HALF SPEED TURBINE

A large open pit mine was being built in the wilderness, and about 200km away, a 120MW, two unit hydro plant was also under construction to provide power for the electric shovels, ore crushing plant and mine townsite. During the feasibility study for the hydro development, there was some controversy over the layout, since two consulting companies had worked on the project, and had markedly different optimum layouts. Eventually the controversy was resolved, and one of the consultants was engaged to produce the detailed engineering drawings for the hydro development, while the other was retained to act as the owner's engineer.

Work on the project proceeded smoothly for about 2 years. By this time, the mining consultant, who had produced the estimate for power requirements, had finalized all electric motor sizes, and realized that the 120MW capacity was going to be tight. The original power demand estimate had been for 85MW in the winter, reducing to about 55MW in the summer. The hydro plant size of two 60MW units was based on one unit being able to carry the full summer demand while the other was down for maintenance. The new demand was for 110MW in winter and about 75MW in summer. This information was communicated to the mine owner, who then asked the engineering consultant to determine what would happen to the power supply if one of the 60MW Francis turbines were to drop off the system due to a fault, when power demand was in the region of 110 to 120MW. A copy of the owner's letter was routinely forwarded to the owner's engineer and George, who woked for the consulting company read it.

Over the preceeding two years an amicable working arrangement had developed between the two rival engineering consultants. After reading the letter, George phoned Bill, his counterpart in the design engineering company to enquire what was to be the answer, since it appeared obvious. Bill advised that they had just developed a sophisticated computer program which could determine the frequency variation on load changes in isolated hydro systems, based on the hydraulic characteristics of the powerplant, the generator inertias, the load inertia, motor torque and the change in load. George replied that this sounded very interesting, and that he would like to see the final report.

The mine consultant provided the detailed list of loads and motor characteristics. Two months later George had a call from Bill advising that he had just returned from holiday, had not yet read the report but it was finished, and that a copy was being couriered to him. Next day George read the report, not getting past the executive summary which started with "We have determined that when one of the Francis units drops off the system, when load demand is at 120MW, the other

60MW turbine will be able to continue providing power at half speed" George immediately phoned Bill, and asked him if he had read the report, to which he replied in the negative.

George asked Bill if he was sitting down, and then he read the opening sentence of the executive summary - there followed a moment of silence, and after Bill composed himself, he thanked George and said he would try to retrieve the report from the mail room, which he was fortunately able to do. The report was revised to indicate that load would have to be reduced to be within the capacity of the remaining unit. Bill later advised George that they were not charging for the report, it was being written off as an internal lesson in what could go wrong with quality control in their computer department. As for the mine, demand for their product increased, the mine expanded, and the hydro plant was doubled in size.

Lesson Learned.

Yes, garbage in - garbage out. But also that review by an independent engineer is worth while, and essential where a new computer program is being used for the first time.