Stop, in the name of progress

ECP—the most significant development in freight train braking since George Westinghouse invented air brakes in the 19th Century—is ready for broad deployment.

By William C. Vantuono, Editor

In October 2007, Norfolk Southern became the first Class I to place ECP (electronically controlled pneumatic) brake-equipped trains in revenue service—two 115-car unit coal trains (above) operating in southwestern Pennsylvania (RA, Nov. 2007, p. 23). NS uses New York Air Brake’s EP-60 system on both the cars (coal hoppers from FreightCar America and Trinity North American Freight Car) and locomotives (GE Transportation). During the next several months, NS plans to add 30 locomotives, 210 new hoppers, and 180 upgraded hoppers to its ECP fleet. BNSF Railway soon followed NS, launching an ECP-equipped train that operates over a 1,500-mile run between Wyoming’s Powder River Basin coal fields and a Southern Company power plant near Birmingham, Ala. The railroad installed NYAB EP-60 technology on 12 of its EMD SD70MAC locomotives, while the Southern Company outfitted 300 coal cars with Wabtec’s ECP-4200 system.

NYAB (a division of Knoor-Bremse) and Wabtec (whose corporate ancestor is Westinghouse Air Brake Co.) have taken the lead as ECP suppliers, working closely together to develop compatible, interoperable systems. Interoperability is an absolute necessity as ECP is gradually phased in across the North American car fleet. A third supplier, Zeifron, offers a slightly different yet fully interoperable system.

ECP is the most significant development in freight train braking since George Westinghouse developed air brakes in the late 19th Century. Westinghouse’s basic system—air pressure applying brake shoes to wheel treads—hasn’t changed all that much in well over 100 years. What is different with ECP is the control system, which relies on electronic signals, rather than changes in brake pipe air pressure, to activate brake valves on
individual freight cars. Because signal propagation from the first to last car is instantaneous, the rate of brake cylinder pressure buildup can be increased. With conventional pneumatic brakes, brake cylinder pressure buildup time is carefully retarded to prevent the last cars in a train, where the brakes have not yet applied, from running into the first cars with fully developed brake cylinder pressure. With ECP, cylinder pressure buildup is about 6 to 7 psi/second for both emergency and service brake applications. Graduated brake release is possible because cylinder pressure is under direct control of the engineer. The brakes can be released, then reapplied as often as necessary to negotiate a changing grade, within the ability of the locomotive compressors to replenish reservoirs at the rear of a long train. Under virtually any operating scenario, it’s very difficult to “run out of air.” (See the car equipment diagram and explanation, opposite page.)

The benefits of ECP are well established: Shorter stopping distances, by as much as 50%, greatly reduced in-train forces; reduced wheel, brake shoe, and draft gear wear; reduced fuel consumption; and self-diagnostics.

In September 2007, the FRA issued a proposed rule that would allow ECP-equipped trains to operate up to 3,500 miles (more than double the previous maximum distance) with fewer stops for routine brake inspections. As envisioned by the FRA, ECP will be implemented industry-wide over a 10- to 15-year period at a total estimated cost of $8.6 billion, beginning with unit coal trains and then gradually progressing through other unit-train and intermodal equipment before migrating to the North American general interchange fleet. This final step will be most daunting, as new ECP-equipped cars are phased in and older cars are either retrofitted or retired. Builders are manufacturing ECP-ready cars that contain electrical conduits and mounting brackets for ECP wirelines and CCDs. FRA says the primary barriers to ECP deployment are the fair distribution of conversion costs and benefits and the challenges presented by interchange operations. ECP conversion costs will fall mainly on railroad customers, which own about 65% of the car fleet, while the benefits will accrue mainly to railroads. FRA maintains there will have to be a cost-benefit sharing model.

The physical car-to-car wireline connection was standardized in 1997 by the AAR, along with general specifications. It uses a connector similar in operation and appearance to an air hose gladhand. During uncoupling, the electrical connectors separate by themselves along with the hoses. During train makeup, they are connected by a brakeman in much the same fashion as the hoses, with a negligible increase in the time required to make the two connections, rather than a single one.

NS and BNSF are still gathering data from their initial ECP deployments. But clearly, ECP is finally well on its way to becoming the standard North American freight railroad braking technology.