note 112 views

Optimizing power shut off

There has been some good discussion about how to determine if we should shut off a customers power and how to tell if they can pay but never will. I want to talk a little about what to do once we have found these customers.

for dispatching technicians to shut off the power I think we could use an optimization model similar to what delivery drivers use in services like amazon.

The constraints would be things like the amount of time it takes to shut off power, how many technicians can we afford to pay, the amount of daylight we have, distance between sites, etc. we would try to maximize number of houses where power was shut off a in a day. The variables would be number of trucks out running the route, which route to take , and how may workers on each truck.

Maybe we could divide our area of interest (our city) into 12 geographic subsections and do one section a month to minimize time spent driving, that way we don't have to go across the whole town every month, and we only worry about shutting off power in the section we focus on that month. We may lose out by not shutting down power in the other 11 sections that month so we'd have to see what the financial trade off would be (labor vs opportunity cost).

Instead of dividing the city into 12 even sections on a gird we could use k -means clustering to pick out map areas. we could use variables like density of people, household size, apartments vs houses, and income to divide our city. Since we are just clustering and not making shut off decisions with this part of the model I don't think it violates any laws using income but I could be mistaken.

hw8

Updated 1 day ago by Alexa Langford and Anne

followup discussions for lingering questions and comments

Resolved Unresolved

Kimberly Kisner 1 day ago I like the idea of using k-means clustering to figure out where to send the technicians to keep them working as expeditiously as we can. We can address the biggest problem area first, and maybe reassess every few months to make sure we're still on track. I would agree that it doesn't seem like we're violating any federal law by using the physical address in our model - in this case, geography is the main question we're addressing.

Paul Lim 1 day ago Also, since one of the constraints is the number of technicians to send out, if it makes sense to have maybe 5-6 technicians total and each technician take care of one or two sections of the city then it could minimize driving time. Also, even though it might seem inefficient to have a technician drive 1 hour from one location to the other, I know (from personal experience) that a house in certain parts of the Bay Area can rack up hundreds of dollars in electricity bill especially during the summer months. It might still make sense to have a technician drive a long time in-between houses if these houses have huge electricity bills.

Vita Šakele 1 day ago My 5 cents. I really like the idea of clustering geographically the households for shut off. I suggest also take into account a value of the whole cluster (the total amount of predicted consumed power or sum of the bills and needed time to shut off). And then during planning the routes of technicians consider it. Some times it might be more profitable for the company at first to shut off a single house with a huge bill in a far area (including travel time and consumed fuel), not a very close cluster with 10 houses. I suppose in come cases in large countries or even cities it is more profitable to pay the technicians overnight stay in particular area or even take some outsourcing services. I believe that there are models from logistics which we can use to plan the technicians routes.

nb_data_analyst 1 day ago Along the same lines, I was thinking about making decision on whom to shut off based on the unpaid amount(including predicted bill for the next month) instead of geography, since I believe the objective would be to save as much as we can.

Michael Goldstein 1 day ago thinking about the routing, something additional to probably think about is turning power back on to customers. Is turning power back on a priority over turning power off? If so, then if a technician is in a particular area to turn power on they then could turn the power off of whichever customers are in that cluster using methods talked about previously. However, if turning power back on is not a priority for the power company we would need to determine how to include that in the clustering models. This is assuming the same technicians are utilized to turn on and turn off the customers power.

Resolved Unresolved

Benjamin Dubreu 14 hours ago
"we would try to maximize number of houses where power was shut off a in a day."

That's not quite it.

If one house was using so much power that the cost of letting it run for free would be bigger than all other houses together, AND I was absolutely certain this house was not going to pay, then I would rather power off this single house, than 100 others combined.

We don't want to "maximize number of houses where power was shut off a in a day.".

We actually want to select a set of house, such that, combined, they offer the best "return on investment", the best "expected value", as defined by :
Pr(not paying) * estimatedConsumptionOfPowerNextMonth - Money it will cost us to get there and shut it off.

With that definition in mind, 10 houses could be worth more than 25.