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Sustainable Heating and Cooling of a Hotel Building in Kuala Lumpur Using a Solar-Powered Absorption Heat Pump System

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ABSTRACT

The increasing demand for energy across industrial, residential, and commercial sectors, coupled with the continued dependence on fossil-fuel-based energy systems, poses significant challenges to sustainable development and climate change mitigation. Among all energy-consuming sectors, buildings account for a significant share of global energy consumption, highlighting the need for innovative and sustainable energy solutions. In response to these challenges, renewable-energy-based HVAC systems, including solar absorption heat pumps, represent viable alternatives for reducing energy consumption and minimising the environmental impacts associated with conventional building energy systems. In this study, a solar absorption heat pump system was numerically investigated for meeting the cooling, domestic hot water and semi-Olympic outdoor swimming-pool heating demands of a 100-occupant reference hotel building in Kuala Lumpur, Malaysia, under tropical climate conditions. Due to their technical advantages, evacuated-tube heat-pipe solar collectors were selected for solar thermal energy generation, while a LiCl–H_2O absorption heat pump with internal energy storage was employed for cooling. The analyses were performed using TRNSYS. The results indicated that the average monthly solar coverage of the cooling demand was 51% over the year, with an average cooling coefficient of performance (COP) of 0.50. The solar energy system also satisfied 96% of the annual domestic hot water demand. In addition, waste heat recovery from the absorption system provided 61,886 kWh of thermal energy annually for swimming-pool heating. Solar energy utilisation resulted in annual economic savings of €17,998 and a reduction of 213,926 kg in CO_2 emissions, equivalent to 91,918 L of petroleum. Waste heat recovery provided an additional annual economic saving of €6,189 and an additional CO_2 reduction of 73,575 kg. The results demonstrate that the solar absorption system can provide significant technical, economic and environmental benefits for hotel buildings in tropical regions, confirming the potential of solar energy as a clean and sustainable energy source for improving building energy sustainability.

KEYWORDS Solar energy, Eco buildings, Heating - cooling, Low carbon energy, Sustainability

1. Introduction

In an era marked by unprecedented technological advancement, the continuing growth in global energy demand is accompanied by a corresponding rise in the problems associated with energy use (IEA 2025). Therefore, meeting the required energy demand through clean and renewable energy sources is essential for a sustainable future (IPCC 2022). A substantial share of global energy consumption is attributable to meeting the energy demands of buildings. Essential end uses such as space heating and cooling and domestic hot water production constitute a major component of building energy consumption (UNEP 2026).

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Numerous studies have investigated the use of renewable-energy-based technologies to meet the energy demands of buildings (Cuce and Riffat 2024; Kutlu *et al.* 2025). Among these technologies, solar cooling applications occupy an important position (Pastakkaya *et al.* 2012; Rodríguez-Hidalgo *et al.* 2008). Compared with conventional cooling systems, innovative sorption cooling technologies offer considerable economic benefits owing to their technical advantages (Boero and Agyenim 2020; Pastakkaya 2023). By obtaining the required thermal energy from solar energy, these systems provide not only technical and economic benefits but also substantial environmental and social gains (IRENA 2017).

This study investigates the use of solar energy to meet the cooling, domestic hot water and swimming-pool heating demands of buildings. A numerical analysis was conducted for a hotel building located in Kuala Lumpur, Malaysia, whose thermal energy demands were supplied by a solar-powered absorption heat pump system. The technical, economic and environmental benefits resulting from the use of the renewable-energy-based system were quantified and subsequently evaluated.

2. Material & methods

2.1. Solar absorption system

The system designed to meet the cooling and domestic hot water demands of the reference hotel building using solar energy comprises a solar-powered absorption heat pump, an evacuated-tube solar collector system and hot water storage tanks, a heat distribution circuit, a heat rejection circuit, and auxiliary energy sources. A schematic representation of the system components is presented in Figure 1. Eight LiCl–H_2O absorption heat pump units, each with a nominal cooling capacity of 10 kW and capable of internally storing thermal energy, were used to meet the cooling demand of the hotel building (Hallström 2009). The thermal energy required to drive the heat pump units, which were connected in cascade, was supplied by high-efficiency evacuated-tube heat-pipe solar collectors, each comprising 30 tubes and having an aperture area of 3.23 m^2, with a total collector area of 700 m^2. The solar collectors were installed on the roof of the hotel building parallel to the roof surface, corresponding to a collector tilt angle of 0°. In addition, hot water storage tanks with a total volume of 30 m^3 were incorporated into the system to store the thermal energy obtained from solar energy, with a constant year-round set-point temperature of 90 °C.

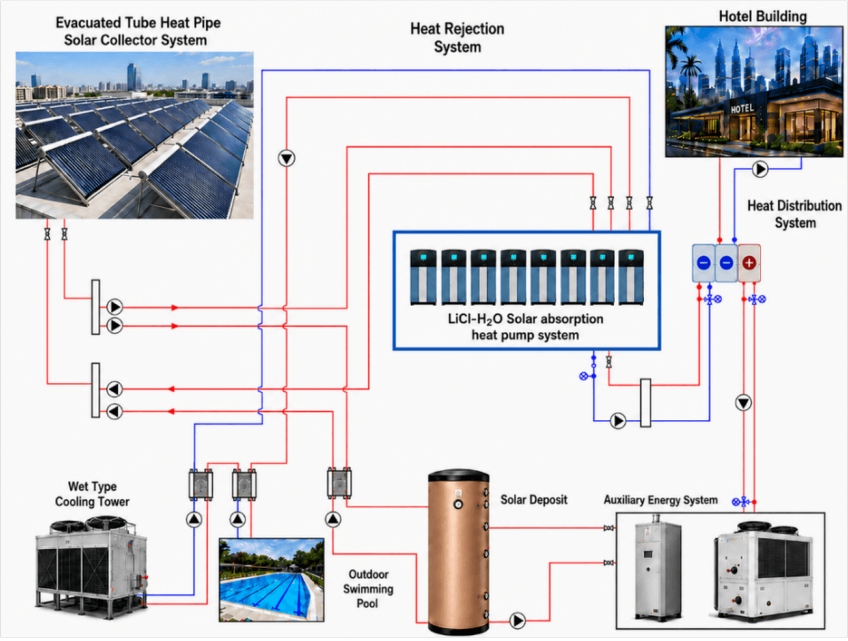

Figure 1. Schematic representation of the solar absorption heat pump system.

The heat distribution system used to supply the cooling energy produced by the absorption heat pump system to meet the cooling load of the hotel building consists of an air-duct distribution system designed to operate at 12/17 °C. When the available solar energy was insufficient, an electric boiler with an average efficiency of 0.9 and an electric chiller with an average coefficient of performance of 3 were integrated into the system to supply the supplementary thermal energy and meet the remaining cooling demand, respectively. The electricity unit cost used to evaluate the economic savings achieved by the overall system was assumed to be €0.09/kWh, based on the commercial electricity tariff applicable in Kuala Lumpur, Malaysia, and the corresponding MYR–EUR exchange rate (TNB 2026; ECB 2026).

A wet-type cooling tower equipped with an axial fan with a nominal power of 1.3 kW was used to reject the waste heat generated by the absorption heat pump system. The monthly wet-bulb design temperatures specified for Kuala Lumpur were used to determine the cooling-tower design temperatures, as shown in Figure 2 (ASHRAE 2009). To recover the waste heat generated by the system, a semi-Olympic outdoor swimming pool with a surface area of 312 m^2, a volume of 625 m^3 and a maximum water temperature of 27 °C was incorporated into the hotel facility. As shown in Figure 2, buildings located in Kuala Lumpur and designed for an indoor summer temperature of 25 °C require cooling only. Accordingly, the absorption heat pump system is operated exclusively for cooling. In addition, part of the waste heat generated during this process is recovered to heat the swimming-pool water, thereby providing an additional economic benefit through the utilisation of solar energy.

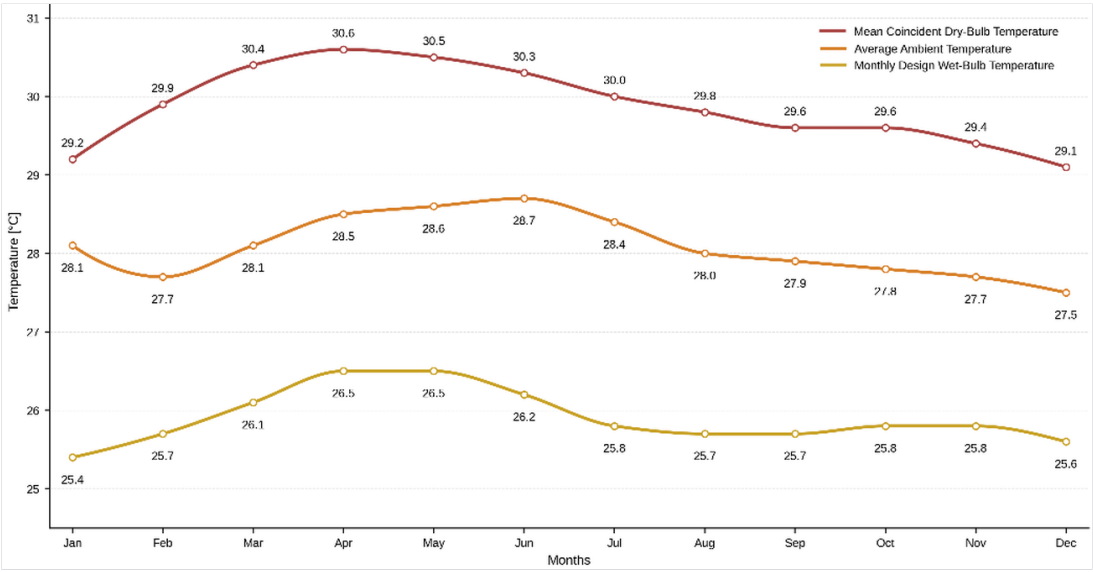

Figure 2. Monthly temperature variations in Kuala Lumpur.

The operating principle of the absorption heat pump in cooling mode is illustrated in Figure 3. The system comprises two interconnected but independently operating vessels, referred to as Vessel A and Vessel B, each containing an identical storage unit filled with a LiCl–H_2O solution. During the charging process, the water contained in the LiCl–H_2O solution within the unit referred to as the reactor in Vessel A evaporates using the thermal energy supplied by the solar collectors and subsequently passes to the unit referred to as the condenser. Meanwhile, the waste heat released in the condenser is rejected from the system through the heat rejection circuit, causing the water vapour to condense. In this innovative system, all the water contained in the salt solution within the unit referred to as the reactor can be evaporated and transferred to the condenser; consequently, the risk of crystallisation encountered in conventional absorption cooling systems is completely eliminated.

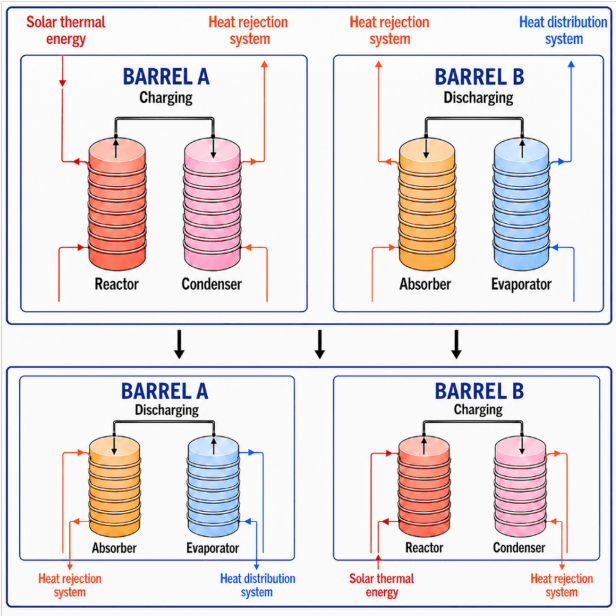

Figure 3. Operating principle of the absorption heat pump.

Once all the water contained in the unit referred to as the reactor, or the desired amount of it, has been evaporated, the pressures in the reactor and condenser are adjusted to initiate the discharging process. During the discharging process, the unit previously referred to as the reactor is referred to as the absorber, while the unit previously referred to as the condenser is referred to as the evaporator. As the pressure within the unit referred to as the evaporator is reduced, the water contained in the unit absorbs heat from the space to be cooled through a heat-exchange circuit and evaporates. The evaporated water is absorbed by the salt solution contained in the unit referred to as the absorber, while the waste heat generated during this process is rejected through the heat rejection system. Although the system is operated exclusively for cooling in the present study, it can also be used for space heating when required by supplying the waste heat generated by the system to the conditioned space.

While Vessel A is being charged, Vessel B is being discharged; when the operating roles of the vessels are reversed, Vessel B is charged and Vessel A is discharged. This alternating operation enables continuous cooling to be maintained. In addition, depending on the operating conditions and the amount of solar energy available, Vessel A and Vessel B can be charged or discharged simultaneously. This operational flexibility allows the cooling demand to be met even during night-time hours when solar energy is not available. Furthermore, owing to the system's internal energy storage capability, the need for external thermal energy storage units can be significantly reduced or even completely eliminated. Consequently, both the space required for system installation and the initial investment cost of the system can be substantially reduced.

2.2. Hotel building and climatic conditions

The hotel building investigated in this study is a single-storey structure located in Kuala Lumpur, Malaysia, with a total floor area of 1,000 m^2 and designed to accommodate 100 occupants. The external wall and window areas of the north- and south-facing façades are equal, at 50 m^2 each, while those of the east- and west-facing façades are similarly equal, at 80 m^2. The average thermal transmittance (U-value) was specified as 2 $W/m^2 \cdot K$ for the external walls and 2.5 $W/m^2 \cdot K$ for the windows (Nasir and Hassan 2020; Chaiyapinunt and Khamporn 2009). To ensure the thermal comfort of the hotel occupants, the indoor comfort temperature was set at 25 °C, while the domestic hot water temperature was set at 50 °C and the daily water consumption was specified as 140 L per occupant,

based on reported hotel water-demand values (Cai *et al.* 2024). The air change rate within the building was set at 5 h^{-1} as a simulation assumption informed by hotel HVAC design guidance (ASHRAE 2023).

As shown in Figure 2, Kuala Lumpur exhibits only limited monthly temperature variation owing to its equatorial location (ASHRAE 2009). The observed fluctuations are associated with the Northeast and Southwest monsoons and the intervening inter-monsoon periods, which influence rainfall, cloud cover and sunshine duration (MET Malaysia, n.d.). Despite these climatic variations, Kuala Lumpur has relatively consistent solar potential throughout the year, providing favourable conditions for the operation of the solar-powered absorption heat pump system considered in this study (NASA POWER 2026).

2.3. Simulation program

The entire system design investigated in this study, including all its components, was simulated using the TRNSYS simulation program. TRNSYS has been widely applied in academic studies for the dynamic modelling, design and performance analysis of solar-assisted heating and cooling systems (Sokhansefat *et al.* 2017; Cerezo *et al.* 2018; Redpath *et al.* 2022). Owing to its modular structure and dynamic-link-library-based architecture, TRNSYS allows a wide range of technical components to be combined and simulated under transient operating conditions over user-defined time intervals, thereby supporting detailed technical and economic analyses. Its long-standing commercial availability and extensive component libraries have also supported its use in practical engineering analyses (Solar Energy Laboratory 2017).

The solar absorption heat pump system and its components were modelled and numerically simulated using the ClimateWell–Solar Cooling v1.1 software package implemented within TRNSYS (Pastakkaya *et al.* 2015). The mathematical modelling of the absorption heat pump was based on the work of Bales and Nordlander (2005). In addition, Conde (2004) presented detailed calculation models and thermophysical properties for aqueous LiCl solutions relevant to the simulation of absorption cooling systems. Meteonorm-based meteorological data files available in the TRNSYS library were used to define the outdoor climatic conditions required for the simulation of the hotel building (Meteotest, n.d.). All analyses were performed on a monthly basis, and the resulting monthly data were evaluated to determine the annual operating characteristics of the system.

3. Results and discussion

The simulation results showed that the average monthly solar coverage of the cooling demand was 51% over the year (Figure 4). The monthly solar coverage of the cooling demand varied only between 42% and 54%, representing a narrow range of 12 percentage points and indicating a relatively stable contribution of the solar absorption heat pump system throughout the year. Previous studies have shown that solar fractions of around 50% can provide a substantial solar contribution while maintaining effective operation with auxiliary energy sources (Henning 2007). Furthermore, economically optimised solar cooling systems may operate at lower solar fractions than the maximum technically achievable values (Eicker *et al.* 2014). Accordingly, maximising the solar fraction is not necessarily the most appropriate design strategy.

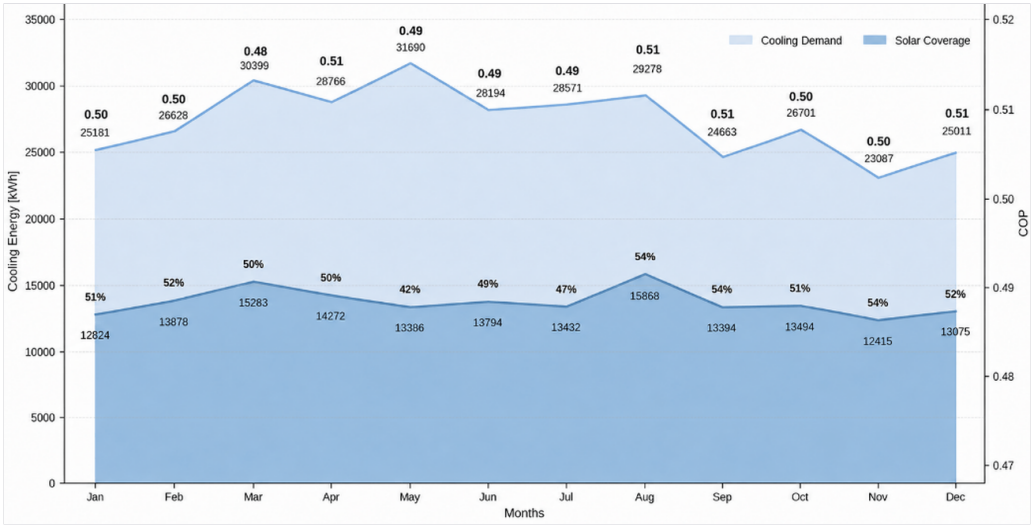

Figure 4. Monthly variation in solar coverage and COP of the absorption cooling system.

As shown in Figure 4, the monthly COP of the absorption system ranged from 0.48 to 0.51 depending on seasonal and operating conditions, representing a very narrow variation range of only 0.03 and indicating relatively stable system performance throughout the year. The annual average COP of the absorption system was determined to be 0.50, consistent with values reported for comparable solar absorption cooling systems under similar operating conditions (Hammad and Audi 1992; Izquierdo Millán *et al.* 1997; Syed *et al.* 2005; Monné *et al.* 2011).

The domestic hot water demand of the hotel building, together with the corresponding solar contribution and coverage ratio, is presented in Figure 5. The average annual solar coverage of the domestic hot water demand was 96%. Depending on seasonal variations and atmospheric conditions, the monthly solar coverage ranged from a minimum of 85% to a maximum of 99%. The results indicate that the solar energy system was able to provide almost all the thermal energy required to meet the annual domestic hot water demand of the hotel occupants.

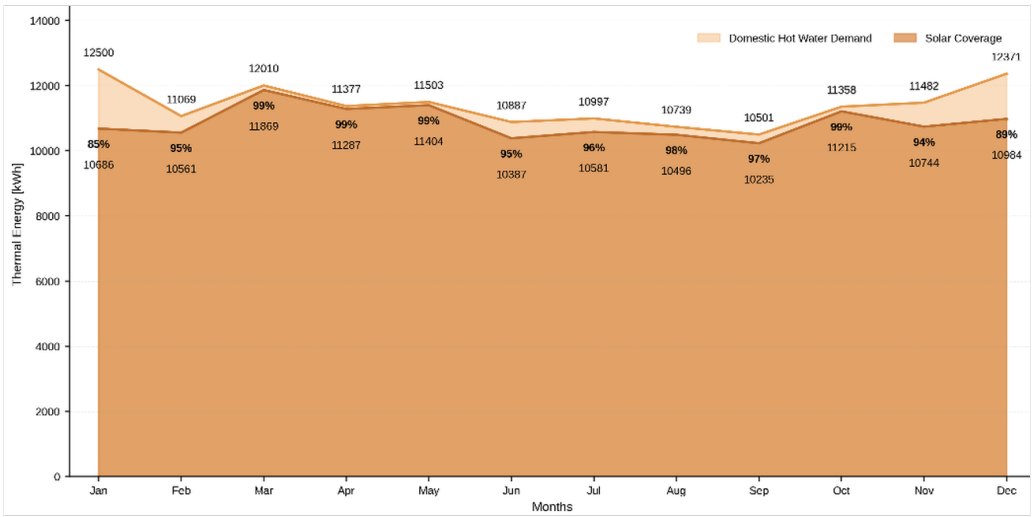

Figure 5. Monthly domestic hot water demand and solar coverage.

The analysis results showed that meeting the cooling demand of the hotel building and the thermal energy demand for domestic hot water using solar energy provided significant economic and environmental benefits. The economic savings achieved through the use of solar energy are presented in Figure 6. The analysis indicated that the use of solar energy resulted in total annual

economic savings of €17,998, of which €13,045 was associated with domestic hot water production and €4,953 with meeting the cooling demand. The economic savings achieved through the use of solar energy could contribute to reducing the payback period of the system, thereby improving the competitiveness of this renewable-energy-based system relative to fossil-fuel-based alternatives.

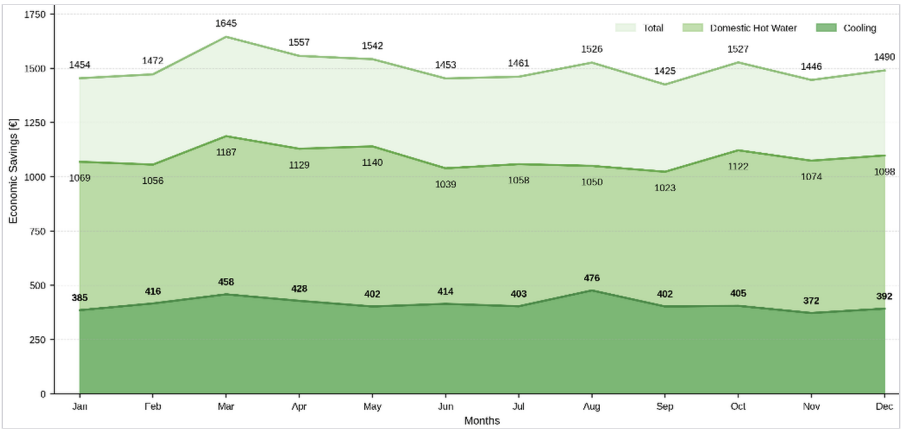

Figure 6. Monthly economic savings from solar energy utilisation.

The use of solar energy also provided significant environmental benefits, resulting in a total annual reduction of 213,926 kg of CO_2 emissions. Approximately 72% of this reduction was associated with domestic hot water production and the remaining 28% with the cooling application. The annual petroleum-equivalent value corresponding to the reduction in CO_2 emissions was calculated as 91,918 L; the monthly variation is presented in Figure 7. The reduction in CO_2 emissions achieved through the use of solar energy, a clean, renewable and domestically available energy source, is expected to provide significant environmental and social benefits by reducing dependence on fossil fuels.

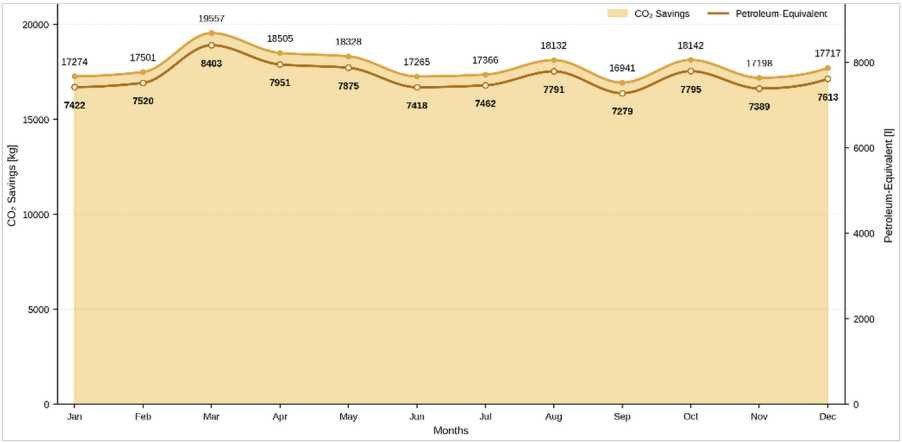

Figure 7. Monthly CO_2 emission reductions and petroleum-equivalent values from solar energy utilisation.

The recovery of waste heat generated by the absorption heat pump for use as an auxiliary energy source in heating the semi-Olympic swimming pool incorporated into the hotel facility was also investigated. The analysis showed that a total of 61,886 kWh of thermal energy could be recovered annually for swimming-pool heating, providing an additional annual economic saving of €6,189. Table 1 presents the monthly variations in the recovered thermal energy, the corresponding economic savings, the reduction in CO_2 emissions and its petroleum-equivalent value. The annual totals were calculated using the unrounded monthly values. Waste heat recovery also resulted in significant additional reductions in CO_2 emissions. The total additional annual reduction in CO_2 emissions was calculated as 73,575 kg, corresponding to a petroleum-equivalent value of 31,637 L (Table 1).

Table 1. Monthly thermal energy recovery, economic savings, CO_2 emission reductions and petroleum-equivalent values.

Months	Recovered Thermal Energy [kWh]	Economic Savings [€]	CO_2 emission reductions [kg]	Petroleum Equivalent [L]
January	4592	459	5459	2347
February	5584	558	6638	2855
March	6187	619	7356	3163
April	4577	458	5441	2340
May	4488	449	5335	2294
June	5792	579	6887	2961
July	3714	371	4415	1899
August	5479	548	6513	2801
September	4641	464	5518	2373
October	5805	581	6902	2968
November	5785	578	6878	2957
December	5243	524	6233	2680
TOTAL	***61886***	***6189***	***73575***	***31637***

The use of waste heat from the absorption system for heating the semi-Olympic outdoor swimming pool increased the total annual economic savings from €17,998 to €24,187, corresponding to an additional saving of €6,189. Similarly, waste heat recovery increased the annual reduction in CO_2 emissions from 213,926 kg to 287,501 kg, representing an additional reduction of 73,575 kg. Waste heat recovery for swimming-pool heating increased both the economic savings and the CO_2 emission reductions by approximately 34%.

4. Conclusion

The results demonstrated the technical feasibility of the proposed solar-powered absorption heat pump system and its successful fulfilment of the intended functions in cooling a 100-occupant reference hotel building in Kuala Lumpur, Malaysia, meeting the domestic hot water demand of the occupants and recovering waste heat for heating a semi-Olympic swimming pool. The average monthly solar coverage of the cooling demand was 51% over the year, while the system satisfied 96% of the annual domestic hot water demand using solar energy and waste heat recovery for swimming-pool heating increased both the economic savings and the CO_2 emission reductions by approximately 34%. By utilising solar energy as a clean, renewable and domestically available energy source, the system achieved substantial economic savings and significant reductions in CO_2 emissions. These benefits indicate that the solar-powered system offers considerable economic and environmental advantages over fossil-fuel-based alternatives, supporting its potential as a competitive and sustainable solution.

The economic savings achieved through the use of solar energy could significantly shorten the payback period of the system, thereby improving its economic viability and encouraging wider adoption. The internal energy storage capability of the absorption system, the elimination of crystallisation risk and the ability to achieve different system capacities through cascade connection provide considerable flexibility in system design. Simulation programs such as TRNSYS, as used in this study, enable systems with different component configurations operating under varied climatic conditions at different locations to be optimised from technical and economic perspectives, thereby supporting the development of technically and economically viable system designs.

The simulation results exhibited a coherent and consistent performance pattern across the technical, economic and environmental indicators evaluated in the study. Improving the technical and economic feasibility of solar-powered systems could enable their more efficient utilisation and

support their wider deployment on a global scale. Solar-powered absorption systems may therefore provide an important alternative for addressing the technical, economic, environmental and social challenges associated with energy use.

Declarations

Author contributions. Bilsay Pastakkaya: Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Visualization, Validation, Supervision, Project administration, Resources, Software, Funding acquisition, Writing (original draft). Şekip Esat Hayber: Writing (review and editing). James Riffat: Conceptualization, Writing (review and editing), Supervision. Seyed Reza Samaei: Writing (review and editing).

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Conflicts of interest. The authors declare no competing interests.

Data availability. The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics. Not required.

Editorial independence. Confirmed

Generative AI. In-text citations and full references formatted to HARVARD REFERENCING, and referencing format and reference section were double checked by AI.

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References

ASHRAE (2009) *ASHRAE Handbook—Fundamentals, SI Edition*. Atlanta, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

ASHRAE (2023) *ASHRAE Handbook—HVAC Applications. Chapter 7, Hospitality*. Peachtree Corners, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers.

Bales, C.; Nordlander, S. (2005) *TCA Evaluation: Lab Measurements, Modelling and System Simulations*. Solar Energy Research Center, Dalarna University, Sweden. ISSN 1401-7555, ISRN DU-SERC-91-SE.

Boero, Andrea; Agyenim, Francis (2020) 'Modeling and simulation of a small-scale solar-powered absorption cooling system in three cities with a tropical climate', *International Journal of Low-Carbon Technologies*, 15(1), pp. 1-16. Available at: https://doi.org/10.1093/ijlct/ctz040

Cai, Rong; Kong, Lingsi; Bai, Yan; Liu, Jialin; Hu, Mengting; Bai, Xue (2024) 'Hierarchy Analysis of Water Demand Among Hotel Consumers for Water Appliances', *Sustainability*, 16(21), pp. 9467. Available at: https://doi.org/10.3390/su16219467

Cerezo, Jesús; Romero, Rosenberg; Ibarra, Jonathan; Rodríguez, Antonio; Montero, Gisela; Acuña, Alexis (2018) 'Dynamic Simulation of an Absorption Cooling System with Different Working Mixtures', *Energies*, 11(2), pp. 259. Available at: https://doi.org/10.3390/en11020259

Chaiyapinunt, Somsak; Khamporn, Nopparat (2009) 'Selecting Glass Window with Film for Buildings in a Hot Climate', *Engineering Journal*, 13(1), pp. 29-42. Available at: https://doi.org/10.4186/ej.2009.13.1.29

Conde, Manuel R. (2004) 'Properties of aqueous solutions of lithium and calcium chlorides: formulations for use in air conditioning equipment design', *International Journal of Thermal Sciences*, 43(4), pp. 367-382. Available at: https://doi.org/10.1016/j.ijthermalsci.2003.09.003

Cuce, Pinar Mert; Riffat, Saffa (2024) 'A Novel Moist Airflow Heating System for Low/Zero Carbon Buildings: a Numerical Study', *Sustainable and Clean Buildings*, 1(1), pp. 23-41. Available at: https://doi.org/10.37256/scb.1120264541

ECB (2026) *Euro Foreign Exchange Reference Rates: Malaysian Ringgit (MYR)*. European Central Bank.

Eicker, Ursula; Pietruschka, Dirk; Haag, Maximilian; Schmitt, Andreas (2014) 'Energy and Economic Performance of Solar Cooling Systems World Wide', *Energy Procedia*, 57, pp. 2581-2589. Available at: https://doi.org/10.1016/j.egypro.2014.10.269

Hallström, O. (2009) 'Solar Cooling®', *Proceedings of the 3rd International Conference on Solar Air-Conditioning, Industry Forum, Vol. 2*. Italy, pp. 1-13.

Hammad, M.A.; Audi, M.S. (1992) 'Performance of a solar LiBr-water absorption refrigeration system', *Renewable Energy*, 2(3), pp. 275-282. Available at: https://doi.org/10.1016/0960-1481(92)90039-6

Henning, Hans-Martin (2007) 'Solar assisted air conditioning of buildings – an overview', *Applied Thermal Engineering*, 27(10), pp. 1734-1749. Available at: https://doi.org/10.1016/j.applthermaleng.2006.07.021

IEA (2025) *Global Energy Review 2025*. Paris: International Energy Agency.

IPCC (2022) *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

IRENA (2017) *Renewable Energy Benefits: Understanding the Socio-economics*. Abu Dhabi: International Renewable Energy Agency.

Izquierdo Millán, M.; Hernández, F.; Martín, E. (1997) 'Solar cooling in Madrid: Energetic efficiencies', *Solar Energy*, 60(6), pp. 367-377. Available at: https://doi.org/10.1016/s0038-092x(97)00021-2

Kutlu, Cagri; Erdinc, Mehmet Tahir; Ehtiwesh, Amin; Bottarelli, Michele; Su, Yuehong; Riffat, Saffa (2025) 'Evaluation of operation control parameters of a residential solar organic Rankine cycle with effects of expander-generator coupling', *Global Decarbonisation*, 1, pp. 1-19. Available at: https://doi.org/10.17184/eac.9437

MET Malaysia (n.d.) *Malaysia's Climate*. Malaysian Meteorological Department.

Meteotest (n.d.) *Meteonorm: Global Meteorological and Solar Irradiation Data*.

Monné, C.; Alonso, S.; Palacín, F.; Serra, L. (2011) 'Monitoring and simulation of an existing solar powered absorption cooling system in Zaragoza (Spain)', *Applied Thermal Engineering*, 31(1), pp. 28-35. Available at: https://doi.org/10.1016/j.applthermaleng.2010.08.002

NASA POWER (2026) *Prediction of Worldwide Energy Resources: Solar and Meteorological Data for Kuala Lumpur, Malaysia*. NASA Langley Research Center.

Nasir, M.H.A.; Hassan, A.S. (2020) 'Thermal performance of double brick wall construction on the building envelope of high-rise hotel in Malaysia', *Journal of Building Engineering*, 31, pp. 101389. Available at: https://doi.org/10.1016/j.jobe.2020.101389

Pastakkaya, Bilsay; Yamankaradeniz, Nurettin; Kaynakli, Omer; Coskun, Salih; Yamanakaradeniz, Recep (2012) 'Experimental analysis of a solar absorption system with interior energy storage', *Journal of Energy in Southern Africa*, 23(2), pp. 39-49. Available at: https://doi.org/10.17159/2413-3051/2012/v23i2a3161

Pastakkaya, B.; Ünlü, K.; Yamankaradeniz, R. (2015) 'Investigation of a solar heat pump for air conditioning of a building with simulation technique', *Engineer and Machinery*, 56(666), pp. 30-37. Available at: https://izlik.org/JA84YR72ZG

Pastakkaya, Bilsay (2023) 'Investigation of solar powered sorption cooling and heating systems to supply hospital's thermal requirements in pandemic periods', *International Journal of Low-Carbon Technologies*, 18, pp. 373-383. Available at: https://doi.org/10.1093/ijlct/ctad026

Redpath, David; Paneri, Anshul; Singh, Harjit; Ghitas, Ahmed; Sabry, Mohamed (2022) 'Design of a Building-Scale Space Solar Cooling System Using TRNSYS', *Sustainability*, 14(18), pp. 11549. Available at: https://doi.org/10.3390/su141811549

Rodríguez-Hidalgo, M.C.; Rodríguez-Aumente, P.; Izquierdo-Millán, M.; Lecuona-Neumann, A.; Salgado-Mangual, R. (2008) 'Energy and carbon emission savings in Spanish housing air-conditioning using solar driven absorption system', *Applied Thermal Engineering*, 28(14-15), pp. 1734-1744. Available at: https://doi.org/10.1016/j.applthermaleng.2007.11.013

Sokhansefat, T.; Mohammadi, D.; Kasaeian, A.; Mahmoudi, A.R. (2017) 'Simulation and parametric study of a 5-ton solar absorption cooling system in Tehran', *Energy Conversion and Management*, 148, pp. 339-351. Available at: https://doi.org/10.1016/j.enconman.2017.05.070

Solar Energy Laboratory (2017) *TRNSYS 18: A Transient System Simulation Program*. Madison, WI: University of Wisconsin–Madison.

Syed, A.; Izquierdo, M.; Rodríguez, P.; Maidment, G.; Missenden, J.; Lecuona, A.; Tozer, R. (2005) 'A novel experimental investigation of a solar cooling system in Madrid', *International Journal of Refrigeration*, 28(6), pp. 859-871. Available at: https://doi.org/10.1016/j.ijrefrig.2005.01.007

TNB (2026) *Pricing and Tariff: Business Electricity Tariffs*. Tenaga Nasional Berhad.

UNEP (2026) *Global Status Report for Buildings and Construction 2025–2026: Building Fast, Falling Short*. Paris: United Nations Environment Programme.

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