# EcoThermo EcoHomeCTL
# wiNET

QUANTUM LEAP
Ideas for Sale

# INNOVATIVE TECHNIQUE AND SYSTEM FOR HEATING COST ALLOCATION, WIRELESS LOW-CONSUMPTION ELECTRONIC RADIATOR VALVES (0.8J FOR ACTUATION) AND IoT PLATFORM FOR HOME AUTOMATION, BIOMEDICAL, ENVIRONMENTAL AND INDUSTRIAL SYSTEMS WIRELESS REMOTE CONTROL

# The Technology: Introduction

- System for the conversion of central heating systems without independent control, in heating system functionally autonomous

- Basic functions
    1. Local temperature control (apartment)
        → thermal comfort (apartments over- or under-heated)
        → energy savings (lower temperature when possible)
    2. Distribution of heating costs according to the actual consumption of each user
        → recognition of savings achieved

- Installation without structural changes to the distribution system and to the boiler

# DRAWBACKS OF EXISTING TECHNOLOGIES

## ALLOCATION REALIZED WITH *HEATING COST ALLOCATORS*

- For vertical distribution circuits, an *heating cost allocator is used*
- This device performs indirect heating exchange measurements
- The allocation quality is deeply affected by: the quality of the installation, the  kwoledge of radiator thermal characteristics (radiators from 40 to 120 years old), the presence of air inside the radiator, the presence of sands on its bottom part, the presence of curtains  in front of the radiator

- **CONSEQUENCES:**
  - Allocation error from 10% to 40% as independent studies demonstrates
  - Complains of the other tenants that percieve the errors
  - Lost of trust
  - Court Summon

# DRAWBACKS OF EXISTING TECHNOLOGIES

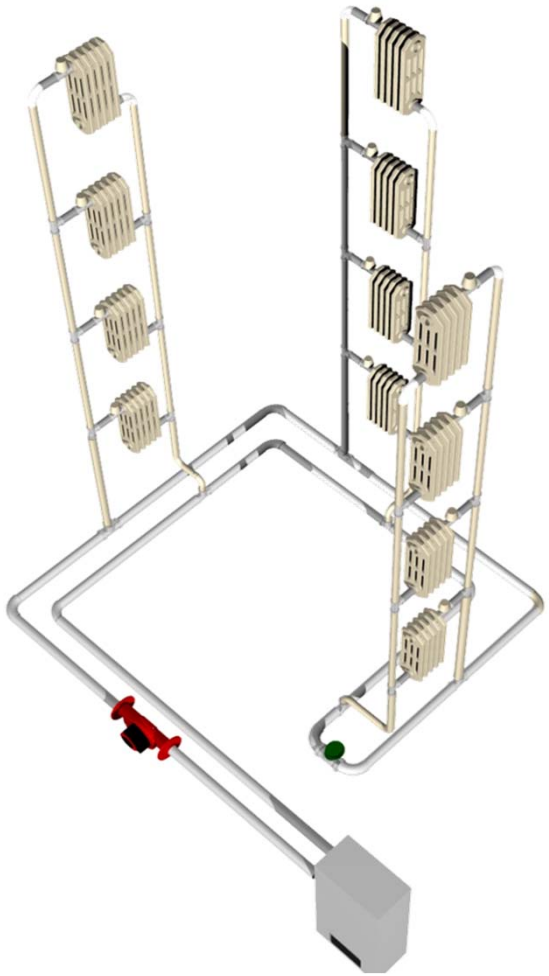
## TEMPERATURE CONTROL REALIZED WITH THERMOSTATIC VALVES

- **IN 99% OF CASES A THERMOSTATIC VALVE, DRAWBACK IS PROPOSED**
  1. Not possible to set a desired temperature in c/f degrees
  2. Not possible to change easily indoor temperature when getting out/in: renounce to the major part of savings (lowering temperature when tenants are outside)

**→ VERY LOW SAVINGS, 6%-12% IN THIS 99% OF CASES (COMMERCIAL PROMISE: 20%-25%)**


- **JUST IN 1% OF CASES, ELECTRONIC VALVES THAT ALLOW INCREASING SAVINGS ARE INSTALLED (x2 – x2.5 TIMES)**
  1. Cost too much
  2. **Batteries stand just one year** instead of the promised three; **administrators do not want to face the relative replacement and tenants complains.**

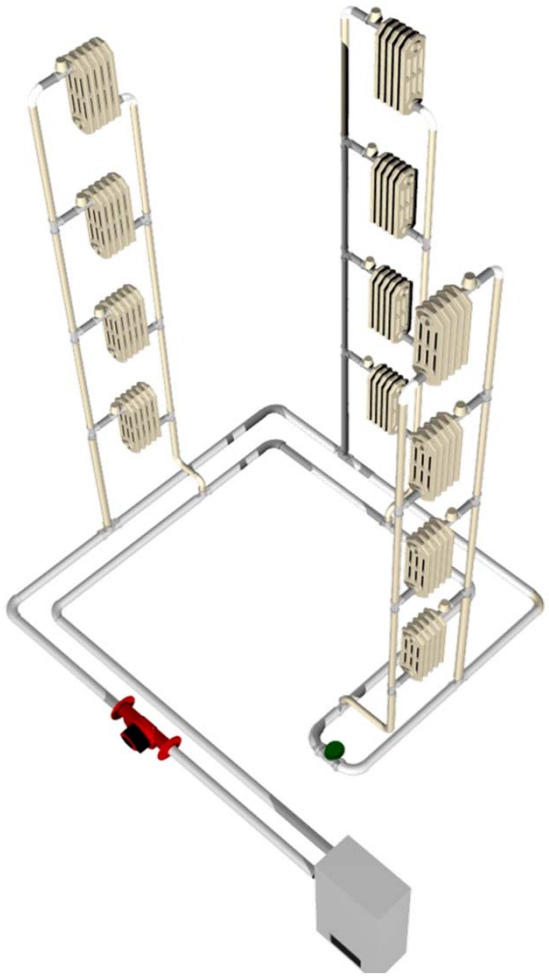
# The Technology: The device 1



- ECOTHERMO implements a math model (thermo-fluid-dynamic model) of the entire distribution system (pipelines) and not just of the radiators such as the hcas do

- This allows ecothermo to know  exactly the flow rate that in every moment passes through every radiator
  - Without having a flow meter on each radiator
  - Having just one flow meter for the entire building

# The Technology: The device 2



- Electronic radiator valves have 2 temperature sensors (radiator inlet and outlet)
- The model estimated radiator flow rate + 2 temperature sensors of electronic valves: equal to a heat meter without a physic flow meter
- We realized a virtual heat meter for each radiator

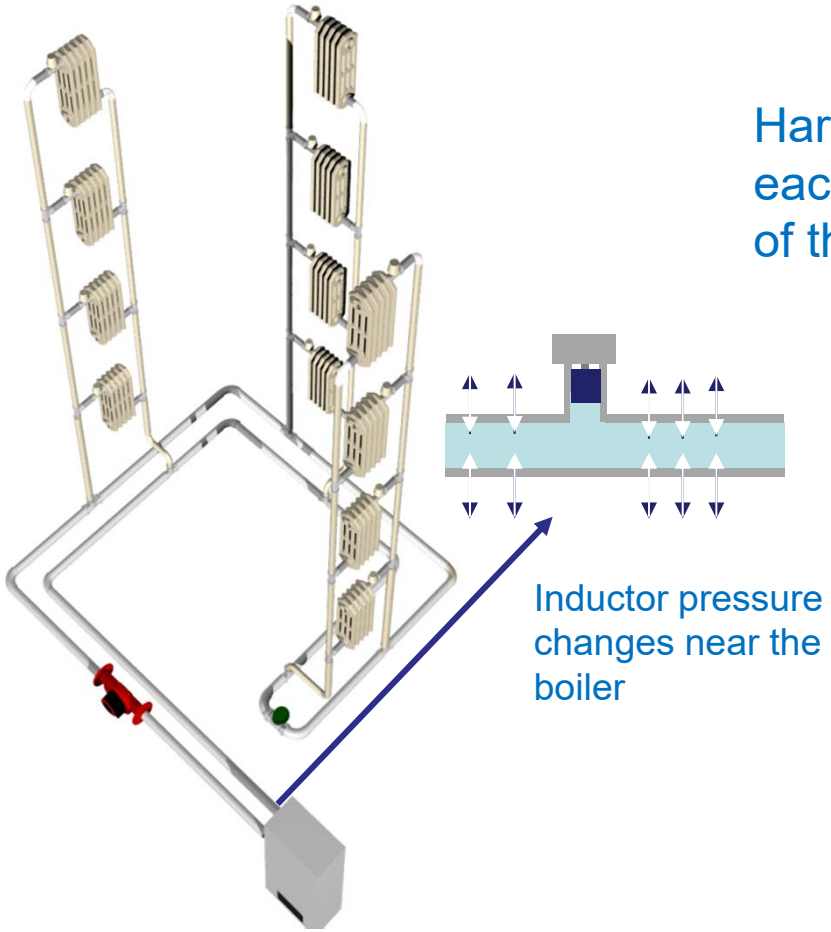
# REAL LIFE TIME OF THE ELECTRONIC VALVE'S BATTERIES

- The market does not accept the active control electronic valve that would ensure to double the heating cost savings. This because the real life time of the batteries is around one year instead of the promised three and an electronic valve and a heat cost allocator per each radiator cost too much.

- 3 improvements have been designed to get the batteries last from 4 to 5 years in the worst working conditions (3 small aa batteries are used).

- A new technologie has been patented to recharge locally the electronic valve batteries (no pv cells, no turbine, no peltier cells).

# ENERGY HARVESTING: FOR WIRELESS CHARGING BATTERIES

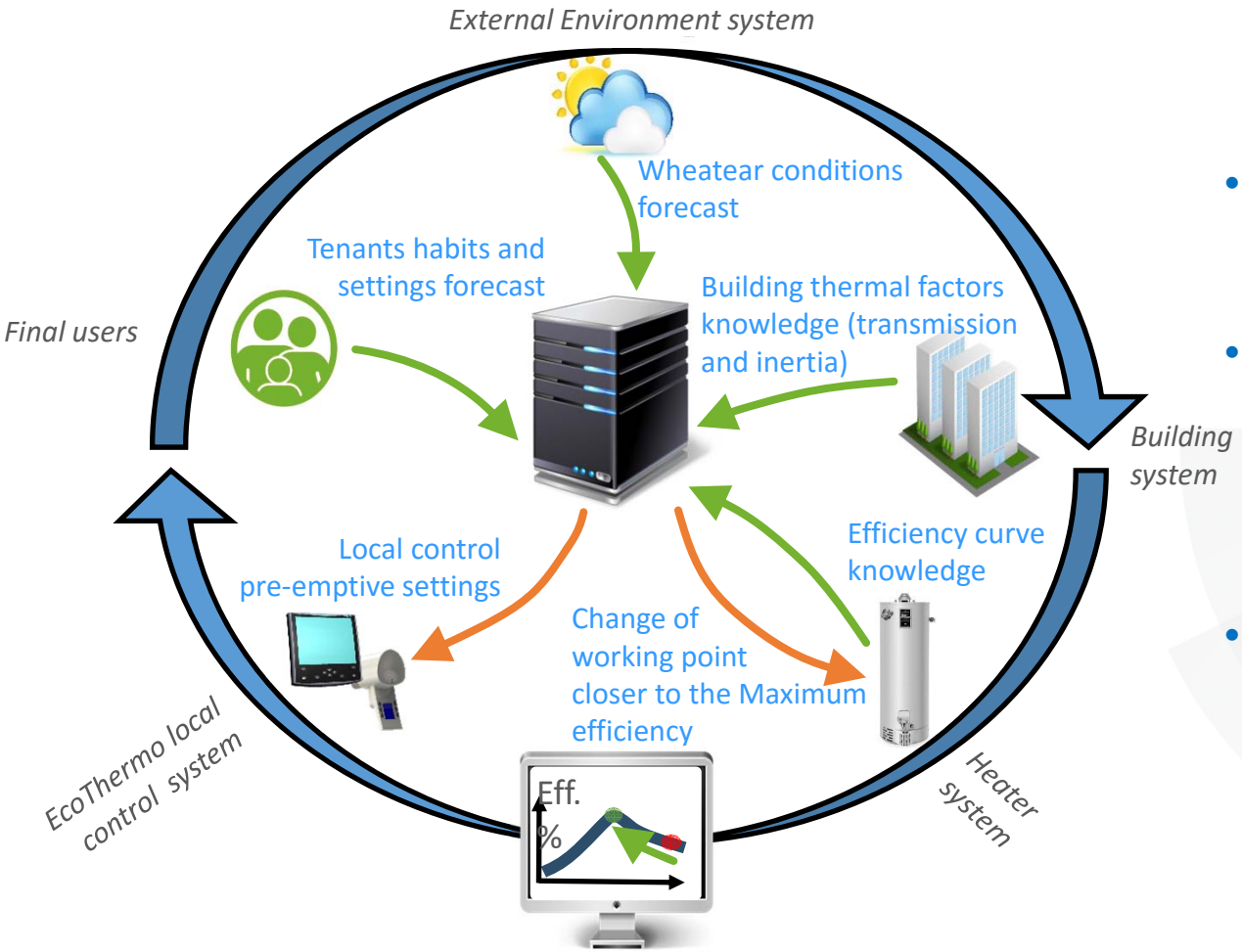


Inductor pressure changes near the boiler

Harvesting is based on a piezoelectric probe on each valve to recharge constantly the batteries of the electronic valves (international patent)

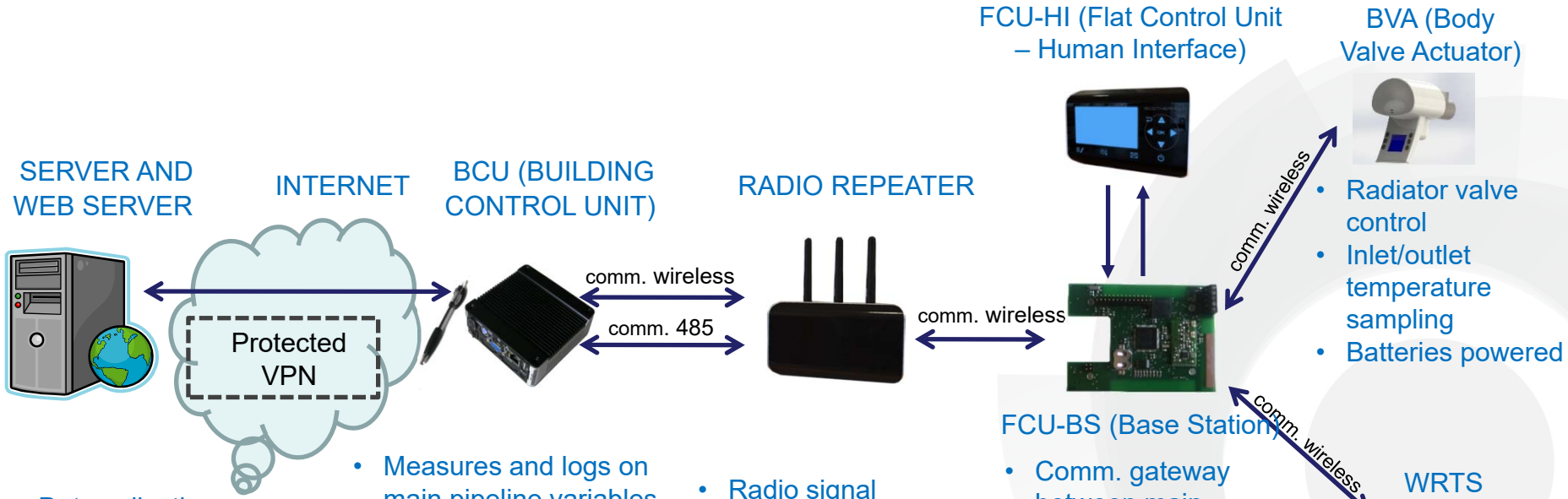
Piezoelectric sensor on the valve

# IMPROVEMENT OF BOILER EFFICIENCY




- Consider the various systems jointly as one supersytem
- Implement pre-emptive policies in the settings of internal temperatures and in the operating point of the boiler
- The system allows to the boiler to work closer to the best efficiency point

# FUNCTIONAL SYSTEM ARCHITECTURE




- Data collection and storage
- Math model for heat cost allocation
- WEB Server
- Communication gateway between WEB server and remote systems

- Measures and logs on main pipeline variables
- Communication gateway between inner / external communication network
- Data collection from remote building devices
- Command queue management

- Radio signal repeater (SRD EU AND US bands)
- Cabled signal repeater (RS485)
- Multichannel: antenna diversity and emergency channel

- Comm. gateway between main building network and flats
- User interface
- Control unit for flat remote devices
- Command queue management
- Remote devices data collection

- Radiator valve control
- Inlet/outlet temperature sampling
- Batteries powered

- Remote premise temperature sampling
- Battery powered

# ECONOMICAL BENEFITS

- **NUMBER OF DEVICES PER RADIATOR CUT BY HALF**
  - Not heat cost allocators
  - Less intrusive, lower cost of installation and maintenance
- **SAVINGS ON HEATING COST INCREASED UP TO 250% WHEN COMPARED TO THE THERMOSTATIC VALVE**
  - Acceptable electronic valve: 4-5 years standing batteries
- **FURTHER SAVINGS**
  - Fully remote controllable
  - It can identify erroneous user behaviors
  - It can forecast user needs and keep the heater close the max efficiency working point

# ECONOMICAL BENEFITS

- **FOR ADMINISTRATORS AND HEAT MANAGEMENT**
  - Administrators: can inform tenants via the messaging system. No paper notice anymore. Accounting is fully automated.
  - Heat managers: constant monitoring of heating infrastructure. No need to schedule regular inspections.

- **NO HEAT COST ALLOCATORS → NO EXHAUSTED BATTERIES**
  Ready technology that removes the frustration of users that cannot use their devices because of flat batteries

- **REDUCTION IN PAYBACK TIME**
  - Traditional systems: avg. 3-4 years
  - Ecothermo: under 2 years

# TECHNOLOGY BENEFITS

- **PREVENTION OF LEGAL DISPUTES DUE TO DEBATABLE ACCOUNTING**
  - NO DISPUTABLE METERING DEVICE MANUAL CONFIGURATION
  - AUTOMATIC ON SITE MEASUREMENT CAMPAIGN FOR METERING IDENTIFICATION
- **ACCURACY INCREASE**
  - COMPARABLE TO HEAT METERS
- **VERSATILITY: CAN BE USED IN SEVERAL CONTEXTS (AT LEAST +15% OF REAL CASES)**
  - Can be used in heating systems with floor heating (allocators cannot be used in this case)
  - Can be used in heating systems with fan coils (allocators cannot be used in this case)
- **EcoThermo WIRELESS INFRASTRUCTURE VERSATILITY (wiNET)**
  - EcoThermo can be applied to radiating panels (e.g floor heating), allocators cannot.
  - EcoThermo can be applied to air convection installations, allocators cannot.

# MARKET WIDTH: NORTH EUROPE

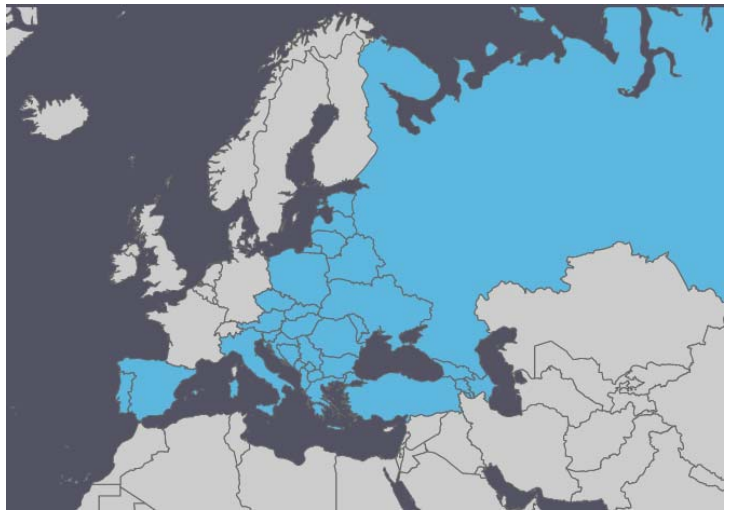
## SEEMLY SATURATED MARKET

- 150 million radiators already converted
- Average cost per radiator: 130 euro
- +20 billion euro income for systems selling
- 750 million euro/year for the heat cost allocation service

## OPPORTUNITY: METERING DEVICES WITH WELDED BATTERIES

- Average release ratio of 10%-12% a year, due to welded batteries that oblige to dispose metering devices (heat cost allocators)
- These are not customers to be persuaded to buy, these are customers that will buy something and are already looking for an alternatives

# MARKET WIDTH: SOUTH AND EAST EUROPE



## ALMOST VIRGIN MARKET

- 170-220 million radiators to be converted
- Average cost per radiator: 130 euro
- +25 billion euro income for systems selling
- 750 million euro/year for the heat cost allocation service

## OPPORTUNITY: EVERYBODY LOOKING FOR A NEW TECHNOLOGY

- Actors along the distribution chain are looking for a new reliable alternative
- State of the art technology is too inflated and  has clear limitations

| | OLD SYSTEMS (HCA+THERMOSTATIC VALVE) | EcoThermo |
|---|---|---|
| POSSIBLE SAVINGS | THERMOSTATIC VALVES: 8%-12% | **18%-25%** |
| SHORT INVESTMENT RETURN TIME | NO, 4.5 TO 7 YEARS LONG | **YES 2 TO 4** YEARS LONG |
| DEFINITIVE INVESTMENT | NO, ALMOST ALL HEAT COST ALLOCATORS MUST DISPOSED AND REBOUGHT AFTER 7-10 BECAUSE THEIR BATTERIES ARE WELDED TO THE ELECTRONICS. | **YES**, NOTHING TO BE DISPOSED BECAUSE OF DISCHARGED BATTERIES |
| ALLOCATION ACCURACY | 9% TYPICAL ERROR<br>40% MAXIMUM ERROR<br>(NO AIR AND SANDS FORMATION CONSIDERED, ERRORS COULD BE HIGHER) | **2,5%-6%** |

| | OLD SYSTEMS | EcoThermo |
|---|---|---|
| MEASURES TRACEABILITY | NOT POSSIBLE TO USE A DIFFERENT METERING DEVICE TO DETECT ERRORS OF HEAT COST ALLOCATOR ALREADY INSTALLED IN A FLAT | IT IS **POSSIBLE TO** VERIFY THE COHERENCE OF THE CONFIGURATION AND **APPLY OTHER COMPARISON METERING INSTRUMENT** |
| DAILY CONSUMPTION REMOTE MONITORING | JUST SOME HEAT COST ALLOCATORS BASED SYSTEM ALLOW THIS. ALL THE OTHER 1 CONSUMPTION DETECTION A YEAR. | **USERS CAN CHECK DAILY THEIR CONSUMPTIONS** AND COMPARE THEM WITH THE BUILDING AVERAGE ONES. |
| COMPATIBLE WITH FLOOR HEATING | NO | **YES** |
| COMPATIBLE WITH COSTLY STYLISH FLAT RADIATOR | NO, EXPENSIVE STYLISH FLAT SURFACE RADIATOR MUST BE DAMAGED TO INSTALL HCAs (PAINT SCRATCHED AND SCREW WELDED) | **YES**, NO HEAT COST ALLOCATORS TO BE INSTALLED |

# Benefits table 3

| | OLD SYSTEMS | EcoThermo |
|---|---|---|
| LOW SYSTEM AESTHETIC INTRUSION | NO, TWO DEVICES PER RADIATOR (THERMOSTATIC VALVE AND HCA). HCA MOUNTED ON RADIATOR FRONTAL SURFACE. | **YES**, JUST ONE DEVICE PER RADIATOR; AN ELECTRONIC VALVE. |
| SUPPORT FOR HEATING CONTRACTORS MAINTENANCE | NO, THESE ARE NOT REMOTE CONTROL SYSTEMS | **YES TWICE**: CONTRACTOR CAN MANUALLY AND REMOTELY DAILY CHECK SYSTEM STATE AND PERFORMANCES, SET FROM OFFICE HEATER/PUMP WORKING POINT. THEE SYSTEM FIND THE BEST HEATER/PUMP WORKING POINT AUTOMATICALLY. |
| FAST TAMPERING DETECTION | NO, IT IS NECESSARY TO ENTER THE FLAT | **YES**, ANY ATTEMPTS IS IMMEDIATELY REPORTED WIRELESSLY TO THE INTERNET SERVER. |

| | OLD SYSTEMS | EcoThermo |
|---|---|---|
| USERS CAN HAVE COMPLETE REMOTE CONTROL OF THE SYSTEMS | NO, THESE SYSTEMS ARE NOT CONNECTED EXTERNALLY AND THEY CANNOT PERFORM ACTIVE CONTROL. | **YES**, EcoThermo IS A COMPLETE Internet of Things SUPER-SYSTEM CONTROLLABLE BY SMART PHONES AND REMOTE INTERNET CONNECTED PCs. |
| EXTENSIONS FOR BUILDING AUTOMATION CONTROL | NO, THESE ARE NOT BUILDING AUTOMATION SYSTEMS | **YES**, WIRELESS WATER METERING, LIGHTING CONTROL, POWER SOCKETS CONTROL, ALARMS, ETC. ALL REMOTELY CONTROLLABLE. |
| READY FOR HOUSE SMART POWER GRIDS | NO, THESE ARE NOT BUILDING AUTOMATION SYSTEMS | **YES** |

| | OLD SYSTEMS (HCA+OLD ELECTRONIC VALVE + ELECTRONIC THERMOSTAT) | EcoThermo |
|---|---|---|
| LOW COST | NO, THIS COMBINATION IS OUT-OF-THE-MARKET PRICE | **YES**, A BIT HIGHER THAN HCAs+ THERMOSTATIC, BUT ENSURING UP TO 250% MORE HEATING SAVINGS AND SHORTER INVESTMENT RETURN TIME |
| BATTERIES LONG DURATION | NO, OLD ELECTRONIC VALVE BATTERIES DISCHARGE IN 1-1.% YEARS. ADMINISTRATOR AND HEATING CONTRACTORS DO NOT WANT FACE THE REQUEST OF ASSISTANCE. | **YES 4-5 YEARS**. BESIDES, THEY ELECTRONIC VALVES ARE CONNECTED TO INTERNET AND THE SYSTEM KNOWS BATTERIES CHARGE AND CAN PLAN IN ADVANCE BATTERIES REPLACEMENT. |

# Thank you!

## Quantum Leap

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