



# GREEN FOR GROWTH FUND

INVESTING IN ENERGY EFFICIENCY  
AND RENEWABLE ENERGY



## **SAVE ENERGY, SAVE COSTS, DEVELOP YOUR BUSINESS**

A practical guide to energy efficient business solutions



# ABOUT THE GREEN FOR GROWTH FUND, SOUTHEAST EUROPE (GGF)

The Green for Growth Fund, Southeast Europe is the first specialized fund to advance energy efficiency (EE) and renewable energy (RE) in Southeast Europe, including Turkey, as well as in the nearby European Eastern Neighbourhood region. Initiated by the European Investment Bank and KfW Entwicklungsbank, GGF is an innovative public-private partnership established to reduce energy consumption and CO2 emissions. GGF provides refinancing to Financial Institutions to enhance their participation in the EE and RE sectors and also makes direct investments in Non-Financial Institutions with projects in these areas. The activities of GGF are supported by a Technical Assistance Facility.



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# WHY INVESTMENTS IN ENERGY EFFICIENCY MAKE SENSE

## ENERGY IS AN INCREASINGLY SCARCE RESOURCE

Energy policy and rising energy prices are being discussed in most countries. Even if energy prices in your country are still relatively low today, that may change in the future, as energy is an increasingly scarce resource and governments are usually paying a lot to keep prices low for consumers.

## USING LESS ENERGY BRINGS COMPETITIVE ADVANTAGES TO YOUR BUSINESS

There is a growing awareness in the business community that there are competitive advantages to be gained by using less energy, so it is not surprising that more and more small and medium enterprises like you are investing in energy efficient technologies. As an added bonus, you can advertise some of your energy efficiency investments as proof that you care about the environment and climate change, values which your clients – and potential clients – might share.

## INVESTMENTS IN MODERN, ENERGY EFFICIENT TECHNOLOGY MAKE A LOT OF ECONOMIC SENSE

You have probably already heard that investments in modern, energy efficient technology and energy management systems generally make a lot of economic sense. Despite the higher initial costs involved, purchasing efficient technology will pay for itself in most cases, because your company will be using less energy than before, and also because your repair and maintenance costs will be lower. Viewed over the entire lifespan of a production facility, then, investments of this kind are worthwhile in several respects.

To determine the economic feasibility (payback period) of your investment, you will need to consider the cost of energy, the price of the new equipment, the hours of use and the amount of energy you actually need. To help you find the best option for your business development, you could seek advice from an energy consultant.

This booklet contains many energy-saving measures, which we have categorised according to business sectors to make it easier to find the ones that are relevant to your line of business. You can read about some best-practice examples which show how other small and medium-sized enterprises have already benefited from their investments. Each section lists the advantages, and offers recommendations which will hopefully encourage you to think seriously about investing in measures that will raise the energy efficiency of your business. To find your sector, turn to the colour-coded overview on the next page. The table of contents on the back cover also lists all of the energy efficiency measures by sector.

## ALL BUSINESSES (P. 4)

In this section you will find information on how to improve the energy situation of your business premises

## AGRICULTURE (P. 26)

This section presents examples of how to make your agricultural business more profitable by saving energy



## SERVICE (P. 10)

Here you will find information about investments that can help you to improve the efficiency of your heating and cooling systems

## PRODUCTION & MANUFACTURING (P. 15)

Here we show you how to save energy by replacing certain types of equipment and machinery



## TRADE (P.22)

In this section you will find information on how to store and move your goods in an energy efficient way

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# All businesses





This section presents some of the options for investing in the energy efficiency of the buildings you own, which is something that could be of interest to all businesses, regardless of the sector you operate in.

Poor insulation, old windows, inappropriately sized heaters or outdated lighting systems – all of these factors could mean that you are spending more money than necessary on energy every single month.

Have you noticed that it is terribly cold at your workplace in winter, and yet in summer it is much too warm? When you modernise a building (offices, commercial premises or production facilities) according to energy efficiency standards you will not only feel the benefits in winter. Investments in efficient insulation, efficient doors and windows and appropriately dimensioned cooling systems will pay off in the hotter seasons, too.

Modern, energy efficient lighting systems will not only reduce your energy costs, but can also improve the quality of the light in all your rooms.

This section includes the following examples of investments that could improve energy efficiency in your business premises:

-  Improving building insulation .....p. 6
-  Replacing windows and doors .....p. 7
-  Replacing old boilers .....p. 8
-  Installing energy efficient lighting.....p. 9





*"We are really pleased with our more comfortable working environment – and with our lower energy bills, of course. Investing in better insulation and efficient air conditioning has really paid off."*

## CLIENT STORY

KIBE ONE Laboratory is a typical Albanian family business located in Durres. The company was established in 2003 by Mr Feim Alliu together with his wife Vjola and their daughter Ires. KIBE ONE is primarily a wholesale and retail supplier of construction materials, such as tiles, plaster, silicon, and insulation material, but as a service to other companies, the Allius also offer to analyse the composition of concrete, ceramics, asphalt and other construction materials in their own laboratory.

The business was launched in a simply constructed building, with single-glazed windows, and with basic doors separating the offices and laboratories from the storage facilities. The premises served their purpose, but left much room for improvement in terms of the comfort they offered to both customers and staff. Another worrying factor for the Allius was the high cost of their cooling and heating bills. Then in 2012 they decided to upgrade the premises by installing:

- **double-glazed windows with insulated aluminium frames**
- **new energy efficient doors**
- **four highly efficient inverter air-conditioning units**

Already in 2013, the energy savings were significant enough to boost the company's profits. In addition to the monetary benefits of more than 1,200 € per year, Mr Alliu and his family are really pleased with their much more comfortable working environment. Their customers and suppliers have also been quick to express their appreciation of the new-look business facilities at KIBE ONE Laboratory.

Investments of this kind are described in detail on pages 7 and 14.

## ENERGY SAVINGS

Previous consumption	67,628 kWh/year
Total energy savings	17,900 kWh/year
Total energy savings	26 %





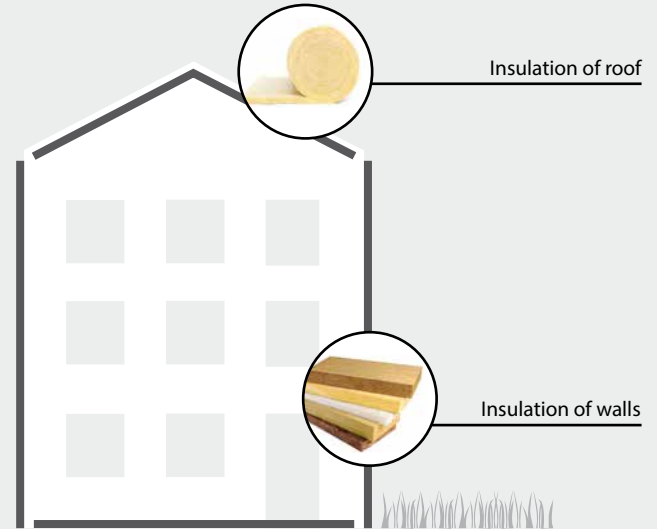
# IMPROVING BUILDING INSULATION

Energy savings:



**up to 60%**

Have you ever thought of the outer walls and the roof of a building – the “building envelope” – as a skin that protects the inside from the outdoor weather conditions? A poorly insulated outside wall leads to losses in terms of both heating and cooling energy, making people feel uncomfortable in their workplace. The insulation of outside walls and roofs is a proven method of improving the indoor climate and thus raising the value of your property. It involves attaching a layer of insulating material to the outside walls, which prevents the heat from escaping to the outside in winter and the absorption of exterior heat in summer. Insulation is suitable both for installation in new buildings and for retrofitting in existing buildings.



There is a great variety of insulation materials to choose from; the right one for you will depend on the area you plan to insulate.

## ADVANTAGES

- Saves money on heating bills and on electricity bills for cooling
- Reduces heat transfer through your walls and prevents damp, mould and condensation
- Improves comfort levels
- Increases the value of the building

## RECOMMENDATIONS

- Try to do insulation work between spring and autumn
- Let a specialist fit the external solid wall insulation
- Choose insulation thick enough to maximise your energy savings
- Consider your heating demand before installing an efficient heating system (it makes sense to insulate your building before upgrading your heating system)





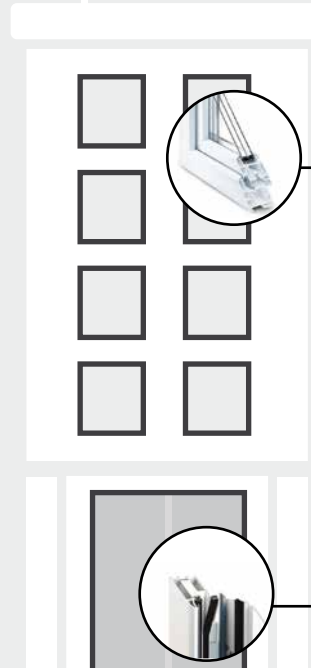
## REPLACING WINDOWS AND DOORS

Energy savings:



**up to 50%**

Everyone likes windows that allow natural light into the interior of a building. However, windows and doors are the thinnest part of the building envelope – they allow a greater degree of heat transfer than walls. Poorly insulated windows and doors lead to air infiltration, condensation and losses of heating and cooling energy. If properly selected and installed, energy efficient windows will help to minimise your heating, cooling and lighting costs, and will also increase the comfort of your working space. As an additional measure, it makes sense to mount exterior sun protection and shading fixtures that prevent overheating indoors and can also direct the sunlight to where it is needed.



Installation of energy efficient windows

The larger the area of your façade that is taken up by windows, the more important it is to choose glass with strong insulating properties. Windows with a thicker air space between the panes, added gases or triple glass are more efficient than conventional double glazing.

Installation of energy efficient doors

### ADVANTAGES

- Saves money on heating bills and on electricity bills for cooling
- Reduces heat transfers through your windows
- Prevents damp, mould and condensation
- Improves comfort levels
- Increases the value of the building

### RECOMMENDATIONS

- Try to install new windows and doors between spring and autumn
- Have doors and windows installed by reputable professionals
- In workspaces, install windows that can be opened to allow natural ventilation
- Make sure the glazed surface area is not more than 30-50% of the building's façade



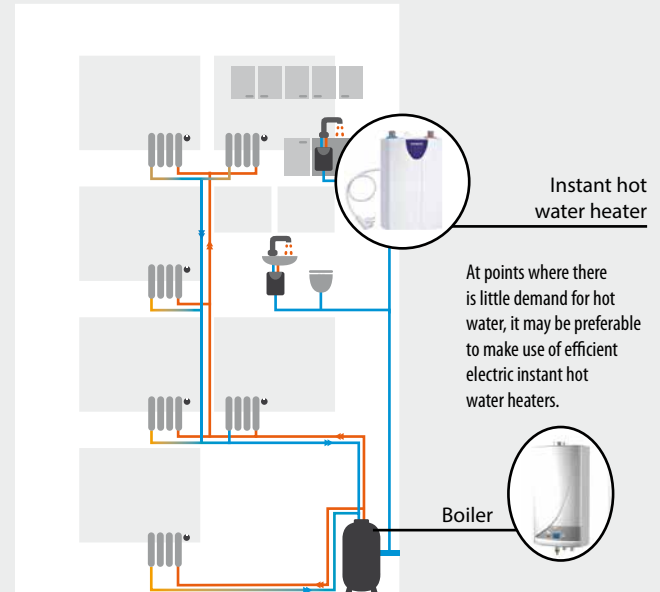
## REPLACING OLD BOILERS

Energy savings:



**up to 30%**

You probably do not pay much attention to the old boiler in the corner of the basement – but in fact it is the heart of your heating system. An inefficient old boiler can develop into a major cost factor, not only because it needs repairing more often, but simply by using more fuel than necessary. If your boiler is 15-20 years old, it probably makes sense to replace it with more modern equipment. There is a wide choice of boilers available, varying in terms of the fuel they use, their capacity and even the technology they are based on. The most efficient technology can be found in condensing boilers, which use their own flue gases to preheat the water before the actual heating process starts.



### ADVANTAGES

- Saves money on heating bills
- More reliable and easier to regulate
- Takes up less space and is easy to integrate into the existing heating system
- Increases the value of your building

### RECOMMENDATIONS

- Consider condensing boilers, as they are best for both space heating and hot water preparation
- Think about improving the insulation of your building at the same time as you modernise your heating system
- If you have many different rooms, it makes sense to monitor and control the temperature throughout the building with programmable thermostats or detailed heating monitoring



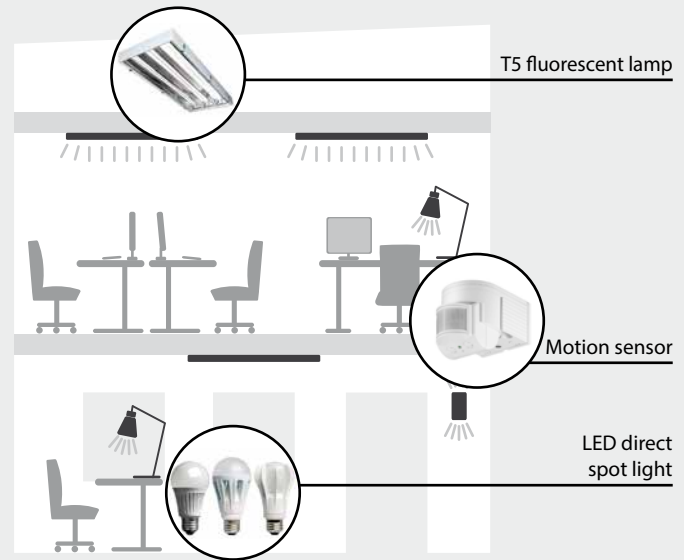
## INSTALLING ENERGY EFFICIENT LIGHTING

Energy savings:



**up to 70%**

In companies, lighting systems are used for a wide range of applications. They light workstations, production plants, offices, warehouses or exterior spaces. Did you know that modern, energy efficient lighting systems can cut your lighting costs by up to 70%? In most companies, the lights are on for many hours a day, or even all day long. So there is considerable potential for saving energy and minimising costs through lighting optimisation. Basically, efficient lighting means replacing incandescent and halogen light bulbs with LED and CFL bulbs. Significant energy savings can also be achieved by installing sensors which automatically turn lights on and off as needed. Modernising your lighting system can noticeably reduce your energy costs without loss of brightness, and what is more, it can even improve the quality of the light.



Modern lighting equipment not only offers energy efficiency, but also comes in a wide range of sizes, shapes and colours. You are certain to find lamps that meet your business needs.

### ADVANTAGES

- Lower maintenance costs and longer service life (LED and CFL bulbs have longer lifespans than incandescent and halogen light bulbs)
- Better for the environment (LED bulbs do not contain contaminating gases)
- Additional light as bright as daylight at the workplace is beneficial to people's health

### RECOMMENDATIONS

- Do not use incandescent bulbs, as they are the least efficient sources of artificial light
- Install light sensors which automatically turn off the lights when a certain level of brightness is reached
- Install motion sensors to switch lights on and off in areas that are not in constant use (e.g. toilets, corridors)



# Service

Do you run any of the following businesses:

- a hotel
- a guesthouse
- a restaurant
- a bar or a café?

Then you surely invest a lot of energy in helping your guests to feel welcome and comfortable. It takes energy not only in the figurative sense – your personal vitality and commitment – but also in the literal sense that it costs you money to heat your rooms to the perfect cosy temperature, to supply reliably hot showers, or to create the ideal light.


Energy costs may not be your primary concern, as they are probably not your biggest expense item. All the same, cutting your energy costs is a highly effective way to increase profit. This section presents some investments in energy efficiency that can help you to bring down your utility costs while at the same time making things more comfortable for your customers and your staff.

The following investments could positively influence your business development:

- 🔧 Upgrading central heating systems ..... p. 12
- ☀️ Installing solar water heating systems (SWHS) .... p. 13
- ❄️ Replacing old air conditioning ..... p. 14

Some more investments that could be useful for your business:

- 🏠 Improving building insulation ..... p. 6
- 🏠 Replacing windows and doors ..... p. 7
- 🔧 Replacing old boilers ..... p. 8
- 💡 Installing energy efficient lighting..... p. 9



*"Besides saving costs, installing an efficient thermal pump and new solar collectors has made our business a much better workplace, too."*

## CLIENT STORY

Cana Petrović has been running her well known restaurant "Stari bunar" (Old Well) since 1994. The cosy restaurant is located in the capital of Serbia in an old family house. Mrs Petrović serves a large selection of delicious meals and wines, and caters for all kinds of events for up to 100 guests. She is not only careful to ensure that the quality of her food is high, but also attaches great importance to creating a pleasant atmosphere which allows her guests to feel at home.

In 2010, when she had the restaurant completely renovated, Mrs Petrović decided to find out how she could improve her heating and cooling situation and her hot water supply. When she discovered how much she would be able to save in the long run by investing in new technology, she decided to install:

- **an efficient thermal pump**
- **solar collectors, which use the power of the sun to generate hot water**

Thanks to the new efficient thermal pump and the solar collectors, Mrs Petrović achieved tangible reductions in her energy consumption, cutting her heating costs by 40%, which means savings of around 1,500 € every year.

But that is not all: by implementing these measures Mrs Petrović has also enhanced the appearance of the restaurant and, more importantly, increased the comfort of her guests, who can now be sure that Mrs Petrović's restaurant is the right venue for their family events, even if it is freezing cold outside.

Investments of this kind are described in detail on page 12 and 13.

## ENERGY SAVINGS

Previous consumption	54,000 kWh/year
Total energy savings	21,600 kWh/year
Total energy savings	40 %



## UPGRADING CENTRAL HEATING SYSTEMS

Energy savings:



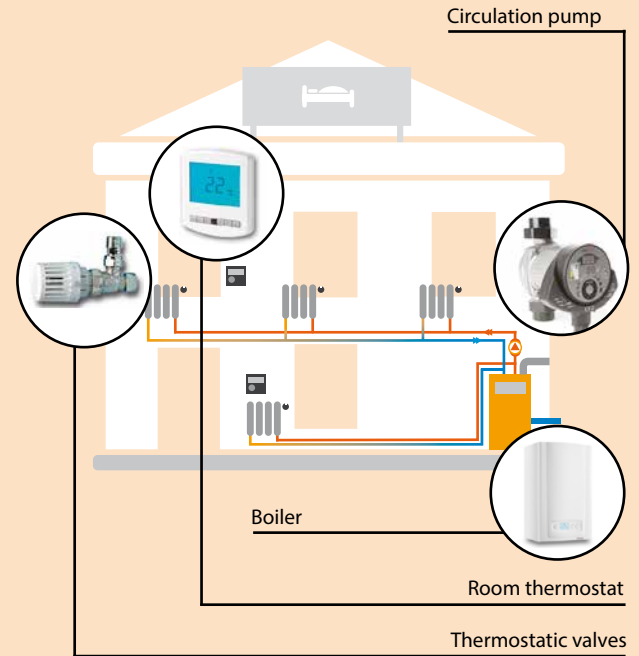
**up to 40 %**

An old heating system loses energy at many points. Especially in a hotel or guesthouse with many different rooms to heat, energy can leak out at many places along the way to the radiators or the shower.

Replacing the boiler is the first step, but if your entire system is old, you might not feel the increased efficiency. In that case, you would do well to consider a more major overhaul, which could include replacing the radiators, the thermostats and the insulation around the pipes. Installing thermostats connected to the radiator valves is a particularly effective way of keeping temperatures stable, and thanks to the automated temperature regulation, you will find that the system consumes much less energy.

### ADVANTAGES

- Reduced expenses for heating
- Better ambient air due to new radiators
- Stable, comfortable room temperatures
- Increased comfort of your guests through an intelligent home automation system



Central heating systems consist of various components, e.g. boilers, circulator pumps, thermostatic valves and room thermostats. When modernising your system, it is important to take all the components into consideration.

### RECOMMENDATIONS

- Use systems which separately regulate the heating and the hot water supply
- Consider installing sensors that turn off the heating when the temperature falls sharply, e.g. due to an open window
- Where accessible, replace and insulate your old pipes



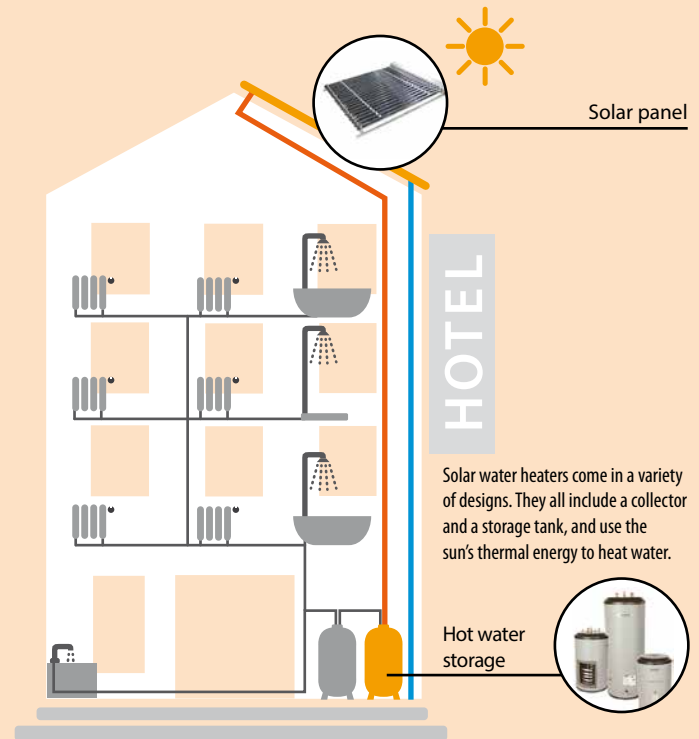
## INSTALLING SOLAR WATER HEATING SYSTEMS (SWHS)

Energy savings:



**up to 80%**

The best thing about a solar water heating system (SWHS) is that the energy it runs on is free of charge! This, coupled with the easy availability of the technology, makes the SWHS a very cost-efficient way to generate hot water. A SWHS can be used all year round, which means that the investment could pay off especially quickly if your business has its high season during the summer months, as the SWHS can generate almost all of the energy needed to supply your hot water.



Solar panel

Solar water heaters come in a variety of designs. They all include a collector and a storage tank, and use the sun's thermal energy to heat water.

Hot water storage

### ADVANTAGES

- Saves money on electricity, gas, or oil as it reduces the fuel needed to provide hot water
- Can be used in all climates
- Can be used all year round
- Increases property value

### RECOMMENDATIONS

- Try to install a SWHS during spring, summer or autumn
- Calculate the optimal size of a SWHS based on your hot water demand
- Ask the company installing the SWHS to recommend the best type of collector for your region (flat or vacuum)
- Advertise the fact that you are using advanced technology in your flyers or your guest rooms





## REPLACING OLD AIR CONDITIONING

Energy savings:

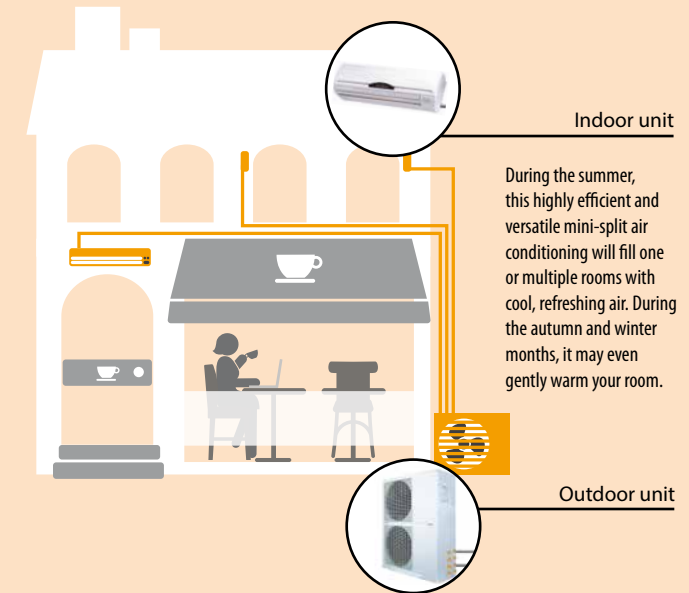


**up to 50%**

It is stiflingly hot outside, but your guests have made themselves comfortable with ice-cold drinks in your air-conditioned coffee bar. Air conditioners in the catering industry are often running for up to 12 hours a day, and in some cases even longer. With the additional expense of keeping your rooms cool, it is easy to see how an inefficient AC system can quickly push up your costs. Various types of AC systems are available, such as air-to-air split systems, and central or semi-central air conditioning. To decide on the right kind of AC for your business, ask your supplier for advice. Your choice will depend on how many rooms you have, whether you need to cool certain parts of the building separately from the others, and whether your façade allows for additional construction.

### ADVANTAGES

- Saves up to 50% on your electricity consumption for cooling
- Split units are fairly easy to install and the advanced technologies (inverter and heat pump) are highly efficient
- Much improved comfort through filtered air and comfortable temperatures



### RECOMMENDATIONS

- Insulate the building before installing a new AC system, as this will already reduce the need for cooling
- Ask your AC supplier to recommend the best type, size and location
- Look for automated room air conditioners, which allow the AC to be turned off in areas when they are not occupied
- Avoid mobile and self-contained AC units, which usually require open windows to release the condensation

# Production & manufacturing

If your business model is based on production or manufacturing, e.g.

- Food processing
- Wood products
- Textiles
- Plastic products
- Metal parts

you are using energy in various forms. Production processes depend above all on motive energy: your machines need power to drive motors, ventilators or compressors. This is probably not the only energy-intensive part of your operations. Many processes involve the management of thermal energy: the application of heat or the reduction of heat through cooling mechanisms. Whatever you manufacture, energy costs will make up a considerable part of your overall business expenses and at some points along your production chain, energy savings of up to 70% might be possible.

Examples of investments that could improve energy efficiency in your business include:

- Replacing old ovens ..... p. 17
- Replacing old industrial boilers .....p. 18
- Replacing pumps, motors and air compressors ....p. 19
- Investing in computer numerical control (CNC) machines p. 21

Depending on your economic activity, these investments could help in saving energy as well:

- Installing energy efficient lighting..... p. 9
- Upgrading cooling chambers and vitrines.....p. 24



*"The new energy efficient baking equipment allows me to guarantee consistently high quality. And my staff definitely appreciate the additional space and cooler temperatures in the bakery."*



## CLIENT STORY

Karen Margaryan is the president of the Armenian Margaryan Business Group, which incorporates several food brands, mainly in the baked goods sector. In the last six years, the group's product range has grown from 15 to 65 different types of pastry. As the business has flourished, the popularity of the products has spread beyond Armenia to customers in neighbouring Georgia.

Mr Margaryan is eager to offer the best possible quality, and he recently decided to invest in some new equipment:

- a new energy efficient single rack oven
- a state-of-the-art dough proofer

After replacing his 30-year-old oven with this new energy efficient single rack oven from Sweden, Mr Margaryan has been able to increase his output and at the same time lower his energy costs. The oven's electronic control system makes sure that each of the baking chambers stays at exactly the right temperature and stops the baking process at the right

time. This guarantees that all products have the same high quality and delicious flavour. As a bonus, the new oven occupies less space and is well insulated, so the bakery is less cramped and does not get so hot. The state-of-the-art dough proofer regulates the speed and quality of the fermentation of the dough, and this specialised equipment ensures not only energy savings but also consistent results.

All in all, Mr Margaryan is very happy with his new equipment, which is saving him around 50% of the energy he was previously consuming in the baking and fermenting processes.

An investment of this kind is described in detail on page 17.

## ENERGY SAVINGS

Consumption before	157,248 kWh/year
Total energy savings	76,153 kWh/year
Total energy savings	48 %



## REPLACING OLD OVENS

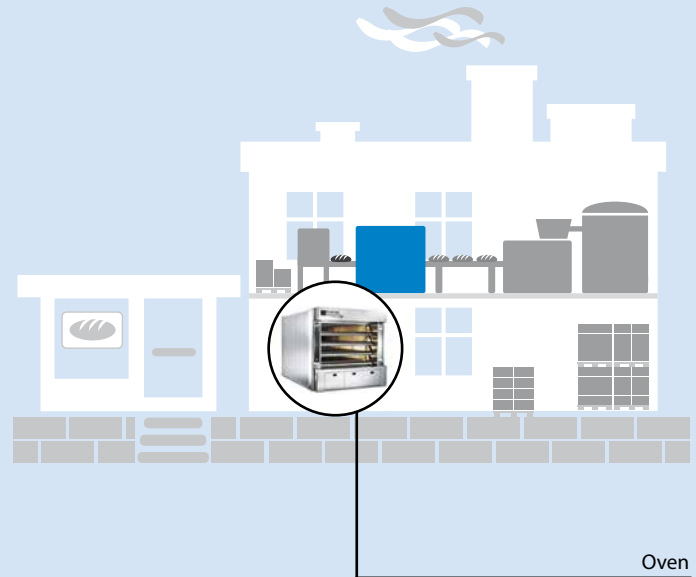
Energy savings:



**up to 60%**

If you operate a bakery or produce dairy goods, ceramics, glass or steel, your production equipment will almost certainly include an oven. The quality of the oven is one of the main factors determining how much time and money you spend on production. If your oven is old and poorly insulated, you probably waste much more energy heating up your premises than you use in your production process. That is why a new oven could not only save up to 60% of your process energy, but could also significantly improve your working conditions.

Ovens come in many shapes and sizes, and run on different fuels.



Oven

As a rule of thumb, an oven can be regarded as efficient if it has electronic controls, adapted burners and thermal insulating materials on the doors and walls, and if it can be used in convection mode.

### ADVANTAGES

- Saves money on energy bills
- Much improved working conditions
- Shortens production time, as the desired temperatures are reached much faster
- Better quality products
- Ovens with heat recovery save up to 30% more energy

### RECOMMENDATIONS

- Make sure that the size of the oven matches the scale of your production – oversized or undersized machinery wastes energy
- Do not open the doors unnecessarily
- Provide your staff with proper instructions to make use of all the features of your new oven, e.g. electronic control panels



## REPLACING OLD INDUSTRIAL BOILERS

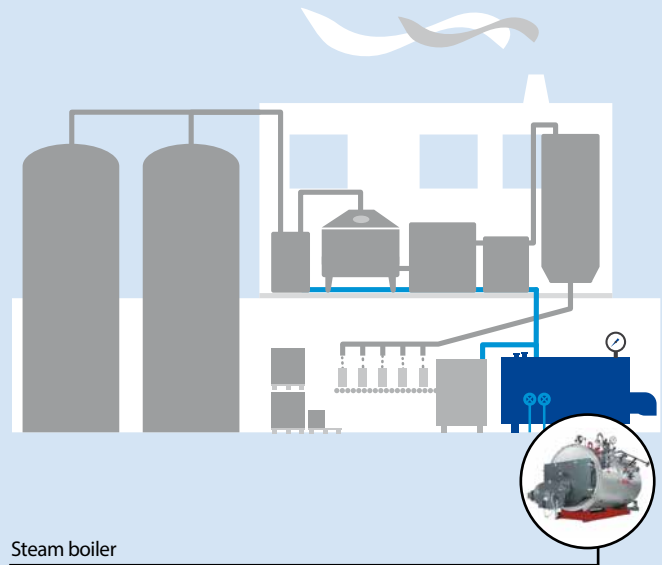
Energy savings:



If your production needs heat or steam, you will own at least one boiler. Boilers consume a lot of energy, especially if they are used to generate steam.

Gas- or oil-fired technology is a highly efficient way to prepare hot water. As with heating systems, there is a choice between high efficiency conventional boilers and condensing boilers, which offer you an efficiency rate of up to 98%.

If your business generates organic waste as a by-product, such as wood, peel, straw or leftovers from dairy production, it could be used in biomass boilers to produce hot water or steam in one of two ways: either by direct combustion (burning) in a biomass boiler or by gasification technology. This would not only reduce your costs, but would also make you a little less vulnerable to rising energy prices.



Steam boiler

Steam boilers operate at higher temperatures than hot water boilers and hence need more energy. Here in particular it makes sense to invest in energy efficient solutions and if possible to make use of organic waste from your own business.

### ADVANTAGES

- Clear reduction of production costs
- Using biomass generated by the production process reduces the amount of waste for disposal
- More reliable processes due to better technology
- Better working atmosphere, as excess heat is minimised

### RECOMMENDATIONS

- Make sure that pipes are properly insulated and cover process baths, where possible
- If your processes do not offer biomass for boiler fuel, try buying it from other producers
- Keep a critical eye on process temperatures – temperatures are often set higher than necessary
- Ask a specialist to assess whether heat recovery would make a meaningful difference to your processes



## REPLACING PUMPS, MOTORS AND AIR COMPRESSORS

Energy savings:



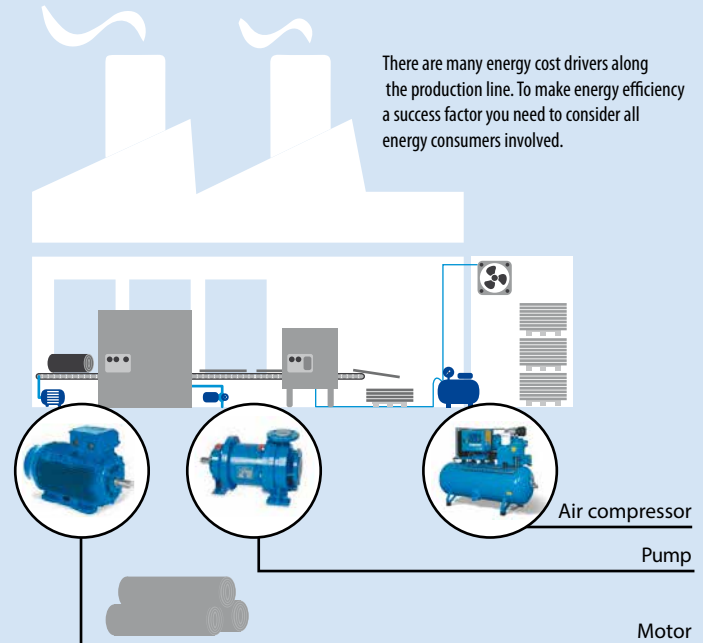
**up to 60%**

Motors, pumps and compressors are used in all businesses where motive energy is needed. They come in different shapes and sizes, but are often invisible from the outside, as they are an integral part of the machinery you use. Electric motors are found in applications as diverse as industrial fans, blowers and pumps, machine tools, household appliances, power tools and disk drives. That explains why they account for 65% of total industrial energy consumption. Compressors transform the power of the motor into motion by compacting a fluid, e.g. air.

As motors, pumps and compressors get older, they tend to become less reliable. The failure of an old motor is often the cause of interruptions in the production cycle, and repairs can be costly. Replacing old compressors and motors will not only make your production line more reliable, but also help you to lower your operating costs, as new equipment will need fewer repairs and consume less energy.

### ADVANTAGES

- Reduced costs due to lower energy consumption (electricity or fuel)
- More reliable
- Decreased maintenance costs
- Reduced dust, fumes or heat emissions mean improved working conditions



### RECOMMENDATIONS

- Check the efficiency of motors, pumps and compressors – consult a specialist
- Match the power of the motor, pump or compressor to the work you want it to do
- Consider replacing the entire production line to use best a motor's efficiency
- If you use many motors, pumps or compressors, seek advice from an energy consultant



*"With our new CNC machine, we can now produce even better quality furniture in much less time. And our electricity consumption is only one-third of what it used to be."*

## CLIENT STORY

Dragoslav Siljak is a very successful Bosnian furniture producer. As well as making customised furniture to order, Mr Siljak's company, Masterwood DOO Kozarac-Prijedor, specialises in the production of solid wooden bedframes and bedroom items.

Some time ago, Mr Siljak installed a production line in order to manufacture his bedframes in series. However, the process was not entirely automatic – some manual work had to be done between the different steps, such as drilling and milling – and over time the production line fell behind current standards. Mr Siljak and his staff sometimes found that setting up machines between two operations took longer than the actual production of the element itself. This process was not only time-consuming, but also expensive: the production line accounted for no less than 56% of the company's total energy consumption. These factors convinced Mr Siljak that it was time to invest in:

- a brand new CNC machine

He is now saving energy in three ways: first, by taking less time to produce each element; second, by cutting down on machine idle-time; and third, by using a machine that requires less electricity than his old production line. The combined effect is that Mr Siljak now saves 67% on the energy needed for production.

In addition to saving roughly 3,500 € per year and reducing material wastage, the new investment has had a positive impact on the business in another respect: thanks to the advanced technology, Mr Siljak is now able to offer more reliable quality, even in times of increased demand. He and his staff now have time for actual business development.

An investment of this kind is described in detail on page 21.

## ENERGY SAVINGS

Consumption per unit before	67,500 kWh/year
Total energy savings	45,130 kWh/year
Total energy savings	67 %





## INVESTING IN COMPUTER NUMERICAL CONTROL (CNC) MACHINES

Energy savings:



**up to 70%**  
per unit produced

Several types of businesses specialise in producing large quantities of similar parts or products, like cutting wooden parts for furniture or shaping metal parts for the automotive industry. If you need to produce parts in bulk, and your products need to be very precise and exactly identical, CNC machines could offer you many advantages. These machines perform predefined, computer-controlled steps (numerical values), from very simple cutting to highly complex operations involving many separate steps.

The overall energy consumption might not decrease if you replace a manually operated machine with a CNC machine. But these machines can deliver 3 to 7 times higher productivity, as they can run 24 hours a day, all year round. This is particularly useful if you plan to increase your output, and helps to recuperate your investment costs relatively quickly.



CNC machine

CNC machinery offers you state-of-the-art energy efficiency and precision. A CNC machine will manufacture exactly identical components.

### ADVANTAGES

- Lower energy costs per unit
- Better and more reliable product quality
- Increased output and relatively fast amortisation
- Safer handling, e.g. in cutting operations

### RECOMMENDATIONS

- The more complex a CNC machine is, the more expensive it is likely to be, so make sure you choose one that meets your requirements
- Although no highly-skilled personnel are needed, make sure your staff receive training
- Look out for opportunities to upgrade your CNC machine
- Advertise the fact that you are using CNC, as it will be seen as a sign of quality



# Trade

If you own

- a small retail shop
- a wholesale store
- a supermarket

you need energy in various forms: to ensure that food stays cool and fresh; to have sufficient and appealing lighting; to transport your goods from warehouse to shop or deliver them to your customers; to keep your salesrooms cool in hot weather and warm in winter.

If you sell merchandise that needs to be refrigerated – fresh meat and fish, fruit, vegetables and deep-frozen products – the electricity to run the cooling chambers and cooling vitrines can make up a substantial part of your operating costs. Good lighting to display products in an attractive way is another high expense factor. This is especially true for large supermarkets, where huge areas need to be lit. If you own a supermarket with a lot of cooling equipment and lighting, it might make sense to approach an energy consultant about the possibility of installing an energy management system (see page 33).

Here are some investments which could positively influence your operational costs:

- 🔧 Upgrading cooling chambers and vitrines ..... p. 24
- 🚚 Replacing old delivery vehicles ..... p. 25

If you are thinking of renovating your warehouse or supermarket, you could also consider:

- 💡 Installing energy efficient lighting..... p. 9
- 🔧 Replacing old air conditioning ..... p. 14



*“Not only has the new refrigeration equipment halved our electricity bills, but it also means we can offer more fruit and vegetables at off-season prices, which is great for our profit margin.”*

CLIENT STORY

Andrea and Zhaneta Thimi live in a small Albanian village and have been growing fruit and vegetables since 2003. From the many apple trees on their 2.5 hectares of land, they are able to harvest about 80-100 tons of apples every year, and between March and October they also grow a wide variety of vegetables.

As experienced sellers of fruit and vegetables at local markets, they are very knowledgeable about pricing and seasonality. In order to be able to sell their produce out of season, they decided to invest in new storage facilities, replacing their old, small, inefficient refrigerating rooms with:

• two new energy efficient refrigerating rooms

The two new refrigerating rooms allow them to store more fruit and vegetables in the harvesting season when their price is low and sell them during off-season periods, especially in winter, when their selling price jumps up. Ad-

ditionally, the new technology allows them to store their produce for longer – at least four months.

Thanks to the increased capacity (125 tons each) and the efficiency of the refrigerating rooms, Mr and Ms Thimi are now also able to store other farmers’ produce and thus generate additional income.

They are very pleased with their investment, as it has allowed them to save more than 1,000 € per year and has broadened their business opportunities. As one of only a few farmers owning such efficient technology, they now have a very competitive position in the local market.

An investment of this kind is described in detail on page 24.

ENERGY SAVINGS

Previous consumption	29,897 kWh/year
Total energy savings	16,134 kWh/year
Total energy savings	54 %



## UPGRADING COOLING CHAMBERS AND VITRINES

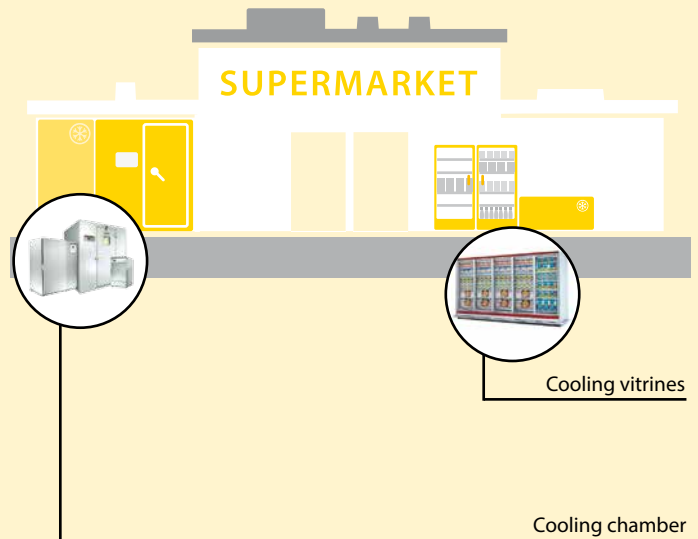
Energy savings:



**up to 60%**

If you sell fresh or deep-frozen goods, you are required to keep them in closed cooling chains to prevent health hazards and to ensure that they meet the necessary quality standards.

That means that your cooling equipment needs to run 24 hours a day, 365 days a year, which makes it highly energy-intensive. In cold storage facilities, the level of efficiency can be improved through insulation and through the use of efficient compressors in your cooling aggregates. But in your salesrooms, large amounts of energy are eaten up by open vitrines. You can save a lot of energy by installing vitrines with closed glazed doors, automated electronic controls and frost control. Modern cooling equipment also has advantages for the atmosphere in your salesrooms: it avoids large temperature differences, and greatly reduces the level of noise caused by the hum of the refrigerator.



To obtain maximum performance from cooling chambers and cooling vitrines, make sure that the insulation, the sealing and the cooling unit are well matched. Closed cooling systems will always be more efficient than open ones.

### ADVANTAGES

- Save on your electricity bills
- High food quality throughout the cooling chain
- Appealing presentation of goods

### RECOMMENDATIONS

- Install closed cooling vitrines wherever possible
- Adjust the size of cooling chambers and vitrines to the smallest possible
- Use cooling equipment with automatic control
- Consider purchasing cooling equipment with very high efficiency ratings



## REPLACING OLD DELIVERY VEHICLES

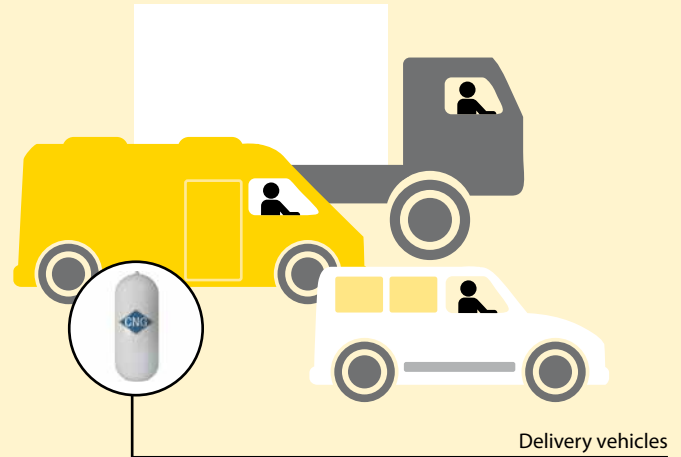
Energy savings:



**up to 35%**

Do you deliver directly to your clients? Or transport goods to storage facilities over long distances? Then you probably run a fleet of vehicles, which are getting more and more expensive due to the rising price of diesel and petrol. If you are thinking of ways to cut your fuel consumption, it is worth considering the alternative of purchasing vehicles that meet the latest engine standards, and that are as small and light as possible while still serving the purpose you want them to use for. Vehicles that run on compressed natural gas (CNG) can also be a very attractive option. CNG is not only significantly cheaper, it is also much cleaner. This is a particular advantage in loading and unloading areas, where vehicles come and go all the time, usually leaving unpleasant fumes behind.

Fuel is also often wasted in vans transporting frozen goods or products which require a closed cold chain. That is why it may make sense to upgrade the refrigerator compartment to one with proper insulation, airtight doors and automated control.



You can either buy a new CNG fuelled car or you can upgrade your current fleet with CNG tanks. This is a mature and safe technology.

### ADVANTAGES

- Lower fuel expenses
- Clean and environmentally friendly technology
- More comfort for your employees
- Reliable cooling during transportation

### RECOMMENDATIONS

- Optimise transportation routes
- Ensure regular maintenance of the vehicles
- Consider training your drivers to drive in a more economical way



# Agriculture





Are you engaged in:

- crop, vegetable or fruit growing or
- livestock farming?




Then your work is often physically demanding, but you are probably using various technologies to make the processes easier and faster. Preparing a field, gathering a harvest, maintaining a plantation – all of these tasks can be mechanised, but fuel consumption can be high. And it takes a lot of energy to keep your greenhouse well aired and at the temperature your vegetables like best.

You do not have much influence over the weather, the climate or the land you have available, but you do have a choice about how much you spend on energy to make the best possible use of those conditions. It might make sense to invest in more efficient machinery, or in thermal insulation, or in switching to renewable energy sources. Considering these options is a good first step towards managing your production costs.

These are investments which typically can improve the energy efficiency of your agricultural business:

-  Replacing old tractors ..... p. 28
-  Replacing harvesters and agricultural equipment p. 29
-  Upgrading heated greenhouses ..... p. 30
-  Improving irrigation efficiency ..... p. 31

More investments which might be useful:

-  Improving building insulation ..... p. 6
-  Replacing old boilers ..... p. 8
-  Installing solar water heating systems (SWHS) .... p. 13

*"My customers are highly impressed with the efficiency of the new combine harvester. They save so much time by harvesting and packing the straw in a single operation."*



## CLIENT STORY

Emanuil Haisinskiy established his agricultural equipment dealership in 1992. Heavy agricultural equipment is rather costly in Ukraine, so he decided to focus on leasing machinery which is not needed all year round, such as harvesters. Many farmers from the surrounding villages use his services.

The harvesters Mr Haisinskiy was leasing were quite old, and he began to notice that his margin from the leasing business was shrinking due to their increasing fuel consumption, not to mention the rising price of diesel. Mr Haisinskiy also saw that new combine harvesters would enable his customers to not only harvest the grain but also pack the straw, leaving the fields very clean. Most farmers appreciate this additional service: not having to treat the straw separately saves them valuable time and costs.

To be able to provide this service, Mr Haisinskiy replaced one of his harvesters and bought:

- **a new state-of-the-art harvester**

Already after the first season he could tell that his turnover had increased, as the new harvester with its new possibilities had stimulated demand.

Note: Replacing a harvester, tractor or other agricultural machinery is also attractive for farmers running their own agricultural business. Such new equipment does not only significantly cut operating expenses but also increases comfort during the long hours of operation.

An investment of this kind is described in detail on page 29.

## ENERGY SAVINGS

Previous consumption	184,662 kWh/year
Total energy savings	59,630 kWh/year
Total energy savings	32 %



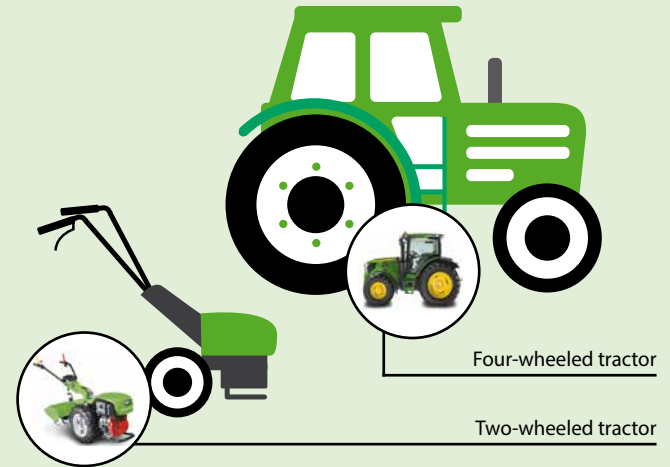


## REPLACING OLD TRACTORS

Energy savings:



Land preparation would be unthinkable without your powerful, versatile tractor. But if your old tractor is difficult to handle, temperamental, hot and noisy, these are usually signs that it is consuming more fuel than necessary to do its job. A new tractor not only offers more comfort and lower fuel consumption – but it may also come with a variety of new technologies that allow you to use it for many more processes than before. Think how much time and fuel you could save if you were able to do most of the land preparation operations at once, or if the more powerful engine would allow you to pull a wider plough to turn more soil with each pass.



For all types of towing vehicles – two-wheeled or four-wheeled – modern energy efficient alternatives are available.

### ADVANTAGES

- Lower diesel bills due to efficient motors
- Greater safety and comfort for you and your staff
- Large tyres or double tyres leave a larger footprint, reducing soil compaction and improving traction power
- Prevent soil compaction by using higher precision tractors which support the use of equipment with automatic inter-row spacing and multistage soil preparation functions

### RECOMMENDATIONS

- Make sure you are using the right tyre pressure – this has a significant influence on diesel consumption
- Clean the radiator and the air filter regularly
- Match the power of your new tractor with the equipment you will be using with it
- Make sure the size and weight of the tractor are appropriate for the type of ground and the size of the land



## REPLACING HARVESTERS AND AGRICULTURAL EQUIPMENT

Energy savings:



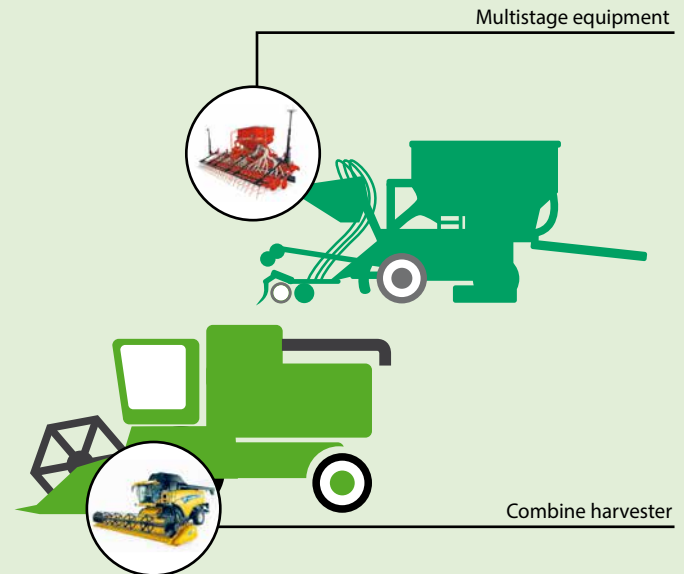
**up to 35%**

Agricultural machinery has become an indispensable part of modern farming. The success of your business is largely determined by how efficient your equipment is. Modern agricultural equipment allows you to carry out many processes at the same time during land preparation as well as during harvesting. Today's harvesters not only come with more powerful engines, but also offer a wide range of automated functions that make them easier to control and to adapt to different field sizes and crops.

During land preparation, most farmers could cut their diesel consumption considerably by deploying multistage equipment and direct seeding machinery, which substantially reduce the number of kilometres driven.

### ADVANTAGES

- Lower diesel bills
- Greater safety and comfort for you and your staff
- Saves time by combining different operations
- Direct seeding equipment helps to improve soil quality and reduces fuel expenses



Using multistage equipment, you can simultaneously till, mulch, prepare seed beds, and drill, saving yourself both time and money.

### RECOMMENDATIONS

- Consider less depth when tilling, as this can save up to eight litres of diesel per hectare
- Seek advice about new methods of soil preparation, which can save energy by reducing the number of steps involved
- Carry out regular maintenance to prolong the life of your equipment
- Make sure your staff know how to handle the new agricultural machinery correctly



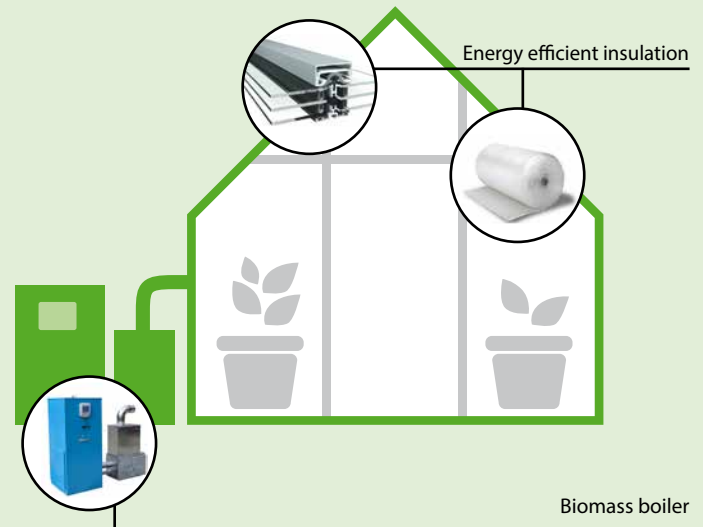
## UPGRADING HEATED GREENHOUSES

Energy savings:



**up to 50%**

Growing vegetables in February or early March requires a lot of care in heated greenhouses. This is a cost- and energy-intensive business. A severe cold snap that lasts for more than a couple of days can put serious pressure on your financial planning, as heating costs can skyrocket. But by upgrading the outer surface of your greenhouses, you can already save energy on a significant scale. Simply upgrading from single-layer to double-layer foil could already save up to 50%. And you can reduce your heating costs further still by investing in more efficient boilers or even alternative energy sources. With proper insulation and computer-controlled high efficiency boilers, you should certainly be able to improve your long-term business prospects.



With high efficiency biomass boilers, e.g. pellet fuelled, you can heat greenhouses of any size, any distance from a mains supply of electricity or gas, in a very cost effective manner.

### ADVANTAGES

- Save money on heating energy
- Direct improvement in your cost/income ratio
- Efficient insulation and heating make it easier to maintain the right level of humidity
- Stay ahead of your competitors by creating more reliable conditions for plant growth

### RECOMMENDATIONS

- Start by improving your insulation, e.g. by upgrading the outer material
- Change your fuel source to biomass, a geothermal heat pump, etc.
- Find out about the availability of new types of seeds that need less warmth to germinate and grow
- If you have glass greenhouses with movable vents, consider automating the ventilation by installing a computerised control system



## IMPROVING IRRIGATION EFFICIENCY

Energy savings:

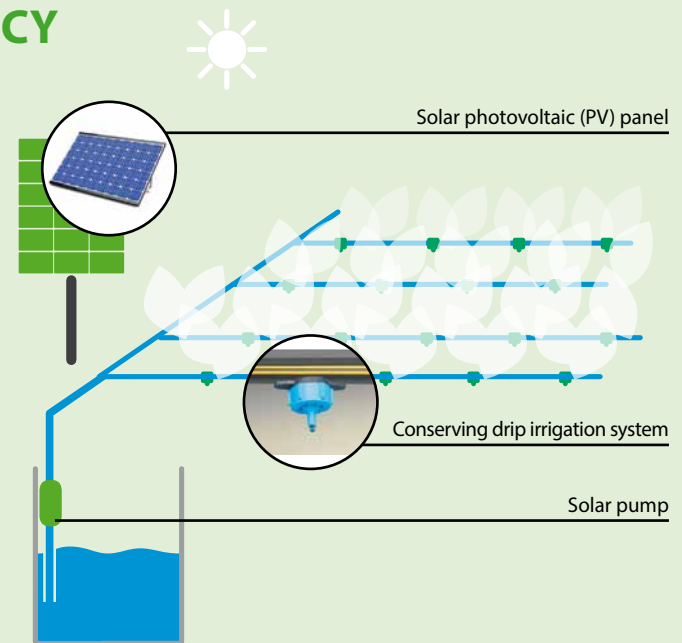


**up to 60%**

When you grow crops, vegetables or fruits, weather is obviously a key factor – and an unpredictable one. A dry spring season or a prolonged heat wave in summer can have a major impact on your harvest and consequently on the success of your business. To supply your plants with sufficient moisture during dry periods, you need water and energy. How much you really need depends on your method of irrigation. Irrigation technology has advanced a long way, and investing in an automated system can already save you a lot of time and water. In addition, you could think about running your pump on photovoltaic (PV) electricity, replacing the mains electricity or diesel you may have been using so far. In remote areas, PV could even make irrigation possible for the first time. It can help you raise your production without having to invest in expensive diesel.

### ADVANTAGES

- Save money on electricity or diesel
- Reduce weeds, as areas can be very precisely watered
- Can help to increase crop yield
- Save water, as automated systems supply the precise amounts necessary



Photovoltaic (PV) cells convert solar energy into electric energy. PV energy should be stored in an additional battery to bridge periods of lower solar intensity.

### RECOMMENDATIONS

- Find the technology best suited to your type of crop, e.g. drip irrigation for trees, vineyards and greenhouses
- To get the best out of your automated systems, train yourself and your staff to programme them correctly
- Keep water tanks in the shade to reduce evaporation losses
- If possible, combine your irrigation system with rain harvesting methods



# How to seek expert advice

Most of the measures that we have presented in this booklet are easy to implement. But every company's situation and requirements are different, and these need to be taken into account carefully when deciding which type and size of energy efficient equipment will offer the best solution in terms of both energy consumption and costs. That is why it is important for most of the investments to obtain a professional opinion before implementing new technologies.

The Allius received some good advice from their energy consultant, who recommended that they first invest in insulating the building envelope by installing new double-glazed windows and doors for their business premises. This enabled them to reduce the need for cooling in the first place, which in turn meant that when the new highly efficient split-system air-conditioning was installed, they were able to take full advantage of it.

The Allius' example also applies to businesses wishing to invest in production equipment, transport and agricultural machinery.

### Seeking advice from an energy consultant

It can sometimes be challenging to identify the investment that would enable your company to save energy most effectively. If you want to save energy over the long term and are planning to make major investments, or investments of various kinds, to achieve that objective, you should seek advice from an energy consultant. Make sure that the expert you consult has the appropriate expertise. A competent energy consultant – or energy auditor, as they are often called – will be able to give you valuable support in identifying areas with energy-saving potential, and in designing and implementing measures to lower your energy consumption and energy costs. Make sure that your energy consultant also calculates the economic feasibility of the proposed measures.

An energy consultant usually takes the following steps:



### Implementing an energy management system

Have you ever thought of systematically reducing your energy consumption and monitoring it over the long term? That is the purpose of an energy management system. Systematic energy management helps to make your company's energy consumption more transparent, enabling you to identify potential for savings, reduce your energy costs and make your company more competitive. It is suitable for all types of organisations, whatever the size or sector, but is particularly beneficial if your operations involve energy-intensive processes. An energy management system is a long-term investment that will become an integral part of your company's business strategy.

The basic idea behind an energy management system – as with any other management system – is to continuously improve processes on the basis of a recurring cycle. This consists of the following phases:

**PLAN:** Starting from an initial analysis and evaluation of energy input and energy consumption, targets are set and action plans developed.








**DO:** The action plans are implemented, energy-relevant processes are planned, responsibilities are assigned and staff are trained.

**ACT:** Based on the results of the analysis, corrective measures are taken, if necessary.

**CHECK:** The effectiveness of the implementation is analysed.

# ALL ENERGY SAVING MEASURES

Here is a selection of measures that can make your business more competitive, more profitable, more energy efficient:

	<b>Insulation</b>	
	Improving building insulation .....	6
	Replacing windows and doors.....	7
	<b>Lighting</b>	
	Installing energy efficient lighting .....	9
	<b>Renewable energies</b>	
	Installing solar water heating systems (SWHS) .....	13
	<b>Heating, cooling and ventilation &amp; Process heating and cooling</b>	
	Replacing old boilers.....	8
	Upgrading central heating systems .....	12
	Replacing old air conditioning.....	14
	Replacing old ovens .....	17
	Replacing old industrial boilers.....	18
	Upgrading cooling chambers and vitrines .....	24
	<b>Production machinery</b>	
	Replacing pumps, motors and air compressors.....	19
	Investing in computer numerical control (CNC) machines	21
	<b>Transport</b>	
	Replacing old delivery vehicles .....	25
	<b>Agriculture</b>	
	Replacing old tractors.....	28
	Replacing harvesters and agricultural equipment ....	29
	Upgrading heated greenhouses .....	30
	Improving irrigation efficiency .....	31

