Green Heating

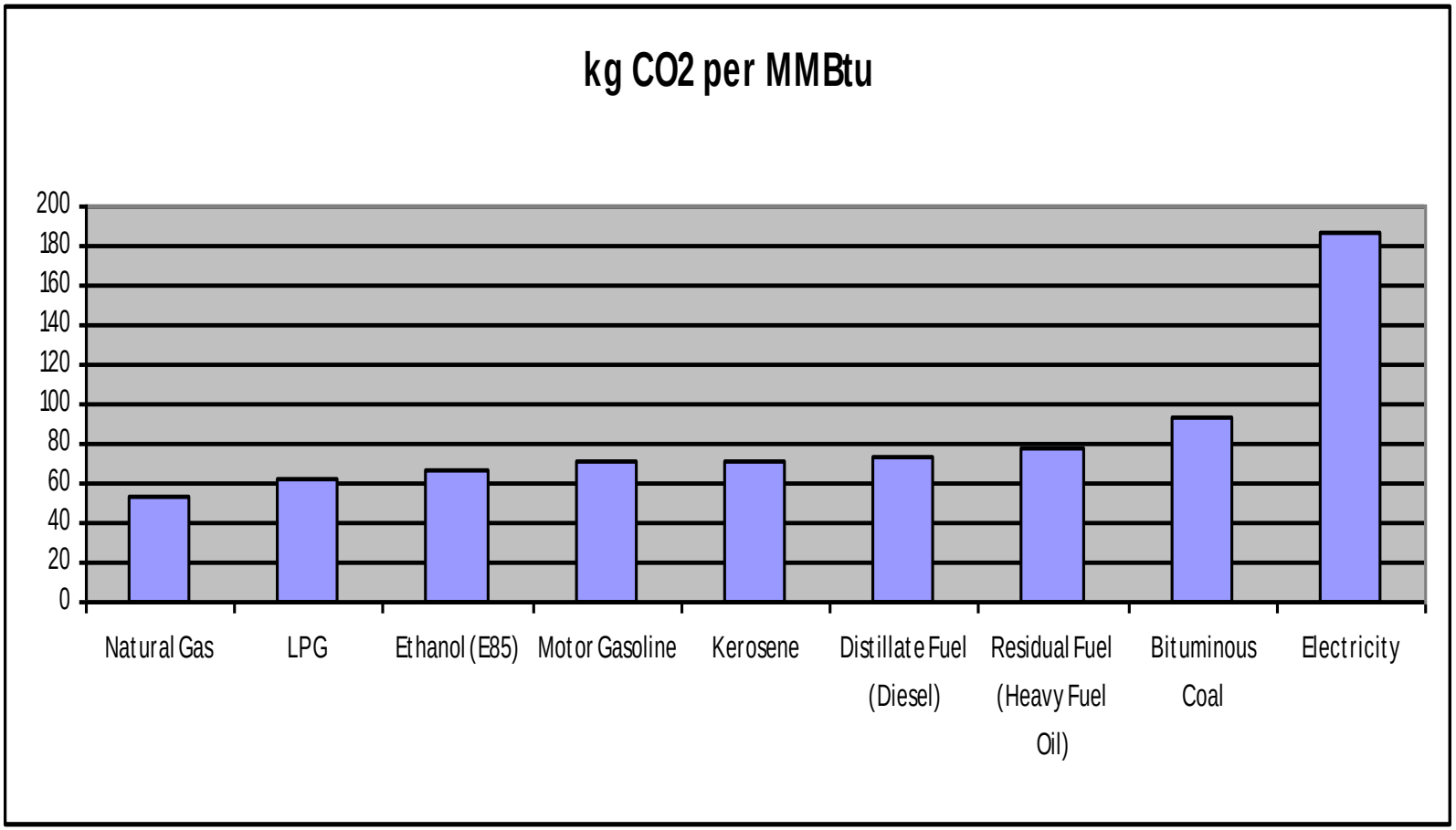
The goal of green heating is to use the least amount of fuel to heat a conditioned space.

$$\left(\frac{\text{Heatloss (BTU)}}{\text{(Indoor Temperature - Outdoor temperature) X 1HR}}\right) \text{X} \left(\frac{\text{Heating Degree Days X 24hrs}}{\text{CCF's of Gas X 100kBTU}}\right) = \text{\% Efficiency}$$

Heating System Efficiency can further be broken down into three parts.

- **Fuel Efficiency**
- **Boiler Side Efficiency**
- **System Side Efficiency**

Fuel Efficiency



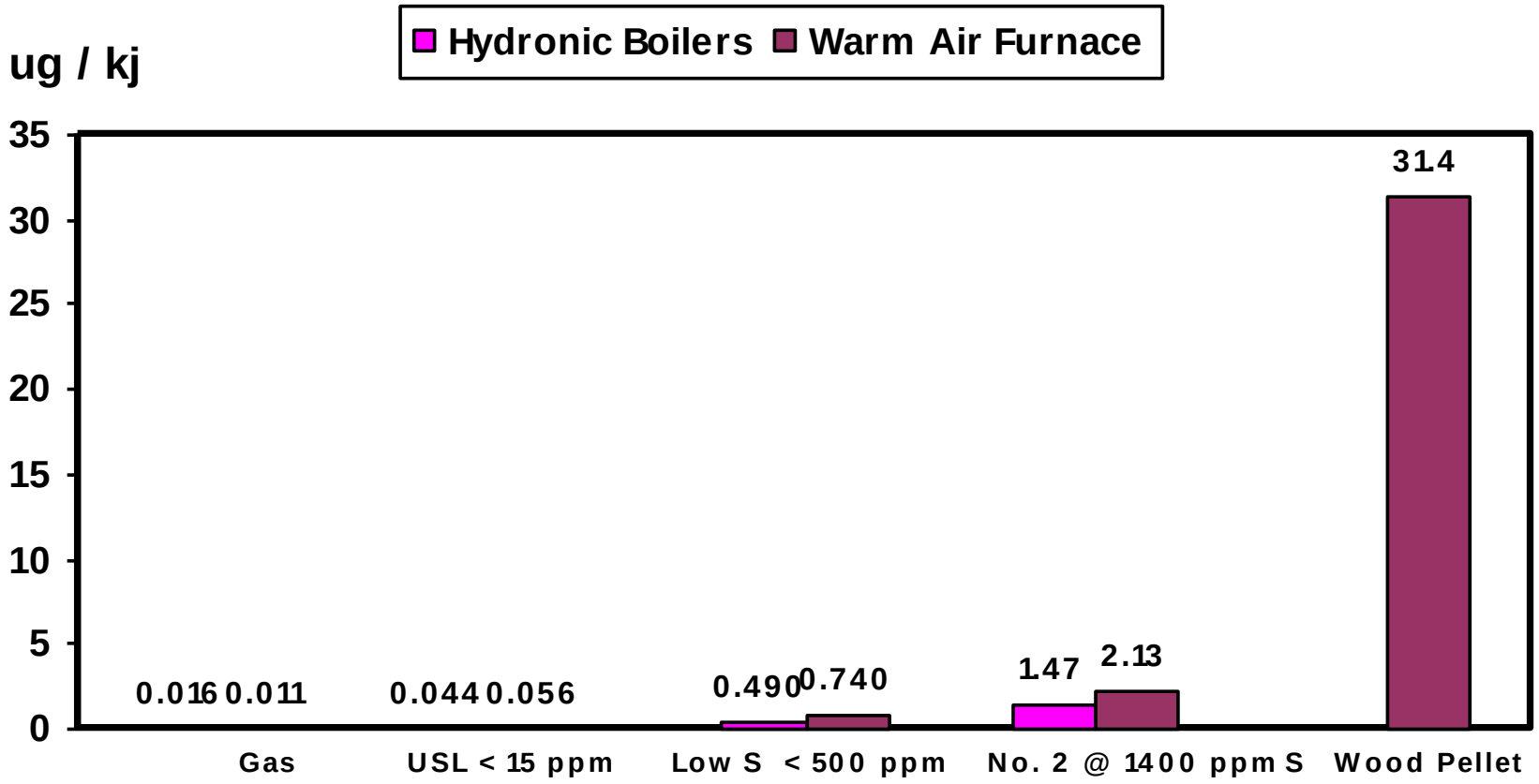
From John Sigenthaler P.E.

Comparison and Conversion of Different Fuel Costs in Connecticut

Electricity:	**20. 56 cents per kwh = $6.025 per therm**
Natural Gas:	**$1.61 per ccf = $1.57 per therm**
#2 Heating Oil:	**$2.48 per gallon = $1.79 per therm**
Propane:	**$2.61 per gallon = $2.86 per therm**

1 therm = 100,000 btu's

Fine Particulate Emissions



From Brookhaven Labs

Relative Emissions of Fine Particulate Matter From Home Heating Devices

Ref. Smoke Gets in Your Lungs: O**utdoor Wood Boilers in New York State October 2005** New York State Office of the Attorney General Environmental Protection Bureau

From BrookHaven Labs

Solar
Free Energy

Geothermal
Energy from the Ground

Combined Heat & Power

Boiler Side Efficiency

"The Fuel Savings were Immense!"

Brook Jones, the homeowner

Boiler Replacement Study

School	Before Therms Steam	After Therms LT/Cond Blr	Therms Saved	Percent Saved
1	69,327	25,171	44,156	64%
2	50,875	16,607	34,268	67%
3	64,513	24,008	40,505	63%
4	96,671	29,933	66,738	69%
5	42,078	12,034	30,044	71%
6	64,780	19,787	44,993	69%
7	61,499	23,496	38,003	62%
8	54,333	17,025	37,308	69%
9	97,257	23,210	74,047	76%
10	77,514	24,623	52,891	68%
			Average	68%

Table 1: Steam to condensing boilers.

School	Before Therms 180°F HW	After Therms LT/Cond Blr	Therms Saved	Percent Saved
11	59,246	28,207	31,039	52%
12	67,255	38,689	28,566	42%
13	54,812	24,051	30,761	56%
14	45,262	28,089	17,173	38%
15	49,553	24,636	24,917	50%
16	60,487	24,629	35,858	59%
17	55,109	31,099	24,010	44%
18	57,987	20,804	37,183	64%
19	39,150	26,040	13,110	33%
20	44,651	22,357	22,294	50%
			Average	49%

Table 2: Conventional HW boilers to condensing boilers.

From the ASHRAE Journal by Tom Durkin P.E.

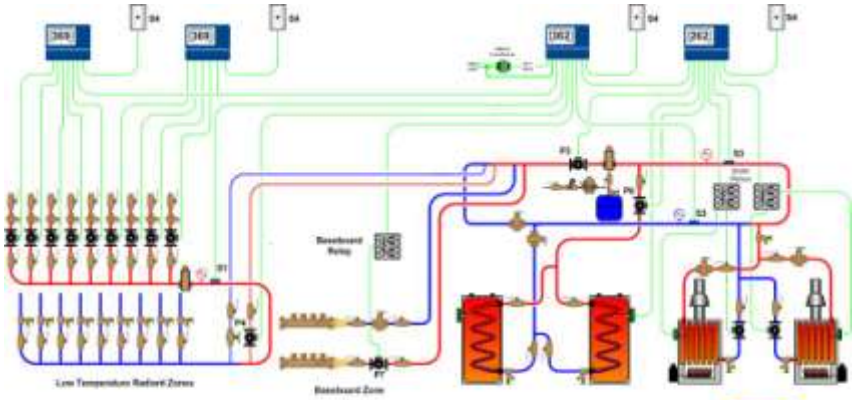
Five ways to save Energy on the Boiler Side

- Lower water Temperature
- Recover Heat from the Condensate
- Less Standby Losses
- Reduce Short Cycling
- Tune combustion for lower stack temperature and oxygen.

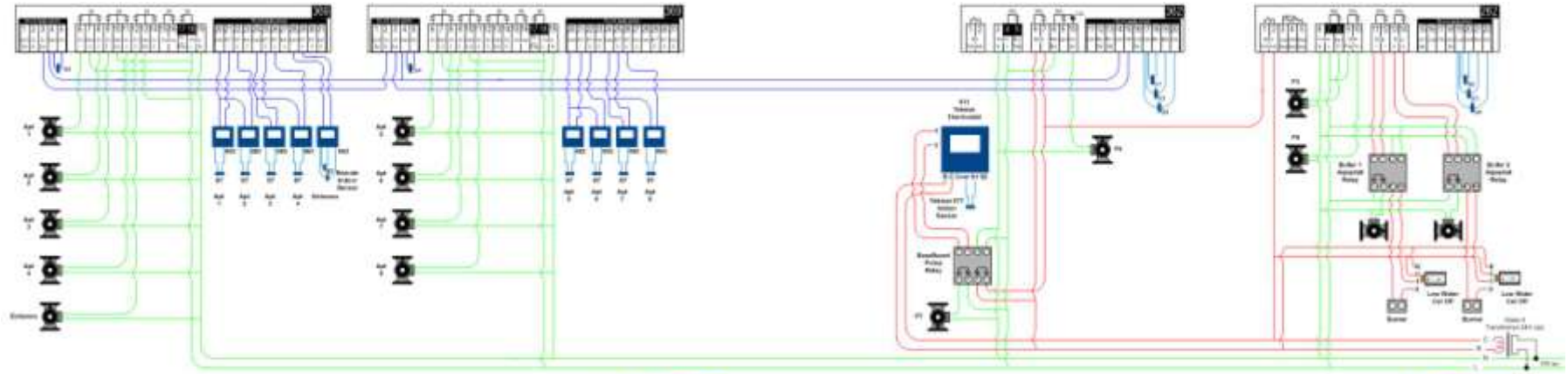
- *“After we installed radiant floor heating in several rooms, even on the coldest days, you can stand anywhere in the room and you're warm and comfortable. And with our indirect water heater, we never run out of hot water. Just as important, our hydronic system has cut our heating bills by 30%.”*
- **-- Albert James, owner of a 3,000 sq. ft. home in Stamford, CT**


Buderus
Buderus

CAD Drawings



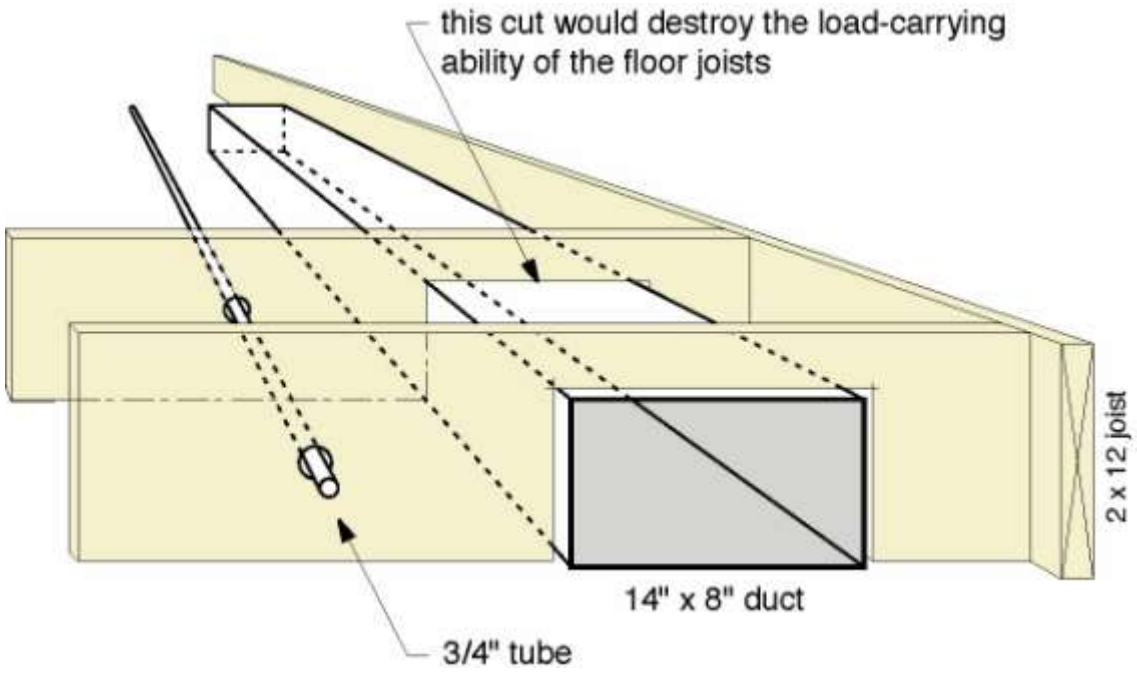
JR's Plumbing & Heating LLC
www.ComfortableHeat.com
Mechanical Drawing
8 Apartments at 20 Grove St



JR's Plumbing & Heating LLC
www.ComfortableHeat.com
Electrical Drawing Part 1
8 Apartments at 20 Grove St

JR's Plumbing & Heating LLC
www.ComfortableHeat.com
Electrical Drawing Part 2
8 Apartments at 20 Grove St

System Side Efficiency



From John Sigenthaler P.E.

- Santa waves bye bye to the energy as it escapes out of the vent.

Best Ways to save energy on the system side

- Lower the water temperature
- Run smaller distribution pipes
- Do not run pipes in unconditioned spaces
- Put your heat emitters on the inside walls
- Turn down the thermostat
- Balance the room temperatures

European Style Hydronics

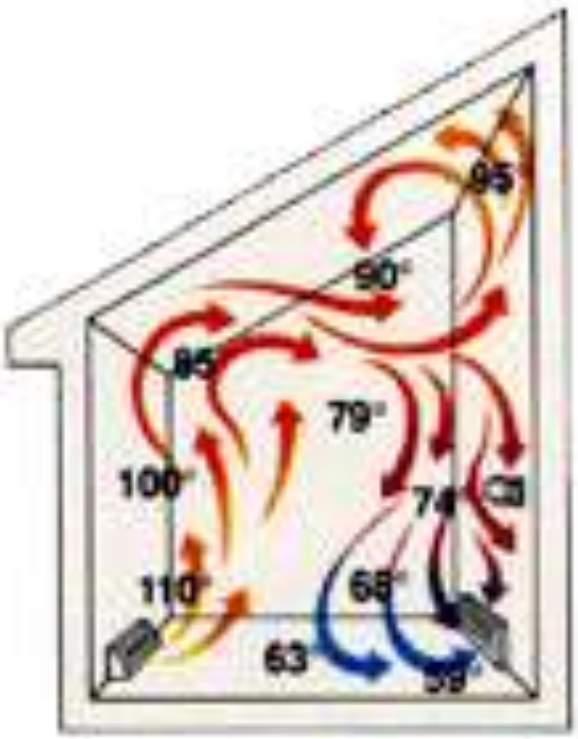
- “In Europe, essentially 100% of home heating systems are hydronic. Advantages reported for hydronic systems include comfort, reduced electric power consumption, and near elimination of energy losses associated with distribution systems (duct losses can reach 30-40%)”.

- by Dr. Tom Butcher, Dept Head, Energy Efficiency Buildings Div, Brookhaven Laboratories (One of 10 U.S. Dept of Energy Laboratories)

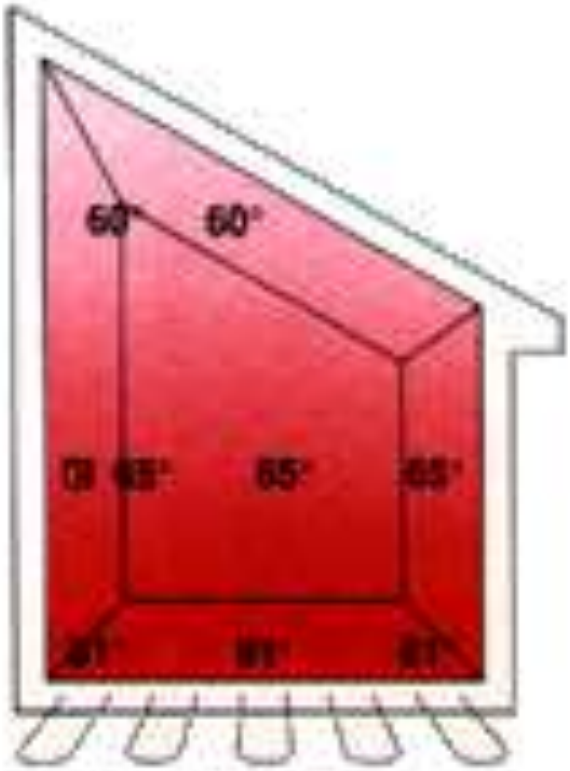
Low Temperature Hydronics

- In Germany it is illegal to design for more the 138 degrees and a outdoor reset control is mandatory.
- The rule of thumb is for every 2 or 3 degrees you lower the water temperature you can save 1% in fuel.

Even Temperatures are delivered with warm comfortable radiant heating. Central Europe is 67% Radiant Heat.



Forced Air



Radiant Floor

Radiant Heating

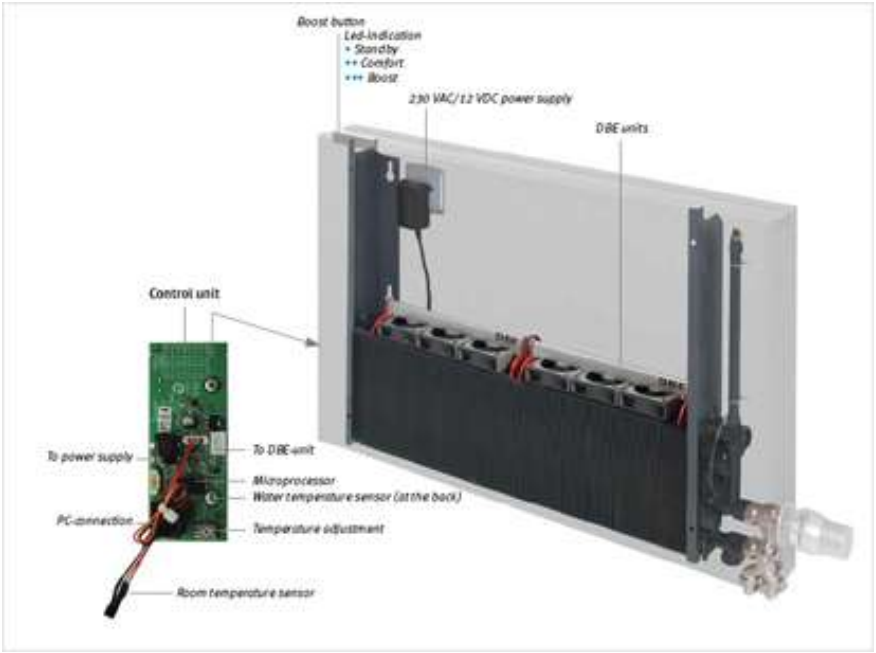
Before and After

Underneath and Above

Jaga low temperature radiators and convectors

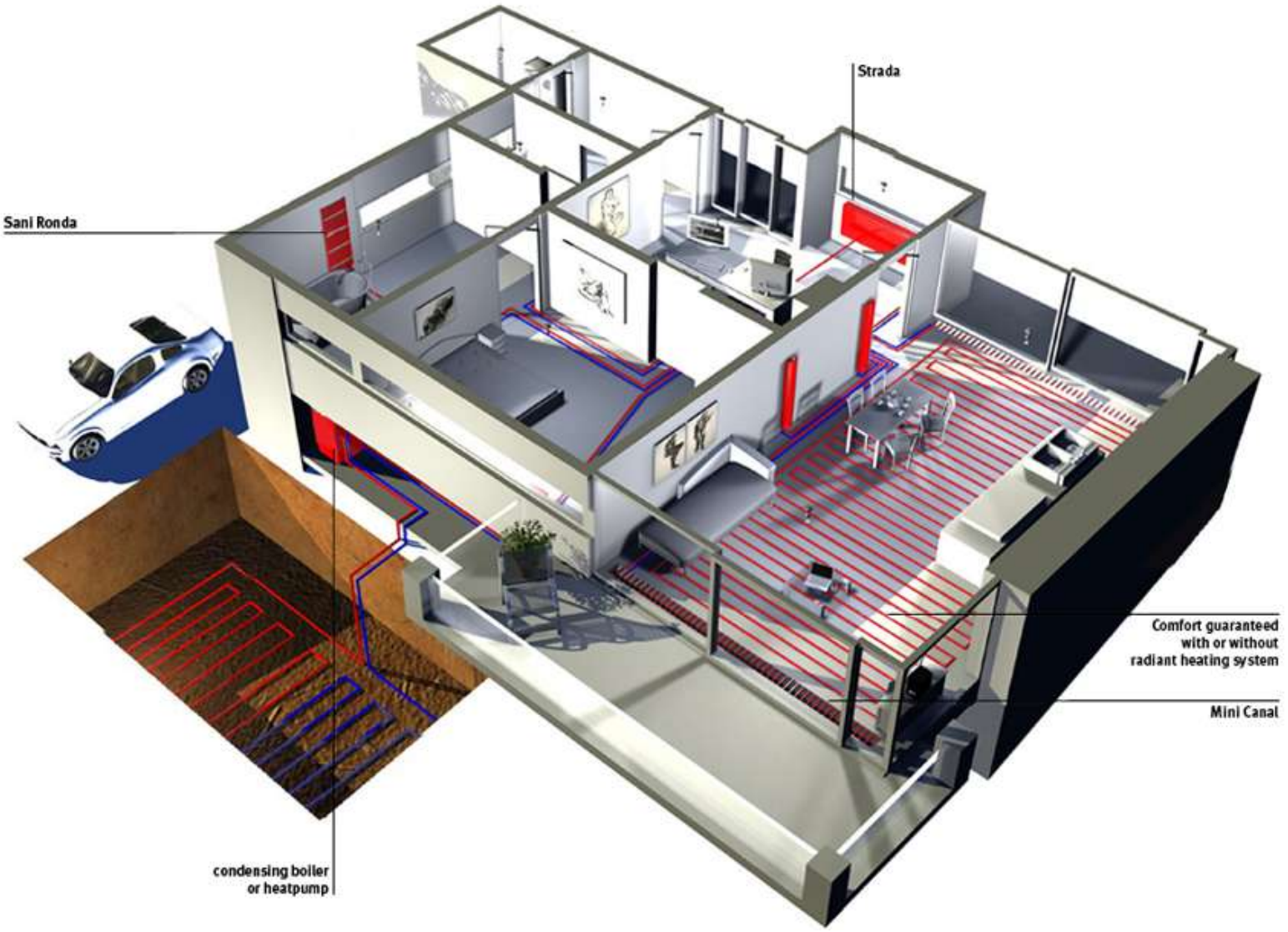
Jaga DBE

- Prepare yourself for the future: same size, 3 times the heating output
- Standard Low-H2O emitters are the most powerful on the market, thus the best choice for condensing boilers. But that’s not all! With optional DBE, these outputs can even be tripled! Combined with DBE the same fin tube element emits 2 to 3 times more heat, with no increase of size! This makes Low-H2O the best solution for heat pumps, solar energy and all systems running wih extremely low water temperatures as low as 95°F. DBE technology gives you the opportunity to make the best use of the full range of new, environmentally friendly systems.



Artistic Statements

The European House



Thank you!

- John Ruhnke
- JR’s ComfortableHeat LLC
- www.ComfortableHeat.com
- JR@ComfortableHeat.com
- (203) 849-1479