Neutrons for the 21st Century: The European Spallation Source

Newsletter

December 2001

Outcome of the 7th ESS General Meeting held in Seggau, Austria, September 2001

The European Spallation Source (ESS) project aims for a decision in 2003 to build a unique third generation neutron source, according to a schedule which will allow start of operation in 2010. That the ESS is in a very active state became evident at the 7th ESS General Meeting held at Seggau Castle in Styria, Austria, on September 26-29, 2001. About 130 participants and more than 50 oral presentations dealt with the design and technical aspects of the facility. The meeting focused on the progress of the ESS project and the efforts required to achieve the milestones of the project. The first day was devoted to the presentation of the American and Japanese projects which are already under construction, and to an extensive overview of the status of the ESS project. The second day concentrated on detailed technical presentations and discussions of the ESS study. It was arranged in three parallel sessions – accelerator and ring, target stations and instrumentation. Leading experts in the fields chaired these sessions, and presented summaries of them on the last day of the meeting. Science and science-political issues were also discussed.

The main goal of the meeting was to progress towards a new ESS reference design. Concerning the technical aspects of the project there are four different topics: the 10 MW accelerator, the compressor rings, the two target stations and the instrumentation. At Seggau it became clear that both a normal conducting and a superconducting linear accelerator could fulfil the specifications for the ESS. The normal conducting reference design has been worked on extensively; it is robust and feasible. The superconducting option has the potential to be a better solution but will require more detailed development work. As to the compressor ring, the meeting confirmed that the modified 1996 design was clearly the preferred solution. The ESS will have two individually optimised 5 MW target stations: (1) short pulsed at 50

Hz and (2) long pulsed at 16.7 Hz target. With this overall design the ESS will be unique and will to excel over the other projects in progress.

Latest news from the COUNCIL Chairman

The Council has worked hard since the Abingdon meeting in June to progress the ESS project. We are now all set to work towards the ESS presentation next May 2002 (see elsewhere in the newsletter) and the work programmes for 2002 and 2003. A special council meeting took place at Schiphol Airport in October this year.

To do justice to the major tasks that are on our table and to the contributions of major partners, we have created a Project-Directorate of four directors (see elsewhere in the newsletter).

The accelerator part of ESS is an area where thanks to the work of the ESS team under Ian Gardner and the CONCERT team under Jean-Louis Laclare, we have a number of options; a sort of embarrassment of riches, to quote Jonathan Israel's history of the Dutch Republic. Where there are options there is debate! Therefore the council has indicated a procedure for arriving at a decision on what to present in May. We have a normal conducting solution that will do the job for us. But inside and outside the council there are many people who believe that a superconducting option might be superior. The Seggau meeting, however, clearly pointed out that on current evidence the differences are not that clear cut. So the council wants to see from the Project-Director, in collaboration with his colleagues in the Directorate, more evidence on the advantages of a superconducting solution. This will define the work for the next few months. The newly appointed Technical Advisory Committee that will meet at the beginning of January 2002 will certainly give critical input to the Project Directorate and the council on the various options. The council will then decide early next year on what to present.

This already introduces a third important element: the council decided on the composition of the TAC. You will find more details elsewhere in this newsletter.

There has also been a lot of discussion on the political position of ESS. There was an OECD Global Science Forum meeting in Copenhagen that was not only focused on neutron sources; there have been discussions on AUSTRON; ENSA has continued its work on the neutron landscape; in Germany the Wissenschaftsrat is gearing up for its assessment of some nine large projects in which German labs are involved, including the ESS project. In a later issue more space can be devoted to these

important discussions. Two things stand out, however, very clearly. ESS is not only among the big projects under consideration in Europe, and the only truly European one, it is also a project that is grounded firmly in a widely accepted global strategy. As the Copenhagen meeting agreed, the number of neutron sources has already declined faster than anticipated in 1990 when OECD ministers endorsed a global neutron strategy. This underlines the necessity for building the ESS now, to supply Europe's community of neutron researchers in what will then be the top facility in the world. The hope that some people understandably express, that for example SNS can for a long time and in large measure accommodate European needs, was firmly contradicted by representatives from the SNS and the US DoE at the Copenhagen meeting.

This points to a second issue: European users and facilities must accept that we have to focus our resources in order to develop and realise front ranking neutron facilities. This sometimes amounts to a hard message, but in the reality of governments and science agencies it is one that counts.

Peter Tindemans

ESS Organisation

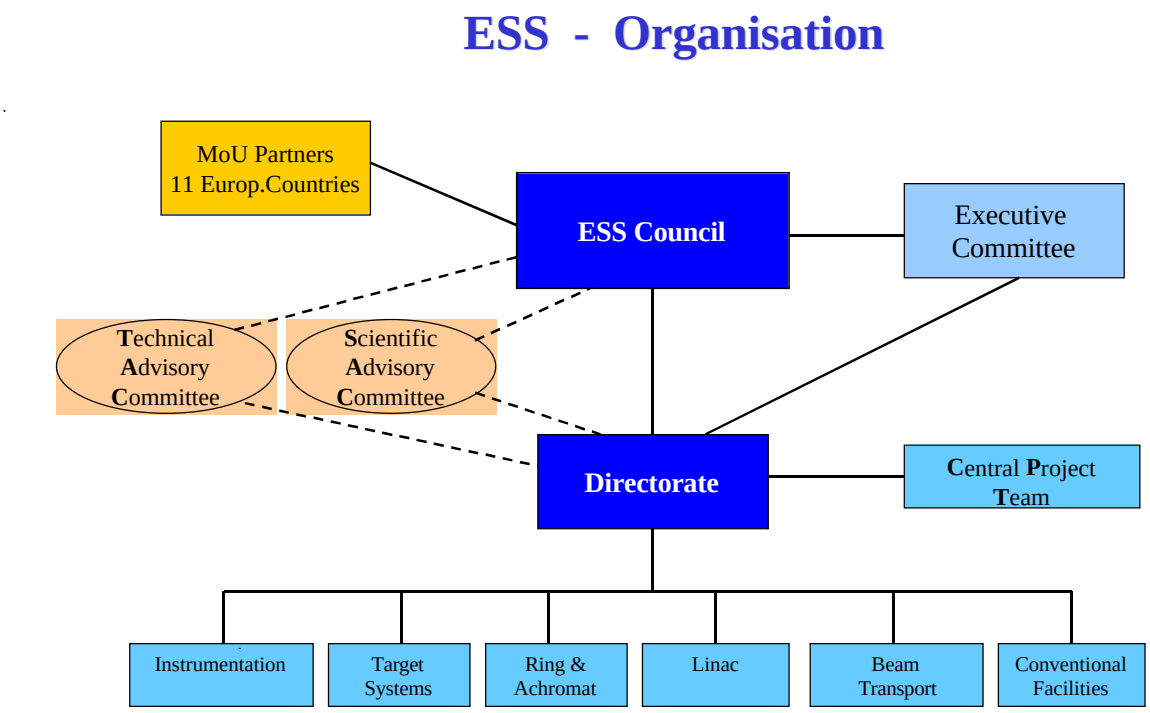
From the organisational point of view, many things are changing within the ESS project management, which is now formed by the following committees:

- Council
- Executive Committee (EC)
- Project Directorate (PD)
- Science Advisory Committee (SAC)
- Technical Advisory Committee (TAC)
- Technical Management Team (TMT) – the former Core Group

The most important change is the establishment of the Project Directorate, formed by four Directors:

- Kurt Clausen, Risø, Denmark
- Ian Gardner, ISIS, UK
- Jean Louis Laclare, CEA, France
- Dieter Richter, FZ Jülich, Germany

Jean Louis Laclare is the Project Director and has responsibility for the superconducting linac and infrastructures. Kurt Clausen has overall responsibility for the targets and the instrumentation and for the ESS presentation in May 2002 in Bonn (see below). Ian Gardner has responsibility for the normal conducting linac and the overall costing of the project. Dieter Richter is the Science Director, with the role of promoting the ESS in the scientific community and continuing to develop the scientific case. The Directors manage all technical and science work for ESS as well as the support for publicity, external presentation and other areas relevant to the project.



The ESS Council is formed by representatives of the laboratories of the ESS collaboration of 11 different European countries.

Members	
A. Belushkin	JINR Dubna, Russia
F. Barocchi	INFM, Italy
R. Cywinski	ENSA
R. Eichler	PSI, Switzerland
M. Fontanesi	CNR, Italy
F. Gounand	CEA, France
R. Feidenhans'l	Risø, Denmark
H. Klein	University of Frankfurt, Germany

E. Koptelov	Troitsk, Russia
H. Rauch	Atominstitut Wien, Austria
D. Reistad	University of Uppsala, Sweden
D. Schildt	EPSRC, UK
U. Steigenberger	Secretary
M. Steiner	HMI, Germany
A. Taylor	CLRC, UK
P. Tindemans	Chairman
A. Verkooijen	IRI, Netherlands
R. Wagner	FZ Jülich, Germany
F. Yndurain	CIEMAT, Spain

The ESS Council includes a number of official observers:

Observers:	
T. Mason	SNS Project, USA
S. Nagamiya	JSNS Project, Japan
G. Ricco	INFN
N. Williams	ESF
NN	EU

The Project Directorate also attends the council meetings.

The Executive Committee comprises the Council Chairman, the Council Secretary and the four Directors and forms the day-to-day link between the Council and the Directorate.

Technical Advisory Committee

The Technical Advisory Committee contains five groups with a total of 17 scientists involved. Their role is to advise the ESS Council on technical aspects of the machine.

• Chairman	G. Lander	ITU, Germany
• Conventional facilities	J. Lawson	SNS, USA
	J.P. Magnien	ESRF, France
• Instruments	W. Press	ILL, France
	P.Böni	FRM II, Germany
	M.Arai	JNS, Japan
	D.Myles	EMBL, France
• Linac, beam transport:	R. Garoby	CERN, Switzerland
	D. Proch	DESY, Germany
	J. Stovall	LANL, USA
	Y. Yamazaki	KEK, Japan
• Rings, painting and beam transport	H. Schönauer	CERN, Switzerland

	B. Weng	BNL, USA
• Target	J. Carpenter	ANL, USA
	M. Furusaka	KEK, Japan
	K. Jones	LANL, USA
	J. Knebel	KFK, Germany

Scientific Advisory Committee

The Scientific Advisory Committee consists of the representatives of each Science Group – and has 11 members. The role of the SAC is to advise the ESS Council on scientific aspects of the ESS applications.

• Chairman	D. Richter	FZ Jülich, Germany
• Biology and Biotechnology	J.R. Helliwell	Univ. Manchester, UK
• Chemical Structure, Kinetics	W.I.F. David	ISIS, UK
and Dynamics	H. Jobic	Univ. Lyon, France
• Earth Science, Environmental	R. Rinaldi	Univ. Perugia, Italy
Science and Cultural Heritage		
• Fundamental Physics	H. Rauch	Atominstitut Wien, Austria
• Liquids and Glasses	R.L. McGreevy	Univ. Uppsala, Sweden
	F. Mulder	IRI Delft, The Netherlands
• Materials Science and	H. Zabel	Univ. Bochum, Germany
Engineering	T. Lorentzen,	Danish Stir Welding Tech. Denmark
• Soft Condensed Matter	J. Colmenero	Univ. San Sebastian, Spain
• Solid State Physics	C. Vettier	ILL, France
	A. Furrer	PSI, Switzerland
	B. Cywinski	Leeds, UK
	C. Fermon	CEA, France
	B. Stirling	ESRF, France
• SNS Project	T. Mason	SNS, USA
• JSNS Project	S. Ikeda	KEK, Japan

Task Groups

The ESS work has been divided into six individual tasks headed by the following task leaders:

	Leader	**Deputy**
Instrumentation	F. Mezei (HMI, Germany)	R. Eccleston (ISIS, UK)
Target systems	G. Bauer (FZJ, Germany)	T. Broome (ISIS, UK)
Ring and achromat	C. Prior (ISIS, UK)	
Linac	A. Mosnier (CEA, France)	
Beam transport	R. Maier (FZJ, Germany)	

Conventional facilities P. Giovannoni (CEA, France)

Public Launch of the ESS Project

The ESS Project will be presented to the scientific community, politicians and decision makers at a European ESS Meeting next May 16-17, 2002, at the former German Parliament in Bonn. Neutron users from all over Europe will be invited to support the project. The key event will be in the afternoon of May 16 with high level presentations on the scientific, technical and political status of the ESS as well as on the site proposals for hosting the ESS. On Friday 17 May there will be more detailed and more specific scientific presentations on the opportunities that the ESS will open up in different scientific areas. A number of satellite activities are planned on Wednesday 15th May and on the afternoon of Friday 17th May: poster sessions, meetings of the national neutron scattering association, networking meetings and a meeting of the Neutron Round Table.

This meeting is a key event in the ESS Project. Mark this date in your diary!

For further information please consult http://www.ess-europe.de

News from the Scientific Advisory Committee (SAC): Next steps to the Final Science Case and the choice of Day One Instruments for the ESS

As reported in the last ESS newsletter, the SAC workshop in conjunction with the 3rd SAC Meeting in May 2001, in Engelberg (Switzerland) ended with the recommendation of SAC to build the ESS facility with a 50Hz short pulse target station and a $16^2/_3$Hz long pulse target station, both at a level of 5MW proton beam energy with equal priority. In its meeting on June 15, 2001, in Abingdon, the ESS Council followed this recommendation.

The workshop led to a new approach to the science case by focussing on threshhold areas and experiments in the different science fields which are accessible by ESS. The reports on the disciplinary science case were published a few weeks after the workshop in a Progress Report on 'Scientific Trends in Condensed Matter Research

and Instrumentation Opportunities at ESS' which is available on the ESS web site (http:\\www.ess-europe.de under 'Documentation').

In November 2001 the 4th SAC Meeting took place at the ILL in Grenoble, France. There further steps were taken towards the final science case and the instrumental layout of the ESS.

The SAC concluded that the ESS science case should also address contributions of the ESS to priority research missions and thus demonstrate how the ESS will contribute to the societal needs in Europe. Nine research missions were identified, which are widely supported by the European Union as well as by many European countries. It will be the task of the upcoming SAC workshop in March 2002 to finalize the science case and to position ESS in the context of science, technology and society.

The second major goal of the 4th SAC meeting in Grenoble was the selection of 'Day One Instruments' for the ESS. Since the ESS will be a science driven facility, input from the different science groups was important. To define the science demands on the ESS instrumentation each science group provided a priority list of instruments based on the flagship areas and experiments which are described in the Engelberg reports. The evaluation of the priority lists from the different science groups is illustrated by the blue bars in Fig. 1 for instruments at the long pulse target station. Selecting the instruments with a score higher than the mean value, represented by the blue horizontal line in Fig. 1, one obtains a proposal for an instrument suite with five instruments at the long pulse and eight instruments at the short pulse station.

Since in this evaluation procedure the demands of each science group were given equal importance, a different approach was made by applying weighting factors for the demands of each science group. These weighting factors were obtained by evaluating the statistics of requested beam times at the ILL in Grenoble in April 2001. The red bars in Fig. 1 illustrate the results of this procedure for the instruments at the long pulse target station. Now, only three instruments score higher than the average (red horizontal line). However, the list of six instruments with the highest scores, extracted from Fig. 1, again contains the five instruments one obtains without weighting factors, plus the Diffuse Scattering instrument.

This weighting experiment shows that the selection of instruments is more or less independent of the weighting factors. The same holds for the instruments at the short pulse target station.

The list of instruments derived from the science demands of the different science groups was therefore taken as a sound basis for discussion.

The final list will be worked out taking into account other aspects like novel instrumentation and the demands of emerging science fields like biology for which the importance of neutron scattering is growing rapidly.

Fig. 1: Instrument priorities at the long pulse target station with (red) and without (blue) weighting factors.