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Designing an Electric Vehicle Wireless Charging System

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PURPOSE

To design a wireless charging system for an electric toy car.

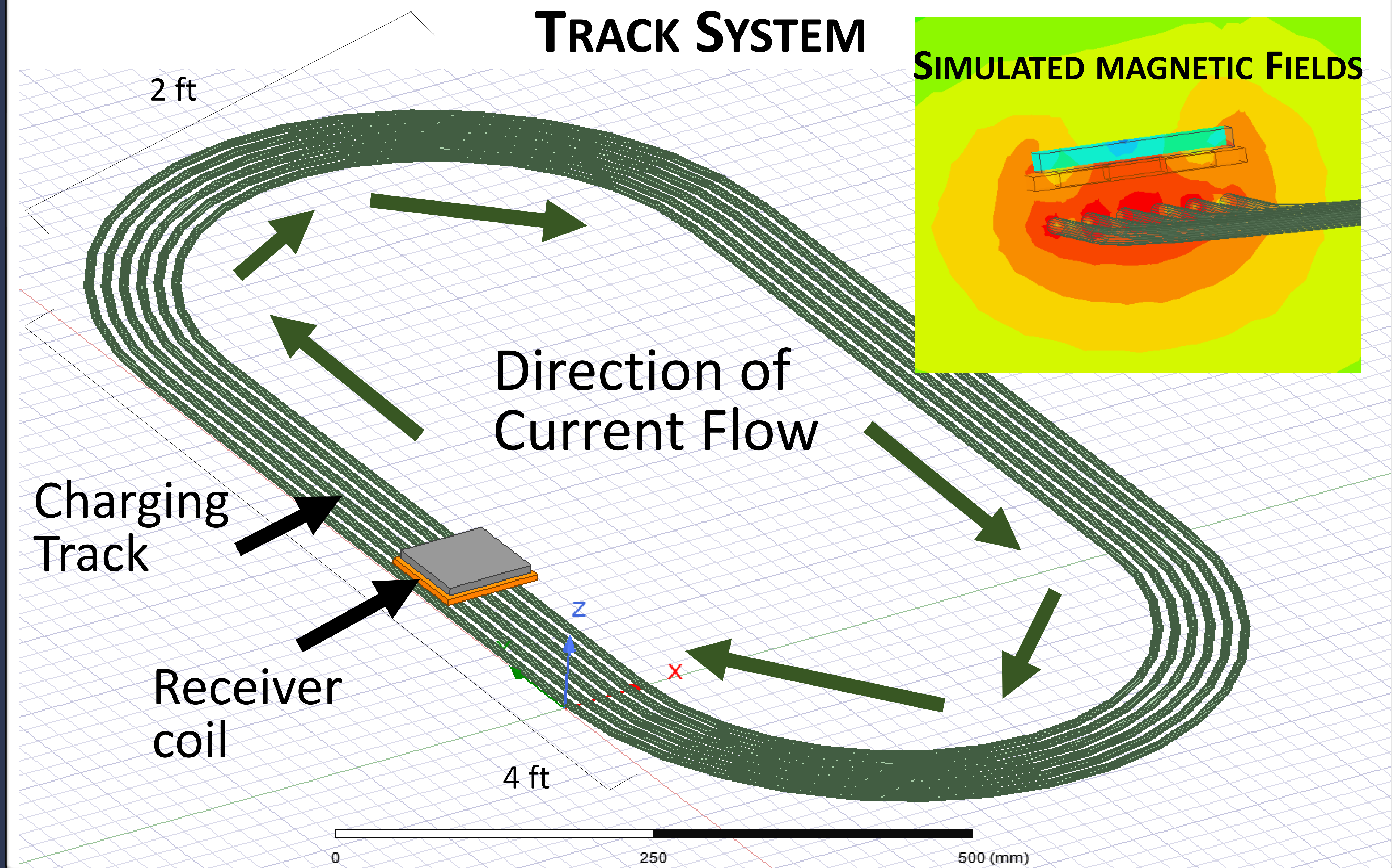
Track will be used for teaching junior high and high schoolers about the engineering design process.

CHALLENGE

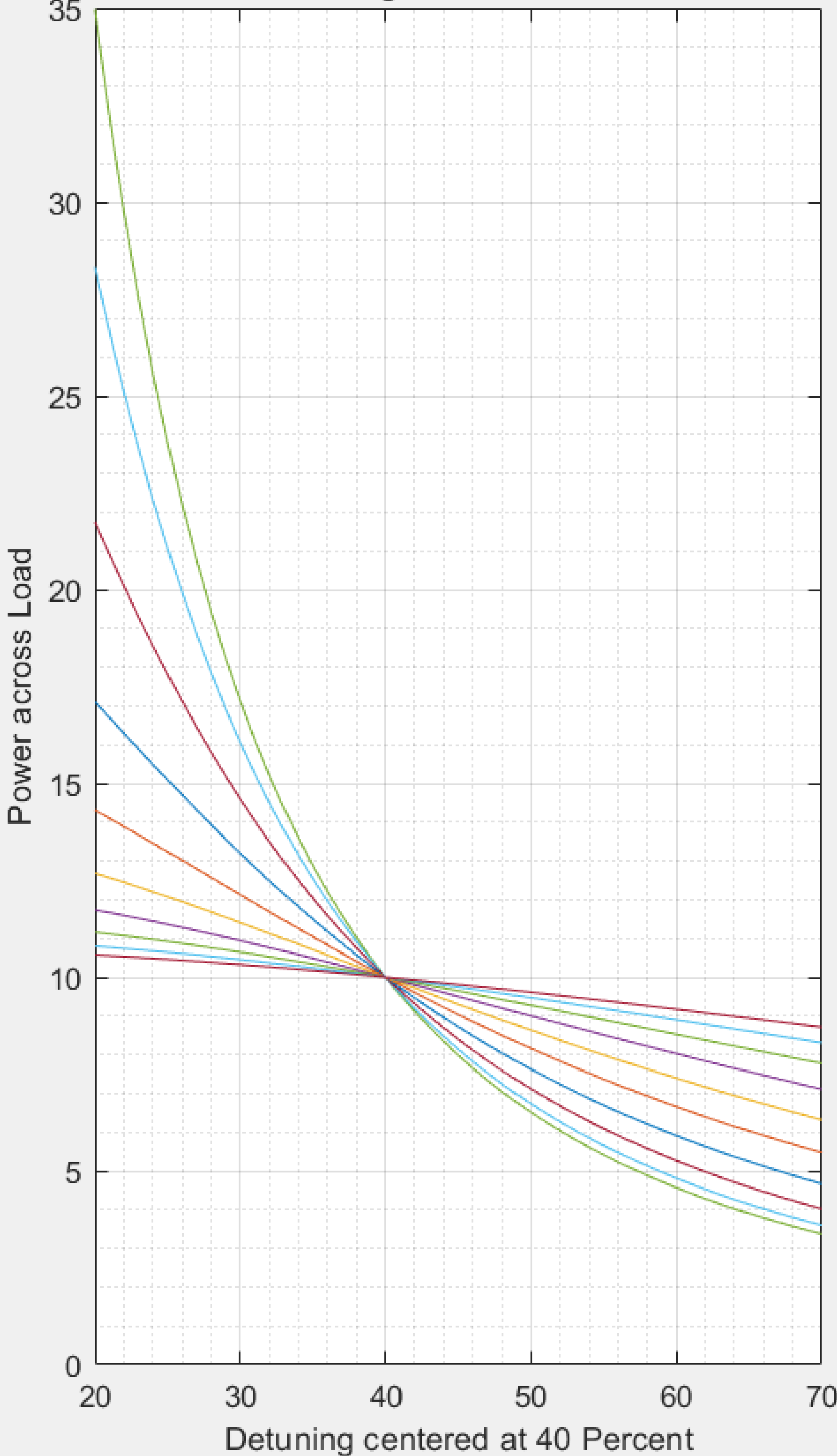
Design a system that will be:

- Cost effective
- Safe for students
- Provide consistent power to car motor

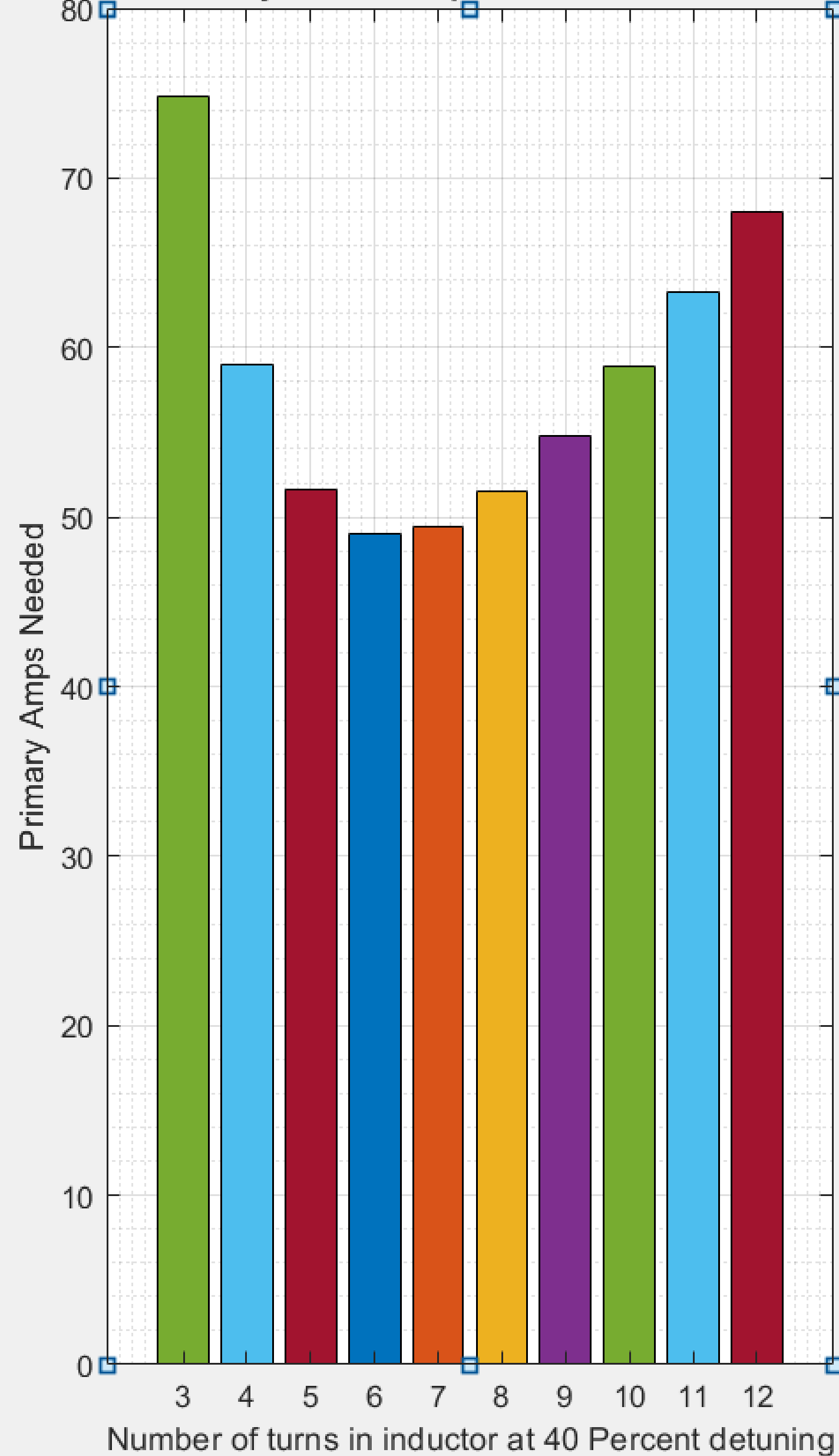
TRACK SYSTEM



Power change at set detune value



Primary current required at detune value



DESIGN PROCESS

1. Design the geometry of track and car dimensions
 2. Determine circuit that will provide 10 W of power to car motor safely and consistently
 3. Verify designs using mathematics and computer simulation software
- Repeat steps 1-3 to optimize solution

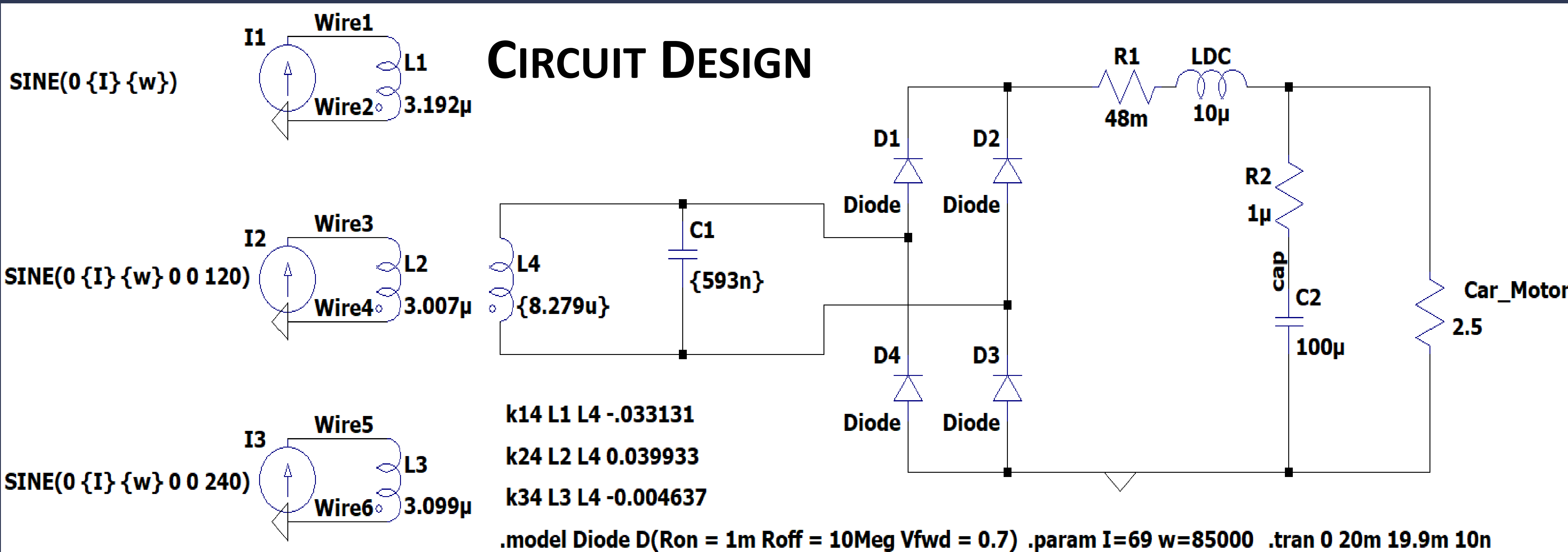
CONSTRAINTS

- 10 W of power to car motor
- Low power change with +/- 10% capacitance tolerance
- Low secondary voltage

VARIABLES

- Resonant capacitance and inductance
- Primary coil currents
- Coil size and air gap

CIRCUIT DESIGN



CHOSEN DESIGN

The following variables were found to be the cheapest, safest, and most consistent solution:

- 12 Turns in car inductor coil
- 40% detuned resonant circuit for voltage safety
- 68.01 Amps current in track