# Scope

The Control of Hydraulic System Pressure micro-credential sets the minimum requirements for a person to demonstrate competence to safely deenergize and lock out wind turbine hydraulic systems.

# MICRO-CREDENTIAL Hydraulic System Pressure

### Prerequisites

1. Completed Basic Hydraulics Micro Credential
2. Completed Lock Out Tag Out Micro Credential (Should include logic behind sources of potential energy.)

### Competencies

#### Hazards of hydraulic systems in a Wind Turbine.

1. Identify components with potential energy associated with hydraulic systems
	1. Electrical – Circuit Breakers, Electrical Contacts, Valves
	2. Hydraulic – HPU, Accumulators, Hoses, Manifolds, Valves
	3. Mechanical – Pitch Linkage, Cylinders, Brake Calipers, Pinion Gear, Slew Gear
2. Identify / Explain risks related to fluid under pressure associated with hydraulic systems
	1. Explain Hydraulic injection injuries, how they occur
	2. Explain understanding of limitations of PPE in relation to fluid under pressure
	3. Explain hydraulic fluid vaporization and associated hazards

#### Identify key components of a hydraulic system in relation to system pressure

1. Hydraulic Pump
2. Manifold
3. Hydraulic Accumulator
4. Key valves and ports in relation to system pressure

#### Explain how to check system pressure

1. Identify where to attached gauge (With use of drawings or markings)
2. Identify where to monitor system pressure if no gauge is needed (With use of drawings or markings)

#### Explain reason for deenergizing HPU (Hydraulic Power Unit) before removing system pressure.

1. To ensure HPU does not operate when system pressure drops.
2. Demonstrate measures taken to open electrical circuit to hydraulic pump unit motor.
3. Identify component or components used to open electrical circuit to HPU motor.

#### Demonstrate how to remove system pressure

1. Demonstrate attaching pressure gauge if needed
2. Open electric power circuit to pump
3. Identify valve to release system pressure
4. Identify valve to release accumulator pressure

#### Follow Lock Out Tag Out procedure

1. Lock or Tag Circuit Breaker for Hydraulic Pump
2. Tag Key Valves to maintain zero system pressure
3. Tag blade locks or pitch system lock
4. Explain precautions to be taken if system components are not capable of being locked.

#### Identify Hydraulic Systems that can be found in a Wind Turbine and special precautions to be taken with those systems.

1. **Hydraulic Pitch**
	1. Explain reasons for locking blades or pitch system in place before removing system pressure
		1. To keep components from moving when system pressure is released
		2. To eliminate potential run away of wind turbine
	2. Lock blades or pitch system in place
		1. Demonstrate how to apply blade locks or how to lock pitch system in place.
2. **Hydraulic Yaw**
	1. Explain reason for ensuring yaw brake is applied and locked in position before deenergizing and releasing system pressure.
		1. To ensure nacelle cannot be pushed around by the wind
	2. Demonstrate checking yaw brake, engaging and locking it in place
3. **Hydraulic Brake (High Speed Shaft)**
	1. Explain reason for engaging rotor lock or mechanical lock before deenergizing and releasing system pressure for the High-speed brake.
		1. To keep drive train from rotating
	2. Identify other possible means for brake to be applied with a loss of power.
		1. In some cases, a capacitor is used to supply power for a valve to release pressure stored in an accumulator to apply brake.
		2. This would have to be considered as a potential hazard when working on the brake system
	3. Demonstrate engaging hydraulic lock mechanism for the drivetrain
4. **Hydraulic Rotor Lock (Main Shaft)**
	1. Explain the significance of the Hydraulic Rotor Lock when hydraulic system pressure is not available.
		1. The Hydraulic Rotor Lock can be manually operated with a hand pump if there is no electrical power available.