Electric Utility Applications

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Solutions for Electric Utilities

- Customer Care and Billing
- Weather Data
- Data API
- Customer Data Portal
- Customer Contact Management
- Service Level Agreement Monitoring
- Rate Design and Simulation
- Rate Assignment and Validation
- Key Customer Insight
- Key Customer identification
- Demand forecasting
- Program Measurement and Verification
- PV Management
- Meter Aggregation and Analysis
- Electric Vehicle Identification
- Transformer Monitoring and Analysis
- Metering Quality Assurance
- Billing Quality Assurance

Customer Care and Billing System

Major electric utility customer care and billing system transformation

Problem

- **Billing system too complex to easily modify**
- **Needed 360 view of major corporate customers**
- **Give customers ability to self-service their data needs**
- **Check each bill for 100% accuracy before sending**
- **Give key account team flexible customer info**

Solution

Delivered parallel customer care and billing system costing 1/10th of legacy app

Reconciled every bill before being sent to customer

Delivered customer data portal to all customers

Entire solution in production in 90 days

Utility gained deeper understanding of its largest customers

Key accounts team and call center increased customer satisfaction

Why Fractal

Delivered parallel solution with Fractal Programming.

Parallel application ran over 1,000 times faster, reduced storage 90%, and eliminated billing errors.

Utility was able to add new features in hours and days rather than months.

Financial Impact

Eliminated need for $35 million billing system rewrite

Weather Data

Weather data source for demand forecasting, scenario analysis, machine learning, financial forecasting

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Problem

- **Weather data is required for many business functions and applications**
- **Consistent weather assumptions must be made across multiple business processes and applications**
- **Required weather data may need to be integrated from multiple data sources**

Why Fractal

Delivered weather data management system with Fractal Programming.

Integrates data from multiple data sources and reconciles the sources for a consistent data view.

Data accessible both interactively and programmatically via web APIs.

Insures consistent weather assumptions across business processes and applications.

Solution

Weather data management system

Integrates data from multiple data sources

Provides data at multiple levels of time granularity (5-minute, hourly, daily, weekly, monthly)

Data accessible via interactive graphical user interface(s) as well as application programming interface(s) API

Impact

Increased consistency across business processes.

Increased quality and consistency in analysis and forecasting processes and applications.

Data API

Web services data API for metering, billing, customer information.

Problem

- **Customers increasingly requesting programmatic access to their data**
- **Large customers want convenient access to their entire portfolio of accounts and associated information**
- **An API is necessary In order to make many third party services available to customers**

Solution

Web services API's are exposed as components of parallel systems for managing meter data, billing, and customer information

Customers can access the data both via interactive web portals and via programmatic APIs

Multiple data format supported (JSON, XML, CSV) as well as custom data formats

Why Fractal

Delivered parallel data management system with Fractal Programming.

Make metering, billing, weather, and other customer data available without imposing any load on legacy systems-of-record.

Consistent interface and interaction for customers across all data types and data requests.

Impact

Increased customer satisfaction.

No additional load on IT resources.

Third party services easier to enable for customers.

CUSTOMER DATA PORTAL

Make customer bills, meter data, and rate plans available on customer's desktops and mobile devices.

Problem

- **Customers want access to energy and billing data on digital devices**
- **Customers want to do scenario analysis for rate plans**
- **Customers want budget forecasts**
- **Customers want visibility to solar and wind energy usage metrics**
- **Customer want to supplement their data**

Solution

Parallel customer care and billing system that is accessible from customer's digital devices

Instant customer visibility to their real time bill

Customer can test different rate plans in real time

Customers have easy access to budget forecasts

Customers can self-service their data needs which frees up key account and call center resources

Why Fractal

Delivered a parallel customer care and billing system in 90 days at 1/10th the cost of legacy system.

App provides customer rate plan scenario analysis, budget forecasts, green energy metrics, and enables customer to enter supplemental information about energy efficiency projects.

Customers can self-service their information needs on web portal from their digital devices.

Impact

$10 million development cost savings and customer support cost reduction for customer information portal.

Service Level Agreement Monitoring

Monitoring, analysis, and alarming for data provider service level agreements

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Problem

- **Data provider service level agreements can be challenging to monitor, analyze and manage**
- **Meter data service level shortfalls can lead to billing problems with customers**
- **Quick early detection of data provider problems is needed to prevent downstream issues**

Solution

Parallel meter data management system

Analyze all interval and daily data to locate any missing data elements and test against service level agreement metrics

Reconcile all interval data against all daily data to check for consistency

Machine learning module to identify unusual consumption patterns that can indicate meter reading issues

Why Fractal

Delivered parallel meter data management system (MDMS) with Fractal Programming.

Parallel MDMS application identifies all missing data and meter reading errors.

Automatic alerting and alarming of failures to meet data service level agreement metrics.

Utility is able to bill with confidence that meter data is correct.

Impact

Increase in bill quality.

Reduction is customer billing complaints and issues.

Customer Contact Management

Critical loads, priority loads, and key account contact management. Automated email, text, and voicemail communication of information, alerts, and alarms.

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Problem

- **Contact information for notification of outages or other problems can be different than billing contact**
- **The scale of customer base can make data management and automated communication challenging**
- **Customers need to be able to update contact information and preferences to track changes in their internal organization**

Solution

Customer portal that enables customers to update their contact information and preferences

Internal support portal for use by call center and key accounts team to track and update customer contact information

Identification and classification of critical, priority, and key accounts loads for real-time detection of site-specific outages and other issues

Why Fractal

Fractal enables data portals to be easily built for both internal and external customer use.

Flexible database definitions enable easy addition of attributes for tracking critical, priority, and key accounts.

Native email, text, and voicemail communication for alerting and alarming

Solution scalability for entire customer base.

Impact

Customers proactively notified and updated on issues.

Changes in customer organization and contact points continually tracked and accounted for.

RATE PLANNING AND SIMULATION

Real time plan any rate across every customer with 100% accuracy.

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Problem

- **Utility needs to plan different rates across millions of customers every year**
- **Rates complicated due to wind, solar and other green energy and distributed generation initiatives**
- **Costs millions of dollars to simulate rates, create financial forecasts, and estimate customer impact**
- **Large or individual customers may have surprises**

Solution

Implement real time rate planning engine

Test every rate, across every customer, using previous bills

Forecast utility yearly revenue to the penny

Eliminate all new rate surprises

Enable utility profitability analysis by rate plan

Why Fractal

Fractal Programming enables flexible real-time creation of rate plans.

App performance enables rate plans to be run against 100% of customers for dozens (multiple years) of billing cycles in minutes.

Utility eliminates all new rate surprises for customers.

Utility has highly accurate financial forecasts for itself and its customers.

Impact

Saved $2 million paid to rate consultants for single rate plan.

Saved $8 million for subsequent rate planning.

RATE ASSIGNMENT AND VALIDATION

Scan all customer accounts to validate qualification for assigned rate. Automatically assign rates to customer accounts.

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Problem

- **Assigning rates to accounts can be time consuming and error prone**
- **Rate assignment complicated due to wind, solar, EV and other green energy and distributed generation initiatives**
- **Qualification requirements for rates change over time requiring reassessment of all customer accounts**

Solution

Implement qualification rules for each rate class

Test every rate on every customer account

Enable “what if” scenario analysis for key account customers for qualification for different rate

Forecast customer budget impact and utility revenue changes for new rate assignments

Enable utility profitability analysis by rate plan

Why Fractal

Fractal Programming enables flexible rules for checking rate assignments.

App performance enables 100% of customer accounts to be validated for correct rate assignment.

Automatic assignment of correct rates.

Automated customer notification of new rate assignments along with explanation.

Impact

Saved half a million dollars in consulting fees for validating rate assignments.

100% of customers on correct rate plans.

KEY CUSTOMER INSIGHT

Incorporate key customer insights from multiple data sources both internal and external to utility.

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Problem

- **Key customer insight data is often located outside of systems-of-record**
- **Valuable customer information is located department-level computers or desktop spreadsheets that are not accessible by systems-of-record**
- **Customer entered and customer maintained data needs to be incorporated into customer insight apps**
- **Public domain information (eg. tax records) must be incorporated into customer insights**

Solution

Implement continuous real-time data import from systems-of-record

Implement continuous real-time data import from department-level computers and desktop applications

Implement continuous real-time data import from public domain sources

Implement continuous real-time data import directly from customers

Why Fractal

Fractal Programming enables continuous real-time data import.

Data import tools work with data sets internal and external to utility, including public domain data sets.

Data import tools work with desktop resources such as spreadsheets and text files in addition to data exports from systems-of-record.

Customer data entry / import supported.

Impact

Deeper key customer insight.

Enables all customer information, regardless of where it resides, to be incorporated into 360 degree view of customer relationship and customer activities.

KEY CUSTOMER IDENTIFICATION

Identify key account customers based on consumption patterns, spending levels, program participation, and rules-based metrics.

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Problem

- **Key customer relationship are not always obvious – especially when customers have a portfolio of locations and multiple billable entities**
- **Ownership of commercial properties frequently via special purpose vehicles, making it unclear who the portfolio customer relationship is with**
- **Qualification for key account status based on spending levels and program participation can be complicated to identify and track**

Solution

Implement qualification rules for key accounts

Implement aggregation rules to identify portfolio relationships

Classify every customer at both individual account and aggregate customer portfolio level

Enable utility profitability analysis by key account relationship

Why Fractal

Fractal Programming enables flexible rules for assigning accounts to a customer based on multiple attributes.

App performance enables rule sets to be applied to entire customer base to identify key account relationships.

Automatic assignment of key account status based on qualification rules.

Both metered and non-metered attributes incorporated into rules.

Impact

Identify key account customers by evaluating total portfolio consumption and behavior.

Enables more focused programs by identifying impactful portfolio level decision makers in customer base.

DEMAND FORECASTING

Legacy forecasting system would not run quickly enough for capital markets futures positions to be taken

Problem

- **Forecasting system must run in less than 12 hours**
- **Using major data center, legacy system did not always finish in time**
- **Utility also needed to increase system size and capacity**
- **Utility needed to accurately bid in futures market**

Solution

Fractal Programming enabled new demand forecasting system to be written and deployed in a single business quarter

Dramatically increased accuracy and number of scenarios that can be run

Uses full customer data set instead of just a data sub-set

System runs in minutes instead of hours

Why Fractal

Fractal Programming enabled the development of a demand forecasting App that runs over 1,000 times faster than the legacy App.

Forecasting system was delivered in a single business quarter and is more accurate than legacy system.

Financial Impact

Added accuracy of forecasting 100% of the data, not samples, impacts millions of dollars of futures contracts each year.

Program Measurement And Verification

Virtual meters used to measure aggregate response to utility programs and events. Program effectiveness analyzed and customer response behaviors verified.

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Problem

- **Effectiveness of utility program difficult to measure and analyze**
- **The scale of large programs make data processing difficult**
- **Need to analyze sub-groups within programs**
- **Need to adjust group definitions based on changing conditions**

Solution

Virtual meters defined for program participants to analyze aggregate behavior

Each individual customer's behavior also analyzed

Virtual meters defined for each sub-group within the program

Virtual meters also defined for reference groups that do not participate in the program

Why Fractal

Fractal Programming enables virtual meters that aggregate millions of individual meters.

Virtual meter definitions are easy to create and edit.

Fractal Programming performance enables real-time analysis.

Utility can now accurately measure and analyze program participation and effectiveness.

Impact

Programs can be analyzed at overall program level and sub-groups to identify where program is most effective.

Program resources can be allocated based on effectiveness to maximize program impact and results.

Photo Voltaic Management

Monitor output of PV arrays to detect and alert on equipment and production problems

Problem

- **Need to monitor PV arrays across entire distribution grid**
- **Need detect equipment problems (especially invertor failures)**
- **Need to check output against equipment ratings**
- **Need to correlate output over all PV arrays to account for cloud cover and weather patterns**

Solution

Virtual meter capability enables easy definition of PV groups

Analysis performed on both daily and interval data

Analysis by equipment type and program participation

Automated alerting when equipment issues detected

Why Fractal

Fractal Programming performance enables real-time monitoring and alerting of all PV meters.

Machine learning on generation patterns to detect and categorize equipment issues.

Automated alerting and alarming at scale of entire customer base.

Analysis includes equipment type and correlation with other similar PV arrays.

Impact

Increased customer satisfaction due to identification and alerting of equipment issues.

Increased and more predictable PV output.

Metering Aggregation And Analysis

Virtual meters enable aggregation and behavior analysis by rate class, customer demographic, consumption patterns, program participation, equipment and building type.

Problem

- **Need to analyze aggregate behavior by customer groups**
- **Need a flexible/easy way to define customer groups**
- **Need to correlate behavior with weather, program participation, and other non-billing attributes**
- **Need to aggregate at the scale of entire customer base**

Solution

Virtual meter capability enables easy definition of customer groups

Aggregation performed on both daily and interval data

Aggregation by rate class, demographics, consumption patterns, program participation, on premise equipment, and building type

Analyze group response to events such as demand response, weather changes, etc.

Why Fractal

Fractal Programming enables virtual meters that aggregate millions of individual meters.

Virtual meter definitions are easy to create and edit.

Fractal Programming performance enables real-time analysis.

Utility can now do more sophisticated analysis by grouping / aggregating customer base many different ways.

Impact

Much deeper insight into customer behavior.

Much deeper insight into customer program results.

Transformer Monitoring And Analysis

Virtual meters at the transformer level enable aggregation of end point loads so that transformers can be monitored for capacity and performance issues.

Problem

- **Large intermittent loads such as EV charging can cause distribution transformer overload**
- **Variable distributed generation can cause distribution transformer overload**
- **Installing interval meters on all transformers would be prohibitively expensive**

Solution

Virtual meters defined for every transformer that aggregate all of the transformer's end point loads

Aggregation performed on both 15-minute interval and daily data

Alerting and alarming based on transformer rated capacity

Identify problems and take corrective action before transformer failure

Why Fractal

Fractal Computing enables virtual meters that aggregate millions of individual meters.

Virtual meter definitions are easy to create and edit.

Fractal Computing performance enables real-time analysis.

Utility can now detect when transformers are being operated at or over rated capacity and take proactive action.

Impact

Enables proactive action to prevent transformer failure and associated liability.

More reliable delivery of power to customers.

ELECTRIC VEHICLE IDENTIFICATION

Identify location of electric vehicles on the grid using machine learning

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Problem

- **Electric vehicle (EV) charging impacts the grid causing potentially dangerous transformer overloads**
- **There is no easy way for utilities to identify these locations**
- **Need to know who has electric vehicles so that customer programs can be more targeted**

Solution

Electric meter data evaluated for back years and current months to identify load profiles indicative of EV charging

Utility was able to make much more accurate forecasts of electric demand for EVs

Distribution grid hot spots identified and distribution transformer failures avoided

Why Fractal

Fractal Programming delivered identification app in a single business quarter.

Machine learning used to analyze utility electric meter data and create statistically significant “EV identifiers”.

Fractal Programming performance enables application to run in real-time and identify charging events as they occur.

Impact

Prevented transformer failures by identifying distribution hot spots and proactively upgrading transformers.

Utility was able to more aggressively roll out EV and distributed generation programs.

Metering Quality Assurance

Verification and reconciliation of daily and interval meter data.

Problem

- **Multiple sources of meter data can lead to inconsistencies**
- **Customers need to see a consistent data view**
- **Billing calculations must produce matching results regardless of meter data source**
- **Meter communication issues create data issues**

Solution

Delivered parallel meter data management system to check system-of-record

Reconciled all interval data against all daily data

Reconciled all daily and interval data against billing system data

Machine learning module to identify unusual consumption patterns

Why Fractal

Delivered parallel solution with Fractal Programming.

Parallel application ran over 1,000 times faster, reduced storage 90%, and eliminated meter data errors.

Utility is able to bill with confidence that meter data is correct.

Utility now has an independent way of checking billing and meter data.

Impact

Eliminated need for $10 million meter data management system re-write.

Billing Quality Assurance

Verification and line item reconciliation of all customer bills including reconciliation against source meter data.

Problem

- **Billing system complexity makes billing errors likely**
- **Changes in rate structures and rate plan assignments require additional quality assurance checks**
- **Need to quickly check bills before sending**
- **Need to reconcile billing input values against source meter data**

Solution

Delivered parallel billing system to check system-of-record billing system

Reconciled every line item of every bill before being sent to customer

Rate editor enables real-time changes to rate structures and rate plans

Billing inputs reconciled against source meter data and any discrepancies flagged

Rate assignments on every account checked to insure that account qualifies for that rate

Why Fractal

Delivered parallel solution with Fractal Programming.

Parallel application ran over 1,000 times faster, reduced storage 90%, and eliminated billing errors.

Utility is able to update rate models in minutes.

Utility now has an independent way of checking billing and meter data.

Impact

Eliminated need for $35 million billing system rewrite