Wireless Power Specifications Document

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Revision History

Revision	Description	Author	Date	Approval
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SCOPE

General: This document describes the design and verification requirements for a wireless power system. This system will supply power within a given radius using a Tesla Coil. This will also specify a receiver that is to be installed on sites which use this power. This receiver will be able to convert this wireless power into 120/240V AC power to be used in homes.

1 APPLICABLE DOCUMENTS

2 STAKEHOLDER REQUIREMENTS

The stakeholders for the Tesla Coil Power System are:

1. Anyone living near the implemented system.
2. The company designing the system.
3. The customer who purchases the system.
4. Any personnel who build and maintain the system.

3.1 Stakeholders User Stories

The primary stakeholders needs are described below.

- **People living in the community around the system will be the daily consumer.**
  1. The system must have no adverse health effect or safety concerns to the community.

     User Story
     As a community member, I am concerned about the safety of this system. I do not want the electromagnetic field to affect the health of a family and the electronic devices in the vicinity. I do not want to be randomly shocked or have my electronics fried.

  2. System does not interfere with commercial and residential signal traffic.

     User Story
     As a community member, I do not want the system to interfere with any signals such as Wi-Fi, radio, and cellular signals.

- **The company that makes the system:**
  1. System must comply with all legal standards.

     User Story
     As the designers of this system, law suits are a thing that should be avoided whenever possible. The design of the system needs to apply to all the rules and regulations that apply to each part.

2. Utilize existing technology whenever possible

   User Story
   Due to cost and time restraints, existing technology must be researched and implemented when possible to preserve resources. Don't reinvent the wheel.

- **The customer is the one who will be purchasing and installing the system.**

1. Must be easy to setup.

   User Story
   When our company installs the system, there must be clear instruction on how to set up the system. Whenever possible, use diagrams and images to explain complex mechanisms. The people who will be on site to install the system may not have an engineering background so the process should be made easier to understand.

2. Must be reliable.

   User Story
   The system must be able to operate on its own for 35 years without any need for major part replacement and maintenance. Only common inspections and minor maintenance should be required.

   The system must continue to operate unless there is a blackout. This includes hot summer days over 110 F and winter nights below -20 F. The system must also operate in all weather conditions such as rain, snow, and at any humidity. A backup generator must be installed in case of a blackout for emergency shutdown. The system must also be able to survive an earthquake.

3. The system must be within the following size, cost restrictions, and operating field.

   User Story
   Space is limited so the system must fit on a 2,000 sq. ft property with a height restriction of 100 ft. All of the part must be transportable by semi-trucks. The total system weight is not crucial, but the system weight should be close to 40 tons or below.

The total system cost needs to be below $100 million with a monthly maintenance and operational cost below $60k.

The system will be obtaining its power from another source such as dams and this system will convert this power into wireless energy. The effective radius of power distribution must be 20 miles.

- **Any personnel who build and maintain the system.**

1. Mustbe a computer on site to interface with the system.

   User Story
   There must be a computer module on the site that allows technicians to monitor the current status of the system. The interface must use a keyboard, mouse, and monitor for the user to interact with. The interface must be easy to navigate and understand using easy to read formatting and menus. Alerts must be implemented into the system to alert the technician of any system changes.

   A manual must be created and easily available for technical training purposes and on site reference. Technicians must undergo technical training before being authorized to work on the system.

4 ENGINEERING REQUIREMENTS

4.1 Interface Requirements

4.1.1 Receivers must be able to interface with existing infrastructure in homes with only minor modification

4.1.2 The system must have a terminal on site to allow maintenance personnel to view the status of the system

4.2 Functional Requirements

4.2.1 Receivers must be able to obtain electricity from the source anywhere within a ten-mile radius.

4.2.2 A working receiver must be able to convert the wireless electricity to 120 V / 240 V AC usable in homes

4.2.3 System must operate indefinitely unless an outage occurs.

4.2.4 The system shall continue to run while common maintenance tasks are performed.

4.2.5 The system shall run without fluctuations in the range more than +- 1% of the max radius

4.2.6 The system must provide stable power under load of 500 receivers

4.3 Support Requirements

4.3.1 The system must be maintained by authorized technicians.

4.3.2 The system must not cause harm to personnel if they follow the proper safety precautions

4.3.3 No large magnets or uncertified electrical equipment within 100 yards of the coils while operating.

4.3.4 The system must fit on a 2,000 sq. ft. property.

4.3.5 System height when fully assembled must be below 100 feet.

4.3.6 Parts must be able to be transportable on an 18 wheel semi.

4.3.7 The system must weigh below 40 tons

4.3.8 System must run without need of complete major part replacement for 35+ years.

5 VERIFICATION OF REQUIREMENTS

5.1 Interface Verification

5.1.1 Install receiver at user site and record what modifications had to be made.

5.1.2 Verify terminal is on site and shows the status of the system

5.2 Functional Verification

5.2.1 Move a receiver within the 10 mile radius to 100 locations and verify the receiver still receives power.

5.2.2 Measure receiver voltage to ensure the voltage is 120/240 V AC at 60 Hz

5.2.3 Perform high load stress tests on the system to verify it continues to operate

5.2.4 While the system is running, perform standard maintenance procedures and verify

power output is within tolerance.
5.2.5 Test 100 locations around the 1% tolerance ring at the edge of the 10 mile radius
5.2.6 Set up and test 500 receivers and verify the output voltage is within tolerance

5.3 Support Verification

5.3.1 Technicians require to have technical training specific to the system
5.3.2 Create rules that allow technicians to operate the system safely
5.3.3 Post warning signs at edge of property and entry points detailing risk of unauthorized objects if within the property.
5.3.4 Measure the square footage of the property needed to set up the system. Verify that this measurement is within 2,000 sq. ft.
5.3.5 Measure the system height when fully assembled and verify that is below 100 ft.
5.3.6 Verify all system parts are able to be loaded onto 18 wheel semis
5.3.7 Weigh individual parts and verify the total is less than 40 tons
5.3.8 Perform part stress test to simulate the wear of 35 years and verify the functionality of the component up to that point

5.4 Verify Coverage of Stakeholder Requirements

Paragraph Number	Test Type	Tester's Name	Pass/Fail	Date