Consider a 3 MW wind turbine with a hydrostatic transmission (transmission formed by a hydraulic pump and motor) operating at 35 MPa. Find the viscous pressure drop in the tubing traveling up and down the 100 m tower.

Hydraulic Fluid: ISO 46
\[ \nu = 46 \text{ cSt} \]
\[ \rho = 870 \text{ kg/m}^3 \]
Pipe: 100 m long, 20 cm diameter, perfectly smooth

Find:
1. Determine the flow rate and average fluid velocity.
2. Calculate the Reynolds number. Laminar or Turbulent?
3. Find the friction factor.
4. Calculate the viscous pressure drop.
5. How does this compare to the pressure difference due to gravity?