An efficient mechanism for cross-border support of renewable electricity in the European Union

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from / to	MS A	MS B	MS C	SUM
Bilateral Payments				
Gross Payments				
MS A	97.72	33.16	28.72	159.60
MS B	28.87	88.37	26.03	143.27
MS C	11.50	11.66	33.48	56.64
Payments corrected for surplus				
MS A	100.06	42.84	45.09	187.98
MS B	29.56	114.15	40.86	184.58
MS C	11.78	15.06	52.55	79.39
Net Payments				
MS A	0.00	13.28	33.31	46.58
MS B	0.00	0.00	25.80	25.80
MS C	0.00	0.00	0.00	0.00
EU Fund				
Gross Payments				
MS to EU Fund	159.60	143.27	56.64	359.52
Surplus redistributed				
EU Fund to MS	0.00	0.00	0.00	0.00
Net Payments				
MS to EU Fund	159.60	143.27	56.64	359.52

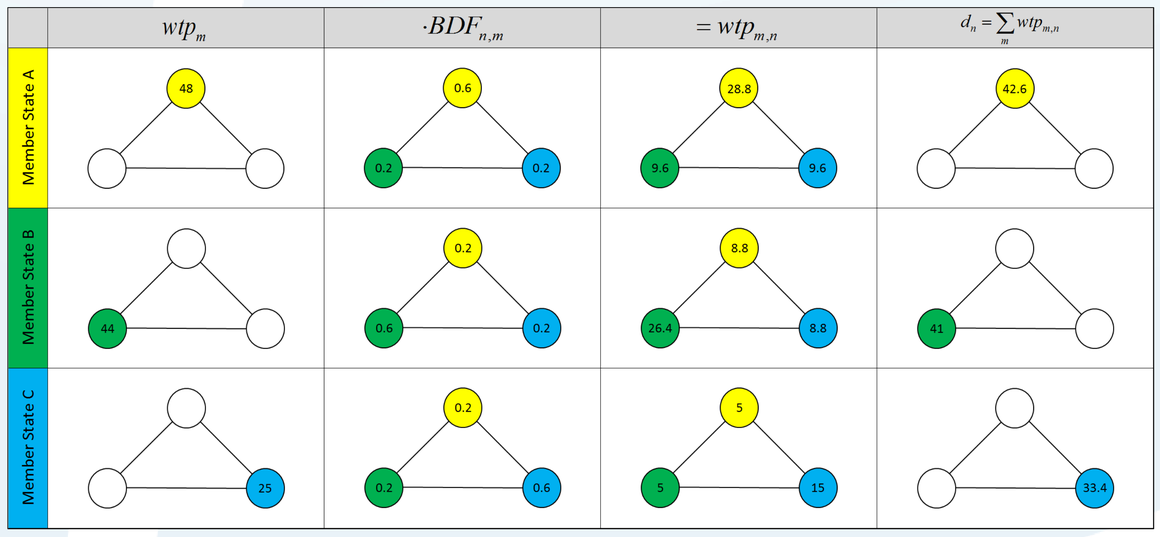
Background

We propose a new mechanism for cross-border support of renewable electricity in the European Union. The guiding idea is that the cross-border mechanism allocates new RES-e generating capacity across EU Member States to where it is most valuable. This can, but need not coincide with the most cost efficient allocation.

The mechanism would be designed as an EU wide auction in that Member States and generators of RES-e bid prices indicating their willingness to pay for, respectively their costs of additional RES-e generating capacity. In addition to prices the auctioneer uses a cross-border impact matrix that indicates the spill-over of benefits between Member States induced from additional RES-e generating capacity to select the set of bids that maximizes EU-wide surplus. We define value as the sum of market and non-market value of RES-e generating capacity net of its long-term variable and investment costs of generation.

The ability to exchange RES-e capacity between EU member states improves the welfare of all Member States since potentials and demands for RES-e capacity vary across the EU. This notion is reflected in the promotion of so called cooperation mechanisms by the EC. The existing mechanisms appear, unfortunately, to be insufficient to facilitate the efficient level of trade in capacity across the EU; only a small quantity of energy is expected to be subject to cooperation mechanisms (Klessmann et al., 2010). We identify three characteristics of the market for RES-e capacity that contribute to the failure of the market as is. First, significant information asymmetries exist: the willingness of Member States to pay for RES-e capacity and the cost of firms supplying that capacity is the private information of individual Member States and RES-e generators respectively. Strategic considerations cause these actors to misrepresent this private information in negotiations, leading to inefficient outcomes. The mechanism we propose seeks to minimize the incentives for actors to do so. Second, the costs and benefits of adding a unit of RES-e capacity are not entirely born by actors making the expansion decision; that is, RES-e capacity generates externalities in the market. Bi- or multi-lateral negotiations alone are therefore unlikely to result in efficient RES-e capacity. Our mechanism incorporates these externalities into prices for capacity ensuring that choices reflect the true costs and benefits. Finally, the transaction costs of bi- or multi-lateral negotiations are very high since they require parliamentary approval in several states. In particular, establishing the share of costs and benefits seems to have derailed cooperation between Sweden and Norway (Klessmann et al., 2010). In our mechanism these costs would only accrue once for setting-up the mechanism, but then cease to exist for each individual project, which offers significant economies of scale.

Modelling approaches



	Sequential approach	Integrated approach
Stage I	EU-wide cross-border auction	EU-wide cross-border auction
Information exchange	BDF Matrix ↑	BDF Matrix ↑ Installed Capacity ↓
Stage II	Power Market and Network Model	Power Market and Network Model

$$\max_{x^D_{n,b},x^S_{n,b}} surplus = \sum_n \sum_b \left(\sum_m \left(p^D_{m,b} \cdot BDFM_{n,m} \right) \cdot x^D_{n,b} - p^S_{n,b} \cdot x^S_{n,b} \right)$$

$$s.t.$$

$$\sum_n \left(x^D_{n,b} \cdot BDFM_{n,m} \right) \leq xmax^D_{m,b} \qquad \forall n,m,b.$$

$$x^S_{n,b} \leq x\max^S_{n,b} \qquad \forall n,b.$$

$$\sum_b x^D_{n,b} = \sum_b x^S_{n,b} \qquad \forall n.$$