

## **Residential/Commercial Whole-Building DC Power**

Contact: Jared Ellsworth – Idaho Power, Kip Sikes UI

### **Background**

As more electronics require DC (Direct Current) power, and personal home appliances can be manufactured to utilize DC supply as well, if low voltage DC power can be supplied from a central building source, individual power supplies would no longer be required.

### **Problem Statement**

Can low voltage DC power be supplied on existing electrical wiring in a building? What safety concerns need to be addressed, and what electrical circuit protection would be required? What would be the desired voltage(s) to be supplied? Researching these and other questions will lead to a prototype design and physical system mock-up panel for testing.

### **Deliverables**

The capstone design team will provide the following deliverables:

- 1) Research safety, technical limitations, and if any publications or implementations have occurred.
- 2) Specifications, design, parts lists, operation description of the system, and test procedures.
- 3) A report summarizing 1) and 2) for design review.
- 4) Manufacture a panel using plywood and 2X4 framing to represent a portion of a wall. Include a 120 VAC breaker panel which can be plugged into an existing wall outlet. Wire at least 3 normal wall outlets. Along with the breaker panel install at least one AC/DC power supply (depending upon how many DC voltages are to be used), any additional protection equipment, and DC outlets (form to be determined such as USB) using the same wires the AC voltages are using.
- 5) Document all test results.

### **Design Requirements:**

- Utilize off-the-self equipment
- Must comply with all NEC (National Electric Code) safety concerns for 3-wire grounded systems
- Supply up to 15 Amps at 120 V<sub>nominal</sub> AC
- Supply up to 10 Amps DC at voltages not to exceed 24 VDC
- Perform voltage drop and power loss calculations that may be design constraints
- Provide isolation switches/breakers that can disable the AC or any of the DC voltages independently
- Preliminary budget of \$500, which may be modified pending design review