MEASURING CAPITAL: THE CAPITAL STOCK OF THE EUROPEAN TRANSMISSION SYSTEM

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Overview

Fixed assets of Transmission System Operators (TSOs) are characterized by high capital intensities and long lifetimes. Such assets are often used for a longer period of time, beyond their economically useful life i.e., the technical lifetimes are higher than the assumed economically useful life used in accounting. At the end of the economically useful life, the fixed assets are written off when fully depreciated and only a memo value remains to keep the asset on the books of the companies. The fact is, however, that these assets continue to be valuable for a functioning electricity system. An alternative accounting method considering the often higher technical lifetime against the valuation in the balance sheets of the companies is thus of interest.

For this reason, the present research aims to determine the gross and net capital stock of European TSOs by using the economically useful life and the technical lifetime and thereby represent the invested capital in the European transmission system with greater clarity. The gross capital stock is calculated by cumulating annual gross fixed capital formation (investments in fixed assets), reduced by retirements. The net capital stock is calculated by subtracting depreciations, which correspond to the consumption of capital.

Capital is seen as a storage of value and it must be measured due to its central role in an economy. Measuring capital, i.e. determining the capital stock, provides a comprehensive picture of the economic wealth of individual sectors or of whole economies. The net capital stock measures the market value of capital and it is therefore a measure of wealth. The net capital stock is also called the “wealth stock”. The wealth aspect of capital brings in the topic of balance sheets. This makes a comparison of the wealth stock and the value of the fixed assets shown in the balance sheets even more interesting. In the scope of this paper, while the first one uses replacement values and technical lifetimes to calculate depreciation, the latter is based on historical acquisition values and depreciations are calculated with the economically useful life.

Methods

The acquisition of data for the historical network development of the European transmission network was one of the central challenges to calculate the capital stock. For some countries such as the Czech Republic or Croatia, appropriate data was available. For other countries including France or Romania only a few reference points for the network development could be obtained. An overview of the investigated European countries with their interconnected transmission networks is shown in Fig. 1. In order to visualize the historical network development for those countries and calculate the capital stock, a simulation of the development based on the reference points and the electricity demand of the country was necessary.

Results

The analysis of the long service life fixed assets of the European TSOs aims at presenting the current capital stock as also the development over time. The analysis includes fixed assets in the form of overhead lines, cables, submarine cables and substations (onshore). These asset groups form the capital stock. By using the researched and modelled data for the network development, the capital stock based on replacement values for the year 2015 is calculated and presented for three scenarios: (1) the gross capital stock without consideration of depreciation but including asset retirements, (2) the net capital stock with the technical lifetime (100 years for overhead lines, 40 years for cables, 40 years for substations) and (3) the net capital stock with the economically useful life (50 years for overhead lines, 40 years for cables and 35 years for substations).

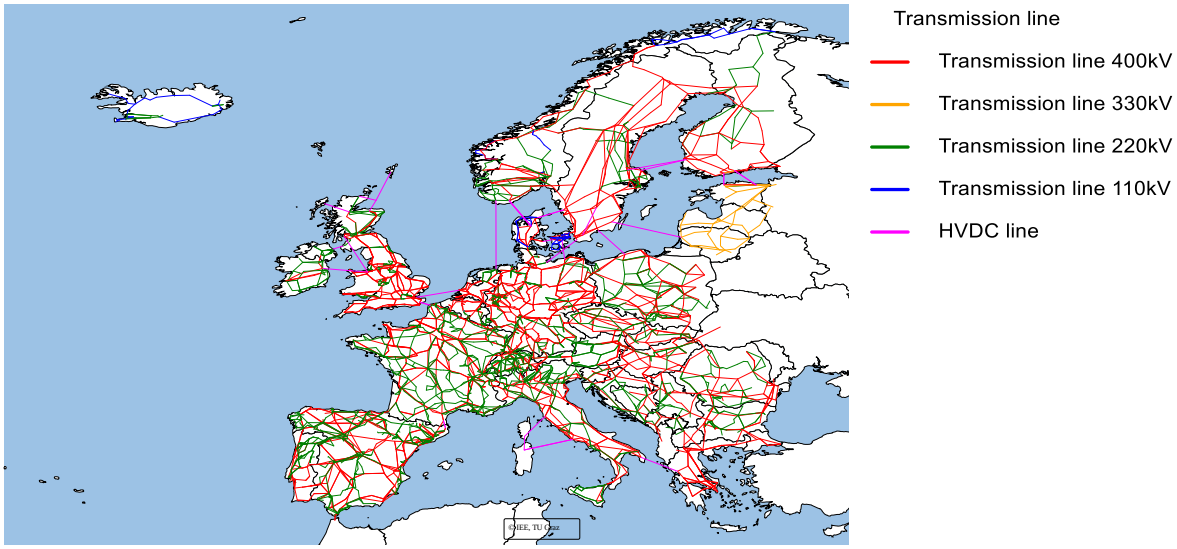

Fig. 1: Investigated countries with their interconnected transmission network.

Conclusions

Capital measurement plays a central role in determining the wealth of single sectors or of economies. For the electricity sector in particular such a measurement of capital is essential since the fixed assets are characterized by long lifetimes and enormous investments. Most of the life cycle costs in electricity production and transmission are investment costs and capital expenditures are between 9 and 75 times higher than operating expenditures. It is thus of particular interest to determine the capital stock of European TSOs. A valuation based on the fixed assets shown in the balance sheets of the companies – as often done due to a lack of data – does not show the actual value of long-lasting assets due to nominal price increases over time, i.e. there is a great difference between the historical acquisition value and the replacement value. The capital stock concept based on replacement values illustrates the value of the fixed assets in a form closer to reality and can therefore be used to determine the actual value of long-term fixed assets.

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