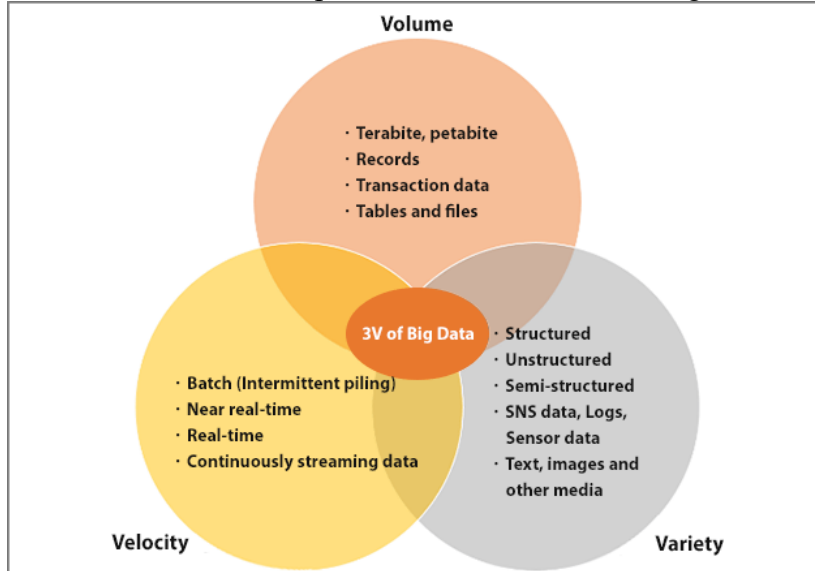
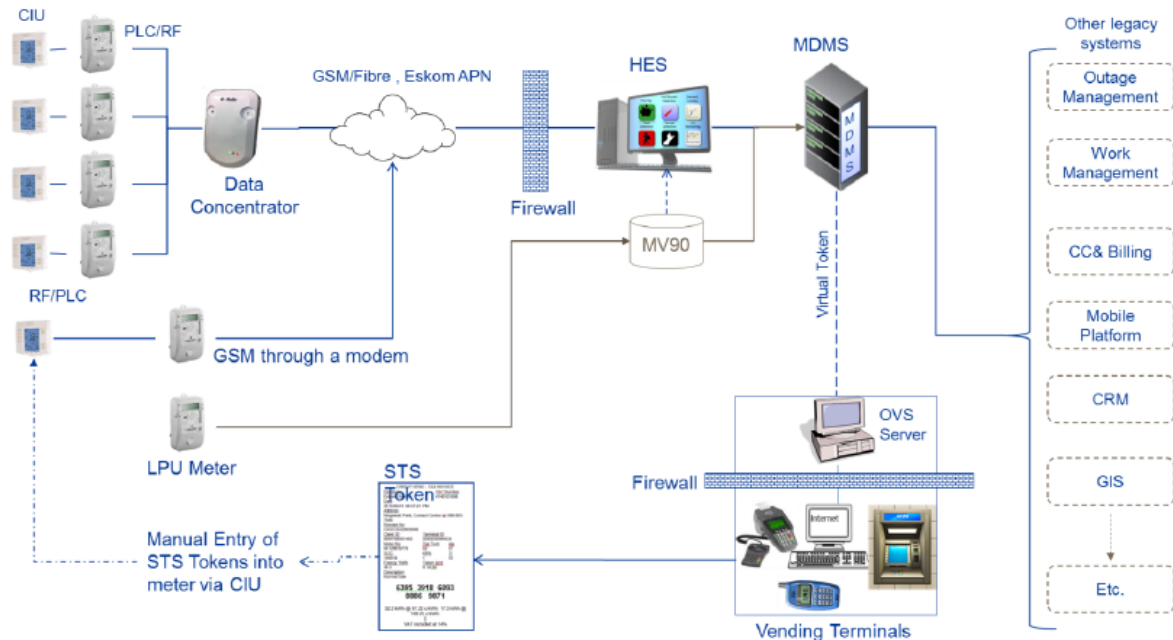


**Question 1.5:** What are the examples of Big Data in the power industry which could be classified as Big Data by giving quantitative characteristics of the data Volume, Velocity and Variety? Which one of the three V's impose the most serious challenge for the power industry?



**Answer 1.5:** Smart grids is an example of Big Data in the power industry. Smart grids enable improved monitoring, with real-time management of the power grid. The introduction of Smart grid technologies in the power industry has brought in significant influx of data into the utility systems. The Volume and the Velocity at which the data is being generated via devices such as smart meters, is huge and some of the data requires real-time analysis. For instance, typical smart meter data are energy consumption collected every 15 min and are stored in billing centers.

Research shows that one million smart meters installed in a utility result in nearly 3 TB of new energy consumption data every year. Another example is the PMUs, which is said to result in nearly 40 TB of new data per year for a typical utility. [Zhou K. Fu C. Yang S.: 'Big data driven smart energy management: from big data to big insights', Renew. Sustain. Energy Rev., 2016, 56, pp. 215– 225]



**Figure 2: AMI architecture used in Eskom**

Eskom is already deploying Advanced Metering Infrastructure (AMI). These Smart meters are deployed with the Head end System (HES), Data Concentrators (DCs) and associated telecommunication network infrastructure.

In Eskom PMUs are used to measure high-resolution voltage and current in the power grid. Data is reported at a rate of 20ms back to System Operator That's 50 times per second!

PMUs report at 30 to 60 times per second rate as time-synchronised phasor to phasor data concentrators located at the sub-station level or at control centres.

Without a doubt, the V that poses the most challenge, is the Volume due to the exponential increase in the data being generated by the smart devices that are deployed by the power utilities in their path to digital transformation. More challenges that come with the increase in data volume, is data storage, data mining, data processing, data querying, and data management as a whole. Big Data analytics plays and will continue to play a big role in improving data processing and it will be prudent for power utilities to invest in such technology solutions sooner rather than later.