**Team 1: PICA**

Our Senior Design group, team PICA (Power Information Collection Architecture), is comprised of four electrical and computer engineering students who all have a strong desire to serve God with the abilities He has given us, along with the training we have received here at Calvin College. One way we believe we can achieve this goal is through the development of a home power monitoring system capable of monitoring total and circuit-by-circuit power usage in a home.. Developing this technology gives us the opportunity to be good stewards of the resources God has given us by providing better information about power consumption. As good stewards of God’s Earth we want to make sure the natural resources available to us are not wasted, by arming consumers with more accurate information about their consumption, we hope to see reductions in power consumption.

Traditionally, power consumption data has been estimated based on discrete-time readings taken by a technician. Sending a technician out to each meter in an area is costly and inefficient in an internet connected world. Additionally, a consumer cannot know exactly how much the power they consume costs until the end of a billing cycle, a problem we hope to alleviate with our PICA system. Several off the shelf solutions already exist to address some of these concerns in a residential or commercial setting, but with limited functionality or high-cost. Once we collect power usage data, our system aggregates and packages the data for presentation to both the consumer and utility provider.The problem we are trying to solve is the fact that data regarding power usage is severely limited for power companies as well as homeowners or business owners. For the power companies, data from the meters is very minimal and grid control is limited to manual operation, costing them time and money. As the cost of electricity becomes higher and higher, use of electricity in buildings and homes is becoming a bigger concern and people have few cheap or simple ways to monitor this. There are many options available to try to solve this problem; however, most of them only address part of the problem, giving some information to the consumer and none to the power company or vice-versa.

Most homeowners are unaware of exactly how much power they are consuming hourly or daily. They receive a monthly bill from the power company, but are unaware of where their usage is exactly coming from. Our system will have the ability to inform the homeowner of how much power they are consuming per outlet hour-by-hour, day-by day, month-by-month, or whichever the homeowner desires. This information will be displayed to a user in real time over a wall-mounted display unit or a web interface.

Our system has three sub-systems which include the base station, e-panel, and the solid-state breakers. The target market of the PICA system comprises of both electricity producers and electricity consumers, which is one of the reasons there are three sub-systems. The power companies supply and own the electric meters attached to the buildings where they supply power, the PICA system’s E-meter will only target the market of electricity-producing companies. The other two subsystems, the solid-state breakers and base station, target the power-consuming market (homeowners), since the devices will assist in monitoring power consumption inside the home, where the power company does not have involvement with.

The PICA system as a whole is designed to accurately collect and display information about power quality and consumption to a consumer. Due to the fact that we are marketing to both electricity producers and electricity consumers, the system is designed to be modular, in which components do not require the use of all systems in order to operate. They can however operate individually or together as group of sensors and controls in order to provide the consumer with more accurate and up-to-date information about their power usage or consumption.