



TAUBER INSTITUTE
FOR GLOBAL OPERATIONS
UNIVERSITY OF MICHIGAN

25
YEARS

Clean Transportation: Fuel Switching-Advisory Services



With roots going back to 1852, incorporated in 1905 and headquartered in San Francisco, the Pacific Gas and Electric Company (PG&E) is a utilities company providing natural gas and electricity services to approximately 16 million people throughout a 70,000-square-mile service area in northern and central California.

The leading subsidiary of the holding company PG&E Corporation, which has a market capitalization of \$29.37 billion, PG&E has approximately 23,000 employees and reported \$17.14 billion in revenue for 2017. The company is one of three regulated, investor owned utilities overseen by the California Public Utilities Commission, and is one of the largest electric utility businesses in the U.S.

The state of California has been working with key stakeholders, including PG&E, to achieve goals of reducing greenhouse gas (GHG) emissions in all sectors. Policies enacted to achieve these goals include the Clean Energy and Pollution Reduction Act of 2015, which requires the state to reduce GHG emissions to below 40 percent of 1990 levels by 2030. As a result, PG&E is actively considering new growth opportunities to meet the state's objective of reducing GHG emissions.

To address this challenge, PG&E brought in a student team from the Tauber Institute for Global Operations at the University of Michigan, consisting of Madeline Gilleran, a member of the Engineering Global Leadership Honors (EGL) program, which leads to BSE and MSE degrees in Mechanical Engineering, and Pauline Park and Vikram Vaidyanathan, both working on Master of Business Administration (MBA) degrees.

"This project was driven by the large projected adoption of electric vehicles in California, largely due to policy goals and mandates, which is ultimately driven by the state's aggressive 2030 and 2050 GHG goals," said Lydia Krefta, a PG&E principal business analyst and project sponsor. "Given a goal of an 80 percent GHG reduction by 2050 and with 40 percent of current state emissions coming from transportation, the state is looking toward clean fuel vehicles to lead a significant amount of the GHG reduction. Given PG&E's unique positioning as a fuel supplier for both electric and natural gas vehicles, the Tauber team was asked to design a solution that would help PG&E (and thus California) customers lower barriers to vehicle fuel switching.

"Since PG&E is a regulated utility, the students had to learn a completely new business model. PG&E does not compete or make a profit like most other, less regulated utilities. In addition, California is unique in much of its environmental policy and regulations. Regulations and policy were very unique features of this project, which challenged the students to think in creative and innovative ways about which solutions could work in this paradigm.

"The purpose of the project was to reassess the low carbon fuel market to determine if PG&E could increase its natural gas load while helping California meet 2050 GHG goals by displacing dirtier fuels such as bunker fuel, used in marine applications, and gasoline," said Krefta.

By integrating the views across a single database, all groups could make decisions and have discussions using the same data. This provided a level of trust across the groups which had not previously been achieved.



Matthew Brown
Ross School of Business



Ruiwei Jiang
College of Engineering

“This included analyzing the current processes PG&E has in place to help customers switch to low carbon fuel vehicles, such as natural gas, electric, and hydrogen, and developing a proposal for PG&E to better assist customers through a fuel switching advisory service.”

In reassessing the low carbon fuel market, “the students looked at previous PG&E corporate strategy assessments and researched market trends in California, nationally, and internationally,” said Krefta. “They developed a load forecast model based on research insights and determined which opportunities PG&E should pursue for its natural gas business.”

This market reassessment included a new analysis of potential market size, drivers and barriers to adoption, regulatory factors, and market trends on the following: hydrogen light-duty vehicles (LDV); medium-duty vehicles (MDV); and heavy duty-vehicles (HDV) fueled by hydrogen, natural gas or electricity; marine applications; rail applications; fuel cells; propane to natural gas conversions; and micro combined heat and power (micro-CHP) systems. This phase of the project concluded with a recommendation by the Tauber team to focus efforts on the LDV, HDV, and MDV markets.

Since this conclusion was in line with PG&E's recent focus on alternative fuel vehicles, the second phase of the project came from the internal Clean Transportation Team's work plan. The scope of this phase was to explore fuel switching services within PG&E by mapping the existing process and making recommendations for an ideal future state, addressing electricity, natural gas, and hydrogen as alternative fuels.

These services not only include advisory activities such as performing rate analyses, but also core utility actions such as service planning to connect infrastructure to PG&E's grid or gas pipelines.



“The students worked closely with a diverse set of stakeholders to understand current processes and gaps,” said Krefta. “The Tauber team worked closely with PG&E's service planning and distribution planning departments to identify a gap between electric vehicle (EV) service planning and long term distribution planning.

“They realized that if these groups are not aligned, there can be long-run excessive costs which would lead to unaffordable service for our customers. The Tauber team proposed an effective solution to identify critical collaboration points to mitigate these adverse effects to the business and to the customers.

“More specifically, the team recommended better alignment early in the EV charging station siting process, which PG&E now attempts to incorporate into EV siting work.”

Having completed more than 90 stakeholder interviews, the Tauber team created a detailed process map and an accommodating action plan which highlights six focus areas: coordinating and tracking clean transportation projects, continuing to build subject matter expertise, developing future strategic initiatives, marketing clean transportation externally, exploring preliminary siting capabilities, and formalizing the fuel-switching process through a newly developed position and training for existing employees.

“The Tauber team developed a proposed solution and worked closely with these stakeholders to ensure buy-in was received for their final fuel switching advisory services recommendation,” said Krefta.

Once implemented, this action plan is expected to have significant impact on PG&E's business and the California environment. Enabling the adoption of alternative fuel vehicles, this process improvement could increase PG&E revenue by \$230 million and reduce California GHG emissions by 187,000 metric tons of carbon dioxide (CO₂) equivalent in 2030, assuming that 10 percent of adoption will be successful due to these services.

“Much of the work the team did flows into two initiatives,” said Krefta. “In the fourth quarter of 2017, a Clean Transportation Strategy team was formed, which provided PG&E with a focal point for all the great work the Tauber team did, and much of their work was transitioned to this team. Additionally, in late 2017 and early 2018, PG&E started the rollout of the Electric Vehicle Charge Network (EVCN). The work the team did on aligning EV charger siting with service planning, distribution planning, and other stakeholders was used as these teams aligned to begin deployment of more than 7,000 Level 2 chargers.”

The Challenge

PG&E is actively considering new growth opportunities that can complement California's objective of reducing greenhouse gas emissions. The Tauber team was tasked with identifying an ideal growth avenue.

After analysis, the Tauber team recommended PG&E focus efforts on hydrogen light-duty vehicles, and medium-duty vehicles and heavy-duty vehicles fueled by hydrogen, natural gas, or electricity. The team created a detailed process map and an accommodating action plan which highlights six focus areas: coordinating and tracking clean transportation projects, continuing to build subject matter expertise, developing future strategic initiatives, marketing clean transportation externally, exploring preliminary siting capabilities, and formalizing the fuel-switching process through a newly developed position and training for existing employees. Once implemented, this action plan is expected to have significant impact on PG&E's business and the California environment.

Pacific Gas & Electric Project Team

Students

Madeline Gilleran—EGL (BSE & MSE Mechanical Engineering)

Pauline Park—Master of Business Administration

Vikram Vaidyanathan—Master of Business Administration

Project Sponsors

Mallik Angalakudati—Vice President of Corporate Strategy

Lydia Krefta—Business Analyst, Principal

Easar Forghany—Business Analyst, Senior

Faculty Advisors

Matthew Brown—Ross School of Business

Ruiwei Jiang—College of Engineering

About Tauber Team Projects

The 2017 Tauber Team Projects resulted in \$575 million in savings according to sponsoring company calculations, an average of \$18.5 million per project over 3 years.

Each two- to three-person Tauber Team consists of graduate engineering, MBA, and/or MSCM students. Along with receiving high-level corporate support from the sponsoring company, each team is advised by a College of Engineering and a Ross School of Business faculty member and overseen by a Tauber Institute Co-Director. The projects begin on-site in May and continue for 14 weeks. Students present the results of their projects and compete for over \$40,000 in scholarships at the U-M Tauber Institute's annual *Spotlight!* event, held each September in Ann Arbor, Michigan. *Spotlight!* provides outstanding opportunities for students and corporate partners to establish relationships while exploring innovations in operations and manufacturing.

To learn more about the Tauber Institute for Global Operations, visit tauber.umich.edu or contact us at 734-647-1333.

