NCSX Preliminary Design Cost Estimate Summary Form
(Attachment 1a)

SUMMARY DESCRIPTION

WBS Number: 31	**Title: Magnetic Diagnostics**
Originator: Dave Johnson	

Description

This WBS element consists of all the magnetic diagnostics required to accomplish the NCSX mission as defined in the General Requirements. This includes in-vessel and ex-vessel magnetic sensors needed to measure the equilibrium plasma position and shape, the plasma current, the plasma conductivity, and the total plasma stored energy. It also includes sensors to measure edge magnetic field variations due to internal MHD activity (Mirnov coils). For a typical group of magnetics channels, there are the sensors, sensor mounts, sensor lead cables, a vacuum electrical feedthrus (if in-vessel sensors), junction boxes near the machine, field cables, racks, rack cross-connects, interconnect rack cabling, integrators, data acquisition, AC power and isolation and grounding. digitizers. WBS 3 is responsible for the sensors, sensor mounts, sensor leads, racks, and integrators. Other components in the above list are covered in other WBS areas.

A significant modeling development is needed to optimally plan the type, number and placement of magnetic sensors, particularly those needed for plasma control. The model development is not budgeted in this WBS. At this time, it is estimated that approximately 232 magnetic sensors are needed to satisfy the requirements for Phases 1and 2. No in-vessel sensors are assumed for day-1 operation. Pending the outcome of this optimization modeling effort, and for budgeting purposes, we will assume the following types of sensors:

- Ex-Vessel Saddle Loops (200 loops);
- Two Co-Wound Loops for each Coil (Total of 36 for Modular Coils, 36 for TF Coils, 24 for PF Coils, and 24 for External Trim Coils)
- Extgernal Rogowoski Coils (2 coils);
- Diamagnetic Loops (2 loops)

Critical space allocations for magnetics components, such as port space for feedthrus, and rack space for supporting electronics, should anticipate the need in Phases 3 - 6 for more magnetics channels, approaching an ultimate need for 200 – 300 additional channels.

Description of Existing Equipment/Facilities to be Reused: **None.**

Description of Major Modifications Required to Existing Equipment/Facilities: **None.**

Date: 9/15/03