

## **Energy day 2017 – Conclusions**

### **How to evaluate interdisciplinary research projects linking mathematics, IT and engineering disciplines**

Discussion showed that the vast majority of grant agencies, not only in the Czech Republic, are highly specialized and not very well equipped to deal with interdisciplinary projects. Because of that the possibility of obtaining funds for their solution is extremely limited. One of the possible solutions to this problem is that the universities, the academia, as well as the industry, need to create systematic pressure on the political representation, which decides on the concepts and finances scientific research. The aim is to significantly increase support for interdisciplinary research.

The participants in the debate have repeatedly stressed that almost all major problems, which are worth solving, lead to interdisciplinary projects. Unfortunately most grant agencies, with the exception of TAČR, do not know how to deal with these issues. The best solution would be to create a panel composed of experts from the individual disciplines to deal with these projects. The current procedure, which is to send the project to several panels that understand it "only partially", has been proven to be ineffective, because the specialized panels generally tend to favor narrowly focused projects (i.e. projects strictly limited to one discipline).

In the discussion it was also stated, that in public tenders for large industrial projects, it is imperative that the participants in the competition should be not only key industrial enterprises, but also universities and academic institutions. The best example of this arrangement is the European project Eureka. Universities and academia must also involve PhD students and young associates, for whom working on these projects is the best training for future work in research.

Since the Czech, German and Austrian energy sectors form closely interconnected unit, in which the individual parties need each other, it is necessary to link corresponding research projects. Another alternative is to try joining already existing foreign projects, preferably German projects.

The participants in the discussion agreed that administration of the EU funds has become so demanding, that it discourages many researchers and businesses. This leads to researchers spending a lot of time doing paperwork instead of doing the actual research. The current existing law regarding the public tenders also does not support the development of scientific research. In fact, the existing law effectively hinders research activities.

### **How to efficiently use computer networks and/or supercomputers to solve large-scale optimization problems**

Participants noted that many problems that the researchers think they need a supercomputer (or clustered computers) for solving, could be solved without them.

Choosing the appropriate algorithms for tasks, which are suitable for processing on supercomputers or on large computer networks, is a much bigger problem, than most users think. The implementation of tasks for supercomputers (or clustered computers) is typical large multidisciplinary problem, which cannot be solved without close cooperation between mathematicians, analysts, who are creating the necessary algorithms, and, last but not least, the programmers implementing the computer codes.

The architecture of supercomputers and large computer networks, including information processing logic, process synchronization, data transfer, memory management, etc., are very different from ordinary computers, and it takes a long time to find the optimal solution. A major challenge in this area is primarily the creation of software tools to facilitate the use of supercomputers (or clustered computers) for the so-called "common" users.

Participants have also stated that, despite the information spread on the Internet, processing of large data files is not necessarily a task that requires the use of a supercomputer. Similarly, large advances in the capacity and speed of conventional computers (or clustered computers), create an increasingly prolific platform, that can be an alternative to the massive use of supercomputers. That is because the advanced conventional computers are much easier to obtain, along with much easier task management. This does not mean that there are no tasks that cannot be solved without supercomputers. However, the preparation of successful supercomputer solution usually takes a long time and requires continuous development.

### **How to increase the industry's interest in the results of the theoretical research developed at universities and academic institutions.**

The participants in the discussion agreed that, the universities and academic institutions have to try to "sell" their knowledge and research results, just like an industry would, which is not always the case.

So far we have seen that it is not enough to only have interesting theoretical results and knowledge. It is equally important to have a thought out plan accompanied by a suitable message that convinces not only industry managers, but also politics and the media, that the research results can help in the development and the competitiveness of the industrial sector or the country.