

Innovative laboratory.

Electromagnetic Power Technology.



The success of a sustainable energy supply in a free energy market depends on proper management of the energy flows. For control and management, power electronics are indispensable. The knowledge about electromagnetic power technology and the development of components are about to undergo explosive growth. In consultation with the universities of Delft and Eindhoven, KEMA and ECN are therefore building a laboratory for electromagnetic power technology (EMPT).

Due to the emergence of decentralized energy sources and the liberalization of the energy market, the control and management of electrical flows is gaining in importance. Hierarchically controlled one-way traffic continues to decline in favor of (autonomous) networks supplied by large and small

generating stations that provide varying electric currents in all directions. The complexity of constantly balancing supply and demand is therefore increasing while the assets are simultaneously being utilized to their limits.

Information and communication technology has given power technology a strong impulse. Electromagnetic power technology allows network managers and operators to better guide the energy flow. It therefore also contributes to a more rapid transition to a durable energy supply. For example, the application of power electronics in network-integrated decentralized generators such as micro-CHP, wind turbines and solar cells increases the ability to intervene on an extremely local level in an intelligent manner.



Professional Environment

The knowledge of power technology and the development of components are at the very beginning of their growth. There is a need for a professional environment in which practical knowledge can be gathered and innovative components with control systems can be developed and tested. For this reason, KEMA and ECN have taken the initiative to build an EMPT laboratory in Arnhem. The technical universities of Delft and Eindhoven will both be closely involved in the development. The Dutch Ministry of Economic Affairs has granted a subsidy for this project.

The purpose of this laboratory is to:

- Acquire knowledge about electromagnetic power technology
- Perform research into electrical energy in the broadest sense of the word
- Develop and facilitate power electronics and electromagnetic power technology
- Test components and systems containing power electronics
- Develop test procedures for the application of power electronics.

The research will be specifically focused on proofs of concept, proofs of principle, prototypes and new control and regulation algorithms. In addition, new products will be developed and tested with an emphasis on expansion of the applications and complete testing, including related controllers and IT infrastructure. The develop-

ment of new test procedures, as well as competence development for the management of lab facilities, will have a high priority. The lab will also be particularly well suited to the development of technical expertise based on experience gained from projects that can later be applied to consultancy services. Additionally, the lab will be used to support schooling and training programs. And lastly, the laboratory will also support participation in the development of standards.

High Power

The EMPT lab fills a unique position among the areas of specialization of other international laboratories. The development and test activities relate to components in the power class of up to 1-3 MW, a voltage level of 4 kV and a bandwidth of 3 kHz. The programmable converter that forms the heart of the lab can create a predefined 'poor-quality network' including, among other things, dips and harmonics. Distributed Energy Resources (DER) tests will be carried out upon requests from clients and in accordance with standards such as IEEE 1547.

Initially the laboratory will have the status of a development lab that is primarily directed toward R&D.

At a later stage, it is to be expected that it will become a commercial laboratory with an emphasis on testing. Eventually, the intention is to grow to become an interna-

tionally renowned center of excellence for power electronics.

Public-Private Cooperation

The EMPT lab distinguishes itself through the close cooperation between public and private parties. The facility is important for scientific research, the industry providing related products and the energy companies. The technical universities of Delft and Eindhoven will use the lab for researching modern semiconductor switches for electricity networks, among other things. The laboratory also offers facilities that could be useful for the development of power transformers for the rail and shipping industries. Manufacturers of power electronics also benefit from a facility where their products can be developed and tested. As end users, network managers and operators are interested in the laboratory as a facility for carrying out pilots and demonstrations.

A non-profit organization will manage the EMPT lab. The EMPT lab is expected to open at the beginning of 2007.

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