# Energy-based analysis and control of power networks and markets

Stegink, Tjerk Wiebe

# Stellingen

*behorende bij het proefschrift*

## Energy-based analysis and control of power networks and markets

*van*

Tjerk W. Stegink

1. Also intermediate-order multi-machine models admit port-Hamiltonian representations and shifted passivity properties. (Chapter 2)

2. Using shifted passivity, power system dynamics and real-time dynamic pricing algorithms can succesfully be coupled to achieve an asymptotically stable closed-loop system with welfare maximizing equilibria. (Chapters 3,4,5,6)

3. Nodal power constraints (as well as line congestion and transmission costs) can succesfully be incorporated in dynamic pricing algorithms achieving optimal power allocation in (a)cyclic nonlinear power networks. (Chapter 5)

4. Optimal power sharing and frequency regulation for high- and low-dimensional power networks dynamics can be ensured by consensus-based control algorithms. (Chapters 4 and 7)

5. Projected primal-dual dynamics for (nonstrict) convex optimization problems with hard inequality constraints are pointwise asymptotically stable. (Chapter 8)

6. Appropriate real-time (iterative) price-bidding mechanisms for strategic generators lead to a Nash equilibrium, economic dispatch and frequency regulation. (Chapters 9 and 10)

7. We shall not cease from exploration and the end of all our exploring will be to arrive where we started and know the place for the first time.