**The WAR interim recommendations on the Vista2025 Update process**

Editors: Marco van Leeuwen, Juan Rojo, Charles Timmermans

**General introduction.** The timespan of the VistaUpdate process deals with the next 5 to 10 years. In this document, we provide recommendations about the possible directions that this process could take and their implications for the future of Nikhef. These recommendations are the outcome of the several discussions that have taken place within the WAR as well as at the Vista25Update (online) workshop. The staff-meeting in October 2020 and the corresponding questionnaire that was circulated among all Nikhef staff members. We divide our recommendations into three categories: **Scientific Policy, Organization,** and **Societal Connection.**

**Recommendations on Scientific Policy,** concerning the (continued) implication of Nikhef in existing and future experiments (both confirmed and proposed) and the general balance between the various programs that constitute the Nikhef partnership (Institute & Universities).

* **Involvement in the HL-LHC program.** The European Strategy on Particle Physics Update has reiterated once more that the full exploitation of the HL-LHC physics program remains the absolute priority for the field. Specifically, the continuation of the currently thriving programs on flavor physics (LHCb) and heavy ion physics (ALICE) into the HL-LHC era is recommended, which was not a guaranteed outcome. Nikhef should continue to play a leading role, **being a major partner in driving the physics program of the HL-LHC in the areas of high-pT and Higgs physics (ATLAS), flavor physics (LHCb), and heavy ion physics (ALICE)**. Nikhef should thus ensure providing the relevant resources to fulfill this ambition, both from the instrumental point of view (new HL-LHC detectors for ATLAS, LHCb, and ALICE) as well in terms of physics analysis person-power. This requires, at the very least, maintaining the current critical size of the three experiments in a timescale of up to 15 years from now, something which will require a close collaboration with our university partners who employ many of the staff members involved in the LHC experiments.
* **Involvement in future higher-energy colliders in Europe.** Another outcome of the EPPSU was the identification of the Future Circular Colliders (FCC) infrastructure as a major priority for the future of particle physics in Europe. However, specific decisions on which (if any) machines to build (and in which order) have been delayed to the following EPPS update in 2025. Given that particle collider physics and close participation in CERN activities are at the core of Nikhef’s mission, we consider it very important that Nikhef actively participates in the discussions towards the next high-energy collider in Europe. At this point, this would involve both participating in the efforts aiming to strengthen the physics case of such a facility as well as being involved in the detector R&D for these projects. The Nikhef directorate should ensure that Nikhef develops the necessary expertise and know-how to play a leading role in the design, construction and operation of ***detector(s) at the next particle collider*** in Europe once this facility has been approved.
* **Involvement in future higher-energy colliders outside Europe**. It is also conceivable that other high-energy colliders could be built in Asia, specifically the ILC in Japan and the CepC/SppC in China. While it is difficult at this point to ascertain the likelihood that any of these facilities will be built, our recommendation would be that possible Nikhef participation would only take place under the CERN umbrella.
* **Involvement in astroparticle physics experiments.** Nikhef has a very strong portfolio of astroparticle physics activities, including consolidated programs such as KM3NET, XENON, and Cosmic Rays as well as recently initiated activities such as DUNE. However, the APP activities are at a critical level of person-power. WAR recognizes the scientific interest of these experiments as well as the local commitments of individual (university) groups to these endeavors. The Nikhef directorate should ensure that APP activities maintain a critical mass to be able to continue providing a leading contribution in these experiments as is the case now. The WAR recommends not to start new initiatives in this area, unless additional resources either from Nikhef or from outside the current collaboration become available.

**Involvement in gravitational wave experiments.** Gravitational waves are undoubtedly a thriving field that has delivered several remarkable discoveries in the recent years, and that promises more with the next-generation GW experiments. In the past few years, the relative weight of GW activities in the Nikhef partnership has increased in a significant manner, especially due to the Sectorplan hires by the University partners. The WAR recommends the continued participation of Nikhef in the LIGO/Virgo experiments, as well as preparation for the eventual approval of the Einstein telescope (irrespective of whether or not it would be built in the NL).

* **Involvement in low-energy experiments that search for indirect signatures of physics beyond the Standard Model.** The WAR recommends the full exploitation of the physics potential of the eEDM experiment and to make sure that the experiment maximises its competitive advantages to other experiments. The WAR recommends not to start new initiatives in this area, unless additional resources either from Nikhef or from outside the current collaboration become available.

**Recommendations on Organization,** concerning the issues raised in VistaUpdate: “sharing of experience of common techniques among the research programs and common background, especially between the gravitational waves groups and other parts of Nikhef”:

* **Coordination in neutrino activities.** The WAR is pleased to see that the Nikhef **neutrino platform** is proving to be an excellent tool for communication, exploring synergies and attracting funding for all neutrino-related activities of Nikhef (KM3NET, DUNE, PTOLEMY, possibly GRAND). The platform enables to explore and exploit synergies between the physics programs as well as detector instrumentation. Its organization could serve as an example for other transversal initiatives.
* **Coordination in Data Science activities**. Data science is a common denominator for most if not all of the Nikhef programs. The WAR recommends to set up/develop a discussion platform for Data Science, to encourage sharing of experience and expertise and potentially foster collaboration between the experiments in this area. Formalizing DS activities with the explicit charge to attract a diverse (in terms of activities) user base would be beneficial to the entire Nikhef partnership. In this respect we note that a strong DS education is highly beneficial for PhD students and postdocs that transition to industry jobs. The WAR recommends that DS lectures become part of the regular topical lectures.
* We note that, while most of the members of the Dutch APP community have a background in particle physics, the GW science community is more closely affiliated with the astronomy community, and most Dutch GW scientists do not have a particle physics background. This risks to lead to a situation where the Nikhef staff is somewhat divided into two communities: its particle physics core (including APP) and the more recently added GW activities. ***We recommend that initiatives are taken to ensure a healthy balance of GW activities in relation to the particle physics ones (which are and should remain the core of the Nikhef scientific activity) as well as initiative to bridge the gaps and create a unified sense of community (also by means of scientific synergies) between the GW and PP/APP groups.***
* Female and minority groups are underrepresented in the field and the Nikhef workforce. In management this underrepresentation is enhanced. The WAR considers a proper representation part of a healthy inclusive environment, therefore it recommends to take this into account when positions become available.

**Recommendations on Societal Connection**, on Nikhef as an active player in Dutch society responsibly executing its mission and informing the public about its research:

* The impact of human activity on the environment and in particular the emission of greenhouse gasses is an important theme in society. The WAR recommends that Nikhef takes steps to stimulate an internal discussion on the impact of our work on the environment, for example by making an inventory of the major CO2E (CO2 equivalent) emissions of the different parts of its research and discussing possibilities for reduction of the Nikhef footprint without harming the scientific productivity of the institute. The WAR is of the opinion that this discussion fits within the societal role of Nikhef as a public research institute. Moreover, as this is becoming a topic of government policy, we expect that public institutions will be asked for a greenhouse emissions evaluation at some point in the future. Starting this discussion now is also a good preparation for such developments.
* Nikhef has an excellent outreach record and presence in the media. This informs the public and is also helpful in attracting the best students to study (particle) physics. The WAR recommends this high level activity to continue at its present high quality, also in view of the outreach activities in other branches of physical sciences.
* Nikhef makes an explicit effort to reach underrepresented groups at a young age, when career decisions are taken, e.g. by providing female and minority role models in outreach activities.
* When considering participation in large future projects outside Europe, political and social/cultural considerations may play a role in addition to purely scientific ones. When embarking on such collaborations, in particular when they are large scale, such as next-generation colliders, it is important to seek guidance from NWO and possibly the ministry of foreign affairs and to verify that international partners and host institutes fulfill the requirements set out by them.