CHAPTER 2

Myths and realities of the ESS project

A systematic scrutiny of readily accepted 'truths'

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This chapter scrutinizes three major claims that are part of the public marketing of the ESS project. As the title of this chapter suggests, these claims have been readily accepted by the general public as 'truths', despite no real case being made, let alone any documentation that could support it. The claims are seldom explicitly made by ESS proponents or subject to debate; rather, they are *discursive* in a Foucauldian sense, functioning not as straightforwardly pronounced claims, but established in an opaque process of the normalization of certain behaviour and beliefs through the subtle (and sometimes anonymous) issuing of coherent messages through public channels (Foucault 1977; Barker & Cheney 1994). This makes these claims all the more difficult to deconstruct and discuss, since they have been made into general beliefs that have stuck in the public mind, often more or less subconsciously or for simple reasons of convenience.

The purpose of this chapter, therefore, is to consider the accuracy of these 'truths' and how they correspond to established knowledge of the history, politics, and sociology of Big Science in general, European collaboration on Big Science, and Big Science in the Swedish context. While myth and reality are important issues here, the purpose of the chapter is not to straightforwardly refute (or confirm) the claims under scrutiny. Rather, it is to discuss them thoroughly and use them as prisms through which important issues can be viewed,

thus giving the reader insight into established knowledge in areas relevant to the scholarly study of the ESS. The three claims are:

#1 The ESS will become the world's leading neutron source.
#2 Lund is the best site for the ESS, and the ESS will be of great benefit to Swedish science.
#3 On 28 May 2009, representatives of a number of European governments decided to build the ESS in Lund.

The processes of localizing, designing, building, funding, and organizing large scientific facilities such as the ESS are extremely complex. By throwing some light on this complexity, the ambition here is to reduce an apparent knowledge deficit. After a brief background, the claims will be discussed one by one, while the final section offers some concluding reflections.

Background and framework

The ESS—as a technoscientific-political project—is situated in a distinct historical, political, and sociological context that gives opportunities to and sets constraints on the work of establishing the facility in Lund, and any attempt to study this work. While the ESS will be an accelerator-based, multibillion Euro research facility, it is nothing like the monster machines built during the cold-war era for the discovery of elementary particles, whose *raison d'être* was the arms race logic, by its remote connection to nuclear energy and warfare, and whose purpose was both singular and utterly curious, namely that of explaining the origins of the universe. The ESS is a multi-purpose facility, conceptualized in a post-cold-war context where the life sciences and materials sciences (including nanoscience and nanotechnology) have long since replaced nuclear and particle physics at the apex of science.

Yet the ESS is also something as anomalous as a large scientific facility planned for Sweden, and something as politically complicated as a large collaborative European research facility for basic science. The Swedish public science system, dominated by the old, large universities and structurally diversified, with little or no central authority and

with limited steering mechanisms at its disposal, has seldom before managed to muster the determination and the resources necessary to build a major, internationally competitive research facility (Benner 2008; Benner & Sandström 2000; Hallonsten 2011). True, MAX-lab in Lund attracts some 800 users annually and is on the verge of an upgrade that would put it in the exclusive group of global leaders in the field of synchrotron radiation, but it is arguably a one-off and is performing suboptimally due to persistent problems with resource scarcity (Hallonsten 2011); furthermore, the fate of MAX IV is still unknown.[1] Sweden participates in most European collaborative basic science projects, but rarely with contributions exceeding five per cent, and has only joined such collaborations after prolonged debates about the supposed crowding out of other worthy recipients of funding (Widmalm 1993; Edqvist 2009, 135–6; Granberg 2012). Europe has often had a hard time coming to terms with its collective scientific ambitions and how they correspond to the dual interest realms of the common good and national sovereignty. With the successive treaties that make up the European Community and European Union silent on basic science collaboration, and often faced with strong competition from North America and East Asia, the (Western) European scientific communities have been forced to rely on the goodwill of their national governments to agree and pay their fair share in collective efforts, with little or no precedent or established structures. The resulting turf battles and political stalemates, academic bean-counting and a careful monitoring of national self-interest, have more often than not threatened to kill both planned and existing projects (Hallonsten 2012; Krige 2003; Papon 2004).

Thus when studying the process by which the ESS is coming into being, it is important to keep in mind the following: the fact that a project like the ESS makes perfect scientific and technological sense during its planning, design conceptualization, or construction phases, does not make it *a priori* politically viable, nor does it guarantee a favourable outcome in terms of (*i*) the performance of the facility (in a wide sense); (*ii*) its contribution to science, and ultimately to society at large; or (*iii*) dynamic and synergistic relationships with institutions and interests in its local or regional surroundings. The ESS is indeed a well-founded and well-supported project by

almost any scientific and technological measure. It stands on the shoulders of giants in the shape of a European neutron-scattering user community that ever since the neutron was first used as a tool for experimentation has kept its world lead both in scientific performance and productivity, and in technological inventiveness and reliability. The ESS was originally envisaged and planned by the core elite of this European community of neutron-scattering users. Despite this, it is not yet even close to a definitive decision or agreement on funding, let alone the start of construction, and while its American counterpart—the Spallation Neutron Source (SNS) in Oak Ridge, Tennessee—has already taken the first steps towards an upgrade that allegedly would make it surpass the ESS in performance, European countries are still quibbling about the unpredictability of the returns of their possible investments in the ESS. Hence, a fundamental assumption underpinning the analysis in this chapter is that there are major and potentially multifaceted discrepancies between, on one hand, the content and purpose of the ESS project, and on the other, the context and preconditions that determine much of its fate. These discrepancies have manifested themselves repeatedly in the work of the ESS's proponents to win the necessary support of various actors and stakeholders, and have apparently been allowed to influence much of the public discourse around the project.

It is currently popular in social studies of science policy, governance, and practice to posit and theorize a profound and irreversible change in science, broadly defined, and specifically academic science. Levelling growth curves, increased competition, and intensified demands for social relevance and economic spin-offs have doubtlessly changed the politics and governance of science, on the macro as well as the micro level. The increasing influence of new goals and markers of success ('excellence', 'relevance', 'innovation') in recent decades and the introduction of externally devised management practices in scientific organizations have intensified the pressure on science to advertise and market itself, regardless of whether the mission or content is such that it benefits from enhanced public relations efforts (Aronowitz 2000; Belanger et al. 2002; Bulotaite 2003). Furthermore, the alleged marketization and commodification

of science have made research that is demonstrably problem-oriented and socially relevant increasingly valued above 'fundamental' or 'critical' research (Radder 2010; Jacob 2009). This development is a case in point in the changed rationale for investments in large scientific facilities. The cold-war logic gave *carte blanche* to fundamental physics, and, some would argue, to anything that could be remotely related to fundamental physics (Pais 1986; Hoddeson & Kolb 2000; Greenberg 1999/1967). In essence, the reason was a morbid and partly unintended marketing effort for Big Science sustained by Hiroshima, mutually assured destruction (MAD), and Apollo 11. Modern large scientific facilities such as the ESS clearly have less free advertising of this sort to rely on, and need an entirely different set of promises with which to market themselves and motivate the costs. These promises are not only of a scientific or technical nature (such as world-leading performance, good prospects of future Nobel Prizes, and spectacular deliverables), but expand into assurances of minimal environmental impact, predictions of tremendous synergistic effects for local and regional economies, and optimistic claims of wholehearted support from other countries' governments. It appears that deliberate marketing efforts, frequently run by marketing professionals, are important in giving large scientific facilities credibility, yet at the same time they seem largely disconnected from the actual purpose of the institution being advertised (in other words, the production of a particular type of knowledge), and from the realities of the untidy process of getting the job done. That these marketing efforts are influential in shaping the public discourse surrounding the ESS project is a given.

Claim #1: The ESS will become the world's best neutron source

> MAX IV and ESS complement each other, and make up *the world's best* facilities for materials science research.[2]

There is, quite simply, a whole range of possible threats to the prospects of the ESS actually achieving a 'world-leading position' in

fifteen years time or so, after billions of Euros having been invested. These threats can be divided into two main groups: technical and scientific; and political and economic. One need only glance at the general literature on the sociology of planning and organizing large, costly projects to see that examples of billion-Euro-projects being finalized on time and within budget are rare, and the reasons are naturally the repeated occurrence of unforeseen incidents that cost money and time (see, for example, Flyvbjerg et al. 2003).

Looking at historical examples of large scientific facilities similar to the ESS, a number of common pitfalls can be detected, all of which could potentially damage the prospects of becoming the 'world's best'. These include, but are certainly not limited to, funding shortages and organizational inefficiencies that are normally due to insufficient political will on the part of the funder(s), and not least secondary effects from unforeseen incidents involving third parties, such as delays in deliveries or in licensing and regulation processes. Especially when a large facility is subject to international collaboration, in which case most of the organizational and institutional framework for the construction and operation of the facility is determined by the mood swings and bureaucratic inertia of international political negotiations (Hallonsten 2012), several seemingly irrational chains of events may severely harm the prospects of achieving what might be technically and scientifically desirable and conceivable, and financially defendable. On top of this, of course, there are the myriad technical difficulties and pitfalls that are often entirely unforeseen and unavoidable, given the complexity and size of the technical systems of large scientific facilities like the ESS.

But although technical performance is crucial for the scientific productivity of facilities such as the ESS, it should be noted that even the largest accelerator, producing the most intense neutron beams, will not be able to support any ground-breaking science if it is not also equipped with all the seemingly peripheral, but in reality crucial, support mechanisms and arrangements for conducting well-functioning scientific experiments. And it is on this account that all the talk of a world-leading ESS becomes, if possible, even more uncertain than on the technical side, because many of the support structures are not even on the drawing board yet, and the requirements of the scientific

communities in this respect are not entirely known. The exact nature of optimal user support, sample handling, safety regulations, lodging and communications, and allocation procedures for experimental time—all of which are crucial details for any facility that wants to lay claim to being the world's best neutron source for science—is not known. And, it should be added, overperformance on any of these scores or on the technical side, while underperforming on others, might be highly inefficient and even wasteful.

In the case of ESS, still technically and organizationally 'in its infancy' (ESS 2010, 6), quite a few things lie between now and the start of operation, let alone success on all accounts: the outcome of intergovernmental negotiations; the possibility that any large European country might reorient its science and innovation policy; parliamentary elections; possible financial collapse and a further deepening Euro crisis; political resolution of environmental and energy issues; delays in procurement processes and deliveries; and, of course, the possible malfunctioning of critical technical components. In other words, while the claim that the ESS will be the world's best neutron source cannot be confirmed, it equally well cannot be refuted. It is sufficient for the purposes of this chapter to point out that any such claims are inadequate by definition, if they are not made with qualifications such as stating that it is the ambition of the ESS project to be the world's most advanced. A trivial point, really, since any other ambition would be laughable given the project's price tag.

Claim #2: Lund is the best site for the ESS, and the ESS will be of great benefit to Swedish science

> This is the greatest thing ever to happen to Swedish science.[3]

The ESS is solidly anchored in a strong European scientific and technological tradition in the area of neutron science, so there is no reason to dispute the claims that the realization of the ESS is crucial in order for Europe to keep its long-standing world-leading role in the scientific use of neutron scattering (for example, Tindemans &

Clausen 2003; ESS 2002; ESFRI 2003; 2008). When it comes to Sweden, however, the claims are rather more ambiguous. A messy task meets those who try to assess the strength of the Swedish scientific community in experimental work using intense neutron beams, since such use for experimental work supposedly spans several disciplines and subfields that do not always mention these neutrons when advertising their activities. A rough count of the number of Swedish users at the Institut Laue-Langevin (ILL) in Grenoble or ISIS at Harwell, compared with other countries and balanced by GDP or population, could perhaps give a clue, but the figures for ILL and ISIS are not public. The evaluation of Sweden's strength in science utilizing neutrons for experimental work will therefore have to rely on second-hand sources, of which there are a small number. One litmus test is the thorough investigation by Granberg (2012) of the conflict and collaboration generated by the ESS project in Swedish science so far. Granberg lists official responses by eighty-three organizations (including all of Sweden's universities and university colleges and all other public organizations performing or funding research) to the governmental report that outlined the preconditions for a Swedish bid to host the ESS, published in 2005. The then ESS-Scandinavia consortium's judgment on these answers was that 'a very large number' of the responses (some fifty) were 'positive or strongly positive' and that fewer than ten expressed concerns or criticism of the idea of a Swedish ESS bid (ESSS 2005). This, however, says little about scientific need or interest in the possible experimental resources provided by an ESS facility, but it is at least a rough gauge of the academic support for the ESS project, albeit now seven years out of date.

In total, thirty institutions identified by Granberg (2012) as 'academic' submitted formal comments on the investigation.[4] Two of them, the Karolinska Institute and Uppsala University, flatly rejected the idea of a Swedish bid for ESS. The Royal Academy of Sciences accepted the idea 'with strong reservations and critical comments'. Twenty-seven academic organizations were largely positive. Interestingly, all the positive responses, including the strongly favourable ones, were presented as conditional endorsements, expressing concerns about crowding-out effects and imbalances in the national research system, and demanding that investment in the ESS be

separate from the ordinary science budget. Umeå University, the Royal Institute of Technology, Mid Sweden University, Linköping University, and Luleå University of Technology in particular were very clear on these points. Of course, it should duly be noted that as in all countries, Swedish academia is characterized by a degree of conservatism and caution towards large discontinuous projects, and that caution of this type is to be expected in any national scientific community. Nonetheless, as a measure of Swedish demand for an advanced neutron spallation facility, the responses give a clue regarding the match or mismatch between the ESS project and the preparedness of Swedish scientists to make appropriate use of the ESS and its world-leading experimental resources. The fear of crowding-out effects should be taken as an indication that although Swedish academics are cautiously positive towards the ESS, the project is certainly not one of their top priorities.

In fact, there are also indications that Sweden is severely unprepared for the ESS scientifically and technologically speaking, and perhaps also with regard to science policy priority-setting. A vigorous campaign was pursued against the project in 2007–2008 by the Royal Academy of Sciences, in whose view 'the scientific motivation for an investment in ESS in Sweden is extremely poor' and it is 'incomprehensible, seen from a scientific and technical point of view' that the government was prioritizing the ESS over MAX IV (Öqvist 2008). One must ask why this protest did not mobilize support in other organizations or, for example, at the level of the Swedish Parliament, and there are no real clues as to how to answer this, but we can at least scrutinize the points made by the Royal Academy of Sciences.

First, there seems to have been some reason for the academic community's worry that the ESS would indeed financially crowd out another project cherished by large groups of Swedish physicists, namely the MAX IV Laboratory.[5] Back in 2008, when the future of both projects was highly uncertain, there were signs of direct competition between them. For example, the then minister for education and research, Lars Leijonborg, stated during a presentation of the 2008 research bill at the Royal Academy of Sciences that 'there won't be two accelerator facilities in Lund' (quoted in Sundqvist et al. 2008), which was taken as a flat-out rejection of the MAX IV

project in favour of the ESS. The proponents of the ESS, including government officials and representatives of the ESS-Scandinavia consortium, usually claimed (and still do) that MAX IV is a major selling-point to get other European countries to support the siting of the ESS in Lund, and that the April 2009 'decision' to fund and build MAX IV was a contributing factor in the May 2009 'decision' (of which more anon) to build the ESS in Lund.[6] But the claim is quite hollow, given that no particular effort was made by the government to make MAX IV a reality—quite the opposite, in fact, although the neglect was perhaps passive and indirect. The *de facto* competition between the ESS and MAX IV projects was noted by former university chancellor Anders Flodström in an investigation of possible approaches to financing and finalizing MAX IV in March 2009: since Sweden was (and is) pledging a great deal of money to the ESS and is actively seeking financial support for the ESS among the other Nordic governments, there was 'in practice' little or no room for direct Swedish or Nordic investment in MAX IV, 'possibly with the exception of Finland' (since Finland had declared itself uninterested in the ESS), and as a result, 'there is some competition at the national and Nordic level between MAX IV and the ESS-project' (Flodström 2009). Another experienced voice in the debate put the matter slightly differently. Erna Möller, then CEO of the Knut and Alice Wallenberg Foundation, one of the major financers of MAX-lab historically and now a large donor to MAX IV, was asked by a newspaper in May 2009, 'Is the government frankly counting on the foundation's support for MAX IV and therefore neglecting the project in favour of the ESS?' Her answer was indeed thought-provoking: 'I have asked them. They didn't answer, but we're not stupid. We get it' (quoted in Ek 2009). In its 2012 guide to research infrastructure, the Swedish Research Council raised doubts about the benefits of ESS for Swedish science and warned of crowding-out effects:

> The larger benefit from the ESS in Sweden is expected to be regional growth, business development, and other socio-economic gains, and therefore it is important that other research areas are not charged with additional costs for the localization of the facility in Sweden. (VR 2011, 32)

There are historical reasons both for the apparent limits to the Swedish government's generosity towards large science facility projects (though this also is quite natural—science policy is always about priorities), and the scientific community's worries about crowding-out. Ever since Prime Minister Olof Palme in 1972 referred the question of Swedish participation in CERN II (and thus the responsibility for bearing its large costs) to the scientific community by calling it 'a wholesome exercise in determining research priorities' (Widmalm 1993, 121), Swedish investment in large scientific facilities and projects has been, most of all, a question of priorities within the scientific community.[7] Edqvist (2009, 135–6) makes the same historical connection by asserting that in 1997, the then minister for education and research Carl Tham's questioning of the utility of Swedish membership of CERN compared to other possible uses for the money was indeed well-founded, because it led to scrutiny of the question and eventually to consolidation of the support for that particular priority. The ESS project, however, has not been thoroughly examined from a scientific point of view and not weighed properly against other possible investments, argues Edqvist (2009, 135), but is rather founded in an ambition to increase visibility and prestige, as well as in considerations of regional development. In 2009, the government's strategy seems to have been to make it appear as if the ESS project would not compete for the Research Council's money, but experience shows it eventually will, argues Edqvist, given the need for international recruitment and similar investments to make Swedish research prominent and competitive in neutron-related areas. The crowding-out effects that most certainly will come may therefore pose a threat to the breadth and quality of Swedish science as a whole (Edqvist 2009, 136).

On a more general note, it can be concluded that nobody should really expect the ESS not to have any displacement effect on Swedish science as a whole. One of the reactions from the domestic neutron user community on the 'decision' in May 2009 was that an ESS located in Lund would mean a shift in balance between different areas of Swedish science, in favour of science utilizing neutron beams. And this is, furthermore, quite logical: it could easily be argued that not mobilizing in favour of such scientific fields when there is the prospect of having a very advanced neutron source in one's backyard

would be irresponsible, even if it means harsh internal priorities and (unavoidable) displacement effects. Priorities, strategic mobilization, and concentration of resources are common themes in the current Swedish government's science policy regime, in international trends in the same area, and in one dominant school of thought in international research policy. None of these see priority work as harmful in itself, but rather a necessity in the face of globalization. Instead, the question is whether the science made possible by intense neutron beams is the right area to prioritize in Sweden. Quite naturally, no absolute answer can be given, but, as is evident, some would clearly say 'probably not'.

The question can also be related to the issue of how one might assess the prospects of the ESS really becoming a world-leading neutron scattering facility. Speculating on the basis of the asserted strength of European neutron-based science, one might ask why none of Europe's science giants—France, Germany, or the UK—wanted to host the ESS. Perhaps the project is judged too uncertain, scientifically or technically, but it is clearly not within the scope of this chapter to speculate about this. On the other hand it can be argued is that if Europe is to maintain its lead in neutron-related science without any significant loss of momentum, it should perhaps have decided to locate the facility in a country already established as a stronghold of neutron-based research. But then, it should be remembered, such rational strategies often fall by the wayside when high-level politics is to have its way.

Claim #3: On 28 May 2009, representatives of a number of European governments decided to build the ESS in Lund

> It is now definite that the research facility ESS (European Spallation Source) will be built in Lund.[8]

The exact details of what was decided in Brussels on 28 May 2009 is shrouded in mystery, as is the discussion that preceded it, and we can only guess what the various European governments really

pledged or promised through their delegates.[9] It is clear, however, that in early 2013 the ESS still had only two member countries (and shareholders): Sweden and Denmark. The commitments of other countries are still limited to (non-binding) declarations of intent. The main document regulating this intent, and from what one might deduce its strict legal meaning, says nothing more than that the undersigned 'wish to enter into' the ESS project and 'signal their intention to participate'. Crucially, the document also, states:

> The Present Memorandum of Understanding implies no legal commitment for the construction and operation of the European Spallation Source but the ESS Partner Countries signal their best intentions to pursue these goals. (ESS 2011, 1)

Nonetheless, the de facto decision to build the ESS in Lund may well have been taken in Brussels on 31 May 2009, despite no legally binding commitments by European countries to participate and contribute to financing the facility, and despite no other proper documentation of such a decision other than word of mouth. What speaks against this is the precedent of European scientific collaboration: history shows that promises of participation, threats of withdrawal, and changes to seemingly definite siting plans routinely come and go in the process by which European collaborative Big Science facilities come into being (Hallonsten 2009, 211–21; Hallonsten 2012).

Ever since the creation of CERN in 1954, Western Europe has kept its competitive position in international Big Science largely by intergovernmental collaboration, and a series of laboratories, facilities, and organizations have been launched.[10] Interestingly, however, these collaborations in 'basic science' have not been subject to coherent policy-making and have been entirely left out of the EC/EU collaboration.[11] According to some analysts, this has contributed to the success of many of the projects, as they have been left untouched by bureaucracy and institutional inertia (Hoerber 2009, 410; Gaubert & Lebeau 2009, 38; Papon 2004), but it has also created a pluralistic and incoherent system of organizations and centres, and an opaque and cluttered policy field (Hallonsten 2012;

Krige 2003). Collaborations are based on ad hoc agreements and are the result of processes involving a great degree of political improvization, and frequently the fate of the project is largely decided by the broader (geo)political situation in Europe at the critical moment. A few historical examples—and there are only very few examples comparable with the ESS—will serve to illustrate this.

Most obviously, CERN was at least as much a political project as a scientific one—the US wanted to secure its influence over (Western) Europe also in realms besides the military, and a collaborative effort in non-weapons nuclear research was a giant leap towards reconciliation after the War (Krige 2006). The process by which it came into being, extensively chronicled by Hermann et al. (1987; 1990) involved political manoeuvring on several levels. Its upgrade programme in the 1960s, however, is a more spectacular example, because it involved threats of complete withdrawal by major contributors over site selection and soaring costs (Pestre 1996; Krige 2003). From the 1960s onwards, site selection became a critical issue in the negotiations, since projects had generally grown big enough to promise substantial economic benefits to host countries, while simultaneously *les trente glorieuses* came to an end and economic austerity took a hold. The European Southern Observatory (ESO) was not touched by such problems since it was destined for a location outside Europe, but it was nonetheless delayed by a decade as a result of the political strains between France and the UK in the 1960s (Woltjer 2009). The reason the ILL ended up in Grenoble is normally said to have been low electricity costs, but there are also rumours that it answered the need for a reconciliatory agreement between Charles de Gaulle and Konrad Adenauer (Hallonsten 2012). Russia's substantial financial contribution in 2007 to the European X-ray Free Electron Laser (XFEL) in Hamburg, saving the project from a slow death due to a funding shortage, reportedly came to mark a display of unity by Angela Merkel and Vladimir Putin at a summit meeting otherwise described as frosty (Hallonsten 2012). The siting of the ESRF in Grenoble, decided behind closed doors by France and Germany (the two main donors to the project), came at a time when relations between the two countries were as healthy as ever and European mobilization in science and technology was

at its height, but it caused resentment among other prospective member countries who had hoped for a 'scientific' site selection procedure—meaning a transparent process, with the site chosen on the basis of clearly stated criteria—and the end result was only reluctantly accepted (Hallonsten 2009, 217). And in all cases, it is quite clear that the final go-ahead was not given until the funding question had been resolved.

Hence, although there are many reasons for attempting to follow a rational procedure when establishing a facility like the ESS on the basis of intergovernmental collaboration, there are almost no historical cases to support the notion that this would even be possible. In February 2009, as expectations in Lund grew that the spring would indeed bring a breakthrough for the Swedish ESS candidature, the chief negotiator Allan Larsson laid out the following prospective chain of events in a newspaper interview:

> As I understand it, there are expectations for a decision in May on a location for the facility. Then a decision has to be made regarding the technology to be used. This is expected to cost SEK250 million, the Swedish government has guaranteed this money, and it will take two years. When this is done in mid-2011, the funding question has to be resolved. And by that time, England and Germany will present their research investment budgets. (Quoted in Samuelsson 2009)

Apart from the fact that we know now that this timetable has not been followed, there is reason to question the likelihood that a decision like this could really be taken in such an orderly fashion. The example of the ESRF provides some further clues. The formal go-ahead in 1984 came in the shape of an agreement between France and Germany to jointly contribute over 50 per cent of the funding, given that they could decide on a location. The deal was combined with an agreement on another research facility with a significantly more 'applied' focus and hence a clearer industrial connection, the European Transonic Wind Tunnel (ETW), which by this deal was located to Cologne in Germany and funded by a similar arrangement between the two countries. That the ESRF

was thus considered the second prize in the deal might have been what gave France the liberty to make a last-minute change to the planned site from Strasbourg (conveniently close to the German border) to Grenoble, which came about by a combination of local pork-barrel politics in the Isère region and expectations of a future synergistic relationship between the new facility and the existing ILL (Hallonsten 2009, 217). Interestingly, the announcement of the Franco-German agreement came in the midst of a lengthy 'scientific' site-selection process for the ESRF, conducted by the provisional council and engaging a range of experts in assessing the strengths and weaknesses of various candidate sites, among which Trieste in Italy and Copenhagen in Denmark were reportedly about to come out as the strongest. These countries, as well as several other prospective members, were completely taken by surprise. The announcement of the Franco-German agreement completely undid the work of the 'scientific' site-selection process and turned the tables radically by creating a situation where the ESRF would have to be built in Grenoble or not be built at all. And this because the investment pledged by France and Germany could neither be matched by any other country involved, nor would be invested in the project if France and Germany did not get their way. Other countries that had promoted their own sites were now in a political trap. If they withdrew from the project, they would appear indifferent to its scientific prospects and merely interested in the pecuniary benefits of hosting the facility. Country after country felt obliged to join, and in early 1985 a Memorandum of Understanding between five major participants (France, the Federal Republic of Germany, Italy, Spain, and the UK) was signed.

The parallels between the 1985 Memorandum of Understanding and the 2009 Memorandum of Understanding on the ESS are clear, and since the ESRF opened to users only nine years later, it can of course be argued that a de facto decision was made in 1985, and thus it was a de facto decision on the ESS in 2009. Yet it should be noted that the ESRF was not at all a done deal in 1985. The Memorandum of Understanding expired two years later, and close to the deadline it was still very uncertain whether the budget contributions from member countries would be sufficient to cover all

the projected costs. Efforts towards the end of this two-year period to save the project resulted in severe imbalances that still plague the collaboration, but that are nearly impossible to change because it would mean a completely new round of negotiations, the outcome of which would be at best uncertain. Just as in the negotiations leading up to the creation of the ESO and the ILL in the mid- to late-1960s (and, for that matter, in EC negotiations in the late 1970s), the UK put obstacles in the way by demanding to pay less than what would normally be expected given their relative economic strength and prominence of their scientific community. Italy, for its part, was lured into paying much more than what would normally be expected. The Nordic countries, meanwhile, came off cheaply (Hallonsten 2009, 219–21).

There are four principal lessons to be learned from this episode. First, 'decisions' of different sorts may well be made along the way without being a guarantee of anything. Second, pledges to cover the majority of the funding, preferably involving influential countries capable of paying large shares, such as France and Germany, are helpful in reducing uncertainty somewhat. Third, site selection—if not predetermined on the basis of other considerations, as for the ESO or the XFEL[12]—goes hand in hand with such funding pledges. Fourth, no matter what the official process of site selection may be, surprises in the shape of demonstrations of power on the part of the major players may come at any time. Add to this the historical precedent of high-level politics mirrored in the key decisions on Big Science projects (for example, Franco-British rivalry in the 1960s, Franco-German friendship in the 1970s and 1980s, and German–Russian conflicts and attempted reconciliations in the 2000s), and one might well ask what urgent political need on the European scene anno 2013 could possibly provide the impetus for a decisive event in the negotiations over the ESS? A distraction manoeuvre?[13]

Regardless, knowing how large collaborative European research facilities have come about in the past and the lack of any sign that the ESS project would be any different in this respect, we can conclude that nothing—or not much—was actually decided on 28 May 2009. This is mirrored in the bilateral agreements between the Swedish

government and other countries, for example the Swedish–German agreement which contains the following passage:

> On the basis of a successful redesign Germany is in principle ready to contribute to the ESS financially with a mix of in-kind and cash contributions in the range of 10–13% according to the current cost estimates. This commitment does not prejudice the final decision about the financing of ESS after the redesign. (Swedish-German agreement 2009)

This means in essence that Germany will decide whether it will invest, and if so, how much, only after the revised technical design has been finalized. Sweden has made similar agreements—or at least, the ones known of at the time of writing—with Estonia, France, Latvia, Lithuania, Poland, and Spain; none containing estimated figures for the countries' involvement beyond 10 per cent of the future costs of ESS construction.

Concluding discussion

In a recent article examining the public promotion of the ESS project by its proponents, Agrell (2012) wonders whether this promotion effort is a matter of 'selling' or 'overselling', or whether the ESS is in fact 'already sold'. Indeed, Agrell notes, there has been an aggressive strategy of 'selling' the project and a defensive effort to counter expected criticism, but as it turns out, much of this seems to have been in vain, because thus far public resistance to the project has been negligible. The conclusion seems to be that the proponents of the ESS have been engaged in 'overselling', despite the fact that the project seems to have been 'already sold'.

Perhaps this can help to explain why the three claims examined in this chapter have been so readily accepted in the public debate on the ESS (or lack of it) and that there is hence a need for a book chapter like this to nuance the oversimplified official image.

Of the three examined claims, only the third can in fact be bluntly refuted as untruthful, and even then it is with a reservation. In the future, when the history of the political process to decide upon the

location of the ESS is fully analysed, then 28 May 2009 may indeed be identified as the crucial moment in the process, and possibly even identified as the date when the de facto decision was made.

The first claim is neither confirmed nor refuted here, but rather disapproved of because it is simply inadequate. Some readers will certainly assert that such claims can never be made without qualifications along the lines of 'the ambition is that...' and that such qualifications are hence implied, and have been so all along. If this is indeed the case, this chapter's scrutiny of the first claim is superfluous and can be overlooked, with no damage done.

The second claim is both very important and very interesting. It is neither confirmed or refuted here, and the discussion has rather remained on the level of the correlation between the prospects for the ESS facility and the preparedness of Swedish science to make use of those prospects, and what this means in terms of the real danger of crowding-out effects. It deserves reiterating that crowding-out is not necessarily a bad thing, as it can (or should) be viewed as a natural effect of priority-setting. Either way, it is certain that any discussion of the second claim can only offer preliminary inferences, and a proper evaluation will need to be made *ex post*, benefiting from longitudinal data. The issue would also likely benefit from a continued discussion of topical events in the coming years, as the ESS comes into being. This chapter thus ends with the hope that further analysis of the matters discussed in response to the second claim, as well as the substance behind other questionable assertions regarding the ESS project not covered in this analysis, will be given proper attention in future studies.

Notes

1 In principle, the discussion of what constitutes the quality and performance of a large research facility, advanced under the first claim below, applies to MAX IV as well. In short, one can say that intentions to build a world-class facility are worth very little if resources are not supplied to an extent that matches these intentions.
2 Official video advertisement (Region Skåne 2011), emphasis added.
3 News report, 31 May 2009, on the 'decision' to locate the ESS in Lund, quoting the Swedish minister of education and science Lars Leijonborg (Fagerström 2009).
4 The universities and university colleges, in alphabetical order, were Chalmers University of Technology, Gävle University College, Halmstad University College,

Jönköping University College, Kalmar University College, Karlstad University, Karolinska Institute, Kristianstad University College, Linköping University, Luleå University of Technology, Lund University, Malmö University College, Mid Sweden University, Mälardalen University College, Örebro University, Royal Institute of Technology, Skövde University College, Stockholm University, Umeå University, the University College of Trollhättan and Uddevalla, University of Gothenburg, Uppsala University and Växjö University. Other academic organizations considered were, in alphabetical order, the Swedish Confederation of Professional Associations, the Swedish Foundation for Strategic Research, the Royal Swedish Academy of Engineering Sciences, the Royal Swedish Academy of Sciences, the Swedish Neutron Scattering Society, the Swedish Research Council, and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning.

5 MAX IV is the next-generation synchrotron radiation laboratory currently being built in Lund, continuing a three-decade tradition at MAX-lab of providing Swedish, Nordic, and international materials and life scientists with state-of-the art synchrotron radiation instrumentation. Unlike the ESS, the MAX IV facility has grown gradually, bottom-up and on the basis of proven experience at the existing MAX-lab, with very little high-level political support (see, for example, Benner 2012; Hallonsten 2011). For a comprehensive account of the history of MAX-lab, see Hallonsten 2011, and for a brief historical contextualization of MAX IV including developments up to 2008, see Hallonsten 2009, 197–203.

6 In 2009, a Memorandum of Understanding was signed between the Swedish Research Council, the Swedish Agency for Innovation Systems, Skåne Regional Council, and Lund University stating that this 'Gang of Four' would jointly fund large parts (initially SEK750 million) of the MAX IV Laboratory and work together to secure additional funding necessary for the project's realization (Lund University et al. 2009). Two years later, the Knut and Alice Wallenberg Foundation issued a large grant of 400 million SEK for instrumentation at MAX IV (KAW 2011). In an international perspective, this composite funding model and the fact that only part of the funding for the facility is guaranteed at the start of construction (VR 2011, 32, 71–2, 102–103) is highly unusual. In most, if not all, similar cases internationally, funding has been provided in the shape of substantial governmental financing. There is no reasonable cause for this not being the case in Sweden other than the government's prioritization of the ESS over MAX IV, although it should be added that the government has taken no action to prevent MAX IV from being built.

7 Swedish membership of CERN II, the ESRF, the ILL, and the ESO, as well as the national facilities MAX-lab, Onsala Space Observatory (and formerly Studsvik, the Svedberg Lab, and the Manne Siegbahn Institute) are all funded 'within existing frameworks' (a phrase commonly used in research bills, see, for example, Governmental Bill 2004/05, 72–3; Governmental Bill 2008/09, 2, 207, 210). This means in essence that decisions are left to the scientific community, through its representation on the Swedish Research Council, because the Swedish Research Council is traditionally the only source of money for these projects and collaborations. This state of affairs is the principal root of the eternal problem of suboptimal funding of MAX-lab (for an extensive account of this, see Hallonsten 2011), because no one is in principle ready to pay up front; only reluctantly, at a stretch, and after lengthy negotiations.

8 3 June 2009 press release from Lund University (Lund University 2009).

9 News reports state that the meeting lasted four hours, that the delegations of the candidate countries (Hungary, Spain and Sweden) left the room for some of the meeting, and that eventually 'seven of the countries present' articulated support for Sweden whereas none backed Hungary or Spain (Fagerström 2009; *SkD* 2009).

10 For example, the Joint Research Centre within the framework of Euratom (established 1957), the European Space Research Organization (ESRO) (1962), the European Launcher Development Organization (ELDO) (1962), the European Southern Observatory (ESO) (1962), the European Science Foundation (ESF) (1973), the European Molecular Biology Laboratory (EMBL) (1973), the European Space Agency (ESA) (1975), the Joint European Torus (JET) for fusion research (1977), the Institute Laue-Langevin (ILL) for research with neutrons (1967), the European Synchrotron Radiation Facility (ESRF) (1988), and the European X-ray Free Electron Laser (XFEL) (2009) (Herman 1986, 150–9; Krige 2003, 899; Papon 2004, 64–5).

11 Until only recently, at least. The launch in 2000 of the Lisbon Strategy to establish Europe as the world's leading knowledge-based economy by 2010 brought with it some EU initiatives in the area of research infrastructure, most notably a budget item of €200 million within the Seventh Framework Programme (FP7) for infrastructure projects' preparatory phases—the activities that forego intergovernmental agreement and that thus normally lack a funding source (ESFRI 2008). So far, 34 projects have been supported in their Preparatory Phases (including ESS and XFEL). Some research infrastructures are also automatically eligible for investment loans from the European Investment Bank, by decree of the European Commission (ESFRI 2009; European Commission 2010). In addition, the European Commission's European Strategy Forum on Research Infrastructures (ESFRI) coordinates and formulates strategy, with no decision-making power and no discretionary funding, but with some informal authority over priorities on European level through its *Roadmap for European research infrastructures*, issued biannually (ESFRI 2006; 2008; Tindemans 2010). The ESFRI chair Carlo Rizzuto has expressed wishes to reach the stage of discussing actual funding of research infrastructure by a tenfold budget increase in FP8 (Jimenez 2010).

12 The ESO was, for scientific reasons, destined for a location in the Southern Hemisphere, outside Europe. The XFEL has been planned and designed from the start to suit a specific location outside Hamburg in Germany.

13 One can at least be sure that Greece, if at all entering the ESS collaboration, will do so on a level not decided by itself but, very likely, by France and Germany together.

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