

**Research program:**  
***“Evaluation of investments in switching devices for electric transmission networks:  
analysis of the impact on operating costs and production from renewable sources.”***

**Annex C**

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**Description**

In the European energy sector investments in power generation from renewable sources, especially wind and solar, are greatly increasing. Such plants are not programmable and their production depends on the weather conditions. Production and demand have to be balanced in every moment, since electricity cannot be stored. This balance is more difficult the greater the penetration of renewable energy generation, therefore it is necessary to design flexible transmission networks, able to adapt to operating conditions and dynamically change their configurations. This can be achieved by installing switching devices on some lines, which allow determining suitable network configurations by temporarily disabling one or more lines. This greater flexibility of the transmission system allows facing uncertainty in power production from renewable sources. By isolating appropriate sections of the network (optimal islanding) the propagation of disturbances in the network can be prevented; moreover operating costs can be reduced and the optimal use of the existing lines can be achieved. Flexibility and adaptability of the network to non programmable production depend crucially on the number and placement of the switching devices in the network: it is necessary to identify optimal locations, namely those that lead to the maximum increase in the value of the transmission network, considered as being an asset. To this end it is necessary to identify the optimal investment decisions