

## WIRELESS CHARGING OF ELECTRIC VEHICLES

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With the growing popularity of electric vehicles, the development of a convenient charging infrastructure has become a key challenge. Magnetic induction-based wireless charging offers a solution that eliminates the need for cables. The thesis discusses the principle of operation, advantages and prospects of the technology. Wireless eliminates the key inconvenience of electric vehicles – the need to manually connect cables, the technology is especially promising for public transport and commercial fleets, where minimizing downtime is important.

Wireless charging technology for electric vehicles is based on the principle of magnetic induction, which is actively used in household appliances, such as wireless chargers for smartphones, but scaled up to the level of vehicles. The system consists of two key components: a transmitting coil, which is embedded in the pavement or parking lot, and a receiving coil, which is mounted on the underside of the electric vehicle. When the vehicle assumes the correct position over the charging pad, the system is activated, creating an alternating magnetic field that generates an electric current in the vehicle's receiving coil. This current is then converted and directed to the vehicle's battery. The system requires careful preparation of the infrastructure for effective operation. Charging sites must be equipped with transmission coils, which can be installed either on the surface or under the asphalt pavement. In the case of stationary charging stations, such as in garages, the coils can be mounted on special panels that can support the weight of the vehicle. A more sophisticated option is a dynamic charging, in which the transfer coils are embedded directly into the road surface, allowing electric vehicles to recharge their batteries while on the move. The development of such "smart" roads requires large-scale changes in the city infrastructure. First of all, it is necessary to modernize the road surface to protect electronic components from moisture, temperature fluctuations and mechanical

stress. In addition, a power supply system capable of providing a constant supply of electricity to the charging cells is required. This involves laying additional cable routes and installing converter substations. An important aspect is also the development of intelligent control systems, that will regulate the power supply depending on the presence of vehicles above the charging cells and their current charge level. A number of technical and organizational issues need to be resolved for mass introduction of the technology. First, vehicles must be equipped with a special receiving system that includes three main components: an inductance coil, a rectifier and a charging control system. Secondly, it is important to develop efficient methods of maintenance and repair of charging cells embedded in the road surface. But the prospects for the technology look promising, especially for public transportation. Electric buses equipped with wireless charging systems can recharge their batteries at stops, which significantly increases their autonomy. In the long term, this could lead to a complete abandonment of traditional charging stations in favor of solutions integrated into the urban infrastructure. For private electric vehicles, wireless charging is still an optional feature, but for public transportation, it is already helping to reduce operating costs. As for the advantages for the average user, first of all is convenience. Traditional charging means opening the charging port, pulling out the cable, connecting it to the car and the charging station. All these manipulations are time-consuming and require some physical effort. With wireless charging, all these inconveniences disappear. You need to park the car in a familiar place, and the system automatically starts the charging process, without any additional actions. It seems like a small thing, but when this situation is repeated day after day, the savings in time and nerves become really tangible. Thus, wireless charging of electric vehicles is a complex but promising technology that requires deep modernization of transport infrastructure. Its successful implementation can fundamentally change the approach to the operation of electric vehicles, making the charging process more convenient and unnoticeable for users. For an ordinary driver, it means freedom from routine manipulations with cables, psychological comfort and significant time savings. Urban infrastructure can gradually adapt to this technology, turning roads and parking lots into invisible energy sources. However, there are many technical, economic and organizational challenges to be solved in order to move from pilot projects to mass use.