Energy Policy Plan 2020-2030: the path for UGent in the energy transition

This paper was prepared by the Energy Policy Working Group, DGFB, DOZA, DSV and DFIN.

1. Framework and principles

With the energy policy plan, approved by the BC on 19 March 2009, UGent committed itself to reducing the energy consumption of the patrimony by 20% by 2020 compared to the energy consumption in 1998. Additional energy consumption for the new buildings since 2009 had to be compensated by own renewable energy generation.

This ambitious goal formed a clear framework for the past decade. The UGent management monitored progress via an annual follow-up report and a two-yearly sustainability report, and various policy instruments were developed to achieve the objectives. The most relevant were

- the provision for sustainable measures since 2010, allowing proven savings to be reinvested in sustainable energy projects;
- the provision for renovation since 2010 to which the balances of the maintenance programmes and general budgets of welfare and the environment are added annually in order to expand the renovation budget with additional budget for energy measures;
- The decision to strive for near-zero energy (BEN) buildings and renovations;
- proper integration of energy measures into the building policy (adjustments to the draft directive, checking the investment plan against the energy objectives, etc.);
- the investments in green energy (PV installations, heat pump, etc.);
- the decision to build an additional wind turbine on the Proeftuinstraat campus and to select a project developer that allows as much direct participation by local residents, students and staff as possible;
- the development of the support base through energy campaigns, Transition UGent, ...

Since 1998, the consumption of fuel, electricity and water has been closely monitored in the energy accounts. **Electricity consumption has increased by 52% since 1998**; electricity bills have increased by 96% (from 3.4 mio to 6.8 mio €/year) (Figure 1).

Adjusted fuel consumption fell by 16% since 1998, while fuel costs increased by 46% (from 2.1 mio to 3 mio €/year) (Figure 2).

Water consumption has decreased by 41% since 1998; cost price has increased by 126% since then, but this is partly due to the sanitation contributions that are settled via the invoice whereas previously this was done via a separate levy (from 0.42 mio to 0.95 mio €/year) (Figure 3)**.**

Both fuel and water consumption per m² of building area have fallen by 36% and 55% respectively since 1998; electricity consumption per m², on the other hand, rose by 15%.

Since UGent has opted to purchase green electricity since mid-2008, **CO2 emissions** have **dropped by about 62%** (Figure 4). In absolute numbers, this means a decrease of 31,000 tons of CO2, and a remaining CO2 emission of ca. 18,000 tons (excl. the emissions caused by mobiliteit).

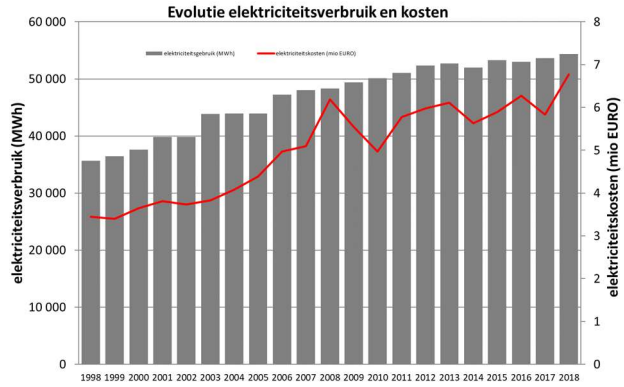


Fig. 1: Electricity consumption and costs from 1998 to 2018

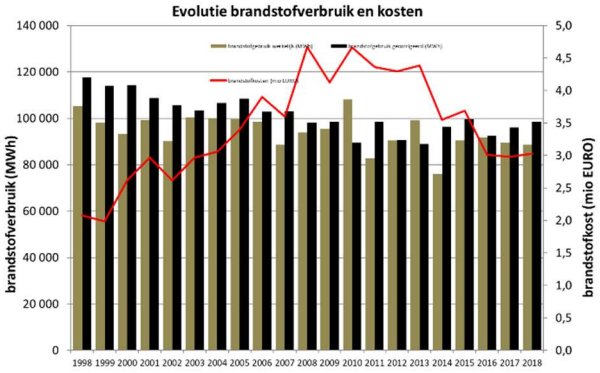


Fig. 2: Fuel consumption and costs from 1998 to 2018

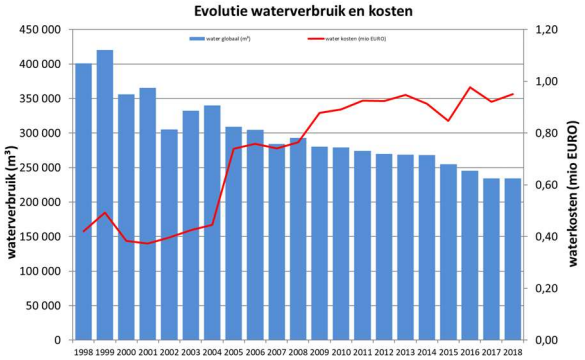


Fig. 3: Water consumption and costs from 1998 to 2018

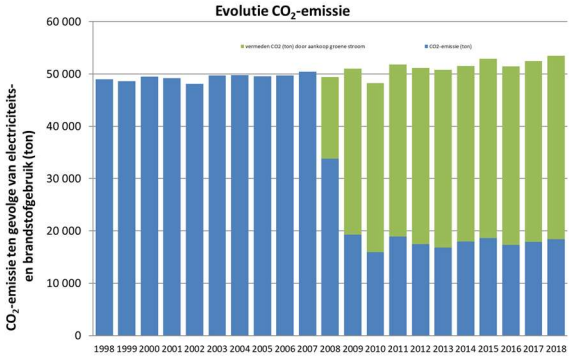


Fig. 4: CO2 emissions *from 1998 to 2018*

The total adjusted energy consumption of 2018 decreased by 15.5% compared to 1998, when the new buildings since 2010 are excluded: UFO, E. Braunschool, S10, Kantienberg, Groeninghe, Mercator A and B, Dunant 2, sports research centre, Veterinary Research Building, Block F of campus Coupure, MRB2, resto Diergeneeskunde, i-Gent and the underground depot of campus Boekentoren.

In addition, the additional consumption of the new buildings (approx. 20,663 MWh) is no longer compensated by the own green energy production (approx. 12,151 MWh). However, UGent did decide to install a 4th wind turbine on campus Proeftuinstraat.

The figures show that UGent will just not reach the 2009 target for energy reduction of the existing patrimony, although it will come close. Also the objective to cover the extra consumption of all new construction projects after 2009 with own produced green energy will not be reached in 2020; probably it will be a few years later because of the decision in 2017 to install a 4th wind turbine on campus Proeftuinstraat.

2020 is by no means an end point. Climate change calls for drastic measures. The EU is committed to reducing its emissions by 80-95% by 2050 compared to 1990, under the Paris climate agreement, if all developed countries make an effort[1]. **This means an almost complete transition to renewable energy, a halt to further use of fossil fuels and a very significant reduction in energy demand. Several decisions to be made now must already**

[1] *https://europa.eu/european-union/topics/climate-action_nl*

take this transition into account, especially in terms of infrastructure that will be in use for decades.

To prepare for this transition, UGent proposes an Energy Policy Plan 2.0, an action plan for the period 2020-2030. This policy plan was drawn up with various stakeholders (working group on energy policy, experts from UGent, Transition UGent, City of Ghent, ...) and is based on the EU objectives, i.e. :

- By 2030, at least 40% less greenhouse gas emissions compared to 1990;
- at least 32% of total energy consumption from renewable energy by 2030;
- at least 32.5% more energy efficiency by 2030;
- 80-95% reduction in greenhouse gas emissions by 2050 compared to 1990.

The EU states that CO2 emissions must be reduced by 1.5% per year until 2030 and from then on by 4.6% per year until 2050. These targets may even be tightened in the coming years to bring them more in line with the Paris Climate Agreement.

The main sources of CO2 emissions for UGent are building heating and electricity, commuting and air travel. Reduction objectives apply to each of these compartments. In addition, there must be a strong focus on 'nature-based solutions', i.e. the sustainable management and use of nature. This memorandum discusses objectives and measures to reduce CO2 emissions from building heating and electricity.

2. Objective

UGent supports the EU ambition to reduce greenhouse gas emissions by 80-95% by 2050 and sets a specific target for the period 2020-2030:

- to reduce total CO2 emissions from building heating and electricity by an average of 1.5% per year2,
- to reduce energy consumption annually through more efficient use of space and energy (% is determined by master plan 2050), and
- to build and renovate fossil-free from now on.

3. Action plan

To achieve the above objectives, an ambitious action plan is needed. This contains study work, investment measures and measures to achieve behavioural and systemic change. It is built around 2 pillars, namely :

- **energy efficiency**
- **investments in green energy**

Twelve **leverage actions** are put forward that have the potential to accelerate the energy policy plan being pursued. These actions can leverage follow-up projects if they receive the necessary policy support and resources. The leverage actions have the advantage that they can be started up in the relatively short term and do not have to wait for the results of studies, policy, the market, etc.

Study is also part of the present action plan, because there are still many gaps in knowledge, and social and technological developments are happening very fast. It is important that we move in a clear direction in the coming years and gradually gain insight into the challenges and problems that we will encounter. The lessons learned from the leverage actions can feed

[2] *If the EU ambition were to be tightened further in the coming years (to bring it more in line with the Paris Climate Agreement), this UGent objective would also have to be adjusted.*

into these studies. At the same time, we must ensure that no investments are made during the search process that cause lock-ins or go in the opposite direction.

Finally, reference is made to the **extra financial effort** that will be required. In the course of the next 10 years, a budget will have to be provided for this. Actions for this will also be brought forward.

3.1 Pillar I: space and energy efficiency

Since 1998, the energy consumption of the entire UGent building stock has decreased by barely 2%. Forecasts show that after investment plan 3, energy consumption will increase by 1.5% in 2028 due to a new extension in m². CO2 emissions from energy supply to buildings will be only 2-5% lower than today, due to a switch from natural gas installations to heat pumps.

This analysis shows that a different and more ambitious approach is needed to achieve the objectives of this energy policy plan. In addition to focusing on BEN-buildings and green electricity, far-reaching efforts must be made to:

- Densification and infill of the building stock
- Accelerated reconstruction and renovation
- Careful building management

3.1.1. Densification and infill of the building stock

Problem statement

It goes without saying that the more efficient use of space through densification and infill development leads to a more efficient use of energy per square metre.

This is not a new objective. It is one of the priorities of the real estate policy plan 2019-2028 (approved in November 2015) to realise a compact university with an efficient and economical use of space. After all, reducing the UGent footprint contributes to various goals: cost efficiency, sustainability in various senses and the creation of a close-knit living community.

Thanks to this shared vision, a few first steps have already been taken, such as:

- the introduction of a central auditorium management system
- the further roll-out of the "Different Work" concept
- *sharing projects* with third parties such as the realisation of laboratories in collaboration with VIB and research suites in collaboration with ILVO
- the adjustment of the area standard for offices
- the central server infrastructure
- the university-wide expertise centres
- the Directive on the shared use of L3 and A3 facilities
- the plan for core facilities for the Faculty of Medicine and Health Sciences
- the ambition to organise the departments of Organic and Inorganic Chemistry together
- occupancy and utilisation measurements in recent projects and benchmarking with other universities and research institutions
- ...

Despite this ambition, knowledge and good examples**, the surface area increased by 15% from 2013 to 2018** (from 767,132 m² to 880,895 m²), **an increase of 5% in investment plan 3** (to 916,956 m²). Of course, this will also compensate for the growth in staff and student numbers, but occupancy measurements of auditoriums, meeting rooms, lab space, ... very

often show under-occupancy and under-use, also in the case of new buildings (office space in the Small Pets building) or recent renovations (Ledeganck building). With the exception of a few examples, the expansion remains tailor-made for the applicant, department- or faculty-specific, bound to a particular campus, etc., despite the DGFB's critical eye. despite the DGFB's critical eye. All too often, we are stuck in a 'pattern', whereby we offer an answer to additional needs by adding buildings and leaving the old buildings untouched.

Drawing up a master plan for the building stock 2050

We have to ask ourselves the following questions: Which campuses do we deploy for the further development of UGent? Do we limit the number of university campuses? Which buildings still have sufficient quality to be renovated? Which buildings do we dispose of? How do we fill in the available space optimally? How can the quality and energy performance of UGent's building stock be improved? How do we transform the entire building stock in the next 30 years to the desired end result: comfortable, energy-neutral, fossil-free, sustainable?

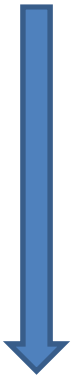
These questions must be examined and result in a master plan for UGent's building stock, which must provide a short-, medium- and long-term perspective for densification, renovation and new construction towards 2050.

The master plan must be attuned to the European climate objectives by 2050 and make visible how the transition to a sustainable building stock will be tackled in the coming years. Consequently, the master plan must make the interim objectives more concrete with regard to energy reduction and allow progress towards 2050 to be monitored.

The following concrete measures are proposed:

S1. Elaboration of master plan for building heritage 2050	
Study	The accessibility, spatial and social quality, compacting capacity, etc., are mapped out at campus level and the potential for evolving into a 'future-proof' campus is estimated.
	The building technical and energy quality, comfort, versatility, accessibility, architectural value... are inventoried at the building level and the potential to evolve into a 'future proof' building is estimated.
	Budget: Process manager and evaluators (regular operation DGFB).
Determine direction	A vision will be developed (in terms of use, sustainability ambitions, space needs, etc.) in a think tank consisting of various stakeholders (administrators, experts, the City of Ghent, users, policy staff, etc.).
	With the vision in mind, a roadmap will be drawn up. This consists of several scenarios for achieving the 2050 target and formulates, among others, intermediate objectives regarding energy reduction and energy efficiency. In addition, the roadmap defines concrete and phased actions for the period 2020-2030, taking into account the planned construction and renovations as foreseen in investment plan 3.
	Investment plan 3 may be adjusted. The renovation budget is allocated to specific total renovation projects.
	Budget: Process manager (50 man-days), think tank (regular operation), thematic working groups (regular operation).
	Interim targets for energy reduction and energy efficiency allow for a thorough and transparent follow-up and clarify priorities, thereby providing sufficient financial resources.

	By 2050, the entire building stock will have been transformed into the desired end result: comfortable, energy-neutral, fossil-free and sustainable buildings.

H1. Densification of the Ledeganck campus	
Lever action 	Together with the new research building for fac. WE, it is being investigated how this faculty can become denser (Ledeganck, S-buildings, Proeftuin). The focus is on effective densification of the Ledeganck campus, where the buildings have recently been thoroughly renovated. This allows old space- and energy-inefficient buildings to be freed up (of the WE faculty, but possibly also of other faculties), thus making a total renovation, reallocation, demolition, etc. possible.
	Budget: Project leader DGFB, in cooperation with fac. WE and the think tank Masterplan 2050 (regular operation) *<u>Extra budget for compacting campus Ledeganck</u>* *+ Budget for total renovation of vacant buildings (^{1st} phase in investment plan 3).*
Continued	Vacant buildings can be thoroughly renovated.
	Lessons learned serve as input for similar renovation processes (Technicum-Plateau, Rommelaere-Rectorate-Pand, Ardoyen campus buildings, etc.).
	Budget: Renovation budget in investment plan 3 in ^{1st} phase *- Savings through more efficient use and better utilisation, less space taken up, less electricity used, no investment in similar infrastructure, etc.*

<u>Densification and infill steering by users</u>

To further stimulate infrastructure sharing, a number of actions need to gain momentum and be incorporated as fully-fledged policy measures. This already happened for the phasing out of decentralised server rooms and their relocation to the central data infrastructure. Since 2016, a limited group of university-wide expertise centres[3] have been supported with BOF funds. For L3 facilities and animalaria, the draft guideline states that, in principle, such infrastructure will no longer be provided additionally and that activities that require it must take place in the infrastructure already available.

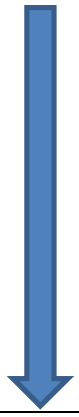
However, more control is needed. Right from the preliminary design phase, work is tailored to specific departments, which makes flexible use impossible. For example, the animal room of MRB2 was custom designed for a department that never took up residence there. In the meantime, it has been rebuilt for the 3rd time.

In order to use specific space and equipment more efficiently, additional supporting measures are therefore needed, such as:

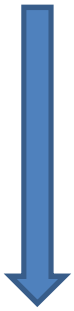
- generic and flexible design, starting from a 'future proof' basic concept per type of activity (chemistry, biosafety, etc.)
- making specific infrastructure accessible to third parties
- making an inventory of the available dedicated infrastructure
- the support for a central management system (manpower, management system, etc.)
- Elaboration of steering / accountability mechanisms

[3] https://www.ugent.be/en/research/research-ugent/researchdirectory/centres-of-expertise.pdf/

The following concrete measures are proposed:

S2. Development of future proof basic concepts for different types of labs	
Study 	Instead of customised designs for the user, basic concepts are worked out and laid down for the various types of laboratory. These concepts are designed according to a number of standards for all buildings (carcass, finishing, techniques), allowing the building to be adapted and future-proof. Maintenance can be performed in the same uniform and efficient manner for all buildings. If additional customisation is required for certain research, this can be considered later in the planning process (design phase). In order to limit this customisation to what is strictly necessary, departments must themselves bear the costs of these specific requirements, for example, or they are allocated a fixed budget that they are free to spend.
	Budget: Manpower (regular operation DGFB, energy policy working group, lab community).
Anchoring	Labs are designed to be sustainable and modular. Customisation is limited to the most necessary.
	Budget: Savings through more efficient use and better utilisation, less space taken up, less electricity used, no investment in similar infrastructure, etc.

S3. Information build-up on available expertise, infrastructure and devices	
Study 	The available specific expertise, infrastructure and equipment at UGent will be inventoried as part of the UGent research information system GISMO (data on infrastructure should be delivered to the Flemish Research Portal FRIS by the end of 2021).
	Budget: Budget as part of GISMO (regular operation DICT and DOZA).
Anchoring	Knowledge of available expertise, infrastructure and devices will lead to more voluntary sharing.
	If not: Work out control/response mechanisms to increase shared use of (energy-consuming) infrastructure (cf. data centres).
	Budget: Savings through more efficient use and better utilisation, less space taken up, less electricity used, no investment in similar infrastructure, etc.

H2. The 'core facilities' roll out further	
Lever action 	One of the policy priorities of the GE faculty is the installation of various core facilities: core infinity, core animalarium, core flow cytometry, core logistic support, etc. This allows infrastructure, material and/or services to be shared across departments and research groups, possibly even externally. In a first phase, the faculty made funds available for the appointment of a 'core facility manager'. This fits in with the policy that resources released for ATP are mainly used for cross-departmental or faculty-wide initiatives. After all, the provision of a core stands or falls with the availability of staff. When Block B comes into use, the faculty asks the departments involved to use ATP for the benefit of the cores. A firm foundation has already been laid for the latter, as the faculty has been prioritising the use of personnel points released by ATP for cross-departmental and cross-research initiatives for a number of years.

	DGFB, DFIN, DOZA and DICT assist in the design and development of tools for management, cost ventilation, staff allocation, etc.
	Budget: Faculty of GE releases resources for a core facility manager and allocates ATP points from departments to the core facilities; DFIN and DICT develop management tools (regular resources DFIN and project work DICT) *- Savings through more efficient use and better utilisation, less space taken up, less electricity used, no investment in similar infrastructure, etc.*
Continued	Other faculties/research groups, for which a new building/renovation is planned, will be supported in elaborating and implementing the concept of core facilities (faculty BW, department WE06 and WE07 in faculty WE). As a transitional step, a lab manager can be appointed who has an overview of the available infrastructure and lab activities at the faculty and who can judge whether co-use is possible in the case of new questions.
	Lessons learned serve as input for the design guideline.
	The surface area standard for laboratories is refined and applied as standard (deviations are possible after justification).
	Budget: Each faculty releases funds for the appointment of a 'core facility manager' and allocates ATP from departments to core facilities. *Support in setting up management systems, organisation and setting up the infrastructure, ... (regular operation DGFB, DICT, DFIN, DOZA)* *- Savings through more efficient use and better utilisation, less space taken up, less electricity used, no investment in similar infrastructure, etc.*

H3. Shared large lab spaces for fac. WE, BW, FW a.o.	
Lever action	The practical rooms of the faculties WE, BW and FW were inventoried and their use was mapped. Several of these rooms are underutilised and underused. Shared and more efficient use is possible, provided that the timetables are harmonised and that there is good and reliable management. In the new building for the FW and GE faculties, a multi-purpose practical room will be set up which can be used for all FW faculty chemistry practicals with large student groups. This will free up the space- and energy-inefficient 'temporary practicals' building on the Pharmacy campus for demolition.
	Budget: Additional budget for new Pharmacy building to enable shared use (approx. EUR 100,000) *+ Support in management, scheduling, ... (regular operation DGFB, DICT, DFIN).*
	With the construction of a new research building for the fac. WE, the renovation of the education infrastructure for chemistry must also be considered. This should also include the demand for space from other scientific bachelor's programmes (faculty BW, EA, FW, GE, ...), so that a 'central teaching lab' for chemistry can be created. In this way, the old practical labs in Block B on Coupure Campus can be abandoned, among other things.

	Budget: Support for management, scheduling, ... (regular operation DGFB, DICT, DFIN).
Continued	Other faculties and research groups, for which a new building or renovation is planned, will be guided to elaborate and implement this concept as well.
	Lessons learned serve as input for the design guideline.
	Budget: Management support, scheduling, etc. (regular operation DGFB, DICT, DFIN) *savings through more efficient use and better utilisation, less space taken up, less electricity used, no investment in similar infrastructure, etc.*

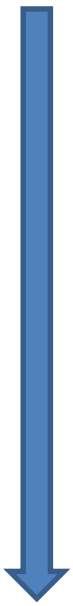
Sensitising and empowering

The construction and energy costs are borne centrally at UGent. As a result, users are not encouraged to use space and energy efficiently. Energy campaigns and awareness-raising projects have been working on this for 10 years.

There are many examples that show this to be insufficient. Climate chambers are (half) empty, L3 facilities are not used for the high-risk activities for which they were designed, needs are estimated too high [for illustration: MRB2 was designed for 190 people in the labs (approx. 14 m²/p), whereas now only 124 work there (approx. 23 m²/p)], ...

Raising awareness is a good first step, but if this is insufficiently effective, the step towards accountability must be taken, e.g. by charging space usage to the users or by charging the energy cost of specific energy-guzzling infrastructure and appliances. In this way, an incentive can be created to use space (and energy) sparingly. A system of accountability could limit the continuous demand for additional space and stimulate the joint use of the available space.

The following concrete measures are proposed:

H4. Common -80°C freezers for long term storage	
Lever action 	Bioresource centre Ghent (Health, innovation and research institute, campus UZGent) provides 45 -80°C freezers and 6 liquid nitrogen vessels (Isothermal Freezers CBS, 35000 cryovials/barrel) for the storage of biological agents. The Bioresource centre Ghent is the central contact point for biobanks at U(Z)Gent, with a coordinating function and a central management system (with cost ventilation). There is still a lot of unused space, as this is little known and departments can freely place -80°C freezers. However, one -80°C freezer consumes 2500 to 3500 kWh annually and a lot of biological material remains untouched (and in some cases superfluous) in the freezer for many years, which may not be in conformity with the stricter biobank legislation. There are an estimated 130 -80°C freezers at UGent, 9 -150°C freezers and 1 -180°C freezer. In addition to the advantage of saving energy, the Bioresource centre Ghent has back-up freezers and the Biobank legislation has recently been tightened up, which means that stricter requirements are being imposed on biobanks (more safety requirements, audits by the government, back-up plans and emergency plans, etc.). These matters are better organised in a central infrastructure. To encourage departments to use this infrastructure for long-term storage of biological samples, they can receive a one-off payment for the electricity

	costs saved (cf. pilot project 'thinking differently about space', ca. EUR 1,000) per -80°C freezer that is taken out of use.
	Budget: Financial incentives (regular operation DGFB) *- Savings by decommissioning -80°C freezers.*
Continued	Departments are encouraged to provide long-term storage in shared storage facilities (in the first phase on the UZGent campus).
	If this has too little effect: develop steering/response mechanisms to increase the shared use of energy-consuming infrastructure (cf. data centres): e.g. EUR 500/year per -80°C freezer put into operation.
	Budget: Savings through more efficient use and better utilisation, less space taken up, less electricity used, no investment in similar infrastructure, etc.

S4. Optimising strategy around economical use of space	
Study	In fac. RE and WE, an awareness-raising project 'thinking about space together' is underway to reflect on the economical use of space. In the fac. WE, proposals were worked out in workshops to use space more efficiently and to give up superfluous space. In total, 2000 m² of useful space was involved, which can be put out of use (comparable to the total area of Rectorate 2). In the fac. RE there was no support to work on this.
	Working out the next steps, taking into account the following questions: - How to deal with this disused but fragmented space for the WE faculty (see also leverage action 'densification of campus Ledeganck')? - How to deal with faculties/departments that do not wish to participate? - Is further guidance needed? The fac. WE would save 2000 m², while the faculty has 5000 m² too much on the basis of the surface study.
	Budget: Financial incentives (regular operation DGFB) *- Savings through reduced maintenance costs, reduced electricity consumption, ...*
Continued	If it is successful enough, the pilot project can be rolled out further in the other faculties.
	If the pilot project leads to insufficient results, instruments must be developed to steer more forcefully, such as financially charging for the use of space.
	Budget: Savings through more efficient use and better utilisation, less space taken up, less electricity used, no investment in similar infrastructure, etc.

3.1.2 Accelerated (re)construction and renovation

Problem statement

UGent strives for near-zero energy buildings (BEN) for new constructions and total renovations and has included numerous energy measures in its design guidelines. The new restaurant on the Merelbeke campus was built according to the BEN principle; in the meantime, the restaurant has been in use for 2 years without any comfort problems. BEN is also being sought

for the renovation of Block I and part of Block II of the Technicum, the renovation of Dunant 1 and Sint-Pietersnieuwstraat 51, the extension of De Brug, the new practical building on the Pharmacy campus and the new Block B on the UZ campus. **Given the size of UGent's building stock, we are only at the beginning. Moreover, the step towards fossil-free buildings must now be taken.**
If all buildings with a construction or renovation year older than 2000 and a construction or renovation year older than 1990 are to be brought up to modern standards, an additional EUR 600 million and EUR 500 million respectively are needed.

In view of this slow pace and underfunding, it is proposed that new building and renovation projects already be carried out in such a way that they are '2050-proof', i.e. no longer needing fossil fuel. After all, the buildings tackled now will still be standing in 2050. If the transition has to take place in intermediate steps, for example by temporarily installing CHPs or by feeding a heat network with natural gas, this must be thoroughly justified and the commitment to switching to fossil-free energy in the long term must be clear.

In addition, the master plan's step-by-step plan should make it clear in one or two years' time how the entire building stock can become BEN and fossil-free by 2050. This will mean an acceleration that will require a great deal of additional funding. First suggestions of possible financing channels are given in section 2.4.

Stricter energy requirements

Many energy measures were included in the draft directive. These are to be tightened up for new construction and major renovation projects.

The following concrete measures are proposed:

S5. Tightening up energy measures in the draft directive	
Study	Technological changes are rapid. Decisive developments are often taking place, for example, in the potential of smart grid, light as a service, circular materials. Such developments should be monitored in order to use them - if applicable - to reduce the energy demand of university activities.
	Budget: Fee for sustainable measures and renovation guideline.
Anchoring	New energy-saving measures will be included in design guidelines, making this a part of all construction projects.
	Budget: Reflected in investment plan 3 and future investment plans.

Total renovations

Depending on the capacity, combustion installations must be renewed every 15 (< 50kW) to 35 (> 600 kW) years. If this has to be done in buildings that have not been insulated to current standards, that do not yet have low temperature circuits and where the heat emitters have not yet been replaced (traditional heating systems), then a high heating regime remains necessary (80/60°C). There are no interesting sustainable alternatives for this.

Therefore, the focus should be on total renovation. A recent good example of this is building S2 on Sterre campus, where a hybrid system (heat pump and gas boilers) can now be chosen, since the building underwent a total renovation a few years ago. A bad example is building S9, where the combustion installation urgently needs to be tackled, but where a gas condensing boiler has to be chosen because the building was not insulated beforehand.

The following concrete measures are proposed:

H5. Total renovations in investment plan 3	
Lever action 	In investment plan 3, EUR 100,000,000 was reserved for replacement investments. This budget should be sufficiently safeguarded for total renovations (proposal: EUR 60,000,000). Depending on the results of the master plan for buildings-patrimony 2050, some buildings will be brought forward.
	Budget: EUR 60,000,000 (provided for in investment plan 3).
Continued	The total renovation will be carried out according to the BEN principle, which means that when the heating infrastructure is replaced in the future, sustainable, fossil-free alternatives can be chosen.
	All buildings renovated from 2020 onwards will be equipped so that they no longer need fossil fuels for heating.
	Budget: Reflected in future investment plans.

H6. Additional total renovations in accordance with roadmap of master plan	
Lever action 	The roadmap that translates the vision of the master plan into implementation will propose concrete and phased construction and renovation projects for the period 2020-2030. This will presumably be much more ambitious than the steps currently planned in Investment Plan 3 if we are to achieve the 2050 targets.
	Budget: Additional budget (not yet budgeted).
Continued	By 2050, the entire building stock will have been transformed into the desired end result: comfortable, energy-neutral, fossil-free and sustainable buildings.
	Budget: Reflected in future investment plans.

3.1.3 Careful building management

Problem statement

Good and proactive building management helps to find and realise energy saving opportunities and to monitor their success. Since the Technical Bureau of DGFB does not have enough manpower to fully include this in their tasks, it was integrated into the maintenance company's assignment for a number of years. They were asked to make proposals to reduce energy consumption, otherwise a fine would follow. However, this approach does not work. The maintenance company does not take a proactive approach and accepts the fine. The management of the buildings is inadequate: heating systems are not optimally adjusted, there is not enough time for energy audits, etc. The contract still runs until 2022, but it cannot be extended under the same conditions.

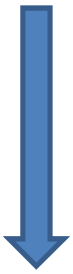
It was also found that new high-tech buildings and the many new installations (rainwater recovery systems, heat pumps, solar boilers, presence detectors, etc.) require much more attention. The follow-up of the engineering offices is minimal after provisional delivery and the focus of the building managers is mainly on proper functional operation. **Most attention is paid to eliminating the (identified) teething problems, but this does not yet mean that the installations are working optimally and that the energy performance initially promised is being achieved.**

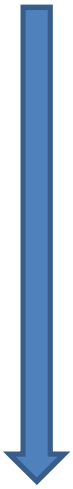
Management of energy systems

Once a building or an installation is in use, many parameters must be closely monitored. After all, the building will be put into use step by step and the user profile will change over time, e.g. due to shifts in services, functions, etc. Installations must therefore be continuously adjusted and adapted to a (changing) user profile and the building's users. This makes it possible to save energy while creating a comfortable and healthy indoor climate.

One energy manager is far from sufficient to proactively monitor and optimise building management systems. However, there is still a lot of low-hanging fruit. 0.5% savings on an annual basis means EUR 55,000 less expenditure.

The following concrete measure is proposed:

H7. Establishment of energy cell	
Lever action 	At least 2 energy managers are active in the energy cell of the Technical Bureau, with the task of: - Proactively monitor and update building management systems. - Conduct and follow up energy audits. - Set up an energy working group of experts, users and authorities in the 5 most consuming buildings (e.g. VIB-UGent building). - Contact point for possible energy-saving measures throughout the patrimony.
	Budget: 1 additional FTE (in addition to the one already available)
Continued	Sufficient time is spent on building management.
	Budget: Savings through more efficient use.

H8. Aftercare	
Lever action 	The iGent building on the Ardoyen campus of Tech Lane Ghent Science Park was inaugurated in 2015. The building design is strongly focused on sustainability and efficient use of space, using the latest technologies. The building has a central building management system. Now that the building has been in use for several years, a review of the energy technologies is appropriate. Are the technological systems working optimally and energy-efficiently in accordance with the promised energy performance? Is adjustment needed? Is the building management sufficient or does it need better monitoring? A 'commissioning team' of academics, students and policy staff within UGent with expertise and affinity in building management, construction and usage processes is appointed to investigate this. Based on the findings, energy systems can be optimised and lessons can be drawn for the general building management of UGent (see also "UGent as a living lab for energy research").
	Budget: EUR 75,000 (provision for sustainable measures).
Continued	There is an effective and integrated strategy on aftercare and building management for the entire UGent building stock.
	Budget: Savings through more efficient use.

3.2 Pillar II: Renewable Energy

Electricity and heat demand must be met entirely from renewable energy sources by 2050 and 32% by 2030.

UGent now derives about half of its energy demand from green energy, mainly through the purchase of green electricity. In order to further increase this share, strong efforts are required:

- Green heat
- Green own electricity production

3.2.1 Green heat

Problem statement

The buildings are mainly heated by natural gas (76%), heat from the Luminus heat network (16%) and fuel oil (2%). **Heating via heat pumps (0.3%), CHP (3.6%) and biomass (0.3%) is still minimal. However, this is the change that will have to be made in the coming years.**

Disconnection of fossil energy

Research is needed into how buildings, and by extension campuses, can be heated without fossil fuels. This is already happening in iGhent, where heat for building heating is recovered from the data centre. But further rollout will require a lot of technological research and new methods to implement the technological solutions. What heat sources are available in the vicinity? What is the operational reliability of new technologies? What is the renovation rate to go fossil-free? When and with which budget will the investment 'outside the contours' of the project be made?

The following concrete measures can contribute to this:

H9. '2050-proof' renovations and new buildings	
Lever action	In all new construction projects and total renovations, sustainable energy sources are resolutely chosen instead of fossil fuels, or prepared accordingly. In the coming years, this will include Block B on the UZGent campus, the new buildings on the Proeftuinstraat campus, the new research building on the Sterre campus, the new homes and a number of total renovations.
	For the new S11 research building, circular materials are chosen wherever possible.
	Budget: Fee for sustainable measures + *Additional budget (not yet budgeted).*
Continued	The investment plan grows into an inclusive story, where the extra efforts needed for the provision of renewable energy sources are included in the project budget.
	For example, investments are being made in a heat network.
	Budget: Reflected in future investment plans

S6. Study of energy transition to fossil-free campuses	
Study	An energy transition plan is being drawn up for the Sterre campus to evolve into a fossil-free campus by 2050. This transition plan consists of several scenarios to achieve this long-term goal. In addition, the energy transition plan defines a concrete and phased action plan for the period 2020-2030, taking into account the planned construction works and renovations during that period.
	A similar study is being drawn up for Campus Proeftuin, Pharmacy and Merelbeke.
	Budget: Fee for sustainable measures (EUR 30,000)
Anchoring	Similar studies are being drawn up for the other campuses.
	Budget: Reflected in investment plan 3 and future investment plans

H10. Switch to fossil-free energy supply for Sterre campus	
Lever action	Align the planned new building and renovation projects from investment plan 3 of the Sterre campus with the energy transition plan .
	The cooling machines in the S10 *data centre* are due for replacement. By opting for a new generation of cooling machines and a modified hydraulic approach, the low-temperature heat can be recovered via water/water heat pumps in nearby (well-insulated) buildings. In the longer term, a larger share of energy could be distributed in a similar way by means of a heat network. A study of this is recommended.
	Budget: Fee for sustainable measures + extra budget (not yet budgeted)
Continued	Similar operations for other projects on other campuses (Living Labs, Pharmacy) included in investment plan 3 ff.
	Budget: Reflected in investment plan 3 and future investment plans

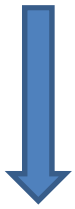
3.2.2 Green in-house electricity production

The consumed electricity consists of purchased green electricity (79%), electricity generated by three wind turbines on campus Proefhoeve (18%), electricity generated by CHPs on campus Coupure and campus Ledeganck (3%) and solar panels (0.34%).

To increase the share of its own green energy, UGent agreed to install an additional wind turbine on campus Proeftuin and to choose a project developer that allows as much direct participation by local residents, students and staff as possible. The permit application will be submitted in 2019.

The share of solar energy increased due to larger solar panel installations on the facade of the i-Gent building and the installation on the roof of S8, in addition to smaller ones on the roofs of Petrochemie, PPW, Heidestraat, homes Astrid and Canterburry and Small Pets. An installation on the roof of the GUSB will be installed in 2019. Due to a lack of manpower, this cannot be done any faster.

The following concrete measures are proposed:

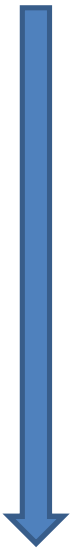
H11. Accelerating the use of rooftops for electricity production	
Lever action 	By means of a tender, a third party financier can be sought who installs as many PV installations as possible on UGent roofs and operates them. It can be stated that UGent wants to buy the power at a reduced rate. It can also be asked to raise as much money as possible from UGent and its stakeholders (staff and students). It can also be decided to provide its own manpower and resources for this purpose.
	Budget: Nothing if third-party funding is chosen. If UGent wishes to finance this roll-out itself, then 0.5 FTE is needed.

4. Create support, raise awareness, inform

The transition to a sustainable energy system based on renewable energy sources promises to be quite a challenge, and one that will not tolerate any more delays. At the same time, there are many uncertainties, familiar systems and practices will have to change and complex, risky and expensive interventions have to be budgeted for in the already very tight budget. So there is a need for strong support for making the energy transition a top priority.

Administrators must be convinced of the necessity. Staff members and students must feel involved in the energy policy of UGent and be convinced of the importance of energy efficiency, know how to use BEN-buildings, understand why infrastructure needs to be shared and needs to be correctly assessed, be stimulated to take on commitments that go beyond their comfort zone, etc. Annual energy sensitisation campaigns, energy audits, the think tank Transitie UGent, etc. are a response to this. When these positive stimuli do not produce the necessary results, the UGent administration has to take the step towards control and accountability.

The following concrete measures are proposed:

H12. Joining forces and strengthening support base	
Lever action 	The following initiatives have been running for years and will be continued and strengthened: ○ Working Group on Energy Policy: a network of policy officers (DGFB, DICT, Environment), energy experts and interested parties. They shape the energy policy plan, follow up the action plan, give advice and develop policy instruments and experiments. ○ Transitie UGent: an open renewal network of committed students and staff, academics and policy makers, who meet about four times a year and discuss various sustainability themes. They act as a sounding board group and help create support for the further rollout and integration into the energy policy. ○ Faculty environmental committees: a group of staff members who monitor environmental and climate issues related to their faculty. They act as a sounding board group and help create support among the building users. ○ Campaigns on energy sensitisation in the winter period, efficient use of space, global climate objectives, etc.

	○ Broad communication about the objectives and policy choices and the results achieved. ○ General point of contact for remarks, suggestions, initiatives, ... concerning energy policy (energie@ugent.be, milieu@ugent.be, duurzaam@ugent.be) .
	Budget: Included in the regular resources of the Environment Department, DGFB, etc.
Continued	A widely supported Energy Policy Plan 2020-2030 and effective implementation of the proposed actions.

5. Research

The energy transition still requires a great deal of technical, process and social innovation. There are still many knowledge gaps and challenges for knowledge institutions to achieve a sustainable and energy-neutral building heritage. As a university, we can act as a living lab in research projects.

The following collaborations have already been set up:

S7. UGent as a living lab for energy research	
Study	The Interreg project BISEPS[4] looks for synergies in terms of energy exchange on campuses and between companies, e.g. through recuperation and exchange of residual heat or exchange of electrical energy. In the project, a simulation tool is developed that maps out which energy synergies are possible on business campuses, which technological and economic barriers exist and what the financial benefits could be. The simulation tool is applied to campus A of Tech Lane Ghent Science Park and the Ostend campus.
	The Interreg project ROLECS[5] looks at streamlining energy tariffs, legislation and technical aspects to enable Local Energy Communities (LEC). These are locally defined zones in which participants themselves take some of the responsibility for energy production and balancing. It is being investigated whether campus A of Tech Lane Ghent Science Park and the Ostend campus could be suitable for implementing a LEC.
	The IDLab research group is housed in the iGent building and has experienced that the temperature in the building can vary significantly between offices and is not always ideal (often too warm). Also, a number of systems are not always used or controlled optimally (e.g. control of sun blinds and windows). Given IDLab's strong expertise in data analysis and sensor communication, and the interest in using iGent as a living lab for testing new developments in realistic conditions, an internal trajectory has been set up in which a number of analyses will be carried out on the data available from iGent's building management system. Afterwards, additional sensors can be installed to capture additional data (e.g. on presence of users or air quality) and an interaction with the users can be set up. The aim is to achieve optimum comfort with minimum energy consumption (see also lever action "aftercare").

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	At the city academy, students investigate the possible reconversion of Ghent University's building stock[6] from the 1960s and 1970s (poorly insulated buildings with outdated energy techniques). The renovation task is not only a matter of infrastructure and technology, but is also a challenging management issue (cooperation around heat networks, around district parking, around integrated mobility, etc.) (see also lever action "extra total renovations in accordance with master plan").
	A thesis student from the Engineering Architecture programme is conducting exploratory analyses on the monitoring data of the iGent tower, energy- and comfort-related, to contribute to the development of an aftercare strategy for UGent (see also lever action "aftercare").
	In the course of the Architectural Engineering programme, a student worked on the "energy performance gap", i.e. the difference between the promised energy savings before and the actual energy savings after a renovation. More specifically, they looked at building S5 and home Boudewijn. In a follow-up project, buildings will be further monitored in order to investigate what the ideal monitoring detail is, in function of costs/benefits (see also lever action "aftercare").
	…
Continued	The knowledge gained must then be translated into solutions for policy issues of governments and UGent.

But in addition to this research initiated by UGent researchers, the building and energy managers at UGent have a number of research questions. Sometimes new technologies clash with legislation (high temperature requirements for Legionella prevention vs. low temperature heating), or there are doubts whether the new technology is really more sustainable when the full picture is taken into account (low energy building vs. suboptimal renovation (no energy needed for production of new materials).

Often there is no ready-made answer to this ('a wicked issue') and different researchers will have to work from a multi-perspective viewpoint.

The following measure is proposed for this purpose:

S8. Developing a high-performance platform for socially relevant research	
Study	In the first instance, this could involve the further development of the City Academy into a 'collaboratorium' in which students from different disciplines, professors, policy makers, businesses and civil society organisations share and develop knowledge about social and ecological challenges. It is a place where people think together about problem definitions and solutions, about future visions and strategies, about experiments and scaling up.
	Budget: Extra manpower for coordination (possibly as part of university-wide policy choice for sustainability or as part of sustainability policy, not yet budgeted)
Anchoring	Policy officers can further shape their policies in interaction with teachers, students and researchers.

6

6. Funding

Sustainable building and the transition to a fossil-free building stock must become an **inclusive story**. The costs associated with this must be integrated into an investment plan, in a building project, etc. However, investment plan 3 does not yet go this far. **The measures to be taken to build and renovate according to the BEN-principles are anchored, but additional budgets for e.g. a connection to a heat network, a BEO field, ... are not yet foreseen.** The budgets below can be used to finance this in the meantime.

Commission sustainable measures:

In investment plan 1, EUR 1 million was provided for extra energy measures. In addition, the BC decided in 2010 to supplement this 'provision for sustainable measures' annually with 'proven' savings and income, according to certain guidelines.

Thanks to this financing mechanism, EUR 350,000 to EUR 800,000 could be added annually to the provision and additional PV installations could be installed, the project budget for iGent and Block F of Campus Coupure was supplemented, allowing additional investments in energy-efficient measures, BEN-building and renovation could be started, etc.

In 2018 and 2019, it was decided to use the saved funds (i.e. EUR 1,515,138) for other purposes due to a budgetary shortfall. As a result, the provision currently amounts to only EUR 332,828. In the Energy Policy Plan 2020-2030, it must be ensured that the provision is used for the purposes intended and not to compensate for budget shortfalls in other areas.

In the Energy Policy Plan 2.0, this provision for sustainable measures and the associated mechanism is also maintained according to the following guidelines:

- The premiums, subsidies, ... that the government, Fluvius, ... donates for energy-saving measures and installations.
- The savings resulting from the wind turbines in Melle. The green electricity produced is purchased by UGent at a cheaper rate. The resulting savings (approximately EUR 240,000/year) will be returned to the provision. Previously it was agreed that this would only be done for 10 years. It is proposed to do this for 10 years more.
- The visible savings from energy audits. On the one hand, these were realised through awareness-raising or adjustments to procedures or regulations, and on the other hand through limited expenditure from operating resources (insulation of pipes, vacuum pumps, etc.). These estimated/proven savings can be returned to the provision for 5 years.
- The savings resulting from implementation works in accordance with the replacement programme. These works were mostly carried out for reasons of modernisation, replacement of worn-out building parts or installations, fire safety, comfort, etc.; the energy savings are a favourable 'side effect'. These estimated/proven **fossil energy** savings can be returned to the provision for a period of 5 years.
- The savings from additional investments, financed from the provision for sustainable investments. The estimated **fossil energy** savings can be returned to the provision for 5 years.
- All efforts that must be made in new building projects/renovations in accordance with the design guideline must fall within the project budget (and are not eligible for the provision for sustainable measures).

This would allow for additional investments of approx. 300,000 EUR/year (3,000,000 EUR until 2030) in Component II and approx. 150,000 EUR/year (1,500,000 EUR until 2030) in Component III.

Commission renovation directive:

In 2010, the BC undertook to set up a provision for financing measures that must be carried out within the framework of the renovation directive. This created additional resources to carry out necessary energy measures that fell outside the renovation budget. The provision is made up of the balances of the maintenance programmes and general budgets of Welfare and Environment.

Thanks to this financing mechanism, EUR 370,000 to EUR 760,000 could be added to the provision each year and extra roof insulation could be installed, single-glazing and external joinery replaced, sun blinds installed, etc.

In 2018 and 2019, it was decided to use the saved funds (i.e. EUR 1,062,411) for other purposes due to a budgetary shortfall. As a result, the provision currently amounts to only EUR 332,828.

The Energy Policy Plan 2020-2030 also retains this provision for renovation and the accompanying mechanism. It is better to ensure that the provision is used for the purposes intended.

This would allow for additional investments of approx. 300,000 EUR/year (3,000,000 EUR until 2030) in Component II and approx. 150,000 EUR/year (1,500,000 EUR until 2030) in Component III.

Grants:

- Green heat, residual heat, heat grids and biomethane call: Those investing in new green heat, residual heat, heat grids or biomethane production projects can apply for support (30% of the investment) during the annual call for projects. At each new round, the admissible investment projects are assessed and ranked. The available subsidy amount will be divided among the favourably ranked investment projects until the budgetary envelope is exhausted. More info: https://www.energiesparen.be/call-groene-warmte
- Certificate system: Certain installations are entitled to green power and/or combined heat and power certificates. More information: https://www.energiesparen.be/groene-energie-en-wkk/professionelen/steunregeling
- Climate investments in higher education buildings: After the 2016 and 2017 calls, a new call would take place in autumn 2019.

Budget investment plans section II and III:

However, it is certain that the above financing channels will not be sufficient. Large investments, i.e. total renovations, construction of a BEO field, connection to a heat source in the neighbourhood, etc. will require larger budgets.

It is proposed that such projects be given priority in the budget and that the necessary budgets be added to the provision for sustainable measures. Over the years, the size of the required budget will become increasingly clear.

Sustainable investment fund UGent and third-party financing:

Some investments will pay for themselves in a relatively short period of time and can be considered a sustainable investment. UGent has a sustainable investment policy, which means that it invests 90% of its liquid assets (EUR 230,000,000) only in sustainable fossil-free investment funds. In addition, 10% of the total capital to be invested is taken under own management and invested in specific funds in which UGent wishes to participate because they are closely related to the UGent activities or in sustainable projects (23,000,000 EUR).

There is also the option of third-party financing, whereby an external party borrows or raises money via a cooperative from staff, students and local residents and uses it to finance energy projects. However, this is only applicable for projects with a favourable return.

Adjustment of the programme:

In some cases, the both-and story comes under pressure. For a long time, we were able to build and renovate more sustainably, without questioning the programme. We only had to add extra resources to the project budget for extra insulation, solar panels, heat pumps, and so on.

Some concrete cases show that this is not always the case.

For example, in the assignment for the new homes, the request is made to design 'sustainable' homes, preferably fossil-free. In addition, the Directorate of Student Services requires that each room have a hot water tap. The study bureau came to the conclusion - partly as a result of measures relating to legislation on Legionella - that providing hot water in every room is difficult to reconcile with the design of a sustainable home. These measures require many more water pipes at high temperature (+60°C), which leads to more energy losses. Moreover, a constant circulation is required (so also during weekends & summer months).

So a choice has to be made between sustainability and the extent to which we deviate from this for the sake of our current comfort requirements (within the legal framework).

It is suggested that consideration be given to open-mindedness each time and that the common goal of CO2 emissions be kept in mind at all times.

Additional staff:

Several boards indicate that they have no extra room for new initiatives:

- General: process supervisor master plan 2050 and elaboration of step-by-step plan (approx. 50 man-days)
- DGFB: additional project managers when adapting the investment plan (e.g. circular construction, installation of heat network, compaction of Ledeganck, etc.)
- DGFB: additional energy manager
- Central support for roll-out of core facilities
- Sustainability office: extra employee sustainability to initiate new initiatives, to link science to policy, for policy preparatory work (linking, facilitating, penholder, ...), ...

It is suggested that these needs be met in the forthcoming staffing plan.

7. Feasibility

With this Energy Policy Plan 2020-2030, UGent is moving in a clear direction for the coming years. The transition to a CO2-neutral building stock by 2050 is the goal and will be very decisive for all investments in the coming years. This will require additional budgetary efforts. But besides the knowledge that these investments must be made to face up to the climate crisis, this paragraph points out some direct and indirect advantages of the proposed actions.

Investing in quick wins:

By improving building management and carrying out quick-wins (adjusting boilers, sealing gaps, providing an airlock instead of an open door, targeted use of the pull box, etc.), an estimated 5% of energy can be saved per building. This would mean an annual saving of EUR 150,000.

Compaction

When infrastructure is used more efficiently and better utilised, it brings many benefits:

- less space required

- reduced electricity consumption (for heating, cooling, etc.)
- less maintenance
- less investment in similar devices
- more efficient management and maintenance by specialist groups
- …

The space requirements study from 2012 was adapted to current staff figures and current space usage (very rough grain). This shows a surplus of 13,000 m² lab space (18 m²/FTE) and 3,000 m² office space (12 m²/FTE). The annual operating costs are 50 EUR/m² for office and 100 EUR/m² for lab, i.e. 1,450,000 EUR per year.

Furthermore, every m² that is not built saves about 2,000 EUR, every m² that is not renovated saves 1,500 EUR.

Focus on the major consumers

The UGent-VIB building consumes more than double the amount of electricity per m² than a building with similar activities. Suppose this consumption could be halved (and become similar to the consumption of other lab buildings), then 500,000 EUR/year would be saved.

The data centre S10 is also a large consumer. If the electricity consumption were to drop by 10% due to more efficient servers, coolers or more economical use by the clients, EUR 75,000/year would be saved.

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Discussed with / tuned to DGFB, DSV, DOZA, DFIN,Transition UGent

Submitted for opinion to Sustainability Committee, Building Committee, Social Council