



Station Balance

Presented by Bruce Wilkerson



**Marathon
Pipe Line LLC**

Required Instrumentation

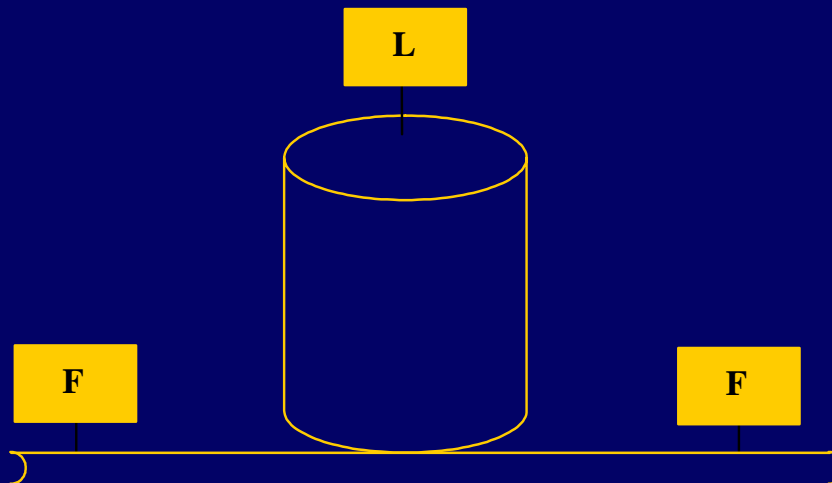
- ◆ Flow at each receipt or delivery meter
- ◆ Level of each tank



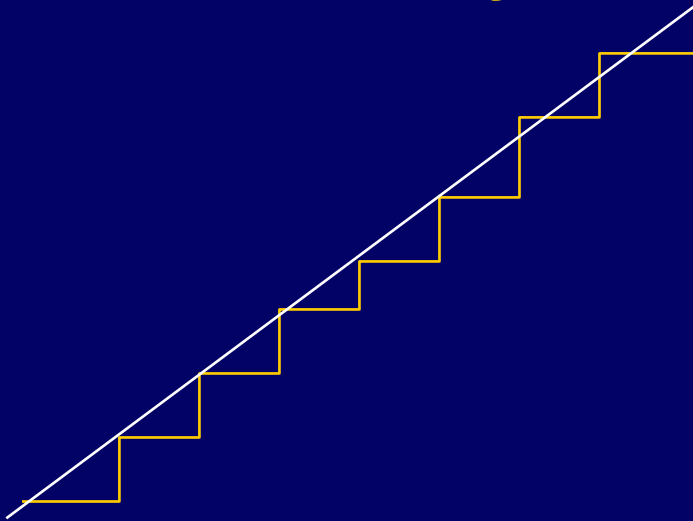
Same As Pipeline LD – But Different!



$$F_{\text{leak}} = \sum F_{\text{in}} - \sum F_{\text{out}} - \Delta \text{Vol}$$



Level Accuracy



- ◆ Given a 250,000 BBL tank
 - 45 feet high
 - Level accurate to +/- 0.01 feet
 - Resolution of 56 bbls per increment
 - SCADA update rate may limit this more

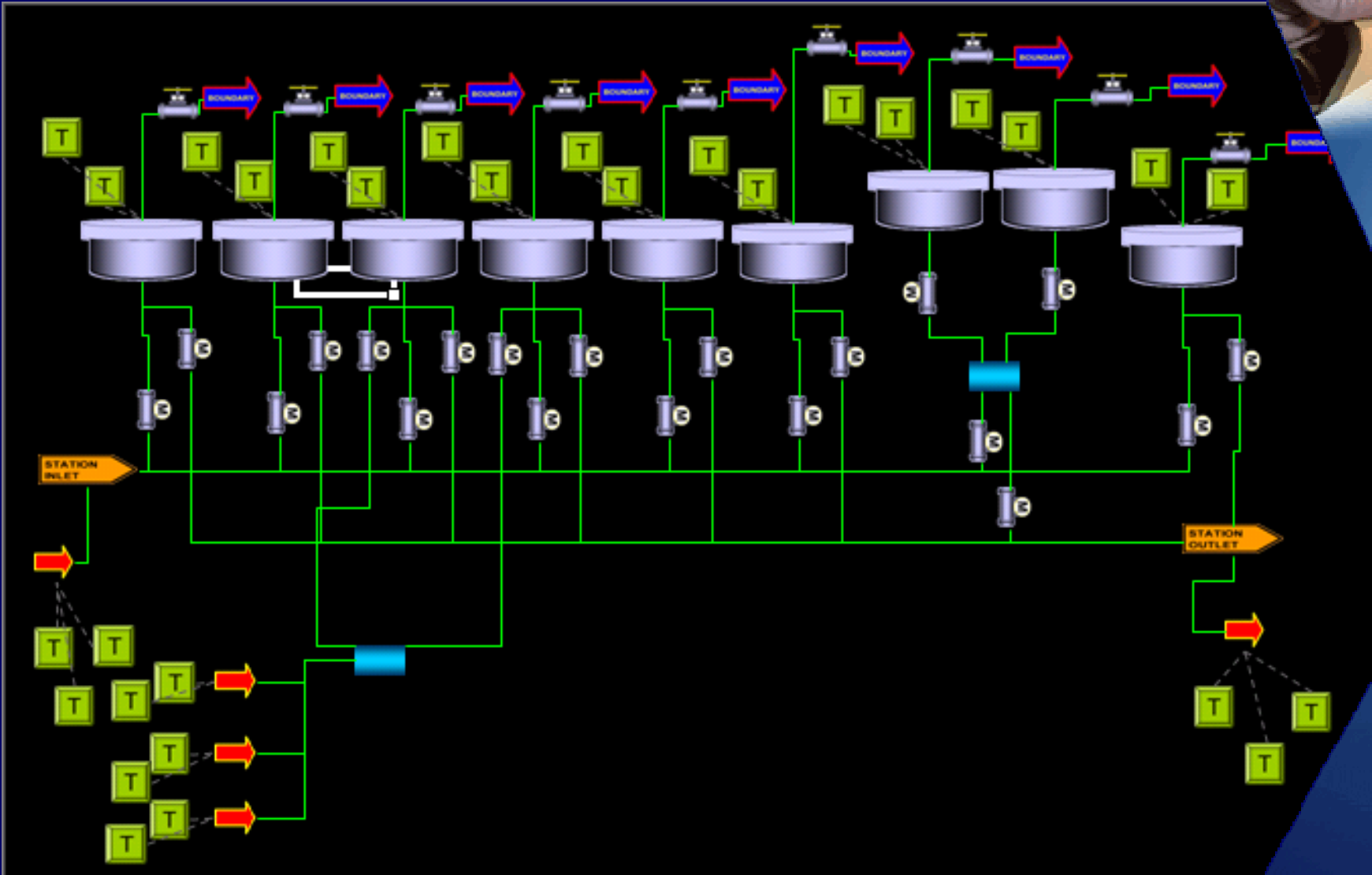


Sources of Error

- ◆ Level Sticks
- ◆ Communication outage
- ◆ Draining Roof
- ◆ Level spikes
- ◆ Temperature spikes
- ◆ Roof on legs



Station Configuration

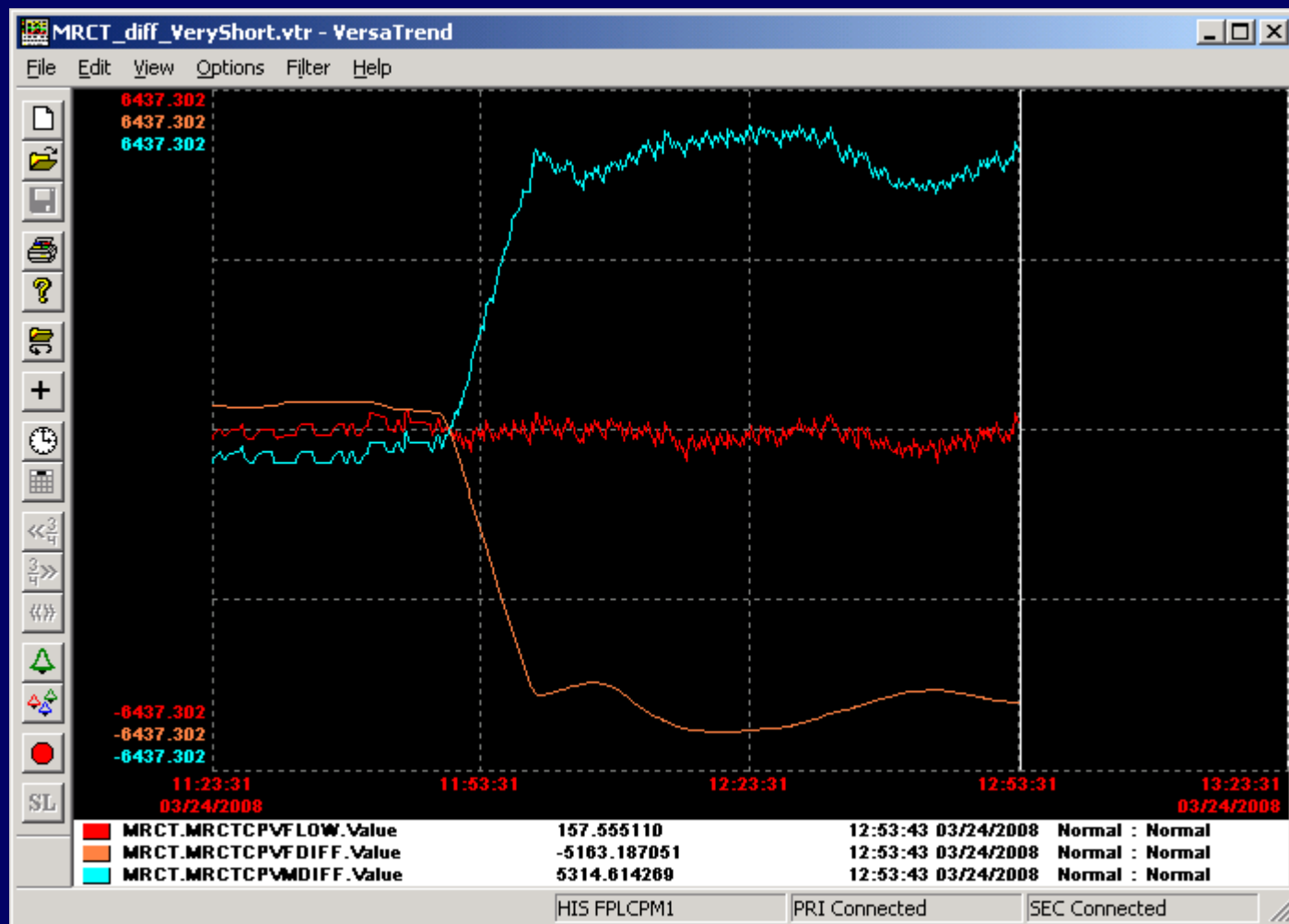


What about API 1149?

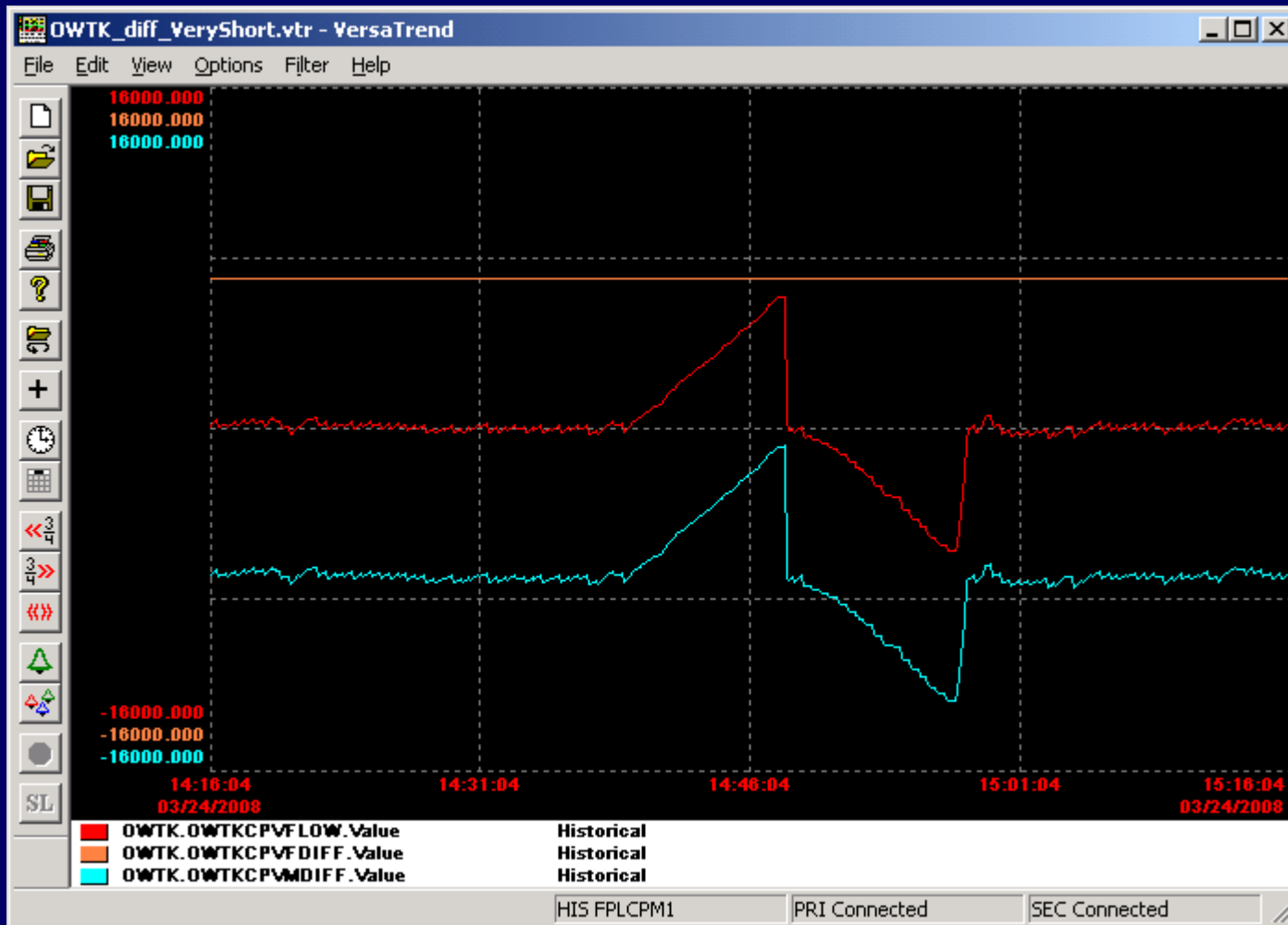
- ◆ Silent on station balance uncertainty
- ◆ Flow uncertainty is the same
- ◆ Volume uncertainty easier to calculate
 - Know the accuracy of the level sensor
 - Know the diameter of the tank
 - Gives theoretical uncertainty of the volume



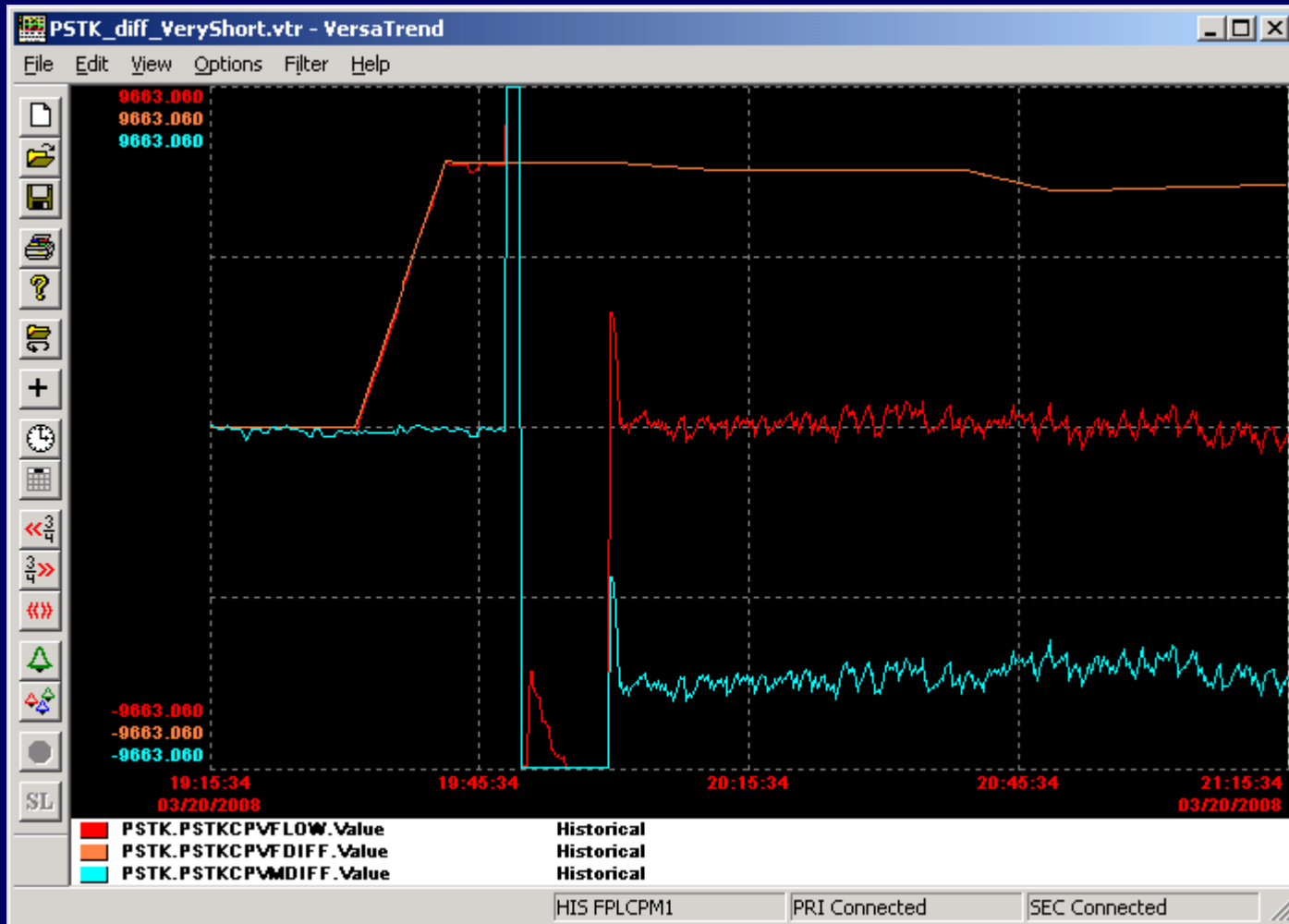
What it Should Look Like



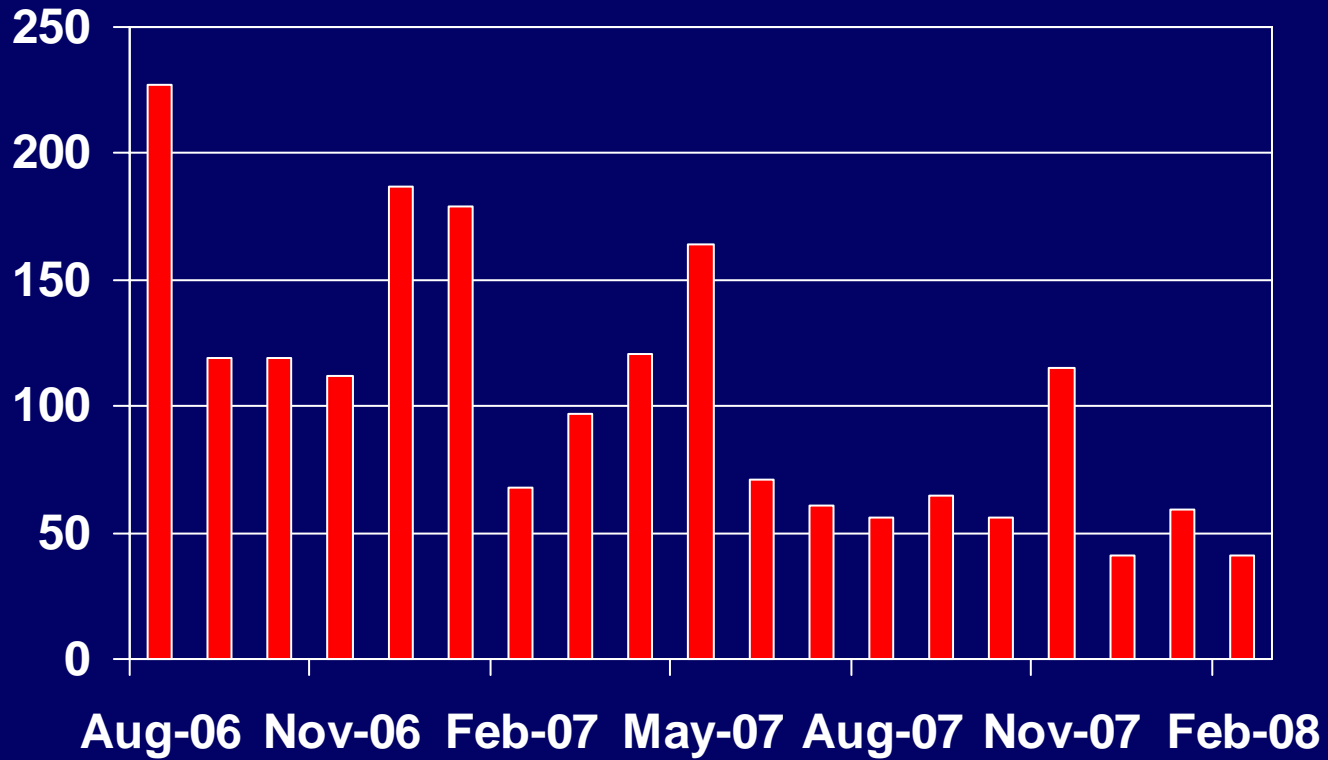
Sticking Gauge or Comm. Outage



Gauge Stuck on Startup



Historical Results



Questions?