

**Michigan State University  
College of Engineering; Dept. of Electrical and Computer Eng.  
ECE 480 Capstone Design Course Project Charter**

**Team 4: Electricity Generation from Degenerative Breaking of Rail Cars**

**Sponsoring Company/ Organization: Union-Pacific Railroad**

**Contact Information:**

**Name: Eric Gehringer, AVP – Track Systems**

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**Phone and Best Time of Day to Call: (prefers email for initial contact)**

**Background Information:**

Union-Pacific has long sections of track that require extensive breaking because even a small grade poses difficulties given the mass of trains. For example, Sherman Hill has 42 miles of 1.55% grade and dynamic breaking is used extensively. Dynamic breaking places the traction motors in generator phase (the reverse of delivering torque), with the generated current flowing into resistance grids with large blowers. Essentially all the energy generated is expelled as waste heat. While this saves UP by reducing the strain on brakes, the heat generated is a wasted opportunity.

**Business Case:**

If the current generated could be converted into a grid-friendly form, the energy could be sold back onto the grid at virtually no cost to Union Pacific as the dynamical breaking is a common technique that is not going to be abandoned.

**Project Intellectual Property Considerations: None**

**Deliverables:**

Business case study based upon data collected using the outcome of the project measurements/demonstration, conversion efficiency, and practicality.

**Goals:**

The goals of this project are to develop hardware and analysis to quantify the following:

- Measure the current produced by dynamical breaking under operational conditions by working with the sponsor.

- Analyze possibilities for converting this energy into grid-friendly power either directly onto trolley-style wires or by mass storage for future transfer. Estimate, based on U-P statistics of rail movement, what the scaled value of the energy would be per year.
- Demonstrate, on a model scale, a proposed conversion or storage and delivery process, using a small dynamical breaking system (such as from a model car.)

**Project Team:** (Completed once semester begins)

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**Faculty Advisor:** (Assigned by ECE Dept . based on project requirements)

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