FERMILAB ENGINEERING NOTE	SECTION PPD/MD	PROJECT LBNE	SERIAL-CATEGORY	PAGE

SUBJECT	NAME	DATE	REVISION DATE
RATE OF CRYOSTAT PRESSURE RISE FOR LOSS OF COOLING	RUSS RUCINSKI	5/15/10	

- CALCULATE RATE OF CRYOSTAT PRESSURE RISE W/ HEATLOAD.

ULLAGE VOLUME: $(.9\,m)(15\,m)(82\,m) = 861\,m^3$

AR VAPOR DENSITY $= .368\ lb/ft^3 \times \frac{1\,kg}{2.2\,lb} \times \left[\frac{3.28\,ft}{m}\right]^3 = 5.9\ \frac{kg}{m^3}$

$h_{fg} = 158.7\ J/g$ HEATLOAD = 37 KW (MEMBRANE CRYOSTAT)

BOIL-OFF RATE = 836 kg/hr

$$\frac{dP}{dt} = \frac{14.7\ psi}{\left(5.9\ \frac{kg}{m^3}\right)(861\ m^3)} \times 836\ \frac{kg}{hr} \times \frac{1\ hr}{60\ min} = 0.04\ \frac{psi}{min}$$

$$\frac{dP}{dt} = 2.4\ psi/hr$$

$\Rightarrow$ WILL HAVE ABOUT 1 HOUR TO REACT TO A LOSS OF COOLING EVENT. VERY REASONABLE DESIGN.