

Accepted Manuscript

Environmental and economic evaluations of building energy retrofits: Case study of a commercial building

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PII: S0360-1323(18)30555-9

DOI: [10.1016/j.buildenv.2018.09.007](https://doi.org/10.1016/j.buildenv.2018.09.007)

Reference: BAE 5683

To appear in: *Building and Environment*

Received Date: 7 June 2018

Revised Date: 27 August 2018

Accepted Date: 5 September 2018

Please cite this article as: Zheng L, Lai J, Environmental and economic evaluations of building energy retrofits: Case study of a commercial building, *Building and Environment* (2018), doi: 10.1016/j.buildenv.2018.09.007.

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1 **Environmental and Economic Evaluations of Building Energy Retrofits:**
2 **Case Study of a Commercial Building**

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8

9 **Abstract**

10 Implementing energy saving measures (ESMs) in buildings is a critical part of the global de-
11 carbonization process. To private building owners, the cost-effectiveness of ESMs is a major
12 concern. To public policy makers, maximizing carbon reduction within budgets is a common
13 goal. As such, a plethora of studies have been pursued to evaluate the economic or
14 environmental effectiveness of ESMs; however, the reliability of their results are often
15 uncertain due to the dearth of real data. This paper reports a case study on evaluating the
16 retrofit adopted for the air-conditioning (AC) system of a commercial building in Hong
17 Kong. Using longitudinal energy and cost data of the AC system, the economic performance
18 of the retrofit was evaluated by analyzing its net present value and return on investment, and
19 an indicator known as ‘carbon reduction efficiency’ was introduced to assess the
20 environmental-cum-economic performance of the retrofit. Besides the development of a
21 scaling factor that accounts for the climatic influence on AC energy use, the effect of

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