

ARC Roads Systems



Insertion of Active Charging Lanes for Electric Powered Cars

Baltimore Metro Area Highways

Arc Roads

We are Arc Road Systems, a company founded in 2012 and headquartered in the Baltimore Metropolitan Area in Maryland. Arc Roads manufactures and installs electrically charged roads for high traffic systems such as highways and interstates. Our systems will provide a solution for electric vehicles by allowing a longer range for traveling on roads. With more efficient electric vehicle range, more people will make the switch to electric vehicles for the environmental benefits they provide. With electric vehicle becoming the norm for transportation in the future, pollution will drop from the decrease burning of fossil fuels and decrease of noise pollution caused by combustion engines.

Arc Roads are a network of roads which are powered by electric generators that are in large facilities, much like electric plants that power our metropolitan area. These facilities use underground cables to route the power generated to the roads that is distributed to electric vehicles. As electric vehicles travel along Arc Roads, the internal batteries of the electric vehicles will receive electric current through electric induction, transferring the current to the battery and charging it to give more range for electric vehicles.

The use of Arc Roads will not be a direct cost to users like with fossil fuels. Costs associated with the design, construction and maintaining the systems will be covered by national taxes paid to the government. With this in place, manufacturers of automobiles will see a unique approach to creating change for future transportation by providing the infrastructure to accommodate the technology as it meets its potential.

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Prior Experiences

Holland (2013)

In one of the most environmentally friendly countries on the globe, Arc Road Systems implemented its Arc Road in two 10 mile sections of the International European Roads that connect continental Europe together. After one year, ownership of electric vehicles increased by 25% and the estimated decrease in air pollutants was 15.85%.



Electric priority lane in Holland

Canada (2013)

Canada has tested Arc Roads on sections of the Trans-Canada Highway spanning 15 miles each. After one year of use, electric vehicle on the road increased by 5% and vehicle pollutant emissions decreased by 7%.



Electric cars charging in Toronto

England (2014)

Arc Roads were tested on multiple A-roads in the United Kingdom. After one year of testing the Arc Roads, electric vehicles on the road increased by 9% and pollution caused by vehicle emissions decreased by 10%.



Electric Road Simulation

Los Angeles (2015)

For a city heavily dependent on personal transportation, Arc Roads can make a large difference in reducing emissions. After one year of use, electric vehicles on the road increased by 15% and emissions decreased by 18%.



Business Description

General Company Description

Arc Road Systems is an American engineering company headquartered in Silicon Valley, California. Nowadays Electric cars are being restricted by limited driving range. To solve this problem Arc Road Systems has developed an innovative wireless charging technology that can be implemented to provide a greater range for electric cars. Arc Road Systems will give Electric vehicles the edge to compete with traditional gasoline powered vehicles. Beneath the pavement of the electric road is a network of concealed cables and wires, from which electric vehicles will harness the power using electromagnetic fields that this network creates, recharging their batteries as they drive.

Arc Road System's Workforce

Arc Road Systems is an American engineering company that has prior experiences working around the globe. Arc Road System is comprised of many valuable teams including: Research and development, Project Management, Operations Management, General Engineers, Field Operations, and also a Testing and development team. Arc Road Systems employs over 3000 workers to ensure the success of a project on all levels.

- Research and Development (300 physicists and 200 general scientists)
- Project Management Team (500 employees all led by a Project Management CEO)
- Operations Management (700 employees all led by Operations Management CTO)
- General Engineers (500 General Engineers)
- Field Operations (300 Field Operation Workers and 200 Quality control Workers)
- Testing and Development (300 Software Engineers)

Mission Statement

The future of wireless charging has emerged with the inception of Arc Road Systems. Integrating safe wireless power transfer technology into the asphalt. Established to promote and create a more consumer friendly experience for potential Electric vehicle buyers.

Vision Statement

Arc Road System's responsibility is to continually improve all technological aspects of the world in which we operate creating a better future for the community. Our vision is put into

action through innovate inventions that promote and establish environmental stewardship, and a continuing desire for progress

Industry Description

Arc Road Systems will supply innovative technology to local and federal government to implement within the transportation industry with a focus on Road and Highway construction. As a company that develops these wireless power transfer technology, Arc Road Systems will appeal to federal and state governments for the installation of inductive electric charging capabilities within highways and country roads. Arc Road Systems will also provide Wireless Park and Charge technology for Electric Vehicles in the long run, giving growth capabilities to both public and private sectors.

Product and Services

Arc Road Systems will provide unique products and services including:

- Wireless and Electromagnetic Power transfer Technology for Electric Vehicles
- Wireless Park and Charge technology for Electric Vehicles

Arc Road Systems will provide services including installation and maintenance of the wireless technology. The company will work hand in hand with the road construction company to ensure safe integration of this technology into the asphalt.

Unique Aspect of Arc Road Systems

Arc Road Systems are the pioneers in developing wireless transfer technology for outdoor use. Arc Road Systems holds patents for the wireless energy transfer technology using resonant energy transfer methods based on oscillating magnetic fields. Arc Road technology is very unique because it is based on strong coupling between electromagnetic resonant objects to transfer energy wirelessly between them. This differs from other methods like simple induction, microwaves, or air ionization. By utilizing transmitters and receivers that contain magnetic loop antennas critically tuned to the same frequency, Arc Road Systems is able to achieve one of a kind wireless transfer technology.

Benefits for the Customer

Arc Road Systems are not only the pioneers in developing wireless transfer technology but also the current market leader in the industry. By choosing Arc Road Systems, the customer receives cutting edge technology and unbeatable service at affordable prices. Arc Road Systems has prior experience in over 9 countries with installing and maintaining electromagnetic transfer technology. Compared to other companies, Arc Road System's design and utility patents allow for the most efficient wireless transfer technology specifically for implementation on roads.

Form of Business

Arc Road Systems will serve as a Limited Liability Corporation (LLC)

Technical Section

1. Problem Statement

There has been a delay in the development of wireless-power technology due to a simple lack of need, especially when referring to wireless phone chargers. However with the application of these technology to roads, it solves one of the major problems with electric cars, “Can I get where I need to go without worrying about running out of battery?” and the answer with Arc Roads is yes.

2. Arc Road System’s Technology

Arc Road System’s technology for recharging lanes is based on strong coupling between electromagnetic resonant objects to transfer energy wirelessly between them. The system consists of transmitters and receivers that contain magnetic loop antennas critically tuned to the same frequency, as opposed to other methods such as simple induction, microwaves, air ionization.



3. Electromagnetic Technology

Arc Roads operate within the electromagnetic near field, receiving devices must be very close to the transmitter. In fact they must be no farther than a quarter wave length away, which is equal to a few meters away. Our devices are coupled almost entirely with magnetic fields, while the electric fields are largely confined within capacitors inside the devices. We design them this way because it makes them much safer than resonant energy transfer using electric fields with higher electric fields, such as tesla coils which have such high electricity fields that they can generate lightning, since most materials couple weakly to magnetic fields (Karalis).

4. Wireless Power Transmission

Unlike the far field wireless power transmission systems based on traveling electromagnetic waves, Arc Roads employs near field resonant inductive coupling through magnetic fields similar to those found in transformers. The only difference is that the primary coil and secondary winding are physically separated, and tuned to resonate to increase their magnetic coupling (Karalis).

5. Coil Technology

These tuned magnetic fields generated by the primary coil can be arranged to interact vigorously with matched secondary windings in distant equipment but far more weakly with any surrounding objects or materials such as radio signals or biological tissue. This means that our electromagnetic fields can charge without interfering with radio, satellite, or any other functions of the car, but also will still be able to charge the car through the body of the car itself (Karalis).

6. Combining Resonances and Electromagnetic Technology

Arc Roads are based on using “strongly-coupled” resonances to achieve a high power-transmission efficiency, meaning that we make sure our materials work well together in order to achieve the highest level of energy transfer we can without direct contact through a cable or other medium. Using non resonant materials for example would be almost 1 million times less efficient in this particular system, which is horrible when you need your car to get from point A to point B without running out of charge (Karalis).

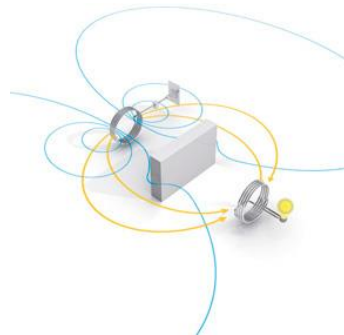


Figure: Source Resonator

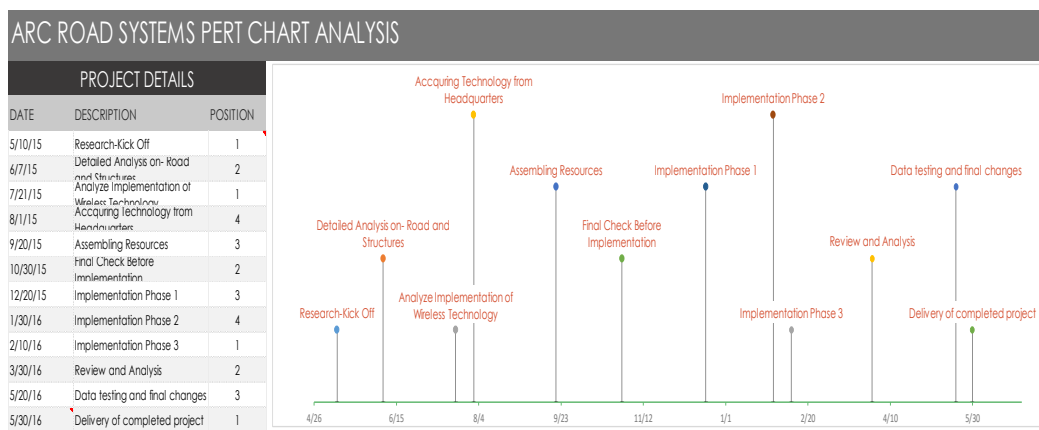
7. Safety of the Arc Road Technology

Research suggests that the exposure levels to these electromagnetic fields are below the threshold for FCC safety regulations, meaning that these waves are totally safe to be around. Our road’s radiated-power levels are also below the FCC’s radio interference regulations, which ensure that these roads will not interfere with the drivers on them or near them at all (Karalis).

Management Section

1. Description of Work Tasks

Arc Road Systems will take up the responsibility of acquiring, assembling, installing and maintaining the electromagnetic transfer technology. Arc Road System’s project management team has a proven record on accomplishing tasks with efficiency and in the given time frame. The project management team that consists of more than 500 employees, who will develop a unique plan that is specific to the needs of Baltimore Metro Area roads. Arc Road Systems will do a detailed analysis of the current conditions and possibilities for safe implementation of the technology. All of the activities that Arc Road Systems plans to do is specified in the PERT analysis chart below.



Deliverables

- Written report of Arc Road System’s requirements
- Written report for Technical Requirements
- Hardware and Software standards report
- Maintenance and Operations Plan
- Signed Contract from Arc Road Systems

Project Organization

Arc Road System’s responsibility is to continually improve all technological aspects of the world in which we operate creating a better future for the community. Our vision is put into action through innovate inventions that promote and establish environmental stewardship, and a continuing desire for progress

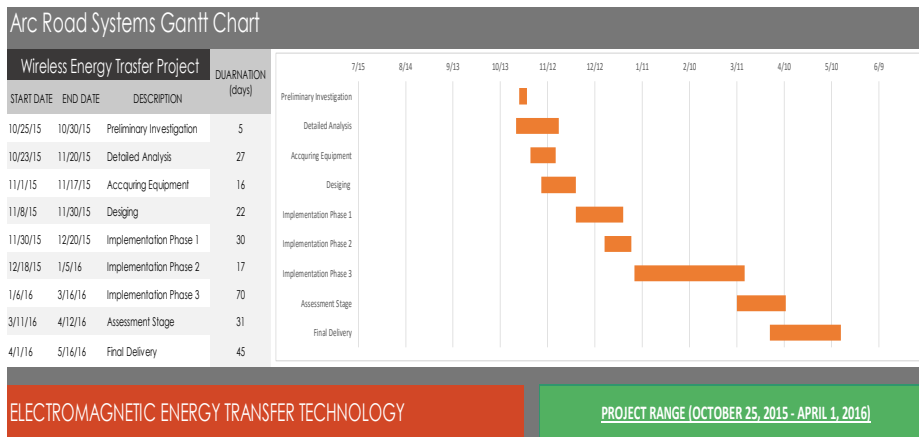
International Experiences

Another aspect that is unique to Arc Road Systems is that our company has developed and implemented electro-magnetic technology throughout the globe. We have worked in over 4 continents and over 9 countries since inception. Our Research and Development team has found

success in developing wireless transfer technology for specific weather and physical conditions. Few of the projects the team has planned and controlled included Netherland, United Kingdoms, Qatar, Canada, United States and Dubai.

Project Schedule

Arc Road System’s comprises of an immense workforce that is capable of handling complex projects like these. Our Project Management and Operations Management team works hand in hand to address several project aspects simultaneously. Arc Road System’s infrastructure is capable of handling multiple projects like these at the same time. Arc Road Systems will provide services starting with acquiring hardware and software technologies, assembling and installation. We also pledge to do quarterly maintenance for the wireless technology at our expenses. The company will work hand in hand with the road construction company to ensure safe integration and project success. Our plans for approaching the Baltimore Metro Area roads has been stated below on the Gantt chart.



Equipment and Facility

Arc Road Systems includes a variety of technical and managerial equipment. Our company holds over 20 million dollar worth of high tech equipment for electromagnetic energy transfer. Our company uses the best and cutting edge technology to ensure the safety and efficiency of the projects we implement. Arc Road System’s Headquarter is in California, but will soon establish a facility in Baltimore upon project approval. Our Facility will be capable of handling 2 to 3 wireless transfer projects simultaneously.

Cost Section

Cost Breakdown

Arc Road Systems have divided the costs into three major sections. The prior experiences in installing the wireless transfer technology has enabled Arc Road System to estimate the prices with precision. Arc Road Systems have a special Cost and Budgeting team that has developed a complete breakdown of all the costs that need to be met for the successful completion of this project. The Cost Analysis sheet is attached below for this proposal.

1. Material Costs

The largest amount of funds needs to be allocated for acquiring materials. Arc Road Systems will take the responsibility of gathering materials both domestically and internationally. The project development and Operations team will analyze the specific needs of Baltimore Metro Area road, in order to acquire materials with greater precision. The materials and Equipment cost for the wireless energy transfer technology will account for \$1,800,000.

2. Labor Costs

The labor costs can be broken down in to four main sections for Arc Road Systems. The research and development team will create electromagnetic technology that is specific for the conditions in Baltimore. The project management team will design and schedule all of the activities regarding phase 1 and 2. The operations management and field operations will be responsible for implementing and maintaining quality control. The overall labor expenses should equate to \$470,000.

3. General Expenses

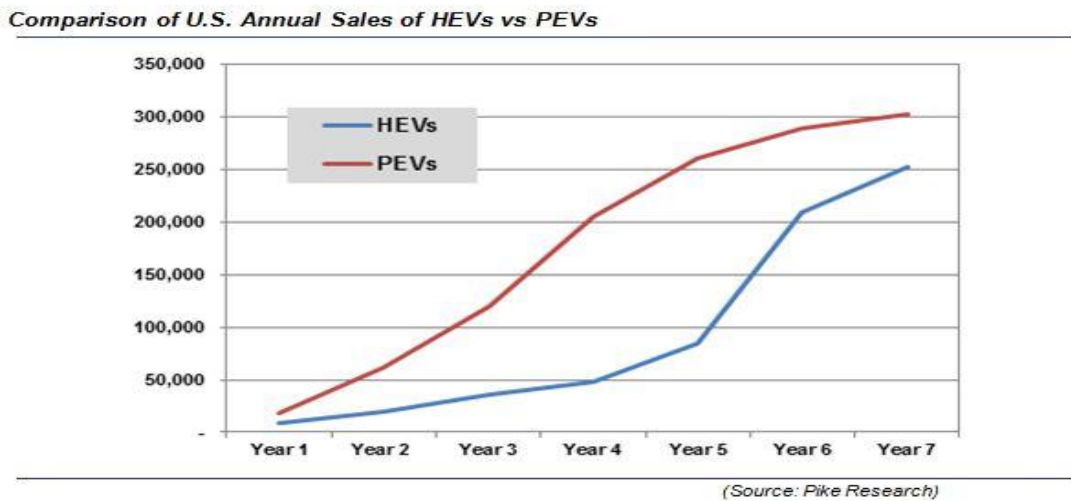
Arc Road Systems is also expecting other expenses, including but not limited to facilities, travel, documentation, and testing. All of these sections are specified in detail on the Cost Analysis. Our company is dedicated to being a transparent company that provides you every detail of the expenses we acquire. Arc Road Systems also pledges to undertake any additional expenses that are acquired but not listed in the budget breakdown. Arc Road Systems is proud to offer the highest quality wireless transfer technology available in the market at an affordable price.

ARC ROAD SYSTEMS COSTS			
Category	Estimated Quantity	Additional Charges	Estimated Subtotal
Labor			
Research and Development	500		\$100,000.00
Project Management Team	300		\$70,000.00
Operations Management	700		\$200,000.00
Field Operations	500		\$100,000.00
General Expenses			
Total Expenses			\$470,000.00
Materials			
Raw materials	5,000		\$100,000.00
Electronic Goods	5		\$50,000.00
Electromagnetic Devices	13		\$700,000.00
Other devices and implants	1		\$100,000.00
Material Expenses			\$950,000.00
Equipment			
Physical Equipment	500		\$600,000.00
Software Equipment	300		\$100,000.00
Transportation Equipment	200		\$150,000.00
Total Equipment Expenses			\$850,000.00
Facilities			
	50		
Building Expense			
New building at Baltimore			\$10,000.00
Rent and other Expenses			\$6,000.00
Other Expenses			\$10,000.00
Total Expenses			\$26,000.00
Travel Expenses			
Air transportation			\$25,000.00
Road Transportation			\$40,000.00
Import and export fees			\$30,000.00
Other services			\$10,000.00
Travel Expenses			\$105,000.00
Documentaion and Other Expenses			
Preliminary Analysis			\$5,000.00
Detailed Analysis			\$4,000.00
Implementation Expense			\$500.00
Implementation Phase 2			\$1,000.00
Implementation Phase 3			\$5,000.00
Office supplies			\$2,000.00
General Supplies			\$1,000.00
Labor and General technicians			\$5,000.00
Total			\$23,500.00
Additional Costs			
Escalation Costs			\$10,000.00
Time & Expense (T&E)			\$5,000.00
Company staff T&E			\$10,000.00
General			\$10,000.00
Total			\$35,000.00
Contingency			
Fee			\$100,000.00
Profit			\$200,000.00
Giveaway Subtotal			\$300,000.00
Profit and Fees Total			\$489,500.00
Sub Contracting And Consulting			
Sub Contracting			\$92,000.00
Consulting Expense			\$20,000.00
General			\$9,500.00
Total			\$121,500.00
Promotional Expenses			
Brochures (development and production)			\$1,000.00
Mailings			\$1,000.00
Postcards			\$1,000.00
Television			\$10,000.00
Radio			\$2,000.00
Newspapers			\$3,000.00
Billboards			\$10,000.00
Bus sides			\$1,000.00
Total			\$29,000.00
Data Testing and Initial Maintenance			
Initial Data Testing			\$20,000.00
Final Data Testing			\$40,000.00
Initial Maintenance Fee			\$15,000.00
General			\$15,000.00
Public Relations Costs Total			\$90,000.00
ESTIMATED PROJECT GRAND TOTAL			\$3,000,000.00

Market opportunity

1. Introduction

Over the last few years, electric vehicles such as plug-in type vehicles and hybrids are becoming more and more prevalent on today’s roads. These vehicles are great at reducing the carbon footprint left by the vehicle as well as saving the driver money on fuel. While these vehicles are better for the environment and are generally cheaper to run than a standard gasoline vehicle, the range that an electric vehicle can reach is much lower than that of their gasoline powered counterparts. To remedy this, we at *Arc Roads Systems* are working diligently to produce roads of the future that are capable of providing energy to electric vehicles on the move. Please refer to the technical section for more information on the road design itself, but our design will be capable of charging the battery of almost any electric vehicle that passes over it on the go.



This figure shows the average sales of EVs and HEVs per year.

2. Who will Use it

As for who will use this technology, there are many people in the state of Maryland already who have adopted electric or hybrid vehicles as their main source of transportation. In the U.S. alone, there are already over 3 million people who own and drive either an electric or hybrid vehicle. In the state of Maryland alone there are approximately 75,000 green vehicles on the road today. Every year these numbers continue to surge in the U.S. by approximately 150,000 new green vehicles or more on the roads. With the number of green vehicles on the road

only increasing, *Arc Roads* has the opportunity to cater to the needs of thousands of drivers every day by helping them get to where they need to go.

3. How Will It Help

The range of electric vehicles is currently vastly inferior to that of most standard gasoline powered vehicles. The average plug in electric vehicle can travel anywhere from 80 to 150 miles on a single charge. With *Arc Roads*, drivers can be at ease knowing that their car's battery will charge while they are on the go so they won't have to worry about finding a charging station. The taxpayers who will pay for this project will certainly have the chance to get their money's worth by using our *Arc Roads*. The money that electric vehicle and hybrid car owners will save by driving these roads will even be enough to tempt more people to purchase these types of vehicles. *Arc Roads* is a project that is sure to promote the use of more green technology and help the city of Baltimore as well as the state of Maryland reach their goal of reducing greenhouse gas emissions in the coming years.

Competition

We at *Arc Road Systems* know that we are not the only name in the business of building electric roads. For that reason we have compiled a list of our competitors.

1. Witricity

This company, much like our own, is in the business of designing and building roads that will charge electric vehicle batteries while on the go. *WiTricity's* design involves the use of panels imbedded in the ground to generate an electric field that is capable of charging the battery of electric vehicles on the move so long as they have the proper capture module installed.

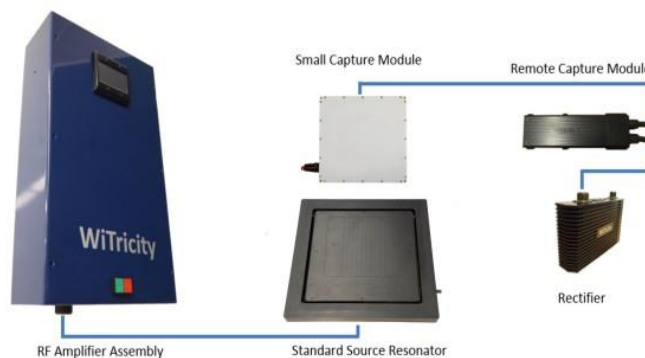


Figure: A simple plan of WiTricity's electric panels

Strengths:

- Can charge vehicles while on the move
- Can charge multiple vehicles at once
- Can be used with existing roads

Weaknesses:

- Current iterations of this tech aren't as effective at charging vehicles on the move as they would like to be
- Vehicles must have a special capture module attached to its battery to charge

2. Wave

A U.S. company based out of Utah that works on creating electric roads as well as public transportation for said roads. *Wave's* technology also uses panels that are imbedded into the ground to provide charge to electric vehicles via magnetic fields.



Figure: A bus powered by Wave technology

Strengths:

- Imbedded into the ground so there is no need for a plug for the vehicle being charged
- Can charge vehicles on the move
- Can charge more than one vehicle at a time

Weaknesses:

- Current iterations of this tech are tuned for use by vehicles custom designed by Wave
- Currently only used by Busses and Trams

3. Solar Roadways

A recent startup company that is working on constructing new roads from scratch by using special panels designed by their company. These panels have solar cells built in so that they are capable of generating their own power rather than be connected to the power grid.

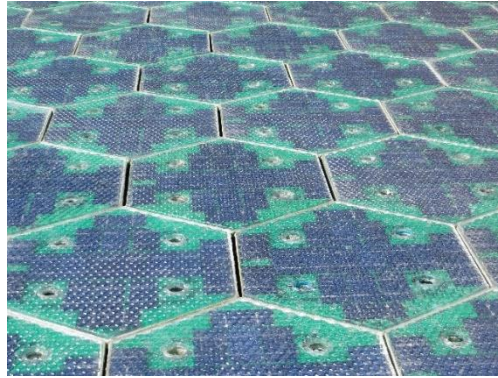


Figure: Solar cells by Solar Roadways

Strengths:

- Solar powered rather than connected to the power grid
- Panels are incredibly durable
- Panels are easily interchangeable

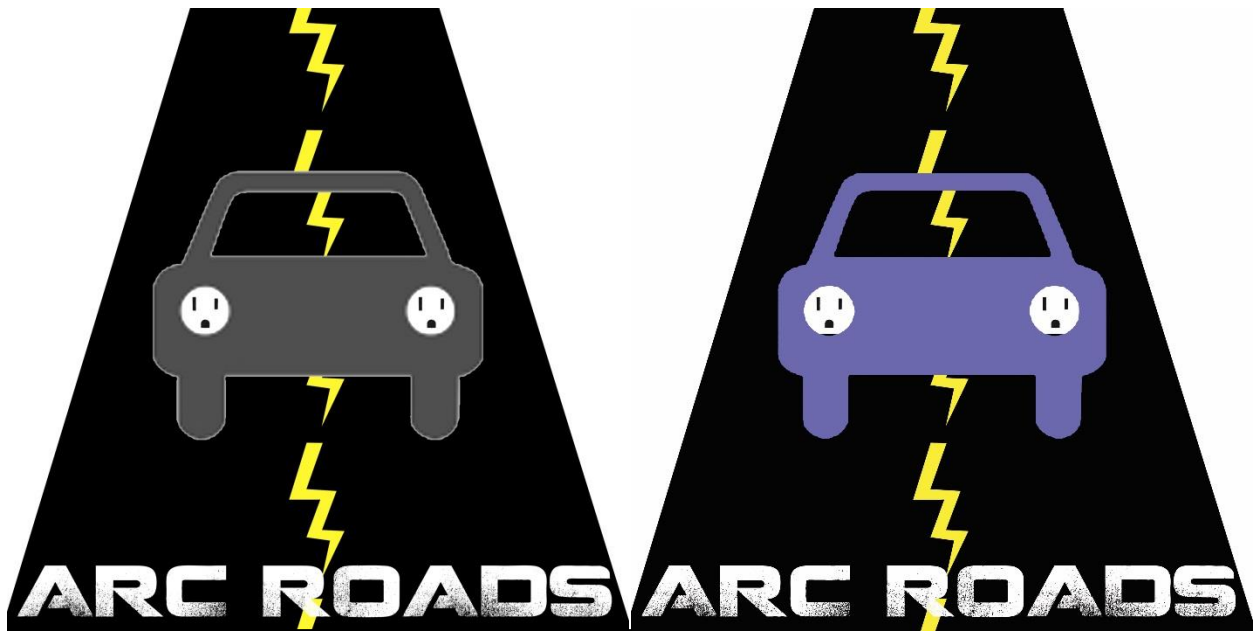
Weaknesses:

- Panels require more skilled technicians to lay them down properly
- Panel must be scrapped once solar cell is depleted
- No totally compatible with current roads

Conclusion

These are just a few of the other companies that *Arc Roads* competes against in this field. While each of their companies and their products have their merits, we at *Arc Road Systems* are confident that our product can outperform out competition.

Logo Feedback



Old Logo:

New Logo:

Changes Made:

Many of the individuals I surveyed suggested making the car stand out more from the background, so I changed the car's color to blue and switched the color mode of the image to CMYK in order to get a more accurate representation of what the logo will look like when printed.

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