

Evaluation report

Evaluated point	Grade	Comments
Scientific impact of research	Good	<p>We confine our comments to those sections that we could identify as relevant to Engineering and Technology i.e. those which take basic scientific discoveries and use them to design and create new structures, products or systems. Research in High Performance Computing (HPC) has led to the construction of a Tier-2 cloud computing centre (ETAIS). The infrastructure is split between Tallinn Technical University, Tartu University and NICPB. This serves research activity throughout Estonia and is also used for the CERN computing grid. The centre also supports work carried out by other groups in the department. The embedded developments have led to creation of a spin-off company OpenNode.</p> <p>Activity in the field of energy materials has led to the development of thin film, efficient, high temperature solid oxide fuel cells that can be stacked to generate up to 1 kV. Life times need improvement.</p> <p>The production of ash from the extraction of oil from shale is an increasing problem in Estonia. NICBP have an active programme for turning such waste into products such as building materials.</p> <p>Considerable development has taken place in the area of NMR especially in the instrumentation for investigation of solids. Probes have been designed and constructed in house for magic angle spinning (MAS) down to 4-5 K. Focus on construction of sample holders has had some commercial application but the major benefits have been the support of condensed matter physics groups.</p> <p>In a similar fashion construction of an impressive THz spectrometer that can function in the far IR under extreme conditions of high field and low temperature is employed in house for the study of magnetic systems such as multiferroics.</p> <p>Nano materials are characterized, primarily by powder X-ray diffraction for use in MRI imaging.</p> <p>The quality of the science associated with these programmes is high.</p> <p>The general level of publication output of the whole institution is strong.</p>
Sustainability and potential of research	Satisfactory	<p>There exist various challenges to the sustainability of research, predominantly with the current organizational structure, funding mechanism and involvement of PhD research.</p>

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		<p>As accurately identified by the Institution, the research area of engineering and technology is not the primary focus of the institute, but it is developed to support the research in natural sciences programs.</p> <p>Considering this context, the fact that the institution holds the largest scientific computing centre in Estonia and that it is part of the ETAIS infrastructure is impressive. Groups have also contributed with significant improvements to the unique experimental facilities of the institution. Further developments on impact through start-up companies, e.g. OpenNode for commercial purposes and Lingvist, highlight the potential for development in the area.</p> <p>There is significant infrastructure and equipment in the institution, with some unique facilities, but with the current financial arrangements, the sustainability is a cause for concern.</p> <p>Plans will be needed for maintenance, which cannot be supported through individual research grants brought in by the researchers. The funding mechanism for large infrastructure will need to be addressed.</p> <p>Similarly, the current mechanism of funding salaries of all staff members through research grants is volatile and a real threat to the work of the groups.</p> <p>As would be expected with the presence of a research group with a prominent position in the national and international scene, a high number of PhD students undertake their research in NICPB, although it is not a degree granting institution. The links with the different universities are encouraging and provide a real asset for the training of new researchers and attracting international visitors. However, it is surprising that despite the close collaboration with the universities, NICPB does not receive any funding or overheads support for the maintenance of the equipment, which is critical for the doctoral students.</p> <p>Additional support would also be expected as NICPB contributes to the training activities at the universities, through the organisation of the Functional Materials and Technologies graduate school encompassing mostly PhD level students of material science and technology.</p> <p>We have assessed this category “Satisfactory” as although the potential for high quality research is good, the current funding mechanism is not conducive to the long-term operation and planning of the organization and restructuring will be required.</p>
Societal importance of research	Good	Basic research within physics and material physics is carried out at NICPB. There is not so much of applied research. The Institute’s activities in Engineering and Technology are

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		<p>primarily to further develop equipment for the experimental studies in material physics. However some of the NICPB activities have generated commercial applications via spin-off companies. The following are examples of societal importance of NICPB research:</p> <p>The Estonian Research Computational Infrastructure ETAIS is a network of computer centres between NICPB, Tallinn Technical University TTÜ and Tartu University UT. NICPB has contributed with a large scale computer cluster. Besides serving Estonian research, this datacentre is used by the CERN computing grid WLCG for analysis of LHC data generated in the LHC experiments.</p> <p>The NICPB computer centre has generated two spin-off companies working with commercial applications:</p> <p>OpenNode, founded in 2011, have developed open source software to implement computer clusters with cloud architecture and they also provide contract work for their installation. They have been successful in many countries.</p> <p>Lingvist, founded in 2013, have developed software for machine learning and fast learning of foreign languages. They have been successful in several countries, e.g. in France, Switzerland, Germany and Russia.</p> <p>The solid oxide fuel cell research is implemented commercially by Elcogen.</p> <p>NICPB's role as representing Estonia at CERN means also that they are a link between CERN and Estonian industry, this encourages Estonian companies to develop and deliver equipment to CERN infrastructure and to the LHC experiments. Examples are e.g. power transformers.</p> <p>The NICPB in-house development of test equipment and instruments should have some potential for commercial exploitation, but that doesn't seem to have been much utilized so far.</p> <p>The involvement of PhD students from TTÜ and UT as active researchers in the NICPB projects also means an important contribution to fostering the next generation of researchers in Estonia and the scientific education of those proceeding to industry and business.</p> <p>It should also be mentioned that NICPB regularly invite high school students, to boost their interest in physics.</p>
<p>Scientific basis in the field is sufficient to conduct doctoral studies. (This question should</p>		<p>The Institute is not a degree awarding body.</p>

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<p>be answered only if: a) institution being evaluated is conducting doctoral studies and; b) The field being evaluated is proposed to grant positive evaluation. If these conditions are met then: a) If the level of scientific basis is sufficient for conducting doctoral studies in every structural unit being evaluated, then the answer should be „yes“; b) If the scientific basis is not sufficient in some structural units, then those units should be listed.)</p>		

Summary assessment

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<p>Areas of special note as appropriate (Where necessary indicate sub-fields, assessment criteria, and/or structural units which, in the committee's opinion, were of a notably high level.)</p>		<p>None.</p>
<p>Areas in need of improvement as appropriate (Where necessary indicate sub-fields of the field being evaluated, assessment criteria, and/or structural units which, in the committee's opinion, revealed significant shortcomings.)</p>		<p>The science at NICBP has potential for industrial application. The Institute recognizes the need to focus more on liaison with industrial partners.</p>
<p>Assessment proposal to the Minister of Education and Research</p>	<p>To grant positive evaluation</p>	<p>The institute does good science.</p>

Feedback

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<p>Feedback for institution (This question should be answered only if the institution asked for feedback from the evaluation committee in the self-report (about up to three specific areas of R&D which it finds to be currently important, e.g., related to its development plan).)</p>	<p>In the self-evaluation, NICPB raised the question on distribution of funding to research institutes in other countries.</p> <p>As an example in Sweden: Swerea IVF (in mechanical production engineering, automation and product development) and Swerea KIMAB (in materials, production processes and corrosion) until the beginning of the 2000 decade had a decreasing share of basic funding from the Ministry of Enterprise and Innovation, down to roughly 10 %. 90% of the budget had to be covered by grants applied for in competition and from projects with industry.</p> <p>Currently this situation has improved a bit: Roughly 15 – 20 % basic funding now comes from the Ministry of Enterprise and Innovation. The remaining funding is project based. Half of this has to be applied for from public sources in Sweden (Vinnova, the Energy Authority, the Strategic Foundation for Research, MISTRA) and half of this comes from industry.</p>
<p>Suggestions for unit, institution, state etc. (As appropriate, committee can give additional feedback for the structural unit, the institution, or the State (please specify whom feedback is directed to) according to the directive assessment criteria for regular evaluation (article 7).</p>	<p>Suggestion for the state:</p> <p>The funding of NICPB is almost exclusively grant based. Such a situation leads to considerable financial insecurity and may lead to failure of the Institution. Resolution of this situation is highly desirable. This issue on unsatisfactory funding of NICPB, is also related to the lack of a national regulation of scientist's career in Estonia.</p> <p>A note for the NICPB Institute:</p> <p>In the context of diversity and inclusivity and the European Disability Strategy priorities, accessibility requirements for wheelchair access may need to be revisited and the buildings adapted accordingly. Ramps and wheelchair access to the main entrance, to the ground floor and to seminar and meeting rooms on the ground floor have been installed as has a disabled toilet. However, in some parts of the building, access to wheelchairs appears more difficult due to lack of feasible elevators and through door frames which have stepped access, e.g. in some labs and offices.</p>

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	The development of a focus group to review provision in the light of appropriate standards and best practice guidelines could be considered.