



NLINE ENERGY

Microsteam[®] Turbine

ENERGY RECOVERY
SOLUTIONS



TURN THIS PRV **INTO THIS**

APEX INDUSTRIAL SOLUTIONS, INC.

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How NLine Works with Your Existing System

The Secret of Energy Recovery

NLine Turbines generate electricity from your steam system's pressure reducing valve.

You already have 90% of what you need.

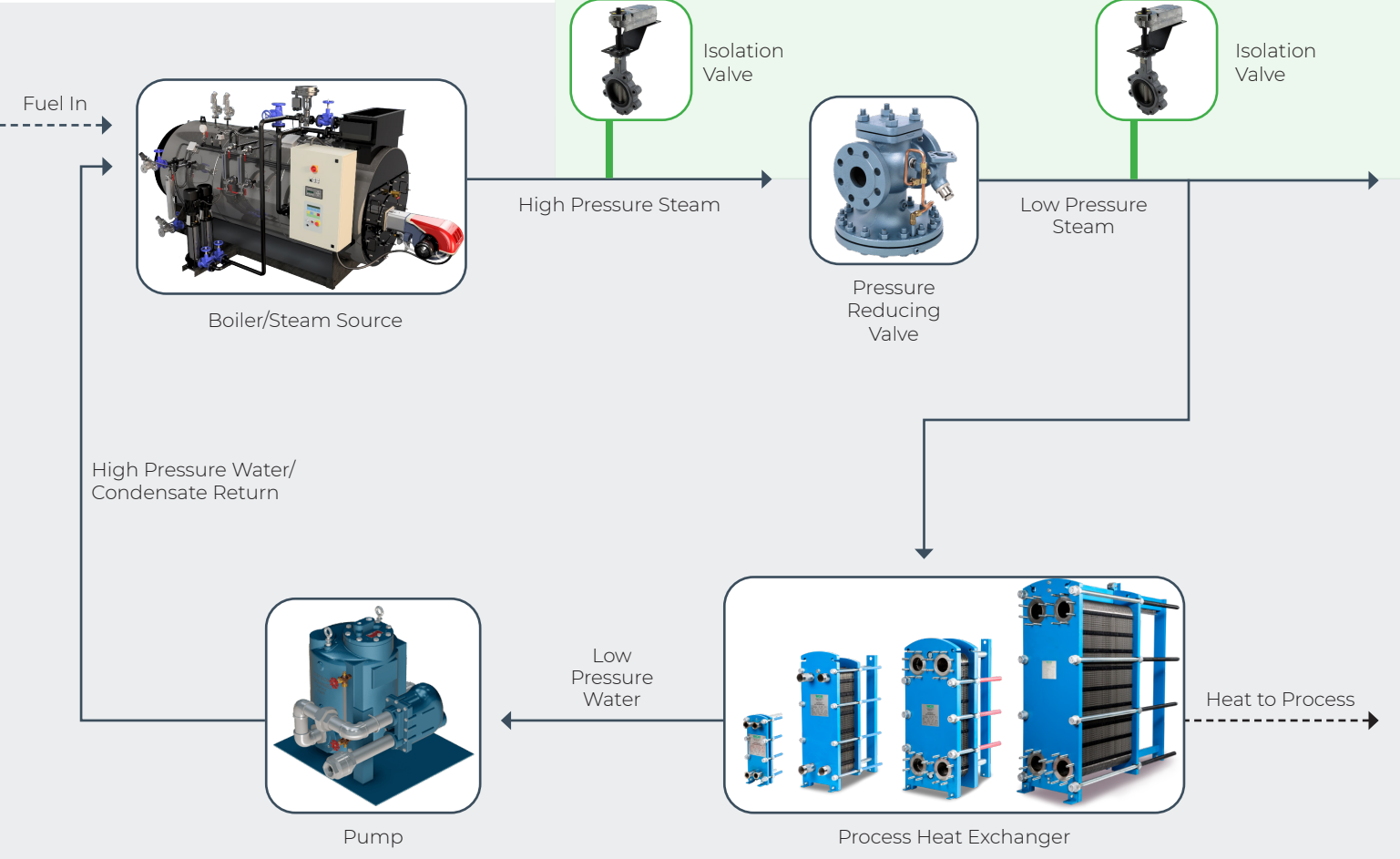
With a simple bypass, you can install an NLine Microsteam Turbine parallel to your PRV to harvest your unused thermal energy.

KEY

Existing Infrastructure
(a simplistic example)

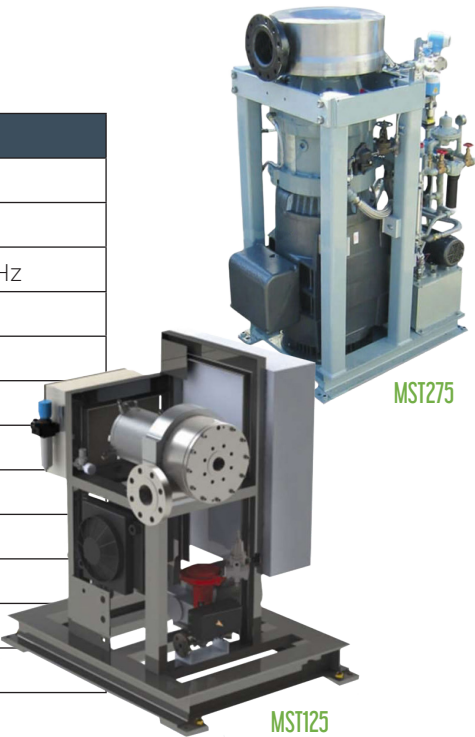
New Investment in NLine

Electrical



Models & Specifications

	MST125	MST275
Power Characteristics		
Output @ Full Load	125 kWe	275 kWe
Voltage	480V, 3 Ph, 60 Hz	480V, 3 Ph, 60 Hz
Annual Generation	1MM kWh	2.4MM kWh
High Efficiency Operating		
Turbine	Up to 80%	Up to 82%
Gearbox	N/A	96.5%
Generator (Sync or Induction)	95.0%	95.8%
Operating Limits		
Max Inlet Pressure	300 PSIG	720 PSIG
Min Discharge Pressure	0 PSIG	0 PSIG
Skid Footprint	34" x 46"	36" x 48"



Features

High Efficiency Components

- Radial Patented Outflow Turbine
- Epicyclic Gear Box: 300 kW Rated
- Induction Generator: 96% @ 275 kWe

Compact Design

- Fits Through Standard Door
- Minimally Invasive to Existing Steam System

Modern Control System

- PLC Controls with Color HMI Option
- Single-Button Startup
- Automatic Synchronization
- Unattended Operation with Hardwired Safety Trips

Robust Construction

- 20+ Year Lifetime
- Minimal Maintenance
- Tolerant of Poor-Quality Steam
- Stainless Steel Nozzle



Simple Electrical Design

- Pre-Wired, Factory-Tested Instrumentation
- Quick-Connect Cables
- Plug-and-Play Integration
- Minimal Installation Costs
- Ability to daisy-chain multiple turbines

Quiet Operation

- 85 dBA Untreated Acoustically

Benefits

- 1.5 - 2X increased output efficiency*
- Best in class! 82% peak efficiency
- Reduce Greenhouse Gas (GHG) emissions - bolster your sustainability initiatives
- High-alloy rotating assembly provides corrosion/erosion resistance

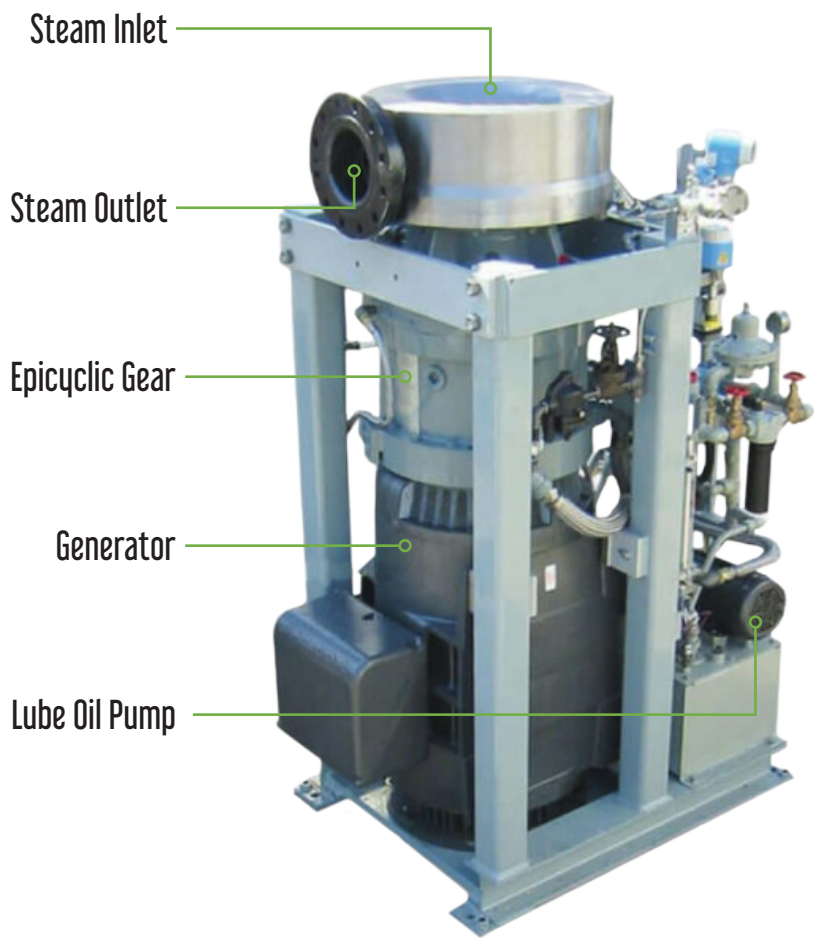
UP TO 2X INCREASED OUTPUT EFFICIENCY!*

- Microgrid capable for plant resiliency
- Plug-n-Play package reduces installation cost
- Save thousands of tons of CO₂ emissions each year... Per turbine!
- ~2 - 4 year payback

*When compared to a traditional steam turbine system.

Microsteam® Turbine

The **Microsteam Turbine (MST)** is a compact energy recovery system that utilizes pressure and flow energy that would otherwise be wasted in your steam system's PRV (*pressure reducing valve*). **The MST harvests all of that energy and converts it into usable electricity.**



TURN WASTED ENERGY INTO SAVINGS

EXAMPLE
When your current steam process is upgraded with the Microsteam Turbine, assuming an example pressure drop of 200 to 125 PSIG (75 PSI) at a steam flow of 20,000 lbs/hr. That will result in:
~ 2.3MM kWh Generated/Year **~ 1,797 Tons of CO₂ Avoided/Year**
That's the equivalent savings of:

183,441
Gallons of Gasoline Consumed

296
Homes' Electricity Use for One Year

198,273,828
Number of Smartphones Charged

Typical Applications



HOSPITALS/UNIVERSITIES



FOOD & BEVERAGE



AG PROCESSING/INDUSTRIAL MANUFACTURING

WILL MY SYSTEM BENEFIT FROM NLINE?

IF ANY OF THE DESCRIPTIONS TO THE RIGHT APPLY TO YOUR SYSTEM YOU WILL BENEFIT FROM AN NLINE TURBINE

- High pressure to low pressure systems with a 65 PSI minimum pressure drop
- High pressure to low pressure systems with high steam flow rates (40,000 PPH or greater)
- Systems that operate 24/7 or close to it
- Biomass energy systems

Proven & Recognized



NLine Microsteam Turbine Systems are made in the USA.



The Microsteam® Turbine is certified in the US Department of Energy's eCatalog as a Recognized CHP Packaged System.



NLine is a pre-approved provider of technology by the New York State Energy Research and Development Authority.



NLine is officially acknowledged by the state of California Air Resources Board as a zero-emission technology through DG-017 certification.



Unintrusive Installation

Steam Tie-In

- The only down-time required is for installation of isolation valves on high and low pressure headers. (See page 2.) The majority of the installation is completed while the plant is in operation so you can keep operations on schedule.

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 a microgrid for plant resiliency

Maintenance

- NLine and O&M schedule - annual service plus detailed turbine inspection every 5th year
- Maintenance agreement renewed every 5 years



Financing

Cash/debt financed purchase from corporate balance sheet

- Includes tax credits, grants, and incentives

NLine Energy, Inc. arranged construction financing / lease purchase

- Term length dependent on project/client financials

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

What Financing Option is Right for You?

The Apex Team is familiar with all financing options available. Our team will evaluate your plant alongside a certified energy engineer and will be able to show you projected energy savings, payback calculations, and your cost.

Bring your plant into the 21st century and start saving money on wasted energy today!
Explore Your Options: **763-777-9525**

PACE Financing

- PACE or Property Assessed Clean Energy Financing, is offered to all commercial business owners in Minnesota (and most other states) to encourage corporations to help combat climate crisis and reduce the deficit.
- 100% of your project costs are covered.** Payments are repaid through a special property tax assessment with terms up to 20 years.
- With the money you will save on energy, you will likely be able to pay the loan back long before 20 years is up!**
- For more information, call Apex at **763-777-9525**



How the University of Idaho maintains resilient microgrid with NLine Energy's Microsteam Turbine

Problem

Like many college campuses, the University of Idaho has a steam heating system that operates twenty-four hours a day. At the heart of the system is a steam plant that produces all the steam used to heat the buildings on the campus.

"What makes our steam distribution system unique is that it produces **more than 250 million pounds of steam** each year using biomass in the form of low-cost, locally sourced wood chip waste for fuel," said steam plant manager Scott Smith.

The problem was that Scott and Marc couldn't find a turbine that was small enough—or savvy enough—to turn the steam created by the system into energy.

"In addition to the energy savings, we wanted to make our energy plant **as resilient as possible**," said Marc. "Sure, we have a backup generator in the building, but it's a single piece of equipment, and if it fails, we lose power. We needed a turbine to help us create an electricity microgrid powered by steam."



Solution

After gaining a thorough understanding of the university's needs, NLine recommended that the university install three Microsteam® turbines in parallel. That configuration maximized the power generation potential from the wide variety of flow rates throughout the year.

Results

Significant Cost Savings

"When you calculate how much power we can make with NLine's turbines, the university saves more than **\$400,000 each year**," said Marc. "Adding up the project's total cost, we estimate that we will see a four-year payback period."

Resilient Microgrid

"Our resilient microgrid produces enough steam energy to heat the campus year-round, and it takes multiple failures before our microgrid goes down. We have **three turbines working in parallel** so that we have multiple backups," said Marc.

Repeatable Solution

"What we've done on our campus is applicable to universities across the country and possibly even some industrial processes, like sawmills and food processing plants, even hospitals," said Marc. "It's fairly easy to scale and replicate this system as needed."

Key Stats
825 kW New Renewable Generation
15% of Campus Demand Offset
3.5 Year Payback (Including Microgrid)

\$9,917,000
20 Yr Net Savings

6,433,000 kWh
Annual Generation



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