Dave Kornegay's approach to Joint Load Optimization, as detailed in the 1995 reference document, addresses the classic "chasing" and stability problems encountered in multi-unit hydroelectric powerhouses.

In essence, his idea functions as a coordinated governor control strategy that shifts the logic from "unit-centric" to "plant-centric" load management. Here is the operational breakdown of how the logic functions:

1. Eliminating "Unit Chasing" (Load Interaction)

In a multi-unit plant, if each governor is left to respond to frequency deviations using standard droop settings without coordination, units often hunt against one another. Dave's approach enforces a hierarchy in load distribution. The optimization logic ensures that:

- **Response Segregation:** Instead of all units reacting simultaneously to every minor frequency fluctuation, the system designates specific units to handle "fast" primary frequency response, while others are tasked with "slow" base-load efficiency maintenance.
- **Deadband Tuning:** By carefully tuning the governor deadbands and response rates, the control system prevents the competitive hunting behavior that occurs when multiple governors with similar tuning parameters interpret grid noise as a required load correction.

2. Efficiency-Based Dispatch

The core of the "optimization" isn't just stability; it's economic dispatching based on the unique efficiency curve of each turbine-generator set.

- **Incremental Efficiency Matching:** The system evaluates the "water rate vs. power" curve for each unit. Rather than simply splitting load equally (a common "steady-state" mistake), the algorithm directs load to units currently operating in their "sweet spot" of the efficiency curve.
- **Vibration Zone Avoidance:** The logic incorporates hard constraints to steer the plant operation away from known mechanical vibration zones (often referred to as "rough zones" or "cavitating zones"). If a unit's load requirement would force it into an unstable vibration zone, the algorithm dynamically re-calculates to shift that load to a companion unit that can handle the delta without violating its own performance constraints.

3. Stability via Common-Bus Coordination

By treating the powerhouse as a single functional entity rather than a collection of independent units, the strategy manages the shared hydraulic path (the penstock or common header).

- **Pressure/Flow Compensation:** The logic accounts for the physical coupling of the units. By coordinating the wicket gate movements, the system minimizes the pressure surges that can occur when multiple units modulate flow simultaneously, which is critical for maintaining stability in cascade operations.

This methodology effectively converts the governor system from a simple reactive speed-control loop into a sophisticated, multi-unit performance manager. It prioritizes maximizing the "marginal gain" of water usage across the entire station while ensuring the frequency response stays within regulatory compliance—avoiding the common pitfalls of unit-to-unit interaction that often degrade station performance.