Fuel Storage Cost for Pumped Hydro Units

Fuel Storage Cost

FirstEnergy believes the water retained in the upper reservoir for Black Start Service is analogous to the fuel oil stored in a tank for an Oil Fired unit. Therefore the Pumped Hydro unit should be compensated with Black Start revenue similar to the Oil Fired unit.

The formula below for the Fuel Storage Costs is from the approved PJM Schedule 6A.

Oil Fired Unit

{MTSL + [(# Run Hours) * (Fuel Burn Rate)]} *
(12 Month Forward Strip + Basis) * (Bond Rate)

MTSL is the Minimum Tank Suction Level
Run Hours is the hours required to operate as a black start unit (16 Hr minimum)
Fuel Burn Rate is the consumption rate of the fuel oil
12 Month Forward strip is the future cost of fuel oil
Basis is the transportation charge to deliver the fuel from the market to the unit
Bond Rate is the value Moody's Utility Index for Bonds rated Baa1

Fuel Storage Cost

Taking the formula for the Oil Fired unit an equivalent model was created for the Pumped Hydro unit.

Oil Fired Unit

{MTSL + [(# Run Hours) * (Fuel Burn Rate)]} *
(12 Month Forward Strip + Basis) * (Bond Rate)

Pumped Hydro Unit

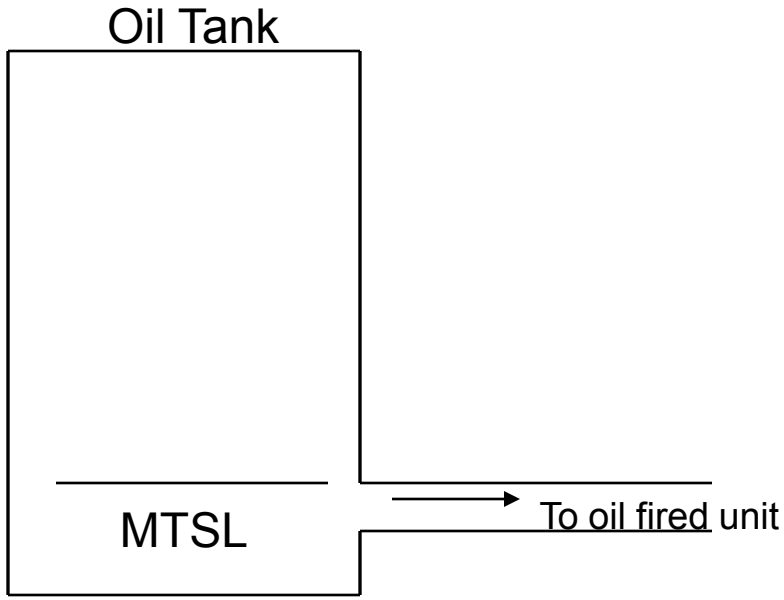
{MPL + (BSL * Water Rate) } *
{(12 Month Forward Strip + Basis) / (Pump Efficiency)} * (Bond Rate)

MPL is the Minimum Pond Level
Run Hours is the hours required to operate as a black start unit (16 Hr minimum)
Water Rate is the consumption rate of the water per foot
12 Month Forward strip (off-peak) is the future cost of pumping operations
Basis is the historical congestion/transportation charge to deliver the power to pump
Pump Efficiency is the ratio of energy output (gen) to energy input (pump)
Bond Rate is the value from Moody's Utility Index for Bonds rated Baa1

Pumped Hydro Fuel Storage Costs

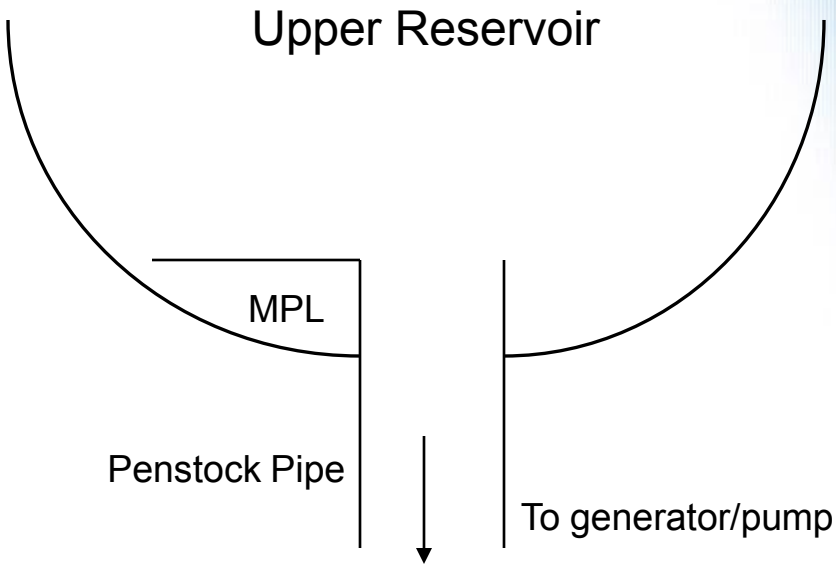
Oil fired unit

- MTSL – minimum tank suction level



Hydro unit

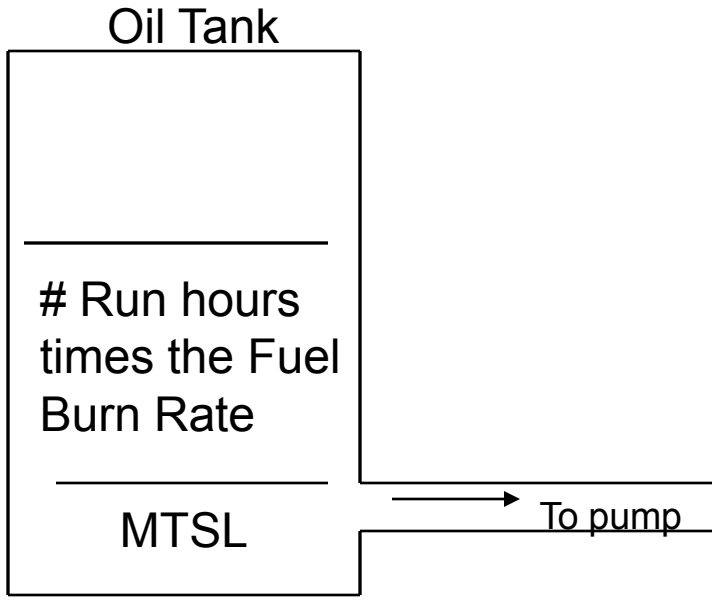
- MPL – Minimum Pond Level is the level of water required to maintain head pressure on the generating unit



Pumped Hydro Fuel Storage Costs

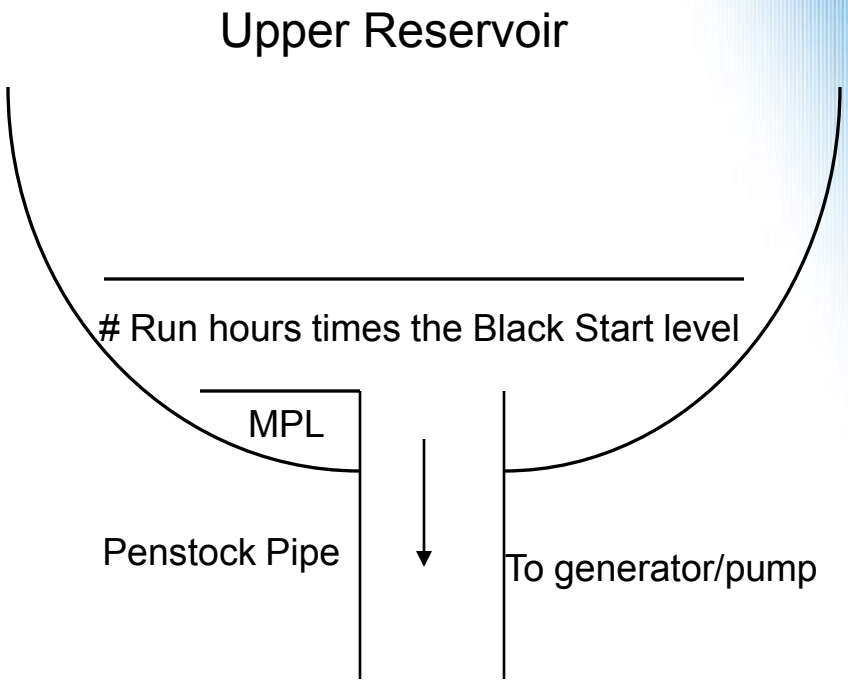
Oil fired unit

- # Run hours times the Fuel Burn Rate defines the fuel in the tank for Black Start capability



Hydro unit

- # Run hours times the Water Rate defines the equivalent MWHs required for Black Start service



Sample Calculation

Given Values:
MPL = 0 Ft
Black Start Level = 15 Ft
Water Rate = 50 MWH/Ft
12 Month Forward Strip = $35.12/MWH (West Hub Off Peak)
Basis (West Hub to Seneca) = $1/MWH
Pump Efficiency = 0.70
Bond Rate = 6.16%

Formula:
{(MPL + BSL) * Water Rate } *
{(12 Month Forward Strip + Basis) / (Pump Efficiency)} * (Bond Rate)

{(0 Ft + 15 Ft) * 50 MWH/Ft} * {($35.12/MWH + $1/MWH) / 0.70) * 0.0616}

Result: $2,383.92
This amount would be included in the black start revenue requirements in Section 4 of the Formulaic Cost Data form.

Appendix - Definitions

Definitions

Oil fired unit

- MTSL – minimum tank suction level
- # Run hours – are the actual number of hours a TP requires a unit to run. Defined as the lesser of 16 or the # of hours required by the TO's restoration plan

Hydro unit

- MPL – Minimum Pond Level is the water required to maintain head pressure on the generating unit
- # Run hours – are the actual number of hours a TP requires a unit to run. Defined as the lesser of 16 or the # of hours required by the TO's restoration plan
- BSL – Black Start Level is number of feet of water retained for Black Start

Definitions

Oil fired unit

- Fuel Burn Rate – is the actual fuel burn rate for the Black Start unit
- 12 Month Forward strip – is the average of forward prices for the fuel burned in the unit

Hydro unit

- Water Rate – is the number of Megawatt-Hours that can be produced for a one foot drop in pond water level (MWH/ft).
- 12 Month Forward Strip is the average off peak forward prices for the power required to pump the pond measured in $/MWH

Pumped Hydro Fuel Storage Costs

Oil fired unit

- Basis – is the transportation costs from the location referenced in the forward price data to the BS unit plus any variable taxes
- Bond Rate is the value determined with reference to the Moody's Utility Index for Bonds rated Baa1 (as determined and published by PJM).

Hydro unit

- Basis – is the congestion cost (transportation) to supply the power for pumping in $/MWH as calculated from PJM LMP data for the previous 12 months from June 1 to May 31
- Bond Rate is the value determined with reference to the Moody's Utility Index for Bonds rated Baa1 (as determined and published by PJM).

Definitions

Oil fired unit

Hydro unit

- Pump Efficiency is the ratio of the number of MWH of generation returned to the pond as the result of consuming 1 MWH of pumping energy. So for every 1 MWH of pumping energy the equivalent of 0.7 MWH of water is returned to the upper reservoir. In terms of generation, 1 MWH of generation requires 1.429 MWH of pumping power to replace the water in the upper reservoir.