Operations | Telecom | Network optimization | Network analysis

SustainabilityAnalytics– Meeting Carbon Commitments most Efficiently

BUSINESS PROBLEM

With the increased prevalence of energy compliance laws coming into effect in cities and states across the US in the coming 10 years, companies must reduce their real estate energy consumption to be compliant with emissions standards and avoid fines. Verizon owns and operates thousands of buildings, many of which are central offices (COs) which consume large amounts of energy to maintain network transmission effectively. A wide range of energy efficiency upgrades are possible for each central office, but there is a finite amount of time, resources, and capital available. Upgrade options must be prioritized optimally to maximize impact.

APPROACH

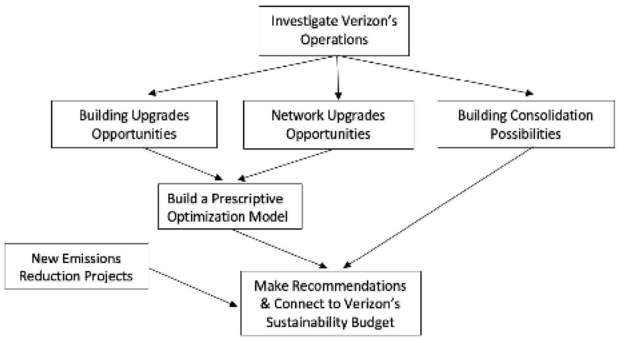
I broke down how energy consumption could be reduced across Verizon's real estate into 3 categories: energy efficiency upgrades, energy consumption reduction, and real estate consolidation. For each category I engaged with primary stakeholders on what factors needed to be taken into account to make accurate decisions. These were utilized as primary inputs for an optimization model.

DATA SOURCES

Verizon has time series energy consumption data across their building portfolio dating back to 2018 which will be used to establish trends for consumption over time to quantify potential impacts of upgrades. A list of potential building retrofits that improve energy efficiency, with their associated capital and energy savings, is available from both the real estate and network teams.

Data Types and Format

Time series available in SQL type DBs accessible online or through csv download. Building metadata and building audit data in excel spreadsheets.



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IMPACT

There are three areas of impact that resulted from this project. Our first area of impact is a result of the output of our final optimization model where we see that an optimization model built to reduce energy spend for Verizon can result in a 14% reduction in energy costs and an 18% reduction in emissions for the company's NYC baseline location. With these savings scaled to a national level for Verizon's operations, this model's implementation would cause a 7% reduction in Verizon's entire scope 1 and 2 greenhouse gas emissions by utilizing a prescriptive optimization framework to decide what building and equipment upgrades to carry out for energy savings. These nationally scaled energy savings sum to >$200 million. The next area of impact looks at alternative solutions to meet Verizon's net-zero goals that have a reduction in emissions, to complement both building upgrades and the existing method of financing VPPAs for renewable energy credits. We find that if Verizon's sustainability budget was restructured and distributed to a variety of emissions reduction projects, a 60% reduction in emissions is possible for the same cost per ton of CO2 that Verizon is currently spending. Our final area of impact highlights the financial and sustainability opportunities available from the consolidation of central offices in high-population-density metropolitan areas. These opportunities sum to billions of dollars of savings for Verizon and significant reductions in emissions.

DRIVERS

The introduction of environmental compliance laws across the US over the coming years was the main driver for this project. The first of these laws is Local Law 97 in NYC, which fines building owners for exceeding pre-determined emissions limits. Verizon owns and operates 68 high energy consuming central offices in NYC. Identifying how to minimize the negative financial impact of LL97 on Verizon's operations was the main driver for this project.

BARRIERS

The largest barrier that impacted the project was related to data. An abundance of data was available for the project to build out the optimization model, but much of the buidling upgrade effects on efficiency were based on predictions from energy auditors rather than from real operational data. Ideally the model would be maintained by Verizon to include a feedback loop of actual upgrade accuracy to improve model efficacy.

ENABLERS

Albeit an incredibly large company, the people and teams within Verizon genuinely care about measures to reduce emissions from the company's operations. Once we were able to identify goals of saving money while also reducing emissions, it was easy to gain support across teams within the company, which made obtaining data much easier.

ACTIONS

Much of the early stages of the project, in advance of building the optimization model, was spent conducting significant stakeholder engagement. This process was particularly helpful as it provided information on how Verizon's operations between its real estate and network teams were intertwined. Both had their own performance metrics, and an important aspect of this stage of the project was leveraging these metrics towards inputs for model.

INNOVATION

The area of my project investigating the impact of central office consolidation was one of the most innovative aspects of the project. The decision to consolidate buildings' operations into one another was not something that was deemed suitable to build into an optimization model. Instead, we identified where potential groupings of central offices were that could be consolidated and the impact of each building on both bottom line and emissions.

IMPROVEMENT

The optimization model provided a project management tool that could lead to a 14% reduction in energy costs, and a 18% reduction in emissions for Verizon's NYC central office portfolio. We also show a path to net-zero with a 60% reduction in actual emissions through restructuring Verizon's sustainability spend. Lastly, we quantified the potential billions of dollars of savings through central office consolidation in New York City alone.

BEST PRACTICES

Build a well structured data dictionary for all input data. This process was invaluable for this project as all necessary information was stored in a single location, making building and editing the optimization model much easier.

OTHER APPLICATIONS

The optimization model and its three dimensional binary decision matrix is directly applicable as a planning tool where time and location need to be taken into account, as well as an event. In our case this event was a building upgrade for a given building in a given year. An example of how this could be applied in a different context would be as simple as a university program class scheduling tool to minimize walking distance for students.