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There are three types of optimization. Type 1, which we abbreviate as "T1," refers to optimizing the performance of a single, stand-alone generating unit. Index or relative efficiency testing is a common T1 activity. The Index Test Box (ITB), presently being developed is designed to conduct automatic, unattended, and less expensive index tests, while the generating unit remains in normal operation. Its output will be the optimum blade to gate relation or "cam curve," and a relative performance profile, both with and without fish screens. Type 2 or "T2" refers to optimizing the combined generating efficiency of a complete powerhouse. Type 3 refers to optimizing a river basin with multiple powerhouses. Each of these types builds on the other. The full benefit of Type 3 cannot be achieved unless Types 2 and 1 are already in place and the full benefit of Type 2 cannot be achieved unless Type 1 is in place. Because of the necessary restrictions, such as reservoir rule curves for flood control, HDC is not presently involved in Type 3 optimization.

The individual generating units in any powerhouse, even those of the same "family," have differences in their performance profiles. Several decades ago, the current meter test program found, for example, that the peak efficiency of the first fourteen units at The Dalles varied by 7.36%. There were also variations in the power at which peak efficiency occurred. The T2 computer program we are developing, called T2 Optimizer, is designed to calculate the most efficient manner to share a total powerhouse load set point among these different performing generating units. There are two calculating procedures in this program. The first calculates how to apportion the total load among specified units. This procedure has been named "Economic Dispatch" and is abbreviated "ED." The second procedure selects or preselects which units are to enter the ED procedure so that the absolute optimum powerhouse efficiency is achieved. This second procedure is called "Unit Commitment" and is abbreviated "UC." There are two types of UC. The simpler is based on considerations of efficiency only and is called "Instantaneous Unit Commitment" or "Unit Commitment on an Efficiency Basis." The more complex UC considers a number of additional factors such as the cost of starting and stopping units. This is called "Economic Unit Commitment" or "Unit Commitment on a Time Basis."

T2 and NRTTO, which stands for Near Real Time Optimization, are not duplicative efforts. The development of T2 has been coordinated with BPA and at present, the two programs are envisioned as working together as a team. Basically, they will operate in a kind of feedback loop with each other. NRTTO will calculate the total powerhouse load set point and a recommendation of which units to have on line with a recommended unit loading for each project. (In that sense, NRTTO is actually a hybrid of Type 2 and Type 3 optimizations). Each project will have its own T2 program. T2 will then be used to calculate the actual unit loading for each machine (ED) in a given powerhouse and also compare the recommended economic unit commitment of NRTTO with its own instantaneous unit commitment. Whatever changes are made in the powerhouse for unit operation and loading will then be communicated back to NRTTO.

Among the reasons this synergy has evolved is that BPA desires to have a continuing check on the answers from NRTTO by an independent means. For this reason, each program is provided with the identical database of generating unit performance. Also, the ED calculation in T2 is believed to be more accurate than that in NRTTO. This is because its procedure operates on the tabular performance data directly without having to try to simulate the performance data by converting it into algebraic equations. Further, NRTTO is designed to provide the second, more complex economic unit commitment. It had been planned that T2 would calculate the instantaneous unit commitment to provide the absolute optimum powerhouse efficiency to evaluate the result of NRTTO. However, there has been some discussion of expanding T2 to do an economic unit commitment for direct comparison with NRTTO.