Energy policy plan 2020-2030: follow-up report 2021

1. Framework and principles

UGent supports the EU ambition of becoming CO_2 -neutral by 2050. 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 taken now already have to take this transition into account, especially in terms of infrastructure that will be in use for decades.

This ambition was made concrete for the next 10 years in an energy policy plan 2020-2030 (Executive Council dated 28/6/2019, RVB dated 9/10/2020, adjustment in RVB dated 3/9/21):

- **Total CO_2 emissions from building heating and electricity supply are reduced by at least 40% by 2030 compared to 1998[1] ;**
- **energy consumption is reduced by at least 2.5% per year through more efficient use of space and energy;**
- **From now on (2019), fossil-free construction and renovation.**

This requires investments and measures to bring about a change in behaviour and systems. This should include investments in space and energy efficiency and investments in green energy facilities.

The trias energetica determines the strategy: firstly, reduce energy consumption through wastage, secondly, make maximum use of energy from renewable sources, and finally, use (fossil) energy sources as efficiently as possible to meet the remaining energy demand.

This is also what the IPCC report clearly states[2] : "greening of energy sources is not enough, demand must also be reduced".

After all, renewable energy sources also have their limits, e.g. in terms of available space. In addition, the use of renewable energy sources requires major adjustments to a building (low-temperature heat) and therefore a strong reduction in energy demand. Finally, reference is made to the electrification of the energy system and the electricity grid also has its limitations.

Annually, a follow-up report gives a state of affairs, explains the actions carried out and assesses the results. This forms the basis for continuous improvement and adjustment and determines the input for next year's plans.

The energy policy plan is part of UGent's climate plan. In the meantime, the energy policy plan has also been coordinated with the master plan 'UGent verbeeldt 2050' (UGent imagines 2050).

2. Evolution of energy use and costs from 1998 to 2021

Since 1998, the consumption of fuel and electricity has been closely monitored in the energy accounts. Due to the corona crisis and the compulsory homework for many months, the data for 2020 and 2021 are not representative. For the sake of completeness, they are shown here, as in previous years.

[1] 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.

[2] https://www.ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/

Electricity consumption has increased by 57% since 1998; electricity bills have increased by 146% (from 3.4 million to 8.5 million €/year) (Figure 1). **Compared to 2019, the consumption increased by 5%, the total cost by 27%**.

Since 1998, the **adjusted fuel consumption** decreased by 11%, while the fuel cost increased by 158% (from 2.1 million to 5.4 million €/year) (Figure 2). **Compared to 2019, the actual consumption increased by 22% and the corrected consumption by 11%, the total cost by 85%.**

Since 1998, fuel consumption per m² of building area has dropped by 34%; electricity consumption per m², on the other hand, rose by 16% (figure 3). Fuel and electricity consumption per UGent employee (staff + student) fell by 74% and 25% respectively (figure 4).

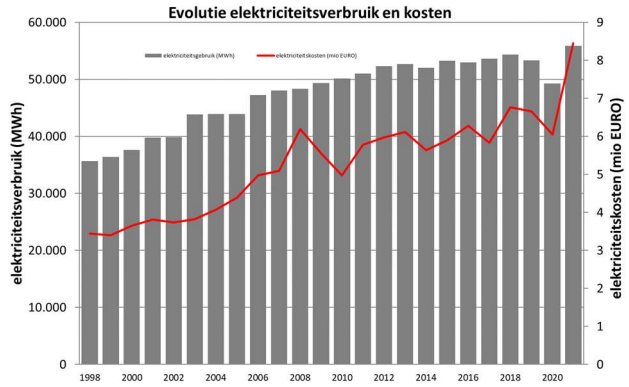

Fig. 1: Electricity consumption and costs from 1998 to 2021

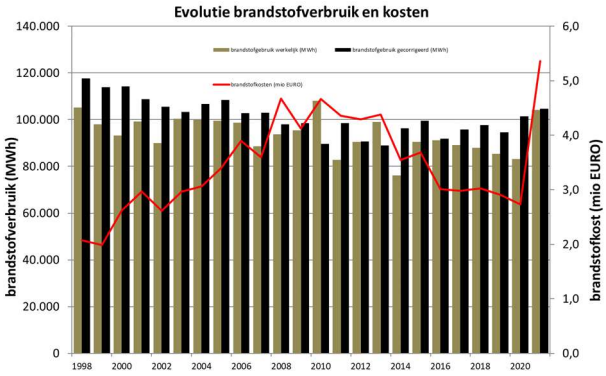

Fig. 2: Fuel consumption and costs from 1998 to 2021

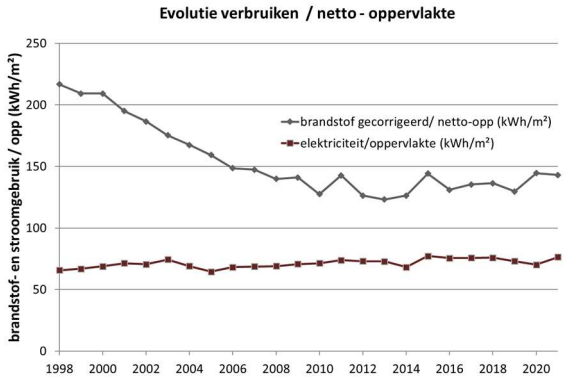

Fig. 3: Energy consumption per m² from 1998 to 2021

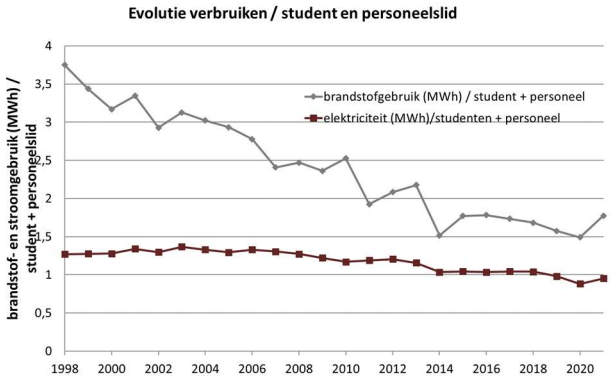

Fig. 4: Energy consumption per UGent employee from 1998 to 2021

In the framework of the climate plan, Climate Lab calculated the CO_2 footprint of the UGent[3] using the 'Bilan Carbone' method. The CO_2 reduction objectives by 2030 with respect to 1990 were recalculated to the reference year 1998, the beginning of the energy accounting of UGent[4] . This gives a correct picture of the efforts needed for the next 10 years:

- WB2C ('well below 2°C'), the CO_2 reduction targets endorsed by the European Commission: 40 % CO_2 e by 2030 compared to 1998;

[3] *Carbon footprint of Ghent University:* *https://www.ugent.be/nl/univgent/waarvoor-staat-ugent/duurzaamheidsbeleid/klimaatplan/co2footprint*

[4] Partial science-based targets for energy: https://www.ugent.be/nl/univgent/waarvoor-staat-ugent/duurzaamheidsbeleid/klimaatplan/doel-energie

- WB1.5 ('well below 1.5°C'), the CO_2 reduction targets that are necessary for a national continent or knowledge institution to take the lead and go faster, in line with the IPCC recommendations: -67% CO_2 e by 2030 compared to 1998.

Table 1 shows the evolution of CO_2 equivalent emissions from heating and electricity supply in the buildings, in addition to the targets set. The purchase of green electricity is not rewarded in the calculation method, as the energy mix of an energy supplier is taken into account. **CO_2 emissions increased by 22.4% compared to 2020 and by 18% compared to 2019.**

	Emissions (tCO_2 e)				Target 2030 (tCO_2 e)	
	1998	2019	2020	2021	WB2C	WB1.5C
Fossil combustion	25.363	16.049	15.645	19.111		
Heat grid	872	2.533	2.464	3.233		
Electricity (purchased and produced)	3.882	4.681	4.321	5.121		
Total	**30.118**	**23.296**	**22.430**	**27.465**	**18.100**	**9.900**
Reduction from previous year (%)			*-3,7%*	*+22,4%*		

Table 1: CO_2 emissions in 1998 (base year), 2019, 2020, 2021 and targets for 2030

The data for 2020 were very distorted by the corona crisis, as were those for 2021. The 2021 data are, however, very worrying. For most of the year, teleworking was compulsory or strongly recommended, yet occupancy in the buildings was very low. Teaching activities and lab research were carried out *on campus* in rooms with maximum ventilation. Ventilation limits were raised, the ventilation period was extended (2 hours before and 2 hours after activities) and windows were opened en masse. A lot of heat was lost in this way. Consideration should be given to how this can be handled more rationally. Windows were very often left open in the evening, all night and at weekends, or windows were opened in sufficiently mechanically ventilated buildings or without the CO_2 concentration exceeding the warning threshold. The fact that at the same time prices are very high makes it all the worse.

3. Evaluation of action plan and adjustment

Given the high level of ambition of the energy policy plan and the urgency of the climate issue, it is very important to monitor the targets closely. Depending on the results of the actions undertaken, adjustments will have to be made. The evaluation below will therefore at the same time determine the action plan for the coming year.

3.1 Pillar 1: Optimising space and energy efficiency

As a result of stricter regulations, extra investments and the ambitions of Ghent University as part of the energy policy plan, new buildings and total renovations are gradually becoming more energy efficient and disconnected from fossil energy wherever possible.

But the climate crisis, and recently the energy crisis as well, as a result of which unit prices for electricity are 100% and for natural gas 300% higher than last year, necessitate an acceleration. At current energy prices, we are heading for an energy bill of EUR 12 million more than in 2020, and have proposed a number of emergency measures to limit the cost as much as possible. These measures can be evaluated afterwards (and possibly maintained, also when prices would (partially) drop again).

In addition, there is much to be gained by using space more efficiently. Several buildings are underutilised, certain research infrastructure can be shared more, and the many home-based jobs have created free office space. Managing this requires a lot of reorganisation, but concentrating

and densifying buildings means that less space needs to be heated. It also means that the bill for making the entire patrimony future-proof becomes less demanding.

With pillar 1, there is a stronger focus on (see also master plan 'UGent verbeeldt 2050'):

- Densification and infill of the building stock (concentration)
- Increasing energy efficiency

3.1.1. Densification and infill of the building stock

UGent has a patrimony of approximately 965,000 m². In 2021 it was decided to no longer keep Het Pand (10,000 m²) and campus Rommelaere (12,000 m²) in the portfolio. The renovation costs were too high and the activities can be absorbed elsewhere. Investment plan 3 still provides for an expansion of 54,000 gross m². As a result, and due to the sharp increase in the cost of building materials, , there is little or no budget left for demolishing or renovating abandoned buildings.

The following actions are proposed:

Action 1.	**Elaboration of master plan for building heritage 2050** Under the heading 'UGent imagines 2050', a structural vision is being developed to rethink our campuses and buildings in the light of the sustainability challenges that await us in the coming decades, but also and above all to optimise our core tasks and the interaction between them. With the vision in mind, a roadmap will be drawn up. It 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 adapted to this roadmap. The renovation budget is allocated to specific total renovation projects. The goal is to transform the entire building stock by 2050 into the desired end result: comfortable, energy-neutral, fossil-free and sustainable buildings.
Evaluation	In the first phase, work was done on a shared, inspiring vision text. The Board of Directors endorsed this charter on 18 December 2020. Then the quality and potential of our campuses and buildings were analysed. The second phase of the project is currently underway. In this phase, the aim is to translate the vision in the Charter into a concrete strategic spatial framework that defines the contours within which UGent can develop itself in the future, in and with the city. A proposal for a spatial-strategic framework was first presented and discussed in the management consultations. There it became clear that this required further elaboration and consultation. In particular, a future perspective had to be sought for the campuses which were indicated in the proposal as having less potential for transformation and which it was proposed should no longer form part of UGent's core assets in the future. Meanwhile, various scenarios were devised.
Adjustment and planning (proposal)	One preferred scenario for a future spatial framework is indicated. Next, a concrete step-by-step plan is set out with a 2035 horizon and a more fundamental plan with a 2050 horizon.

	The conclusions drawn from this plan should be useful for adjusting the multi-year budget of the investment plan.

Action 2.	**Densification of under-utilised buildings or releasing them for renovation, demolition, transfer or re-use** Because a number of new buildings will be put into use (S11, research building fac. BW), a number of old buildings (Block B campus Coupure, S3, S4, S4bis and S12) will largely become vacant. Together with the new buildings, it should be investigated what should happen to the remaining groups. After all, the old buildings must be cleared for renovation and demolition/transfer. Even if the renovation / demolition / transfer / reoccupation is delayed, it is important to make the buildings or building sections completely free in the transitional phase, otherwise the heating costs will remain almost the same as for a building that is fully occupied. Experience has shown that this does not happen automatically, but requires guidance (resto Sint-Jansvest, 'provisional practice' on the Pharmacy campus). This requires a decision, so that the remaining groups have to move and manpower and resources are provided to house the remaining groups elsewhere.
Evaluation	On the Sterre and Coupure campuses, an investigation is under way into the possibilities of releasing and reorganising the old buildings after the new ones are put into use. Resto Sint-Jansvest and the Korte Meer buildings were completely vacated and closed, pending handover or renovation. The "temporary practical" building on the Pharmacy campus will continue to be used for limited activities: 3 laboratories are still active in the basement until the high-rise building is refurbished (another three years or so). The heating taps in the top floor were turned off. Various buildings are underused (Campus Proeftuinstraat, Campus Ledeganck, Dunant 1, Resto Kantienberg, etc.). Also, many office spaces now have a lot of residual capacity due to homeworking since the corona crisis.
Adjustment and planning (proposal)	The structural vision 'UGent verbeeldt 2050' (UGent imagines 2050) gives direction to the reorganisation and densification exercises. In the reorganisation study of S3, S4 and S12 after the commissioning of S11, the Ledeganck campus should also be considered. It makes sense to carry out occupancy measurements in order to map out the effect of the many homeworkers and to adjust the space requirements accordingly. The occupancy measurements can also be used to evaluate whether the approach in the newest buildings (Technicum I and II, new Pharmacy building) is appropriate or whether adjustments are still needed.

Action 3.	**Elaboration of "future proof" basic concepts for different types of labs** Instead of designing for the user, basic concepts for the various types of labs are worked out and laid down. These concepts are designed according to a number of standards for all buildings (structural work, finish, techniques), which allow the building to be adapted and made 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.
Evaluation	An analysis was made with DGFB of examples where design agencies have worked with the concept of 'flexible and generic design' in recent UGent projects and in some external examples: what is strong, what is not? what is customised, what is generic? what is a good ratio? Different design agencies each came up with their own solutions. These were evaluated and a number of initial guidelines emerged.
Adjustment and planning (proposal)	The search for basic modules and guidelines for various major types of activities (axle sizes, utilities, branch lines, etc.) continues. These can then be included in the design guideline. Consideration should also be given to optimising the design process with regard to participation. For example, is it an idea to provide a sketch design first and only then to enter into a dialogue with the future building users? Can a number of preconditions be defined, which then have to be respected as much as possible? Should a kind of faculty 'scientific committee', which can assess needs more accurately, be involved in the assessment of space requests? This thought exercise also fits in with the analysis of why building projects at Ghent University take so long.

Action 4.	**Information build-up on available expertise, infrastructure and devices** The available specific expertise, infrastructure and equipment at UGent are inventoried as part of the UGent research information system GISMO. Knowledge of available expertise, infrastructure and equipment will lead to more voluntary cooperation.
Evaluation	The expertise is registered in the research explorer and is now publicly accessible. The data model to include the available infrastructure was made available in September 2020. The input can be provided voluntarily. At present, very little use is made of this possibility (with the exception of researchers from the LW faculty, where this possibility has already been offered for some time via the separate research portal).
Adjustment and planning (proposal)	Communication remains necessary. Furthermore, the GISMO sub-project for the eCV will provide a new impetus for the re-use of this information (expected in 2023) (see also research transition plan).

Action 5.	**More core facilities become operational** UGent focuses on core facilities. This is a cost-effective means of making infrastructure, materials and/or services available to researchers within and outside the institution. Core facilities serve as a nexus that stimulates cooperation between internal and external researchers, thereby increasing the quality and impact of research and potentially accelerating innovation. Moreover, by pooling expertise, the quality of research infrastructure and services increases, as does the research that uses them.

Evaluation	Even before the roll-out of the UGent-wide core facilities policy, some faculties were already exploring this opportunity, with the faculty of GE, for example, going on to actually form such structures. In April 2021, the policy framework and the associated recognition procedure followed, in which co-financing by the BOF was anticipated. By April 2022, four dossiers had been submitted for recognition and several others were in preparation from various faculties.
Adjustment and planning (proposal)	Core facilities can be rolled out more quickly by: - recognition of new core facilities; - Giving higher priority to core facilities in work requests, renovation and new construction.

Action 6.	**Shared large lab space for faculties WE, BW, FW etc.** The practical rooms of the WE, BW and FW faculties were inventoried and their use was charted. 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 on the Pharmacy Campus, a multi-purpose practical room has been created, which can be used for all analytical chemistry practicals of the FW and GE faculties with large student groups. This means that the space- and energy-inefficient 'temporary practicals' building on the Pharmacy Campus can be cleared for demolition. In addition, work is being done on multi-purpose practical space for 'organic and inorganic chemistry'. This will make it possible to free up the old, uncomfortable and energy-inefficient buildings, such as Block B of Coupure campus, S3 of Sterre campus, etc., and possibly reallocate them.
Evaluation	In the new building on the Pharmacy campus, a practical room was extended so that it can be used for all 'analytical chemistry' practicals for large groups (bachelor's programmes). This means that the room can be used by the FW and GE faculties, as well as by other faculties offering analytical chemistry practicals. Also a large microscopy room can be shared by the faculty of GE and the faculty of FW. A preliminary study is underway to set up a multi-purpose lab for 'organic and inorganic chemistry', a Central Chemical Teaching Lab, which can be shared and used efficiently by all the bachelor programmes that organise these labs. This programme could be included in the renovation of S4 and S4bis.
Adjustment and planning (proposal)	It makes sense to carry out occupancy measurements to evaluate the approach in the new Pharmacy building and to draw lessons from this for the preliminary study that is underway for the multi-purpose practical room for 'organic and inorganic chemistry'. It is important during the preliminary study for the Central Chemical Teaching Lab not only to look at the practical exercises of the WE faculty, but also those of the BW faculty and others. The funds for the Central Chemical Teaching Lab are to be committed in investment plan 3 (budget for total renovation).

3.1.2 Increasing energy efficiency

More efficient building management

Action 7.	**(New) Additional measures to reduce very high energy costs**
	Due to the sharp rise in energy prices, a number of short-term measures are proposed:
	- Switch off the heating at 5pm (instead of 6pm or 7pm). The heat will remain in the building for some time.
	- Better alignment of air ventilation of auditoriums with the academic calendar:
	  o during Christmas holidays (14 days)
	  o during a class week between 1ste and 2de semester
	  o during Easter holidays (14 days)
	  o in summer period, after exams 2de semester and before exam period 2 de
	  o after exam period 2de and before start 1ste semester
	- Restriction of the number of buildings where premises can be booked after 7pm and at weekends.
	- Some corona measures can be scaled back after risk analysis:
	  o Several buildings have good mechanical ventilation. There, the windows can remain closed during classes and meetings (CO2 concentration < 900 ppm). This requires extra communication.
	  o Extraction fans of sanitary blocks have been on day and night, 7/7, since corona pandemic. These fans can go along with the building control.
	The above measures form the standard. Limited customisation remains possible, provided there is a justification (e.g. organising a summerschool in a holiday week, no more reservations for certain auditoriums in the last examination week, ...).
	In the event of a new period of compulsory homeworking, certain buildings (without laboratories or auditoria) may be closed. Staff members of those buildings, who still want to/need to come to work, can then temporarily use a workplace in a building that has to remain open (e.g. making flexi-places of meeting rooms in UFO).

Evaluation	The measures were introduced, with the exception of restricting the number of buildings where premises can be reserved after 7pm and at weekends.
Adjustment and planning (proposal)	The measures taken are subsequently evaluated and, if necessary, retained in order to reduce energy consumption, even after the crisis. The measure to limit the number of buildings where rooms can be reserved after 7 p.m. and at weekends will be further elaborated (to be decided by the management consultations). A plan is also being worked out whereby, in the case of compulsory teleworking, certain buildings will be closed and flexible workplaces provided in other buildings (to be decided by the management consultations).

Action 8.	**Expanding the energy cell**

	In the energy cell of the Technical Bureau, at least 2 energy managers are active, with the task of: - proactively monitor and update building management systems - aftercare in newly delivered buildings - 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) - hotline for possible energy-saving measures in the entire patrimony.
Evaluation	A second energy manager was employed from April 2022, paid for with funds from the provision for sustainable measures.
Adjustment and planning (proposal)	Sufficient time is reserved for building management.

Action 9.	**Building management systems follow-up and aftercare** In various new buildings and recent renovations, there has been a strong focus on sustainability and efficient use of space and energy, with the latest technologies being used: iGent, resto Veterinary Medicine, Dunant 1, Technicum I and II, new Pharmacy building, expansion of De Brug, etc. But also after construction or renovation, it is important to monitor the installations properly and to continuously adjust them to the (changing) use profile and the users of the building. This can save energy while creating a comfortable and healthy indoor climate.
Evaluation	The follow-up of controls is ad hoc and too limited. With the appointment of a new energy manager, building management systems can now be proactively monitored and, if necessary, optimised. Aftercare in the delivered buildings is not systematic either. The focus is on eliminating teething problems, and less on the optimal functioning of automatic systems. An after-care study was carried out at the Veterinary Medicine resto, which provided useful information, but which concluded that DGFB should better carry out such studies itself. With the appointment of a new energy management officer, manpower will now be freed up to monitor building management systems more closely and work out an after-care strategy.
Adjustment and planning (proposal)	An effective and integrated strategy on aftercare and building management for the entire UGent building stock is being developed. The energy technologies of recent new builds and renovations are examined.

<u>Increase energy efficiency by (re)building and renovating</u>

Action 10.	**Tightening up energy measures in the draft directive** Technological changes are rapid. Decisive developments are often taking place, e.g. 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.

Evaluation	A new version of the draft directive was approved, in which additional guidelines were set for fossil-free construction and renovation. In several places, aspects of GRO, the Flemish Government's guide to sustainable building, were also integrated.
Adjustment and planning (proposal)	Innovative techniques are experimented with, e.g. as a living lab.

Action 11.	**(Total) renovations in investment plan 3** In investment plan 3, EUR 100,000,000 was reserved for replacement investments. This budget must be sufficiently safeguarded for total renovations (initial proposal: EUR 60,000,000). Depending on the results of the master plan 2050 'UGent verbeeldt 2050', some buildings will be moved forward.
Evaluation	The investment plan 3 has little or no budget left for total renovation. The (provisional) conclusions of the master plan 'UGent verbeeldt 2050' (UGent imagines 2050) therefore did not play a role in the allocation of the renovation budget for the next 10 years. The budget for total renovation was allocated to the renovation of the Aula, the reconstruction of Paddenhoek 1, 2, 3, but also to new construction projects for the study landscape on the UZGent campus and S11 on the Sterre campus. In addition, EUR 7 million is needed annually for urgent repair work. This leaves EUR 15 million in investment plan 3 (until 2028).
Adjustment and planning (proposal)	The remaining renovation budget (EUR 15 million) must be allocated to total renovation as soon as possible. The conclusions from the structural vision 'UGent verbeeldt 2050' must provide direction for this. A start is being made on drawing up new energy performance certificates per building in accordance with the Flemish climate strategy and renovation obligations, so that there is a clear view of the distance to the long-term objective. A clear strategy is being worked out for future issues: - Can 'half' renovations still be useful? Do buildings always have to be thoroughly insulated before they can be switched to heat pumps, even if the efficiency is a lot lower? - Is it feasible to accelerate the roll-out of heat pumps in existing buildings as a preferential and complementary heat production to existing boilers? On the one hand, this is necessary to accelerate the switch to fossil-free, but on the other hand, it could also contribute to cost reduction in the long run, if fuel prices remain high and there is a possible tax shift from electricity to gas. - What other energy efficiency measures could be envisaged that would be economically viable in the short term? - Consideration can be given to 'undershooting hours', just as 'overshooting hours' also exist. The number of exceedance hours is the number of fixed hours for which it is accepted that it becomes too warm in a room, so that the cooling system can be scaled down. A certain number of undershooting hours would allow the heat pump not to provide enough heat on the coldest days and (inefficiently) require additional heating (=> should installations be dimensioned at -8°C if this

	is seldom the case? Perhaps sizing at -2°C is sufficient for almost all cases). As the investment plan 3 is not yet aligned with the objectives of the energy policy plan, it needs to be scrutinised with a view to sustainability and progressive insight. This may give opportunities to release and shift budgets. In addition, a case must be made for more structural funding from the government.

Sensitising and empowering

Action 12.	**Optimising strategy around economical use of space** In 2017, a consultancy firm investigated MSC concepts for a space optimisation of the offices and labs of UGent. Based on this, the surface standard for labs was reduced from 21 m² to 18 m² per FTE (incl. growth) and the RVB decided to convince faculties to save space by making their use of space and the costs involved transparent and open for discussion. A pilot project ran at the WE and RE faculties under the slogan "thinking together about space". Only in the WE faculty was a result achieved. In total, 1,400 m² of useful space was involved, divided among 50 classrooms in various buildings, which was decommissioned at the end of 2019. Based on the surface study, the faculty had 5,000 m² too much.
Evaluation	The results of the pilot study 'thinking together about space' were shared with the RVB. The evaluation report of the "thinking together about space" project showed that more is possible and more is needed. The working method that was applied was a nice first step, but turned out to be insufficiently effective to achieve further major space gains and to meet the proposed energy/climate targets . Therefore, a proposal of concrete policy measures for a more economical use of space was further developed together with a steering committee on 'responsible use of space'. A draft proposal for a policy framework that was discussed with the deans and directors in 2020 did not land. The office concept of the policy framework 'working differently' was also revised, with again more room for individualised, personalised workplaces. However, the impact of the corona crisis (the many home-based jobs) was not yet taken into account.
Adjustment and planning (proposal)	Further work is needed to build support for a policy framework for more economical use of space. In the meantime, the focus can already be on infrastructure that is specific, consumes a lot of energy, requires a lot of management, is subject to strict legislation, ... In these cases, for new buildings, renovation or work requests, one can (more imperatively) ask to investigate in advance whether such infrastructure is already available somewhere, to manage the infrastructure at the level of the faculty or the UGent instead of at the level of a department, to work out a management system that allows shared use (cf. core facilities), ... It makes sense to re-evaluate the occupancy in various office environments and, if necessary, to adapt the office concept of the policy framework 'on/off campus working' (RVB 12/2021) to the changed circumstances.

Action 13.	**Common -80°C freezers for long term storage**

	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 are free to install -80°C freezers. However, the annual consumption of one -80°C freezer is 6000 to 9000 kWh (without additional cooling) and a lot of biological material remains untouched (and in some cases superfluous) in the freezer for many years, which may not be in accordance with the stricter Biobank legislation. There are approximately 130 -80°C freezers at UGent., 9 -150°C freezers and 1 -180°C freezer at UGent. 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 (more safety requirements, audits by the government, back-up plans and emergency plans, etc.). These matters are better organised in a central infrastructure. Departments are encouraged to provide long-term storage in shared storage space (in 1ste phase on the UZGent campus).
Evaluation	Information sessions and an organised site visit in 2019 have not led to an increase in the use of the Bioresource Centre. Additional -80°C freezers are still being installed. A new communication was sent out, informing about the new Biobank legislation and the advantages of the Bioresource Centre and stating that counters will be placed on all -80°C freezers to make the costs transparent, and possibly to charge them in a next phase. The website now also contains this information. Following a new demand for additional -80°C freezers in MRB2, which would require the building's cooling system to be adapted, a working group led by the research director of the GE faculty was set up to initiate various actions. Counters were placed on the -80°C freezers to monitor the consumption and the departments were asked to make an inventory and evaluate the contents of the freezers (type of sample, age, frequency of use, ...).
Adjustment and planning (proposal)	The MRB2 departments are encouraged to store less stock in the laboratory itself, to organise regular clean-ups, to store certain samples at -70°C, ... If awareness-raising does not yield any results, work is done on rewarding or empowering measures. Subsequently, the most effective measures can be rolled out university-wide. A thought exercise was launched to establish multiple centralised biobanks, thereby reducing the distance to centralised infrastructure.

Action 14.	**(New) Discontinuation of colocation of old servers in S10** S10 currently houses about 290 departmental colo-servers. Of these, 113 are older than 10 years. These use a disproportionate amount of energy compared to the amount of computing power they represent. This is related to a law within electronics, Moore's Law, which states that every 18 months the same computing power is obtained with half the energy. This means that 10 year old servers consume 22 times more energy for the same load than new servers (not to mention the even more efficient use if one chooses a virtual server). The consumption of servers over 10 years old is estimated at 164 MWh/year, including cooling at 245 MWh/year. The same computing power can be achieved with new servers at 10 MWh/year.

	Moreover, many of these old departmental servers are apparently switched on 'idle', which still results in an energy consumption of 60% compared to the maximum load. Departments were regularly urged by DICT to retire the old servers and opt for a virtual server on the central DICT platform or to purchase new servers, but so far this has had little effect. A more compelling framework is needed.
Evaluation	This is a new action.
Adjustment and planning (proposal)	It is proposed to draw up a regulation under which server hardware older than 10 years must be decommissioned. The obsolete systems can be replaced by a free virtual server on the central DICT platform or by a new energy-efficient one. Departments are informed about why (high consumption) and supported in the changeover. If the changeover proves to be too slow, then accountability measures must be worked out (e.g. cost recovery).

3.2 Pillar 2: Renewable Energy

The purchased electricity consists of purchased green power (80%), electricity generated by three wind turbines on the Proefhoeve campus (16%), electricity generated by cogeneration installations on the Coupure and Ledeganck campuses (3%) and solar panels (1.1%).

The buildings are mainly heated by natural gas (81%), heat from the Luminus heat network (17%) and fuel oil (0.5%). **Heating via heat pumps (0.5%) and CHP (1.2%) is still minimal. However, this is the change that will have to be made in the coming years.**

In total, UGent 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 need to be made:

- Green heat
- Green own electricity production

3.3.1 Green heat

Action 16.	**Study of energy transition to fossil-free campuses** Energy transition plans are being drawn up to move towards a fossil-free campus by 2050, with a concrete and phased action plan for the next 10 years, taking into account the planned construction and renovations during that period.
Evaluation	Exploratory energy transition studies were started for the campuses Sterre, Proeftuin, UZ Gent, Kortrijk, campus Melle and Ostend Science Park to examine how the campuses can be disconnected from fossil energy and what adjustments are needed for planned investment projects. However, not enough manpower is being invested in the further concretisation of these studies. For the Ardoyen campus, a roadmap for reducing energy needs was drawn up as part of student research. The buildings in the Sint-Pietersnieuwstraat zone (UFO campus, Boekentoren campus, Economy campus) are largely connected to the Luminus heat network (natural gas-fired CHP). Within the framework of the Sint-Pietersnieuwstraat

	master plan, the City of Ghent and Luminus are looking into how to make this heat network more sustainable. For this purpose, a project is being worked on to ship residual heat from the Ghent seaport to the Luminus power station in the Ham. The Flemish Government is providing funds for this project. At the Melle campus, research is being carried out into how fuel oil can be switched off in the short term and how a transition can be made to a sustainable fuel.
Adjustment and planning (proposal)	The energy transition studies must be given the necessary attention and be part of the master plans per campus (starting with those campuses where new developments are planned). This study can also include the drawing up of the new energy performance certificate per building, so that there is a clear view of the distance to the long-term objective. A CO_2 neutrality plan must be drawn up for the Ardoyen campus together with the companies. This is an obligation for science parks, where we have been lacking for several years. This can be taken up by the management committee of the Technology Park or can be included in the master plan for the Ardoyen campus. The roadmap for an energy-efficient Ardoyen campus, drawn up by students of the Faculty of EA, needs to be further refined and can be aligned with the future plans for UGent on that campus.

Action 17.	**2050-proof renovation and new construction and aligning the projects with the energy transition studies** In all new-build projects and total renovations, renewable energy sources are resolutely chosen instead of fossil fuels, or prepared for. Here, the planned projects must be coordinated with the energy transition plans (Action 15).
Evaluation	Fossil-free construction and renovation have meanwhile been included in the design guideline. The plans of the new construction projects and some major renovation projects were adjusted accordingly: - Home C: Heat pumps - Short Lake - Auditorium: Heat pumps - Toadstool corner: heat pumps - New building block B UZ: heat pumps The conclusions of the energy transition study of Sterre campus will be taken into account in the design phase of S11. With the arrival of the new generation Flemish Supercomputer 'Tier-1c' of the Flemish Supercomputer Centre (VSC) at data centre S10, an opportunity will eventually arise to recover high-quality residual heat. The liquid-cooled supercomputer produces water up to a temperature of 60°C with a capacity of 600 to 700kW. If the energy for cooling, power distribution, etc. is also taken into account, the total energy load of the supercomputer will be 1 MW by the beginning of 2023. However, there is no clarity on the continuation of this programme after 2024. Previously, similar setups were placed in the UGent data centre (2012) and KU Leuven (2016).

	When boiler rooms have to be renovated without the building envelope having already been addressed, a gas installation was again chosen. This was done for the renovation of boiler room S2 and GUSB.
Adjustment and planning (proposal)	In the investment plan, reserves should be built up for those energy infrastructures that are outside the construction project itself, e.g. for the construction of a heat network. Energy transition studies not only show the potential of an own BEO field or the connection to a heat network, but also make clear that the heat network requires a sufficient number of buildings that can be fed with low-temperature heating in order to be profitable. This argues in favour of a stronger focus on renovation of the existing patrimony. The large amount of residual heat cannot be structurally incorporated into the energy transition of the (temporary) location. The heat source is only temporarily available. This consequence of wasting energy by discharging residual heat must be taken into account in considerations of location, rotation, etc.

3.3.2 Green in-house electricity production

Action 17.	**Accelerating the use of roofs for electricity production** A cooperation is set up with the Vlaams Energiebedrijf (VEB), founded by the Flemish Government to assist and relieve governments of the burden of installing PV installations. The VEB is an Externally Independent Agency and can thus act as a procurement agency within the law on public contracts. The governmental entities / public services are exempted from organising an award procedure themselves, which saves a lot of time.
Evaluation	UGent chose to make funds temporarily available for the installation of PV systems through an internal loan. The repayment can be done with the income from exploitation. In 2021, PV installations were placed on S1 and S5 of Sterre campus (99.9 kWp and 46.25 kWp respectively) and on Block A of Coupure campus (207 kWp). With the call 'green power', a subsidy of 5 EUR/MWh life span was received for this. The installation of PV systems on roofs of the Veterinary Medicine campus (1,400 kWp) was prepared. For this, too, a subsidy of EUR 5/MWh life cycle was received through the 'green power' call.
Adjustment and planning (proposal)	The installation of PV systems on high-rise Pharmacy, UGent-VIB research building and Lo²cus is being prepared.

Action 18.	**Placement of wind turbine on campus Proeftuinstraat** A right of superficies was granted to Ecopower and EnerGent for the construction and operation of a wind turbine on campus Proeftuinstraat via an energy cooperative. This allows for participation by local residents, staff and students.

Evaluation	The environmental permit application for the construction of a wind turbine on Campus Proeftuinstraat has still not been submitted. The wind turbine on Campus Proeftuinstraat has an overthrow over a green zone from the municipal RUP, which is not allowed if it is not explicitly described in the RUP. Moreover, it is uncertain whether forest can still be cleared for the construction of a wind turbine, even though the planting is planned in a zone coloured as industrial land according to the SIP. In any event, an approved master plan will be required.
Adjustment and planning (proposal)	A planting study for the wind turbine on the Proeftuinstraat campus must be drawn up.

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 Ghent University and be convinced of the importance of energy efficiency, know how to use BEN-buildings, understand why infrastructure must be shared and needs must be correctly assessed, be stimulated to take on commitments beyond their comfort zone, etc.

Action 19.	**Joining forces and** strengthening **support base** ○ 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 members, academics and policy makers, who meet four times a year to discuss various sustainability themes. They act as a sounding board group and help create support for the further development and integration into the energy policy. ○ Faculty environmental and sustainability committees: a group of staff members who monitor environmental and sustainability 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, response to the coronapandemic, 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) .
Evaluation	The energy policy plan, with its objectives and policy choices, is discussed in general UGent communication and some specific media (Green Office newsletter, etc.) and in faculty environmental committees and other working groups on the environment and sustainability. Several action points from the

	plan were also included in covenants of faculties and managements as part of the university-wide policy choice on sustainability. The enlarged energy policy working group remains active and enthusiastic, also for the further elaboration of the energy policy plan. There was an alignment with 'UGent verbeeldt 2050'. The plan served as an inspiration for other higher education institutions.
Adjustment and planning (proposal)	Efforts are continuing.

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:

The Interreg project BISEPS[1] looked for synergies in terms of energy exchange on campuses and between companies, e.g. through recovery and exchange of residual heat or exchange of electrical energy. In the project, a simulation tool was developed that maps out which energy synergies are possible on industrial estates, which technological and economic barriers exist and what the financial benefits are. The simulation tool was applied to the Ardoyen campus and the Ostend campus. For the Ardoyen campus, the results were not conclusive due to a lack of qualitative measurement data. On the developing Ostend campus, more attention is now being paid to energy monitoring.
The VLAIO ICON project ROLECS[2] looked 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 responsibility for energy production and balancing. The Ardoyen campus and the Ostend campus were examined to see whether they could be suitable for implementing a LEC. However, the way in which the legislator has implemented energy communities puts the focus on the private citizen, and offers little room for large companies or organisations such as UGent.
In the Horizon 2020 REScoopVPP project, UGent is helping to build a community-driven smart building ecosystem. This ecosystem consists of a community-driven flexibility box (COFY-Box) and tools to support energy services for aggregators, energy service companies, balancing providers and renewable energy suppliers. The COFY-Box is based on existing open-source home automation technology with more than 1,600 integrations, making it the first fully open, affordable and easy-to-install smart home energy controller. It will improve the control of electric vehicles, photovoltaics and electric batteries and focus on the intelligent integration of sustainable heat storage and heating solutions. UGent's Electrical Energy Engineering Laboratory (EELAB) is mapping the flexibility potential of electrical assets and developing control strategies to optimise their energy use in function of renewable energy availability and energy market price inputs The Building Physics Group (BFG) of UGent is investigating the flexibility of domestic hot water production systems, and how they can be used in a flexible but safe way.
The FlexSys ETF project explores innovative ways to ensure Belgium's electrical security of supply. Exploiting the huge flexibility potential of aggregating distributed assets such as electric vehicles, heat pumps, batteries, etc. is crucial to maintaining security of supply in the renewable electricity system of the future. To make this possible, this project lays the missing foundation in terms of academic knowledge, technology development and commercial value proposals. The

unique and multidisciplinary consortium covering the whole value chain stimulates innovation and creates societal value through a citizen-driven approach. The result allows for a significant reduction in emissions, dependence on fossil fuels, curtailment of renewable energy sources and barriers to consumer investment. FlexSys is a unique collaboration between the Laboratory for Electrical Energy Engineering (EELAB), the Building Physics Group (BFG) and the Centre for Environmental Economics and Management (CEEM) of UGent, complemented by relevant industrial and cooperative players from the energy market.
In the ETF Trilate project, system models are designed or improved that allow the mapping of energy synergies between companies and regions, as well as the required infrastructure. In the region of the Belgian, Dutch and German industrial clusters, the density of energy demand is very high, while the spatial potential for the deployment of renewable energy technologies is limited. Therefore, an analysis of the energy transport infrastructure required for industrial clusters is crucial in the context of security of supply. This project includes the development of scientific models at the level of processes, industrial plants, and energy systems, coupled with an integrated energy infrastructure analysis. The subgroup Energy and ClusterManagement (ECM) of the Laboratory of Electrical Energy Engineering (EELAB) builds on the experience gained, among others in the BISEPS project, to identify synergies in industrial clusters and parks.
Special issue with the architecture students, applying the EPC-NR method (Energy Performance Certificate for Non-Residential Buildings) to a number of UGent buildings.
Master's thesis on the reuse of construction materials from existing buildings. Case studies in Paddenhoek and UZGent Bok B.
Master's thesis of the Industrial Engineering Construction course on the construction-technical aspects of prefabricated renovation systems. Case study in S4 of Sterre campus.
Master's thesis of the course Engineer-Architect on (hot) water use and leak detection in collective student housing. Case studies in home Boudewijn, Kantienberg, Fabiola and Heymans/Vermeylen.
In the course of the Engineer-Architect programme, a PhD student works on the design of heat networks of the latest generation (with heat-cold exchange).
In the master's thesis workshop Circular Building of the City Academy, the following master's theses were worked on, among other things: - circular/sustainable building at UGent, with the FBW new building on campus Proeftuin as a case study for the Bio-Engineering programme, 2021; - importance of the end-of-life treatment of a building for its environmental impact (case study S4) for the courses Industrial Engineering Construction and Engineer Architecture, 2021.
IMEC is working on the research project 'Hybrid AI for optimal building management' (2020-2022) where the iGent tower is one of the studied cases.
The Engineer-Architect course worked on a special issue called 'Roadmap towards an energy efficient FEA campus Ardoyen'. The results can provide insights for the energy policy plan. Following this teaching project, the Architecture and Urban Planning department wrote a master's thesis entitled 'Energy concepts for a low-carbon university campus Ardoyen'.

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 which must be**

taken to build and renovate according to the BEN-principles are anchored, but an extra budget for e.g. a connection to a heat network, a BEO field, ... is not yet foreseen. In order to finance this in the meantime, the following budgets were/can be used.

Commission sustainable measures:

The 'provision for sustainable measures' is included in the investment plan. This provision is supplemented annually by proven savings (see annex 1). In the next budget it will be proposed to transfer the proven savings of the previous years, i.e. **EUR 1,117,177**, from section I to section II. For section III, the proven savings in 2020 amount to **21,001 EUR**.

Grants:

- **Call green heat, residual heat, heat grids and biomethane:** Those who invest in new projects of green heat, residual heat, heat grids or biomethane production can apply for support (30% of the investment) during the annual call for projects. In the further development of the heat networks on the Sterre campus and the Kortrijk campus, these subsidy possibilities will be thoroughly examined.
- **Call green energy and wind turbines**: Through this call, investors in new solar panels (PV installations with an inverter capacity of 40kW to 2MW) and new wind turbines on land (turbine capacity of 10kW to 300kW) can obtain a subsidy. This support scheme replaces the Flemish green certificates for new installations. Companies estimate what support they think they need and submit a bid. After a call is closed, the submitted project applications that are admissible and meet the conditions are ranked by category, according to their bid. The available group budget is divided among the best-ranked projects (those that produce the most green electricity per requested euro of support) until the budget is exhausted. Thus, UGent received EUR **18,301.30, EUR 13,521.53 and EUR 129,035.80 respectively** for the installations on the Coupure, Sterre and Veterinary Medicine campuses**.**
- **Certificate system:** Older installations are entitled to green power and/or CHP certificates. For the PV installations and the CHP, **EUR 31,484.1 and EUR 48,236 respectively** were received in 2021.

Internal loan:

For the cooperation with VEB for the accelerated installation of PV systems, it is proposed to set up an internal loan that will make the funds temporarily available. Repayment can be made with the income from operations. In the meantime, EUR 141,913 has been made available for the PV installation on campus Coupure, and EUR 111,785 for the PV installations on S2 and S5.

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 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.

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.

For the construction and operation of a wind turbine on campus Proeftuin, a long lease agreement was concluded with the energy cooperative Energent and Ecopower. A participation of UGent

through this sustainable investment fund will be considered again later, when the environmental permit is obtained.

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.

This is not always the case, so more radical choices are needed. It is suggested that consideration be given to open-mindedness each time and that the common objective of CO_2 emissions be kept in mind at all times.

Questioning increasingly stringent regulations:

Legislation on fire safety, AREI, Codex Well-being, Legionella, CO2 concentration in the interior, etc. is becoming increasingly stricter. Questions are asked whether the impact on energy consumption, materials consumption and the required budget is in proportion to the added value of this measure in terms of health. The climate risk is not taken into account at all. Yet everything must urgently be done to limit this climate risk. UGent, VLIR and other institutions can give a signal here.

Release of budgets in 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.

Finding them will be very difficult, not least because of the structural budget deficit that must be eliminated in the coming years, but also because of the tightness of investment plan 3.

Budgetary shifts will have to be made. If these are done with the agreed objectives in mind, they can help support the sustainable system changes. Moreover, the search for additional resources creates the possibility of developing a guiding policy without prohibition or 'stick', whereby the option with the highest associated CO_2 production and environmental footprint receives an increased contribution in order to stimulate the most climate and environmentally friendly options.

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