ExecutiveSummary This submittal explains how all responsibilities were fulfilled in accordance with the project guidelines set forth by the ASCE Charles Pankow Annual Architectural Engineering Competition. The submittal begins with information about systems integration, site analysis, project scope, and design criteria. Thereafter different sections describe all aspects of analysis: **building power generation, building power distribution, special systems, lobby lighting, restaurant, office floors lighting, parking garage, and LEED**. Supplemental material has also been provided. This includes: appendices with supporting documentation and references, as well as drawing sheets with detailed floor plans and schedules.

Before reimagining this building system, the electrical team established specific goals they deemed essential to designing a net-zero energy building:

- A highly electrically efficient building
- Building power generated onsite
- An interactive lighting design

The electrical team was also influenced by other disciplines. They were part of an 8 member integrated project team that worked together to optimize all aspects of 350 Mission's design and construction. AEI2 sought to create a building that would exhibit **Performance**, **Endurance** and **Connectivity**.

Building Power Generation The new 350 Mission will be a net-zero building with an EUI of -0.02 kBTU/hr-sf. A combined heat and power system will be fueled by bio-methane generated from an anaerobic digestion process in the basement of the building. The digesters will receive input from 350 Mission's sewage and compost, as well as municipal wastewater from San Francisco's combined sewer and waste food from the restaurants within a quarter mile radius of the site. The resulting bio-methane will fuel an internal combustion engine that will produce 310kW of power every hour. This source will be paralleled with the utility grid, allowing the building to take from the grid if fuel is lacking and give back to the grid when the system is over producing. Over the course of the year the engine will generate 2,715,600 kWh, while the building will require 2,707,682 kWh. In the case of grid failure and bio-methane deficiency, the building will have a fuel reserve for emergency power generation. Before this system was selected, the electrical team explored the idea of using solar power and piezoelectric panels. Further analysis proved these systems to be inadequate design solutions.

Building Power Distribution Paralleling switchgear will be responsible for paralleling the utility grid and the internal combustion engine system. A bus duct will run through the building core, distributing power at each level. Because a building's lighting power load is a large portion of the total building load, the electrical team took time to create an efficient lighting design and control system to fulfill space and task requirements. A digital lighting control system will be part of this scheme.

Special Systems The electrical team deemed telecom infrastructure to be an important power consideration. The electrical team recommends that a virtual desktop infrastructure be used to reduce power loads from computers and improve information technology efficiency. Similar to remote-desktopping, this system will have individual users working off remote servers instead of traditional workstation CPUs and will reduce data electricity usage by 37%.

Lobby As the sole area of the building where all occupants come together, the electrical team wanted to create an interactive lobby space. Different layers of light were imagined to highlight these interactions. Color changing LEDs, motion activated Sensitile concrete and an LED screen that will display public artwork will be the illuminating components. An interactive dashboard in the space will also educate occupants about energy efficiency.

Office Floors The concept of interaction was continued on the office levels. The lighting design was used to create a hierarchy of spaces that define where the greatest and least number of interactions will occur. In the open office a lighting power density of 0.6 was achieved. Task/ambient LED lighting fixtures will be attached to each individual workstation. The task light will be controlled by the desk occupant and the upward directed ambient light is integrated into the daylighting scheme to conserve energy. Photosensors will dim this uplight and control an automated shading system.