Economic Control Loops in Energy Policy

G. Kaestle[1]
[1] TU Clausthal, Leibnizstraße 28, 38678 Clausthal-Zellerfeld, gunnar.kaestle@tu-clausthal.de

Selforganising Incentives

Feed-in tariffs (FIT) [1] have proven to be superior compared to quota and tender models due to lower income risks for the investor (cf. with the CAPM). Nevertheless, a fixed FIT degression shows certain deficits which result in irritating effects in rapidly developing environments. “One reason is probably that prices for PV systems fall faster than the fostering FIT can be reduced” Matthias Kurth is cited in a BNetzA press release from 2012-01-09.

An alternative to fixed FITs is a self-adjusting mechanism for feed-in tariffs in the form of an economic control loop [2]. This has already been implemented in the German Renewable Energy Act for the calculation of the reduction of PV support, the so called “breathing cap”. The article shall point out the weaknesses of the existing implementation, e.g. discrete steps of the controller and the measurement of the new installations. In very dynamic markets this may lead to unwanted effects which are known from system analysis. Proposals for improvement will be presented that are derived from basic knowledge on control theory.

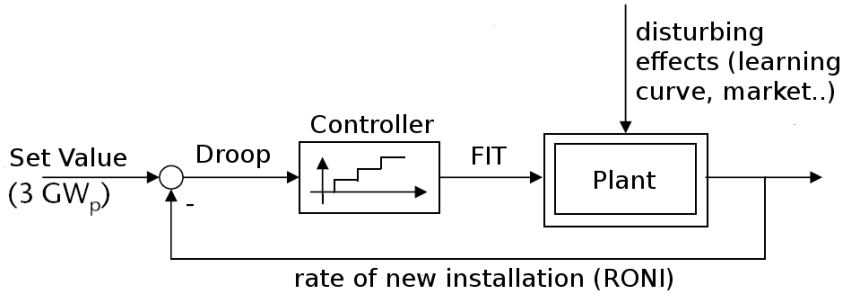

Fig 1: Sketched control scheme for PV FIT according to EEG 2012

Furthermore, the question has to be answered, how far the instrument of economic control loops can be used in other domains of renewable energy besides solar energy. The growth of onshore wind energy declined significantly in Germany between 2003 and 2010. As a second item, the support for combined heat and power plants is compared to support mechanisms for renewable energy. A first approach for the introduction of economic control systems shall be presented, in order to achieve the aim for 2020 in doubling CHP power production, fostering the installation of dispatchable electricity generating units and relieving the necessity for capacity markets.

Finally, the EU Emission Trading System will be also touched. Similar to the “breathing cap” as a nested instrument of quota (target RONI) and price (FIT), “breathing emissions” may help to stabilize the price for EU Emission Allowances. A nested instrument of a price-based approach (target price path similar to the British Carbon Price Floor [3]) with an inner quota-based approach (yearly emission volume of CO_2-certificates) will reduce the availability of EUAs if the market price is low and vice versa. This mechanism allows a self-acting compensation for unforeseen disturbances of the cap and trade scheme in the CO_2 market, such as a global economic crisis, a boom in renewable energy deployment or a successful collaboration with non-EU countries via flexible mechanisms of the Kyoto protocol [4]. The result is a more stable price development improving investment security for CO_2 mitigating measures.

An excursus on some background information shall flank the use cases for economic control loops given above. A helpful instrument for evaluating the economic feasibility by integrating cash-flows is the Laplace transform [5] (or z-transform for discrete time steps), as it is an equivalent for net present value calculation. Mathematic rules known from control theory are thus able to simplify economic assessments. Besides discounting cash-flows, discounting energy flows [6] is also a more general but very important assessment of investments in the energy sector. As the limiting EROI-factor (energy return on energy invested) [7] gradually shrinks in the fossil fuel sector due to the human nature to go for the low hanging fruits first, severe medium to long term economic implications have to be anticipated [8]. This is due to the fact that energy is a very powerful production factor [9] as seen during the oil price shocks of ’73, ’79, ‘91 and 2008. Therefore, a controlled transition towards non-exhaustive energy resources with a stable EROI has to be started in time when discretionary spending in learning investments and the deployment of new technology is still possible. The so called net energy cliff shall be avoided by following an exergy efficient transition pathway.

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