Case Study - Power Company

Summary

This paper describes analytics models and data that can be used by power company to shut off the power for customers who could pay but won't.

Turn power off for customers
- Who are not ever going to pay.

Do not turn power off for customers
- Who forgot or got behind
- Who are facing hardships

It also handles the logistical problems where power company is having man-power issues and there are more customers whose power should be shut-off, than the company has capacity to do.

Logistical Problems
- Manual shutoff
- Worker has to goto location
- More work than company can handle.

Solution Approach

My approach is divided into these steps -

As the preliminary step, for all the non paying customers, Power company can communicate to customers about the possibility of power shut off. If there are customers who are facing hardships, or running behind in payment, these factors can be considered to leave the power on, since they might pay bill eventually. Using this communication, customers can have information like willingness to pay and ability to pay. Use combination of models to provide solution

1. Customer Identification
2. Power cost estimation, if the power is not shut off.
3. Shut off selection and prioritization.
4. Simulation.

1. Customer Identification

Given:
- Customer's Credit score
- Household Income
- Past history of defaults on payments to any company
- Payment history to power company
- Value of home
- Rent or Own
- How long they lived there
- Married or Single
- How many people in household
- Household Income
- Willingness to pay
- Ability to pay

Use:
Classification Model (SVM or KNN)

To:
Identify customers who
- Pay
- Can pay, but do not pay
- Unable to pay

Advantage of this approach:
It gives clear decision if the non paying customer should be considered for power shut-off or not.

2. Power Cost Estimation

Hybrid approach to predict next month power cost

If sufficient Payment history data is available for non paying customers -
Given:
- Customer's Credit score
- Payment history data
- Number of people in household
- Household Income
- Past power usage

Use:
ARIMA model

To:
- Estimate next month power cost

If sufficient Payment history data is <u>not</u> available for non paying customers -
Given:
- Customer's Credit score
- Number of people in household
- Household Income
- Past power usage

Use:
Factor based regression model

To:
- Estimate next month power cost

3. Shut-Off Selection

Since power has to be manually shut off, we also need to estimate the travel and worker cost.

Predict probability of payment

Given:
- Customer's Credit score
- Household Income
- Past history of defaults on payments to any company
- Payment history to power company
- Value of home
- Rent or Own
- How long they lived there
- Married or Single
- How many people in household
- Household Income
- Willingness to pay
- Ability to pay

Use:
Logistic Regression

To:
Predict the probability of payment.

Given:
- Address of non paying customer
- Workers availability for shut off
- Past Drive time estimates
- Time to shut off power

Use:
Vehicle Routing Optimization

To:
- Evaluate the travel time and cost for shut off.

Given:
- Probability of payment
- Estimated power cost
- Past Drive time estimates
- Travel time and cost for shut off

Use:
Simulation

To:
- Maximize the total value of shutoffs.
- Suggest employment of additional workers or temporary contractors.