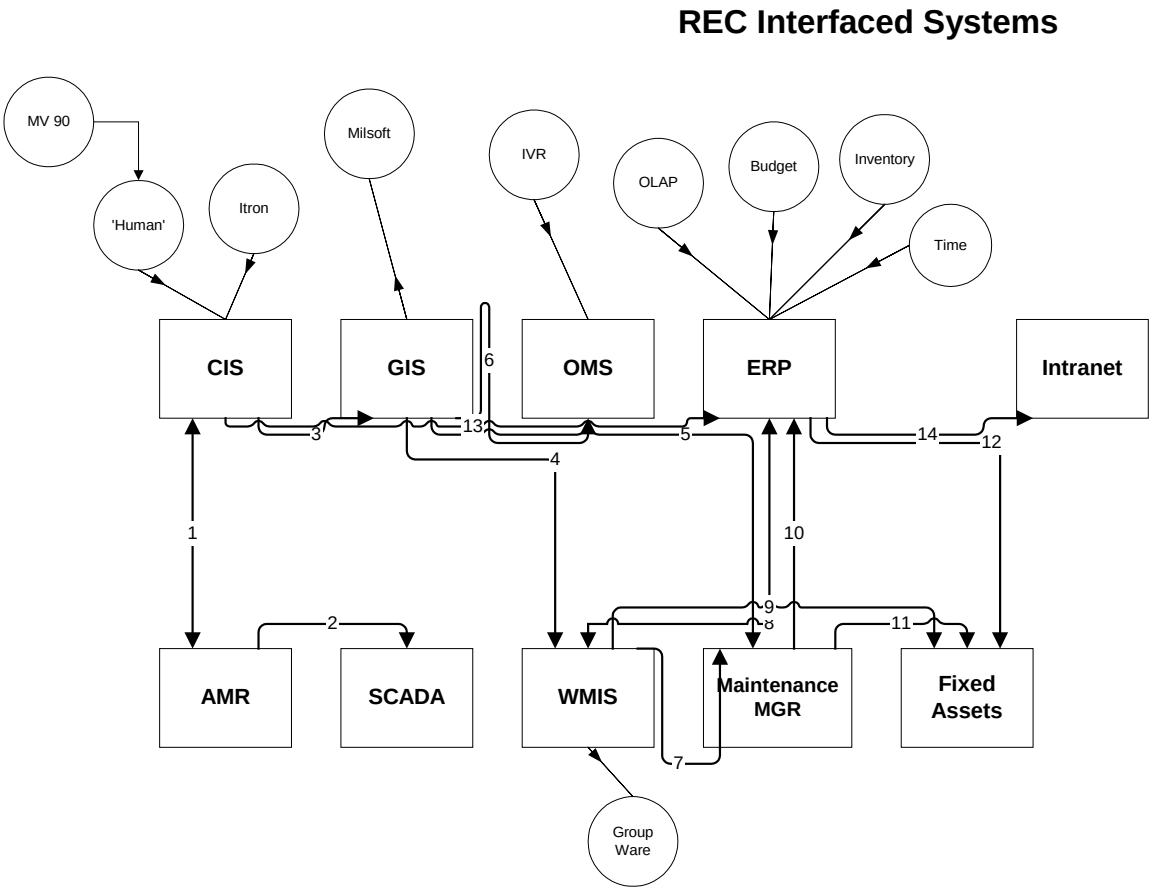
The original plan was to interface each system as it was brought into production. The financial system was the first and it was interfaced where possible, and necessary, to the AS/400 based applications. Work Management was next, and it was interfaced more closely with the financial system already implemented. As each successive system was put into production, part of the project was creating, testing and implementing the interfaces to the existing systems.

Most of the interfaces implemented were duplicating existing interfaces. There were exceptions to this: 1) An interface was built between the meter test system and CIS. Previously a report was printed and the data was manually entered to the meter file. 2) Plant record keeping was a manual process. When PowerPlant was implemented, the act of closing a job in WMIS created the continuing property records in plant accounting. 3) Customer lists must be provided to Competitive Service Providers for retail access purposes. CIS created a file that posts directly to the Customer Choice website. 4) GIS, as a new system, required extensive information from CIS to properly maintain the electric system model. 5) GIS provides a daily update of the customer/circuit relationship to outage management. 6) GIS provides to the engineering software circuit connectivity and equipment for load balancing.



These interfaces use both point-to-point and a common extract file. The common extract file is built each night as part of the batch processing. Individual systems provide data to the file, and other systems access the data as needed. We have not found a single method capable of providing the functionality desired. We have evaluated--and continue to evaluate--middleware as a better solution. To date, our common extract file remains the method of choice.

Integration View



REC Data Interface Applications

Interface key	Name	Data Flow	Purpose	Occurrence
1	Meter Read Upload	Meters to CIS	Loads meter readings into CIS.	Daily Batch program
	Meter Read Download	CIS to ITRON	Extracts meters to be read and sends to ITRON.	Daily Batch program
	Meter Test	Labtrack to CIS	Loads test results from Labtrack to CIS.	On demand batch program.
	New Meter Import	Flat file to CIS	Loads New Meters from the Manufacturer file into CIS.	On demand batch program.
	AMR Update	Extracts data from CIS and AMR system.	Interrogates the status of meters with AMR modules in CIS. Compares this with the meters status in the AMR system and sends a flat file to Marsha of any differences.	Daily Batch program
	Annual Meeting	CIS to Cooperative Living Magazine	This interface serves two functions. 1) Creates an extract file to send to Cooperative Living magazine. Lists persons to be sent a Magazine. 2) Creates a file that is used for the annual meeting-proxy mailing.	There are two formats of this program. #1 is ran 7 times per year. The program that incorporates the #2 information is ran once per year for the July magazine.
	AP	CIS to Financials	Builds a table using Accounts Payable information for credit refunds. This table is used by Financials accounts payable.	Daily Batch program
	Balancing and Settlement	CIS to ODEC Server	This process identifies the monthly usage's associated with power supplier for financial settlement of energy imbalance charges.	
	Bill Print	CIS to bill print vender	Extract information for bill print.	Daily Batch program
	Correspondence		Extracts information from CIS and places this information in letter templates to be sent to the customer.	Daily Batch program
	Direct Debit	CIS to vender	Extracts autopay information in a flat file to send to the vender.	Daily Batch program
	EDI	EDI transactions into CIS	Processes EDI files received from Suppliers.	
	External Payments	Flat files to CIS	Load payments from: 1) Fuel Assistance, State of Virginia 2) Lockbox	Daily Batch program
	Field Orders	CIS to Crystal Enterprise	This program inserts information in special field order tables and sends a trigger to Crystal reports to extract the data.	Auto
	General Ledger	CIS to Financials	Extracts GL transactions and sends flat file to Financials	Daily Batch program
	Mass List	From CIS	Generates a flat file that contains customer information to be posted on the Customer Choice website for access by the suppliers.	Run every 6 months
	Non CIS	CIS to Financials	Extracts pass through payments made in CIS. These are payments received through CIS but billed in an external system. Feeds Financials AR.	Daily Batch program
	State Assistance	Diskette from State to CIS	Loads customer information from the State of Virginia for persons eligible to receive Fuel assistance. (External Payments above loads the payments)	On demand batch program.
2		AMR to SCADA		Daily Batch program
3	Common Extract	CIS to GIS	Customer information required by other systems	Nightly Batch program
4	Map Number Generator	GIS to WMIS	Map Number generation/reservation (new service orders)	Real time
5	Cascade interface	GIS to Cascade	Transformer location	

REC Data Interface Applications

Interface key	Name	Data Flow	Purpose	Occurrence
6	TCA Build	GIS to TCA	daily update of customer-circuit relationship	Nightly Batch program
7		WMIS to Cascade	"human interface" only at this time	
8		**WMIS to Financials**		(stored procedures in Financials DB)
		New WR to Activity		batch - 10 min
		Close Activity		batch - 10 min
		Material Requisition		batch - 10 min
		Financials to WMIS		
		Material List Update		batch - nightly
		Material Issues		batch - hourly
		Material Returns		batch - hourly
		Labor Charges		batch - 2 weeks
9		**WMIS to Power Plant**	Load WO/WR data to Power Plant for asset analysis and reconciliation and eventual unitization.	
		WMIS Header Info	Nameplate Info for Power Plant	on demand
		WMIS Estimates	Construction Unit Estimates	on demand
		Power Plant to WMIS	Posting Completion Notice	on demand
		Financials to Power Plant	Financials Charges to Work Orders	on demand
	GL Feed	**Power Plant to Financials**	Depreciation expense	
10		Cascade to Financials	"human interface" only at this time	
11		Cascade to Power Plant	"human interface" only at this time	
12		Financials to Cascade	"human interface" only at this time	
13		CIS to Financials		
14		Financials to Intranet	Financials payroll check information, and org charts with pictures available	After biweekly payroll, charts updated manually as needed
		BSI Tax Factory	Federal and State Income tax tables for use in calculating payroll	Manual feeds from BSI notified thru email updated manually
others		MV90 to CIS	Human intervention required, proprietary ODBC driver	
	Itron Download	CIS to Itron	list of meters to be read by Itron today	Nightly Batch program
	Milsoft extract	GIS to Milsoft	Circuit connectivity and equipment for load balancing	On demand / manual load
	IVR interface	IVR to TCA	Automation of customer outage calls	Real time
		Financials and Essbase	Loads ERP legacy data - both meta and tranaction - to the ESSBASE REC cube for budget variance analysis processing and forecasting	
		Financials and Pillar	Loads ERP legacy data - both meta and tranaction - to the Pillar *.pln files for budget analysis processing	
		Inventory to Financials	Handheld devices and manual entry to Financials	Fed manually
		Financials and time entry	Employee time entry data -	Financials updated at time of biweekly payrolls
		CIS and Marketing		
		WMIS to Email	MS Outlook Integration in WMIS	Real time

As we learn more about each system, their capabilities, and our desires to improve productivity, additional interface/integration possibilities appear:

- AMR provides several opportunities for integrations. During outages, we can "ping" selected meters to further refine the outage prediction. The ability to feed information directly from OMS to and from AMR will improve response time.
- SCADA will be interfaced with OMS to improve accuracy when we control devices remotely to open or close circuits.
- CIS and the IVR can be more tightly interfaced to allow customer initiated pay plans on delinquent accounts without customer service rep intervention.
- Electronic Bill Presentment and Payment will require customer access to their account information through the Internet to CIS.
- Customers will have the ability to access their workorder status through the Internet by connection to WMIS.

If there are more opportunities to enhance our effectiveness, we just are not aware of them yet. It has been said, "Information technology is not a destination; it is a journey." This applies equally to integration.

Epilogue

Thursday, September 18, 2003, Hurricane Isabel provided REC with the opportunity to stress test all of our systems. Approximately 1:30 p.m. the first outage was reported. During the afternoon and evening, OMS recorded outages through IVR input by the customer as well as phone representatives. Friday morning we had 76,000 customers without power. With 85,000 total connections, we had 89.4% in the dark!

Due to the nature and expected magnitude of Isabel, REC implemented the Major Storm Guidelines the Monday before the storm. All time off was canceled beginning Thursday. Every employee was expected to contribute to the restoration effort. Contract line crews were contacted and plans for their arrival before the storm were made. Mutual Aid

cooperatives and right-of-way crews were also brought in prior to Friday. Crews from nine states were added to REC employees, resulting in 644 people working to restore power – more than double our regular work force.

The 3,000 square miles of REC's service territory was bisected by the eye of the storm. Every part of the system was affected. More than 300 poles were broken, 400 crossarms were destroyed, 170 transformers, and one OCB were damaged. We have never seen such widespread devastation to our system. During the ice storms of 1994, our previous record outage, we had "only" 20,000 customers without electricity.

Our experience with prior major outages (though none were this major) told us the employees in the field would perform Herculean tasks to restore power as quickly as possible. This, they did yet again. By Sunday morning 46,000 customers were on-line. Each successive day the progress became more difficult to achieve. Restoring power to the substations and major circuits reaped quick rewards. As we moved further out and restored individual lines, the effort expended was just as great, but the affected customers were fewer in number. Ten days after the storm hit, service to the last customer was re-energized the afternoon of Sunday, September 28.

While we expected and are grateful for the work the employees did in the field, we did not know how our systems would react to such a massive event. Fortunately, even though everything did not work exactly as planned, the systems worked extraordinarily well.

OMS - We split the outage system into two dispatch areas, one for each district office. Rather than having 80,000 outage cards printed and stacked on tables, OMS kept track of what was out, who was working where, and how many customers were affected by each trouble spot. This allowed us to prioritize, based on the number of customers, which open point to attack next. Each dispatch center had an OMS operator, a duty supervisor, and the director of operations and construction supervising and controlling the restoration effort. This was fewer than half the number of people required in prior events.

AMR – We were able to manually "ping" meters to verify outage status. We used this ability to verify trouble spots and "Life Line" customer (medically sensitive) status.

GIS – This system not only provided the basis for OMS, but also allowed staff to better communicate with customers during phone calls.

IVR – Combined with the new Automatic Call Distribution system, IVR handled a record number of calls. During the event, we received almost 81,000 calls. IVR handled 44.7% of the calls, allowing the customer to directly report the outage to OMS. IVR directed 49.1% of the calls to phone representatives who took the information from the customer, recorded the outage in OMS, and were able to tell the customer if there was a crew working on the line affecting them. A number of customers, 6.2%, abandoned their calls after waiting an average of only 15 seconds in the queue. Over the 10 days of Isabel, we had phone coverage 24 hours each day. Basic outage information at the start

of the IVR message was updated twice daily, and the average call delay was only 18 seconds!

What did we learn about the systems?

- They performed very well.
- They allowed us to put more people in the field effecting repairs.
- They provided better communication to our customers.
- They helped us restore service quicker than we would have without them.

What can be improved?

1) Reporting from OMS. Individual counties wanted to know how many of their residents were out, and we could only estimate the number.
2) Whenever we completed a switching order in OMS, the system would lock everyone out while it re-built the entire electric model to reflect the changes.
3) Communication with field workers can be improved. Is this the impetus to push mobile computing?
4) Customers want to have more accurate estimates of when their power will be restored. We may never be able to advise them exactly when, but we need to do better than, "As soon as we can!"
5) Improving the integration between OMS, AMR, and SCADA will help reduce workloads.

It is amazing what an organization can do when all the employees are working in a concerted way to achieve a common goal – get the customer back on. The field workers have a new appreciation for the work done by all the office workers who were drafted to take calls; the office workers are amazed at what was accomplished in the field. With everyone rowing in the same direction and at the same time, we were able to reach home port with every customer restored to full service.