

UK ESS Instrument Project

Business case

The UK-ESS business case describes the requirement for UK participation in the ESS. The UK has the largest and most productive neutron scattering community in Europe and this community needs access to the best capabilities to maintain our competitive advantage in materials science. Both ISIS and ILL are oversubscribed by a factor of roughly two – meaning that there is significant high-quality demand to fully occupy two facilities of each type. ISIS, as the UK national facility, is 75% used by the UK and 25% through international partnerships. It provides for about 2/3 of the UK use of neutrons.

The ESS will provide unique capabilities to this community to perform leading materials research in the basic and applied physical and life sciences. To efficiently support this community requires access to the ESS and existing operational facilities. This grouping of facilities will provide sufficient access to deliver the capacity requirements of the community. The ESS will not be able to deliver this level of capacity on its own particularly when considered against the predicted background of neutron availability within Europe in the coming years.

The desirability of including instrument delivery in the project is based on the UK's leading experience in spallation neutron instrumentation.

This experience has numerous benefits to the success of the ESS:

ISIS has unparalleled expertise in spallation instrument builds. Spallation instrumentation has numerous characteristics which are not necessarily shared with reactor based or synchrotron x-ray instruments and therefore it is important that these differences are accounted for. It is likely that at least one of the beamlines will be in the first phase of instrumentation at ESS. The importance of this is that it presents an opportunity for ISIS to share its experience of instrument builds with the ESS and its in-kind partners. This will help the ESS in its approach to instrument builds and to minimize the optimism bias prevalent in all projects. As partners in the ESS it is essential that the UK community has access to a suite of highly performing instruments and our engagement with the instrument builds will help ensure this.

ISIS has unique knowledge of operating and maintaining spallation instrumentations. Reliable operation and availability of the beamlines is key to the scientific success of ESS across its entire instrument suite.

The involvement of ISIS in the instrument builds will help ensure early *scientific* success. It is of central importance that the first phase of ESS instrumentation is able to deliver performance that is at least competitive with the best current facilities and can rapidly evolve as the source power increases.

The project offers excellent professional development opportunities for ISIS and ESS staff, both technical and scientific, which benefits the instrument programme at both ESS and ISIS.

The instruments under consideration have significant UK academic and industrial interest. Whilst the instruments will be part of the public suite of instruments they will be in demand by leading UK groups.

ISIS has extensive experience of supporting technologies required to deliver the science case. Of particular note are the requirements that the beamlines place on bespoke sample environment and analysis software. This experience will allow the beamlines to rapidly deliver on their science case.

For details of the project timeline and costs reference should be made to the UK ESS Business case Document Number - UK-ESS-17070