Renewable Energy

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1. Most Downloaded

Renewable Power-to-Gas: A technological and economic review

Abstract
The Power-to-Gas (PtG) process chain could play a significant role in the future energy system. Renewable electric energy can be transformed into storable methane via electrolysis and subsequent methanation.

This article compares the available electrolysis and methanation technologies with respect to the stringent requirements of the PtG chain such as low CAPEX, high efficiency, and high flexibility.

Three water electrolysis technologies are considered: alkaline electrolysis, PEM electrolysis, and solid oxide electrolysis. Alkaline electrolysis is currently the cheapest technology; however, in the future PEM electrolysis could be better suited for the PtG process chain. Solid oxide electrolysis could also be an option in future, especially if heat sources are available.

Several different reactor concepts can be used for the methanation reaction. For catalytic methanation, typically fixed-bed reactors are used; however, novel reactor concepts such as three-phase methanation and micro reactors are currently under development. Another approach is the biochemical conversion. The bioprocess takes place in aqueous solutions and close to ambient temperatures.

Finally, the whole process chain is discussed. Critical aspects of the PtG process are the availability of CO_2 sources, the dynamic behaviour of the individual process steps, and especially the economics as well as the efficiency.

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2. Recent Articles

Energy extraction and hydrodynamic behavior analysis by an oscillating hydrofoil device

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Abstract

In this paper, a modified model is proposed for an oscillating foil energy harvesting device, and the corresponding mathematical model is established too. A grid model for foil NACA0015 is built by using dynamic and moving mesh technology of the Computational Fluid Dynamics (CFD) software FLUENT. To understand the hydrodynamic performance and energy extraction capability of the modified model, the effects of motion parameters (heaving component parameters and pitching component parameters) are investigated. The evolutions of angle of attack and vortex field are examined. The results show that motion radius and heaving amplitude play important roles in impacting the time-averaged power coefficient. As the frequency increases, the peak value of the effective angle of attack is decline. The effect of pitching amplitude is gradually increased on the time-averaged power coefficient. Under the large frequency, the energy extraction efficiency is more sensitive to the motion radius and heaving amplitude. Moreover, there exists an optimal oscillation frequency to achieve a maximum time-averaged power coefficient for each pitching amplitude.

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Bioethanol production from agricultural wastes: An overview(Review)

Abstract

Due to rapid growth in population and industrialization, worldwide ethanol demand is increasing continuously. Conventional crops such as corn and sugarcane are unable to meet the global demand of bioethanol production due to their primary value of food and feed. Therefore, lignocellulosic substances such as agricultural wastes are attractive feedstocks for bioethanol production. Agricultural wastes are cost effective, renewable and abundant. Bioethanol from agricultural waste could be a promising technology though the process has several challenges and limitations such as biomass transport and handling, and efficient

pretreatment methods for total delignification of lignocellulosics. Proper pretreatment methods can increase concentrations of fermentable sugars after enzymatic saccharification, thereby improving the efficiency of the whole process. Conversion of glucose as well as xylose to ethanol needs some new fermentation technologies, to make the whole process cost effective. In this review, available technologies for bioethanol production from agricultural wastes are discussed.

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4. Open Access Article

مقاله های زیر بصورت کامل قابل دریافت و درصورت تمایل قابل ترجمه می باشد

Establishing a fully coupled CFD analysis tool for floating offshore wind turbines

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Abstract

An accurate study of a floating offshore wind turbine (FOWT) system requires interdisciplinary knowledge about wind turbine aerodynamics, floating platform hydrodynamics and mooring line dynamics, as well as interaction between these discipline areas. Computational Fluid Dynamics (CFD) provides a new means of analysing a fully coupled fluid-structure interaction (FSI) system in a detailed manner. In this paper, a numerical tool based on the open source CFD toolbox OpenFOAM for application to FOWTs will be described. Various benchmark cases are first modelled to demonstrate the capability of the tool. The OC4 DeepCWind semi-submersible FOWT model is then investigated under different operating conditions.

With this tool, the effects of the dynamic motions of the floating platform on the wind turbine aerodynamic performance and the impact of the wind turbine aerodynamics on the behaviour of the floating platform and on the mooring system responses are examined. The present results provide quantitative information of three-dimensional FSI that may complement related experimental studies. In addition, CFD modelling enables the detailed quantitative analysis of the wind turbine flow field, the pressure distribution along blades and their effects on the wind turbine aerodynamics and the hydrodynamics of the floating structure, which is difficult to carry out experimentally.

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