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Retail Beamed Power for a Micro Renewable Energy Architecture: Survey

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Retail delivery of electric power through millimeter waves is relevant in developing areas where the market for communication devices outpaces the power grid infrastructure. It is also a critical component of an evolutionary path towards terrestrial and space-based renewable power generation. Narrow-band power can be delivered as focused beams to receivers near end-users, from central power plants, rural distribution points, UAVs, tethered aerostats, stratospheric airship platforms, or space satellites. This article surveys the available knowledge base on millimeter wave beamed power delivery. It then considers design requirements for a retail beamed power architecture, in the context of rural India where power delivery is lagging behind the demand growth for connectivity. A survey of technology developments relevant to millimeter wave beaming is conducted, and indicates that massive, mass-produced solid-state arrays capable of achieving good efficiency and cost effectiveness are possible in the near term to enable such retail power beaming architectures.

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1. INTRODUCTION

Despite present fears of low end-to-end efficiency, millimeter wave technology offers attractive architectures for rural beamed power delivery. In this article we present reasons why retail Beamed Power Transmission Systems (BPTS) at such frequencies may be viable in the not too distant future. There are no market-ready devices presented here, just an architecture to which such technology will fit. The article is intended to trigger thought among the electronics and telecommunications community on the possibilities of synergy between the infrastructure for connectivity devices using embedded systems, and the infrastructure needed to enable very large numbers of their potential customers to access power for those devices. Micro renewable energy devices, as we define them here, denote devices that generate power from renewable resources,

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