

## FURTHER INFORMATION ON THE RESEARCH TOPICS ADDRESSED

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### Maximum possible supply of industry with renewable energies

The prerequisites for this are a switching to new technologies of energy generation and storage as well as finding the most efficient use of the energy used. Large heat pumps for industrial use play a special role here. With their help, previously unused waste heat from industrial processes can be used in other areas - for example to supply surrounding settlements with heating. The decisive factor here is optimal integration into the existing energy systems. At AIT, planning tools have been developed for this purpose, which are used in cooperation with large industrial companies (such as Wienerberger). This technology is also used in some projects of the new initiative "New Energy for Industry" (NEFI), which is led by AIT together with partners.

[www.ait.ac.at/blog/waermepumpen-energiequelle-der-zukunft/](http://www.ait.ac.at/blog/waermepumpen-energiequelle-der-zukunft/)  
[www.nefi.at](http://www.nefi.at)

### Automation

The AIT Center for Vision, Automation & Control works on advanced mechatronics, industrial automation, and robotics, using the latest sensor technologies and machine learning algorithms. The centre covers the entire development chain from theoretical and scientific work to building prototypes and implementation in industry. This is made possible by the centre's close cooperation with the Institute for Automation and Control Engineering (ACIN) at the Vienna University of Technology and with PROFACTOR in Steyr, in which the AIT has been involved for several years. This know-how transfer makes it possible for AIT to play in the premier league, for example, in sensor systems for autonomous vehicles, in the automation of industrial processes or in quality testing systems. This is extremely important for the domestic economy in order to counter the high pressure from the Far East and the risk of deindustrialisation in Europe.

<https://www.ait.ac.at/ueber-das-ait/center/center-for-vision-automation-control/>

### Encryption and quantum communication

The security of data is increasingly at risk - and not only from criminal cyber attacks. The encryption methods commonly used today will become crackable in the foreseeable future due to technological advances such as quantum computing. Already today, states like China are hoarding large amounts of encrypted data that they will be able to read in the future. To prevent this, encryption methods are being developed at AIT that will also be secure in the future because they are fundamentally unbreakable (so-called "post-quantum cryptography"). But the secure transmission of data is also a focus of research: for many years, the AIT has been developing the technical equipment for so-called quantum cryptography in cooperation with Austrian quantum physicists: with this method, it is possible to exclude the possibility of someone eavesdropping on the transmission of data without authorisation.

The European Commission is using the expertise and technologies of the AIT to set up the Quantum Communication Infrastructure Initiative (EuroQCI). The AIT also plays a leading role in important EU flagship projects for quantum technology development and leads an EU-wide demonstration project for quantum communication (OPENQKD).

[www.ait.ac.at/blog/gut-verschluesselt-mit-hilfe-von-quanten/](http://www.ait.ac.at/blog/gut-verschluesselt-mit-hilfe-von-quanten/)  
[www.ait.ac.at/themen/physical-layer-security/optical-quantum-technologies/](http://www.ait.ac.at/themen/physical-layer-security/optical-quantum-technologies/)

### Adaptation to climate change

Since the founding of the AIT, research into the interplay between plants and microorganisms has been a central area. The ambitious goal of Competence Unit head Angela Sessitsch is to use the microbiome - i.e. the microorganisms that live with and in plants - to strengthen plants, supply them with nutrients and make them more stress-resistant, so that the use of pesticides and fertilisers in the field can be greatly reduced in the future. To achieve this, it is necessary to understand the processes in the plants very precisely. The findings from basic research in the field of the microbiome and plant physiology make it possible to enter into consortia in which methods are developed together with partners from science and industry. These are ultimately transferred into practice in concrete contract research and spin-offs.

<https://www.ait.ac.at/themen/microbe-assisted-crop-production/>

### Secure smart grids

Intelligent electricity grids - so-called "smart grids", which are also being developed at AIT - make it possible to integrate larger amounts of green electricity into the grids. However, the coupling of electricity grids with information and communication technology also makes them more vulnerable to cyber attacks. The consequences can go as far as a blackout. To prevent this, so-called "intrusion detection systems" are being developed at the AIT, which use artificial intelligence methods to learn to distinguish between known "good" activities and unknown harmful activities in the networks. If an anomaly occurs, an alarm is raised immediately.

<https://www.ait.ac.at/blog/gefaehrdete-smart-grids/>