Hydrogen Production: Fundamentals and Case Study Summaries

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Abstract

It is important that parties interested in hydrogen technologies standardize methods of evaluating the performance and efficiency of these technologies. A detailed description of the chemical and electrical processes for electrolysis and fuel cells is presented. Hydrogen and hydrocarbon fuels also pose a source of confusion about whether the efficiencies are based on the higher or lower heating value. A discussion of fundamental principles for fuel cell and electrolyzer systems is presented along with recommendations. Renewable hydrogen production is being researched across the globe to enable the environmental benefits of this energy carrier to be realized. The focus of many of these projects is coupling wind energy with hydrogen production (via water electrolysis) in an effort to use all available wind energy and to store that energy to be used during times of high electricity demand. Summaries of projects from Canada, Greece, Spain, United Kingdom and the United States are provided.