

## **Anticipative Transmission Planning under Uncertainty**

Verena Hagspiel (1), Afzal S. Siddiqui (2,3), Trine K. Boomsma (4),

(1) Department of Industrial Economics and Technology Management, Norwegian University of Science and Technology, Trondheim, Norway

(2) Department of Statistical Science, University College London , UK

(3) Department of Computer and Systems Sciences Stockholm University, Sweden

(4) Department of Mathematical Sciences, University of Copenhagen, Denmark

Transmission system operators (TSOs) build transmission lines to take generation capacity into account. However, their decision is confounded by policies that promote renewable energy technologies. Thus, what should be the size of the transmission line to accommodate subsequent generation expansion? Taking the perspective of a TSO, we use a real options approach not only to determine the optimal timing and sizing of the transmission line but also to explore its effects on generation expansion.

First findings suggest that subsequent generation capacity expansion can affect both the timing and sizing of transmission lines. Neglecting the option to defer generation capacity can result in a substantial loss. Value of flexibility from timing the transmission investment is eroded most when volatility is low. By contrast, the relative loss in flexibility from transmission sizing increases with volatility.