# Popular science summary of the PhD thesis

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| PhD student | Jiawei Wang |
| Title of the PhD thesis | Integrated energy systems – unleashing the flexibility between heat and power |
| PhD school/Department | Department of Electrical Engineering |

## Science summary

* Please give a short popular summary in Danish or English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology:

The transition of the whole energy system from the one relying on fossil fuels to the one extensively using renewable energy, requires integration of all available energy sectors into a single integrated energy system in a holistic way. Optimal utilisation of available coupling technologies, e.g. combined heat and power (CHP) units and power-to-heat (P2H) units, can significantly contribute to the operation of an IES. Such an IES can achieve synergy between different energy sectors and obtain a sustainable, cost-effective, flexible and reliable energy system.

However, the transition to the high integration of renewable energy sources into the existing system, as well as development of low-temperature district heating (LTDH) causes generation-load imbalance and high energy losses related problems for both the electricity and heating sectors. These problems can negatively influence reliable, secure and profitable system operation. In this context, flexibility at generation and demand sides can be exploited to address the challenges mentioned above. In parallel with the evident development of coupling technologies, such as CHP units, as well as P2H units, the flexibility provided for heating and electricity sectors can be achieved through optimal operation and control of the coupling units locating at both generation and demand side of the electricity and heating sectors.

Hence, this Thesis is focused on flexibility provision for district heating and electricity sectors during short-term operation, considering availability and involvement of the CHP units and P2H units, at generation and demand sides of the IES.

Please email the summary to the PhD secretary at the department