	Renewable energy	Heating and Cooling	Building automation	Toubleshooting
Finland		**Installation of hybrid heating system** Contains elements of: • **Supply engineering:** Check the suitable compination for heating system Geo, Air, and electricity+ others possible • **Electriclal engineering:** Check the energy supply of the building system based requirements of the system. Main el. supply requirements • **Construction technology:** Checking the building heating requirements and possible improvments • **Building Automation:** Check the operating status of the central control system. Check the correct parameterization and optimation of energy use • **Information technology:** Find suitable sensors, transmission lines and protocol for the automation	**Renovation of building automation system** Contains elements of: • **Supply engineering:** Checking the heating technology and the operating status. • **Electriclal engineering:** Check the energy supply of the building system based on the automation requirements • **Construction technology:** Checking the building envelope for possible damage components and processes • **Building Automation:** Check the operating status of the central control system. Check the correct parameterization and optimation of energy use • **Information technology:** Find suitable sensors, transmission lines and protocol for the automation	
			Adjusting and optimization of building automation system for energy saving operation. Contains elements of: • **Supply engineering:** Checking the heating technology and the operating status. • **Electriclal engineering:** Check the energy supply of the building system. • **Construction technology:** Checking the building envelope for possible damage or cold bridges. • **Building Automation:** Check the operating status of the central control system. Check the correct parameterisation. • **Information technology:** Check the temperature sensors, check the transmission lines and the (radio) signals	

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Italy	**Supply and installation of photovoltaic systems on the roofs of residential and commercial buildings.** Contains elements of: ➢ **Supply engineering:** supply and installation of photovoltaic systems. ➢ **Electrical engineering:** photovoltaic panels installation, wiring and connection every part of the system, set home network connection. ➢ **Construction technology:** Panels installation, wiring and holing for cable passage. ➢ **Building Automation:** installation of the manager system. Configuration of it according on specific customer needs and environmental conditions. ➢ **Information technology:** recording, processing and forwarding of measurement data and operating states, including to mobile end devices.		**Installation and configuration of a control system to check functional parameters of a greenhouse.** Contains elements of : • **Electrical engineering**: installation and connection of sensors (air temperature and humidity, soil moisture, leaf pH, natural and artificial lighting…) • **Botany**: Correct application of sensors to leaves • **Construction technology**: network cabling, cable routing and wiring system • **Electronic engineering**: installation of a microcontroller that imports and analyzes data and connecting the sensors • **Computer science engineering**: microcontroller programming	
Nether-land	**Installation of heat pumps.** Contains elements of: ➢ **Supply engineering:** Installation, connection and commissioning of heat pumps ➢ **Electrical engineering:** Installation and connection the heat pump to the electrical supply	**Building a tiny house** ➢ **Design and planning:** Design a house and prepare a blueprint ➢ **Calculate costs:** Use Revit or another program to draw the house and calculate costs ➢ **Carpentry and bricklaying technology:** Built the walls, floor and windows		

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	➢ **Construction technology:** Opening of the roof and or wall and make sure that no leakage can happen ➢ **Building automation:** Installation of thermostat ➢ **Communication:** Inform and teach the customer how to use the system	➢ **Supply engineering:** Installation of electrical supplies. ➢ **Mechanical engineering:** Installation of central or solar heating and cooking facilities. Installation of leak free and isolated roof.		
		Installation of a bathroom ➢ **Design and planning:** Design a bathroom according to customers wishes and prepare a blueprint ➢ **Calculate costs:** Use a program to draw the bathroom and calculate costs ➢ **Mechanical engineering:** Installation of bath, shower, heating system in floor and for towels, sink and taps.		
Spain	**Installation of heat pump to produce Hot Water / HVAC.** ➢ **Design engineering:** The correct sizing of the heat/cold providing equipment. ➢ **Supply engineering:** Buying the device that will correctly perform the necessary cooling or heating. ➢ **Architect:** The ducts or plumbing shall be shown in the corresponding drawings to avoid clashes between trades. ➢ **Building automation:** The building shall operate in the most effective way. The automation shall be as efficient as possible.	**Installation of a Heat Exchanger (HEX) to avoid losing energy during winter** ➢ **Architect:** The heat exchanger is a big equipment that shall be located in a proper place. The ducts going or coming from this device are big, necessary drawings need to be prepared. The loads of the HEX shall be taken into consideration when preparing the drawings (especial foundations?) ➢ **Construction Technology:** All the ducts and HEX shall be properly insulated. ➢ **Design engineering:** The correct sizing of the HEX and main Fans. ➢ **Supply engineering:** Buying the device that will correctly perform heat exchange and fans. ➢ **Building automation:** The building shall operate in the most effective way. The automation shall be as efficient as possible. Depending on the outside		

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	➢ **Ventilation system of the building:** The ventilation system shall be done in accordance to the heating/cooling machine. The hot and cold air shall be sent to the different rooms of the building. ➢ **Plumber:** The hot water needs to be sent to the different rooms of the building. ➢ **Electrical engineering:** All the devices (heat pump, pump, fans...) are electrically powered. ➢ **Maintenance works:** Checkings shall be performed to assure there is not any risk of Legionella disease (backup Gas boiler?)	temperature, it may not be necessary to turn ON the device. ➢ **Electrical engineering**: All the Fans are electrically powered and may be quite powerful.		
	Installation of PV cells ➢ **Architect:** A proper place on the roof shall be chosen for the location of PV cells. ➢ **Design engineering:** The PV cells shall be properly oriented, and all kinds of shadows shall be avoided. ➢ **Supply engineering:** Buying the correct PV cells. ➢ **Electrical engineering:** The electricity can be used by the building or can be sent to the grid (smart grid?)			
Germany	**Installation of solar thermal systems on the roofs of commercial buildings**			**Troubleshooting in building systems and building installations as ordered by the customer. The customer reports a cold room.**

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	as well as detached houses and apartment blocks. Contains elements of: ➢ **Supply engineering:** Installation, connection, and commissioning of solar thermal collectors. ➢ **Electriclal engineering:** Installation and connection of pumps and electrical sensors. ➢ **Construction technology:** Opening of the roof to attach the collectors, openings for cable routing. ➢ **Building Automation:** Integration of measured parameters from the collectors into the heating control system. ➢ **Information technology** Recording, processing and forwarding of measurement data and operating states, including to mobile end devices			Contains elements of: ➢ **Supply engineering:** Checking the heating technology and the operating status. ➢ **Electriclal engineering:** Check the energy supply of the building system. ➢ **Construction technology:** Checking the building envelope for possible damage or cold bridges. ➢ **Building Automation:** Check the operating status of the central control system. Check the correct parameterisation. ➢ **Information technology:** Check the temperature sensors, check the transmission lines and the (radio)signals

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