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For more than a century it has been known that signals and power can be transferred electromagnetically. This knowledge has motivated substantial research and development into wireless signal transmission which today is widely used. Power transfer across air gaps, however, has tended to be restricted to electric machines that have tight magnetic couplings. It is only very recently that a novel technology termed IPT (Inductive Power Transfer) has made wireless/contactless power delivery to movable objects a practical reality. This research work presents the basic concept of contactless/wireless power transfer and typical IPT systems that employ modern power conversion, control, and magnetic coupling techniques to achieve clean and reliable power transfer without direct electrical contacts. Both current-fed parallel and voltage-fed series resonant converters are fully investigated using mathematical analysis, computer simulations, and practical experiments to evaluate their properties and usability in practical systems. Two new resonant converters are proposed which show excellent dynamic soft switching performance suitable for wireless/contactless power transfer applications.