Climate Positive Organisation

Definition Energy

CREATING MEANINGFUL EXPERIENCES

ER&IM

<Date>

Breda University OF APPLIED SCIENCES

Energy: Executive Summary

BUas is transforming its energy approach from passive consumption to active generation and radical efficiency, positioning energy as the foundation of our climate positive ambition.

1. Why it matters

Energy underpins every aspect of campus operations and represents our most significant environmental impact. As BUas pursues climate positivity by 2035, energy transformation is essential—it directly affects our carbon footprint, operational costs, and our ability to demonstrate leadership in sustainability to students, staff, and the wider higher education sector.

2. Energy at BUas

Energy encompasses both consumption and generation across our campus. We define it as strategically managing our energy use by first reducing demand, then sourcing from sustainable supplies, and generating renewable energy (BUas already distinguishes itself not using gas). This approach ensures efficiency drives every decision before considering generation..

3. Our ambition

BUas aims to be a **good example in energy generation** and a **frontrunner in energy consumption**. Our targets are concrete: achieve Paris Proof status (70 kWh/m²/year per building or less) for all three buildings by 2033, implement maximum sustainability improvements using district heating by 2035, and reduce our WEii scores from current levels (Ocean: 67, Frontier: 78, Horizon: 75) whilst transitioning to 100% renewable energy sources.

4. Making it happen

Implementation follows a FastLane approach across three phases: quick wins (2027-2028), Paris Proof measures (2027-2032), and maximum sustainability with district heating (2027-2037). Each building receives tailored interventions—insulation, efficient systems, solar panels, and heating transitions—with progress tracked through annual WEii monitoring, clear energy consumption reviews cycles, and building-specific dashboards that demonstrate tangible carbon reductions and cost savings.

5. Investment

The Fastlane analysis estimates total investment of €8,510,979 across all phases and buildings through 2037. While some measures align with our existing MJOP (multi annual maintenance plan), others represent new regulatory requirements or strategic opportunities. Given that BUas buildings are approaching the Paris-proof target of 70 kWh/m²/year (WEii protocol), the Back Office team will prioritize Haskoning's recommendations based on emission reduction impact and alignment with broader CPO objectives—including Nature & Climate Adaptation and Social Impact themes. This sustainable multi-year maintenance plan will follow the standard annual budget approval cycle.

The investment in energy is an investment in BUas' operational resilience, environmental leadership, and long-term financial sustainability.

1 Available information

Scientific Context
Energy in buildings requires reducing demand while maximizing renewable generation following **Trias Energetica**: (1) Reduce demand, (2) Use renewables, (3) Use fossil fuels efficiently.

Paris Proof Standard: 70 kWh/m²/year for higher education buildings, measured using Werkelijke Energie Intensiteit (WEii) protocol based on actual consumption with weighting factors for energy carriers.

Current BUas Status (2024)
Building Performance:

- Ocean: 67 kWh/m²/year ✓
- Frontier: 78 kWh/m²/year (+11%)
- Horizon: 75 kWh/m²/year (+7%)

Energy Mix:

- Electricity: 100% Dutch renewable (1.68 million kWh/year)
- Heating: Stadswarmte (7,642 GJ/year)
- Solar: 103 kWp, 97,000 kWh/year (~6% of electrical demand)

Legislation & Local Context
European: EU Climate Law (55% reduction 2030, neutrality 2050), EPBD IV (zero-emission buildings 2030), RED III (42.5% renewable energy 2030)
National: Energy Saving Obligation (<5 year payback measures required), EPBD IV, GACS mandatory 2026. Klimaatwet (55% reduction 2030, 95% by 2050), Energy Saving Obligation (<5 year payback measures required), EPBD IV, GACS mandatory 2026, Paris Proof operational energy limits.
Breda: Transitievisie Warmte (CO_2-neutral 2044), RES West-Brabant coordination, stadswarmte transitioning to renewable sources.
Ennatuurlijk is the exclusive **district heating** supplier for Breda's region and is legally required to transition toward zero-carbon sources. The organization has committed to 100% carbon neutrality through renewables by 2040. Key considerations include Ennatuurlijk's dependency on third-party suppliers and the composition of their energy mix. Their transition from coal to biomass represents progress, though biomass sustainability warrants ongoing scrutiny. Continuous monitoring of their progress toward the 2040 renewable target is recommended to ensure alignment with municipal sustainability goals.

Building Constraints

- **Horizon:** Monument status limits exterior modifications
- **Frontier:** Roof structural capacity needs assessment for PV
- **Ocean:** Already optimal performance; limited expansion space

2 BUas definition

Energy consumption refers to the energy consumed by the buildings on the site. The goal is to minimise the energy consumption on-site and set minimum operational energy requirements in line with Paris Proof targets for the educational branch. When we achieve 'Paris-proof target', this means Buas' energy is balanced in terms of the energy consumed versus our approved 'share' of energy (according to the Paris Agreement): if we use less energy than we are allocated we can consider this 'climate positive'. For existing buildings, the FastLane workstream identified several measures that should be implemented to minimise energy consumption. Finally, to go beyond merely limiting BUas' environmental impact in terms of energy management and in line with the university's ambition to become a ZoOp, BUas shall engage annually with an ecological expert (or speaker of the living) to identify interventions that deliver regenerative value to nature and support their effective implementation

Ambition Levels

- **Consumption:** FRONTRUNNER - All buildings should achieve WEii ≤70 kWh/m²/year target through (at least) FastLane scenarios 1-3, demonstrating climate leadership.
- **Generation:** GOOD EXAMPLE - Maximize on-site generation within constraints, invest strategically in off-site renewables to close gap. Alternatively, being a front runner could materialize through the generation of more energy than we produce, yet we do not envision this option as a realistic target.
- **Behavior:** Frontrunner. Define how and enable/engage the community to act responsibly.

KPIs and Targets

- Primary: WEii ≤70 kWh/m²/year for all buildings + full climate positive new build.
- Secondary: Total consumption decrease (kWh/year), generation renewable percentage increase, on-site capacity/production increase, off-site procurement (read electricity and district heating suppliers).

3 Scope

In scope:

- All BUas-owned and operated buildings on campus, and new build.
- Operational energy consumption (heating, cooling, lighting, ventilation, equipment)
- On-site renewable energy generation infrastructure (primarily solar PV, and further potential investments)
- Off-site renewable energy procurement, power purchase agreements and investment.
- Energy monitoring and management systems (WEii tracking, real-time dashboards, EMS/GACS compliance)
- Alternative heating/cooling systems (WKO/LWWP) to complement district heating
- Energy management systems and smart building technologies
- Energy efficiency measures identified through FastLane scenario analysis

Out of scope:

- Embodied carbon in materials (Materials theme)
- Student housing and off-campus facilities
- Scope 3 energy related activities ofthird-party operated facilities on campus, such asexternal vendors, contractors)

Rationale: This scope focuses on areas within BUas's direct operational control where immediate impact is achievable. The boundary aligns with standard building energy reporting protocols while avoiding duplication with other CPO themes that address embodied carbon.

4 Relation to other CPO themes

Critical dependencies:

- **Materials:** Energy saving measures completed through build environment adjustment require materials with embodied carbon (example: PV panels).
  Coordination: Apply R-ladder, prioritize low-embodied-carbon insulation (recycled cotton, expanded cork), avoid premature equipment disposal, material passports
- **Nature & Climate Adaptation**: Rising temperatures increase cooling demands while green infrastructure provides passive cooling. Heat stress mitigation strategies (shading, water features, green roofs) must be integrated with energy systems. Solar PV placement must consider biodiversity goals.

Synergistic relationships:

- **Health:** Indoor environmental quality (thermal comfort, air quality, lighting) directly impacts energy consumption. Health and comfort requirements for ventilation must be balanced with efficiency targets
- **Water:** Energy for water circulation (district heating, WKO pumping) and rainwater harvesting reducing potable water energy demand

Enabling connections:

- **Mobility:** Future EV charging infrastructure will significantly impact campus electricity demand and must be integrated with renewable generation capacity planning.
- **Education & Research:** Energy systems serve as living laboratories for student learning and research projects, creating opportunities for innovation and engagement.
  Examples: Built Environment student projects, thesis topics, dashboards development as teaching

Potential conflicts to manage:

- Ventilation requirements for health versus energy reduction goals
- Solar panel placement versus green roof biodiversity objectives
- Monument status (Horizon building) creates some design constraints for energy improvements, though 2019 renovation already achieved strong performance. Mitigation: Prioritize energy investments in Frontier and Ocean buildings where no heritage restrictions apply.
- Initial capital costs for deep energy retrofits requiring strategic prioritization alongside other sustainability investments
- Increased energy consumption related to Buas AI's education and activities.

5 Stakeholders and partners

Internal

Departments and teams

- Back Office (implementation)
- Finance & Control (budget)
- Procurement (contracts)
- CPO Core Team (oversight)
- ICT (systems)
- Communications (engagement)

Users: Academies, staff, students (occupants); janitors (operations); Energy Theme Leader (strategy)

External

Technical:

- Royal HaskoningDHV (roadmap)
- Energy consultants
- Contractors (installation)
- WKO specialists (Q1 2026 study)

Suppliers:

- Renewable electricity provider, EnNatuurlijk (stadswarmte), equipment vendors

Partners: Other Dutch universities, DGBC, Municipality of Breda, RES West-Brabant, renewable energy cooperatives

Roles

Strategic: Executive Board (approvals), CPO Core Team (coordination), Theme Leader (strategy)
Operational: Back Office Team Leader (oversight), Back Office team members (implementation)
Implementation: Contractors (installation), Consultants (design), Internal teams (coordination)

6 Action plan

Milestones aligned with EU/national targets:

- 2026:
  - GACS implementation (legal requirement)
  - WKO feasibility study completed
  - Definition of electricity supply vision in preparation of the next tender (start date January 2028)
  - Frontier HVAC replacement tender
  - Selection and inclusion of Fastlane Scenario into the actual sustainable MJOP (1.Quick wins, 2.Paris Proof and 3.Maximale verduurzaming o.b.v. Stadswarmte)
- 2027: New HVAC Frontier implemented (within DUMAVA grant framework)
- 2028:
  - WKO/district heating decision implemented, all buildings progress towards Paris Proof target
  - Quick win scenario selected measures implemented
- 2033:
  - Paris proof scenario selected measures implemented
  - All buildings WEii ≤70 kWh/m^2/year
- 2037: Maximale verduurzaming o.b.v. Stadswarmte selected measures implemented
- 2050: Full contribution to EU/NL climate neutrality

7 Timeline

Short-Term (2026)

Milestones for 2026:

- GACS implementation (legal requirement)
- WKO feasibility study completed
- Definition of electricity supply vision in preparation for next tender (start date January 2028)
- Fastlane scenario 1,2, 3 review, priority settings, and submission in sustainable MJOP, horizon reviewed (2027-3037)

Long-Term (2027-2050)

- 2027:
  - Start of Sustainable MJOP deployment
  - New HVAC Frontier implemented (within DUMAVA grant framework)
- 2028:
  - WKO/district heating decision implemented
  - Quick win scenario selected measures implemented
- 2033:
  - Paris proof scenario selected measures implemented
  - All buildings WEii ≤70 kWh/m²/year
- 2037: Maximale verduurzaming o.b.v. Stadswarmte selected measures implemented
- 2050: Full contribution to EU/NL climate neutrality

Evaluation Points:

- Annual review of WEii performance
- Monitoring of consumption data (review cycle to be defined)
- Major decision points: 2026 (WKO feasibility), 2027 (electricity tender), 2028 (heating system)

8 Measuring and monitoring

Baseline Measurement

Current Situation (2024 Baseline - WEii protocol):

Building	Area (m^2)	Electricity (kWh/year)	Stadswarmte (GJ/year)	WEii Score	vs Paris Proof
Ocean	3,592	123,073	1,276	67	✓ Below target
Frontier	14,774	843,041	3,360	78	+11% above
Horizon	13,241	713,109	3,006	75	+7% above
Campus Total	**31,607**	**1,679,223**	**7,642**	**~74**	**+6% above**

Current Energy Mix:

- Electricity: 100% Dutch renewable (1.68 million kWh/year)
- Heating: Stadswarmte (7,642 GJ/year)
- Solar: Ocean 31 kWp (29,000 kWh/year), Horizon 72 kWp (68,000 kWh/year)
- Total solar: 103 kWp, 97,000 kWh/year (~6% of electrical demand)

Data Collection:

- Utility billing data from grid operator and EnNatuurlijk
- Building management system data (Priva GBS)
- Solar generation monitoring systems
- WEii protocol calculation

Key Performance Indicators

Primary KPI:
Werkelijke Energie Intensiteit (WEii) ≤70 kWh/m²/year for all buildings
Measurement: Annual WEii protocol calculation
Verification: External consultant (Royal HaskoningDHV?)
Reporting: Annual sustainability report, CPO dashboard

Secondary KPIs:

- Total campus energy consumption (kWh/year)
- Building-specific WEii scores
- On-site renewable generation capacity (kWp) and production (kWh/year)
- Renewable energy percentage in total mix

Monitoring

Continuous: Building management system (Priva GBS), solar generation systems
Monthly: Utility consumption data, anomaly detection
Quarterly: Consumption pattern analysis, CPO Core Team reporting
Annual: WEii calculations (verified), comprehensive performance report, Executive Board presentation

9 Budget and resources

Financial Resources

Note: Budget allocations are subject to Executive Board approval through standard annual planning cycles.

Committed Actions (2026-2027):

- GACS implementation: Budget under review
- WKO feasibility study: Budget under review
- Frontier HVAC: €1.037.968 incl. VAT maximal budget estimate
- DUMAVA grant for Frontier HVAC (2027): €207.594 secured external funding

Multi-Year Investment Projection - Haskoning B.V. Technical Assessment

Haskoning conducted comprehensive technical analysis of Ocean, Frontier, and Horizon buildings through the Fastlane process, identifying energy-saving measures across five implementation scenarios. The team selected the first three scenarios below as the most prudent approach, though the budget projections:

Investment cost (CAPEX)				
Scenario's	1. Quickwins	2. Paris Proof	3. Maximale verduurzaming o.b.v. Stadswarmte	Grand Total
2026				
2027	€ 114.350,00	€ 114.350,00	€ 494.959,00	€ 723.659,00
2028	€ 79.150,00	€ 96.965,00	€ 487.180,00	€ 663.295,00
2029		€ 476.880,00	€ 1.172.455,00	€ 1.649.335,00
2030			€ 1.092.385,00	€ 1.092.385,00
2031	€ 694.000,00	€ 264.000,00	€ 1.321.415,00	€ 2.279.415,00
2032	€ 3.000,00	€ 268.750,00	€ 382.565,00	€ 654.315,00
2033			€ 228.115,00	€ 228.115,00
2034			€ 110.815,00	€ 110.815,00
2035			€ 110.815,00	€ 110.815,00
2036		€ 31.600,00	€ 142.415,00	€ 174.015,00
2037		€ 97.500,00	€ 727.315,00	€ 824.815,00
Grand Total	€ 890.500,00	€ 1.350.045,00	€ 6.270.434,00	€ 8.510.979,00
Average payback period (years)	14	19	30	30

With BUas buildings approaching the Paris-proof target of 70 kWh/m²/year (WEii protocol), the Back Office team will filter Haskoning's recommendations to prioritize high-impact measures that both reduce emissions and strategically support broader CPO objectives across Nature & Climate Adaptation, Social Impact, and other themes.

Potential Funding Sources to be investigated:

- BUas capital budget (annual allocation)
- Government subsidies: SDE++, ISDE, EIA
- DUMAVA grant (secured for Frontier)
- Energy savings reinvestment
- Green financing options

Operating Budget:

- Energy cost savings to be quantified following implementation

- Maintenance costs for new systems integrated into operational budgets

Human Resources

Required Capacity:

- CPO Energy Theme Leader: Strategic coordination (0,3 FTE)
- Back Office Project Coordinator: Implementation oversight (0,5-0,8FTE)
- Energy management expertise: Based on implementation scale Janitors: Operational support per building (0,3 -0,6 FTE total)

Peak Implementation Periods:

- 2026-2027 (GACS, WKO study): +0.3-0.5 FTE temporary
- 2027-2028 (HVAC Frontier, heating decision): +0.5-0.8 FTE temporary

Peak total: 2.2-3.7 FTE

External Support:

- Royal HaskoningDHV: Roadmap consultancy
- WKO specialists: Feasibility study (2026)
- Commissioning agents: Major installations
- Independent verification: WEii calculations

Skills Development:

- Building automation systems (GACS compliance)
- Energy data analysis and monitoring
- System-specific training as implemented

Facilities and Materials

Infrastructure:

- Building management system expansion (Priva GBS)
- Energy monitoring software and dashboards
- Measurement equipment for diagnostics
- Data storage within existing ICT

Procurement:

- Framework contracts with suppliers
- Sustainable procurement criteria (Materials Theme alignment)
- Cross-theme coordination on materials

10 Risks and barriers

Financial Risks

Budget Approval

- Risk: Annual capital budget approval uncertain
- Mitigation: Phased approach; external funding; demonstrate ROI through savings

Energy Price Volatility

- Risk: Fluctuating prices affect savings projections
- Mitigation: Conservative assumptions; costs avoidance approach; emphasize non-financial benefits

Cost Escalation

- Risk: Actual costs exceed estimates
- Mitigation: Competitive tendering; contingency allocations; phased implementation

Organisational Risks

Competing Priorities

- Risk: Energy initiatives compete with other institutional priorities
- Mitigation: Executive Board approval and prioritization; integration into KPIs; demonstrate benefits

Cross-Theme Coordination

- Risk: Coordination complexity across Energy, Materials, Health, Nature themes
- Mitigation: Regular CPO meetings; integrated planning; clear governance

Staff Capacity

- Risk: Insufficient expertise or capacity
- Mitigation: Prioritized action plan, temporary project full time allocation, temporary additional FTE, external consultants; phased implementation

Change Management

- Risk: User resistance to operational changes
- Mitigation: Proactive communication; gradual implementation; feedback mechanisms

Games

Leisure & Events

Tourism

Media

Data Science & AI

Hotel

Logistics

Built Environment

Facility

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