TECHNOLOGY TRANSFER OF INNOVATIVE DISTRIBUTED ENERGY SYSTEMS FROM DEVELOPED TO DEVELOPING COUNTRIES: AN ENERGY SYSTEM MODEL FOR CLIMATE CHANGE MITIGATION

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Overview

Global awareness on environmental issues and urgent necessity of green house gas (GHG) emissions reductions has set high expectations on technology. Amongst the several options for achieving reductions, energy efficiency is considered to be not only cost-effective, but also able to achieve considerable reductions and to be presently available for deployment. Among the many ways to achieve energy efficiency on the supply side, distributed energy technologies such as combined heat and power (CHP) are capable of achieving high efficiencies compared to other conventional technologies. The need of developing countries to reduce energy intensity growth without compromising their development, and the responsibility of developed nations in leading climate change abatement, makes transnational technology transfer of energy efficient technologies an ideal solution. However, technology transfer can be interpreted in many ways; therefore, it is the purpose of this study to properly identify technology transfer mechanisms and analyse its effects through the use of an energy system model.

This study considers an energy system model for a developing country with which analyzing new technology diffusion and its effects on energy systems can allow for making better decisions in policymaking. This model will be used to quantify the penetration of distributed energy technologies focusing on CHP, while taking into account the effects of the actors involved in technology transfer. The specific objective is to use this model as an evaluation tool in assessing the benefits of technology transfer to climate change mitigation, by estimated emission reductions and the increase in overall energy efficiency.

Methods

Through the use of the multi-period market equilibrium model META·Net (The Market Equilibrium and Technology Assessment Network Modelling System) –applied to the industrial and commercial sectors in Colombia–, modules representing technology transfer are used for analyzing the diffusion of previously unavailable CHP distributed energy technologies under different market regulation and policy parameters. Within this model, technology transfer is analyzed as a part of the development stages of technology innovation process on a transnational scale where different actors are present; investments through Foreign Direct Investment, Multilateral Development Banks, Official Development Aid, and Clean Development Mechanisms, as well as policy interventions by the developing country government.

Results

Numerical results of model forecasts will be presented at the New Orleans conference, specifically, on the market penetration of CHP technologies and the respective prices of emission reductions, as well as overall energy efficiency. An adequate policy framework for technology transfer is based on these results.

Conclusions

Technology transfer, focused on innovative energy technologies, is proposed in this research for use as a reference in energy policy making. With the proper institutions as well as policies, technology transfer is a win-win agreement; it allows for developing countries to leapfrog energy technologies, reducing energy intensity without compromising development, and developing countries can meet emission reduction targets and expand business markets. However, developed countries need to set strict emission reduction targets in order to achieve significant technology spillovers, and developing countries need adequate technology transfer institutions and programs, as well as proper regulation to successfully allow diffusion and assimilation of innovative technologies.

References

Foxon, T. J. (2003). Inducing innovation for a low-carbon future: drivers, barriers and policies, London, The Carbon Trust.

International Energy Agency. (2008). Combined heat and power: Evaluating the benefits of greater global investment. Paris, France, IEA.

IPCC, B. Metz (2000). Methodological and technological issues in technology transfer: special report of IPCC Working Group III. Cambridge, Cambridge University Press for the Intergovernmental Panel on Climate Change.

Munasinghe, M. and P. Meier (1993). Energy policy analysis and modeling. Cambridge [England] ; New York, NY, USA, Cambridge University Press.

Steger, U. (2005). Sustainable development and innovation in the energy sector. Berlin, Springer.

Stern, N. H. and Great Britain. Treasury. (2007). The economics of climate change : the Stern review. Cambridge, UK; New York, Cambridge University Press.

Chen, E. K. Y., J. H. Dunning, et al. (1994). Transnational Corporations and technology transfer to developing countries. London ; New York, Routledge.