MPT AND ITS GROUND APPLICATIONS : RURAL TELECOMMUNICATIONS

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Abstract

Power and Telecommunications are the key drivers that can bridge the digital divide and alleviate poverty in rural areas. The development of telecommunications in the rural areas has been hampered by their sparse population and meager resources. Microwave Power Transmission can be exploited in these rural areas. As the last mile challenges has been confronted with the use of wireless telecommunications, last mile power challenges can also be solved extensively with MPT. Telecommunication devices are getting smaller and are more energy efficient which means they can also be powered from the same source that provides the wireless information link.

Microwave Power Transmission technology is a well researched technology field that has huge potentials in solving some of the major problems facing the world today in terms of energy needs. Though with lots of skepticisms from pressure groups, it is still a lot safer when compared to the damage fossil fuels have caused and how they continue to devastate our environment. Apart from the fears, the cost of deploying solar power stations in space is also a hurdle that must be scaled to make it feasible. But the application of microwave power transmission on the ground is what can be carried out with less hassle. The difficulties of getting required telecommunications infrastructure into the rural areas stem from the inadequate power supply or the total lack of it. Without power supply, it is almost impossible to get anything done in today's electronic world. Telecommunication has been perceived as an economic driver that can spur trade and industry. It is well documented how Information and Telecommunication Technology (ICT) revolutionized the lives of people in China and India. Two of the world's most populous countries. The lack of incentives has also not encouraged telecommunication companies to invest in the rural areas. The combination of two developed fields of wireless applications can be harnessed to develop a system that can be beneficial to the areas that are lacking in both power and telecommunications. Using the same MPT wireless link to power wireless telecommunication devices some distances away is a feasible application of MPT that must be considered.

Since world war II, the field of MPT has seen great developments in both devices and techniques that are adapted to realize higher efficiencies in end to end MPT systems. Efforts were increased in the 1950s and 1960s when high power microwave tubes capable of generating hundreds of kilowatts at microwave levels were developed. It is known that electromagnetic energy is associated with the propagation of electromagnetic waves and theoretically we can use all electromagnetic waves for wireless telecommunication and microwave power transmission. The difference between MPT and communication is that of efficiency of the the power being delivered to the receiver. Though energy is transmitted in communication systems, the energy involved is only adequate for the transmission of information. The end to end efficiency is too low to be considered an MPT system.

There are two main frequencies that have gained traction in the wireless information world; the 2.45GHz and 5.8GHz frequencies which both belong to the ISM (Industrial, Scientific, and Medical band). As there has been great development for devices in the 2.45GHz frequency over the past four (4) decades, the cost of equipment in this frequency range has gone down dramatically that it is more attractive to build an MPT using this frequency. With these advancements, it is possible to use MPT systems to extend coverage of the available utility grid to areas that are sparsely populated or very remote that extension of transmission line would be a very huge investment. The magnetron is a standard and ubiquitous device that have enjoyed lots of refinement and can be obtained cheaply. Though using the 5.8GHz frequency will enhance the system, it is still very expensive to implement MPT at the scale we are looking at. The wireless communication link will be deployed on the 5.8GHz frequency. This is so because wireless telecommunications equipment at this frequency are readily available and also to mitigate interference between wireless links. This is to reduce the overall cost of implementation.