TÜV SÜD National Engineering Laboratory was contracted by a major operating company to conduct a detailed uncertainty analysis on an allocation system to investigate why they were receiving significantly lower gas volumes than they would get from the meter measurements.

**Issue**
A major operator was one of three partners in a gas allocation system that used uncertainty-based allocation calculations. The allocation system is shown in the diagram below. In uncertainty-based allocation calculations, summed flows of the gas from the three partners are reconciled with the fiscal flow. The difference is divided between the partners, in proportion to their uncertainty. So a partner with a higher uncertainty would receive less gas than the others. As part of this agreement, the client was receiving significantly lower amounts of gas than they would have been apportioned from direct measurement. TÜV SÜD National Engineering Laboratory attributed this to high uncertainty from the measurement of density.

**Approach**
TÜV SÜD National Engineering Laboratory built a calculation model of the allocation system, including uncertainty budget tables for each of the allocation meters in the system and the custody transfer meter. There were also tables for other equipment such as densitometers. The overall uncertainty in the flow was compared to the other two partners in the system. TÜV SÜD National Engineering Laboratory made suggestions to decrease the overall uncertainty in the flow for this partner.
**Solutions**
Examination of data supplied to TÜV SÜD National Engineering Laboratory revealed that the densitometer in the system was unstable and this contributed significantly to both the overall density uncertainty and also the overall uncertainty in the flow. This was seen to be causing a large proportion of the reduction in the allocated hydrocarbons. To improve this situation, TÜV SÜD National Engineering Laboratory recommended that the densitometer be replaced by a gas chromatograph. This lower uncertainty in density resulted in a reduced gas flow uncertainty and therefore a higher volume of allocated gas.

**Benefits**
The benefits to the client can be assessed over a period in the allocation agreement. Due to TÜV SÜD National Engineering Laboratory’s recommendation on density measurement, the increase in allocated gas saved the client a total of £27 million per annum.