

BIOMASS

CASE STUDIES SERIES

Toblach/Innichen Woodchip District Heating & CHP System

**Heating Capacity
(output): One 10 MW
(34 MMBtu/hr) boiler
and two 4 MW (14
MMBtu/hr) boilers**

**Electrical Capacity:
1.5 MW**

**Emissions Reduction
and Combustion
Control Equipment:
Multi-cyclone, electro-
static precipitator,
condensation plant,
moving grates, O₂
sensor control**

Year Installed: 1995

**Thermal Output:
Hot water**

**District Heating
Network Length:
44 km (27 miles)**

**District Heating
Customers: 900**



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TOWNS OF TOBLACH AND OLANG, SOUTH TYROL, ITALY

How Three Alpine Resort Towns Became District Heat Champions

In 1994, the mayor of Toblach, an affluent resort town in Italy's region of the Alps near the Austrian border, asked a young municipal employee named Stefan Clara if he could take charge of creating a new, woodchip district heating system to serve the town of 3,300. Clara said yes. Then he hurried back to his office to find out what "district heating" was.

He knows now.

Today, Toblach's woodchip district heating system serves more than 900 buildings in two towns. It's owned and run through an innovative co-op membership, and it has expanded to produce electricity, and to heat more than 90 percent of the buildings in Toblach and the neighboring community of Innichen, four kilometers (2.5 miles) away. Customers are reportedly very happy with the district system, whose initial development in the mid-1990s paralleled that of a similar system in the neighboring town of Olang. Today there are 60 wood-fired district heating systems in Italy's South Tyrol region, whose total population of 550,000 is smaller than Vermont's.

As part of a feasibility study for the Toblach system, Stefan Clara went door to door, talking with the owners of the town's larger buildings, including the 60 local resort hotels. The feasibility study had set a target of 70 percent customer commitment as a threshold for building the biomass plant and pipeline.

After three months, the mayor asked Clara if he had reached that goal. Again, Clara said yes—but, in fact, he hadn't quite made it.

"I was so scared," he recalls—"but as soon as the decision to build was made, I quickly got the remaining commitments."

In 1995, the Toblach system went online with two, four MW thermal (14 MMBtu/hour) Kohlbach woodchip boilers, and with 120 buildings connected. Membership has since grown to more than 500 members in Toblach and 400 in Innichen. Clara, who guided the system for its first 10 years, led the develop-



PHOTO COURTESY LEO HALL

ment of the co-op membership arrangement, in which each customer/owner has one vote and can join in decision-making. The most important member is the municipality itself, which owns the local schools, a number of city buildings, and a large office complex.

Building owners provided 20 percent of the system capital, with one-fifth of their portion coming from the municipality. Grants from the provincial government of South Tyrol met between 30 and 40 percent of the initial capital cost for the system, with low-interest loans providing the rest. To help out, local banks deferred principal payments in the system's early years.

Expanding and Repaying Debt without Raising Rates

Along with its cooperative membership, the Toblach system has taken a forward-looking approach to building its fuel supply. To strengthen the link between energy use and local, family-owned forests, the system pays local farmers 75 percent more than the market price for woodchips, which today is €30-40 per tonne (\$35-\$45 US per US ton), close to US prices. Northern Italian heating oil prices were €0.70 per liter (\$3.50 US per US gallon) when the Toblach system was built. They are now about €1 per liter.

Pictured on front: The Toblach district energy plant in the Dolomites of northeastern Italy. Right: Thermal oil heater of the ORC CHP plant, similar to the one in Toblach.

The system innovated again when it expanded in 2003 to serve Innichen, population 3,100, with its large hospital, nursing home, swimming-pool complex, and bigger hotels than Toblach's. Along with laying pipe to the town, the plant added combined heat and power (CHP) capability, using a new system called "organic Rankine cycle," or ORC, built by the Italian firm Turboden.

Unlike the steam-boiler technology that is conventional for CHP, ORC does not develop high pressures, is much safer, and requires very little operator attention. To power the ORC system and serve the Innichen heat network, the plant added a third woodchip boiler, with 10 MW (34 MMBtu/hour) capacity. It cost €8 million to expand the central plant in Toblach and add the new wood boiler and ORC equipment there, not including the pipe cost to connect the two towns and provide heat to buildings in Innichen.

Adding the ORC sharply increased revenue to the system, because Italy at the time was paying green-power producers to supply electricity to the grid under a generous "feed-in" tariff. Although the feed-in rate has fallen since then, it is still high and provides valuable revenue that has allowed the co-op to prosper.

These revenues supplement those from the system's co-op members. The price members pay for their heat—about €80 per MW hour (\$30 US per MMBtu)—has not changed since 1995.

Since it was commissioned, the Toblach system has been earning money and building reserves. When the system has repaid its construction debt, the co-op's board will decide whether to reduce rates or pay dividends to members.

The Toblach system has been regarded as a European leader in district energy because it has innovated consistently, it pioneered

the user-co-op ownership model, it installed the biggest ORC system available at the time, it uses emissions-control equipment that achieves the best-available results, and it works with co-op members to help them reduce their use of heat energy. Also, the system supports local forest owners, and it has made its central energy plant a center for educating children, the public, and eco-tourists—all while keeping rates flat for 15 years.

In Olang, Performance Converted Skeptics

A few miles west along the Upper Valley of the Rienz River, the resort town of Olang commissioned its district-heating woodchip system just before Toblach's. Olang has 3,000 residents and nearly 3,000 hotel beds. After a nearby fiberboard plant closed, area loggers, mills, farmers, and forest landowners wanted a new market for woodchips.

Even so, "there were skeptics," recalls former mayor Alfred Jud. "They thought the system wouldn't run in the summer, and they would have to keep their boilers and water heaters. But that wasn't the case."

Rising oil prices in the mid-1990s stimulated signups to Olang's system, which now serves 90 percent of the buildings in town. Olang's plant has two, four MW (13.5 MMBtu/hour) Mawera chip boilers, and a 680 kW ORC for power production. It is owned by its original 160 local investors/customers, while its total number of customers has grown to 300.

Jud stresses the importance of maximizing the efficiency of buildings connected to the district system, through insulation, new windows, overall tightening-up, and better thermostatic controls. This, he notes, makes the whole district-heating system more efficient.



PHOTO COURTESY LEO HALL

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