System Needs Statement

Requirements Matrix Example
USC Sensor Environmental Details

**Placement:**
The USC boiler monitoring will require that sensors be placed on the steam (inside) and fireside (gas side) of components locations. Monitoring will also occur in the penthouse region as well as at headers outside the boiler.

**Components:**
The monitored components will include superheater and reheater panels as well as upper furnace waterwalls, piping and thick walled components.

**Radiant conditions:**
The monitored components will be primarily in indirect radiant locations. However the routing of the sensor network will include boiler radiant zone locations.

**Operating Environment:**
- **Temperature:**
  - Fire side gas temperatures 1550ºC (2800ºF).
  - Metal temperature 810ºC (1500ºF)
- **Pressure:**
  - Fireside gas pressure: atmospheric to +/- 1 bar
  - Steamside pressure 350 bars (5500psi)
- **Chemical:**
  - Fireside: A reducing environment with a variable level of fuel based sulfur oxides.
  - Steam side: pH 7-9
  - Iron hydroxide dissolved oxygen 0-100ppb

Requirements Matrix Example
USC Sensor Performance Requirements

**Temperature**
- Temperature range 50 - 800ºC
- FOAK and Startup <1450ºF (800ºC)
- Continuous <1200ºF (600ºC)
- Response time < 5 seconds (90% step response time)
- Accuracy +/- 2.5 ºC (5ºF)
- Drift < +/− 2.5 ºC (5ºF)/yr @ 500-600ºC

**Strain**
- Range 5 – 10,000 micro-strain
- Accuracy 50 με
- Temperature sensitivity < 1 με/ 100ºC
- Response time < 5 seconds (90% step response)
- Drift < 50 με/year at 760ºC
- Differential Pressure via diaphragm strain
- Accuracy 0.02 psia (0.5"WC)

**Pressure**
- High Pressure Range 350 bar
- Accuracy +/- 1% FS
- Response time < 2 seconds (90% step response)
- Stability < 2 bar/year at 500ºC
- Temperature Sensitivity: +/- 10 psi / 100ºC