NLINE ENERGY®
EVERY DROP OF ENERGY

Thermal Energy Recovery

Council of Industrial Boiler Owners

cibo
Powering a sustainable energy future

August, 2024

Turbine Technology

- Microsteam® turbines are versatile
- Clean power generation from existing steam systems
- Utilize readily available or excess renewable fuel sources (biomass applications)
- Ultra-efficient rotor design
- 1.5x – 2x increased output efficiency
- Create energy savings
- Reduce Greenhouse Gas (GHG) emissions

Harvest Wasted Energy with Microsteam®

Reliability

- Saturated or superheated steam
- High-alloy rotating assembly provides corrosion / erosion resistance

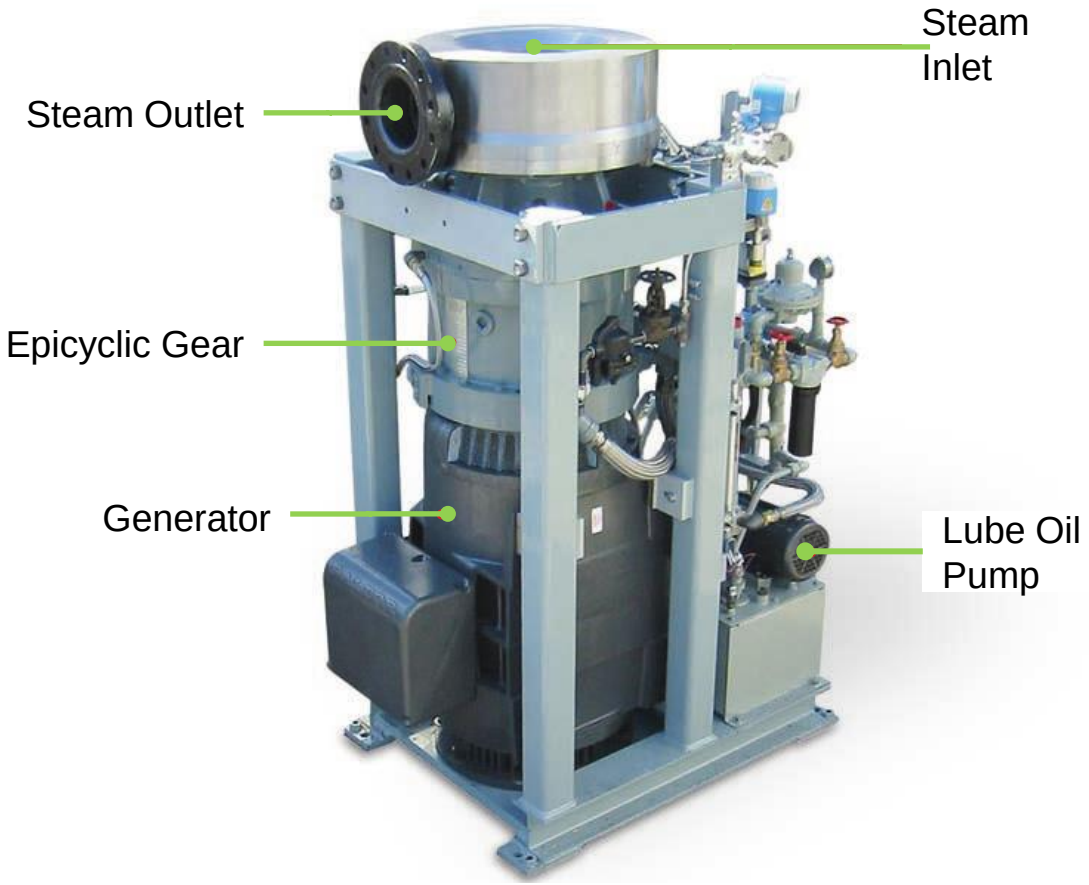
Efficiency / Resiliency

- Best in class 80% peak efficiency
- Microgrid capable for plant resiliency

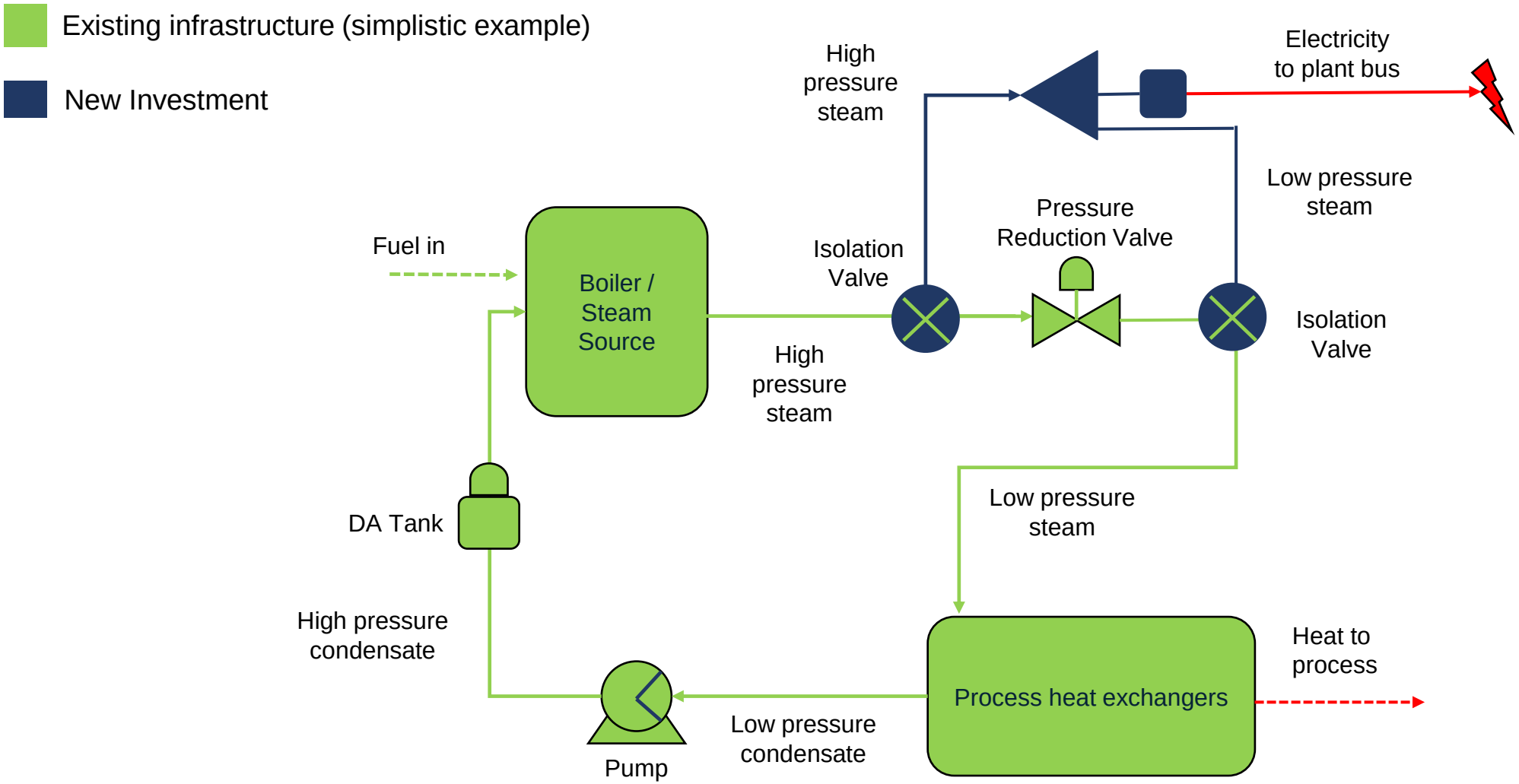
Economics / Sustainability

- 275 kWe Plug-n-Play package reduces installation cost
- Reduction in GHGs, bolster sustainability policies
- Save thousands of Tons CO2e per year, per turbine

New revenue stream (~2-4 year payback)



Energy from Existing Systems

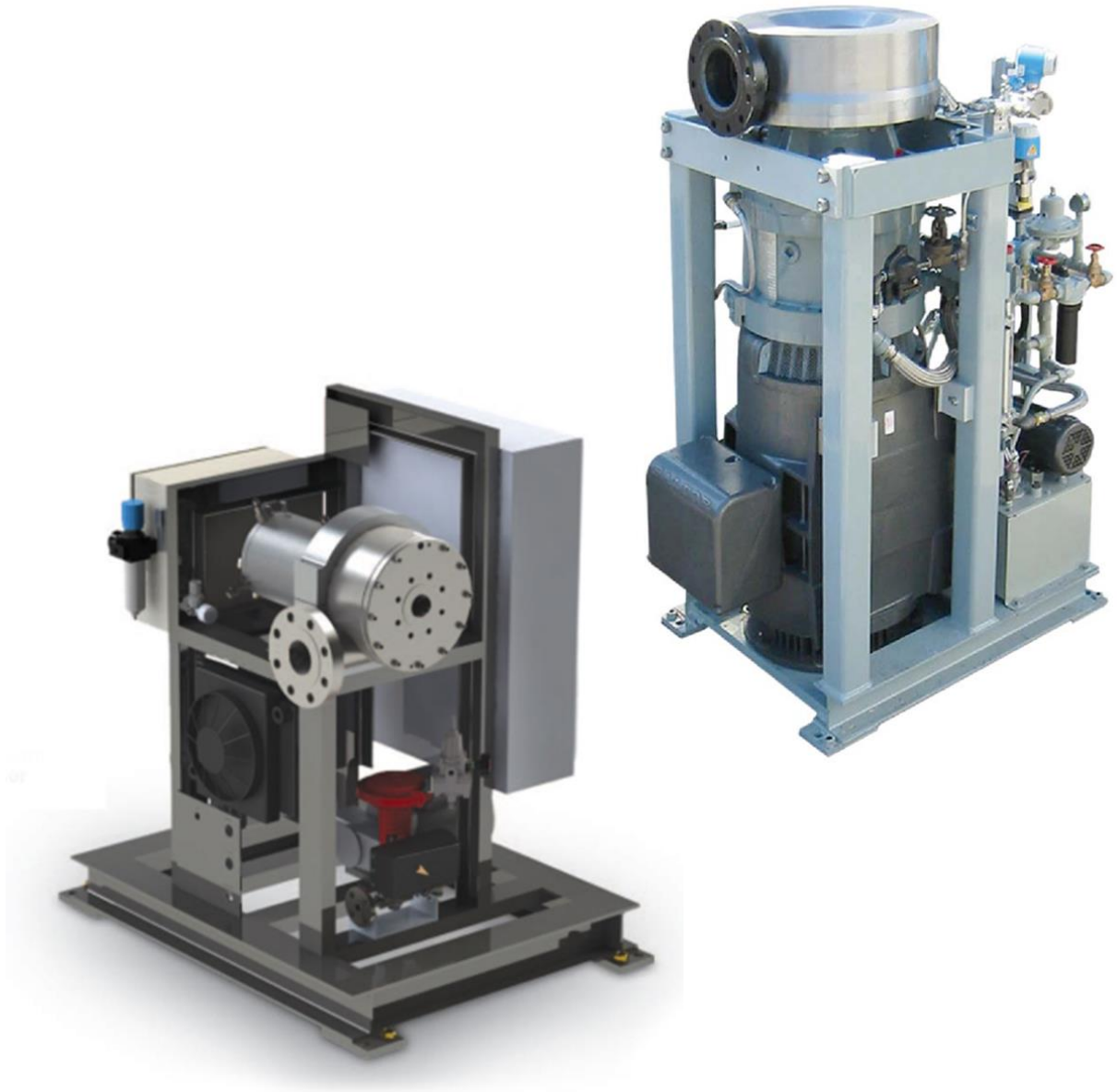


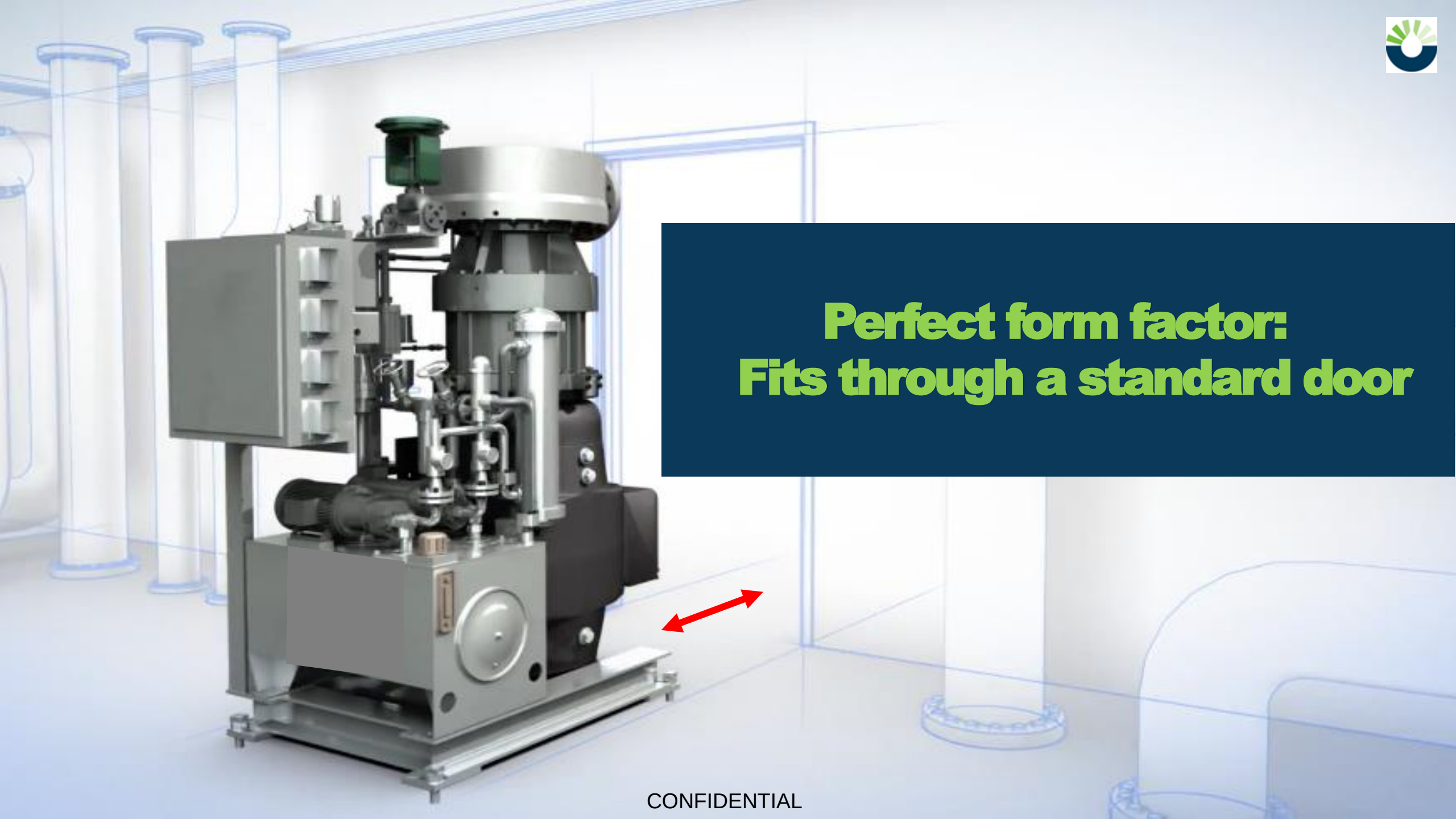
MST Specifications

- 275 kWe & 125 kWe output units
- Single-stage or two-stage rotor
- Pressure Capabilities:

MST275	MST125
Inlet - 720 psig	Inlet – 300 psig
Outlet - 0 psig	Outlet – 0 psig

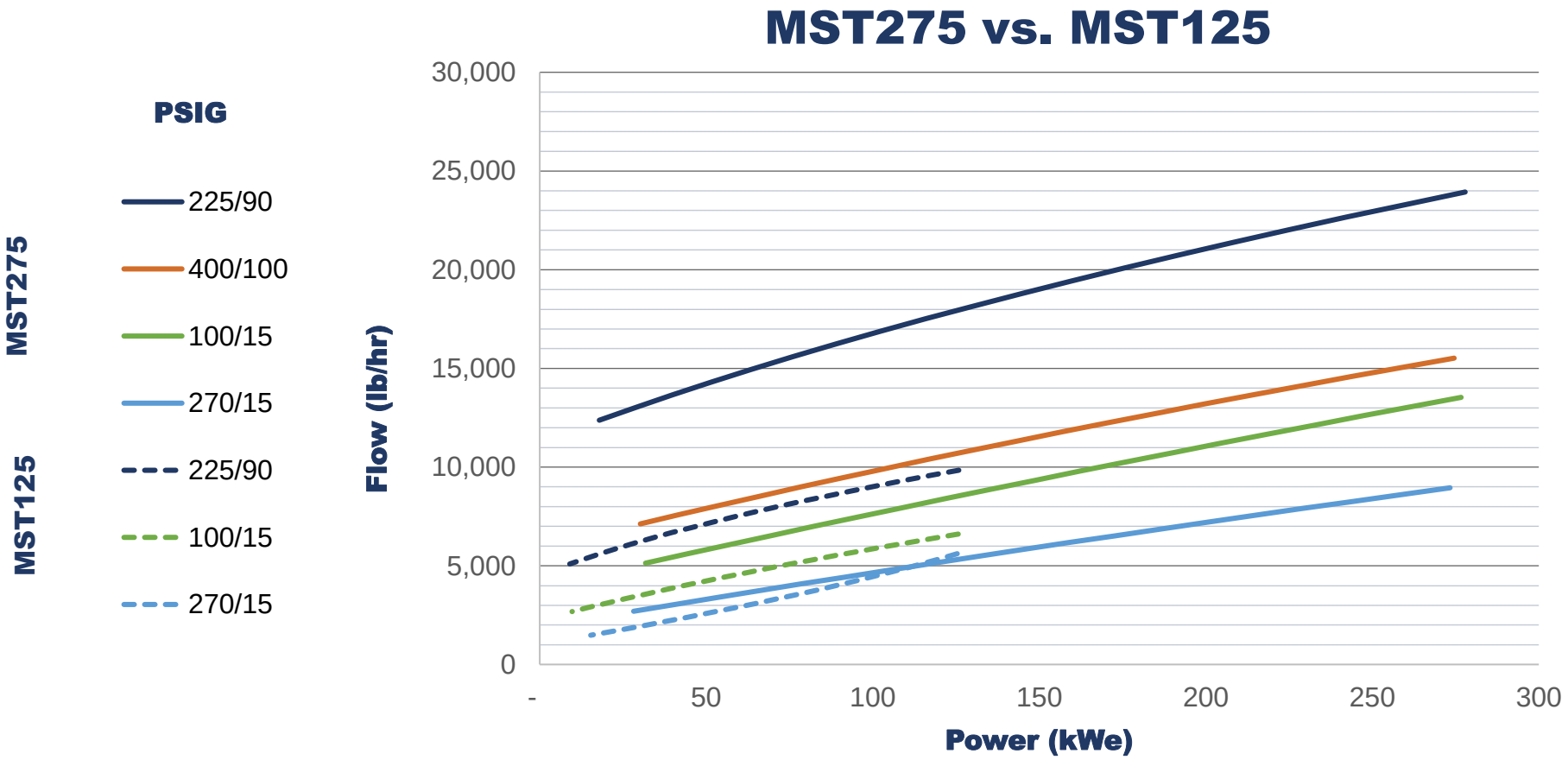
- Flow determined by pressure ratio:
  - Higher ratio = lower flow
  - Lower ratio = higher flow
- Induction or Synchronous generator
- PLC based controls





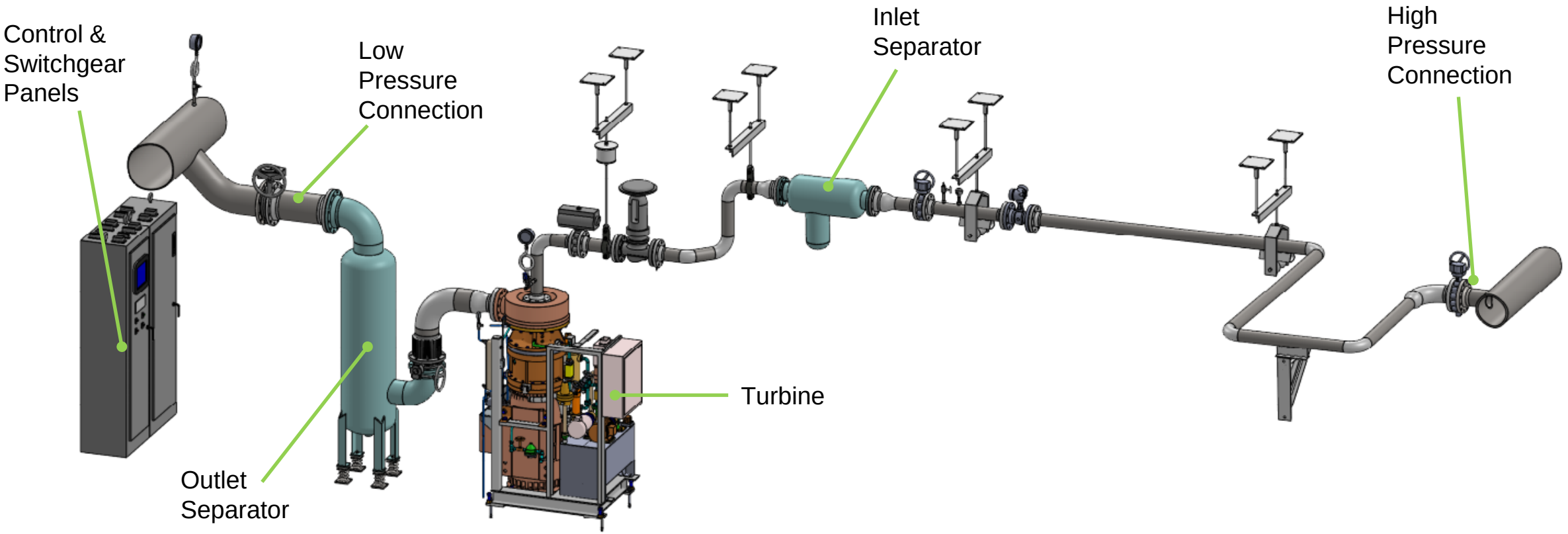
Varying Pressures & Steam Flows

Sample Pressure Drop Scenarios*



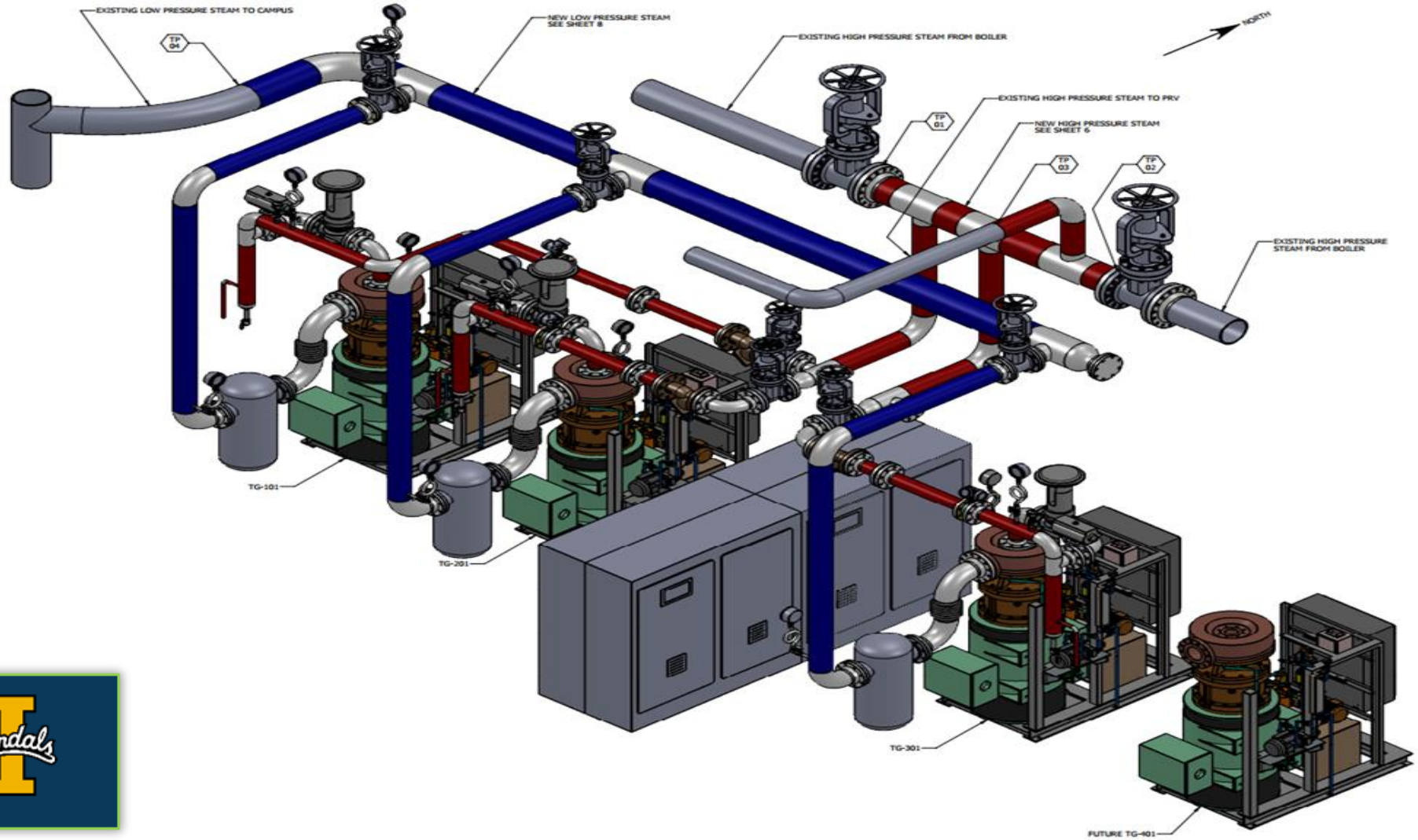
*** Limitless pressure ratio and flow combinations available**

Standard Package



Example only – upstream/downstream components and piping layout varies with each project

Multiple-Turbine Project Example



Unintrusive Installation

Steam Tie-In

- Piping connections to High & Low Pressure Headers

Electrical Tie-In

- Spare compartment on existing MCC, 500A minimum breaker
- Back feed to 480V distribution transformer

Controls

- Seamless integration into existing plant SCADA system
- Choice of communication protocols (ethernet, Modbus, etc.)

Power

- Synchronous or Induction generator
- Create Microgrid for plant resiliency

Maintenance

- NLine O&M schedule – annual service plus detailed turbine inspection every fifth year
- Maintenance agreement renewed every five years

Proven. Recognized. Pre-Approved.

US Department of Energy eCatalog:
CHP Packaged System Approved
CHP Solutions Provider Approved

U.S. DEPARTMENT OF ENERGY
COMBINED HEAT & POWER eCATALOG
RECOGNIZED SOLUTION PROVIDER

Pre-approved, certified technology by the New York State Energy Research and Development Authority

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

State of California Air Recourses Board (CARB)
Zero-Emission Technology
DG-017 certification

CALIFORNIA AIR RESOURCES BOARD

Sustainability

- Reduced Greenhouse Gas Emissions (GHGs)
- Tons CO2E avoided every year
- Future market value for Tons of GHG…

Example Only:

Project generates ~2,300,000 kWh per year / 46,000 MWh over 20-years

Potential for ~1,600 Tons of GHG reduced annually / 32,000 Tons over 20-years

382 Cars Driven, Annually

106,072,794 Smartphones Charged, Annually

69,791 Trash Bags Recycled – Not Landfilled, Annually

Solar Comparison…

Power Generation:

- MST Actual Output = 1,245,388 kWh (size of a refrigerator)
- Proposed Solar Field Area = 11 Acres
  1,300,800 kWh

Incentives Accelerate Payback

Robust marketplace for energy efficiency/recovery, WHP projects

Inflation Reduction Act of 2022

- Increased investment (ITC), production (PTC) tax credits
- New Direct Payment classification
- **Program deadline (Jan 1, 2025)**
- 30% base credit
- Prevailing Wage & Apprenticeship Rules / Rates exempt under 1MW)
- Bonus credits:
  - 10% for Domestic Content
  - 10% for Energy Communities

State Incentive Programs…

Utility Rebate Programs…

Financing

Project finance options for purchase of Microsteam turbine systems

1. **Cash/debt financed purchase from corporate balance sheet**
   - Includes tax credits, grants, and incentives

2. **NLine Energy, Inc. Power Purchase Agreement (PPA)**
   - NLine finances/installs/owns project with electricity sold to client at an agreed-to $/kWh rate
   - Multi-Year Power Purchase Agreement / negotiated term

NLINE ENERGY®

EVERY DROP OF ENERGY

University of Idaho – 3-MST275 array plus Microgrid

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