# Black Start
# Minimum Tank Suction Level

Market Implementation Committee

June 5, 2017

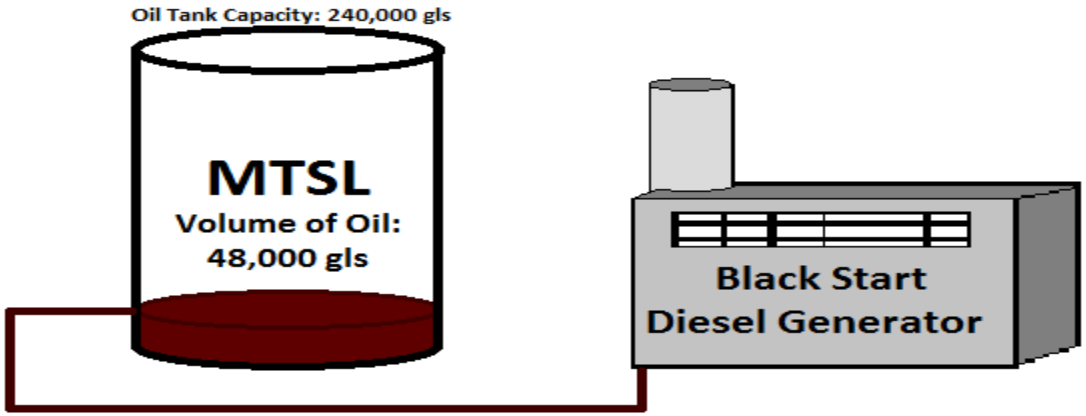
Joseph Bowring
Gerard Cerchio

Monitoring Analytics

# Minimum Tank Suction Level - Stand Alone

- **Some units that participate in the PJM energy market have oil tanks.**
- **All oil tanks at PJM units have minimum tank suction levels regardless of whether they are black start. (Unless they use direct current pumps.)**

# Minimum Tank Suction Level - Black Start Only



# Minimum Tank Suction Level Example - Black Start Only

- **Black Start MTSL = MTSL**
  - **Where:**
  - **Black Start Tank Ratio = 100 Percent**

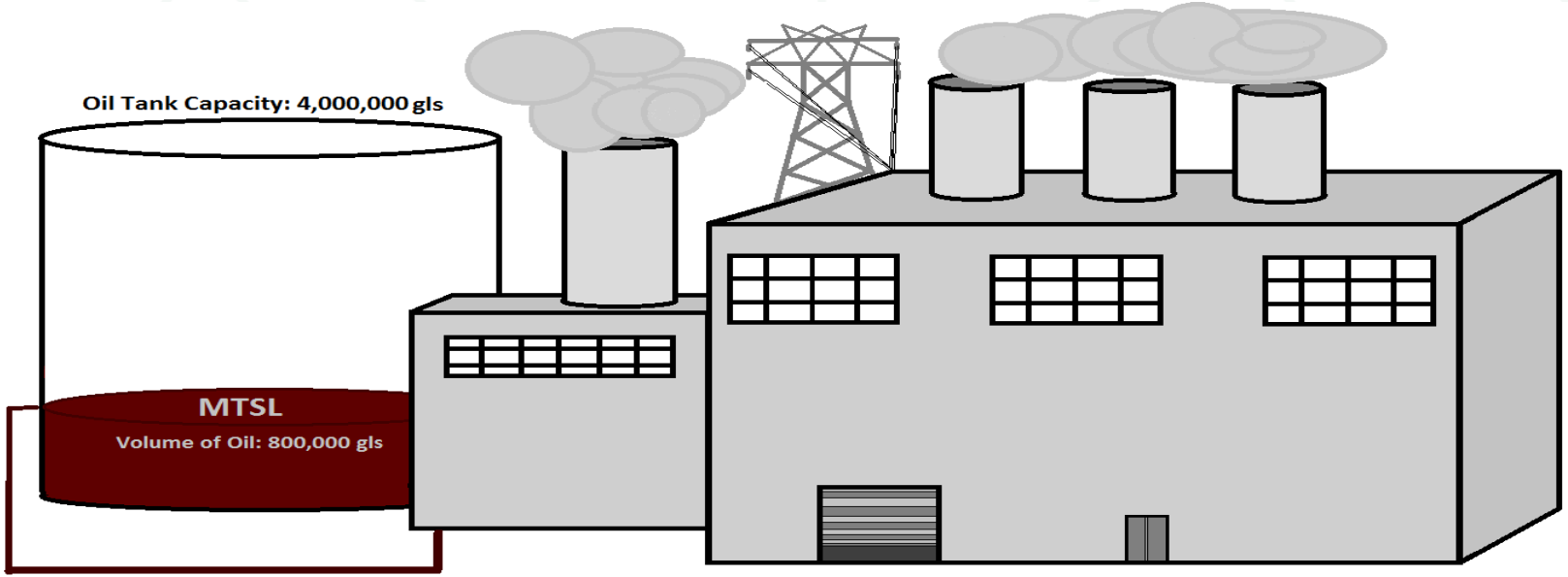
# Minimum Tank Suction Level Example - Black Start Only

- **Example:**
  - **Tank Capacity: 240,000 gals**
  - **MTSL: 48,000 gals**
  - **Unit Fuel Burn Rate: 12,000 gals per hour**
  - **Minimum Run Hours: 16 hours**
  - **Total Black Start Fuel Burn: 192,000 gals**
  - $\textbf{Black Start Tank Ratio} = 100\ \%$
  - **Black Start MTSL = 48,000 gals**
  - **Tank Capacity = Fuel Burn + MTSL**

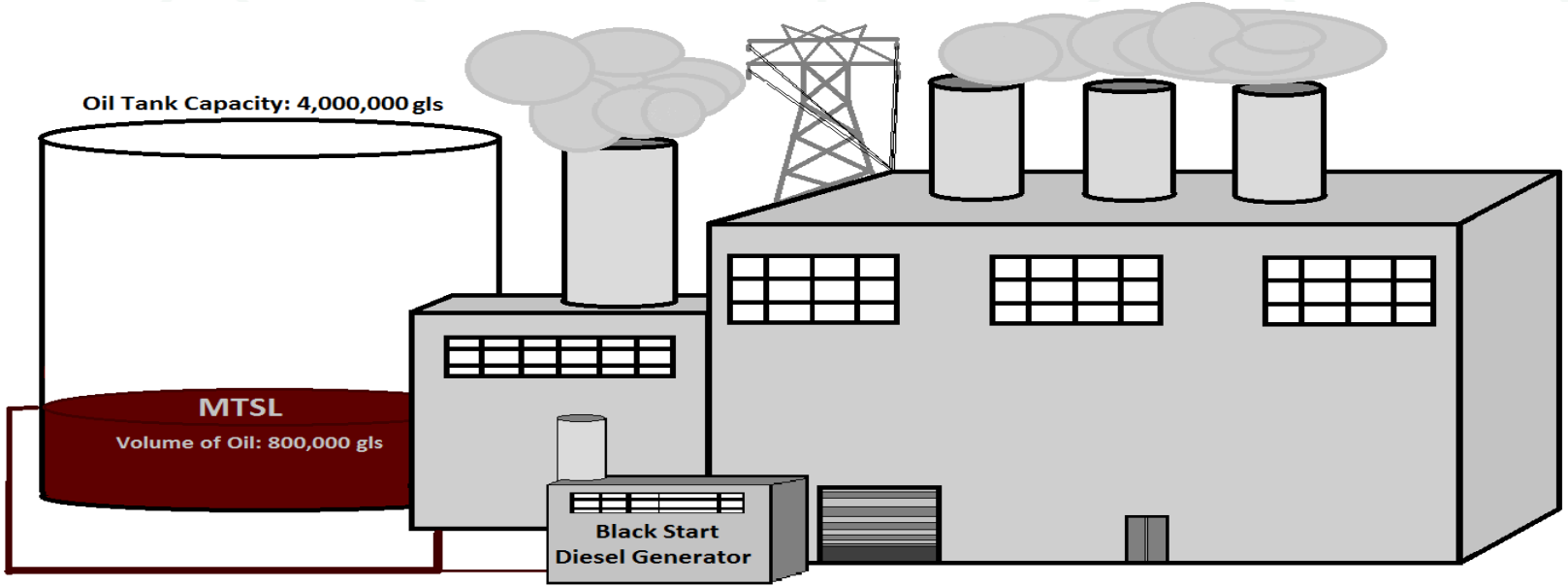
# Minimum Tank Suction Level - Shared

- **Many Black Start units use fuel tanks that are shared with other units that participate in the PJM energy market.**

# Minimum Tank Suction Level - Before Black Start



# Minimum Tank Suction Level - Shared



# Minimum Tank Suction Level Example - Shared Tank

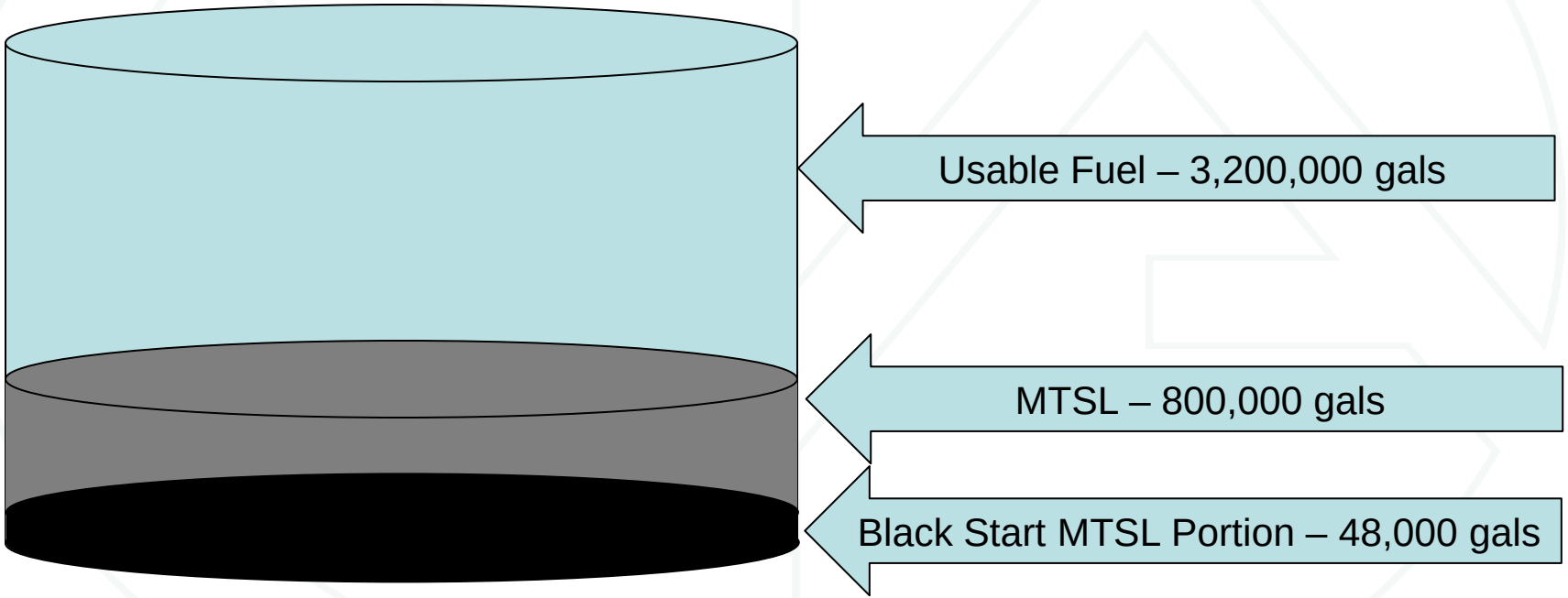
- $\textbf{Black Start MTSL} = \textbf{Black Start Tank Ratio} \times \textbf{MTSL}$
  - **Where:**
  - $\textbf{Black Start Tank Ratio} = \frac{\textbf{Unit Fuel Burn Rate} \times \textbf{Minimum Run Hours}}{\textbf{Tank Capacity} - \textbf{MTSL}}$

# Minimum Tank Suction Level Example - Shared Tank

- **Example:**
  - **Tank Capacity: 4,000,000 gals**
  - **MTSL: 800,000 gals**
  - **Unit Fuel Burn Rate: 12,000 gals per hour**
  - **Minimum Run Hours: 16 hours**
  - **Total Black Start Fuel Burn: 192,000 gals**
  - $\textbf{Black Start Tank Ratio} = \frac{12{,}000\frac{\text{gals}}{\text{hr}} \times 16\ hrs}{4{,}000{,}000\ \text{gls} - 800{,}000\ \text{gals}} = 6.0\ \%$
  - **Black Start MTSL = 6.0% x 800,000 gals = 48,000 gals**

# Minimum Tank Suction Level

**Tank Capacity: 4,000,000 gals**



# PJM Method vs. IMM Method

- **PJM's method would allow recovery of carrying cost on 800,000 gals of fuel.**
- **The IMM's method would allow recovery of carrying costs on 48,000 gals of fuel.**
- **The actual incremental amount of MTSL that results from the addition of black start capability is zero.**

**Monitoring Analytics, LLC**
**2621 Van Buren Avenue**
**Suite 160**
**Eagleville, PA**
**19403**
**(610) 271-8050**
**MA@monitoringanalytics.com**
**www.MonitoringAnalytics.com**