Energy-saving renovation of a high school in Hauts-de-France

MBENEFITS analysis carried out with Pôlénergie, Hélène Bécu

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Analysis Methodology

Analysis Methodology
- 4 steps -
Checklist / Indicators

PROJECT IDEA → 1 Context & Scope → 2 Operational impacts → 3 Strategic impacts → 4 Financial evaluation → ANALYSIS RESULTS → INVESTMENT DECISION-MAKING *Go / No go*

Capital budgeting process and project selection

Software

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Step 1 – Company's analysis

Activities carried out on the high-school site (figures for 2023):

- Education: 520 students and apprentices.
- Accommodation: 233 boarders.
- 64 teachers and administrative staff.

Customer segments and value proposition:

- Customer segments or stakeholders: students and their parents; the French state; teachers and administrative staff; companies (future employers); the community.
- Value proposition: "We train professionals capable of meeting the present and future challenges of their professional lives, the citizens of tomorrow, while respecting the values of the Gospel". 88% exam pass rate.

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Step 1 – Project scope

Current situation and weaknesses :

- The school aims to be a centre of excellence and attractiveness in a context of demographic decline.
- Comfortable and safe buildings are essential for teaching and learning, but the main buildings are 50 years old.
- Some classrooms and workspaces are dilapidated: poor thermal comfort and air quality create poor learning conditions (inadequate ventilation of classrooms, high CO2 levels causing drowsiness, humidity). Increasingly high outside temperatures in spring and autumn exacerbate the risks.
- The non-insulated dormitories under the roofs do not provide good thermal comfort, a situation that is likely to worsen in spring (due to rising outside temperatures) and penalise the ancillary activity of seasonal rentals.
- The energy performance is poor (1.5 GWh/year, 10,000 m2 of buildings).
- 80% of the energy consumed is of fossil origin (gas, fuel oil), with associated CO2 emissions and energy price risks.

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Step 1 – Project scope

Future situation considered and advantages :

- **Entire site**: heat supply via urban heating network (powered by renewable energy); building management system (BMS) for improved monitoring and control of technical equipment.
- **Buildings** for **Education** (E-G-K+I), **Accommodation** (A-B-D), **Sports** (C): external insulation of the facades and internal insulation of the attics; replacement of windows; dual-flow mechanical ventilation; relamping (E-G-K-I).
- Improved teaching and accommodation conditions. Buildings capable of coping with increasingly frequent heat waves, not only in summer but also in mid-season, enabling the school to be more resilient in its missions.
- 50% reduction in fossil fuel consumption and almost 100% reduction in CO2 emissions.

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Step 2 – Energy & operations

Energy analysis

Energy consumption before energy renovation:

- Energy fluids impacted: electricity, natural gas, domestic fuel oil.
- Total consumption (rounded) of the buildings impacted by the planned actions:
  - Electricité : 268’000 kWh/an.
  - Natural gas : 1’171’000 KWh/an.
  - Fuel oil : 140’000 kWh/an.

Future energy consumption (after implementation of the EPAs)

Scenario 3:

- Estimated electricity savings for all buildings: 7,888 kWh/year = 2.9%.
- Estimated heat savings for all buildings: 555,760 kWh/year = 40.6%.
- Estimated energy cost savings (electricity and heating): €50,650/year.
- 100% elimination of fossil fuels – Annual reduction in CO2 emissions: 288 tonnes.

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Operational analysis

Indoor environmental quality (IEQ) and academic performance

- **Thermal comfort**. The temperature of classrooms affects pupils' ability to learn: the speed at which schoolwork is completed slows down significantly as the temperature rises.
- **Indoor air quality**. Poor air quality affects students' normal schoolwork (simple learning tasks such as maths and language exercises), but also their marks in exams, end-of-year results and absenteeism.
- Students achieve the **same results two weeks faster** by increasing their learning speed thanks to better conditions (based on 700 hours of instruction/year).

https://www.bpie.eu/publication/building-4-people-valorising-the-benefits-of-energy-renovation-investments-in-schools-offices-and-hospitals/

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Operational analysis

Impact of energy performance improvement actions on operational excellence:

THE 4 DIMENSIONS of OPERATIONAL EXCELLENCE

- **Safety:** Better health for learners and teachers thanks to better thermal comfort (hot/cold) and better indoor air quality (ventilation). — Safety
- **Quality:** Improvement of the quality of teaching and accommodation conditions (thermal comfort, visual comfort, acoustic comfort, indoor air quality). — Quality
- **Costs:** Avoided future investment costs (due to increasing obsolescence, decreasing subsidies) and lower energy costs. — Costs
- **Time:** Faster acquisition of knowledge and skills; more time for teaching thanks to faster learning and reduced absenteeism. — Time

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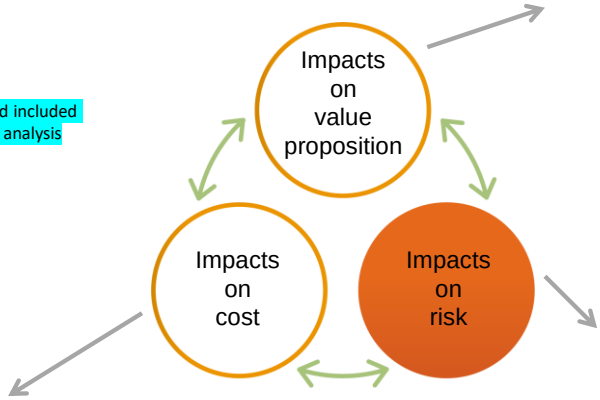
Strategic analysis
Value-Cost-Risk

Step 3 – Strategic analysis

NEBs monetized and included in the DCF financial analysis



- Lower absenteeism costs
- Lower energy costs

- Better product (services) quality
- Improved security of premises
- Reduced absenteeism (teachers and pupils)

- Missions better guaranteed
- Elimination of fossil fuels - A NET ZERO CARBON school
- Exemplary behaviour and community contribution (RCU)
- Increased sales
- Increases in operating profit, book value of assets and market value of building

- Reduced risk of disruption to activities and failure to achieve the school's mission
- Reduced business risk
- Reduced legal risks
- Reduced financial risks
- Reduced fossil fuel energy price risk
- Reduced risk of energy supply disruption
- Reduced climate risks

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Detailed financial calculation – Scenario 3

Step 4 – Financial analysis

Total annual energy benefits/savings
(inward investment flows)

RÉDUCTION DU COÛT TOTAL DE L'ÉNERGIE EN EUR				0	50 649	54 530
BÉNÉFICES NON ÉNERGÉTIQUES (BNE)						
BÉNÉFICES NON ÉNERGÉTIQUES	Montant en EUR	Période de début	Durée du projet	Année 0	Année 1	Année 2
Hausse du chiffre d'affaires annuel	46 000	Année 1	Récurrent	0	46 000	46 000
TOTAL DES BENEFICES NON ENERGETIQUES (CHIFFRE D'AFFAIRES ADDITIONNEL OU REDUCTION DE COÛTS)				0	46 000	46 000

Total annual non-energy benefits
(inward investment flows)

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Step 4 – Financial analysis

Financial analysis scenario 3

EBs only:

- CAPEX: 6'195'430 € (after subsidies)
- annual investment income: 50'649 € (1st year)
- NPV: -4'456'632 €
- IRR: -2,52 %
- Simple payback: 21 years

EBs + NEBs:

- CAPEX: 6'195'430 € (after subsidies)
- annual investment income: 96'649 € (1st year)
- NPV: -3'902'325 €
- IRR: -1,42 %
- Simple payback: 21 years

Discount rate: 5.4%
Duration of the investment: 20 years (= the number of years taken into account to calculate the NPV and the IRR).NB: the figures relating to NPV include three assumptions: a (modest) increase in annual turnover; an annual increase over the duration of the investment (20 years) of 3% in the prices of electricity, gas and domestic fuel oil over the period; a 30% increase in the market value of the property asset in year 20 of the investment.

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Step 5 – Conclusions

Why this project deserves to happen (even if not profitable):

- Thanks to significant improvements in the quality, comfort and safety of teaching and accommodation conditions, the school's value proposition is strengthened for all its customers and stakeholders.
- Increased turnover; reduction in operating costs (energy, absenteeism).
- Operating profit (OP) and market value of property assets increase.
- Reduction of major risks: Business continuity, commercial, health, legal, financial, energy and climate.
- The school, modernised and strengthened, is able to fulfil its missions, play its role in the local community (RCU) and meet the expectations of its clients and shareholders in the long term.

If the project is not realised: The building becomes obsolete and the associated financial risks continue to increase; the initial investment is higher and the subsidies decrease. The value proposition for all stakeholders is at risk of erosion and other risks increase.

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