



Europe needs fresh focus on big-science projects

Messy governance and a lack of long-term planning threaten the success of the European Spallation Source, says Olof Hallonsten.

Big science has come to Sweden. The frozen ground near Lund, in the country's south, is being dug out to make way for Europe's latest megaproject. The European Spallation Source (ESS) is a €1.8-billion (US\$2-billion) neutron-beam machine designed to study materials structure and is scheduled to open in 2019.

The project is under way, but its future is far from secure. The funding is incomplete, the politics that support it are unpredictable and the legal framework is a mess. Yet Europe considers such risky circumstances as normal. Every collaborative big-science project in Europe has been birthed in similar messy, ad hoc circumstances.

Still, the ESS is a risk too far. If the project is not to founder, Europe — not least the two hosts, Sweden and Denmark — must learn the lessons of the past. The project must immediately be put on a more solid footing to help it through the almost inevitable cost overruns and delays, which could otherwise threaten its success and drain money from the rest of Swedish science.

Whereas the United States, Japan and others tend to run big-science projects as an arm of central government, either through federal funding or national agencies, European collaborative efforts lack this type of political grounding. The European Commission plays only a minor part — coordinating the early stages of big basic-science projects such as the ESS.

Developing collaborative projects in this way — as for the European Southern Observatory and the European Synchrotron Radiation Facility (ESRF), for example — avoids the sluggish and notorious bureaucracy of Brussels and the European Commission. But the downsides of this approach are the deals done behind closed doors, unaccountability and significant inherent uncertainty.

A brief history of the ESS demonstrates this. Germany and the United Kingdom, Europe's neutron-scattering strongholds, initially proposed to host the lab, but funds could not be agreed, and preparations ground to a halt in 2002. Even when Sweden received widespread support from other countries for its bid in May 2009, no central funding agreement was put in place. Instead, the Swedish government entered into several parallel bilateral negotiations, which still seem not to be fully resolved.

The funding solution presented by the Swedish government in July last year is so far not backed by binding agreements from all the expected contributing countries. This raises the question of whether the project will meet design specifications and scientific expectations, and at what cost. Several members have not yet progressed beyond the informal 'letters of intent' level, and so most legal and financial issues remain unresolved. Meanwhile, the governments of Sweden and Denmark have already

invested more than €100 million in the ESS project, and have recruited about 200 people to work on it. Swedish scientists and others with a stake in the project must pressure ministers to ensure that the funding pledges made by other countries are made legally watertight.

Sweden has near-zero experience of building and hosting big-science labs. Its research-policy system is decentralized and consensus-oriented, and possibly not suited to handing over significant sums to individual projects of this size. The Swedish government has pledged to pay just over one-third of the projected ESS construction cost, but what if that cost increases? Even firm supporters of neutron-scattering science such as the United Kingdom and Germany hesitated for five years after the 2009 site decision before making binding membership pledges. Will project partners be willing to pay more if necessary? If not, then where

will Sweden find the cash to meet the shortfall? Analysis of Swedish government spending plans for future years suggests that no contingency funds have been set aside. If the cost of the ESS skyrockets, then the Swedish government might have to cut back in other areas.

Existing government investment in the ESS has been financed through a complicated set of funding flows, and the numbers do not always seem to add up. This, too, signals a lack of a long-term plan, and little preparation for unforeseen events and cost increases (see O. Hallonsten *Sci. Public Policy* <http://doi.org/z8m>; 2014). Sweden must include a contingency margin in its budget. This has worked previously to minimize risk, for example with the construction of the ESRF in Grenoble, France.

Research policy is always a game of priorities, but big-science projects carry complex risks that

must be properly prepared for and managed. Although the European Commission has made some moves to explore how it could establish legal frameworks for such collaborations, as well as helping to plan and set political priorities to make them happen, it is too early to predict the outcome of these efforts. It is unlikely, anyway, that new policies will be put in place in time to benefit the ESS.

The project has already suffered from the indecision of Europe in collaborative big science: while Europe has been discussing and haggling over construction and costs of the ESS, both Japan and the United States have swiftly built and started to operate their own versions. Europe is now playing catch-up. If it is not to fall further behind, then its attitude to big-science projects must change. The current preparations for the ESS are a good place to start. ■

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