

# FirstEnergy

## Fuel Storage Costs for Pumped Hydro Units

In creating the Fuel Storage Costs for Pumped Hydro Units the logic and formulas parallel the currently approved methodology in PJM's Schedule 6A for Oil Fired Units with fuel storage tanks.

Fuel Storage Costs for Oil fired Black Start units is defined by the equation:  
 $\{MTSL + [(\# \text{ Run Hours}) * (\text{Fuel Burn Rate})]\} * (12 \text{ Month Forward Strip} + \text{Basis}) * (\text{Bond Rate})$  where

MTSL is the minimum tank suction level

# Run Hours is the hours required to operate by the TP or 16 whichever is less

Fuel Burn Rate is the actual fuel consumption rate

12 Month Forward Strip is the average of forward prices for the fuel burned in the unit

Basis is the transportation charge from the location referenced in the forward price data to the unit plus any variable taxes

Bond Rate is the value determined with reference to the Moody's Utility Index for bonds rated Baa1.

In creating an analogous equation for a Pumped Hydro unit the following equation was derived using the fuel oil formula as a reference:

### **Proposed Water Storage Costs for Pumped Hydro Black Start units:**

$\{(\text{MPL} + \text{Black Start Level}) * \text{Water Rate}\} * \{(12 \text{ Month Forward Strip} + \text{Basis}) / (\text{Pump Efficiency})\} * (\text{Bond Rate})$  where:

MPL is the minimum pond level

Black Start Level is the number of feet of water required by the Transmission Provider to supply the necessary MWH for black start service.

Water Rate is the number of Megawatt-Hours that can be produced for a one foot drop in reservoir water level (MWH/ft).

12 Month Forward Strip is the average off peak forward prices for the power required to pump/return water to the reservoir measured in \$/MWH.

Basis is the congestion cost to supply the power for pumping in \$/MWH as calculated from PJM LMP data for the 12 months of the previous planning year (June 1 to May 31).

Pump Efficiency is the number of MWH of generation available as a result of consuming 1 MWH of pumping energy.

Bond Rate is the value determined with reference to the Moody's Utility Index for Bonds rated Baa1 (as determined and published by PJM).

Example:

Given values:

Minimum Pond Level	0 Feet
Black Start Level	15 Feet
Water Rate	50 MWH/ft
12 Month Forward Strip	35.12 \$/MWH (PJM West Hub)
Basis	1.00 \$/MWH
Pump Efficiency	0.70
Bond Rate	6.16%

Sample Calculation:

$$((0 \text{ ft} + 15 \text{ ft}) * (50 \text{ MWH/ft})) * ((35.12 \text{ \$/MWH} + 1.00 \text{ \$/MWH})/0.70) * (0.0616) =$$

\$2,383.92

This amount (\$2,383.92) would be the annual Fuel Storage Costs revenue requirements as calculated in Section 4 of the PJM Black Start Formulaic Cost Data Form.