UJ ENERGY PLAN 2023-2030	
Document number	1
Custodian	Executive Director: Facilities Management
Responsible Division	Facilities Management
Status	First draft
Approved by	PRCC (proposed)
Date of approval	TBD
Amendments	First draft
Dates of amendments	November 2023
Review date	June 2024

Related Documents	
UJ documents (e.g. Policies, Regulations, Guidelines, Contracts) • **UJ Policy on Policy Document** • **UJ Strategic Plan 2025** • **UJ Operational Plan**	**Other** (e.g. Legislation, DoE and HEQC directives and guidelines) • National Environmental Management Act – Environmental Laws Amendment – No 14 of 2009 • Carbon Tax Act 15 of 2019 • National Energy Efficiency Strategy of the Republic of South Africa (2015 revision) • National Energy Regulator of South Africa • DOE integrated energy plan (revision of 2016) • DOE integrated resource plan (2019)
Stakeholders affected by this document (units and divisions who should be familiar with it):	• All UJ employees • All UJ students • All UJ external stakeholders
Website address of this document:	Not publicly presented

Table of Contents

1. OVERVIEW

Energy planning in its broadest sense is about the reality of providing a resource constrained by supply from external suppliers in South Africa that has arisen only partly due to the international pressure to reduce energy consumption, reduce carbon generation and finally move towards a fully circular economy. Compounded in South Africa this supply problem is exacerbated by a growing and increasingly split population and set of Higher Education Institutions (HEIs). The politics of inequality of resources, and the ability to afford the resources is one that must nationally be addressed if the HEI area is to remain and prosper within a society that is increasingly unable to afford the associated costs of resource constraint and rationing.

Over and above the resource constraint a UJ response to energy provision and management remains that the goals put in place for maintaining the UJ facilities and teaching abilities at the highest possible level is that the world itself is in crisis. It is this need that lies behind the development of the UJ Energy Plan in addition to the UJ Sustainability Policy and the UJ Energy Water and Resource Plan (EWRP). The crisis to maintain living standards while adapting to a recognized world in which resources (of all types) are limited has eventually been recognized and formally captured via the UN Sustainable Development Goals (SDGs). It is the manner in which UJ both addresses the national resource (specifically energy in this plan) rationing and the international pressure to reduce use and improve quality of resource use that will determine the overall quality of the UJ Energy Plan and its implementation. The UN 2030 Agenda for Sustainable Development, produced the set of goals that, if achieved, may provide the basis for a more equitable and sustainable place for all on our planet. These seventeen Sustainable Development Goals (SDGs) can be listed as:

1. No poverty
2. Zero hunger
3. Good health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry innovation and infrastructure
10. Reduced inequalities
11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Life below the water
15. Life on land
16. Peace, justice and strong institutions
17. Partnerships for the goals

One of the central aspects of the UN's 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs) is the significant role that stakeholders have been assigned in their implementation, follow-up and review. Now more than six years into the implementation of the 2030 Agenda, several countries' strategies to engage stakeholders are still in the early stages. Many stakeholder engagement practices are strong in some ways but weak in others, with little guidance available for a systematic analysis. While academics may continue to debate and define, operationally, the idea of climate change and associated anthropogenic effects, the world, and specifically closer to home, UJ, needs to act, and act firmly and timeously. This Energy Plan is a limited scope version of the UJ Energy Resources and Waste Plan for 2025 (ERWP 2025) and is meant as a more concise guide to all stakeholders about the UJ Facilities Management's intentions with energy provision, production, efficiency and reduction for the foreseeable future.

The UJ Sustainability Policy itself is an Operational Policy as is this UJ Energy Plan and thus speaks to the operational aspects of promoting economic, social and environmental sustainability and energy use within the stricter confines of the UJ – but with the expressed desire that UJ stakeholders will draw on its principles in terms of the actions universally. This operational orientation is relevant to the UJ positioning itself within the domain of its peers in such a way as to be a leader in sustainability.

UJ has already committed itself to improve on its use of energy in the UJ Sustainability Policy via targets presented to the Management Executive Committee MEC and the Physical and Resources Committee of Council (PRCC) during the past few years – updated and made more relevant each year. These targets, while being active KPI related goals, are firstly an instantiation of the desire of the broader UJ community to align itself with a growing world-wide trend of recognizing the limits to growth which the world faces. As a direct result UJ has already made some limited progress to reduce all resource usage, increase waste recycling and develop alternative energy sources. In practice this has resulted in a partially successful approach that has resulted in the placement of specific targets in the 2025 UJ Strategic Plan which itself leads to very clear, albeit it somewhat restricted, requirements on the institution to improve on its environmental responsibility with respect to the sustainability elements that make up the UJ sustainability and carbon footprint metrics.

Looking forward, the institution will ensure that our students and the community at large know and understand energy sustainability, that the institution will ensure that our research outputs provide solutions to the existing sustainability challenges faced, that the institution will attempt to be in the forefront of innovation and development regarding sustainability, and that the institution will endeavor to become an energy neutral and carbon zero institution.

Typical international university targets can be captured as per the following extract from a highly rated university in the southern hemisphere. It must be noted however that single numbers can never capture fully the specifics of a particular institution's sustainability, green or carbon footprint targets. At least part of the reason is that various institutions consider items as under their control or not, and if deemed not as under their control a particular source of carbon etc. may then be ignored while being taken into account by other institutions. An example of such an item would be in-out commuter carbon generation by staff and students at a university – some may see this as potentially under their control while others see this as the result of local planning and historical factors and not therefore directly influenceable. It is when UJ can meet and exceed similar benchmarks that we will be able to justifiably claim to be an international leader in tertiary education facilities.

Measures: The following targets[1]

	2011	2020
Energy consumption (kWh/m² GFA)	150	147 (-2%)
Waste water (m³/m² GFA)	0.70	0.60 (-14%)
Paper (A4 reams/EFTS)	3.70	3.07 (-17%)
Solid waste to landfill (m³/EFTS)	0.43	0.34 (-21%)
CO_2 (t CO_2-e/EFTS)	0.81	0.69 (-15%)

This document, the UJ Energy Plan, has as its sole purpose an attempt to focus the discussion on the production, provision, management and efficiency aspects of all uses of energy and its correlates within the UJ family. This also implies the generation of measurable targets and processes that will result in UJ becoming a national, and over time an international, leader in the challenge to return to a fully balanced energy resource based economy – one that sustains life and generates a future for all the nation's citizenry.

[1] Energy consumption in buildings only; CO_2 emissions as a result of energy consumed in buildings, waste disposed of to landfill and work-related air travel. GFA is Gross Floor Area; EFTS – Equivalent Full Time Student

1.1 Executive Summary

The coming together of a perfect storm for Southern African universities in terms of a need to move to increased sustainability, a desire to support the UN SDGs, cost increases for all utilities, the extended developments related to Eskom load shedding, and the expense of becoming energy independent after years of enforced and cultivated dependency has made the development of a comprehensive risk management approach to the aforementioned a necessity.

The UJ Energy Plan (UJEP) presented here addresses on a holistic manner (and with a deliberate per campus implementation focus) the present UJ energy environment, it introduces the formal manner in which all sustainability and energy projects are managed and it reports on the present status of projects that have been completed, are in design phase, are being implemented or are blue sky proposals at this stage.

This document also includes examples of the various management outputs such as annual reports, metrics agreed upon annually and formal processes to ensure that stakeholders are kept informed of all manner of energy and sustainability projects and processes.

1.2 Introduction

The UJ Energy Plan (UJEP) is a strategic plan that details how the University of Johannesburg (UJ) addresses existing and developing energy shocks such as the recent Eskom load shedding as well as local government increasingly using utilities as a major income source. South Africa's primary power supplier Eskom has not been able to meet the country's power needs and this has necessitated that UJ implement internal Risk Mitigation measures to ensure business continuity to support the core businesses of Teaching and Learning, and Research. The strategic plan is the outcome of an iterative, collaborative process between the University's stakeholders, including but not limited to, members from Energy and Sustainability team and Facilities Management.

The UJEP will also provide the Department of Higher Education and Training (DHET) a clear picture of the University's ability to survive and thrive under Eskom power load shedding increased energy needs and costs and this will further assist DHET to target possible future funding to mitigate the energy risks facing UJ, thus placing UJ on a sustainable energy trajectory.

In support of the following strategic Goals

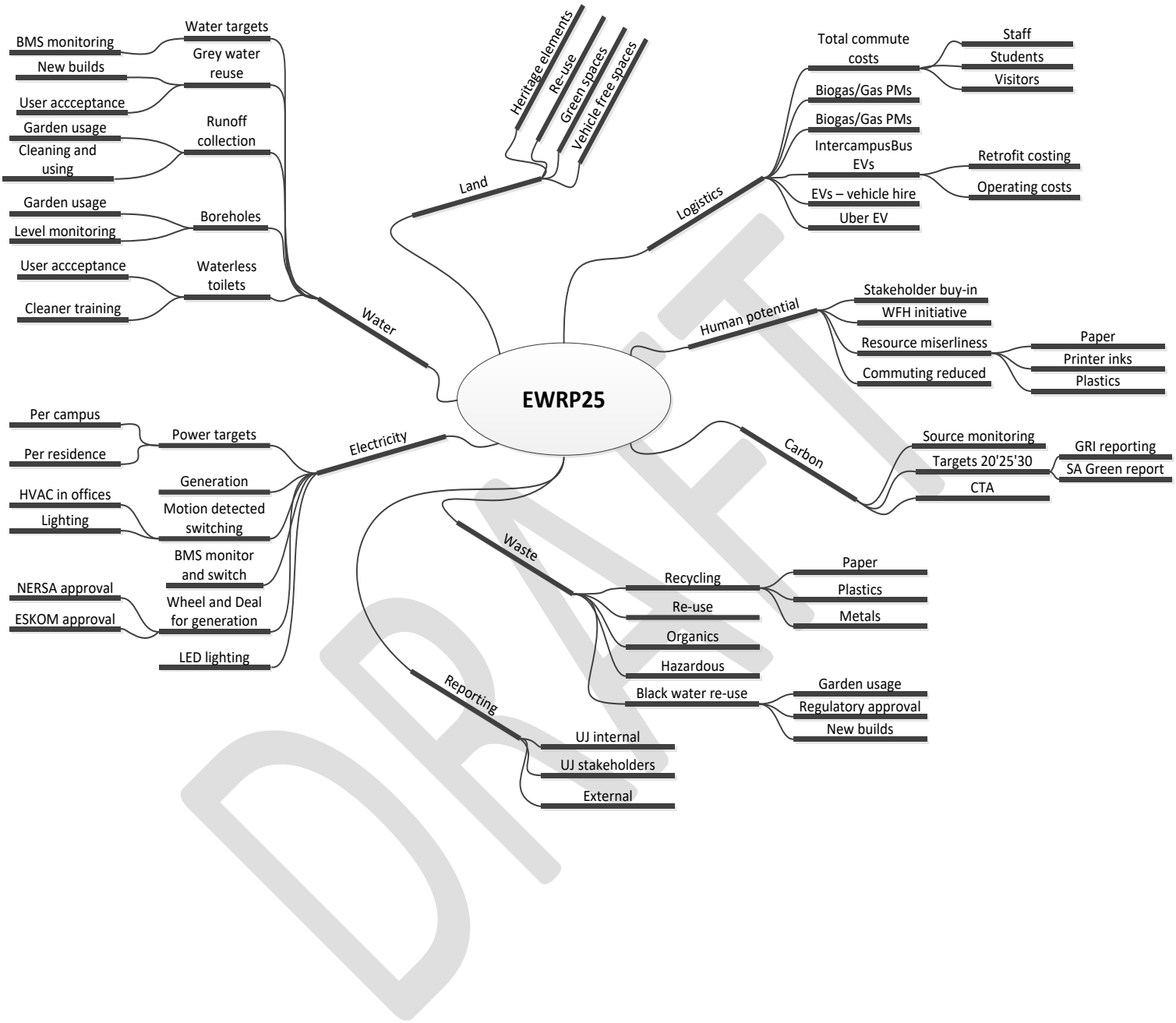
1. Excellence in teaching and learning
2. An International profile for Global Excellence and Stature (GES)
3. An enriching student-friendly learning and living experience

UJ has developed this UJEP so that it can continue to minimize its energy costs of operating facilities through sustainable design, timely maintenance and efficient operation, while supporting the University's goals of excellence in education, research and outreach.

The UJEP is a holistic, multi-pronged approach that considers and responds to the University's existing infrastructure and assets, policies and standards, future development plans, and past project experiences. The UJEP addresses, immediate, short, medium and long term energy requirements for the university and has as basis the positioning of UJ to facilitate development of projects with the flexibility that demonstrates responsible leadership towards environmental stewardship.

2. UJ OVERALL ENERGY AND SUSTAINABILITY CONSIDERATIONS

UJ PHYSICAL RESOURCES SUSTAINABILITY ISSUES



3. UJ ENERGY PLAN – TERMS OF REFERENCE

The following defines the UJ Energy Plan Terms of Reference which includes management lines, reporting and accountability.

The UJ Energy Plan is developed to:

1. Ensure that the University's Energy related resources are properly managed, specifically in terms of
    a. Strategies to develop energy resources
    b. Ability to manage energy interruptions
    c. Cost of energy
    d. Efficiency of energy consumption and production
    e. Reduction in energy related carbon generation
    f. Ensuring that UJ acts in accordance with appropriate Statutes, Regulations and Directives that may be issued by any relevant arm of State, e.g. SARS for carbon tax purposes, Department of Energy in terms of EPC certification

Purpose

1. The purpose of the UJ Energy Plan is to provide strategic direction, support and oversight with respect to the planning and implementation of the various UJ initiatives and activities that are directly related to, and will impact on UJ energy consumption, production and reporting.
2. Furthermore, the UJ Energy Plan is meant to provide specifics on implementation that are medium to long term guides for improved energy consumption, production and reporting.

3.1 Stakeholders of the UJ Energy Plan

The following are the persons actively responsible in developing, maintaining and implementing the UJ Energy Plan:

1. Chief Operating Officer (Principal Accountable Person)
2. Chief Financial Officer
3. Executive Director: Facilities Management
4. Executive Director: Finance Expenditure
5. Executive Director: Finance Governance
6. Senior Director: Campuses
7. Director CTS Projects
8. Director Sustainability, Environment and Utilities
9. Director Student Affairs
10. UJ Facilities Management Maintenance Manager (CTS)
11. Campus Directors
12. Campus Maintenance Managers

The Principal Accountable Person Chairperson may invite any person to provide inputs, aid in the development and implementation or perform reviews of the UJ Energy Plan as required to ensure the appropriateness of, the effectiveness of, and the efficiency of the UJ Energy Plan.

3.2 Scope of the UJ Energy Plan

The UJ Energy Plan has been developed to provide:

1. A formal mechanism to capture the details related to the many UJ energy resource related activities
2. Indicate responsible persons or departments for the various UJ energy related activities
3. Access any information it needs to fulfil its responsibilities subject to (relevant policy)
4. Extend these responsibilities
5. Investigate matters within its mandate

3.3 UJ Energy Financial Processes

The UJ Energy Plan will

1. As part of the UJ Energy Plan (UJEP) implementation funding requests for certain capital items and projects will be directed at the requisite times to the DHET as they have primary responsibility for capital structural funding of South African universities.
2. Be funded via direct funding requests for new projects via the COO and CFO to the MEC or if of sufficient value to the UJ Council
3. Be funded via direct funding requests for minor projects (under R1m in capex value) via the normal Facilities Management funding process and should be captured within the Strategic Initiative funding item – except where the project is campus specific and will be funded from the Campus Small Caps funding
4. Be funded via direct funding requests for maintenance from the normal Facilities Management funding process for either preventative or ad hoc maintenance as required
5. Functions within the University's financial management and be subject to the relevant UJ policies and procedures
6. Applies the principle of corporate governance with regards to financial management

3.4 Reporting Responsibilities

The UJEP committee reports to the COO who reports to the MEC and has the following functions/roles and responsibilities

1. Approves the initiation, acceleration, deferral, or cancellation of any energy related projects
2. Ensures adequate resourcing for the UJ Energy Plan
3. Reviews and recommends for approval to relevant committees within UJ for final approval of capital projects in line with the University's capital approval process
4. Ensures relevant external and internal stakeholders have been appropriately consulted with respect to planning and implementation of all energy related projects
5. Defines project success metrics
6. Monitors implementation or execution of all energy projects to ensure they are carried out without delays and within allocated budget
7. Reviews and Monitors the energy plan and projects relevance and viability
8. Receives energy plan related project status updates and provide direction and advice to the project team
9. Ensures that the various energy projects are governed appropriately
10. Authorises changes from previous energy projects and plans
11. Ensures the delivery of value to UJ in terms of energy projects
12. Assesses risks associated with the UJ Energy Plan and those projects chosen for implementation
13. Ensures that all energy projects are incorporated into the UJ Overall Risk Register and that they comply to UJ risk management process requirements

14. Ensure the integrity, ethical behaviour, transparency and independent oversight of all UJ energy projects
15. Reviews and tracks post implementation project performance to monitor benefits realised
16. Approve preparation of all energy projects changes and terminations.

Committee Operations

1. The committee shall hold monthly meetings, the appointed secretariat shall keep the attendance register
2. Ad hoc meetings may be convened as and when required by the Chairperson or a member who has submitted a request to the secretariat or chairperson
3. Submissions to the committee will be at least four (4) days before the meeting to enable members to study the documentation and allow adequate opportunity for formal and informal discussions. Prior syndication with relevant committee members is encouraged.
4. Members must be fully prepared for the meetings to be able to provide constructive input on matters for discussion
5. Minutes must be completed within 5 working days from the date of the meeting and circulated to the Chairperson and members of the committee for review thereof.

3.5 UJ Energy Plan Lifespan and Review periods

The Plan will remain in force until all related energy resource related goals have been achieved. The Plan must be reviewed semi-annually to ensure that the latest developments, changes in strategy, changes in market related information, changes in operational information, and changes in reported information are captured.

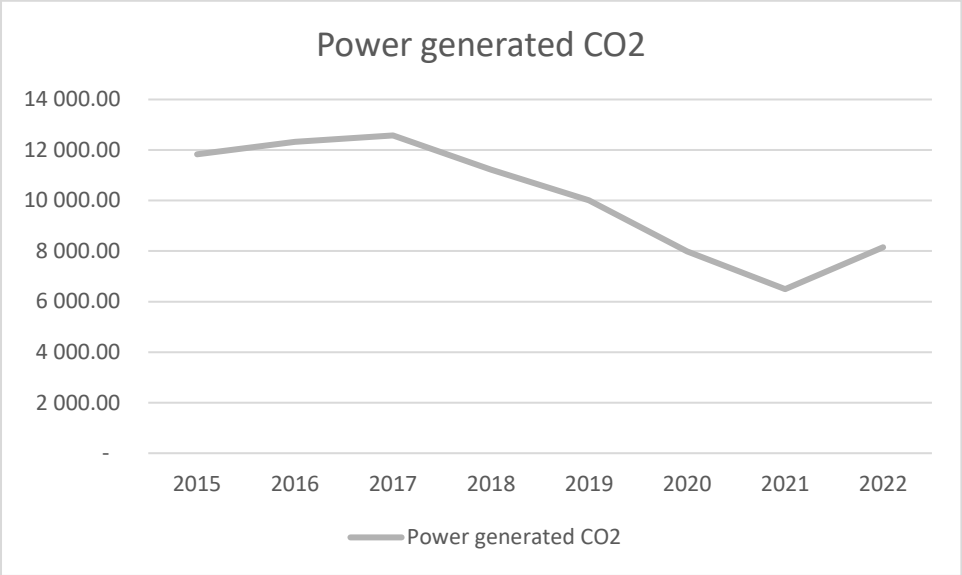
4. CAMPUS CONTEXTS

UJ will manage the various campuses and facilities in two separate categories

1. Academic campuses – e.g. APB, APK, DFC, JBS Park, SWC, off campus residences, off campus houses (e.g. 33 Twickenham rd, 40 Hampton rd)
2. Non-academic facilities – e.g. UJ on Empire, UJ on Stanley, off campus houses (e.g. 53 Twickenham rd), off campus offices (e.g. 30 Henley rd)

Each of the UJ campuses has a unique context which requires separate considerations when a campus specific Energy Plan is developed. For that reason there will be a section in this document that considers the overall UJ Energy Plan and the strategies related to this and also a campus specific energy plan for each separate campus – which should be seen as an implementation guideline for each campus that takes into account the campus context. Notwithstanding the overall UJ energy plan and its specific targets it is also incumbent on all UJ stakeholders to, within the context of their campus. meet specific targets that are contextually defined.

For this reason all reporting to the PRCC and MEC will capture both the overall performance in terms of energy provision, production, storage and usage as well as the same parameters per campus. This is not essentially to embarrass or highlight camp and or stakeholder energy mismanagement or misuse but rather to allow efficiency project developments to be directed to those spaces with the most likelihood of providing substantial returns on investment. An example of such reporting is shown below for an unspecified campus over the period from the 2015 baseline to the latest data at the end of 2022.



5. OVERALL UJ ENERGY PLAN

5.1 UJ Energy Plan Major Aims

Advocacy and Policy

Ideas relative to the lobbying and policy advocacy power of UJ leadership and the greater UJ community.

- Better communicate how UJ works within the Johannesburg Metro, the Greater Witwatersrand area and the Gauteng province.
- Reach out to the community with education and mobilize UJ alums to talk to policy makers about climate change.
- Leverage UJ's leadership and influence for national and provincial policy.
- Develop a stronger UJ EWRP Policy output that might be facilitated through class projects with a stronger public sector energy focus and/or through the creation of programs at various UJ centers that revolve around energy production, provision, storage and efficiency.
- Amplify the UJ sectoral impact via an active communication process to start supporting global advocacy campaigns around energy, sustainability and climate change.

Awareness, Outreach, and Visible Markers

Ideas focused on greater awareness of climate action plan progress through better outreach, communication, or physical displays.

- Create on campus displays of EWRP and Energy Plan progress. Dashboard design with major outcomes and real time renewable power generation would be very insightful for stakeholders.
- Create visuals to communicate energy use and impact, for example displaying energy being used in a particular building, what systems are using the most, and what can be done by the occupants that produced that.
- The status on reaching the goals should be shared widely, and be visible. Having that would motivate stakeholders in general but residence students in particular.
- Enable greater access to climate and energy research and science.
- Create an “Energy Clock” for the entrances for all UJ Libraries and project it onto the entrance around the Library, along the lines of the “Climate Clock” in New York City; the clock is a combination of art, information, and activism.
- UJ needs some big “thing” on campus that is a physical manifestation of our culture. Need a physical place for climate reporting and manifestation on each campus. Extra visible renewables for instance.
- Culture change is very important – especially for energy efficiency achievement such as the “Lights OFF” campaign. Symbols are important.

Behavioral changes

Focus on driving individual’s behavioral changes.

- Can we leverage measurement of individual behavioral shifts to accelerate change (our/other) campus culture?
- Work to better understanding and facilitate behavioral change.
- Engage faculty doing research directly on sustainability and energy issues, and encourages the extension of research into behavior change as a driver for UJ energy change.

- Let UJ stakeholders engage more directly in the energy elements of all UJ buildings and campus environments.

Building Level

Ideas relative to efficiency, design, and construction of UJ campus buildings.

- Need to ensure the sustainability and energy efficiency are held foremost on any new building or extensive building renovation projects.
- Put together sustainability standards for construction so that minimum standards for new UJ buildings are Green Star Building standard Level 5

Data

Focus on use, access, and communication of data relative to the Energy Plan goals.

- Make data available on UJ's sustainability and energy policies and their impact.
- Need to interpret data for others in a meaningful and interpretable manner. Not enough just to show results – explain in layman's terms.
- Make the UJ performance data more publicly available to increase transparency and accountability for the EWRP and Energy Plan at UJ.

Emissions and Carbon Neutrality

Focus on UJ's emissions reductions goals, accounting of, and pathways to reach goals.

- The UJ EWRP and Energy Plan should have new GHG emissions goals that are updated at least on a yearly basis given international achievements in the space so that UJ is aligned with the latest science, makes a commitment to becoming carbon neutral by 2040 at the latest.
- Make much more ambitious GHG emissions reductions goals, 32% is much too low.
- Framing UJ reductions in terms of offsets doesn't make space for opportunities for concrete GHG emissions through regular activities. UJ needs more concrete goals for reductions here.
- Drive UJ to be carbon neutral by 2035 if possible but by 2040 at the latest, and make the goal 100%, then close the gap.

Environmental justice

Ideas relative to involving environmental justice as a key tenet of the future climate action plan.

- UJ's policies should reflect awareness of social/environmental justice. For example, understanding that the majority of UJ's plastics are not being recycled, but rather dumped in Malaysia.
- What are the environmental justice implications of the PPA and similar projects?

Incentivization

Ideas around UJ's use of budget to spur innovation and electrification on campus.

- UJ should seek partnerships with various communities (not just the Johannesburg Metro, CityPower and Eskom etc) to potentially create efficiencies of scale in funding initiatives and/or potentially fund UJ initiatives – this should include alliances with renewable power producers such as wind energy farms etc.
- Create a fund where Departments can apply for supplementation of departmental funds so that equipment/vehicle purchased are preferably electric or hydrogen fuel cell based (or more environmentally friendly).
- The UJ EWRP and Energy Plan initiatives require money! Broader engagement on campus would help build advocates to encourage leadership to invest in/prioritize sustainability and energy projects.

Power Purchase Agreement

Ideas related to UJ's PPA.

- Encourage development of the UJ Island solar farm initiative.
- Attempt to complete the PPA with large off campus solar PV farm energy producers via 10 year PPAs that would reduce daylight CO_2 production and reduce energy costs without large direct capital investment requirements.
- UJ should strive to be an example to other institutions. Leverage influence at UJ and among other institutes.
- UJ should not count the PPA based carbon credits without a contractual agreement with the producer to prevent double accounting.

Scope 3: Focus on indirect emissions coming from a number of sources.

- UJ needs to focus more on Scope 3 of the UN SDG implementation plan for energy and sustainability in general.
- Address Scope 3 emissions from laboratories and energy efficiency of laboratories in particular
- Improve HVAC and general laboratory ventilation to reduce energy consumption – consider rolling cooling and thermal storage projects.
- Work to curb vehicles idling on campus from contractors and UJ vehicles alike.
- Move towards electric carts / small vehicles for on campus use by support departments.

Scope 3: Transportation/ Remote Work

- Transportation is more visible than many areas of energy use and UJ should emphasize this area.
- Extending the UJ Intercampus Bus Service to a fully operationally decarbonized service would be a great step forward.
- Determining the impact of the current work-from-home operations model has on UJ's carbon footprint and energy use (by off switching staff HVAC when off campus)
- Savings realized by UJ should at least partly be used to support faculty and staff who have borne the cost (energy use, printing, office furniture, etc.) of working at home. The incentivization would encourage both energy use reduction and a professional attitude for work from home staff.
- Switching stakeholders perception of transportation to work modes —encourage use of public transportation as opposed to individual cars.
- Reduce stakeholder flights nationally and internationally.

Shift to Renewables

Ideas relative to renewable sources of energy either on campus or beyond.

- UJ must study how it can incorporate renewables into the campus itself.
- Capture wind via small urban wind turbines on top of buildings to generate multi megawatt – e.g. all 10plus storey buildings are tall enough to ensure more substantial wind energy availability than at ground level – can this be harnessed effectively.
- Every campus that can should have solar PV installations for at least 25-50% of its peak energy consumption.
- Window screening can save substantial energy during summer HVAC peak usage without substantially reducing winter office warming.
- UJ should use UJ Reserve Funds to purchase several blocks of the SA wind farms now finally operating that may be interested in attracting investors

- There needs to be a comprehensive effort to implement a comprehensive energy efficiency program, and the addition of renewable energy at scale on campus including solar on rooftops, parking lots and windows, and urban scale wind turbines.

Waste Management and Energy

Focus on steps UJ can take with regards to reducing waste and the overall carbon footprint on UJ campuses

- UJ should consider various waste incineration and / or fermentation to generate energy for low level heating and thermal storage purposes.
- There needs to be an increased investment in environmental health and safety practices and specifically Green Labs.
- All UJ campuses have a waste problem. UJ must consider how it can encourage labor, and other motivating structures for behavior change, to fix this problem?

5.2 2015 Baseline

For formal purposes of comparison the 2015 basic data that had at that time been collected, as requested initially by the PRCC in 2014, is being used as a baseline. The first attempt at creating a reporting was aimed at estimates of CO2 generation when carbon first became of interest to UJ senior management and the UJ Council. At that stage it was argued that the majority of the UJ CO2 generation would be related to electricity consumption and that because UJ had no owned power generation that the prime aim would be to track

1. Eskom related energy and CO2
2. Diesel and petrol for fleet vehicles
3. Catbot (heating fuel for UJ APK space heating boilers supplied by Sasol)
4. Natural gas (supplied by Egoli and only used at that stage on the APK campus for some residence boilers)
5. Backup generator diesel consumption

As can be seen in the table below backup diesel generator consumption was less than 50% of the diesel usage for fleet vehicles – in 2022 this has swopped around to the point where backup diesel generators now use four times as much diesel as the fleet vehicles and the nascent UJ Intercampus Bus Service of 2015 now consumes six times as much diesel as the fleet.

Although we will therefore be reporting on performance against energy and CO2 generation against this baseline certain power and CO2 generation terms that are now being measured were not being measured in 2015. It is therefore a lower bound on actual performance rather than a strictly accurate measure of improvements. Some of the terms ignored in 2015 that are already being measured in 2022/3 are:

1. Energy use for diesel generators – this was absolutely minimal in 2015 but is now a major power and CO2 generation item
2. Flights by staff and students in terms of work / conferences / business use (excludes commercial flights for coming to and from home to UJ by students and remote working staff)
3. Paper related energy and CO2

4. Energy and CO2 generation due to the UJ Intercampus Bus service
5. Waste material recycling and disposal energy and CO2 generation
6. Solar PV generated power as replacement for Eskom supply

2015
Equivalent CO2 emissions

Emission Source	Kingsway Campus (APK)	Bunting Road Campus (APB)	Doornfontein Campus (DFC)	Soweto Campus (SWC)	Total CO2	Total tons of CO2
Electricity (Kwh)	30 921 844	9 156 948	11 834 392	6 084 037	57 997 221	57 997
Natural Gas(GJ)	1 077 116	710 805	1 161 484	0	2 949 405	2 949
Catbot	250 460	0	0	0	250 460	250
Petrol (Fleet)	134 854	27 393	61 887	22 503	246 638	247
Diesel Fleet	69 698	8 069	25 635	9 935	113 337	113
Diesel generators	48 093	87	2 625	71 220	122 025	122
Total kg of CO2	32 502 066	9 903 302	13 086 024	6 187 695	61 679 086	61 679
Total Tons of CO2	32 502	9 903	13 086	6 188	61 679	

5.3 General Strategy

Overall, the aims of the UJ Energy Plan is to ensure that

1. UJ teaching and learning are unaffected by Eskom related supply side issues at all times
2. UJ research and postgraduate supervision related events are unaffected by Eskom related supply side issues at all times
3. UJ academics can be assured of better than 95% electrical supply uptime irrespective of loadshedding level – until loadshedding in excess of Level 8
4. Switchovers between Eskom and campus backup power is as undetectable as possible – especially for sensitive research equipment
5. UJ reduces its overall dependence on Eskom power supply
6. UJ increases its percentage of renewable power generation
7. UJ decreases its effective power generation CO2 production by an effective transition to renewable power
8. UJ energy supply is as diversified in terms of supply side production as is possible to reduce the possibility of falling into a replay of the Eskom dependence and failure cycle
9. Conclude agreements with City Power to exempt campuses from loadshedding for 3 largest examination dates in all examination periods to mitigate examination completion risks.

5.4 Specific Strategies

All energy related issues can be solved by one of four basic strategies that may be used to reduce both reliance on Eskom for power as well as overall reduction of reliance on fossil fuel based power. The specific strategies are:

1. Reduction in use
2. Increased efficiency of use
3. Diversification of supply
4. Increased own generation

Reduction in use

These strategies rely on

1. Reducing use by removing equipment using electrical power and moving to alternative energy supply equipment – e.g. gas boilers as replacement for electrical geysers at residences
2. Reducing usage by automated mechanisms – e.g. motion sensor lighting switches in offices and hallways or motion sensing in lecture venues to optimize HVAC flows in groups of large teaching venues with varying usage profiles
3. Reducing power allocated to heating and cooling – e.g. fixed 800W panel heaters in residences and removal of all other electrical heating equipment
4. Reduce fleet and vehicle usage using better scheduling
5. Encouraging remote working and reducing on campus heat and cooling loads
6. Reducing usage by behaviour change of staff and students

Increased efficiency of use

These strategies rely on

1. Improving individual component efficiencies – eg improve lighting using LEDs or the use of RHPs for water heating – replacing all old resistance heater geysers and associated efficiency gains
2. Improving system wide component efficiencies – e.g. replacing old Chiller plants that are 20+ years old with new air cooled variable speed based Chillers
3. Moving from low efficiency electrical resistance heating to RHPs – e.g. residence water heating replacement with RHPs
4. Natural ventilation cooling of buildings in evenings during summer to pre-cool buildings before new day HVAC is switched back
5. Reduce diesel usage by transforming the Intercampus Bus service to a full electric vehicle fleet
6. Substitution of petroleum diesel with a B20 mix of 20% biodiesel and 80% petroleum diesel to reduce carbon generation for diesel use in backup generators and fleet vehicles
7. Thermal storage and release as way of improving thermal system COPs

Diversification of supply

These strategies rely on

1. Moving to gas from Eskom as an interim supply alternative while storage and renewable power production in SA can meet overall power demand
2. Solar PV PPAs agreements – eg buy in from external solar PV producer and wheel across Eskom and City Power grids
3. Wind or tidal energy supply related agreements – eg buy in from external renewable non solar PV producers and wheel across Eskom and City Power grids
4. Move from electrical equipment to gas equipment – eg boilers at residences
5. Consider the development of solar PV powered green hydrogen for vehicle and static power generation purposes in the longer term

Increase in own production

These strategies rely on

1. Installation of solar PV equipment to produce own renewable power
2. Development of solar PV on remote UJ sites that can then be wheeled across the Eskom or City Power grid to supplement on campus UJ solar PV production
3. Development of campus scale gas power production as alternative to Eskom base load supply or the use of diesel generators for loadshedding purposes
4. Implementation of commercial scale vertical axis wind turbines (VAWTs) on all UJ buildings that are more than 10 storeys high as this is lowest level at which sensibly constant wind speeds are recorded in the Gauteng region.
5. Considering lower power wind power production on UJ campuses using AeroTree® types of solutions for microgeneration – generally linked to network provision outside common areas.
6. Power storage where off peak production power is stored for use at peak demand periods to reduce Eskom peak power reliance – ideally mechanical storage but failing that electrical / battery storage
7. The potential for hydrogen generation using excess electrical power generated from a possible large solar PV system on the UJ Island is being considered – the main advantage being that the hydrogen facility could be placed on a campus in the Johannesburg area where the demand for hydrogen would be greater than at the Vaal dam

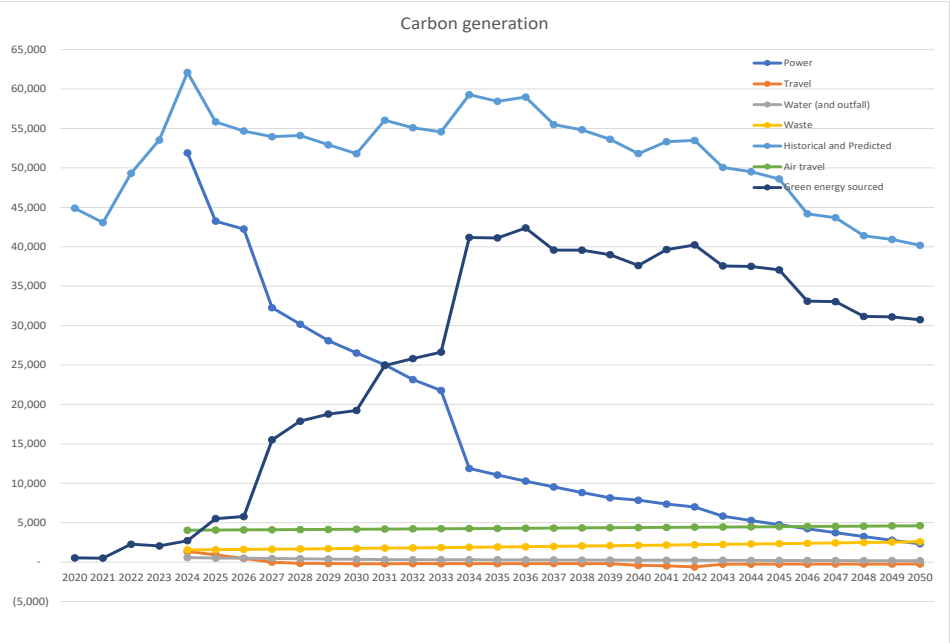
The present model for moving away from a 49 000tCO_2/annum carbon generation situation was modeled using:

1. Historical data for consumption was collected for the following resource classes that all are required by UJ continuing operations
    a. Electricity consumption kWh
    b. Natural Gas GJ
    c. Natural Gas Generators kWh
    d. Petrol (Fleet) (l)
    e. Diesel Fleet equivalent (l)
    f. Diesel generators (l)
    g. Intercampus Bus (l diesel)
    h. Airtravel km
    i. Paper (A4 equal pages)

j. Waste recycling (t)
k. Water municipal (kl)
l. Sewer municipal (kl)

2. Developing a UJ generation / abatement model going forward
3. Developing a utility purchasing model for unsupplied demand
4. Determining the carbon generation from the final utility / resource mix required to satisfy predicted demand

The result of a first iteration analysis and prediction plan is shown in the following chart.



5.5 Present Development Pipeline Process

All of the projects listed below will also be included against the particular campus where the project will be developed but are listed here in a consolidated manner for completeness purposes.

The metric to be used for consideration of value for UJ will be extended to include the consideration of the CO2 reduction and increase in UJ overall sustainability rather than simply the cost of construction.

Utility survivability project pipeline

	Title	Description	Phase	Initial estimate	Earliest new start	Lead staff	Total	Upper max	Month for spending	-	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25
							428.85	417.18		-	0.30	0.30	4.85	3.05	3.65	6.85	25.90	18.35	31.30	39.05	16.60	33.45	16.45	21.88	8.90	39.28	39.10	19.18	10.60	23.38	5.30	15.88	5.10	19.68	4.30	2.30
								263																													
1	SWC Campus Power	SWC campus power substitution. Aims to SWC campus fully Eskom independent	Tender phase	R22m	March 2024	AN / GM		27								2.00	8.00			5.00				1.00	2.00	4.00	5.00									
2	APB Gas generator	APB gas generator proposal – latest supplier data and analysis	Redesign for new base load	R24m	April 2024	GM / MM		33									12.00			2.00	3.00	5.00	5.00	4.00	2.00											
3	48 hour Water storage	48-hour Water storage - generic design and implementation on 5 campuses	Tendering for prof teams	Design R2.0m	January 2024	GM		12				2.40				3.50		1.80	0.90	1.20		2.20														
4	APB Grey Water trial	Grey water use and storage at APB residences	Award	R3.5m	November 2023	GM		3.5				1.50	1.50	0.20					0.30																	
5	Grey Water extensions	After APB grey water extend to all multistorey residences on the APB, APK and DFC campuses	Initiation awaiting trail perform	R22m	Sept 2024	Not needed yet		22														2.20	2.20	2.20	2.20			2.20	2.20	2.20			2.20	2.20		
6	DFC Gas generator	Based on performance of APB gas generator installation – implement similar solution at DFC	Awaiting trail perform	R27m	Jan 2025	MM		33															12.00			2.00	3.00	5.00	5.00	4.00	2.00				
7	FOS / FEBE battery power solutions	As per proposal from Sula for a smart battery storage and power controller do the same for C Lab and D Lab and ALD on APK	Design complete	R 25 - 30m	January 2024	MN		30									2.00	10.00	8.00	8.00				2.00												
8	JBS Park Backup Generator Life extension trial	JBS Park installation of a smart battery storage and power controller similar to the FOS one	Design complete and readying for RFP phase	R 12.5m	June 2024	MN		12.5											1.00	8.00	1.00				2.50												

9	APK power provisioning	Based on performance of APB as well as SWC power solutions create a manner in which full APK campus power provisioning can take place	Awaiting trail perform at SWC and APB	R 80-90m	June 2024	MM	90			1.00	2.00		25.00	25.00	10.00	10.00	10.00	7.00

Utility sustainability project pipeline

Upper level

69.6

1	Solar PV wheel and deal	Finalize a PPA or full ownership of an off-campus solar plant to further increase UJ solar PV based escom power reduction – aim for at least a further 1-2MWp	Design and initiation phase	R 25-27m	June 2024	MN	27		2.70	20.00	5.00							
2	DFC solar extension	Extend DFC solar from 300kWp to 600kWp to reduce load on ESKOM or gas generator installation	Fund dependent	R4.0m	August 2024	MM	4			2.00		2.00						
3	APB solar extension	Extend APB solar from 300kWp to 500kWp to reduce load on ESKOM or eventual gas generator installation	Fund dependent	R2.75m	June 2024	MM	3.5		1.75	1.75								
4	Art Gallery solar	Finalize and implement a solar installation for the Art Gallery of 100kWp	Fund dependent	R2.1m	March 2024	GM	2.1		1.05	1.05								
5	H2 Fuel cell trial	A trial Hydrogen fuel cell installation (150kWbase) to trial technology and develop niche area implementation guides	Fund dependent	R12m	Undecided	Not needed yet	12											
6	APK solar PV phase 2	Equip A Parking APK campus with about 800kWp solar PV - with rework of the parking layout	Fund dependent	R25m	Sept 2024	AN	21			2.50	10.00		8.00				1.50	

Passivation utility project pipeline

							Upper level																		
							12.5																		
1	Window screening	Implementation of solar screening to reduce insolation loads on all north-west to west facing windows on UJ campus buildings	Specify and testing phase	R 1.2 2.5m	Jan 2024	MN	2.5		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10				
2	HVAC switching	Implement connect to light switching based on occupancy to switch off local HVACs in offices across all campuses	Specify and testing phase	R 4m	Sep 2023	MN	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50										
3	Ground loop HVAC assist	Implement ground loop heating and cooling test for local HVACs to reduce power use by local HVACs – trial on the JBS Park and The Atrium buildings	Specify and testing phase	R 3.5m	Jan 2025	GM	3.5											0.50	0.50	0.50	0.50	0.50	0.50	0.50	
4	Advanced demand management controllers	Implement a trial advanced demand management controller at UJoE and JBS Park to reduce peak loads and spread energy use	Fund dependent	R 1.75-2.5m	Feb 2024	????	2.5		0.50	0.50	0.50	0.50	0.50												

Sustainability / green project pipeline

						Lead staff	Upper level																		
							83.75																		
1	EV Buses	Purchase of remaining 13 EV buses for replacement of Stabus contract - operation to bid	Proposal phase	R65-71.5m	June 2024	MN	71.5										21.45		8.58		8.58		8.58		8.58	8.58	8.58
2	JBS Park IoT	Implement IoT for building power and person management	Proposal phase	R3.5-5m	Start: Sep 2023	MM	5		0.15	0.15	0.25	0.25	0.25	0.25	0.50	0.50	0.50	0.50	0.15							
3	UJoE solar PV system	Installation of a 60kWp solar PV as well as backup	Design complete	R1.5m	Oct 2023	GM / Masala	1.5	0.30	0.30	0.30	0.30	0.30													

		generator integration																							
4	The Atrium solar PV system	Installation of a 50kWp solar PV as well as backup generator integration	Proposal phase	R1.5m	March 2024	MM / Masala / AN	1.5		0.75		0.75														
5	Trial gas people movers	Gas enabled people movers (2x) for Logistics as trial	Proposal phase	R1.25m	Start: Jan 2024	AN	1.25									0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
6	UJ Stadium lighting and public area walkways	Replace UJ stadium lighting and road/area lighting on campuses with high efficiency fittings	Proposal phase	R2m	February 2024	MM	3			1.50		1.50													

5.6 Maintenance and Improvement Projects

The following is a short list of the smaller projects aimed reducing energy consumption and addressing energy and sustainability issues through normal maintenance and infrastructure improvement projects.

Utility survivability project pipeline

	Title	Description	Phase	Initial estimate	Earliest new start
1	DALI and other lighting system replacement	Replacing older lighting systems with newer and LED based fittings and simpler controllers	Design	R5m	Dec 2024
2	BMI upgrades	Various UJ campus / building BMI systems are outdated and by upgrading increased efficiencies could be achieved	Design	R24m	Dec 2024
3	Plum Pudding Backup Power	Backup generators for the Plum Pudding guest house and chalets	Design phase	R700k	February 2024
4	Energy Efficient Lighting Block replacements	Energy efficient lighting (Based on M&V load profile/energy audit) – Various identified areas	Design phase	R1.0m	November 2024
5	Operational training	Training maintenance staff to recognized thermal beneficiation	Training to be developed	No cost	Sept 2024
6	IoT Energy management	Using simple occupancy sensors in areas outside BMI reach could generate major thermal energy savings	Awaiting trial perform	NYC	Jan 2025
7	Building entrance upgrades	Changing entrances into buildings with HVAC - stem energy losses to the environment	Awaiting trial perform	R5m	Sept 2024
8	Building double glazing	Using UJoE to trial adding a glazing layer to existing glass building shell to further reduce energy use by HVAC	Awaiting trial perform	R5m	Sept 2024

Utility sustainability project pipeline

1	GBCSA Energy Rating assessment for Buildings	GBCSA star rating on all UJ buildings - minimum target GBCSA rating to be part of spec for new buildings	Tender to be set up	R500k	June 2024
2	APK Campus Security lighting replace / upgrade	Replace/install security lighting across campus	Fund dependent	R2.5m	August 2024

Passivation utility project pipeline

1	HVAC gas replacement	Replacing the present HVAC gases with more sustainable R401 gas	Tender phase	R2.5m	Dec 2024
2	Building thermal flushing	Implement manner to sweep out hot air at night into environment and introduce cooler air into buildings	Awaiting trial perform	NYC	Dec 2024
3	Ground loop HVAC assist	Implement ground loop heating and cooling test for local HVACs to reduce power use by local HVACs – trial on the JBS Park and The Atrium buildings	Trial phase with existing HVACs	R2.0m	Jan 2025
4	Advanced demand management controllers	Implement a trial advanced demand management controller at UJoE and JBS Park to reduce peak loads and spread energy use	Fund dependent	R 1.75-2.5m	Feb 2024

Sustainability / green project pipeline

1	EV Buses	Second shuttle bus for APK / APB off campus residence travel use	Proposal phase	R5.5m	June 2024
2	Pilot Power over internet for monitoring	Pilot Project - Power over internet (PoE/NLC/LLLC)	Proposal phase	R100k	Sep 2024

6. CAMPUS ENERGY PLANS

Since each of the UJ campuses has a unique context as noted above the energy plans for each campus is differentiated by its context. This includes completed, in progress and future planned energy projects.

The plans presented are in campus alphabetic order rather than any other ordering that could be construed to indicate priorities or complexities.

6.1 APB Energy Plan

Campus Context

The APB Campus is a fully urban campus with hospitals, small industrial sites, various commercial spaces and high density urban housing in the immediate vicinity of the campus. It has 3 entrances, two of which are linked to high traffic level roads and one entering though a urban dwelling area. It has a strong mix of residential on campus students of undergraduate and postgraduate levels with a substantial number of commuting students. The intercampus bus service provides access to the other campuses for students resident on APB but who study on any of the other 4 academic campuses. There are stadium areas as part of the main campus area as well as all the normal support facilities for staff and students including a functioning and power backed up Student Centre and staff dining areas.

Campus	**Auckland Park Bunting road**			
Faculties	Education	FADA	Law	FEBE
Location	Crn Bunting and Annet roads Auckland Park			
Acquired / initial date	1964			
Source	Part of UJ merger process			
Campus area	55 000	m2		
Estimated replacement value	235	ZARm		
Academic buildings on campus	12			
Support buildings on campus	2			
Building areas	18 500	m2		
Staff	340			
Commuting students	550			
On campus residence students	-		6	
Off campus residence students	-	550		
Parking spaces	>450			
Incoming power	1700	kVA		
Annual power consumption 2022	6.01	GWh		
Annual CO2 due to power	6 187	t CO2		
Backup power	2 198	kW	9	backup gens
			5	UPS
Renewable energy on site	300	kWp		
Access gates	3			
Lecture venues				

Lecture venue area	2 100	m2		
EPC certified buildings				
Diesel storage (excl generator tanks)		liters		

Present Campus Energy Mix

The APB Campus is fully provisioned for Teaching and Learning power backup for all lecture venues and computer laboratories and the main Library area. The main ICS Data centre is fully provisioned with backup power and backup power supported HVAC equipment, all networking on the campus as well as internal and external routers are also fully supported using backup power from generators. Both the Student Centre and staff dining areas are also fully backup power supported.

All 5 residences on the campus are also fully provisioned for backup power for lighting and small electrical loads (heating equipment in residences is excluded. Water heating for residences is 90% provided by gas boilers from Egoli Gas and 10% from RHPs that are backup power supplied.

All support areas have backup power for lighting and computer use but are still not provisioned for heating or HVAC purposes. There is a single EV charging station on the campus for charging the UJ EV buses that are part of the student intercampus bus service.

Campus	**Auckland Park Bunting road**			
Present T&L Space backup power	100	%	1185	kW
Present Residence backup power	100	%	350	kW
Present Support backup power	75	%	365	kW
Renewable energy on site	300	kW		
Diesel storage (excl gen tanks)	-	liters		

In terms of energy supply to the overall campus this can be summarized at present as:

Campus	**Auckland Park Bunting road**			
Main electrical supply		kVA	City Power	
Gas supply		GJ/hr		
Renewable energy on site	300	kWp		
Backup power	2 198	kW	9	backup gens
EV vehicle charging	1	slow	stations	
Diesel storage (excl gen tanks)	-	liters		

6.1.1 APB Eskom Load Shedding Readiness

Teaching and Learning
100% of lecture venues are fully on backup power
APB Library fully on backup power
APB Data Centre fully on UPS and separate backup generator
100% of network and internal and external routers are on backup power

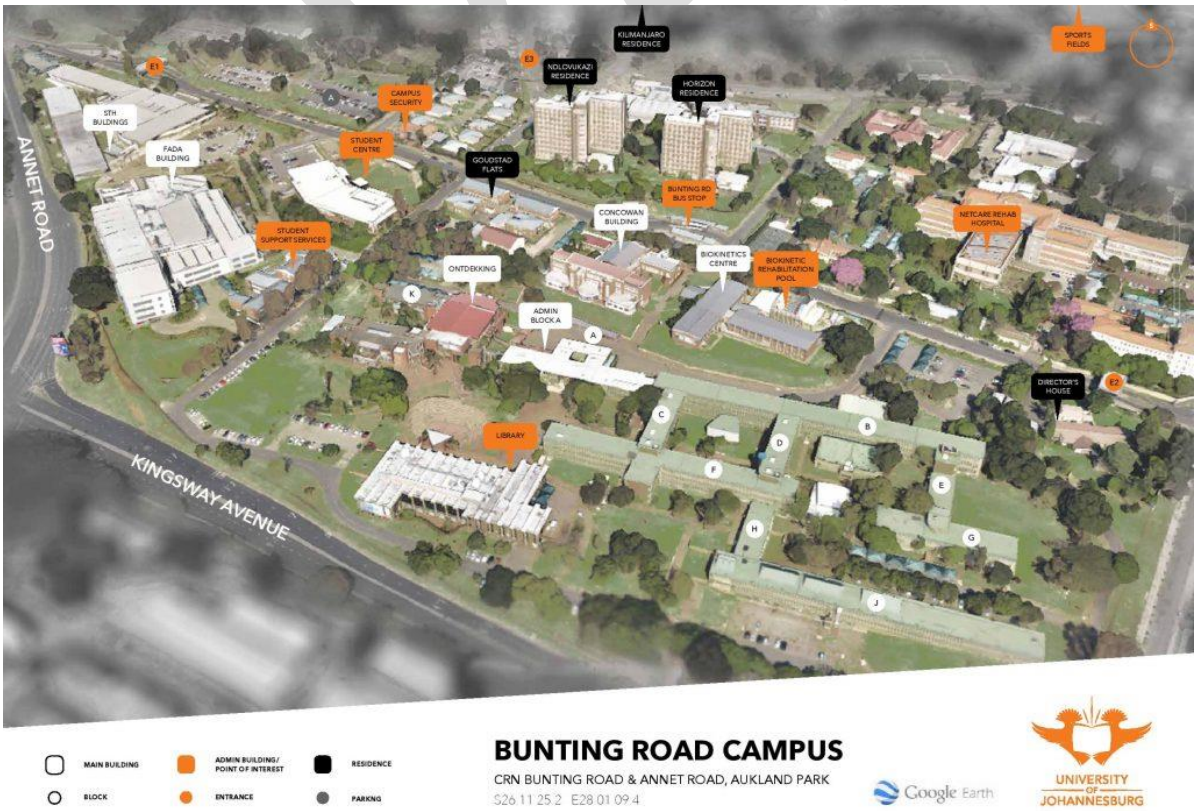
Residences
100% of residences are fully on backup power (Mayine, Ndlovukazi, Horizon, Kilimanjaro, Goudstad, Duiker and Impala Flats)
100% of network and internal and external routers are on backup power

Support Buildings
90% of academic office spaces are on backup power
100% of support buildings are fully on backup power (eg Protection Services, APB Campus Manager Offices, STH conference and events venue areas)

6.1.2 APB Campus Energy Development Plan

The APB campus has the advantage of being next to the Egoli Gas center in Annet road, Richmond allowing for the use of high pressure natural gas for power generation and direct water heating and it is thus less dependent on Eskom supply than some of the other campuses.

APB campus also has substantial buildings with open flat roofs (buildings A through J) for solar PV installations. The first APB solar installation is on top of the flat roof og buildings F and G. As well flat roofs there are substantial areas on the APB campus that could be converted to parking structures with solar PV panels. The immediate analysis is that in addition to the present 300kWp a further 1.5MWp could be installed on the campus if all areas are fully utilized – this would imply a solar PV project in excess of R18m and would because it would then provide more power than the campus uses at peak demand an agreement by City Power to purchase surplus generation at a minimum cost associated with Eskom rates or an agreement to allow virtual wheeling of the power to either the DFC or APK campuses in such case.



6.1.3 APB Campus Energy Already Complete

The following projects are already completed

1. A 300kWp Solar PV plant is operational for 5 years already
2. The Data Centre has both UPS and a separate diesel backup generator in place
3. All on campus networks and internal and external routers are on backup power
4. EPCs have been received for all qualifying buildings
5. LEDs have been implemented in all T&L spaces
6. Backup diesel power is available for all T&L venues
7. Backup diesel power is available for all residences for all but heating purposes

6.1.4 APB Campus Future Energy Projects

Campus Energy Development Plan

Utility survivability project pipeline

	Title	Description	Phase	Initial estimate	Earliest new start
1	APB Gas generator	APB gas generator proposal – latest supplier data and analysis	Redesign for new base load	R24m	April 2024
2	48 hour Water storage	48-hour Water storage - generic design and implementation on 5 campuses	Tendering for prof teams	Design R2.0m	January 2024
3	APB Grey Water trial	Grey water use and storage at APB residences	Award	R3.5m	November 2023

Utility sustainability project pipeline

4	Solar PV wheel and deal	Finalize a PPA or full ownership of an off-campus solar plant to further increase UJ solar PV based escom power reduction – aim for at least a further 1-2MWp	Design and initiation phase	R 25-27m	June 2024
5	APB solar extension	Extend APB solar from 300kWp to 500kWp to reduce load on ESKOM or eventual gas generator installation	Fund dependent	R2.75m	June 2024

Passivation utility project pipeline

6	Window screening	Implementation of solar screening to reduce insolation loads on all north-west to west facing windows on UJ campus buildings	Specify and testing phase	R 1.2 2.5m	Jan 2024
7	HVAC switching	Implement connect to light switching based on occupancy to switch off local HVACs in offices across all campuses	Specify and testing phase	R 4m	Sep 2023

Sustainability / green project pipeline

8	UJ Stadium lighting and public area walkways	Replace UJ stadium lighting and road/area lighting on campuses with high efficiency fittings	Proposal phase	R2m	February 2024

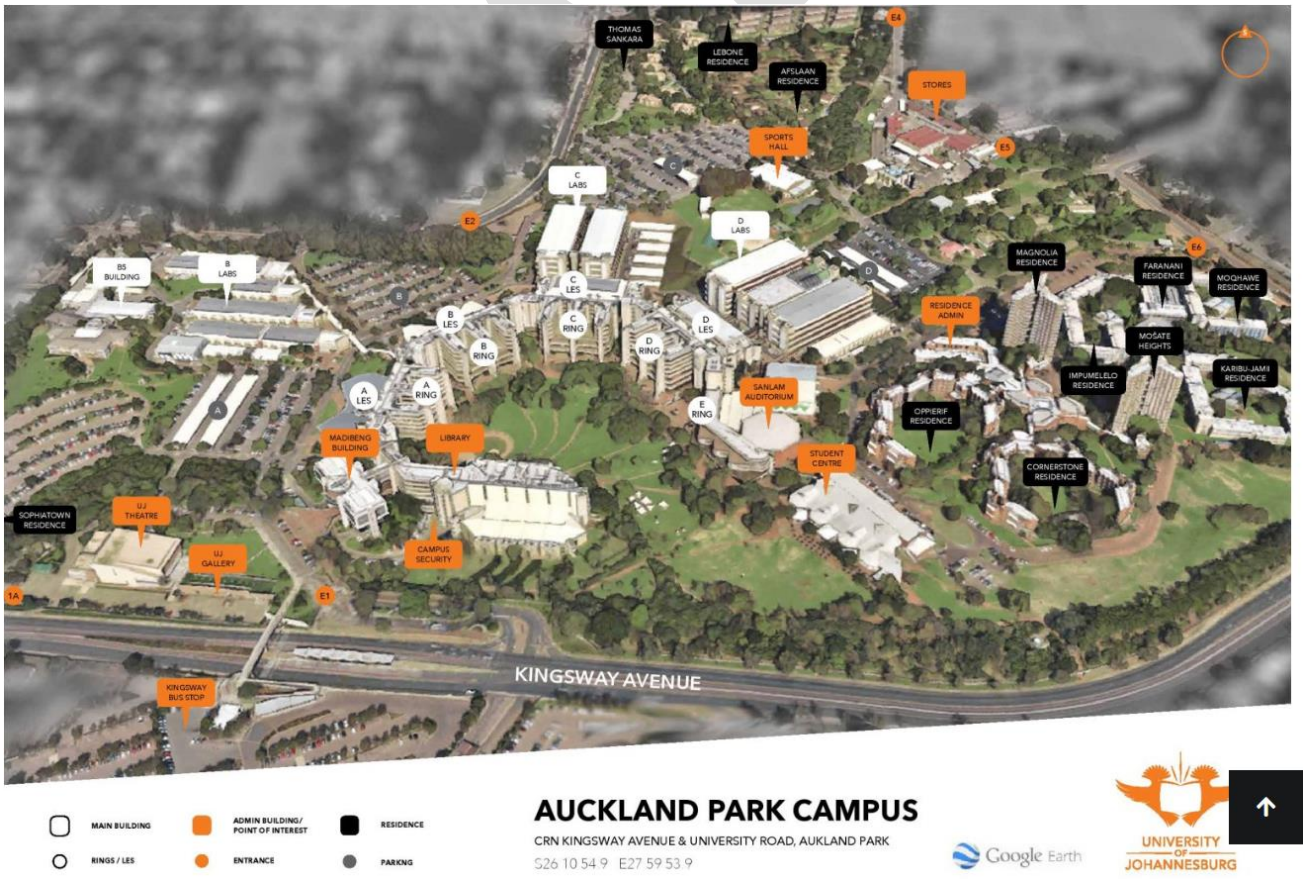
6.2 APK Energy Plan

Campus Context

Auckland Park Kingsway Campus, also known as APK, is the largest and most populated of the four campuses of the University of Johannesburg. The campus was formerly the only educational campus of the Rand Afrikaans University. The campus is located along a major Johannesburg road, Kingsway Avenue, that runs along the north-east side of the campus. The roads that form the boundary of the campus are (clock-wise) University Road, Ditton Avenue, Ripley Road, Hampton Avenue, Studente Avenue, Akademie Road and Perth Road.

APK buildings are divided into A Ring, B Ring, C Ring and D Ring. Each ring has a LES, which stands for Lesingslokaal (Afrikaans for Lesson Venue) behind it and a further LAB behind each LES. Each part of the building is seven stories high. In addition there is an E LES foyer and E Ring which houses the Sanlam Auditorium, Student Media offices, Campus Health Services and the university societies. Next to D LAB Kelder (Cellar) is the UJ Aquarium.

APK is the campus with the most student residences. There are currently a total of 12 residences, including mixed, for females and males.



Existing APK Power Infrastructure

City Power provides electrical power to the University of Johannesburg APK via two 11KV cables connecting to the B/B and switchgear. UJ utilises a 2 ring structure to supply power to

the campus, there are 9 S/S and the 11KV power from City Power is stepped down to 400V to various campus building.

Within the campus, embedded generation of 800kWp of Solar PV is installed and connected to electricity distribution network. For backup power, the campus relies on 28 generators of various sizes with a total installed capacity of more than 6 340kVA.

UPS are also installed throughout the campus dependent on the specific load transition requirements of departments – eg Faculty of Science research laboratories with power sensitive equipment are all isolated from the UJ ring supply via individual UPSs that predate the Eskom load shedding crisis period.

Gas

Natural gas for APK is provided by Egoli Gas via underground pipeline. This gas is used mostly for water heating purposes at the various APK residences on campus.

Aukland Park Kingsway Campus							
Faculties	Education	Science	Humanities	Law	FEBE	CBE	SARChI Chairs
Location	Kingsway, Auckland Park						
Acquired / initial date	1975						
Source	RAU - part of merger process				in some cases - Part of merger		
Campus area	293151 m2						
Estimated replacement value	R940mn						
Academic buildings on campus	12						
Support buildings on campus	3						
Building areas	256 000m2						
Staff	2500						
Commuting students	14 000						
On campus residence students	2 600						
Off campus residence students	1 100						
Parking spaces	>850						
Incoming power	11KV Cable terminating at the B/B						

Annual power consumption 2022	21.927	GWh					
Annual gas consumption 2022	17669.64	GJ					
Annual CO2 due to power	23 594	tCO2					
Backup power Generator	6340	kVA		28 generators			
Backup power UPS	>25						
Renewable energy on site	881 kWp						
Access gates	6						
Lecture venues	240						
Lecture venue area	120 000m2						
EPC certified buildings	5						
Diesel storage (excl gen tanks)	10 000	liters					

6.2.1 APK Eskom Load Shedding Readiness

Percentage Power Backup at APK Campus

Campus	**Auckland Park Kingsway**
Description	Percentage Coverage
Present T&L Space backup power	100 %
Present residence backup power	100 %
Present Support backup power	75 %

6.2.2 APK Campus Energy Already Complete

Completed Power Projects

Campus	**Auckland Park Kingsway**
Project Description	Completion Year
Back-up Power, Installation of new Generator Sets for the Impumelelo and Gloucester Residences	2021
Upgrading of S/S 1,3, 5 switchgear	2022
Upgrading of a water heating system with energy efficient water heating system (Magasyn)	2020
Upgrading of the APK Library HVAC to improve the Heating, Ventilation and Air Conditioning	2020
Supply, installation and commissioning of a 881kWp Photovoltaic Energy Generation Facility	2021

6.2.3 APK Campus Energy Development Plan

New projects on the pipeline for the APK campus include those in the following tables.

Utility survivability project pipeline

Number	Title	Description	Phase	Initial Estimate	Earliest Start date
1	FOS / FEBE battery power solutions	As per proposal from Sula for a smart battery storage and power controller do the same for C Lab and D Lab and ALD on APK	Design complete	R 25 - 30m	Jan-24
2	APK Chiller project	Replacement of evaporative cooling chillers with air cooled high efficiency chillers	Tendering	R45m	Jan-24
3	APK power provisioning	Based on performance of APB as well as SWC power solutions create a manner in which full APK campus power provisioning can take place	Awaiting trail perform at SWC and APB	R 80-90m	Jun-24

Table:

Utility sustainability project pipeline

Number	Title	Description	Phase	Initial Estimate	Earliest Start date
1	APK solar PV phase 2	Equip A Parking APK campus with about 800kWp solar PV - with rework of the parking layout	Fund dependent	R25m	Sep-24
2	Art Gallery solar	Finalize and implement a solar installation for the Art Gallery of 100kWp	Fund dependent	R2.1m	March 2024

The university aims to achieve renewable energy target of 25% of peak demand by 2030 on the APK campus.

Sustainability Efficiency/Green Project Pipeline

1	UJ Stadium lighting and public area walkways	Replace UJ stadium lighting and road/area lighting on campuses with high efficiency fittings (Is APK included)	Proposal phase	R2m	February 2024
2	EV Buses	Purchase of remaining 13 EV buses for replacement of Stabus contract - operation to bid	Proposal phase	R65-71.5m	June 2024

Carbon footprint based on 2022 actual consumption

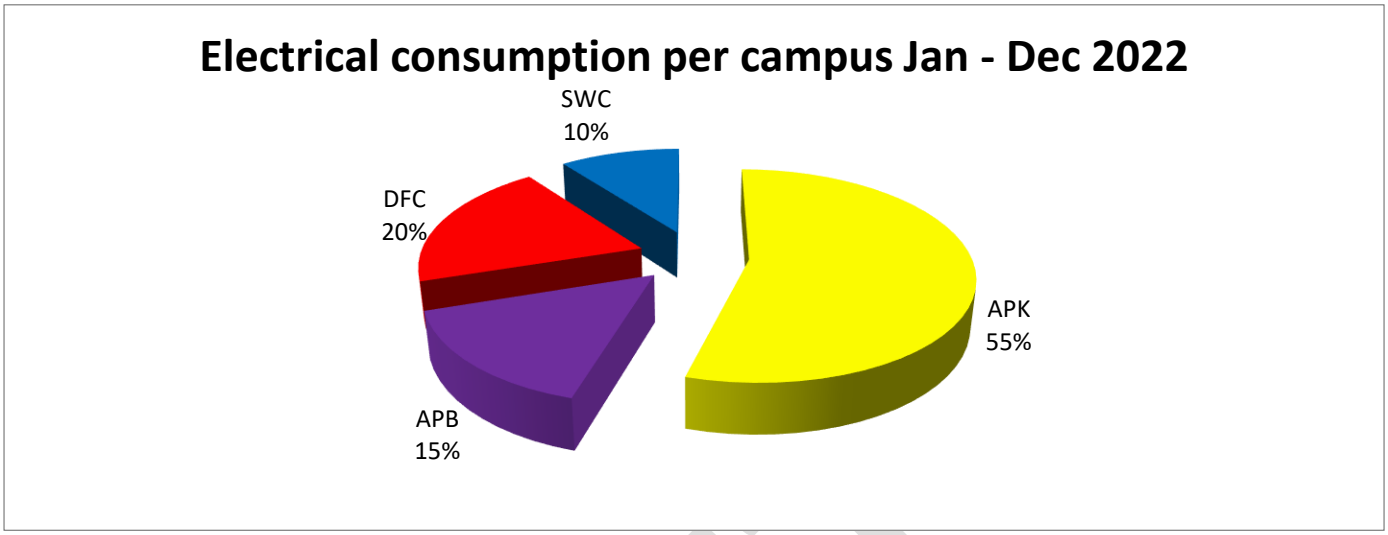
Emmission Source	Kingsway Campus (APK)
Electricity (kWh)	21,927,624
Natural Gas (GJ)	17,699.64
Natural Gas (kWhr)	4,916,566.48
Catbot[2] (l)	-
Petrol (l)	80,584.54
Diesel Fleet (l)	45,242.23
Diesel generators(l)	116,915.40

CO2 Generation for 2022

Emission Source	Kingsway Campus (APK)
Electricity (kWh)	22,585,452.72
Natural Gas(GJ)	1,008,633.61
Catbot	-
Petrol (Fleet)	185,489.49
Diesel Fleet	119,498.30
Diesel generators	308,808.65
Intercampus Bus and Staff flights	1,054,371.00
Paper used by UJ / KMSA sites	504,231.87
Total kg of CO2	25,766,485.65

[2] Catbot – Sasol supplied Polyfuel 7/40D - hydrocarbon liquid fuel that is burned in a furnace or boiler for the generation of heat.

Energy consumption per campus 2022



The University aims to reduce its energy consumption by a further 25% by the year 2030.

Energy monitoring

A vital component of effective energy management and improvements to efficiency is the implementation of a robust energy metering and data collection system. This provides the University stakeholders and tenants with energy performance analytics and feedback required to actively learn and improve behaviors and operations. Energy performance information must be effectively collected and reported to the proper recipients to ensure UJ effectively assess the need, priority, and success of energy projects.

Though power meters are installed at APK at various measuring points, monitoring of energy at the campus has not been effective. With this energy plan, the University intends to expand its energy monitoring capabilities through adding of meters that can measure key energy consuming systems where energy data can be monitored through comprehensive energy management system.

Measuring, verifying, and reporting on the progress of key performance metrics is crucial to the success of any energy management plan, and is a useful tool to increase accountability and drive behaviour and energy change on campus.

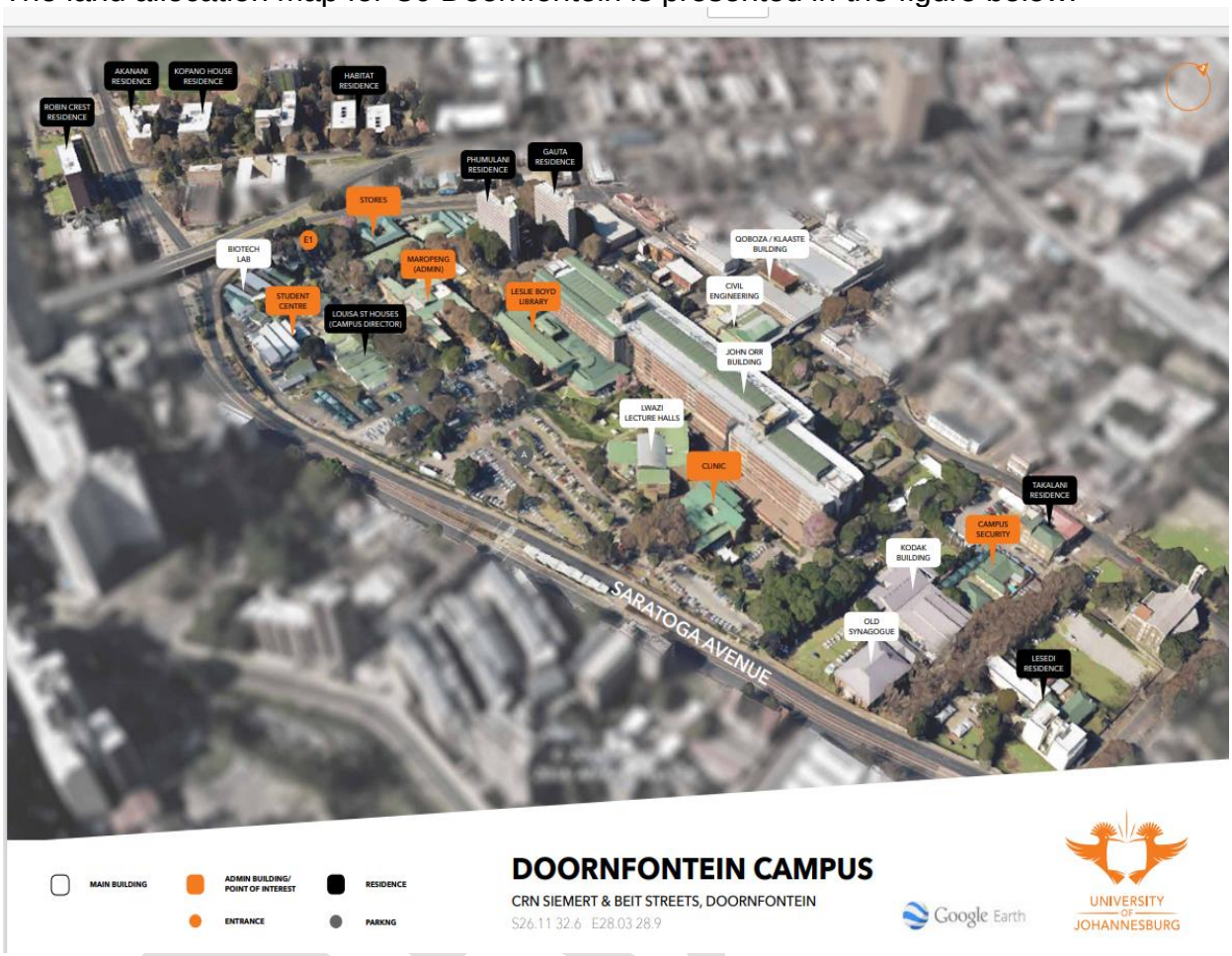
Measurement and Verification

Leveraging energy data, the University will measure the year-on-year total energy use and energy use intensity for the campus as a whole in order to make targeted recommendations on energy management. The University will verify performance of its energy efficiency initiatives annually to ensure the expected energy savings are being achieved.

6.3 DFC Energy Plan

Campus Context

The land allocation map for UJ Doornfontein is presented in the figure below.



The DFC Campus is a fully urban campus with various commercial spaces and high density urban housing in the immediate vicinity of the campus. It has 3 entrances, It has a strong mix of residential on campus students of undergraduate and postgraduate levels. The intercampus bus service provides access to the other campuses for students resident on DFC but who study on any of the other 4 academic campuses.

Campus	**Doornfontein Campus**				
Faculties	Science	Humanities	Law	FEBE	SARChI Chairs
Location	Beit Street Doornfontein				
Acquired / initial date	1965				
Source	Part of UJ merger process				
Campus area	191 200	m2			
Estimated replacement value	R 1200m	ZARm			
Academic buildings on campus	12				

Support buildings on campus	3			
Building areas		m2		
Staff	340			
Commuting students	8000			
On campus residence students	500		4	
Off campus residence students	900	9400	4	
Parking spaces				
Incoming power		kVA	5 incomers	Remember incomers for off campus
Annual power consumption 2022	7.91	GWh		
Annual CO2 due to power	8 308	t CO2		
Backup power	2 198	kW	9	backup gens
			5	UPS
Renewable energy on site	300	kWp		
Access gates	3			
Lecture venues	104			
Lecture venue area	12 400	m2		
EPC certified buildings	12			
Diesel storage (excl generator tanks)		Liters		

Present DFC Campus Energy Mix

The DFC Campus is fully provisioned for Teaching and Learning power backup for all lecture venues and computer laboratories and the main Library area. The main ICS Data centre is fully provisioned with backup power and backup power supported HVAC equipment, all networking on the campus as well as internal and external routers are also fully supported using backup power from generators. Both the Student Centre and staff dining areas are also fully backup power supported.

All 9 residences on the campus are also fully provisioned for backup power for lighting and small electrical loads (heating equipment in residences is excluded). Water heating for residences is 90% provided by gas boilers from Egoli Gas and 10% from RHPs that are backup power supplied.

All support areas have backup power for lighting and computer use but are still not provisioned for heating or HVAC purposes. There is a single EV charging station on the campus for charging the UJ EV buses that are part of the student intercampus bus service. See table 3

Campus	**Doornfontein Campus**			
Present T&L Space backup power	100	%	1185	kW
Present Residence backup power	100	%	350	kW
Present Support backup power	75	%	365	kW
Renewable energy on site	300	kW		
Diesel storage (excl gen tanks)	-	liters		

In terms of energy supply to the overall campus this can be summarized at present in the table below.

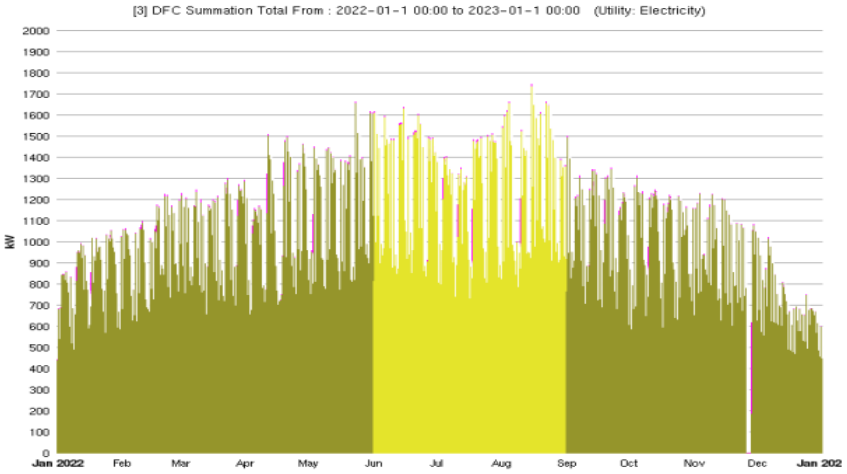
Campus	**Doornfontein Campus**			
Main electrical supply		kVA	City Power	
Gas supply		GJ/hr		
Renewable energy on site	300	kWp		
Backup power	2 910	kW	16	backup gens
EV vehicle charging	1	slow	stations	
Diesel storage (excl gen tanks)	-	liters		

DFC Load Profile

University load profiles are dependent on the intensity of the occupancy of the campuses buildings. The campuses from 18:00 until the next morning tend to run close to baseload throughout the year, working 24/7 (including weekends)

University of Johannesburg

Account Name	Customer No.	Building No.	Unit No.
DFC Summation Total	dfc_tot		3



Energy Analysis	
Total Consumption	6363442.659869
Effective Rate	3.022794499160363
Maximum kWh Demand	1735.3600268554683
Average kWh Demand	726.42039496221
Consumption Demand Load Factor	41.859924379986
Maximum Demand Analysis	
Maximum Demand	1744.6620386791
MD Reached at	2022-08-15 11:00:00
Average kVA Demand	731.82779717852
kVA Load Factor	41.94667969807
Power Factor at Maximum Demand	0.99466830158657
Average Power Factor	0.99224988392972

6.3.1 DFC Eskom Load Shedding Readiness

Teaching and Learning

- 100% of lecture venues are fully on backup power
- APB Library fully on backup power

- 100% of network and internal and external routers are on backup power

Residences

- 100% of residences are fully on backup power
- 100% of network and internal and external routers are on backup power

Support Buildings

- 90% of academic office spaces are on backup generators
- 100% of support buildings are fully on backup power (eg Protection Services, APB Campus Manager Offices)

6.3.2 DFC Campus Energy Already Complete

The following projects are already completed

- A 300kWp Solar PV plant is operational for 5 years already
- EV charging for EV Buses,
- Replaced electrical, coal boilers on residences

6.3.3 DFC Campus Energy Development Plan

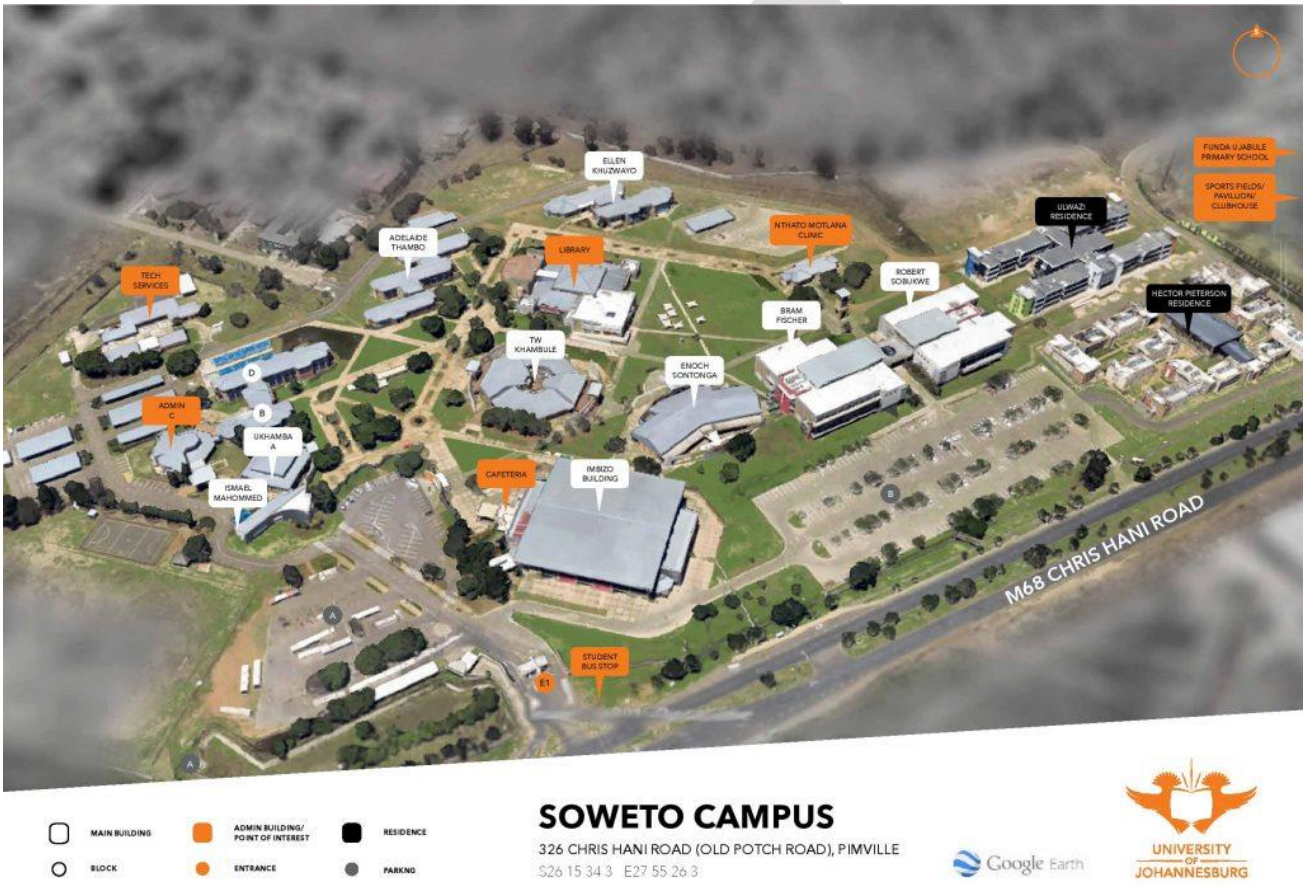
The DFC campus has the advantage of being next to the Egoli Gas centre in Beit Street Doornfontein allowing for the use of high pressure natural gas for power generation and direct water heating and it is thus less dependent on Eskom supply than some of the other campuses.

1	DFC Gas generator	Based on performance of APB gas generator installation – implement similar solution at DFC	Awaiting trail perform	R 22-25m	Start: Jun 2024 End: Dec 2024
2	DFC solar extension	Extend APB solar from 300kWp to 600kWp to reduce load on ESKOM or eventual gas generator installation	Fund dependent	R3.5 -4m	June 2024

6.4 SWC Energy Plan

Campus Context

Soweto Campus, formerly known as Vista University, is located on Chris Hani Road in Soweto Township. The campus has 3 entrances, with the main entrance located along Chris Hani Road. Soweto Campus was transformed at a cost of R450 millions, and it is approximately 24 000 m^2, has a total of 17 lecture halls providing 1842 seats. SWC houses four faculties, Faculty of Education, Faculty of Humanities, Faculty of Law and The South African Research Chair in Teaching and Learning. The campus also accommodates more than 1500 students in five residences. Hector Pieterson and Imbewu are mixed-gender residences, YMCA Men's Residence, YMCA Ladies Residence, Ulwazi Residence and Pishon of Soweto Day House.



The SWC campus has 10 generators of various sizes are already installed that have a total installed capacity of 2 590 kW to provide back-up power during power interruptions.

Campus	**Soweto**			
Faculties	Education, Humanities, Law and SARCHI Chairs			
Location	Chris Hani Rd Diepfloof			
Acquired / initial date	1970			
Source	Vista - part of merger process			

Campus area		m2		
Estimated replacement value		ZAR m		
Academic buildings on campus	12			
Support buildings on campus	2			
Building areas	18 500	m2		
Staff	250			
Commuting students	3 250			
On campus residence students	1 500		4	
Off campus residence students	-	4750		
Parking spaces				
Incoming power	1 500	kVA	1 incomer	
Annual power consumption 2022	3.901	GWh		
Annual CO2 due to power	4 018	t CO2		
Backup power	2 590	kW	10	backup generators
			5	UPS
Renewable energy on site	300	kWp		
Access gates	3			
Lecture venues				
Lecture venue area		m2		
EPC certified buildings	8			
Diesel storage (excl. gen tanks)	-	liters		

300kWp of carport Solar PV that is grid-tied, has been installed at SWC. The total project cost for the 300kWp Solar PV installation project is R3,5 million and was completed in early 2023.

SWC Energy Mix

Soweto Campus has the following energy mix:

Campus	**Soweto**			
Main electrical supply	11	kVA	City Power	2 incomers
Gas supply	N/A	GJ/hr		
Renewable energy on site	300	kWp		
Backup power	2 905	kW	10	backup generators
Diesel storage (excl. gen tanks)	-	liters		

6.4.1 SWC Campus Energy Development Plan

The University of Johannesburg is in a process of implementing a project for supply and installation of a full back-up power generation system that will be able to supply the entire UJ Soweto Campus from the main campus substation and including the installation of an additional 300 kWp carport solar PV system that will be integrated to the existing electrical network that is to be fed by the full supplemental backup power system, during this scenarios:

a. When there is full or partial loss of power due to local area disconnection.
b. Loss of power due to cable theft outside the UJ Soweto Campus area that interrupts supply to the campus.
c. Loss of power due to City Power scheduled load shedding.
d. Loss of power due to unexpected load shedding or load reduction events precipitated by ESKOM / City Power or other causes

The project is currently at a tender stage.

6.4.2 SWC Eskom Load Shedding Readiness

Teaching and Learning

- 100% of the lecture venues are on back-up generators (including the Sport Centre)
- 100% of network and internal and external routers are on back-up power.
- SWC data center is on back-up power.

Residences

- 100% of residences are fully on backup power
- 100% of network and internal and external routers are on backup power

Support Buildings

- 90% of academic office spaces are on backup generators
- 100% of support buildings are fully on backup power (eg Protection Services, SWC Campus Manager Offices)

6.4.3 SWC Campus Energy Already Complete

Completed Power Projects

Campus	**Soweto**
Project Description	Completion Year
Back-up Power, Installation of new Generator Sets for the SWC 4th residence	2021
Upgrading of a water heating system with energy efficient water heating system (Hector Pietersen, Ulwazi and Imbewu residences)	2020
Upgrading of the SWC Library HVAC to improve the Heating, Ventilation and Air Conditioning	2021
Supply, installation and commissioning of a 300kWp Photovoltaic Energy Generation Facility	2021

6.5 JBS PARK Energy Plan

Campus Context

The land allocation map for JBS Park is presented in the following figure.

The JBS Park Campus is a fully urban campus with hospitals, small industrial sites, various commercial spaces and high density urban housing in the immediate vicinity of the campus. It has 2 entrances, one of which is linked to high traffic level roads and one entering though a urban dwelling area. It is primarily the campus used for

- The Johannesburg Business School
- The Graduate School of Architecture
- The School of Economics
- The School of Management
- The Institute of Intelligent Systems
- 7 SARChI Chairs

It has undergraduate and postgraduate level students on the campus area with the various academic units as well as all the normal support facilities for staff and students including a functioning and power backed up student and staff dining area.

Campus	**JBS Park**			
Faculties	Jhb Business School	FADA	SARChI Chairs	
Location	69 Kingsway Auckland Park			
Acquired / initial date	2021			
Source	UJ Reserves			
Campus area	25 000	m2		
Estimated replacement value	235	ZARm		
Academic buildings on campus	1			
Support buildings on campus	1			

Building areas	18 500	m2		
Staff	340			
Commuting students	550			
On campus residence students	-		6	
Off campus residence students	-	550		
Parking spaces				
Incoming power	750	kVA		
Annual power consumption 2022	0.25	GWh	estimated	
Annual CO2 due to power	250	t CO2		
Backup power	1000	kVA	2	backup gens
			1	UPS
Renewable energy on site	150	kWp		
Access gates	2			
Lecture venues	10			
Lecture venue area	2 100	m2		
EPC certified buildings	1			
Diesel storage (excl generator tanks)	10 000	liters		

Current JBS Park Campus Energy Mix

The JBS Park Campus is fully provisioned for Teaching and Learning power backup for all lecture venues and computer laboratories and the main Library area. The main ICS Data centre is fully provisioned with backup power and backup power supported HVAC equipment, all networking on the campus as well as internal and external routers are also fully supported using backup power from generators. Both the Student Centre and staff dining areas are also fully backup power supported.

All support areas have backup power for lighting and computer use but are still not provisioned for heating or HVAC purposes.

Campus	**JBS Park**			
Present T&L Space backup power	100	%	1185	kW
Present Residence backup power	n/a	%	350	kW
Present Support backup power	100	%	365	kW
Renewable energy on site	150	kW		
Diesel storage (excl gen tanks)	10 000	liters		

In terms of energy supply to the overall campus this can be summarized at present as:

Campus	**JBS Park**			
Main electrical supply	750	kVA	City Power	1 incomer

Gas supply		GJ/hr		
Renewable energy on site	150	kWp		
Backup power	1 000	kW	2	backup gens
EV vehicle charging		slow	stations	
Diesel storage (excl gen tanks)	10 000	liters		

6.5.1 JBS Park Eskom Load Shedding Readiness

Teaching and Learning

- 100% of lecture venues are fully on backup power
- 100% of network and internal and external routers are on backup power

Support Buildings

- 100% of academic office spaces are on backup generators
- 100% of support buildings are fully on backup power

6.5.2 JBS Park Campus Energy Already Complete

The following projects are already completed

- A 150kWp Solar PV plant has been operational for 6 months as at December 2023

6.5.3 JBS Park Campus Energy Development Plan

JBS Park Campus Future Energy Projects

1	Gas generator	Based on performance of APB gas generator installation – implement similar solution at JBS Park	Awaiting trail perform	R 22-25m	Start: Jun 2024 End: Dec 2024

6.6 UJ on Empire Energy Plan

Campus Context

UJoE campus was acquired by UJ in 2014 and houses various support functions for the University. The campus is located on Empire Road where it gets its name, with access on the corner of Barry Hertzog and Napier roads. There are no lecture venues and residences on the campus.

UJ on Empire Existing Power Infrastructure

The power for the campus is supplied by City Power, and is equipped with one generator and two UPS for backup power. There is a 100kW renewable energy project planned for the campus, the project is currently on tendering phase.

University of Johannesburg on Empire		
Faculties	Support Departments	UJ Call Centre
Location	Cnr Barry Hertzog and Napier rds Richmond	
Acquired / initial date	2014	
Source	UJ Reserves	
Campus area	4000 m2	
Estimated replacement value	R75m	
Academic buildings on campus	0	
Support buildings on campus	1	
Building areas	8500 m2	

Staff	225	
Commuting students	0	
On campus residence students	0	
Off campus residence students	0	
Parking spaces	128	
Incoming power		
Annual power consumption 2022		
Annual gas consumption 2022		
Annual CO2 due to power		
Backup power Generator	1 x 250kW Generator	
Backup power UPS	2 UPS	
Renewable energy on site	100kWp (Tender process)	
Access gates	1	
Lecture venues	0	
Lecture venue area	0m2	
EPC certified buildings		
Diesel storage (excl gen tanks)		

Table: General overview of UJoE campus

6.6.1 UJoE Eskom Load Shedding Readiness

Percentage Power Backup at UJoE Campus

Campus	**UJoE Campus**	
Description	Percentage Coverage	
Present T&L Space backup power	n/a	
Present residence backup power	n/a	
Present Support backup power	100 %	250kVA

6.6.2 UJoE Campus Energy Development Plan

Renewable Energy Project Pipeline

UJoE Campus		
Description	**Installed**	**Planned**
Renewable energy on site	0	100kWp

Passivation Project Pipeline

1	Window screening	Implementation of solar screening to reduce insolation loads on all north-west to west facing windows on UJ campus buildings	Specify and testing phase	R 1.2 2.5m	Jan-24

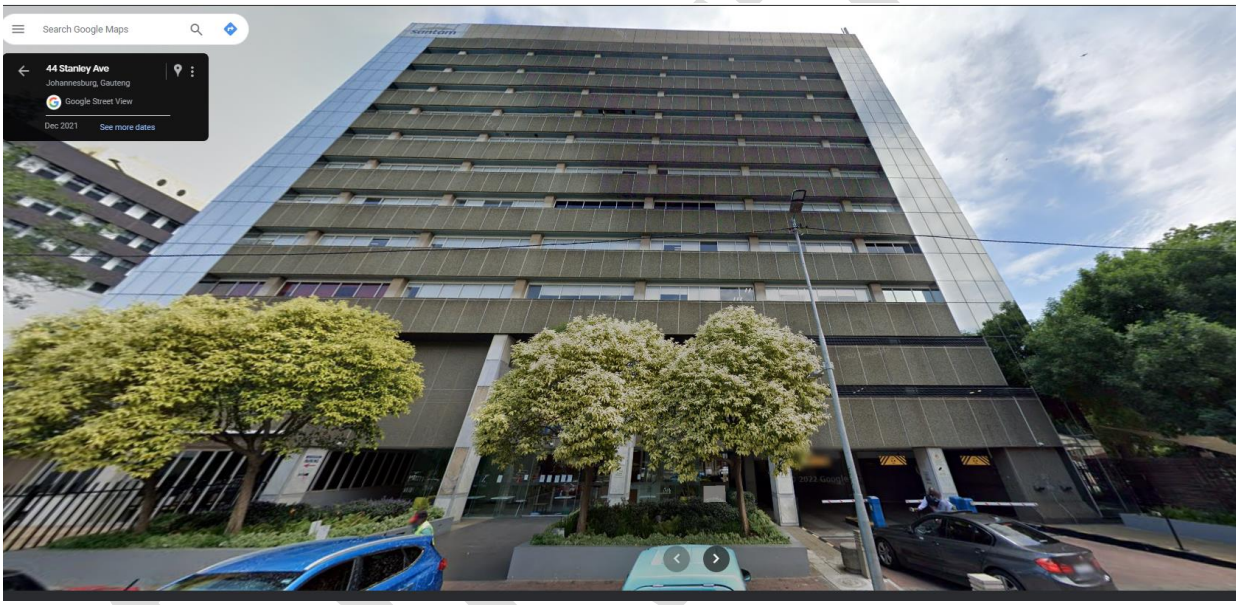
2	Advanced demand management controllers	Implement a trial advanced demand management controller at UJoE and JBS Park to reduce peak loads and spread energy use	Fund dependent	R 1.75-2.5m	Feb-24

6.7 UJ on Stanley Energy Plan

Campus Context

This is a newly acquired campus for the University and will house the support staff from Human Capital Development, Finance – Governance and Expenditure, Committee Secretariat and ICS development teams. The building was acquired to enable drawing support staff from the academic campuses such as APK and DFC where space limits for academic staff are increasingly a restraint on growth for faculties.

Some PDRF and PhD students will be provided with open desk / hot desk space on the 8th and 9th floors. There are limited training rooms for inhouse staff development training and boardrooms on site. Not undergraduate or postgraduate teaching and learning will be accommodated on site. There are also no residences or other student teaching or accommodation spaces allocated.



UJ on Stanley		
Faculties	Support Departments	Committee Secretariat
Location	41 Stanley rd, Richmond	
Acquired / initial date	2023	
Source	UJ Reserves	
Campus area	14 500 m2	
Estimated replacement value	R325m	
Academic buildings on campus	0	
Support buildings on campus	1	
Building areas	14 500 m2	
Staff	425	
Commuting students	200 PDRFs	
On campus residence students	0	
Off campus residence students	0	
Parking spaces	389	

Incoming power		
Annual power consumption 2022	0.19	GWh estimated
Annual gas consumption 2022	0	
Annual CO2 due to power	190	T CO2
Backup power Generator	1 x 250kW backup generator	
Backup power UPS	2 UPS	
Renewable energy on site	80 (Tendering phase)	kWp
Access gates	1	
Lecture venues	0	
Lecture venue area	n/a	
EPC certified buildings	In process	
Diesel storage (excl gen tanks)	N/A	

6.7.1 UJ on Stanley Eskom Load Shedding Readiness

Percentage Power Backup at UJ on Stanley

Campus	**UJ on Stanley Campus**	
Description	Percentage Coverage	
Present T&L Space backup power	n/a	
Present residence backup power	n/a	
Present Support backup power	>100 %	650kVA

6.7.1 UJ on Stanley Campus Energy Development Plan

Passivation project pipeline

1	Ground loop HVAC assist	Implement ground loop heating and cooling test for local HVACs to reduce power use by local HVACs – trial on the JBS Park and UJ on Stanley buildings	Specify and testing phase	R3.5m	Jan-25

Sustainability/Green Project Pipeline

2	UJ on Stanley solar PV system	Installation of a 50kWp solar PV as well as integration into existing backup generator	Proposal phase	R1.5m	Mar-24

6.8 UJ Island

UJ Island Context

UJ is the only university in the world that owns its own island. UJ Island is in the Free State Province in the Vaal Dam but is physically within the Free State province. Passengers and goods are transported only by boat or helicopter from the banks. UJ Island is mainly used by the University and is ideally used for conferences, seminars, training courses, day visits and youth camps. UJ Island is approximately 25 0000m2, and hosts a variety of wild-life animals such as blesbuck, springbuck, zebras, impala, etc., and bird species such as guineafowl, pheasants, cape redbreast, heron and nighthawks.

The island offers sleeping facilities for 100 people at present, where visitors are accommodated in two dormitory style sleeping halls and 2 small guest houses. There is a dining hall and kitchen facilities, a single large conference hall for 100 people and a smaller hall with seating for approximately 60 people. The island also has a variety of sports and recreation facilities available to visitors such as braai facilities, a swimming pool, volleyball and Jukskei court and hiking trails. Game drives are presently also done for visitors.

Campus	**UJ Island**						
Faculties	Facilities Management						
Location	Vaal Dam, Free State Province						
Acquired	1979						
Source	Lease from Dept Water Affairs				in some cases - Part of merger		
Campus area	4 000	m2					
Estimated replacement value	75	ZARm					
Academic buildings on campus	-						
Support buildings on campus	1						
Building areas	8 500	m2					
Staff	225						
Commuting students	-						
On campus residence students	-						
Off campus residence students	-	0					
Parking spaces	128						
Incoming power		kVA					
Annual power consumption 2022		GWh					
Annual CO2 due to power		t CO2					
Backup power	250	kW	1	backup generators			
			2	UPS			
Renewable energy on site	100	kWp	in tender process				
Access gates							
Lecture venues	-						
Lecture venue area	-	m2					
EPC certified buildings							
Diesel storage (excl generator tanks)	-	liters					

6.8.1 The UJ Island Eskom Load Shedding Readiness

The UJ Island has 1 x 250 kW back-up generator and 2 UPS installed to provide power supply during normal power interruptions and load shedding.

6.8.2 The UJ Island Campus Energy Development Plan

The University plans to install a 100 kWp of solar PV on the UJ Island with the project now at tender process stage. In addition to the above, University of Johannesburg is exploring the options of generating green hydrogen on the UJ Island by making use of the existing open space for a combination of Solar PV and hydrogen generation and storage plant. The space

allows for as much as 20MWp without exceeding 20% of the UJ Island surface area at maximum dam water level.

8. UJ ENERGY COMMUNICATIONS PLAN

Given the importance of power / energy provision and sustainability to the continued full operation of the UJ in pursuit of the UJ Strategic Goals it is of critical importance to have a manner of managing the risks, mitigations and strategies related to this for all UJ stakeholders.

The following sections detail the manner in which Facilities Management will communicate the necessary information to stakeholders on a continuing and ad hoc manner – as specific requirements dictate.

7.1 Preamble

Founded in 2005, the University of Johannesburg (UJ) is relatively young, the result of a merger between the Randse Afrikaans Universiteit (RA), Technikon Witwatersrand, and Vista University. UJ is one of the largest residential universities in South Africa, with eight faculties, a college and a business school (Johannesburg Business School) spread across four campuses in the Greater Johannesburg Metropolitan area. The university serves more than 50,000 students and has 4,500 full-time staff members. The university is known for its high excellence in impactful research, innovation, and teaching. UJ is recognised both in Africa and globally for leading the Fourth Industrial Revolution (4IR) conversation, which it also uses for positive societal impact.

7.2 Background and context

For several years, South Africa has been struggling with the energy crisis, which has deepened in recent years and led to prolonged and widespread electricity outages, known as load shedding. The rotational power outages, often exceeding eight hours a day, have had a severe impact on households and businesses, including the higher education sector. The relentless power outages have caused widespread disruptions on campuses, which threaten higher education institutions (HEIs)'s business continuity.

To this end, the University of Johannesburg (UJ), like many other institutions of higher learning, has developed an Energy Plan which seeks to mitigate the risks associated with the intermittent and relentless power cuts. The Energy Plan establishes the University's approach to providing a reliable energy supply programme that focuses on energy efficiency and greenhouse gas emissions reductions. It lays out the implementation roadmap for clean energy on campus for a more sustainable and resilient future. The Risk Mitigation measures are an attempt to ensure business continuity at the University by supporting its core business of teaching, learning and research.

It must be noted that while UJ has been relatively successful in implementing this Energy Plan, the load shedding Risk Mitigating measures have come at a cost for the University's operational budget and placed a heavy strain on its existing resources. More disconcerting is that the power outages, which started over a decade ago, look set to continue, with no indication of abating in the foreseeable future.

This document details the University of Johannesburg's Energy Plan communication strategy to ensure that its Stakeholder Community are well informed of the University's Risk Mitigation measures to ensure that its business continuity while contributing to efforts to reduce the carbon footprint.

7.3 Aims and objectives

- Serves as a guideline for procedures and processes to communicate information related to the University's general Campus Energy Master Plan.
- To communicate and disseminate information related to the University's Campus Energy Plan to the institution's community and its stakeholders in the event of major disruptions of campus activities due to an energy supply outage/crisis.
- To raise greater awareness of issues related to the University's Campus Energy Plan and help mitigate risks that may arise from any disruptions in the electricity supply for a sustainable environment.
- To promote an understanding of the UJ Campus Energy Plan's goals so that staff, students, suppliers and other stakeholders are aware of what their roles and responsibilities are and what positive actions they can take to minimise and mitigate the risks associated with the power outages.
- To promote a greater understanding of the University's energy supply crisis management plan with the view to foster relationships and build mutual trust across operational and academic areas.

7.4 Target Audience

For impact, the communication will be targeted at the University's primary and secondary audiences.

Primary audience: key stakeholders (population) whose behavior we want to change.

- Staff
- Students
- Prospective students

Secondary audience: strategic partners (stakeholders) that the University interacts with, and which (may) have an influence on its primary audience.

- Contractors and suppliers.
- Alumni.
- Parents and surrounding communities
- Government departments.
- State-owned entities (SOEs)
- Non-Governmental Organisations (NGOs),
- Community Based Organisations (CBOs), etc.

7.5 Key Messages

Information will be disseminated in a clear and concise way using a cohesive approach. Key messages will include issues such as impact of load shedding, the Energy Plan status and emerging risks that may impact the Energy Plan, as well as the action plans taken to mitigate or reduce the risks and the level of resources (available) or constraints. The cornerstone of the communication strategy will be to raise greater awareness to the University's Energy Plan, with the view to driving behavioral change that contributes towards a sustainable energy supply.
Special focus is on empowering staff and students and other UJ Stakeholder Community members with practical actions to reduce their energy footprint. There will also be a special focus on the sharing of good news and 'good feel' stories relating to energy and carbon reduction projects undertaken across campuses to promote a positive and sustainable environment.

7.6 Method of Delivery

The Communication Plan will be done through two targeted communication activities: namely, **internal communication** and **external communication**. In both cases, the University will use a variety of communication tools and channels to keep the community stakeholders informed of any possible disruptions. Key to this is using the right channel to communicate messages to the right stakeholders.

7.6.1 Internal Communication

Internally, communication will be done through various tools and channels, such as:

- Email messages
- Circulars to staff and students
- Electronic newsletters and other publications and articles
- University Website
- Notifications and daily updates on the Intranet, including the student portal, ULink.
- Questionnaires

7.6.2 Externally

Externally, the communication platforms that will be used include:

- Media (press) releases
- Targeted media approach (print and/or online publication, radio and TV).
- Social Media, including LinkedIn, Facebook, Twitter.
- Opinion articles (Op-Eds)
- Special news bulletins and campaigns on UJFM and UJTV
- UJ App
- Interactive stakeholder engagement, such as events and meetings.
- Mass SMS campaigns to students and staff, depending on the severity of the crisis.
- Other promotional materials, such as banners, flyers, brochures and leaflets.

The University will also provide regular updates on the status of disruptions and the expected time of resolution.

7.7 Timelines

The University will send an initial email to the community as soon as possible after a major power supply disruption has been identified. The University will post regular and timeous updates using social media and the University website. This may be three times a week, weekly or fortnightly, depending on the urgency. A table of activity that includes specific activities, timescales and responsible person(s) will be created. In some instances, a basket of messages will be created and prescheduled, to be disseminated proactively. The frequency of the information will be increased, should the situation dictate such. The University will continue to communicate with the community until the disruption has been resolved.

7.8 Communication procedures and processes

The advent of digital media has resulted in unintended consequences such as the spread of fake news, disinformation and misinformation. To avoid conflicting and confusing messages in the University's Energy Plan, all communication around it will be centralised in the Office of the University's Strategic Communications Unit. The Office will be solely responsible for disseminating any information related to the University's Energy Plan across its various communication platforms, including social media.

7.9 Measurement and evaluation

For each communication activity, metrics and other methods of measuring success and monitoring progress will be applied.

- Number of people who received the communication.
- Percentage of people who clicked the communiques/content.
- Newsletter open rate
- Increase in website hits on the Energy Plan content.
- Increase of staff and student sign-ups for Energy Plan campaigns.
- Surveys and other feedback forms.
- Percentage of people who took the desired action.

Appendix A PRCC ANNUAL TARGETS

The table below is from a 2021 PRCC Annual Targets that was approved – as such it is only meant as an example since on a yearly basis the targets are updated and new targets are added as they are considered appropriate for UJ to strive towards and in limited cases targets are removed when they are no longer relevant to the operations of the UJ.

PROJECTS AND RESOURCING COMMITTEE OF COUNCIL

ANNUAL PERFORMANCE PLAN

2021

Key Performance Area		Key Performance Indicator	Audited/Actual performance					2021 Target Actual	Strategic Initiatives	Responsibility
			2014	2015	2016 (Baseline)	2019 act 2019 target	2020 act 2020 target			
	Responsible stewardship of the environment	ESKOM energy reduction (excludes benefit from Solar!)	7.40%	1.30%	1.31%	4.25% 2.75%	3.75% **33.7%**	5.75%	Developing. implementing and maintaining effective energy management Limit the real increase in electricity energy cost below the legislated electricity tariff increases. Diversify the energy supply mix towards renewable and lower greenhouse gas emission energy source. Due to 2020 PV system on 3 UJ campus rooftops and carparks	Central Technical Services ED: Facilities Management Campus Directors
		Annual electricity bill	R79.9m	R86.6m	R84.6m	R82.7m R82.62m	R82.62m **(Est: R64.9)**	R82.62m		
	(Energy consumption / Water consumption Carbon footprint / Waste management)	Total annual energy consumption – inc ESKOM and generated	53.6GWh	57.2GWh	56.2GWh	49.28 GWh 50.0 GWh	47.5GWh **37.88GWh**	47.5GWh		
		% of self- generated power	0.00%	0.00%	0.00%	1.08 % 1.5% 0.53GWh	2.95% **2.36%**	2.95%		
		% of power purchased in long-term supply contracts	0.00%	0.00%	0.00%	0.00%	0.00% **0.0%**	0.00%		
		% of energy used from renewable sources (“green energy”).	0.00%	0.00%	0.00%	1.08 % 1.5% 0.55GWh	2.95% **2.68%**	3.75%		

Note that all target for 2021 are based on an escalated 2019 figure as base since the 2020 figures achieved are distorted by the complete closure of campuses for an extended period due to Covid-19 lockdown limitations.

Key Performance Area		Key Performance Indicator	Audited/Actual performance					2021 Target ACTUAL	Strategic Initiatives	Responsibility
			2014	2015	2016 (Baseline)	2019 act 2019 target	2020 act 2020 targe			
		Water use reduction	-	-	-14.30% (vs 2015)	+12.26% -5.00%	-35% **-8.43%**	-7.5%		
		Percentage of buildings with access to water	100.00%	100.00%	100.00%	100.00%	100.00% **100%**	100.00%		
		Average water usage per campus	693.078kl	947.068kl	828.599kl	930.121 kl 650.000kl APB – 200.1 kl (+9.5%) APK - 530.4 kl (+94.3%) DFC - 171.9 k (+3.3%)l SWC – 37.6 kl (-50.4%)	839.78l **-9.71%** APB – 124.98 kl -37.54% APK - 517.6 kl -2.41% DFC - 172.5 k +0.37% SWC – 24.6 kl -34.4%	883.0 kl APB – 190.0 kll APK - 504.0 kl DFC - 163.0 kl SWC – 35.0kl	UJ Sustainability policy Establish and operate economically viable green-rated buildings	ED: Facilities Management Utilities / Sustainability Unit
		Current carbon footprint (Total tons of CO2)	55 872	61 679	56 637	54 156 53 250	52 250 **40 887**	49 200		ED Facilities Management
		Reduction in Carbon footprint	4.00%	7.00%	3.04%	4.38% 4.15%	4.75% **-21.75%**	5.75%	Net Effective Tenant	

Key Performance Area		Key Performance Indicator	Audited/Actual performance					2021 Target	Strategic Initiatives	Responsibility
			2014	2015	2016 (Baseline)	2019 act 2019 target	2020 act 2020 target			
		Waste recycled (Tons)	538T	506T	513.6T	625.3T 475T	675T **673.9T**	725T	Placement of recycling	
		Waste Generated Total	1551T	1773T	1818T	1 858T 2 500T	2 500T **1409.3T**	1 875T	Recycling week in September	Occupational Safety ED: Facilities Management
		Waste Recycled	34.75%	28.55%	28.23%	33.65% 25%	35% **47.81%**	38.5%	New Bulkmatech compactor	
		Revenue earned from recycling	R165 038	R156 944	N/A	R160 946 R200 000	R220k **Not yet**	R275k	Recycling of hazardous waste	
		% of hazardous operational waste generated	1.31%	2.07%	N/A	67% (175T) Not spec'd	70% (200T) **49.46%** 33.3T	72.5% (210T)	Disposal of hazardous waste at Dolphin site in KZN	
		Gas delivery	-	33.7TJ	31.7TJ	32.2TJ 35TJ	35.0TJ **42.4TJ** **+17.46%**	42.5GJ	Egoli Gas Bio Gas initiative	Utilities
		Satisfaction with support divisions		3	3.5	3.4 4.0	4.0 **Not yet available**	4.0	Maintenance support	Sen Campus Dir
		Cash flow management	(new target)			(-)	Achieve +/- 10% **-22%**	Achieve +/- 10% on target cashflow	Review Facilities Management / Finance interaction to	ED: Facilities Management
	Cash Flow and Resource Spending	Maintenance spending Residences	(new target)			(-)	R19.0m **R14.8m**	R37.5m	DHET Residence Maintenance	ED: Facilities Management

		Maintenance spending General	(new target)			(-)	R20.0m **R16.5m**	R28.0m	DHET Backlog Maintenance	ED: Facilities Management
		All property related agreements to be approved by Corporate Governance	-	-	-	84% 100%	100% **100%**	100%	Property and Title Deed register Document	Property Man Sen Campus
	Legal Compliance	UJ Property and Title deed register updated All original signed agreements. legal documents. title deeds. etc to be submitted to Corporate Governance for safekeeping and archiving	-	-	-	84% 100%	100% **100%**	100%	Legal Compliance	Property Man Sen Campus Director Legal ED:

Key Performance Area		Key Performance Indicator	Audited/Actual performance					2021 Target	Strategic Initiatives	Responsibility
			2014	2015	2016 (Baseline)	2019 act 2019 target	2020 act 2020 target			
	Regulatory compliance	% Regulations met by required date	-	-	85%	100% 100%	100% **100%**	100%	OHS act Compliance audit NOSA Audit Develop a guideline on the management of new and existing policies and contracts	UJ General Counsel Property Man Sen Campus Dir ED: Facilities Management
		% of neglected compliance issues	-	-	-	0% 0%	0% **0%**	0%	Effective financial governance. internal controls and risk management	
		% Non-compliant buildings (OHS act)	-	-	-	0% 0%	0% **3%**	0%		
		Compliance with insurance requirements	-	-	-	90% 50%	95% **100%**	100%	Reduce internal and external audit findings.	
		% of compliant policies. procedures & contracts	-	-	40%	90% 90%	100% **95%**	100%	Implement risk management strategies and promote compliance. management	

Key Performance Area		Key Performance Indicator	Audited/Actual performance					2021 Target	Strategic Initiatives	Responsibility
			2014	2015	2016 (Baseline)	2019 act 2019 target	2020 act 2020 target			
	Risk Management	No. of risks over 16 (Residual risks)	-	2	2	3 1	1 **2**	1		ED: Facilities Management
		No. of internal audits with recurring findings over a three year period	-	-	-	3 Major 1 Major	1 **2**	1		ED: Facilities Management
		% of staff trained in critical risk management techniques	-	-	30%	100% 100%	100% **100%**	100%	Risk Management Training Establishment of a Project Management Office PMO responsible for business case development. project prioritisation and project management	ED: Facilities Management

	Capital Projects	Value of failed projects due to risk issues not identified during the decision-making process	-	-	R77m	Nil Nil	Nil **Nil**	Nil		ED: Facilities Management

Appendix B EPC CERTIFICATION REPORTS

Buildings involved in the 2022/3 EPC certification process

Site Code	Building Code	Building Name	Date Built	Ext. Gross Area m²
APB	48	APB - Block A - J	1965-01-01	22 645.35
	57	APB - Library	1970-01-01	4 095.67
	58	APB - Biokinetics Centre	1964-01-01	1 916.17
	59	APB - Con Cowan Building	1956-01-01	3 869.44
	64	APB - Great Hall	1965-01-01	3 071.17
	65	APB - Cafeteria	1978-01-01	1 704.71
	66	APB - Block K	1965-01-01	3 281.17
	422	APB - Pavilion	1967-01-01	1 527.92
	428	APB - FADA Building	2006-01-01	22 108.56
	430	APB - Hotel School	2005-01-01	5 811.64
	431	APB - STH Lecture Halls	2005-01-01	4 206.49
	434	APB - Student Centre	2007-01-01	2 659.72
APK	486	APK - Main Ring Building	2008-01-01	175 946.13
	1600	APK - Student Centre	1997-01-01	5 268.99
	2501	APK - FEBE B Buildings	1986-01-01	12 311.58
	2701	APK - B-5 Bldg	1980-01-01	5 323.60
	2901	APK - Theatre	2006-01-01	5 125.98
	5001	APK - Stores Complex Bldg	1975-01-01	5 925.94
	5002	APK - Central Machine Rm	1975-01-01	2 013.01
	5100	APK - Sport Hall/Bureau	1999-01-01	1 627.58
	6501	APK - A Complex	1974-01-01	1 164.28
DFC	1	DFC - John Orr Building	1986-01-01	96 018.13
	10	DFC - Quadrum	1975-01-01	1 968.42
	13	DFC - Student Ctr & Kitch	1977-01-01	1 553.53
	89	DFC - Buxton Str Building	1995-01-01	2 799.91
	90	DFC - Admin Block	1997-01-01	7 057.76
	91	DFC - Lecturing Halls	1997-01-01	4 496.09
	92	DFC - Clinic	1997-01-01	3 543.02
	95	DFC - Purch And Stores	1996-01-01	1 417.55
	101	DFC - Kodak Building	1930-01-01	3 297.80
	102	DFC - Synagogue	1931-01-01	1 561.11
	106	DFC - Civil Eng Building	1986-01-01	2 939.93
	113	DFC - New Student Centre	2009-01-01	1 883.13
	770	DFC - Perskor	2014-07-07	31 141.54
SWC	3008	SWC - TW Khambule	1996-01-01	5 196.90
	3009	SWC - Enoch Sontonga	1996-01-01	3 750.02
	3011	SWC - Imbizo	1996-01-01	8 510.98
	3012	SWC - Ellen Khuzwayo	1996-01-01	3 217.17
	3013	SWC - Ukhamba A B D	1996-01-01	6 272.99
	3015	SWC - Admin C	1996-01-01	1 290.16
	3018	SWC - Library	1996-01-01	8 125.76
	3019	SWC - Adelaide Tambo	1996-01-01	3 134.96

	3020	SWC - Student Centre	2019-01-01	1 333.88
	3030	SWC - Robert Sobukwe	2010-01-01	5 836.83
	3031	SWC - Braam Fischer	2010-01-01	4 357.40
	3044	SWC - Pavillion	2011-01-01	2 773.29
	3047	SWC - Funda Ujabule Prima	2015-02-16	1 658.69
	3048	SWC - Sports Centre	2011-01-01	5 958.15
	3054	SWC - FU Lecture Halls	2015-05-04	1 291.80
JBS Park (Media 24)	xxxx	Media 24 Building	2000-01-01	17 500.00
Devland SWC	yyyy	UJ Devland	2022-01-01	1 490.02
Grand Total				**532 982.02**

Typical Reports for two buildings with differing certifications.
Enoch Sontonga Building – SWC Campus

Inspection Report Date:	**03 November 2022**
RMS EPC Inspector:	*Nikhil Naidoo*

Certification Name: University of Johannesburg_Enoch Sontonga

Client Information

Company Name: *University of Johannesburg*

Building Name: *Enoch Sontonga*

Building Location

Address 1: *326 Chris Hani Road, Soweto*

City: *Johannesburg*

Province: *Gauteng*

Client Representative

Name: *Masala Mbambeleli*

Contact Number: *(078) 667 1760*

E-mail Address: *mmasala@uj.ac.za*

Building Information (from SANS 10400-XA:2021)

Energy Zone:	1
Occupancy Class:	*A3*
Reference Energy Consumption:	*110* *

*from SANS10400-XA : 2021

Building Assessment Planning

Has the Inspector identified the person who will assist the Inspector during the assessment?	Yes
Has the Inspector phoned the inspection assistant to inspection arrangements?	Yes
Did the Inspector share the Building Assessment Method Statement with the Building Representative?	Yes
Has the Inspector confirmed the site Health & Safety arrangements?	No

Name and Surname of the person who represented the property owner during the site inspection:

Masala Mbambeleli

Date of the Inspection:	2022/10/06
Start Time:	9:00 am
Duration:	30 minutes

Details on when and how Building Assessment Method Statement was shared

Shared by Nikhil Naidoo to the client rep

Details on Health and Safety considerations

General H&S considerations apply

Confirmation by Building Representative:

Year of Assessment Start	*2021/01/01*
Year of Assessment End	*2021/12/31*

Building Operations

During the Year of Assessment:

Single or Multiple Tenants?	Single
Confirm Building Occupancy (%)	100%

Energy Carriers

During the Year of Assessment:

Did the building use grid supplied electricity?	Yes
Did the building use solar PV electricity?	No
Did the building use diesel fuel?	Yes
Did the building use gas?	No
Did the building use any solid fuel for energy?	No
Was energy exported from the building?	No

Building Operating Hours

	Start	End	hours/day	hours/week
Mon to Thurs	*07:00:00*	*18:00:00*	*11*	*44*
Fridays	*07:00:00*	*18:00:00*	*11*	*11*
Saturdays	*00:00:00*	*00:00:00*	*0*	*0*
Sundays	*00:00:00*	*00:00:00*	*0*	*0*
			Total	***55***

Net Floor Area (are these on the plans?)

Building layout during the year of assessment	Yes
Store rooms?	Yes
Parking areas and basements?	No
Outside areas?	No
Vertical building elements?	Yes

Any further actions regarding floor plans?

No further action required

Report	0 20
RMS EPC	Nikhil

Certification Name: University of Johannesburg Enoch Sontonga

Energy Carrier: Grid Supplied Electricity

Consumption Source Data Bulk check

Validations Checks	
Confirm meter location with reticulation diagram	V
Confirm meter existence and purpose with building rep	V
Compare Serial numbers (data file vs reticulation)	V
Check that data time-period is for Year of Assessment	V
Check data completeness (identify estimates)	V
Compare data with another data source	V
Visually inspect meter on site	V
Compare meter serial number (on meter) with other S/N	V

Results	
Consumption Unit of Measure	k
Annual Consumption Value	78
kWh per Annum	78

Describe any other validation methods used

A sensitivity analsyis was done to check the impact of deviating the figure by 2% on the building EPC grade

Inspector comments from site assessment

List any further actions that may be needed:

No further action

Report	0 20
RMS EPC	Nikhil

Certification Name: University of Johannesburg_Enoch Sontonga

Energy Carrier: Solar PV Supplied Electricity

Consumption Source Data	Energy source not

Validations Checks
Confirm meter location with reticulation diagram
Confirm meter existence and purpose with building representative
Compare Serial numbers (data file vs reticulation)
Check that data time-period is for Year of Assessment
Check data completeness (identify estimates)
Compare data with another data source
Visually inspect meter on site
Compare meter serial number (on meter) with other S/N

Results	
Consumption Unit of Measure	k
Annual Consumption Value (Raw)	C
kWh per Annum	C

Describe any other validation methods used

Inspector comments from site assessment

List any further actions that may be needed:

No further action

Report	0 20
RMS ERC	Nikhil

Certification Nam e: University of Johannesburg Enoch Sontonga

Energy Carrier: Diesel Fuel

Consumption Source Data	Another

Validations Checks	
Confirm invoices/delivery notes are for this building location	N
Confirm invoices/delivery notes are for the Year of Assessment	N
Inspect generator or other diesel consuming equipment	Y
Inspect diesel storage facilities	Y
Confirm diesel refilling rules	Y

Results	
Consumption Unit of Measure	kWh
Annual Consumption Value (Raw)	-
MJ/ per unit of measure	39
GJ per annum	-
kWh per Annum	-

Describe any other validation methods used

Inspector comments from site assessment

No diesel genset found by site

List any further actions that may be needed:

No further action

Report	0 20
RMS EPC	Nikhil

Certification Name:	University of Johannesburg_Enoch Sontonga

Energy Carrier: Gas

Consumption Source Data	Energy source not

Validations Checks	
Confirm invoices/delivery notes are for this building location	
Confirm invoices/delivery notes are for the Year of Assessment	
Inspect gas consuming equipment	
Inspect gas storage facilities	
Confirm gas refilling rules	

Results	
Consumption Unit of Measure	kWH
Annual Consumption Value (Raw)	0
MJ/ per unit of measure	46.1
GJ per annum	0
kWh per Annum	**0**

Describe any other validation methods used

Inspector comments from site assessment

List any further actions that may be needed:

No further action

Report	0 20
RMS EPC	Nikhil

Certification Name:	University of Johannesburg_Enoch Sontonga

Energy Carrier: Solid Fuel

Consumption Source Data	Energy source not

Validations Checks

Confirm invoices/delivery notes are for this building location	
Confirm invoices/delivery notes are for the Year of Assessment	
Inspect generator or other diesel consuming equipment	
Inspect storage facilities	
Confirm refilling rules	

Results

Consumption Unit of Measure	kg
Annual Consumption Value (Raw)	0
MJ/ per unit of measure	0.0
GJ per annum	0
kWh per Annum	**0**

Describe any other validation methods used

Inspector comments from site assessment

List any further actions that may be needed:

No further action

Report	0 20
RMS ERC	Nikhil

Certification Nam e: University of Johannesburg Enoch Sontonga

Energy Carrier: Ex port Energy

Consumption Source Data Energy source not

Validations Checks	
Confirm invoices/delivery notes are for this building location	
Confirm invoices/delivery notes are for the Year of Assessment	
Check whether readings are actual and not estimates	
Inspect storage facilities	
Check data against another source	

Results	
Consumption Unit of Measure	kg
Annual Consumption Value (Raw)	0
MJ/ per unit of measure	0.0
GJ per annum	0
kWh per Annum	**0**

Describe any other validation methods used

Inspector comments from site assessment

List any further actions that may be needed:

No further action required

Report Date	**03 November 2022**
RMS EPC Inspector:	*Nikhil Naidoo*

Certification Name: University of Johannesburg_Enoch Sontonga

Exclusions

Store Rooms

Not applicable

Garages/Basement Parking

Yes, the floor plan shows all the parking areas

Outside Areas

No. The floor plan does not show all the outside areas

Net Floor Area Report Findings

Construction Area:	*1 585*
Store Rooms Total	*0*
Outside Areas Total	*0*
Parking Area Total	*0*
Vertical Elements	*0*
Excluded Areas Total	*0*
Net Floor Area	*1 585*
Excluded Area %	*0.0%*

Exclusion Comments

No further action required

Load Type	Qty	Wattage	Hours/Week	Wh/Week	Wks/Yr	kWh/Year
big recessed circle	*12*	*16*	*84*	*16 128*	-	***839***
square wall light	*29*	*10*	*84*	*24 360*	-	***1 267***
lantern pole	*8*	*50*	*84*	*33 600*	-	***1 747***
small LED flood	*5*	*20*	*84*	*8 400*	-	***437***
					-	-
					-	-
					-	-
					-	-
					-	-
					-	-
					-	-
					-	-
			Excluded Areas Total kWh per Year			***4 289***
			Excluded Area Energy as % of Total			***5%***

Excluded Energy is less than 10% of total building energy consumption and does not have to be shown on the certificate

Report Date	03 November 2022
RMS EPC Inspector:	*Nikhil Naidoo*

Certification Name: University of Johannesburg_Enoch Sontonga

Building Details

Building Name	Enoch Sontonga
Energy Zone	1
Reference Energy Consumption (kWh/m2.annum)	110
Year of Assessment Start	01 January 2021
Year of Assessment End	31 December 2021
Occupancy Class	A3
Occupancy Rate	100%

Energy Carriers

Total Energy Consumption (kWh)	78 772
Grid Electricity (kWh):	78 772
Solar PV Electricity (kWh):	0
Diesel Fuel (kWh):	0
Gas (kWh):	0
Solid Fuel (kWh):	0
Export Energy (kWh):	0

Net Floor Area

Total Net Floor Area	1 585
Excluded Area	0
Excluded Area % of Total	0%

Excluded Area Energy Consumption

Total Excluded Area Energy Consumption (kWh)	4 289
Net Energy = Total Energy - Exclusions = 78 772 - 4 289	
Equals (kWh)	74 483
Excluded Area Energy as % of Total	5%

Building Energy Performance

Energy per Unadjusted Net Floor Area (kWh/m2.annum):	47
Energy per Adjusted Net Floor Area (kWh/m2.annum):	47

Building Performance

Building Performance Scale (from SANS 1544)
Rating A: energy performance < 0.3Ereference
Rating B: 0.3Ereference <= energy performance < 0.6Ereference
Rating C: 0.6Ereference <= energy performance < 0.9Ereference
Rating D: 0.9Ereference <= energy performance < 1.1Ereference
Rating E: 1.1Ereference <= energy performance < 1.4Ereference
Rating F: 1.4Ereference <= energy performance < 1.7Ereference
Rating G: energy performance >= 1.7Ereference

Building EPC Calculcation

Reference Energy (kWh/m2.annum):	110
(from SANS 10400-XA:2021)	
Variance = 47 - 110	
Equals (kWh/m2.annum):	-63
Actual/Reference Energy = 47 / 110	
Equals:	0.43
Provisional Building Rating:	B

Additional Information

No of floors (excl parking):	2
Year of Construction:	>2 years
Year of Renovation:	Within the past 2 years
Date of Approved Plans:	>2 years
Cadastral (Erf no) Info:	MANOR MP1&2 11KV WOODLANDS DRIVE

Signature: Inspector

Signature: Client

Inspection Report Date: *03 November 2022*

Certification Name: University of Johannesburg_Enoch Sontonga

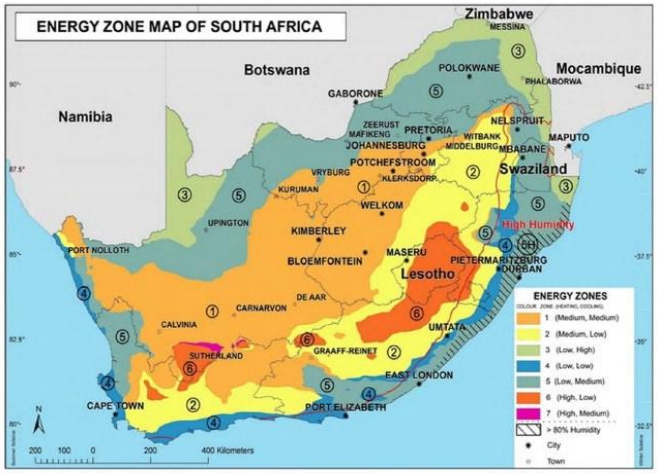


Table 1 — Maximum annual energy consumption per building classification for each energy zone (kWh/m²/a) (Energy zones as shown in figure 1 and annex C)

1	2							
Class of occupancy	**Energy zones**							
	1	**2**	**3**	**4**	**5**	**5H**	**6**	**7**
A1 **Entertainment and public assembly** Occupancy where persons gather to eat, drink, dance or participate in other recreation.	75	75	95	70	95	95	80	80
A2 **Theatrical and indoor sport** Occupancy where persons gather for the viewing of theatrical, operatic, orchestral, choral, cinematographical or sport performances.	95	95	110	90	110	110	105	105
A3 **Places of instruction** Occupancy other than primary or secondary schools, where students or other persons assemble for the purpose of tuition or learning.	110	155	110	125	140	140	120	120
A3 **Places of instruction** Occupancy where school children assemble for the purpose of tuition or learning	60	65	55	60	55	60	65	65
A4 **Worship** Occupancy where persons assemble for the purpose of worshipping.	70	45	45	40	50	40	70	70
E2 **Hospital** Occupancy where people are cared for or treated because of physical or mental disabilities and where they are generally bed-ridden.	325	335	225	295	295	230	345	345
E3 **Other institutional (residential)** Occupancy where groups of people who either are not fully fit, or who are restricted in their movements or their ability to make decisions, reside and are cared for	120	95	90	90	100	80	130	130
F1 **Large shop** Occupancy where merchandise is displayed and offered for sale to the public and the floor area exceeds 250 m².	125	200	155	180	185	150	125	125
F2 **Small shop** Occupancy where merchandise is displayed and offered for sale to the public and the floor area does not exceed 250 m².	75	150	100	125	130	95	80	80

Table 1 (*concluded*)

1	2							
Class of occupancy	**Energy zones**							
	1	**2**	**3**	**4**	**5**	**5H**	**6**	**7**
F3 Wholesaler's store Occupancy where goods are displayed and stored and where only a limited selected group of persons is present at any one time.	125	200	155	180	185	150	125	125
G1 **Offices** Large multi-storey office buildings, banks, consulting rooms and similar uses with lifts and energy consuming services that operate on a typical daytime occupancy.	90	105	110	95	110	95	100	100
G1 **Offices** Stand-alone blocks and / or campus of buildings that form an office park but operate separately	70	150	190	145	180	165	75	75
H1 **Hotel** Occupancy where persons rent furnished rooms, not being dwelling units.	125	130	100	115	125	95	140	140
H2 **Dormitory** Occupancy where groups of people are accommodated in one room	155	170	160	175	160	160	160	180
H3 **Domestic residence** Occupancy consisting of two or more dwelling units on a single site.	90	100	50	80	85	60	110	110
H4 **Dwelling house** Occupancy consisting of a dwelling unit on its own site, including a garage and other domestic outbuilding, if any.	95	100	50	80	85	60	110	110
H5 **Hospitality** Occupancy where unrelated persons rent furnished rooms on a transient basis within a dwelling house or domestic residence with sleeping accommodation for not more than 16 persons within a dwelling unit	120	130	110	120	115	135	135	135

APK Main Ring Building

Inspection Report Date:	**03 November 2022**
RMS EPC Inspector:	*Nikhil Naidoo*

Certification Name: University of Johannesburg_Main Ring

Client Information

Company Name: *University of Johannesburg*
Building Name: *Main Ring*

Building Location

Address 1: *Corner Kingsway and University Road, Auckland Park*
City: *Johannesburg*
Province: *Gauteng*

Client Representative

Name: *Masala Mbambeleli*
Contact Number: *(078) 667 1760*
E-mail Address: *mmasala@uj.ac.za*

Building Information (from SANS 10400-XA:2021)

Energy Zone:	1
Occupancy Class:	*A3*
Reference Energy Consumption:	*110* *

*from SANS10400-XA : 2021

Building Assessment Planning

Has the Inspector identified the person who will assist the Inspector during the assessment?	Yes
Has the Inspector phoned the inspection assistant to inspection arrangements?	Yes
Did the Inspector share the Building Assessment Method Statement with the Building Representative?	Yes
Has the Inspector confirmed the site Health & Safety arrangements?	No

Name and Surname of the person who represented the property owner during the site inspection:
Masala Mbambeleli

Date of the Inspection:	2022/10/06
Start Time:	9:00 am
Duration:	30 minutes

Details on when and how Building Assessment Method Statement was shared
Shared by Nikhil Naidoo to the client rep

Details on Health and Safety considerations
General H&S considerations apply

Confirmation by Building Representative:

Year of Assessment Start	*2021/01/01*
Year of Assessment End	*2021/12/31*

Building Operations

During the Year of Assessment:

Single or Multiple Tenants?	Single
Confirm Building Occupancy (%)	100%

Energy Carriers

During the Year of Assessment:

Did the building use grid supplied electricity?	Yes
Did the building use solar PV electricity?	No
Did the building use diesel fuel?	Yes
Did the building use gas?	No
Did the building use any solid fuel for energy?	No
Was energy exported from the building?	No

Building Operating Hours

	Start	End	hours/day	hours/week
Mon to Thurs	*07:00:00*	*18:00:00*	*11*	*44*
Fridays	*07:00:00*	*18:00:00*	*11*	*11*
Saturdays	*00:00:00*	*00:00:00*	*0*	*0*
Sundays	*00:00:00*	*00:00:00*	*0*	*0*
			Total	***55***

Net Floor Area (are these on the plans?)

Building layout during the year of assessment	Yes
Store rooms?	Yes
Parking areas and basements?	No
Outside areas?	No
Vertical building elements?	Yes

Any further actions regarding floor plans?

No further action required

Report	0 20
RMS EPC	Nikhil

Certification Name: University of Johannesburg Main Ring

Energy Carrier: Grid Supplied Electricity

Consumption Source Data	Bulk check

Validations Checks	
Confirm meter location with reticulation diagram	v
Confirm meter existence and purpose with building rep	v
Compare Serial numbers (data file vs reticulation)	v
Check that data time-period is for Year of Assessment	v
Check data completeness (identify estimates)	v
Compare data with another data source	v
Visually inspect meter on site	v
Compare meter serial number (on meter) with other S/N	v

Results	
Consumption Unit of Measure	k
Annual Consumption Value	9 168
kWh per Annum	9 168

Describe any other validation methods used

A sensitivity analsyis was done to check the impact of deviating the figure by 2% on the building EPC grade

Inspector comments from site assessment

List any further actions that may be needed:

No further action

Report	0 20
RMS ERC	Nikhil

Certification Name: University of Johannesburg Main Ring

Energy Carrier: Solar PV Supplied Electricity

Consumption Source Data Energy source not

Validations Checks	
Confirm meter location with reticulation diagram	
Confirm meter existence and purpose with building representative	
Compare Serial numbers (data file vs reticulation)	
Check that data time-period is for Year of Assessment	
Check data completeness (identify estimates)	
Compare data with another data source	
Visually inspect meter on site	
Compare meter serial number (on meter) with other S/N	

Results	
Consumption Unit of Measure	k
Annual Consumption Value (Raw)	C
kWh per Annum	C

Describe any other validation methods used

Inspector comments from site assessment

No diesel genset

List any further actions that may be needed:

No further action

Report	0 20
RMS EPC	Nikhil

Certification Nam e: University of Johannesburg Main Ring

Energy Carrier: Diesel Fuel

Consumption Source Data	Another

Validations Checks	
Confirm invoices/delivery notes are for this building location	N
Confirm invoices/delivery notes are for the Year of Assessment	N
Inspect generator or other diesel consuming equipment	V
Inspect diesel storage facilities	V
Confirm diesel refilling rules	V

Results	
Consumption Unit of Measure	kWh
Annual Consumption Value (Raw)	382 018
MJ/ per unit of measure	39
GJ per annum	14 746
kWh per Annum	**382 018**

Describe any other validation methods used

Inspector comments from site assessment

Diesel gens were found on site. An assumption was made that the diesel energy footprint accounts for 4% of the total energy footprint.

List any further actions that may be needed:

No further action

Report	0 20
RMS EPC	Nikhil

Certification Name:	University of Johannesburg Main Ring

Energy Carrier: Gas

Consumption Source Data	Energy source not

Validations Checks

Confirm invoices/delivery notes are for this building location	
Confirm invoices/delivery notes are for the Year of Assessment	
Inspect gas consuming equipment	
Inspect gas storage facilities	
Confirm gas refilling rules	

Results

Consumption Unit of Measure	kWH
Annual Consumption Value (Raw)	0
MJ/ per unit of measure	46.1
GJ per annum	0
kWh per Annum	**0**

Describe any other validation methods used

Inspector comments from site assessment

List any further actions that may be needed:

No further action

Report	0 20
RMS EPC	Nikhil

Certification Name:	University of Johannesburg Main Ring

Energy Carrier: Solid Fuel

Consumption Source Data	Energy source not

Validations Checks

Confirm invoices/delivery notes are for this building location	
Confirm invoices/delivery notes are for the Year of Assessment	
Inspect generator or other diesel consuming equipment	
Inspect storage facilities	
Confirm refilling rules	

Results

Consumption Unit of Measure	kg
Annual Consumption Value (Raw)	0
MJ/ per unit of measure	0.0
GJ per annum	0
kWh per Annum	**0**

Describe any other validation methods used

Inspector comments from site assessment

List any further actions that may be needed:

No further action

Report	0 20
RMS ERC	Nikhil

Certification Nam e: University of Johannesburg Main Ring

Energy Carrier: Ex port Energy

Consumption Source Data Energy source not

Validations Checks	
Confirm invoices/delivery notes are for this building location	
Confirm invoices/delivery notes are for the Year of Assessment	
Check whether readings are actual and not estimates	
Inspect storage facilities	
Check data against another source	

Results	
Consumption Unit of Measure	kg
Annual Consumption Value (Raw)	0
MJ/ per unit of measure	0.0
GJ per annum	0
kWh per Annum	**0**

Describe any other validation methods used

Inspector comments from site assessment

List any further actions that may be needed:

No further action required

Report Date	**03 November 2022**
RMS EPC Inspector:	*Nikhil Naidoo*

Certification Name: University of Johannesburg_Main Ring

Exclusions

Store Rooms

Not applicable

Garages/Basement Parking

Yes, the floor plan shows all the parking areas

Outside Areas

No. The floor plan does not show all the outside areas

Net Floor Area Report Findings

Construction Area:	*31 656*
Store Rooms Total	*0*
Outside Areas Total	*0*
Parking Area Total	*0*
Vertical Elements	*0*
Excluded Areas Total	*0*
Net Floor Area	*31 656*
Excluded Area %	*0.0%*

Exclusion Comments

No further action required

Load Type	Qty	Wattage	Hours/Week	Wh/Week	Wks/Yr	kWh/Year
circular roof lights	*49*	*10*	*84*	*41 160*	-	***2 140***
flood light	*50*	*150*	*84*	*630 000*	-	***32 760***
single 5ft LED	*124*	*24*	*84*	*249 984*	-	***12 999***
pole lantern	*12*	*50*	*84*	*50 400*	-	***2 621***
single 1 ft LED	*4*	*9*	*84*	*3 024*	-	***157***
big recessed downligh	*4*	*18*	*84*	*6 048*	-	***314***
square light by stairca	*6*	*10*	*84*	*5 040*	-	***262***
screw light in case	*3*	*20*	*84*	*5 040*	-	***262***
globe light in case	*22*	*20*	*84*	*36 960*	-	***1 922***
					-	-
					-	-
					-	-
			Excluded Areas Total kWh per Year			***53 438***
			Excluded Area Energy as % of Total			***1%***

Excluded Energy is less than 10% of total building energy consumption and does not have to be shown on the certificate

Report Date	03 November 2022
RMS EPC Inspector:	*Nikhil Naidoo*

Certification Name: University of Johannesburg_Main Ring

Building Details

Building Name	Main Ring
Energy Zone	1
Reference Energy Consumption (kWh/m2.annum)	110
Year of Assessment Start	01 January 2021
Year of Assessment End	31 December 2021
Occupancy Class	A3
Occupancy Rate	100%

Energy Carriers

Total Energy Consumption (kWh)	9 550 441
Grid Electricity (kWh):	9 168 423
Solar PV Electricity (kWh):	0
Diesel Fuel (kWh):	382 018
Gas (kWh):	0
Solid Fuel (kWh):	0
Export Energy (kWh):	0

Net Floor Area

Total Net Floor Area	31 656
Excluded Area	0
Excluded Area % of Total	0%

Excluded Area Energy Consumption

Total Excluded Area Energy Consumption (kWh)	53 438
Net Energy = Total Energy - Exclusions = 9 550 441 - 53 438	
Equals (kWh)	9 497 003
Excluded Area Energy as % of Total	1%

Building Energy Performance

Energy per Unadjusted Net Floor Area (kWh/m2.annum):	300
Energy per Adjusted Net Floor Area (kWh/m2.annum):	300

Building Performance

Building Performance Scale (from SANS 1544)
Rating A: energy performance < 0.3Ereference
Rating B: 0.3Ereference <= energy performance < 0.6Ereference
Rating C: 0.6Ereference <= energy performance < 0.9Ereference
Rating D: 0.9Ereference <= energy performance < 1.1Ereference
Rating E: 1.1Ereference <= energy performance < 1.4Ereference
Rating F: 1.4Ereference <= energy performance < 1.7Ereference
Rating G: energy performance >= 1.7Ereference

Building EPC Calculcation

Reference Energy (kWh/m2.annum):	110
(from SANS 10400-XA:2021)	
Variance = 300 - 110	
Equals (kWh/m2.annum):	190
Actual/Reference Energy = 300 / 110	
Equals:	2.73
Provisional Building Rating:	G

Additional Information

No of floors (excl parking):	7
Year of Construction:	>2 years
Year of Renovation:	Within the past 2 years
Date of Approved Plans:	>2 years
Cadastral (Erf no) Info:	

Signature: Inspector

Signature: Client

Inspection Report Date: *03 November 2022*

Certification Name: University of Johannesburg_Main Ring

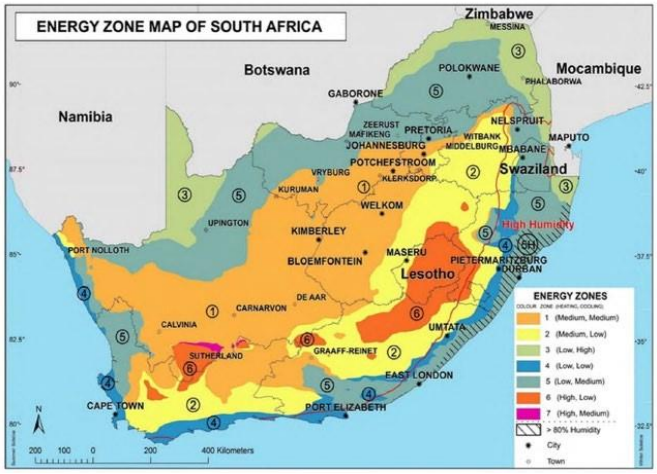


Table 1 — Maximum annual energy consumption per building classification for each energy zone (kWh/m²/a) (Energy zones as shown in figure 1 and annex C)

1	2							
Class of occupancy	**Energy zones**							
	1	**2**	**3**	**4**	**5**	**5H**	**6**	**7**
A1 **Entertainment and public assembly** Occupancy where persons gather to eat, drink, dance or participate in other recreation.	75	75	95	70	95	95	80	80
A2 **Theatrical and indoor sport** Occupancy where persons gather for the viewing of theatrical, operatic, orchestral, choral, cinematographical or sport performances.	95	95	110	90	110	110	105	105
A3 **Places of instruction** Occupancy other than primary or secondary schools, where students or other persons assemble for the purpose of tuition or learning.	110	155	110	125	140	140	120	120
A3 **Places of instruction** Occupancy where school children assemble for the purpose of tuition or learning	60	65	55	60	55	60	65	65
A4 **Worship** Occupancy where persons assemble for the purpose of worshipping.	70	45	45	40	50	40	70	70
E2 **Hospital** Occupancy where people are cared for or treated because of physical or mental disabilities and where they are generally bed-ridden.	325	335	225	295	295	230	345	345
E3 **Other institutional (residential)** Occupancy where groups of people who either are not fully fit, or who are restricted in their movements or their ability to make decisions, reside and are cared for	120	95	90	90	100	80	130	130
F1 **Large shop** Occupancy where merchandise is displayed and offered for sale to the public and the floor area exceeds 250 m².	125	200	155	180	185	150	125	125
F2 **Small shop** Occupancy where merchandise is displayed and offered for sale to the public and the floor area does not exceed 250 m².	75	150	100	125	130	95	80	80

Table 1 (*concluded*)

1	2							
Class of occupancy	**Energy zones**							
	1	**2**	**3**	**4**	**5**	**5H**	**6**	**7**
F3 Wholesaler's store Occupancy where goods are displayed and stored and where only a limited selected group of persons is present at any one time.	125	200	155	180	185	150	125	125
G1 **Offices** Large multi-storey office buildings, banks, consulting rooms and similar uses with lifts and energy consuming services that operate on a typical daytime occupancy.	90	105	110	95	110	95	100	100
G1 **Offices** Stand-alone blocks and / or campus of buildings that form an office park but operate separately	70	150	190	145	180	165	75	75
H1 **Hotel** Occupancy where persons rent furnished rooms, not being dwelling units.	125	130	100	115	125	95	140	140
H2 **Dormitory** Occupancy where groups of people are accommodated in one room	155	170	160	175	160	160	160	180
H3 **Domestic residence** Occupancy consisting of two or more dwelling units on a single site.	90	100	50	80	85	60	110	110
H4 **Dwelling house** Occupancy consisting of a dwelling unit on its own site, including a garage and other domestic outbuilding, if any.	95	100	50	80	85	60	110	110
H5 **Hospitality** Occupancy where unrelated persons rent furnished rooms on a transient basis within a dwelling house or domestic residence with sleeping accommodation for not more than 16 persons within a dwelling unit	120	130	110	120	115	135	135	135

Appendix C ALTSA Audit Reports

Lighting on APB Campus

Key Indicators	Total	
Quantities		
Old Qty Replaced	46 405	
New Qty Installed	22 533	
Power and Energy Saving		
Total Old Power	2 693 191	
Total New Power	540 241	
Max Power Saving (W)	2 152 950	80%
Monthly Old Energy (kWh)	652 751	
Monthly Energy Saving (kWh)	566 150	87%

Maintenance Saving		
Maintenance Rate (Annual % of Initial Cost)	12%	
Annual Saving on Maintenance	R 974 490	
Financial		
Total Supply Cost	R 6 908 749	
Total Installation Cost	R 1 488 765	
Total Installed Cost	R 8 397 514	
Cost per kW	R 15.54	
Prelimanary & General Cost	R 419 876	
Contingency	R 251 925	
Crushing & Disposal	R 554 232	
High Lift Equipment	R 185 000	
Total Project Cost	R 9 808 547	
Potential 12L Subsidy (After Cost)	R 1 331 585	
Total Project Cost Less 12L Subsidy	R 8 476 962	
Monthly Electricity Saving	R 922 825	
Monthly Financial + Maintenance Saving	R1 004 032	
Payback Period (Months)	9.8	
Net Monthly Cashflow Position for 5 yr rental deal	R 1 052 573	
Environmental Impacts		
Annual Savings of SO_2 (Tons)	53.9	
Annual Savings of NOx (Tons)	28.5	
Annual Savings of CO_2 (Tons)	6 726	

General Operating Hrs per Day	see quote
Days per Week	7
Electricity Rate (R/kWh - all inclusive)	R1.67
Maintenance Rate (Annual % of Initial Cost)	12%
ALTSA Retention of DOE Subsidy	30%
12L Subsidy Rate	0.7
Date of Proposal	
R/$ Exchange Rate	R 16.00
Carbon Tax Considered	1
Serviceable	
Annual Electricity Increase	10%

Key Indicators	Total	
Quantities		
Old Qty Replaced	2 698	
New Qty Installed	2 698	
Power and Energy Saving		
Total Old Power	62 485	
Total New Power	29 173	
Max Power Saving (W)	33 312	53%
Monthly Old Energy (kWh)	13 103	
Monthly Energy Saving (kWh)	9 946	76%

Maintenance Saving		
Maintenance Rate (Annual % of Initial Cost)	12%	
Annual Saving on Maintenance	R 233 983	
Financial		
Total Supply Cost	R 326 120	
Total Installation Cost	R 151 486	
Total Installed Cost	R 477 606	
Cost per kW	R 16.37	
Prelimanary & General Cost	R 23 880	
Contingency	R 0	
Crushing & Disposal	R 29 256	
High Lift Equipment	R 0	
Total Project Cost	R 530 742	
Potential 12L Subsidy (After Cost)	R 23 393	
Total Project Cost Less 12L Subsidy	R 507 350	
Monthly Electricity Saving	R 16 610	
Monthly Financial + Maintenance Saving	R36 108	
Payback Period (Months)	14.7	
Net Monthly Cashflow Position for 5 yr rental deal	R 34 198	
Environmental Impacts		
Annual Savings of SO_2 (Tons)	0.9	
Annual Savings of NOx (Tons)	0.5	
Annual Savings of CO_2 (Tons)	118	

Appendix D Planning for Level 8 Load Shedding

Summary of Load Level 8 plus potential characteristics

Power available	Level 8 – Max 14hours – average 12 hours Level 9 – Max 12hours – average 10.5 hours (estimates from ESKOM proposals) Level 10+ – Max 9.5hours – average 7.5 hours (estimates from ESKOM proposals)
Diesel available	Level 8 – Unaffected Level 9 – some outlying areas suffer delivery shortages Level 10+ – diesel consumption rises dramatically and shortages start appearing regularly
Water available	Level 8 – 1-2 days per month with flow restrictions & 1-2 days with no flow at all Level 9 – 2-3 days per month with flow restrictions & 2-3 days with no flow at all Level 10+ – 4+ days per month with flow restrictions & 4+ days with no flow at all
Data / cell use available	Level 8 – almost unaffected urban areas – minimal impact in rural areas Level 9 – a few older cell towers power down per day due to power & faults in urban areas – 5-10% of cell towers are down due to power loss per day & faults start occurring in rural areas Level 10+ – 5-10% of cell towers power down per day due to power & faults in urban areas – 10-15% of cell towers power down per day due to power & faults in rural areas
Ancillary risks	Level 8 – few additional unexpected risks BUT a. some food poisoning related possible events due to food storage no longer being very reliable b. more potential fires due to equipment forgotten on during load shedding c. some flooding due to taps / baths / showers left running during water interruptions d. knock on risks to campus security and off campus power related security problems – small increase in “darkness” theft and muggings Level 9 – further increase in unexpected ancillary risks a. food poisoning related events are much more likely due to food storage no longer being reliable

b. increased risk of residence specific fires due to equipment forgotten on during load shedding
c. some increase in UJ fleet and bus related incidents
d. flooding due to taps / baths / showers left running during water interruptions becoming common
e. knock on risks to campus security and off campus power related security problems – further increase in “darkness” theft and muggings
f. increase in cable theft in areas previously unaffected

Level 10+ – increase in ancillary risks which are no longer unexpected

a. food poisoning related events and management become common – water born disease issues emerge
b. residence specific fires due to equipment forgotten on
c. increase in UJ fleet and bus related incidents
d. flooding due to taps / baths / showers left running during water interruptions
e. almost certain risks to campus security and off campus power related security problems– increase in “darkness” theft and GBH
f. increase in cable theft in areas previously unaffected

Emergency services (fire/health etc.)

Level 8 – almost unaffected urban areas – minor impacts in rural areas

a. health services and fire most affected by water and power

Level 9 – loss of service still low probability

a. health services and fire most affected by water and power
b. time to arrive at scene of requested service can be compromised due to traffic related issues and diesel shortages
c. emergency medical transport even more affected by diesel shortages

Level 10+ – loss of service starting to become problematic for all emergency services

a. firstly simply getting calls through to the service because of cell tower dropouts and data

congestion as more and more is transacted virtually
b. ability to respond will be compromised by diesel and traffic related congestion
c. all emergency services will start having staffing related crises due to non-attendance and failure of public transport services

Additionally risk related events as load shedding escalates that are certain to eventually affect UJ in ways that are difficult to directly quantify:

1. **Staff WFH resistance as electricity becomes scarce – together with loss of generators at UJ campuses this implies inevitable reduction in staff performance – both support / admin / T&L / research**

2. **Water purity related risks (dehydration / non-potable water borne diseases / CoJ & Rand Water contamination of water sources) – potential for diarrhoea, typhoid and cholera grows**

3. **Non support equipment failures from unplanned and uncontrollable power outages – eg FS / FEBE equipment switching failures – eg ADL (Jen) failure – due to accumulated dominoing of load shedding coupled to backup generator and UPS failures**

4. **Overlapping and cascading ("dominoing") failures start to become common – eg power interruption / cable theft results in loss of power to water pumping in the community that then spill over into a UJ campus**

5. **Additional power and water interruption initiated risks to be considered include**
    a. **Battery theft becomes a major problem**
    b. **Increased cable theft**
    c. **Increased solar panel theft**
    d. **Stealing / rendering ineffective surveillance cameras – as happened in past week in E. Cape**
    e. **Reduction in infrastructure support generally – eg unblocking sewers as staffing issues escalate**

Direct results for UJ Campuses

Level 8 – Max 12 hours non supply – average 10 hours – thus uptime for generators averages 9 hours/day with major servicing every 27 days – minor servicing every 7 days

- Still able to maintain power on almost all backup generators – only low risk area backup generators may be down awaiting servicing due to workloads on diesel servicing staff
- Occasional water restrictions due to loss of pumping by CoJ and Rand Water – estimate 5-10% (1 in 10) days without sufficient water on campuses for full campus loads

Level 9 – Max 14 hours non supply – average 12 hours (estimates) – thus uptime for generators averages 11 hours/day with major servicing every 23 days – minor servicing every 6 days

- Inability to maintain power on many backup generators – triage down to Essential level backup generators – major servicing is now prioritized due to workloads on diesel servicing staff
- Probable water restrictions due to loss of pumping by CoJ and Rand Water – estimate 12-14% (1 in 7) days without sufficient water on campuses for full campus loads

Level 10+ – Max 16 hours non supply – average 13 hours (estimates) – thus uptime for generators averages 13 hours/day with major servicing every 20 days at most – minor servicing every 5 days

- Inability to maintain power on almost all backup generators – triage down to 4 Data Centre backup generators, residences on-campus and specified others; due to workloads on diesel servicing staff and pressure on SLA provider staffing shortages become common
- Definite water restrictions due to loss of pumping by CoJ and Rand Water – estimate 25% (1 in 4) days without sufficient water on campuses; 7-10% of days insufficient water even just for residences on campuses – no available water for drive-in students and staff

Other items that may need consideration

1. Direct T&L interventions implemented and their knock-on effects on service provision
2. Intercampus bus service and fuel and turn-around times given increasing traffic congestion
3. Fleet availability in case of diesel / petrol shortages
4. Socio-economic issues affecting staff / students – eg collapse of bus services due to shortages
5. Staff working changes required – prefer work at work but because of water / other shortages at home but MUST work from home – even with reduced power etc

Direct reductions / Indirect reductions / Socially driven reductions of any and perhaps all UJ customer services at various times. Managing this via social media and proper communication becomes an ever increasing burden on all support staff in addition to actual service provision and support.

Interdependencies to take into account

All Levels

- Teaching and Learning interruptions – at very high load shedding travel to campuses / supply of power / data all become increasingly problematic and require alternative considerations
- Power supply interruptions – even with backup generators continual operation will result in stoppages and failures at increased rates – leading questions of removing sensitive equipment from operation to prevent damage / finding alternative solutions
- Water supply via CoJ and ESKOM load shedding – more than 3 days at Level 6 and greater increases probabilities of water reduction
- Backup generator failures – resulting from increased operational periods and reduced ability to maintain at the 60 and 250 hour intervals
- Food related problems – due to loss of 24/7 backup power at extreme levels and coupled diesel shortages – risk of contaminated / spoilt foods from suppliers or in student residence refrigerators
- Intercampus Bus service interruption – at extreme levels of load shedding diesel shortages may make bus service diesel supply limited
- Primary health care issues – related to inability to store medicines per regulation
- Operational failure of SLA and procurement agents – eg loss of ability to buy water because of shortages / diesel / power effects
- Socio-economic issues affecting staff / students related to loss of water / sanitation / power on campuses and the impact on teaching / assessment / research – all the normal major outcomes of the UJ
- NRF publication output depends on ability to keep UJ operating – this cross dependency is critical for overall UJ operations

Other items that may need consideration

Direct reductions / Indirect reductions / Socially driven reductions of any and perhaps all UJ customer services at various times. Managing this via social media and proper communication becomes an ever increasing burden on all support staff in addition to actual service provision and support.

Sliding scale of the 85 UJ Generators use and exclusions
Similar progressions of triage may be needed for other equipment or services (eg water supply in the face of extreme reductions in supply and inability to purchase)

Level (# generators)	Nature of use and exclusions
1. Emergency (4)	2 primary Data centres only
	Main entry gate security
	On campus residences
	Water pumping / supply support
Exclusions	HVAC except for Data Centres
	All laboratories
	General security
	All support areas not connected to maintenance of the emergency generators and
2. Essential service (25)	All of Emergency
Plus	Other Data centres and routers
	Laboratories with specialist equipment that cannot be switched regularly
	Off campus residences
	General security
	Student Centres
	Libraries
	Primary health care clinics on campuses
	Hygiene only related cleaning services
Exclusions	HVAC except for Data Centres
	Normal laboratories – including computer laboratories
	All support areas not required for specific operational purposes
3. Priority service (50+)	All of Essential services
Plus	Teaching and Learning spaces – including laboratories
	Finance departments
	General cleaning services
Exclusions	HVAC except for Data Centres
4. Standard service (85+ gens)	all of Priority service
Plus	Normal support and maintenance operations levels on all campuses
	HVAC
Exclusions	Probably no exclusions at Standard service levels

	Consequence				
Likeihood	**1**	**2**	**3**	**4**	**5**
1	**Low** **Single day over weekend at Level 8** **Business as usual under Level 6 or lower – nothing to be done special operationally** **Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Monthly reviews**	**Low** **Single day during week at Level 8** **Start to mobilize social media and communication for Level 8 – make UJ aware of risk mitigation plans** **Business as usual under Level 6 or lower – nothing to be done special operationally** **Start process to ensure diesel supply and spares for backup generators** **Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Monthly reviews**	**Low** **4 consecutive days at Level 8** **Start to mobilize social media and communication for Level 8 – make UJ aware of risk mitigation plans** **Business as usual under Level 6 or lower – nothing to be done special operationally** **Start process to ensure diesel supply and spares for backup generators** **Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Weekly reviews**	**Medium** **7 consecutive days at Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Ensure residence student utility safety** **Start process to triage use of backup generators** **Switch off of unessential equipment across all campuses** **Go into emergency diesel purchase process as well as requesting additional spares for backup generators** **Arrange for WFH for all but residence students** **Arrange water, power, food parcels and data for residence students**	**High** **Level 8+ for weeks** **More than 3 weeks at Level 8 – more than simply occasional higher level** **Awareness announcements to UJ via social media and communication channels about next phase Level 10+ management** **Ensure residence student utility safety** **Start process to triage use of backup generators** **Switch off of unessential equipment across all campuses** **Go into emergency diesel purchase process as well as requesting additional spares for backup generators** **Arrange for WFH for all but residence students**

				Arrange data for all UJ staff & non-residence students **Procurement in daily review of emergency related procurement requirements** **Management: Facilities Management Daily reviews**	**Arrange water, power, food parcels and data for residence students** **Arrange data for all UJ staff & non-residence students** **Procurement in daily review of emergency related procurement requirements** **Management: Daily MEC management meetings**
2	**Low** **Single day over weekend at Level 8** **Business as usual under Level 6 or lower – nothing to be done special operationally** **Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Monthly reviews**	**Low** **Single day during week at Level 8** **Start to mobilize social media and communication for Level 8 – make UJ aware of risk mitigation plans** **Business as usual under Level 6 or lower – nothing to be done special operationally** **Start process to ensure diesel supply and spares for backup generators**	**Medium** **7 consecutive days at Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Business as usual under Level 6 or lower – nothing to be done special operationally**	**Medium** **7-14 consecutive days at Level 8 – occasional higher level** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Start process to ensure diesel supply and spares for backup generators**	**High** **Level 8+ for weeks** **More than 3 weeks at Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 10+ management** **Ensure residence student utility safety** **Arrange water, power, food parcels and data for residence students**

		Ensure facilities at residences – increase oversight of water and other utilities **Management: Facilities Management Monthly reviews**	**Start process to ensure diesel supply and spares for backup generators** **Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Bi-weekly reviews**	**Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Daily reviews**	**Arrange data for all UJ staff & non-residence students** **Procurement support to manage emergency related POs and other interventions** **Management: Bi-weekly MEC management meetings**
3	**Low** **1-2 days during week at Level 8** **Start to mobilize social media and communication for Level 8 – make UJ aware of risk mitigation plans** **Business as usual under Level 6 or lower – nothing to be done special operationally** **Start process to ensure diesel supply and spares for backup generators** **Ensure facilities at residences – increase**	**Medium** **4 consecutive days at Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Business as usual under Level 6 or lower – nothing to be done special operationally** **Start process to ensure diesel supply and spares for backup generators**	**Medium** **7-14 consecutive days at Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Business as usual under Level 6 or lower – nothing to be done special operationally** **Start process to ensure diesel supply and spares for backup generators**	**High** **14+ consecutive days at Level 8 – occasional higher level** **Awareness announcements to UJ via social media and communication channels about next phase Level 10+ management** **Ensure residence student utility safety** **Arrange water, power, food parcels and data for residence students**	**High** **21+ consecutive days at Level 8 – occasional higher level** **Awareness announcements to UJ via social media and communication channels about next phase Level 10+ management** **Ensure residence student utility safety** **Arrange water, power, food parcels and data for residence students**

	oversight of water and other utilities **Management: Facilities Management Monthly reviews**	**Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Weekly reviews**	**Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Bi-weekly reviews**	**Arrange data for all UJ staff & non-residence students** **Procurement support to manage emergency related POs and other interventions** **Management: Facilities Management Daily reviews** **Management: Bi-weekly MEC management meetings**	**Arrange data for all UJ staff & non-residence students** **Procurement support to manage emergency related POs and other interventions** **Management: Facilities Management Daily reviews** **Management: Bi-weekly MEC management meetings**
4	**Medium** **5 consecutive days at Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Business as usual under Level 6 or lower – nothing to be done special operationally**	**Medium** **7-8 consecutive days at Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Business as usual under Level 6 or lower – nothing to be done special operationally**	**High** **14+ consecutive days at Level 8 – occasional higher level** **Awareness announcements to UJ via social media and communication channels about next phase Level 10+ management** **Ensure residence student utility safety**	**High** **14+ consecutive days at Level 8 – occasional higher level** **Awareness announcements to UJ via social media and communication channels about next phase Level 10+ management** **Ensure residence student utility safety**	**Extreme** **Level 9-10 for weeks** **Possible complete Eskom grid collapse** **2-3 Weeks at Level 10+ - power and days without water on most campuses** **Arrange for WFH for all but residence students** **Arrange water, power, food parcels and data for residence students** **Arrange data for all UJ staff & non-residence students**

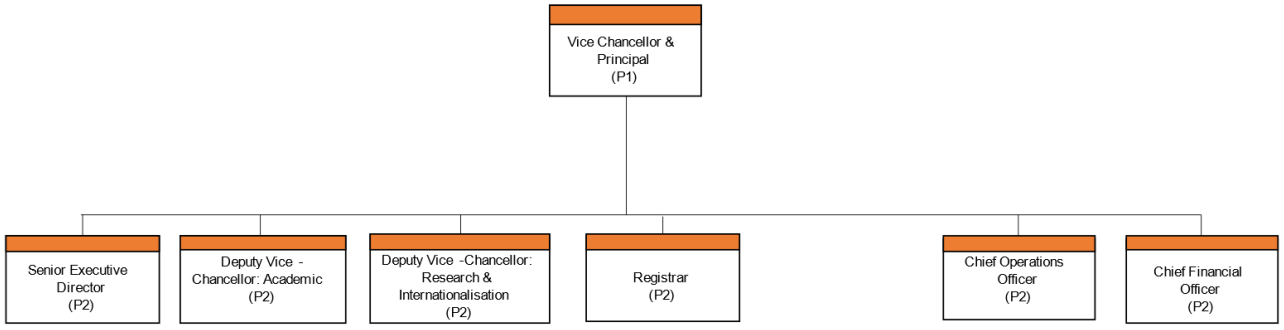
	Start process to ensure diesel supply and spares for backup generators **Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Bi-weekly reviews**	**Start process to ensure diesel supply and spares for backup generators** **Ensure facilities at residences – increase oversight of water and other utilities** **Management: Facilities Management Bi-weekly reviews**	**Arrange water, power, food parcels and data for residence students** **Arrange data for all UJ staff & non-residence students** **Procurement support to manage emergency related POs and other interventions** **Management: Bi-weekly MEC management meetings**	**Arrange water, power, food parcels and data for residence students** **Arrange data for all UJ staff & non-residence students** **Procurement support to manage emergency related POs and other interventions** **Management: Facilities Management Daily reviews** **Management: Bi-weekly MEC management meetings**	**Procurement support to manage emergency related POs and other interventions** **Management: Facilities Management Daily reviews** **Management: Daily MEC management meetings** **UJ Council briefings required**
5	**Medium** **1 week Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Ensure residence student utility safety**	**Medium** **1-2 weeks at Level 8** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Ensure residence student utility safety**	**High** **Level 9-10 for single days** **Awareness announcements to UJ via social media and communication channels about next phase Level 8 management** **Ensure residence student utility safety**	**Extreme** **Level 9-10 for weeks** **Possible complete Eskom grid collapse** **Daily awareness announcements to UJ via social media and communication channels about Level 9 and higher university procedures**	**Extreme** **Level 9-10 for weeks** **3 Weeks+ at Level 10+ - power and days without water on most campuses** **Possible complete Eskom grid collapse** **Daily awareness announcements to UJ via social media and communication channels about Level 9**

	Start process to triage use of backup generators **Switch off of unessential equipment across all campuses** **Go into emergency diesel purchase process as well as requesting additional spares for backup generators** **Arrange for WFH for all but residence students** **Arrange water, power, food parcels and data for residence students** **Arrange data for all UJ staff & non-residence students** **Procurement in daily review of emergency related procurement requirements** **Management: Facilities Management Daily reviews**	**Start process to triage use of backup generators** **Switch off of unessential equipment across all campuses** **Go into emergency diesel purchase process as well as requesting additional spares for backup generators** **Arrange for WFH for all but residence students** **Arrange water, power, food parcels and data for residence students** **Arrange data for all UJ staff & non-residence students** **Procurement in daily review of emergency related procurement requirements** **Management: Facilities Management Daily reviews**	**Start process to triage use of backup generators** **Switch off of unessential equipment across all campuses** **Go into emergency diesel purchase process as well as requesting additional spares for backup generators** **Arrange for WFH for all but residence students** **Arrange water, power, food parcels and data for residence students** **Arrange data for all UJ staff & non-residence students** **Procurement in daily review of emergency related procurement requirements** **Management: Facilities Management Daily reviews** **Management: Bi-weekly MEC management meetings**	**Arrange for WFH for all but residence students** **Arrange water, power, food parcels and data for residence students** **Go into emergency diesel purchase process as well as requesting additional spares for backup generators** **Arrange data for all UJ staff & non-residence students** **Start process to triage use of backup generators** **Switch off of all non-essential equipment across all campuses** **Procurement support to manage emergency related POs and other interventions** **Management: Facilities Management Daily reviews** **Management: Daily MEC management meetings**	**and higher university procedures** **Arrange for WFH for all but residence students** **Arrange water, power, food parcels and data for residence students** **Arrange data for all UJ staff & non-residence students** **Go into emergency diesel purchase process as well as requesting additional spares for backup generators** **Complete process to triage use of backup generators** **Switch off of all non-essential equipment across all campuses.** **Consider switching off all equipment that is not needed to ensure safety and functioning on the campuses.**

				UJ Council briefings required	**Procurement support to manage emergency related POs and other interventions** **Management: Facilities Management Daily reviews** **Management: Daily MEC management meetings** **UJ Council briefings required**

Decision Making

With the following organogram of UJ we can create a table of decision making that must be agreed to and implemented via a formal BCP type of document.



Executive Level Decision Making Required

Functionary	Level	Decisions	Approvals / Implications	Notifications
Vice Chancellor	10+	Returning residence students home	MEC to discuss and approve	Registrar SED Student Affairs COO PS ICS Procurement General UJ announcement
		Request DHET for a return to formal online study until Level 8 or lower	MEC to discuss and approve	MECA SED Student Affairs Deans COO PS
		Change of assessment period and process	MEC to discuss and approve	MECA SED Student Affairs Deans COO ICS UTC Timetables
	9	Moving staff from WFW to WFH / WFA	MEC to discuss and approve	ED HCM COO PS ICS Procurement General UJ announcement
		Moving to partial online learning	MEC to discuss and approve	MECA SED Student Affairs COO

				PS ICS Procurement General UJ announcement
		Change of assessment period and process to accommodate some online assessment again	MEC to discuss and approve	MECA SED Student Affairs Deans COO ICS UTC Timetables
		Request COJ for dispensation around power to campuses for assessment period in June and July	MEC to discuss and approve	COO Facilities Management ICS
	8	Moving staff from WFW to WFH / WFA	MEC to discuss and approve	ED HCM COO PS ICS Procurement General UJ announcement
		Request COJ for dispensation around power to campuses for assessment period in June and July	MEC to discuss and approve	COO Facilities Management ICS
Registrar	8-10+	Management of change in administration processes to accommodate inability to accommodate staff on Campus	MEC to discuss and approve	Registrar Deans COO PS

				ICS General UJ announcement
DVC Academic	10+	How to conduct assessments with limited power	MEC to discuss and approve	Registrar MECA Deans COO ICS UTC Timetable General UJ announcement
	9	Moving academic staff to WFA for all staff that can	MEC to discuss and approve	Registrar MECA Deans COO UTC Timetable General UJ announcement
	8	Together with Deans and UTC start to make plans for alternative assessments in case of severe power changes	MECA to discuss and approve	Registrar MECA Deans COO UTC Timetable General UJ announcement
CFO	10+	Prepare proposal / information document for DHET about costs to continue operations during extreme load shedding	MEC and MECA Inputs from COO and other support areas	Registrar COO ED Finex / ED FinGov ICS

	9	Enable more rapid response for especially the important additional items: increased maintenance costs of power related equipment – eg backup generators, purchasing of diesel, data, spares for equipment	MEC Inputs from COO and other support areas	COO ED Finex / ED FinGov Facilities Management
	8	Enable negotiation with important support contractors to enable rapid response to emergencies during the periods of increased load shedding – especially the following: SLA for Backup Generators / UPSs / Lifts / HVAC and electrical support	MEC Inputs from COO and other support areas	COO ED Finex / ED FinGov Facilities Management Procurement
COO	10+	Determine operational changes to all support functions	COO and Facilities Management recommendations to MEC and MECA	COO ICS UTC Timetable General UJ announcement
	9	Determine operational changes to all support functions	COO and Facilities Management recommendations to MEC and MECA	COO ICS UTC Timetable General UJ announcement
	8	Determine operational changes to all support functions	COO and Facilities Management recommendations to MEC and MECA	COO ICS UTC Timetable General UJ announcement

Operational Level Decision Making Required

Functionary	Level	Decisions	Approvals / Implications	Notifications
ED Facilities Management	10+	Managing increased levels of backup generator servicing and support	COO to approve changes	SD Campuses D CTS PS ICS Procurement
		Ensuring sufficient diesel and fleet servicing and management	Facilities Management Manco discussion	COO D Logistics PS Procurement
		Arranging porta-potties where needed when water interruptions occur	Facilities Management Manco discussion	Registrar COO SED Student Affairs SD Campuses D CTS PS Procurement General UJ announcement
	9	Moving staff from WFW to WFH / WFA	Await approval from MEC Facilities Management Manco discussion of whom moves first	COO Procurement General UJ announcement
	8	Discuss with City Power possibility for singular exceptions for large classes to the normal scheduled load shedding?	COO to approve Facilities Management Manco discussion of whom moves first	COO DVC Academic PS ICS Procurement

				General UJ announcement
CIO	8-10+	Management of change in administration processes to accommodate inability to accommodate staff on Campus	MEC to discuss and approve	Registrar Deans COO PS ICS General UJ announcement
ED PS	8-10+			
SD Campuses	8-10+			
D CTS	10+	Prepare proposal / information document for CFO to present to DHET about costs to continue operations during extreme load shedding	COO and ED Facilities Management	COO ED Finex / ED FinGov
	9			
	8			
D Logistics	10+	Determine operational changes to fleet and diesel	Facilities Management to discuss and approve	COO General UJ announcement
	9			
	8			

Probable risk items and decision making matrix

Risk	Potential mitigations	Domains	Decision Maker / Implementer	Collaboration needed	Response time expected
Water supply risk increasing: Water purchase availability Water tanker availability	Cross campus transport Increase borehole flows Purchase water	Facilities Management CTS Campuses	COO ED Facilities Management D CTS	Procurement for water purchase D Logistics to manage tankers	
Sanitation risk increasing	Water testing Porta-potties Additional external sanitation cleaning brought in	Facilities Management CTS Campuses	COO ED Facilities Management D CTS	Procurement if additional personnel required	
T&L blended lecturing level	Move more to online	Academic	DVC Academic	MECA Deans UTC Timetables	
Assessments processes	Move more to online	Academic	DVC Academic	MECA Deans UTC Timetables	
Backup power: generator failures	Battery packs to install and reduce low power running of generators	Facilities Management CTS Campuses	COO ED Facilities Management D CTS	CFO to make funds available for this Procurement for emergency purchases	+/- 3months for battery deliveries
Backup power: generator failures	SLA for repairs Triaging when necessary	Facilities Management CTS Campuses	COO ED Facilities Management D CTS	Corporate Communications to arrange notices to areas involved	Days

Backup power: generator maintenance	SLA provider management and reporting	Facilities Management CTS Campuses	COO ED Facilities Management D CTS		Days
Backup generator: diesel supply and individual generator delivery risks	Set up formal schedule and report	Facilities Management CTS Campuses	COO ED Facilities Management D CTS		
Backup generator: Spare availability	Consider pre-buying major service spares for all generators and storing in preparation for possible spare runs	Facilities Management CTS Campuses	COO ED Facilities Management D CTS		
Diesel shortages	Ensure that diesel storages are all at maximum – pre-order diesel deliveries rather than wait for low levels Ensure payment of suppliers on time	Facilities Management Logistics	ED Facilities Management D Logistics		
Data and networks: data centres	Ensure backup power stability and redundancy	ICS Facilities Management Logistics	COO CIO	Inputs from CTS to ensure alternative power supply provision when possible	
Data and networks: data use	Arrange data for staff and students	ICS	COO CIO	Procurement for data bundle purchasing Student Affairs for allocation and arrangements	

Data and networks: routers	Check on power to remote routers	ICS	COO CIO	Inputs from CTS / Campuses to correct power supply issues when possible	
Residences: liveability	Sanitation / Water / Power to ensure safe living conditions	Student Affairs	SED Student Affairs COO ED Student Affairs SD Campuses ED Facilities Management	Inputs from SA / CTS / Campuses to revisit safe living conditions on a regular basis	
Security risks: on campus	Address loss / reduced technological surveillance by deploying alternatives	PS	COO ED Student Affairs SD Campuses ED Facilities Management		
Security risks: off campus		PS	COO ED Student Affairs SD Campuses ED Facilities Management		

Special Mitigation Requirements

Special matrix for managing residence related effects etc

Level 8	Water supply on alert to purchase water / transport between campuses – depends on water tanker availability Backup generator accelerated maintenance scheduling and arrangement with SLA provider for responsiveness in excess of SLA contracted response Consider pre-buying major service spares for all generators and storing in preparation for possible spare runs Ensure that diesel storages are all at maximum – pre-order diesel deliveries rather than wait for low levels Data – minimal impact on campus networks – small impact on rural cell networks – some small costs for data provision for students
Level 9	In addition to the Level 8 mitigations Water supply on alert to purchase water / transport between campuses – depends on water tanker availability – also consider prebuying from water suppliers to reduce delivery risk Start getting porta-potties into place for periods with very reduced water flow – especially near residences Data –Reduced data availability on campuses as outlying routers powered by less reliable / important generators starts to become problematic – look to data contracts for staff and students to allow for some remote connectivity via cell networks where they are still functioning – some work from home will not be possible because of local cell networks not being reliable Backup generator accelerated maintenance scheduling and arrangement with SLA provider for responsiveness in excess of SLA contracted response Have already purchased items such as filters / other minor service spares to ensure access to spares for servicing Ensure that diesel storages are all at maximum – pre-order diesel deliveries rather than wait for low levels
Level 10	In addition to the Level 8 and 9 mitigations Definite hygiene and sanitation in major buildings on all campuses Residence liveability now depends on water restrictions / toilet effluent management and hygiene management in residences via inspections etc. Food risks are no longer ignorable and provision of some form of cooling may need to be seriously considered Diesel storage to be kept at maximum even at cost of extra deliveries – pre-order diesel deliveries rather than wait for low levels – also need to consider additional campus wide delivery scheduling for backup generator tank filling – may need additional small diesel tanker for refilling purposes

Loss of even larger backup generators due to overwork and inability to maintain at correct levels – consider request to SLA providers to station maintenance staff permanently on UJ campuses to do minor and major services on a full time basis given all 85 generators will now be working almost continually

Major services of backup generators during working hours is now affecting power delivery to most areas of all campuses – use of loan / rental machines to power major Data Centres now mandatory – at least one rental / additional purchased mid-sized machine for backup during major service periods for normal backup machines

Data –Guarantee of data transmission via cell network starting to degrade seriously – especially in outlying areas with older backup at towers – start considering alternative data routing solutions – on campus networks will degrade outside buildings and in remote areas of campuses where backup power is not guaranteed at higher load shedding levels

Security risks due to reduced technological surveillance affecting asset safety – increase foot patrolling and also drive round vehicle patrols around campuses

Gate management to become a serious risk mitigation point – zero entry policy for persons not issued with permits unless they are staff or students

On campus health service provision to be halted except for emergency care – provision of off-campus agreed service provision

Start considering purchase of backup generator replacement machines as probability of failure escalates to almost certainty for most large critical machines

Make special arrangements with off-campus emergency service providers (fire / health / safety) for special call out processes in case of cell tower loss etc

Generator fuel, service and downtime estimates

Minor Service	2 hours per generator	At Level 10 this is uncertain for all but top 50% of generators
Major Service	4 hours per generator	At Level 10 this is uncertain for all but top 25% of generators

It is recommended that spares for 2 minor services and 1 major service be kept on site and added to after each service as critical generators as spares/consumables might be hard to come by at higher levels of load-shedding and as load shedding periods become longer.

Special mitigation to include local battery storage to alleviate workloads on generators – costing and SLAs to be negotiated asap.

Down time	After Level 8 expect 10% down time on all but the critical backup generators of the data centres	At Level 10 expect 20-25% down time on all but the critical backup generators of the data centres
Fuel restrictions	After Level 8 expect diesel delivery / supply problems to reduce availability by about 5-10% for all but the critical backup generators of the data centres due to occasional shortages	At Level 10 this is almost certain to occur at least 1 to 2 times per month for all generators but the critical backup generators of the data centres.

Data network

At higher levels of load-shedding where non-essential generators will not be functioning, network services will be interrupted. This will result in the academic program, research and administration functions being interrupted on campus. This will also impact Protection Services cameras and access control as these services depend on the data network which will raise the risk profiles in terms of campus safety.

Data serving for off campus students due to water interruptions or such severe power loss and diesel interruption will add about R150/student/month to costs.

During cell tower loss it will be impossible for some off campus students to attend online classes or submit assignments etc on time due to overall data transmission interruptions in the “last mile” of network hardware.

Probability and Cost Impact Analysis

Part of the risk and probability analysis is to determine to what extent the various levels of risk can

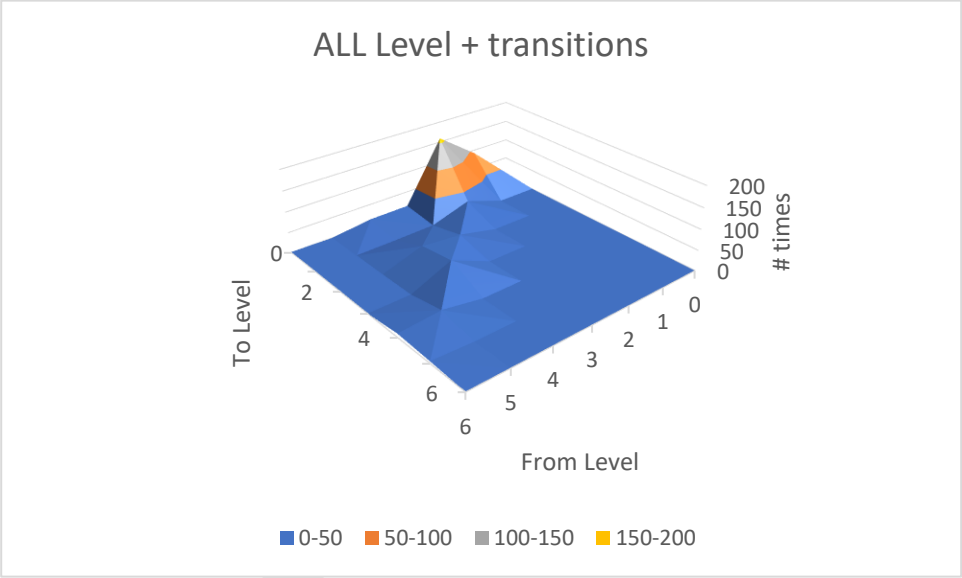
1. Firstly estimate probability of event risks.
    a. We will use the ESP data to do basic estimation of event risk.
    b. We analyse the ESP data to create simple regression models of the load level transition probabilities for the event risks.
2. Secondly estimate costs for the various cases
    a. Events
    b. Mitigations
    c. Cross impacts
3. Thirdly combine the first and second into a probability cost estimate for daily costs as well as 1 month potential maximum excess costs.
4. After the analysis and consideration of mitigations beyond simple replacement (eg the decision to close campuses at Level 10 will change costs) implement such strategic potential moves into the model to determine cost mitigation possible if that route is followed.

Monte Carlo Simulation results

A simulation was produced along the lines of the discussion above. It takes into account the following:

1. Actual hours from ESP[3] for estimating actual transitions up, stay and down once we enter from level 6 into a level 8 and higher state.

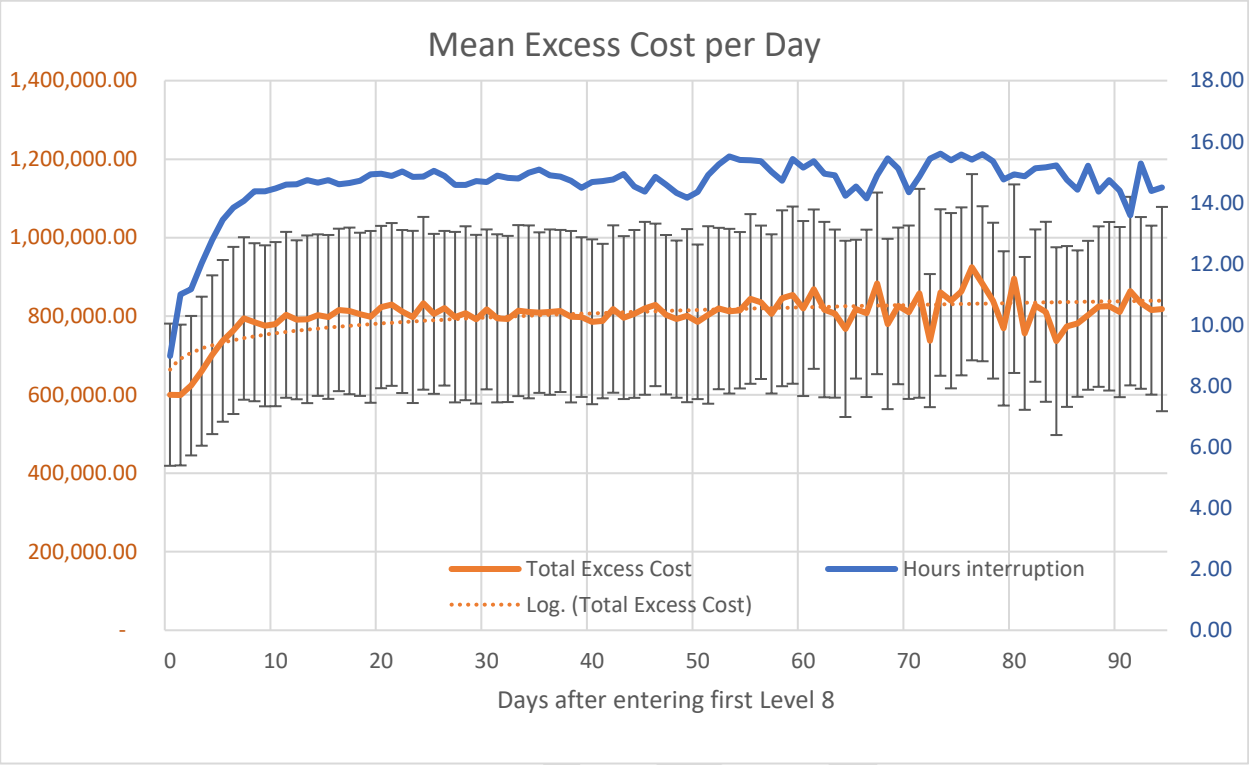
UPS									
Levels		To							
From		0	1	2	3	4	5	6	
	0		92	159	13	12		1	277
	1			32	3	1			36
	2				22	31			53
	3					42	1		43
	4						17	9	26
	5							5	5
	6								0
		0	92	191	38	86	18	15	

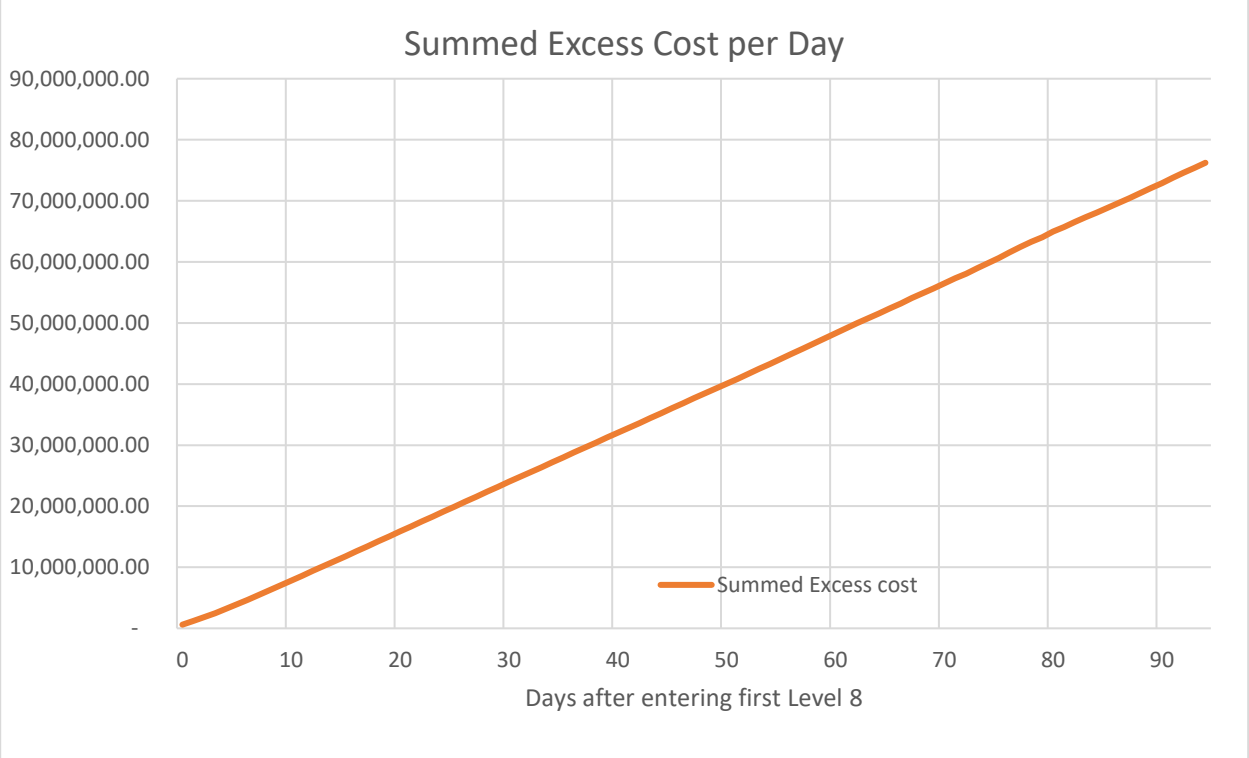


2. Actual costs for diesel usage as collected for January to February 2023 – at the point where we have the correct number of generators and actual high fuel usage levels
3. Actual costs for backup generator servicing as collected for January to February 2023.
4. Actual hours water interruption deduced from UJ data for September 2022 to February 2023 correlated to the power load shedding levels.
5. Actual water costs per litre for CoJ, UJ Trucked and Bought water when there is a water interruption.

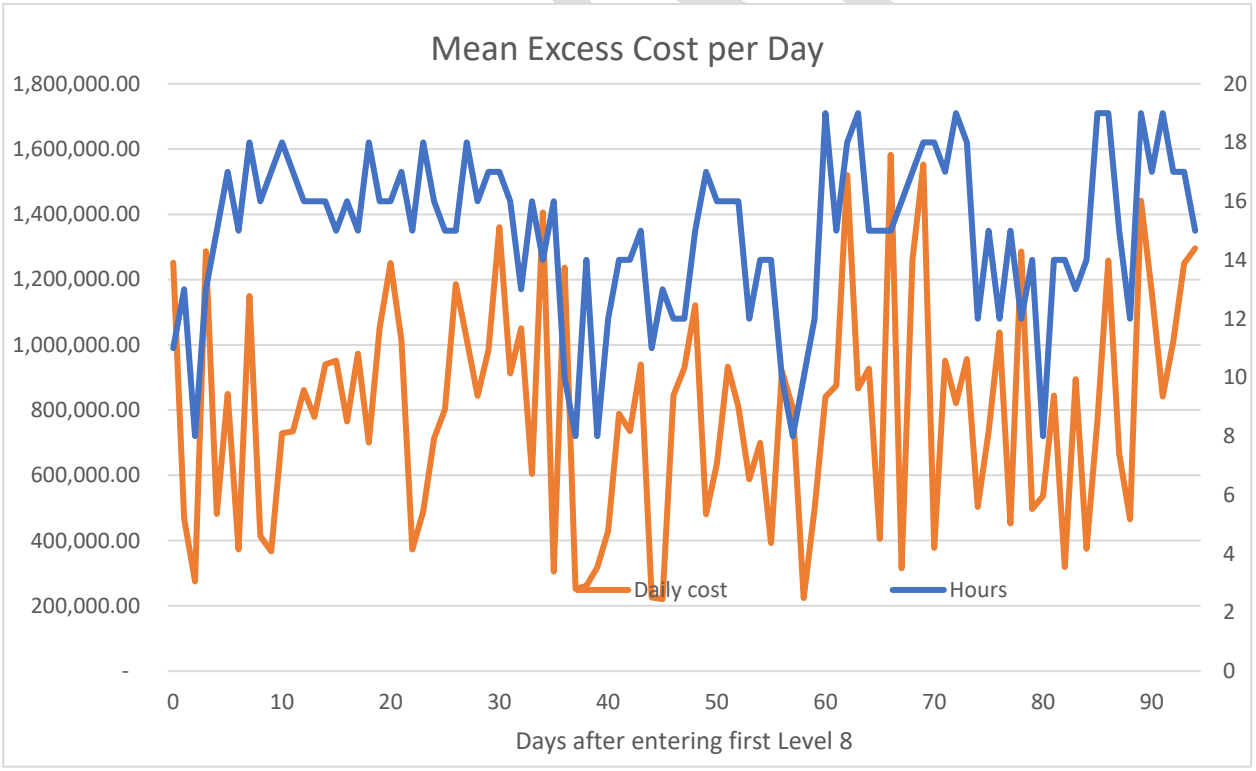
[3] Eskom Se Push – they provided fully documented exact load shedding levels, start and end times as well as intervening (non-shedding) data

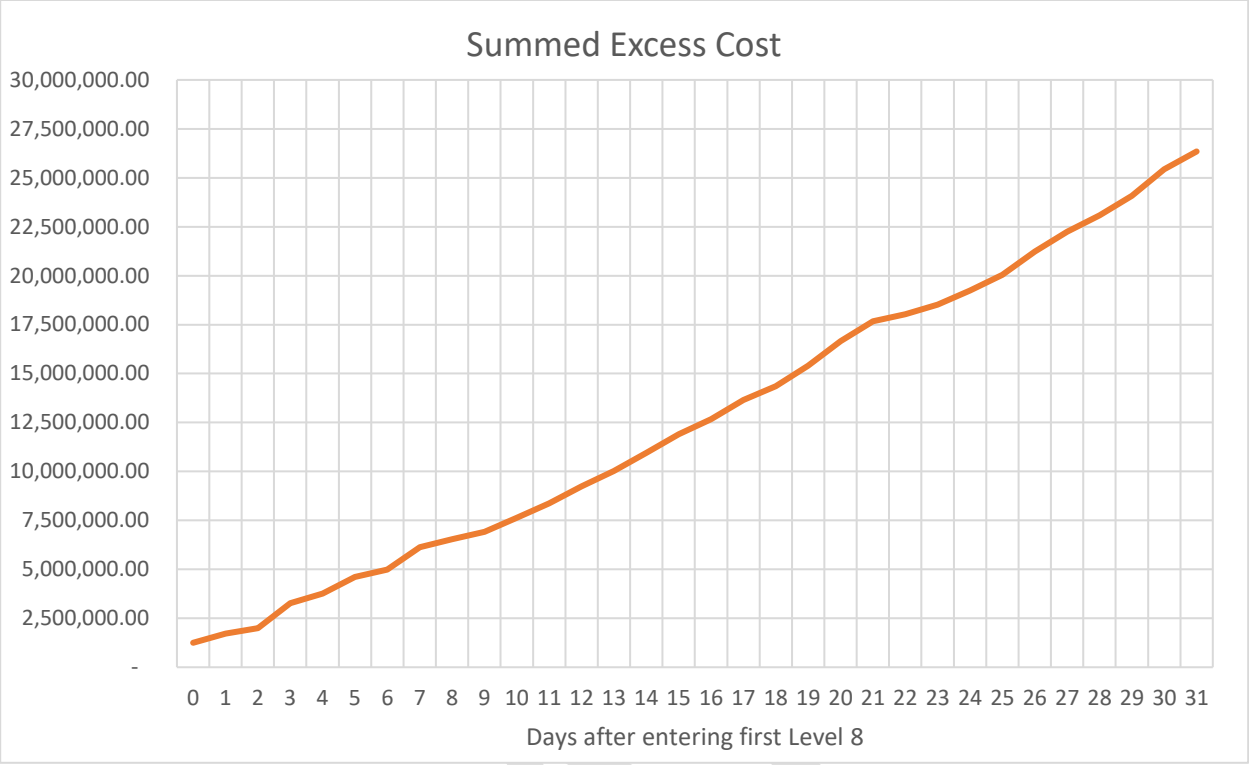
6. Actual data costs per student / staff member when there are data interruptions.





Any particular example 100 day period could look like





Note that improvements to the model could be made, additional elements could be introduced to model strategic decisions around managing risks of having many people on campuses at Level 10 because of water, diesel shortages or the inability of essential services to respond to risky events on the campuses, or the addition of total grid (on campus or country wide) failure.

Appendix E Backup Generators per Campus

APB Bunting Road Generators

Set	Make	Model	Serial number	Location
APB 01	100 kVA Kirloskar	6R1080T	6H.2412/0800026	Kilimanjaro Res
APB 02	150 kVA Kirloskar	6SL9088TA	F6.2316/0800021	Horison Res
APB 03	200 kVA Doosan	PO86TI	EBPOA803400	Con Cowan
APB 04	100 kVA Kirloskar	6R1080T	6H.2412/0800034	Security Office
APB 05	320 kVA Zest Baudouin	6M16G330/5EZ	4918L000513	STH Building
APB 06	313 kVA Scania	DC1260A	6520455	FADA Building
APB 07	150 kVA Kirloskar	6SL9088TA	F6.2316/0800023	Great Hall
APB 08	115 kVA Cummins	85DGDB(19E4)	45047665	Block A
APB 09	150 kVA Kirloskar	6SL9088TA	F6.2316/0800022	Block B
APB 10	200 kVA Kirloskar	6SL1500TA	F6.2511/0800033	Library
APB 11	100 kVA Kirloskar	6R1080T	6H.2412/0800024	Mayine Residence

APK Auckland Park Kingsway Generators

Set	Make	Model	Serial number	Location
APK 01	200 kVA Kirloskar	6SL1500DTA	F6.2511/0800031	Impumelelo Res
APK 02	100 kVA Rolls Royce	656U	1399B27	Moshate Heights Res
APK 03	100 kVA Kirloskar	6SL9088TA	6H.2412/0800036	Oppirif Res
APK 04	300 kVA Scania	DC1260A	6520257	D4 Lab (Aquarium)
APK 05	300 kVA Scania	DC1260A	6520210	Clinic
APK 06	630 kVA Volvo	VP187933	D16*061594*C3*A	D Lab Basement
APK 07	250 kVA Perkins	HCK44C	820494C4	C Les
APK 08	275 kVA Perkins	HCK44C	820494.C4	B Les
APK 09	300 kVA Scania	DC1260A	6520256	C Lab
APK 10	400 kVA Scania	DC1260A	6520657	Core 1
APK 11	630 kVA Volvo	TWD1643GE	D16*03826*C3*A	A Ring
APK 12	300 Kva Kirloskar	6SL1500TA	F6.2511/0300003	Library
APK 13	50 kVA Kirloskar	4R1040T	4H2447/0500001	Art Gallery
APK 14	30 kVA Kirloskar	4R1040T	4H.2078/0800020	Nano Building
APK 15	140 kVA Perkins		3777U03B/1	B2 Lab (Cybernetics)
APK 16	87.5 kVA Detroit	10437005	4A0208753	Central Machine Room /Boiler Room
APK 17	-	-	-	-
APK 18	60 kVA Lovol	1004TG14	HC523556Y	Molesey/ VC House
APK 19	15 kVA Megatron	4045TF158	CD4045C073677	Chiselhurst 21 Hse
APK 20	250 kVA Doosan	P126T1	ED10C802811	Sophiatown

DFC Doornfontein Generators

Set	Make	Model	Serial number	Location
DFC 01	50 kVA Kirloskar	4R1040T	4H.2447/0800044	Louisa Street
DFC 02	150 kVA Kirloskar	6SL9088TA	F62316/0800019	Synagogue
DFC 03	100 kVA Scania	DC1260A	6520382	Clinic
DFC 04	300 kVA Cummins	NT855G4	23222830	John Orr Building (Library)
DFC 05	100 kVA Kirloskar	6R1080T	6H2412/0800032	Transport Building
DFC 06	200 kVA Kirloskar	6SL1500TA	F6.2511/0800032	Admin Block
DFC 07	100 kVA Kirloskar	6R1080T	6H.2412/0800035	Phumlani Res
DFC 08	100 kVA Kirloskar	6R1080T	6H.2412/0800023	Gauta Ladies Res
DFC 09	200 kVA Kirloskar	6SL1500TA	F6.2511/0400001	Civil Engineering Building
DFC 10	1000kVA/ 1mVA Cummins	QST30G4	37256633	Perskor
DFC 11	100 kVA Kirloskar	6R1080T	6H2412/0800038	Buxton Street Building
DFC 12	100 kVA Kirloskar	6R1080T	6H2412/0800031	Robin Crest Residence
DFC 13	100 kVA Kirloskar	6R1080T	6H2412/0800030	Akanani Res/ Sun Valley Res
DFC 14	500 kVA Volvo		2016109428	Habitat
DFC 15	100 kVA Kirloskar	6R1080T	6h2412/0800037	Lesedi Res

SWC Soweto Campus Generators

Set	Make	Model	Serial number	Location
SWC 01	300 kVA Doosan	P126P1-11	EDICB803527	khamba B & D (room 123
SWC 02	200 kVA John Deere	6081HF001	RG6081HF001	Imbizo
SWC 03	200 kVA John Deere	6068HF258	CD6068C037980	Arena
SWC 04	525 kVA Doosan	P180LE	800509EASOA	Robert Sobukwe/Ulwazi
SWC 05	450 kVA Doosan	P180LE	EAS0A800491	Braam Fischer
SWC 06	200 kvVA Doosan	PO86TI	EBPOA83346	Hector Peterson
SWC 07	100 kVA John Deere	6068TF158	CD6068C039501	Sports Centre
SWC 08	65 kVA Fawde	*010 444 32*	CA4110-125Z-09D	Lecture Venue (School)
SWC 09	100 kVA Kirloskar	6R1080P	6H.241/0800033	Mobile Gen

x Extra Gensets

Set	Make	Model	Serial number	Location
1	300KVA Volvo			Lebone, Afslaan Res 1
2	300KVA			Lebone, Afslaan Res 2
3	300KVA			Lebone, Afslaan Res 3
4	300KVA			STH
5	400KVA			SWC new Res
6	60KVA			Kopano Residence
7	400KVA Volvo			UJ on Empire
8	200KVA John Deere			UJ on Empire
9	300KVA Volvo			APK Thomas Sankara
10	PERKINS 62.5KVA			APK VC House No.3
11	200KVA John Deere			APK Karibu Jamii Residence
12	500KVA Perkins			APK JBS Park (Media24)
13	500KVA Perkins			APK JBS Park (Media 24)
14	VOLVO 50KVA			APK Centre For African China
15	VOLVO 60KVA			APK 11 Streatley White house
16	350KVA Volvo			APK Impumelelo
17	150KVA Perkins			APK TechnoLab B2 LAB 225

Appendix F DHET ENERGY PLAN QUESTIONAIRE (2023)

GUIDELINES	QUESTIONNAIRE
8. Accountability and Governance for Energy Planning & Operations **1.1 Individual/s Accountable for Drafting and Implementing the Energy Plan** Each HEI must have a staff member at a senior (director or executive director) that is accountable for the energy plan for an HEI. This person must have intimate knowledge of the Energy Plan and is typically the person that would be largely responsible for its implementation. This is typically a director in the estates and or facilities property/maintenance/operations departments. In certain cases, there may have been consultants/external experts involved in the drafting of the plan or even some parts of the implementation of the plan. This detail will be contained in the plan stipulating the individual or individual/s at a senior management level directing this work. The individual/s and their reporting lines should be indicated in the Energy Plan via an organogram. The plan should also indicate whether the resources supporting the Energy Plan are adequate or what additional resources are required and when these would be in place by.	*Name of Institution:* ***University of Johannesburg*** *Name of person that completed the questionnaire:* ***Mr K Nkwana*** *Role/designation of person that completed the questionnaire:* ***Executive Director Facilities Management*** *Email address:* ***knkwana@uj.ac.za*** *Contact telephone number:* **1. Accountability and Governance for Energy Planning & Operations** **1.1 Individual/s Accountable for Drafting and Implementing the Energy Plan** a) Does your HEI have a director/executive director that is responsible for and has capacity to draft an Energy Plan for the university? If not, please highlight this here and continue to answer all the questions as far as possible. **Falls under the Executive Director but UJ also has a Director Sustainability, Environment and Utilities.** b) What are the directors/executive directors' names responsible for the drafting and implementation of the Energy Plan at your HEI? **Executive Director: Mr K Nkwana** **Director: Mr T Kuntwane** c) Please note the section of the Energy Plan where this is specified.

	1.2 Governance ComUJtee Accountable for Drafting and Implementing the Energy Plan a) What is the name of the governance comUJtee that has oversight over the Energy Plan at your HEI and what is the reporting line into the HEI's Council from there? **The Physical Resources ComUJtee of Council – reports directly into UJ Council** b) How often does this comUJtee discuss the Energy Plan? **Annually until 2023** **Quarterly in future** c) Which roles are represented on this comUJtee? **3 UJ Council members** **Vice Chancellor** **Chief Operating Officer** **Executive Director Facilities Management** d) Please note the section of the Energy Plan where this is specified.

2. Scope & Applicability of the Energy Plan The Energy Plan must define and delineate the boundaries and areas covered by the plan. This could include from bulk supply from Eskom/local council to bulk distribution network, all areas, and buildings for which the HEI is responsible for. The plan also needs to indicate whether there are any HE areas/buildings responsible by others or shared. This includes leased property/buildings to a third party who is responsible for their own energy management. The Energy Plan should typically cover all the HEI's departments and faculties but should indicate if any departments/faculties are excluded from the plan and why that is the case.	**2. Scope & Applicability of the Energy Plan** a) Has the entire HEI been covered by the Energy Plan? If not, which buildings/departments have been excluded and why? **The complete UJ is involved** b) Please note the section of the Energy Plan where this is specified.

3. Energy Security Energy security planning within the Energy Plan is essential in the current context of **Energy Crises** and the ongoing Eskom load shedding. The Energy Plan must contain a **high-level overview of how the HEI manages/plans to deal with ongoing load shedding (energy crisis). This crisis** imposed by Eskom on a daily/regular basis does not have a clear end in sight, which is why the Energy Plan is critical for every HEI. The Energy Plan should indicate what the short-term plans are to deal with more immediate critical aspects of energy security and include a broad outline of the medium- to long-term plans. Some HEIs will already have large central diesel generators covering entire campuses or parts thereof, while others will have smaller distributed generators serving specific buildings on a campus. HEI's may have various other systems and interventions in place including inverters with batteries. The Energy Plan should clearly indicate the current state and kind of systems that are in place. In addition, the plan should indicate how much coverage these back-up systems provide to various HEI activities and what the planned future state and intended coverage of these systems is, including estimated timelines for implementation of these longer-term plans. Where batteries are installed, the typical run-time should be indicated, for example, 2 hours, 4 hours, 6 hours etc. Where the HEIs do not have full back-up power to all parts of the campus it is important to indicate in this section of the Energy Plan **what is given priority** in terms of back-up power provision. A typical prioritized list may include Occupational Health & Safety, Teaching, Research, ICT systems and support, ComUJtee Meetings, Exams, Sports Events etc.	**3. Energy Security** a) Does your HEI have a detailed plan for energy security to allow your HEI activities to continue during Eskom's national load shedding? **Yes** b) Please note the section of the Energy Plan where this is specified. c) If not, please indicate whether your HEI needs assistance from DHET to prepare a plan to deal with energy security due to load shedding. d) Does your HEI have full back-up power to all campuses or only partial back-up power during load shedding? **All Teaching and Learning areas as well as student residences have 100% backup of basic power** **All networks and data centres have 100% backup** **Approximately 85% of total campus areas has 100% backup** e) Please note the section of the Energy Plan where this is specified. f) Does your HEI have sufficient funds to deal with energy security issues? **Probably not since UJ is attempting to take whole campuses completely off-grid and in other cases to replace multiple backup generators with single point power solutions for complete campuses** g) Does your HEI have any digital systems to help manage energy infrastructure during load shedding?

The **cost requirements** of these energy security plans needs to be understood and described in the Energy Plan, both in terms of capital cost and operational cost, and how these will be funded, even if it is simply an approximate indication for various years going forward for the next 5-10 years. Any **critical service providers** should also be noted in the Energy Plan regarding energy security. For example, a service provider that tops up the diesel to all the generators, or inspects the status of batteries etc.	**We do have automated switching on all backup power generators and the campus electrical grid structures. There is however at present no overall digital control of all generators from a central location. In the future this may be considered a possibility but will depend on the present UJ Smart Campus Initiative that is actively being developed. While load shedding resilience is important UJ is planning for a future beyond the present load shedding and where an integrated multicampus Smart Campus solution will be used to optimize at a central campus level.** **All present critical service providers (eg backup generator maintenance, UPS maintenance and electrical utility maintenance) are all presently outsourced to commercial entities and are all covered by standard UJ SLAs. All critical service providers are also appointed / renewed on a maximum of a three year period for support after extensive technical and tendering processes.** h) Please note the section of the Energy Plan where this is specified.

4. Embedded Renewable Energy To help HEIs be less reliant on external energy sources, and be more environmentally and financially sustainable, HEIs must include a renewable energy mix in their Energy Plan to help them do so. While most HEI are primarily reliant on ESKOM coal fired power supply, institutions need to change the energy mix to one which reduces the impact on the planet, specifically to reduce greenhouse gas emission (carbon footprint). There are many forms of renewable energy, notably solar photovoltaic (PV), wind, hydro, and wave/tidal power. The most common and well established is rooftop solar photovoltaic (PV) or car park shade structure PV systems, which is often also the most cost effective. The Energy Plan should detail the size of the type of renewable systems installed and planned future installation with estimated cost and timeframes to implement these systems. It is also recommended that HEIs prepare an annual carbon footprint report using the international greenhouse gas protocol. This is not a requirement of the Energy Plan but is important for HEIs to consider how and when they will start measuring and reporting on their carbon footprint, which will be largely influenced by the energy mix of the campus.	**4. Embedded Renewable Energy** a) Does your HEI have any renewable energy systems installed? If so, what type and what size (in kWp)? **Yes** **At present UJ has solar PV already installed at > 2 000kWp** **At present UJ has solar thermal water heating already installed at > 500kWp** b) Does your HEI have plans to install any renewable energy systems soon (next 5 years)? If so, what type and what size (in kWp)? **Yes** **We are already planning for at least 2 000kWp more solar PV in the coming 3 years** c) Please note the section of the Energy Plan where this is specified. d) Does your HEI measure and report on its carbon footprint? If yes, please provide a link to the most recent report published. If no, please confirm when your HEI plans to issue the first report and who is responsible for this report. **Yes we do measure and report**

5. Energy Monitoring and Management Systems The Energy Plan should indicate what measuring, monitoring and control systems are currently in place to manage the energy systems, and what firm plans are in place for roll out to extend and improve such systems, indicating an approximate timeline for these. The Energy Plan should indicate what additional funding is required to roll out these systems and whether the HEI will likely have the funding to do so. The Energy Plan should specify who monitors these energy management systems and how much time they are able to dedicate to this. It is important to specify the name of the systems used so that stakeholders may share information and lessons learned across the HE sectors. Other HEIs could be familiar with these systems and share valuable insights about these systems with one another.	**5. Energy Monitoring and Management Systems** a) Does your HEI have energy meters installed per building? **Electrical meters at each building** b) Does your HEI have any energy management or building management systems installed to any buildings / systems / campuses? If so, to what extent? **Not yet** c) Does your HEI has dedicated staff that monitors the energy management / building management systems? **Not yet as we do not have installed energy management. The Dir Sustainability, Environment and Utilities is however charged with electrical utility management at a campus and organizational level. He reports on this to the Executive Director Facilities Management and the COO.** d) Please note the section of the Energy Plan where this is specified.

6. Ongoing Maintenance of Energy Infrastructure The Energy Plan must provide a broad **overview of the of the resources required for Operations and Maintenance of all electrical infrastructure both MV and LV. This includes required ongoing maintenance and operations plans, systems and personnel.** The section in the Energy Plan should highlight any major changes proposed to the overall electrical infrastructure masterplan, which should be accompanied by estimated cost and timeframes to implement such a masterplan. An **organogram of staff involved** in the ongoing maintenance and operations of the energy systems and infrastructure should be included. The Energy Plan An indication of what the **annual budgeting process** is for the ongoing maintenance and operations of the energy systems and infrastructure and who is responsible for drawing up the budget.	**6. Ongoing Maintenance of Energy Infrastructure** a) Does your HEI have a set maintenance regime for energy systems and infrastructure? **Yes all equipment is on standard SLAs for external service providers** b) Who is responsible for managing this system and what are their qualifications? **External suppliers via tenders – includes qualification and other technical aspects** c) Who is responsible for drawing up the budget for the maintenance regime for energy systems and infrastructure at your HEI? **Executive Director Facilities Management** d) Please note the section of the Energy Plan where this is specified.

7. Energy Efficiency and Energy Reduction Plans The Energy Plan needs to contain a list of **energy efficiency projects/initiatives of existing buildings/infrastructure. It must include energy efficiency targets and plans for new buildings. This part of the plan will describe how the HEI plan to** reduce its ongoing energy consumption, that will result in a reduction in **energy consumption, utility costs and greenhouse gas emissions.** **Graphs and metrics** related to current and future overall energy consumption patterns would be an added benefit in the Energy Plan. While each individual building's detailed energy consumption is not required – but rather patterns, trends, benchmarks observed over the past few years, including any broad targets for various types of buildings. Any **energy audits** of HEI buildings that have been completed should be highlighted in the Energy Plan, but do not need to be listed – an indication of how many buildings have been audited and how many are not yet audited would be useful in the Energy Plan. An indication of by when any remaining buildings plan to be audited by would be useful. HEIs are to indicate what plans they have in place to issue **Energy Performance Certificates** for those buildings now required by the new regulation (to be in place by December 2025). Any **regulatory and voluntary standards** that the HEIs follow in terms of energy efficiency, should be noted in the Energy Plan, including any HEI policies that are in place to support this. The **cost requirements** of these energy efficiency plans need to be understood and	**7. Energy Efficiency and Energy Reduction Plans** a) Does your HEI implement energy efficiency changes to existing buildings? **UJ is presently planning this now that we have EPC certification figures** b) Is this a regular activity or more random/hap-hazard? **Planned now that we have the EPC measures and certification complete** c) Does your HEI implement energy efficiency on new buildings? **Yes – all have designed in energy and water efficiency as part of the design process** d) What regulatory or voluntary standards are used for energy efficiency at your HEI? **UJ presently complies fully with the EPC requirements** e) What are typically your annual targets (in %) for the overall HEI energy consumption reduction and how often do you meet these targets? **Generally 5-6% per annum** f) What are your longer-term energy reduction targets (in % for 5 years' time or 10 years' time) for the overall HEI? **UJ Facilities Management aims for a 50% power consumption reduction from the 2015 baseline by 2035 at the latest.** g) How many buildings have undergone an energy audit and how many not? **All that are required for EPC certification have been certified per the regulations – we will extend to non-required buildings as soon as funds are available**

described in the Energy Plan. Both in terms of capital cost and operational cost, and how these will be funded, even if it is simply an approximate indication. The Energy Plan can give an indication of how much money will be saved annually from energy efficiency interventions proposed over any specific periods soon (or implemented in the past).	h) Has your HEI already completed the required EPCs for all the relevant buildings? If not, what is the plan for this to be done in time to meet the new regulation? **UJ completed per legislation by the original reporting date of 31 December 2022** i) Please note the section of the Energy Plan where this is specified.
8. Communicating the Energy Plan to HEI stakeholders The Energy Plan must provide an overview of what the plan is to communicate the Energy Plan to the HEI staff and students. While indicating how frequently and what level of detail and via what medium this communication will take place. The Energy Plan must indicate what department or person is responsible to manage the communication of the Energy Plan to the HEI community.	**8. Communicating the Energy Plan to HEI stakeholders** a) How often do communications go out to the HEI community about the Energy Plan? **Not yet except via the VC's newsletters and campus visits** **A new Communication Plan has been developed and will take formal shape in early 2024.** b) Who is responsible for these communications? **This is presently residing with the Executive Director Facilities Management but may be delegated in the near future.** c) Please note the section of the Energy Plan where this is specified.

9. Updates to the Energy Plan The Energy Plan should indicate when the next update to the plan is expected and why that is the proposed timing.	**9. Updates to the Energy Plan** The Energy Plan should indicate when the next update to the plan is expected and why that is the proposed timing. **All UJ Policies and Plans have mandatory review dates.**
10. Appendices to the Energy Plan The Energy Plan may have some appendices that are included, which are referenced in the plan. Although one always needs to avoid giving too much detail in the actual report. Examples of this could be schematics, audited building list, more graphs of energy consumption patterns, back-up power source list etc.	**10. Appendices to the Energy Plan** List any of the appendices that you feel are important for DHET to be aware of in the Energy Plan. **EPC building certifications** **Backup Generators in place** **UPSs in place** **Load Shedding Level 8 Plus Planning** **Annual PRCC Performance Targets**

Appendix G 2022 UJ ANNUAL SUSTAINABILITY REPORT

2015 - 2022

University of Johannesburg GRI G4 Sustainability Report

An International University of choice, anchored in Africa, dynamically shaping the future

Contents

A Message from the Vice Chancellor

To be added when the remainder of the document is approved.

Executive Summary

During the past 6 years that UJ have been actively tracking our performance in sustainability we as an institution have broadened the scope of the targets we track from a simply electrical energy carbon estimate through to an extensive model that includes our sustainability within a broader range of areas.

From 2015 we have already reduced our broadest measure of carbon generation by 38% - which given the extension of our carbon generation categories and improved level of data capture implies that in fact we have performed substantially better than this number. At this point we have in the past twelve months only missed a single target – reduction in diesel consumption for generator use as a direct result of the increase in South African load shedding due to the national supplier ESKOM – while meeting all other targets and exceeding many by substantial margins.

UJ Statement of Support for the 17 UN Sustainability Development Goals

Since 2015, the Council of the University of Johannesburg (Council) has started a process of addressing the 17 UN Sustainability Development Goals (SDGs) as enunciated at various times. UJ has embraced the SGDs and recognize the importance of the call for action by countries and institutions to develop actionable programs that will result in a more sustainable institution and will ignite similar efforts at other South African Higher Education Institutions (HEIs). (A full SGD listing is given in Appendix III).

We have incorporated the UN SDGs into a number of the institutional Policies and operations and Facilities Management strives to develop improvements in all resource usage especially where these are related to the UN SDGs. In addition, we promote these ideals to all markets in which we have an active presence, proving they are a vital component of our strategic direction.

Our commitment to sustainability is a statement of our progress, our achievements and our goals for the future. Transparency is a fundamental part of our activities and we ensure that information pertaining to the economic, social and environmental impact of our operations is accessible and available to all stakeholders.

This sustainability report provides a report on each of the 17 SDGs and also a detailed presentation of our performance in a select number of the SDGs that UJ Facilities Management can actively address.

The structure of the report

This report is developed according to the GRI G4 guidelines as indicated at the GRI website and the information relates to the year 2021 with reference to a pre-reporting period of the year 2015 for all UJ campuses and off site facilities. This is the first UJ GRI G4 sustainability report and has been prepared in 2022 using the relevant GRI G4 guidelines. Since there have been substantial changes in UJ's then, no significant changes regarding to the organization's size, structure, ownership or supply chain have occurred.

Furthermore, no restatements of information or significant changes in the Scope and

Making this document available to stakeholders

UJ has no restrictions on the dissemination of this document or any of its sustainability related reporting. A formal communication process of the annual performance within UJ is as follows:

1. All data is collated and worked into the reporting structure with UJ Facilities Management under the guidance of the Director: Sustainability, Health, Environment and Utilities
2. The collated data is reported to the MEC (Management Executive Committee) and the PRCC (Physical

Resources Committee of Council) via measure based against a prior year target system in the PRCC Annual Performance Plan's targets.

3. The collated data is also summarized into the Facilities Management Annual Report as abstracted in the UJ Annual Report.

4. The final reporting via this document attempts to provide a nuanced review of UJ's achievements according to its stated Energy, Resource, and Waste Policy.

The Profile of the University of Johannesburg

The Nature of the business

UJ is a national HEI in South Africa located in the city of Johannesburg. It was formally brought into existence via the merging of three prior HEIs as mandated by the South African Department of Higher Education and Training in January 2005. Its predecessor institutions were

1. The Randse Afrikaanse Universiteit – and Afrikaans language university in Auckland Park, Jhb
2. The Technikon Witwatersrand – an English language technical college in Doornfontein, Jhb
3. The Vista University – an English language university in Soweto, Jhb

The merger resulted in a university of about 40 000 students at that time spanning the full gamut of normal faculties but excluding a medical faculty with a teaching hospital.

UJ, in 2021, operates on four campuses, namely the Auckland Park Bunting Road Campus; the Auckland Park Kingsway Campus; the Doornfontein Campus; and the Soweto Campus. Images of the campuses can be viewed on the 'Welcome to the UJ Virtual Campus' webpage at https://www.uj.ac.za/pages/virtualcampus.aspx. Knowledge domains are structured into seven faculties, one college, and a business school. These are:

- Faculty of Art, Design and Architecture (FADA)
- Faculty of Education (FE)
- Faculty of Engineering & Built Environment (FEBE)
- Faculty of Health Sciences (FHS)
- Faculty of Humanities (FH)
- Faculty of Law (FL)
- Faculty of Science (FS)
- College of Business and Economics (CBE)
- Johannesburg Business School (JBS)

Initially a school in the CBE, the JBS was subsequently established as a separate entity, with its own Dean, and with the status of a UJ faculty as of 2020.

Since its early days as a 'merged' institution, UJ has transformed into a diverse, inclusive, transformational and collegial institution, with a student population of over 50 000, of whom more than 3000 are international students from 80 countries.

The University's vision, mission and values enable it to be a Pan-African University committed to contributing to our country, continent and the development of our people. UJ recognises that it is more than the sum of our parts and is committed to excellence in teaching, learning, knowledge production and academic freedom. UJ is committed to creating a path for access for its students and constantly strives to ensure that every student has access to affordable and high-quality education in an environment that is diverse, respectful and inclusive. There is a recognition that student access and success cannot be separated, and the University sees itself as having an obligation to provide effective support and a vibrant learning environment to enable its students to achieve.

Towards Sustainability

UJ has been guided towards a more responsible attitude to sustainability since 2015 when the UJ Council mandated the PRCC to institute targets for energy and water consumption. These targets have over time evolved to include management of waste, reporting on the generation sources of power, the use of gas to reduce carbon emissions, the use of solar power and a host of second and third tier sustainability targets and principles.

Reach of Activities

UJ operates nationally as a HEI in South Africa with four main campuses within the greater Johannesburg metropolitan area. The campuses are composed of a variety of teaching and learning spaces, research laboratories, administrative buildings, student residences and retail rental locations (in which student services support companies are active. In total Uj has a total of around 600 000m^2 of covered space and a limited number of sports grounds in the vicinity of the various campuses.

Activities of UJ include

1. Undergraduate teaching and learning – supporting about 44 000 students
2. Post graduate teaching and learning – supporting about 4 000 students

3. Post graduate research based studies – supporting about 3 000 students
4. General academic research projects
5. Academic support services
6. Contract research services for external clients via research entities within UJ
7. A significant number of South African Research Chair Initiative supported academics and groups
8. Commercial development support services
9. Financial and procurement functions
10. A large Facilities Management group
11. Community teaching support within Soweto
12. International collaboration arrangements with a number of international academic institutions
13. A UJ Confucius Institute group
14. A number of DSI Technology Innovation Agency supported research groups such as PEETS
15. Community engagement projects

Climate Committee

The Climate Committee (a sub-committee of the Senate) of UJ is a forum developed to specifically enable a number of stakeholders from staff, students, tenants and consultants. Until the Covid-19 pandemic struck the Climate Committee met bi-annually to consider those issues relevant to the various stakeholders of the UJ. The activities engaged in included developing the ERW Policy

Sustainability reporting trends in South Africa

The research provides a useful representation of the current state regarding Sustainability (Corporate Social Responsibility) Reporting by companies and organizations based in Southern Africa. This indicates that at HEIs in Southern Africa the level of reporting is still quite low.

It is common practice in sustainability reports to include information and data which is required by other national standards and guidelines but at present there are no mandatory reporting requirements on sustainability issues in South Africa except the annual reporting of carbon generation due to indirect power generation using liquid fuels. UJ has for two years already complied with the requirements and submitted the requisite details to the regulator involved.

Policy Review, Vision & Mission

The University of Johannesburg's current Strategic Plan is a living document that guides and frames its activities at all levels of the organisation. It gives effect to the Mission of the University to inspire its community to transform and serve humanity though innovation and the collective pursuit of knowledge. It provides the roadmap to achieving UJ's Vision to be an international university of choice, anchored in Africa, dynamically shaping the future.

The Strategic Plan is organised around 6 strategic objectives:

1. Excellence in research and innovation
2. Excellence in teaching and learning
3. International profile for Global Excellence and Stature (GES)
4. Enriching staff environment and student-friendly learning and living experience
5. National and global reputation management
6. Fitness for Global Excellence and Stature (GES)

The Global Excellence and Stature Strategy (GES), conceived in 2014, and now in its second iteration known as GES 4.0, is a specific investment initiative to accelerate the achievement of the strategic objectives, and to position UJ as a leader in developing people and technology appropriate for the Fourth Industrial Revolution (4IR) as it pertains to the African context. The Strategic Plan underpins all endeavors at the University, and is incorporated in annual reporting processes, planning at faculty and division levels, and in the performance management system.

Sustainability Policy

The ERW Policy is in place to record the aims of the UJ to take steps that result in a more equitable, sustainable future for its stakeholders and the persons in the immediate, national and international communities. It does so by driving as primary those activities that it can directly influence and by measuring and reporting on second and third tier issues that it cannot directly affect but where it can influence its stakeholders to become more responsible environmental citizens.

Vision

"We will also minimize harmful impact on our environment through managing our carbon footprint, reducing energy and water wastage, encouraging paperless communication, and overall fostering of a culture of responsible stewardship."

The UJ's responsibility to the wider world therefore requires that we start a process to eventually become resource and carbon neutral in all spheres of our activities. Even supposedly sustainable products such as paper – of which UJ used more than 145 million A4 sheets in 2019 are to be reconsidered given the often forgotten environmental costs of paper production – water and electricity in a water and power scarce country such as South Africa. UJ as a community should therefore act decisively to addresses sustainability not in a narrow and limited manner but in a much more holistic approach.

Mission

UJ is committed to local, national and internationally developing sustainability by advising and educating individuals, communities, organizations, national institutions and governments to reconsider business models and adopt sustainability strategies that produce positive impacts and high stakeholder value.

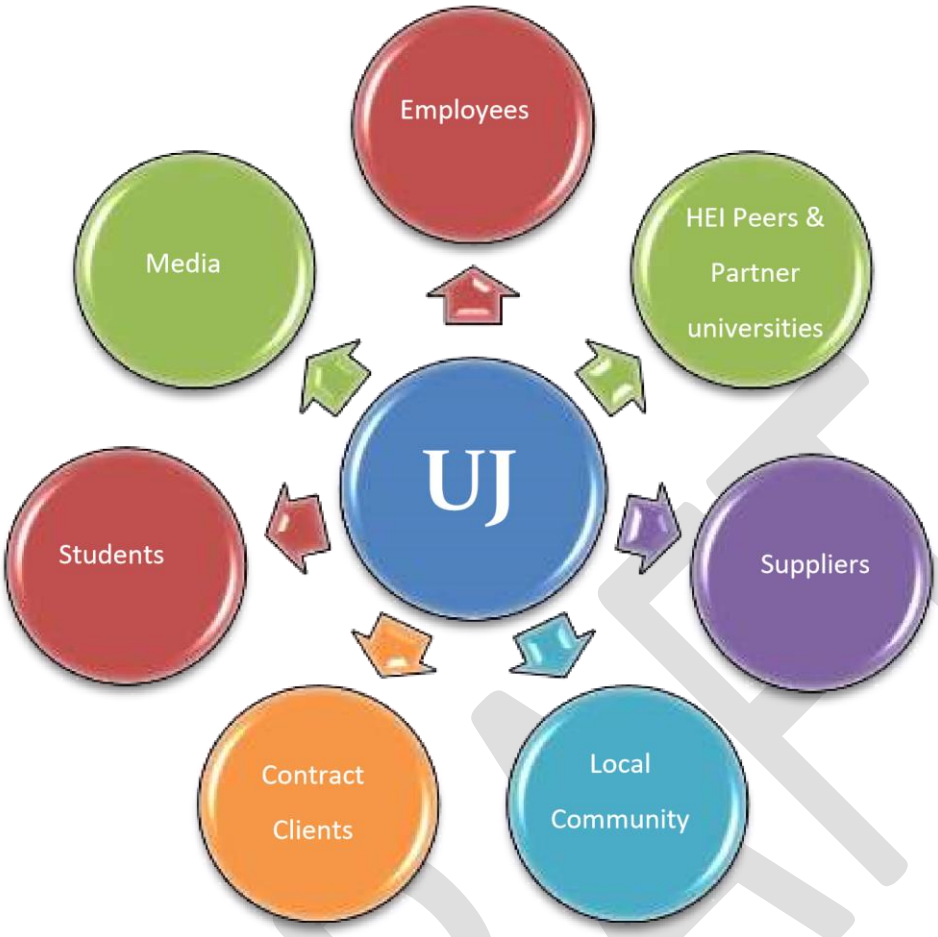
Supply chain

Due to the nature of international tertiary education, our core business, we attempt to only use those external material and equipment suppliers for office material, ICS support, conference venues, and marketing for which local suppliers cannot provide the necessary goods or services. Additionally, we use on occasion use external education partners for our global research and teaching and learning activities and we expect from them to commit to a similar stakeholder code of conduct.

Mapping of stakeholders

UJ as an organization is a South African national HEI but one with substantial involvement internationally through collaboration, research agreements, staff and student exchange agreements, contract research for international corporates and finally active alumni offices abroad. A listing of international collaborators and the nature of the collaboration is given in an appendix to this report. The **Primary Stakeholders** of UJ (shown on the figure below) are:

- **Employees**
- **Students**
- **Peer organizations in Tertiary Education in SA**
- **Contract Clients**
- **Suppliers**
- **Strategic Partner organizations nationally and internationally**
- **Media**
- **Local Community**:



Stakeholder	Key requirements	Ways of Communication	Frequency
Employees	Job security, fair compensation and benefits, opportunities to develop	We engage our employees in developing sustainable solutions through strong internal communications programs, business updates, community volunteering, and informal conversations at all levels. Engagements take place via emails, formal Notices, face to face campus engagements with senior management and union meetings.	Daily

Students	Ensure the policies reflect both company and Individuals, ensure that principles such human rights, working conditions and labor standards, the environment and to anti-corruption are protected	Emails and formal Notices via ULink. Engagements also take place via the Student Representative Council (SRC) and its sitting on management boards. Student Affairs also meets with the SRC on matters of student interest and needs.	Whenever it is necessary
Media	Make use of media houses committed to our own	TV, radio and email shots and formal Notices via ULink.	Whenever it is necessary
	sustainability targets. Using media houses should reduce the carbon costs of communicating with our external stakeholders.		
HEI in SA and Partner universities	This is to enable common development of sustainability initiatives.	We engage with SA HEIs specifically on matters of common interests.	Whenever it is necessary
Contract clients	Discuss business developments, product specifications and sustainable performance	Telephone Formal contracts Emails	Whenever it is necessary
Suppliers	All relevant (legal, operational and financial) documentation is provided, which proves the ethical viability of the organization with respect to human rights, make sure that our suppliers are actively in support the local market	Telephone Emails Media announcements	Daily
Local community	Efforts of our company to contribute to sustainable development of local communities, our primary pursuit is the selection of suppliers with good reputation, transparency and excellent products or services in the local market.	Emails and media announcements	Whenever it is necessary

Materiality Methodology

This sustainability report has been prepared according to the G4 Reporting Guidelines of the Global Reporting Initiative and every effort has been made to incorporate the latest and most relevant material information into the report.

Those areas that UJ's Facilities Management division, guided by UJ Policies and the UJ Council, deem to be material to environmental sustainability issues that face UJ and its local environment are those that are of direct importance and significance to UJ and its broader stakeholder groups. When the UJ ERWP document was developed as a draft with its associated Environmental Sustainability Vision and Policy in 2019, materiality was already seen to be important. Although the UJ ERW Policy has yet to be finally approved by the UJ Council, Facilities Management has already moved forward in engaging with some staff and stakeholders via the Climate Change Sub-committee of the MEC to discuss the risks and potential mitigations that UJ can develop. From an initial assessment it was determined that six areas that UJ can directly affect are of environmental sustainability materiality. These six areas form the focus of the ERW Policy and will be used at least initially to report our progress against on an annual basis. At some future date the UJ strategy related to climate and environment will certainly change and it can be expected that at that point new areas and focus points will be identified.

In order to identify issues that could represent opportunities or risks for our business, now or in the future, we analyzed issues in terms of their relevance and importance to stakeholders and for us. We consider a topic to be of material interest if it is considered as such by any of our stakeholders and/or by UJ itself. The identification process of these material aspects involved the following steps:

- We reviewed best practice approaches to materiality and the approaches of our peers
- We consulted a cross-section of stakeholders from across our business to define a list of material issues
- We created a draft materiality matrix
- We reframed and repositioned the issues to reflect the Facilities Management's staff feedback
- We produced a final version of the matrix

It should be noted that during the reporting period there was formal input from external and internal stakeholders to our materiality process. The following matrix shows the results of our materiality assessment process.

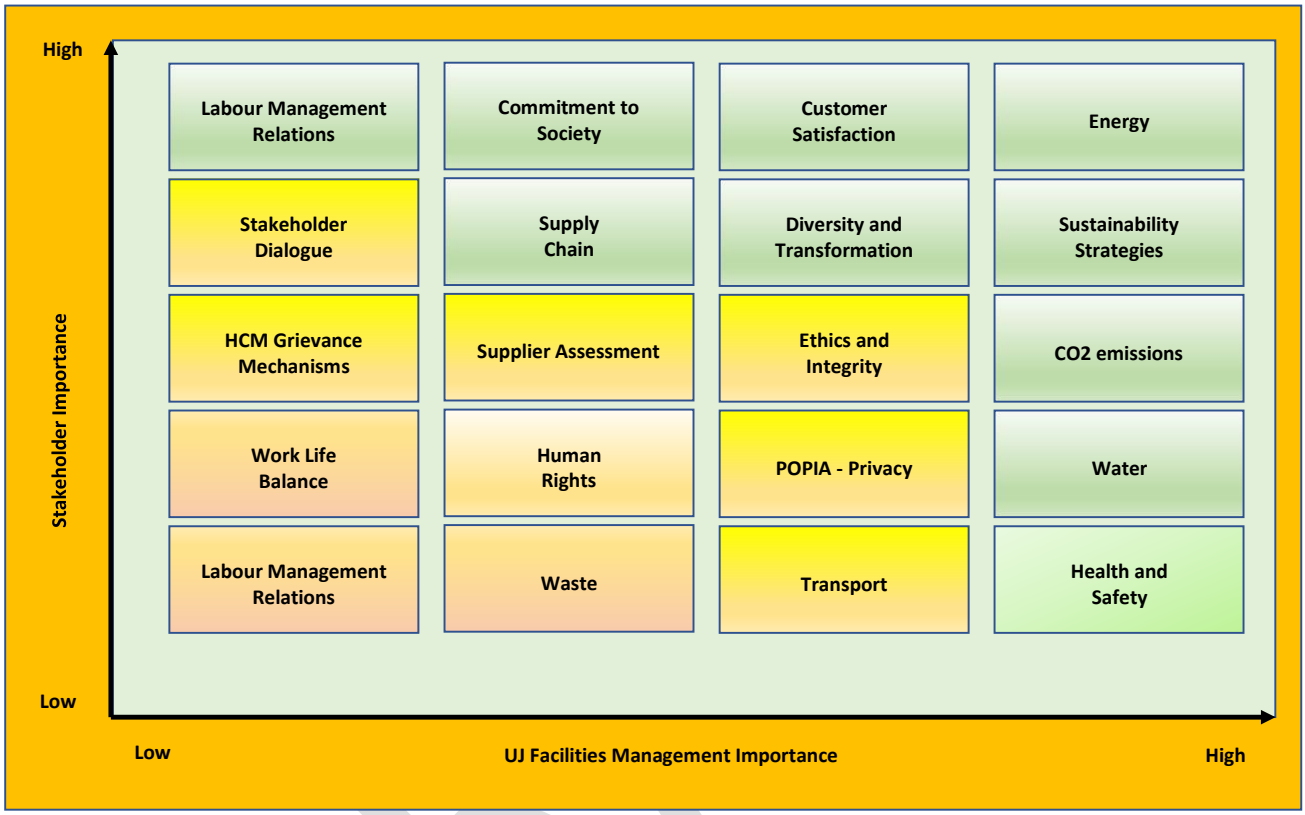


Figure2: Materiality Matrix-Assessment

Based on this assessment, we consider the following topics as material:

Energy
Customer Satisfaction
Sustainability Strategies
Commitment to Society
Diversity & Transformation
CO_2 Emissions
Supply Chain
Ethics and Integrity
Water

Corporate governance

UJ makes use of external auditing team advisors for governance purposes and these can be reached via the UJ Finance and Governance team.

UJ Future Objectives – Materiality

UJ in the Environment

Being an HEI requires UJ to adapt its reporting of the typical marketplace measure to one that reflects UJ's position within the international and national academic market place.

In international terms it is easiest to simply relate present UJ rankings in various of the international HEI rankings.

Ranking	2019 Actual (Final)	2020 Actual (Final)	2021 Actual Final
QS World University Rankings	501-510	439	434
THE World University Rankings	601-800	601800	601-800
		726	725
Academic Ranking of World Universities	601-700	601700	601-700
Shanghai Ranking	657	643	607
Best Global Universities Rankings	366	378	Top 5 in SA
University Ranking by Academic Performance World Ranking	647	603	592
Webometrics			
Global	826	778	711

Africa	7	7	7
South Africa	6	6	6

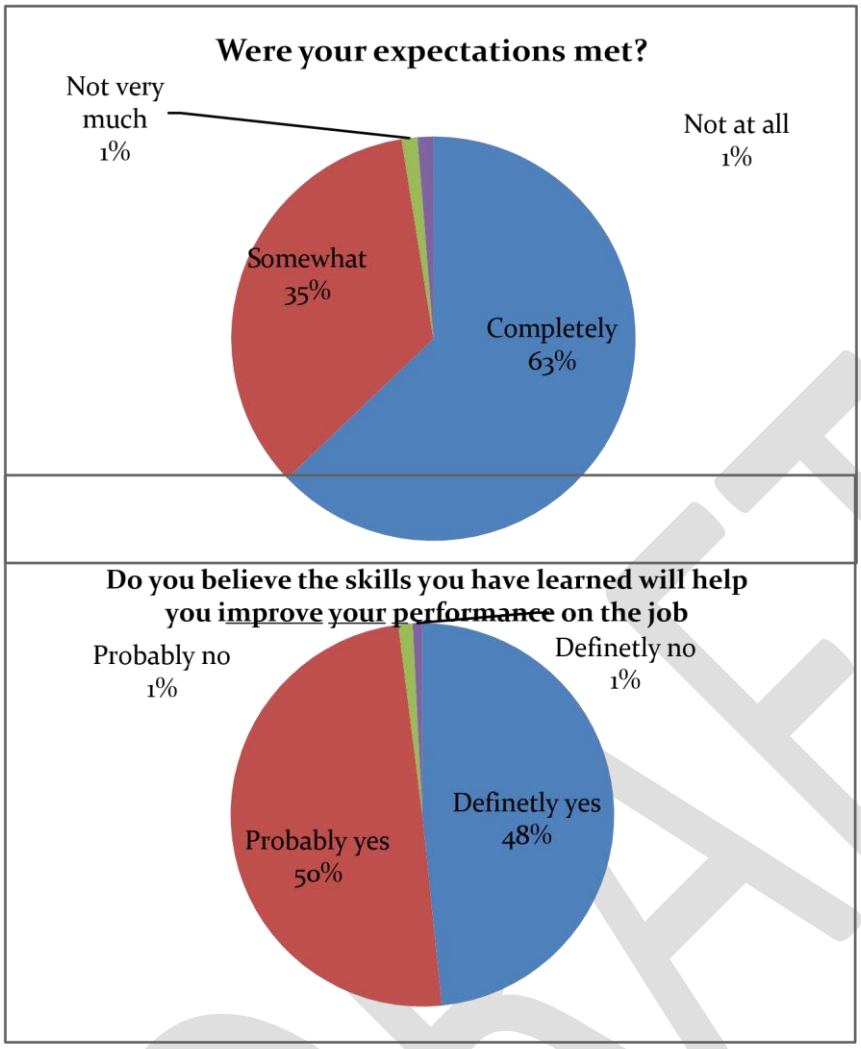
In Southern African terms it is easiest to rely on a comparison of UJ's position in the international rankings – then we obtain the following:

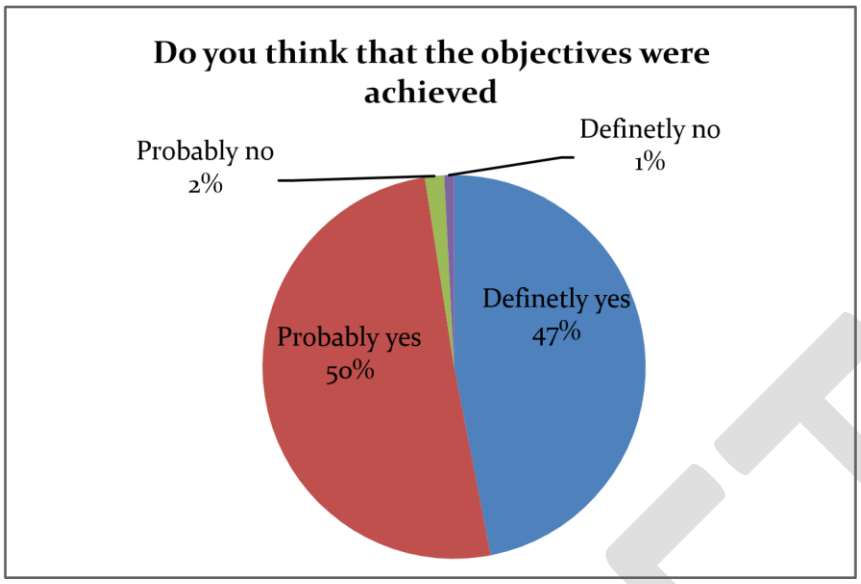
RANKING	2020	2021
THE World University Rankings	**601-800** SA = 7	**601-800** SA = 7
QS World University Rankings	**439** SA = 3	**434** SA = 3
Best Global Universities Rankings	**378** SA = 5	**417** SA = 5
University Ranking by Academic Performance World Ranking	**603** SA = 6	**NYA**
Academic Ranking of World Universities	**601-700** SA = 6	**601-700** SA = 5
Center for World University Rankings	**706** SA = 6	**674** SA = 6

Customer Satisfaction

Customer Satisfaction continues to be one of the highest priorities of CSE. A Customer Satisfaction survey was completed from CSE in 2016. In the survey 64% of CSE customers participated and below you can see the most important results:

87% of our customers said that CSE has the expert technical knowledge to cover their needs 82% of our customers believe that our best quality is our immediate response to their needs CSE conducts customer satisfaction services every three years, so the next survey would be held in Additionally in all trainings there is training evaluation form. At our annual strategy meeting we review all results and take improving actions. On the diagrams that follow, we have included the answers to some of our feedback questions, from all our trainings (open, in house, Europe, USA, MENA) for the reporting years.


Were your expectations met?
Not very much 1%
Not at all 1%
Somewhat 35%
Completely 63%
Do you believe the skills you have learned will help you improve your performance on the job
Probably no 1%
Definetly no 1%
Definetly yes 48%
Probably yes 50%



Procurement Practices

UJ in the ongoing efforts of our university to contribute to sustainable development of local communities, our primary pursuit is the selection of suppliers with good reputation, transparency and excellent products or services in the local market. UJ has an active supplier development process lead by the Procurement Department team within the Finance Revenus section.

Customer Privacy

UJ has an active project in place to ensure compliance with the South African Protection of Personal Information Act (POPIA) promulgated in September 2019. According to this project UJ takes the privacy and confidentiality of all of our stakeholders, students, staff, clients, and community members very seriously, and guarantee them the full protection envisaged in the POPIA. UJ understands that it remains accountable for all personal information within its possession or control and this includes any and all personal information that we receive directly or indirectly. UJ has a formal policy that can be downloaded from the home website and also a defined mechanism for the destruction of received information of individuals that is no longer required for operational purposes.

Environment

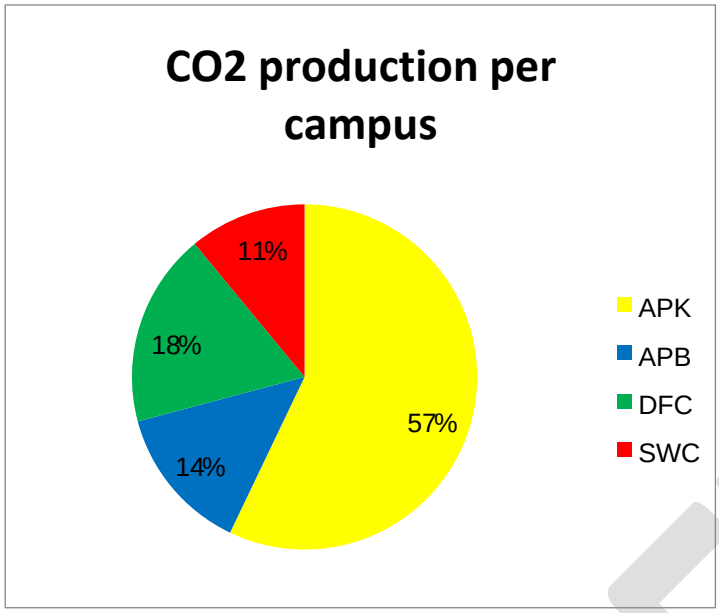
The Environment is the most important reasons for the emphasis in the ERWP of UJ to develop sustainability reporting as well as to provide time based benchmarking as well as ensuring that while we continually upgrade our reporting and benchmarking that for the targets where it is possible we will always report back to the initial 2015 values. Giving reports fixed to the 2015 values ensures that for important targets we can track performance while accepting that UJ growth, in student

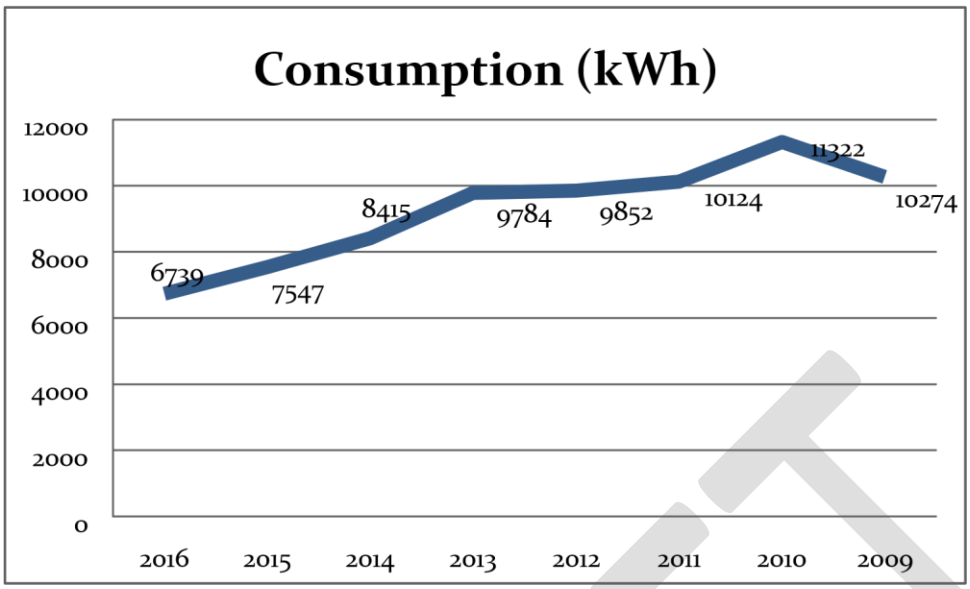
numbers and residence beds for instance, is still on an upward trajectory and that unit-based reporting is essential as a longer term adjunct to absolute value reporting.

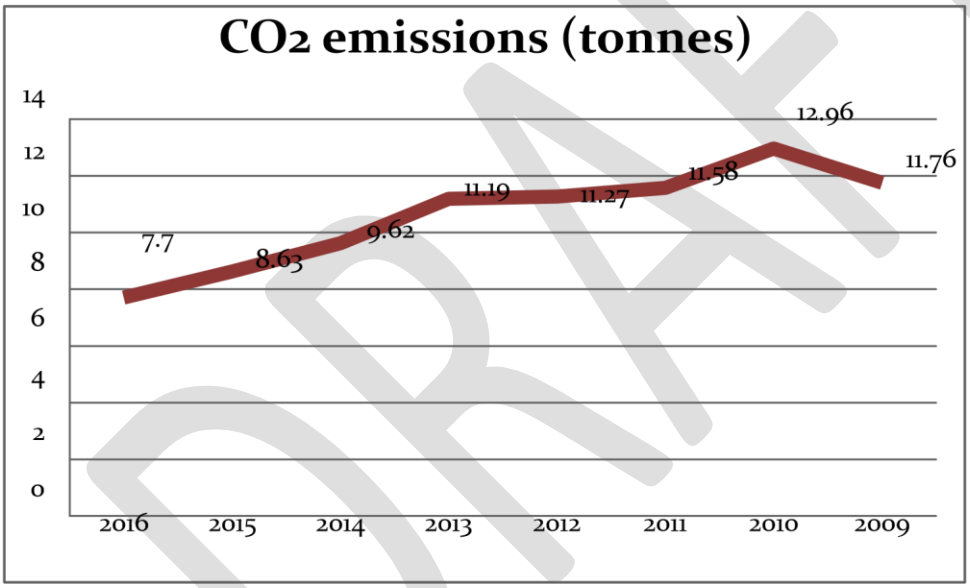
Energy and emissions

Equivalent CO2 emissions

Emission Source	Kingsway Campus (APK)	Bunting Road Campus (APB)	Doornfontein Campus (DFC)	Soweto Campus (SWC)	Total CO2	Total tons of CO2
Electricity (kWh)	20 593 151.	4 984 176	6 487 455	4 074 803	36 139 587	36 139.59
Natural Gas(GJ)	1 005 967.21	255 566.70	234 048.35	-	1 495 582.26	1 495.58
Catbot	-	-	-	-	-	-
Petrol (Fleet)	159 626.63	40 059.81	66 651.43	41 286.44	307 624.31	307.62
Diesel Fleet	90 423.19	11 919.10	36 204.99	52 382.90	190 930.17	190.93
Diesel generators	35 217.14	10 669.64	6 090.84	5 904.86	57 882.48	57.88
Intercampus Bus and Staff flights	980 083.09	203 413.47	443 811.21	221 905.61	1 849 213.38	1 849.21
Paper used by UJ / KMSA sites	276.62	53.89	118.54	55.92	504.97	0.50
Total kg of CO2	22 864 745.	5 505 858.	7 274 381.	4 396 339.	40 041 324.	40 041.32
Total Tons of CO2	22 864.75	5 505.86	7 274.38	4 396.34	40 041.32	reduction of Electrical Power
Solar PV generation (tonnes CO2)	1 027.59	500.92	410.69	410.30	2 349.50	**6.50%**
					Total tons of CO2	37 692







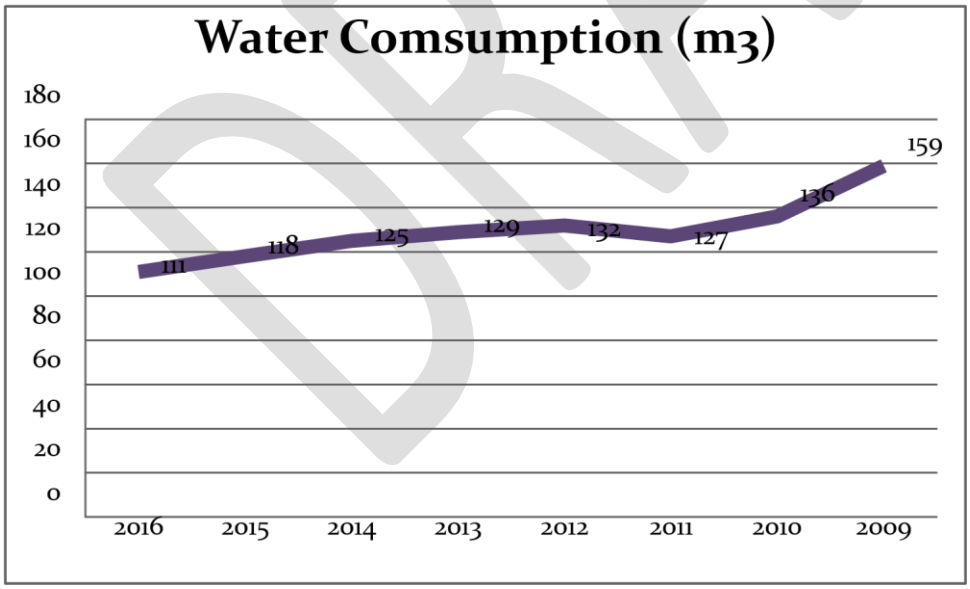
Effluents and Waste

Our organization uses 100% recycled paper. In particular, for the years 2021 onwards and has already reduced paper consumption for a high of approximately 150 million A4 equivalent pages to less than 94 million A4 equivalent pages in 2021.

Water

Water consumption of the organization can be seen in the table and diagram below.

Period Comsumption (m3)	
2016	111
2015	118
2014	125
2013	129
2012	132
2011	127
2010	136
2009	159



Appendices

Appendix I: Material Aspects and Boundaries

MATERIAL ASPECTS AND BOUNDARIES		
Material Aspects	Boundary inside UJ	Boundary Outside UJ
Ethics integrity	UJ Employees Clients Suppliers Community	
Customer satisfaction	UJ Employees Clients	
Customer's privacy	UJ Employees Clients	
Employees' commitment	UJ Employees	
Stakeholders dialogue	UJ Employees Clients Suppliers Community	
Commitment to society	UJ Employees Clients Suppliers	

Appendix II: UN 17 Sustainable Development Goals Table

Sustainability in its broadest sense is about the reality of living on a resource constrained planet with a growing and increasingly split population. The politics of inequality are not at the bar here – what is, is the need to address the disproportionate nature of the manner in that resources are presently being exploited and used on the planet. The UN has as part of its new millennium aims, the 2030 Agenda for Sustainable Development, developed a comprehensive set of goals that, if achieved, may provide the basis for a more equitable and sustainable place for all on our planet. These seventeen Sustainable Development Goals (SDGs) are:

1. No poverty
2. Zero hunger
3. Good health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry innovation and infrastructure

10. Reduced inequalities
11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Life below the water
15. Life on land
16. Peace, justice and strong institutions
17. Partnerships for the goals

Appendix III: UJ Partnership Agreements – August 2021

Name	Faculty	Contract Type
Manna Holdings	College of Business & Economics	MOA
University of Zimbabwe	Faculty of Engineering & the Built Environment	MOA
University of Nottingham Trent	Faculty of Art, Design & Architecture	Student/Staff Exchange
Rajagiri College of Social Sciences	International Office	MOU
Lund University	International Office	Student/Staff Exchange
University of Bethlehem	International Office	MOU
King Faycal University of Chad	International Office	MOU
University of Ghana Professional Studies	International Office	MOU
University of Ghana (Dept of Public Admin and Health Science Management	International Office	MOU
Ladoke Akintola University of Technology	International Office	MOU
Kwara State University	International Office	MOA
University of Lagos	International Office	MOU
Ambrose Alli University	International Office	MOU
University of Rwanda	International Office	MOU
Makerere University	Faculty of Humanities	MOU
University of Zimbabwe	International Office	MOU
World University of Bangladesh	International Office	MOU
Shanghai University	International Office	MOU
Shanghai University	International Office	Student/Staff Exchange
Nanjing Technical University	Faculty of Engineering & the Built Environment	Joint Degree
Renmin University of China	International Office	

University of Hong Kong	International Office	
Changzhaou College of Information Technology	International Office	MOU
Shandong University	International Office	MOU
Central South University, China	International Office	MOU
Shandong University	International Office	Student/Staff Exchange
North West Polytechnical University of China	International Office	MOU
Aisian Institute of Technology	International Office	MOU
Chandigarh University	International Office	MOU
Management Development Institute Gurgaon	International Office	MOU
Seinan Gakuin University	International Office	MOU

National Chengchi University	International Office	MOU
National Taiwan Normal University	International Office	MOU
University of Taipei	International Office	MOU
Palacký University Olomouc	International Office	Erasmus+
University of Augsburg	International Office	MOU
University of Akureyri	International Office	Erasmus+
Polytechnic of Turin	International Office	Erasmus+
Jagiellonian University	International Office	Erasmus+
Gdansk University of Technology	International Office	Erasmus+
Far East Federal University	International Office	MOU
Peoples Friendship Russian University	International Office	MOU
University of Girona	International Office	Erasmus+
Lund University	International Office	Erasmus+
University of Zurich	International Office	MOU
University of Zurich	Faculty of Law	Student/Staff Exchange
Afyon Kocatepe University	International Office	Erasmus+

Altinbas University	International Office	
Appalachian State University	International Office	MOU
George Mason University	International Office	MOU
University of Florida	International Office	MOU
University of Illinois	International Office	MOU
University of Melbourne	International Office	MOU
Western Sydney University	International Office	MOU
Universidad est dual de Campinas	International Office	
Pontifical Catholic university of San Paulo (PCU – SP)	International Office	
Sociedade de Educacao Tiradentes (SET), Brazil	International Office	MOU
ELFA Group PTY (LTD)	International Office	Service level
EMPA		MOU
Southern Africa Engineering Education Network	Faculty of Engineering & the Built Environment	MOU
Utrecht University	Faculty of Humanities	MOU
Universidade Santa Ursula	Faculty of Humanities	
I CAN	College of Business & Economics	MOU
University of Eastern Africa,Baraton(UEAB)	College of Business & Economics	MOU
National Gender/Equality Commission Kenya	College of Business & Economics	MOU
University of South Eastern Kenya	College of Business & Economics	MOU
Egerton University	College of Business & Economics	MOU
Imo State University	College of Business & Economics	MOU
National University of Science Technology	College of Business & Economics	MOA
Chinhoyi University of Technology	College of Business & Economics	MOU
Abu Dhabi University	College of Business & Economics	MOU
IFSD Institute Fiscal Studies Democracy	College of Business & Economics	MOU

Tsukuba of University	Faculty of Health Sciences	MOU
Daystar University	College of Business & Economics	MOU
University of Groningen	Faculty of Art, Design & Architecture	Joint Degree
University of the West of England	College of Business & Economics	MOU
Delft University of Technology	Faculty of Science	MOA
Bharathiar University	International Office	MOU
University of Nigeria	Faculty of Education	MOA
International Development Research	Faculty of Humanities	Grant agreement
University of Lodz Poland	College of Business & Economics	MOU
Helmholtz Zentrum Dresden Roddendorf	Faculty of Science	MOU
China Europe International Business	College of Business & Economics	MOU
School of Inspired Leadership (India)	College of Business & Economics	
LSHTM	Faculty of Humanities	MOA
University of Pisa (UNIPI)	International Office	Erasmus+
Nanyang Technological University	International Office	
Tohoku of University	Faculty of Science	Joint Degree
University of Gdansk	Faculty of Law	Erasmus+
Nanjing Tech University	Faculty of Engineering & the Built Environment	Joint Degree
Groupe ESPI	College of Business & Economics	MOU
University of the West Indies	Faculty of Humanities	Joint Degree
University of the West Indies	Faculty of Humanities	MOA
Manipal University Jaipur	Faculty of Engineering & the Built Environment	MOU
London South Bank University	Faculty of Engineering & the Built Environment	MOA
Swansea University	Faculty of Engineering & the Built Environment	MOA
Jendamark Automation	Faculty of Engineering & the Built Environment	MOA
Royal Academy of Engineering	Faculty of Engineering & the Built Environment	MOA