Design of Sustainability of Solar Panel Integration in A Green Building Complex of Wonogiri Regent Office

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Abstract. With the opportunity to repair and rebuild office buildings in the Wonogiri Office Area, where previously area offices still scattered in various regions, now they will be moved and arranged in 1 location with the concept of City Forest—thus opening up opportunities for more environmentally friendly energy use (Renewable Energy). The implementation of Solar Panel rooftop for office buildings in the planning does not only consider the amount of electricity obtained from the photovoltaic installed for offices. However, it also considers the Sustainable Benefits factor to be more reliable and maintain its sustainability. Sustainable benefits in the Wonogiri Office can see from various factors such as; Social, Organizational, Technical, Economic, Environmental. The sustainability factor is assessed after considering the economic feasibility aspects (NPV, IRR, BCR, PBP, LCOE, NPC) and according to the Solar Power Plant installation’s technical aspects. This paper suggested help solves problems related to renewable energy projects that did not last long. It can also become a pilot project for other agencies in terms of a more sustainable Photovoltaic design. This paper will reveal emission reduction, components that need attention, and the willingness and ability to prepare for renewable energy.

1. Introduction

Indonesia has committed to reducing emissions by 29%; it is related to climate change and follows up on the Paris Agreement. Moreover, Indonesia’s highest emission was in the energy sector in 2010, 453.2 million Ton of CO₂e, so it is necessary to reduce it by one way of using Renewable Energy [1]. Another problem is that the building sector alone absorbs 40% of the world’s energy sources. In Indonesia, buildings are responsible for 50% of total energy expenditure and > 70% for electricity consumption. With the above problems, designing a more renewable energy use for the new Wonogiri office area is necessary to reduce existing problems. The new offices in Wonogiri will later carry the concept of Urban Forests.

The energy used is Photovoltaic because this technology is the most effective and allows it to install in office areas. Based on the installation location, the Solar Power Plant housing/office area can install on the roof area (rooftop) [2]. Problems related to renewable projects, namely the development of 23
projects in 17 renewable energy countries, found that almost 21% of projects failed, and only 48% were fully functional. The problem was user responsibility in maintaining, low technology used, and external influences (political, institutional, environmental) [3]. For the designed generator technology to continue to provide sustainable benefits, it is necessary to have a good design and maintain its capability or reliability. The reliability of a Solar Power Plant is influenced by several factors, such as the components used, minimizing technical errors, and implementing a continuous maintenance mechanism. To benefit from Solar Power Plant and develop it sustainably, generating a renewable energy system needs to be based on various technical and economic feasibility considerations comprehensively and maturely.[4] Regarding economic feasibility, it can view from the value of LCOE, NPV (Present Net Value), BCR (Benefit Cost Ratio), and PBP (Payback Period), and IRR (Internal Rate of Return). It can be seen from the results whether the project to be carried out is feasible [5]. After the feasibility aspect is right, the sustainability factors view in economic, environmental, social, technical, and Organization. Mohamed El-Shimy, Ahmed Sayed, Mostafa Elshahed’s Research in Detailed Analysis of Failure and Repair Rate of Wind and Solar-PV Systems for RAM Assessment the solar-PV system includes five subsystems; Photovoltaic array, DC-DC converter, DC-AC inverter, balance of system (BOS), and battery storage subsystems [6]. Regarding the reliability of the photovoltaic system, research by Gabriele Zini, Christophe Mangeant, and Jean Merten in the reliability of large scale grid-connected photovoltaic systems. Where here uses a fault tree to assess the reliability and obtain ratings of components that need better handling, namely Photovoltaic modules and String Protection (diode) [7].

In this research, two scenarios will be carried out with several job assumptions to obtain the desired results. The feasibility factor will see from a technical and economic point of view. For its sustainability, it will see from a technical point of view by considering its reliability using a fault tree and other aspects, then an economic, environmental, social, and organizational perspective. From an environmental perspective, it will reduce CO$_2$ from using this Solar Power Plant renewable energy. This study aims to design the solar panel rooftop in New Bulusulur Office. It can use as a pilot project for installing solar panels in other areas. Moreover, to avoid similar projects’ failure, this paper will provide an overview of the feasibility and sustainability factors.

2. Research Method

2.1 Feasibility Solar Power Plant

An area on the earth’s surface with the sun’s part affects solar energy potential. However, the potential obtained is also not always constant because of other factors such as Geographic location and time (night, day, afternoon, day, year), season, the local landscape, and local weather [8][9]. When carrying out technical analysis, it is often necessary to choose among possible alternatives, all of which are good from a technical point of view and guarantee the installation’s optimal size. Then evaluate some of the existing solutions based on the economic benefits of an investment [10]. The literature provides several methods to see the feasibility of renewable energy or solar technology. The following authors summarize for this study see Table 1.

| Aspect    | Indicator   | Description                                                                 | Method                  |
|-----------|-------------|-----------------------------------------------------------------------------|-------------------------|
| Technical | Location    | Identify the location to ensure the module will be shadow-free.             | Using Sketchup software |
|           |             | See the Land area and climatic condition. Per MWp requires about 1.5-2.3 hectares (ha) of land, but this also depends on geographic location and the construction equipment used. | Survey and Literature   |
|           |             | According to the Indonesian equatorial latitude, the required slope angle, the safety standard | If the latitude is less than 25°, then the tilt angle of the PV module is an angle latitude is multiplied by |
| Aspect | Indicator | Description | Method |
|--------|-----------|-------------|--------|
| Aspect | Indicator | Description | Method |
| Azimuth angle | for Indonesia, is a slope angle of 6-11 degrees (6° N–11° S). | 0.87 [11] or using the formula: \( \alpha = 90^\circ + (\text{lat} - \delta) \) Southern hemisphere \([10][12]\) tilt angle \( \beta = 180^\circ - (90^\circ + \alpha) \) | Check coordinate location |
| Module selection meets the quality standards of IEC 61215 (monocrystalline and polycrystalline module type) | Potential photovoltaic resources | Solar GIS / pvgis Software | Check Datasheet |
| Module selection meets the quality standards of IEC 61215 (monocrystalline and polycrystalline module type) | Module power tolerance is less than 2.5% under the standard test (STC-standard test conditions) | Check Datasheet |
| Module selection meets the quality standards of IEC 61215 (monocrystalline and polycrystalline module type) | Photovoltaic modules must be able to operate at voltages up to 1000 VDC | Check Datasheet |
| Module selection meets the quality standards of IEC 61215 (monocrystalline and polycrystalline module type) | Photovoltaic modules must also have a warranty period that exceeds 20 years of operation with a maximum reduction in performance of 10% per 10 years | Check Datasheet |
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| Selection of cables and other equipment | Maximum tolerable Electrical losses during operation are 1% for DC and 3% for AC. The cross-sectional area of the interconnecting cables between solar modules in one module string photovoltaic not less than 4mm². | Check Datasheet |
| Inverter | Consider the safety margin 1.25 for the input current and voltage; the inverter’s minimum efficiency is 85%. | Check Datasheet |
| Battery | The battery has a deep discharge character. This type of battery can discharge electrical energy until the remaining 20% of the battery’s storage capacity. If the discharge exceeds that power, the battery life will be shorter. | Check Datasheet |
| Electrical Requirements | For initial estimation of electricity demand | From the survey (electricity bill data) and calculations with IKE (Energy consumption Intensity) of office buildings according to GBCI (Green Building) |
2.2 Sustainability Solar Power Plant
After feasibility, several indicators need to be assessed and later considered see table 2 [15][3][16][17].

Table 2 List of Sustainable Benefit Assessments Adapted from The Sustainability of The Project, Energy Sector Sustainability

| Sustainability Factor | No | Indicator | Description | Unit |
|-----------------------|----|-----------|-------------|------|
| Social                | 1. | Approval for installing the solar panel | Solar panel installation considers the involvement of users and stakeholders from the existing social structure. | (%) |
|                       | 2. | There is awareness related to efficiency | | (%) |
|                       | 3. | There is a target for GBCI (Green Building Council Indonesia) | | (%) |
|                       | 4. | The existence of a management agency | Judging from the previous project, is there any | (%) |
| Organization          | 1. | Maintenance | Based on the replacement of spare part or component | Yes/No |
|                       | 2. | Operational project | Judging by the age of the components | Year |
|                       | 3. | Human Resources | Human resources were Judging from the availability of human | Capable/unable |

Council Indonesia) in 2010, amounting to 250 kWh/m²/year. The formula for the payback period. The formula for the NPV.
| Sustainability Factor | No | Indicator | Description | Unit |
|-----------------------|----|-----------|-------------|------|
| **Technical**         |    |           | resources or community education. |      |
| 1.                    |    | The reliability/ ability of the technology to operate | Analyzed using a fault tree | (%)  |
| 2.                    |    | Capacity Factor | What percentage of the planned demand (from previous electricity usage data) | (%)  |
| 3.                    |    | Comply with future grid services | The power plant can connect to the national power grid | Can/Cannot |
| **Economy**           |    | Benefit | From Benefit-cost ratio | (%)  |
| 2.                    |    | Rate of return | From the payback period, Solar power plant should be | Year  |
| **Environment**       |    | CO₂ Emission | Viewed when using Solar power plant and when not using it | (%)  |
| 2.                    |    | Weather conditions or temperature that can affect the condition of the panel | Seeing the working temperature compared to the average temperature in Wonogiri | Meets/not |
| 3.                    |    | Another effect due to Solar panel | Is there any or not |      |

3. Results and Discussion

3.1. Analysis of Feasibility

3.1.1. Technical Feasibility

The Location of the Wonogiri New Building Office is in Bulusulur Village, Wonogiri District, Wonogiri Regency, Central Java Province. The location is on the edge of the main road Wonogiri-Ponorogo (-7.81, 110.95) (GMT 7.0), see figure 1. The planned office area will be around 14 ha.

From the data, the office’s location is located in the southern hemisphere of latitude so that the panel installation will on the rooftop of the building facing north see figure 2 [18]. According to the calculation, the PV module’s geometry for this building (tilt angle) will correspond to a 7-12 degrees slope and the azimuth of 0° see figure 3. PVGIS-5 estimates of solar electricity generation and potential radiation yearly see figure 4.

![Figure 1. Location for New Office [19]](image1)

![Figure 2. Location for Install Solar Panel Rooftop](image2)
Figure 3. Solar Panel for Rooftop

The solar panel that uses is like the LEN module product, 260 Wp monocrystalline type. Solar Panel Wiring Cable NYAF 10mm, Inverters used the equivalent of Sunny Trippower SMA Inverter with 25000TL 25 KW power that has max efficiency: 98.3%/98.1%, for hybrid used the equivalent of Sunny island 8H and OPzv 2V 1000A battery. The criteria are following the specifications according to the eligibility aspects mentioned in table 1 previously. For the result, see table 3.

Table 3. The Land Area and Power to be Produced

| No | Building Name                  | Estimated Roof Area used for PV facing north (m²) | Number of solar panels (1.65) | Power (260 Wp) | Solar Panel Type | Type   |
|----|--------------------------------|---------------------------------------------------|--------------------------------|----------------|------------------|--------|
| 1. | OPD 1 Building                 | 263.89                                            | 620.13                        | 160 367       | 41600            | 97760  |
| 2. | OPD 2 Building                 | 263.89                                            | 620.13                        | 160 367       | 41600            | 97760  |
| 3. | OPD 3 Building                 | 263.89                                            | 620.13                        | 160 367       | 41600            | 97760  |
| 4. | MPP/ Guesthouse/Center business Building | 263.89                                      | 620.13                        | 160 367       | 41600            | 97760  |
| 5. | Mosque                         | 131.94                                            | 451.9                         | 80 274        | 20800            | 71240  |
| 6. | Mangkunegaran                  | 131.94                                            | 5345.82                       | 80 3240       | 20800            | 842400 |
| 7. | Regent’s Office                | 263.89                                            | 237.5                         | 160 144       | 41600            | 37440  |
| 8. | Water Pump                     | 131.94                                            | 131.94                        | 80 80         | 20800            | 20800  |
| 9. | RO machine                     | 131.94                                            | 131.94                        | 80 80         | 20800            | 20800  |
|    | Total                           | 291200                                           | 1383720                       |                |                  |        |

3.1.2. Economic Feasibility

For scenario 1, investment costs require a fund of IDR 10,583,000,000 and O&M IDR 928,253,310 for 20 years. In comparison, the price for Scenario 2 investment cost IDR 40,355,775,000 and O&M IDR 2,576,760,422 for 20 years. See Table 4 for the result.

Other Parameter: 1 USD=IDR 14600, According to government regulation on purchasing power plants from solar power plants USD 0.14/kWh so in IDR is 2117 current source Bank Indonesia interest rates 4%, tax 10%. For Scenario 1 result of the solar PV energy output of a photovoltaic system is= 475,142 kWh/year, and scenario 2=2,268,557 Kwh/year.

Table 4. The Land Area and Power to be Produced

| No | Economic feasibility parameters | Scenario 1 | Scenario 2 |
|----|----------------------------------|------------|------------|
|    |                                  | IDR 2117  | IDR 3964   |
| 1. | PBP                              | >20 Year   | 20 Year    |
| 2. | NPV                              | IDR       | IDR 469,655|
|    |                                  | 11,926,227,785 | 31,683,520,738 |
| 3. | IRR                              | n/a       | 0.0005%    |
| 4. | BCR                              | 0.63      | 1.00       |
| 5. | NPC                              | -IDR       | -IDR       |
| 6. | LCOE                             | IDR 1785.78 | IDR 1403.61 |
We can choose from the lowest LCOE and NPC parameters to choose a scenario to be applied based on the calculation results. Both scenarios are still by the standard, namely < from the US $ 0.05 - 0.144 / kWh or in IDR 2,102.4. As for the feasibility, when viewed from the Payback Period with sales of IDR 2117.00, it still takes a very long time to return investment costs. However, if we raise it to IDR 3964.00 and IDR 3145.00, this project is worth continuing.

3.1.3. Social Sustainability
The result of the questioner for the 25 OPD, there are 20 answers, and this has represented the OPD. 90% agreed to install Solar Power Plant, and 20% disagreed because an existing building made it impossible to rebuild. So, there is Willing. Concern for energy efficiency in OPD has reached 10%. For the GBCI Rating for offices, 10% of OPD are interested and are already aware of renewable energy, while others have not answered. So, from the social aspect, there is a willingness and awareness to install solar panels. Moreover, the management ability will see from the organizational aspect.

3.1.4. Organization Sustainability
For maintenance and useful life components in Solar Power Plant can see table 5.

| Description                | Year  | Maintenance                          |
|----------------------------|-------|--------------------------------------|
| Useful life Solar panel    | 20 Year | per 1 year for check grounding       |
| Useful life Inverter       | 5-10 Year | per 5 years for maintenance Inverter |
| Useful life MCCB           | 30 Year | per 2 years for Preventive maintenance for instrument and electric component |
| Useful life Online Monitoring | 15 Year     |                                         |
| Useful life Battery        | <20 Year |                                         |
| Useful life Electric       | 30 Year | per 1 year for cleaning and inspection Power Module |
| Instrument                 |         |                                         |
| Useful life Genset         | 14 Year | per 3 year - 1 Tahun for change Spare Part Genset |

Furthermore, the Readiness assessment is the ability (Job Readiness) and willingness (Psychological Readiness) of the OPD government apparatus or seen by the surrounding community’s education level. Ability includes knowledge, experience, and skills needed by a person to complete a task, while willingness is the level of self-confidence, commitment, and motivation of a person to work. In this case, what is meant by able/able is not only having theoretical knowledge (or highly educated) but also being able to realize performance and work. It is related to providing materials for developing soft skills or personal effectiveness [21]. Data for 2018 Employment statistics 73.28% of the Wonogiri population works, and 59.89% of the population aged 15+ are men who work with SD / MI (31.28 percent), followed by SMP / MTs (20.73 percent). The population who did not complete elementary school was relatively high (18.72 percent), while those from tertiary education were only 4.98 percent. Data shows that the Wonogiri District still lacks quality human resources with higher education in its workforce. In Wonogiri, there is a Vocational Training Center (BLK) used for training for around society. This facility can make workers more capable because of Wonogiri residents’ willingness to work very high. There is support from the government so that only 1.71% are unemployed. That data can predict society’s capability and make schedule maintenance and inspection, and predict operational running.

3.1.5. Technical Sustainability
Solar power plants can connect to the national electricity, or the name is grid connection. In this study, the regent’s office area will also connect with the national network. It will also connect to a battery and generator or hybrid. See table 6 For Probabilistic failure rate Grid and hybrid connection with duration for operating 8.5 hours of literature from [22][23][24][7][4].
The resulting reliability for the grid connection is 99.88%. Moreover, for a Hybrid connection higher than the grid, there is 99.99%. Because when it is hybrid, if the solar panel does not work system still has a battery for backup and increases its reliability. After one year until 20 years, the grid and hybrid connection’s reliability decreases, so the important thing is to know the critical equipment for scheduling preventive maintenance. The highly critical grid component is the cooling fan, control communication board (CCB), and rack structure. And for a hybrid, rack structure, charge controller, Grounding/Lighting Protection system, and junction box bypass diode. So, equipment that on the list needs a priority for schedule maintenance.

| No | Event | Remark | Probabilistic failure rate (P) | Event | Remark | Probabilistic failure rate (P) |
|----|-------|--------|-------------------------------|-------|--------|-------------------------------|
| 1  | A     | Rack Structure | 2.07E-04 | Af | Rack Structure AND Charge Controller | 1.13E-08 |
| 2  | B     | Grounding/Lighting Protection System | 1.38E-04 | Bf | Grounding/Lighting Protection System AND Charge Controller | 7.49E-09 |
| 3  | C     | Junction Box Bypass Diode | 5.75E-06 | Cf | Junction Box Bypass Diode AND Charge Controller | 3.13E-10 |
| 4  | D     | Encapsulates leakage | 3.45E-05 | Df | Encapsulates leakage AND Charge Controller | 1.88E-09 |
| 5  | E     | Module | 1.29E-07 | Ef | Module AND Charge Controller | 7.02E-12 |
| 6  | F     | Connector | 3.83E-06 | Ff | Connector AND Charge Controller | 2.08E-10 |
| 7  | G     | Fuse String | 5.33E-07 | Gf | Fuse String AND Charge Controller | 2.91E-11 |
| 8  | H     | SMU | 1.40E-05 | Hf | SMU AND Charge Controller | 7.63E-10 |
| 9  | I     | Fuse | 0.17E-06 | If | Fuse AND Charge Controller | 9.25E-12 |
| 10 | J     | DC Switch | 1.7E-05 | Jf | DC Switch AND Charge Controller | 9.25E-10 |
| 11 | K     | Disconnector | 0.85E-06 | Kf | Disconnector AND Charge Controller | 4.62E-11 |
| 12 | L     | Metal Sleeve | 5.95E-09 | Lf | Metal Sleeve AND Charge Controller | 3.24E-13 |
| 13 | M     | Screw | 5.12E-06 | Mf | Screw AND Charge Controller | 2.79E-10 |
| 14 | N     | Stud | 5.95E-09 | Nf | Stud AND Charge Controller | 3.24E-13 |
| 15 | O     | Block | 1.24E-07 | Of | Block AND Charge Controller | 6.75E-12 |
| 16 | P     | Strip | 1.87E-08 | Pf | Strip AND Charge Controller | 1.02E-12 |
| 17 | Q     | AC Cable Failure | 1.10E-07 | Qf | AC Cable Failure AND Charge Controller | 6.01E-12 |
| 18 | R     | DC Main Cable Failure | 4.10E-07 | Rf | DC Main Cable Failure AND Charge Controller | 2.23E-11 |
| 19 | S     | Open Component | 0.08E-05 | cf | Transformer AND Charge Controller | 9.29E-10 |
| 20 | T     | Short Circuit | 0.085E-05 | df | Power Switch Gear AND Charge Controller | 1.85E-09 |
| 21 | U     | Change parameter | 0.83E-06 | Ag | Rack Structure AND Charge Controller | 1.94E-08 |
| 22 | V     | Cooling Fan | 2.27E-04 |Bg | Grounding/Lighting Protection System AND Charge Controller | 1.29E-08 |
| 23 | W     | Control Communication Board (CCB) | 2.12E-04 | Cg | Junction Box Bypass Diode AND Charge Controller | 5.38E-10 |
| 24 | X     | DC Capacitor | 0.85E-04 | Dg | Enkapsulasi Bocor AND Charge Controller | 3.23E-09 |
| 25 | Y     | DC Main Breaker | 5.16E-05 | Eg | Module AND Charge Controller | 1.21E-11 |
| 26 | Z     | IGBT | 9.38E-05 | Fg | Connector AND Charge Controller | 3.58E-10 |
| 27 | a     | AC Filter | 0.17E-04 | Gg | Fuse String AND Charge Controller | 5.01E-11 |
| 28 | b     | AC Circuit Breaker | 5.16E-05 | Hg | SMU AND Charge Controller | 1.31E-09 |
| 29 | c     | Transformer | 1.71E-05 | Jg | Fuse AND Charge Controller | 1.59E-11 |
| 30 | d     | Power Switch Gear | 0.34E-04 | Jg | DC Switch AND Charge Controller | 1.59E-09 |
| 31 | Kg    | Disconnector AND Charge Controller | 7.95E-11 |
| 32 | Lg    | Metal Sleeve AND Charge Controller | 5.56E-13 |
| 33 | Mg    | Screw AND Charge Controller | 4.79E-10 |
| 34 | Ng    | Stud AND Charge Controller | 5.56E-13 |
| 35 | Qg    | Block AND Charge Controller | 1.16E-11 |
| 36 | Pg    | Strip AND Charge Controller | 1.75E-12 |
| 37 | Qg    | AC Cable Failure AND Charge Controller | 1.03E-11 |
| 38 | Kg    | DC Main Cable Failure AND Charge Controller | 3.84E-11 |
| 39 | cg    | Transformer AND Charge Controller | 1.60E-09 |
| 40 | dg    | Power Switch AND Charge Controller | 3.18E-09 |

The total probability for the grid connection is 1.22E-03.

Total Probability 1.22E-03 Total Probability 7.08E-08

Table 6. Probabilistic Failure Rate for Grid and Hybrid Connection
The energy required for new offices is 13361239 kWh/year with water per day requires electricity of 48.67 KW or 341056 Kwh. From scenario 1, can supply from Solar panel 475142 KWh/year can supply 3.56%, Scenario 2 2268557 Kwh/year, or supply 16.98%.

The maximized roof area facing north is around 43.97% of the total area of new office buildings for scenario 2. For scenario 1, only a portion of the north side area is only utilizing around 9.25% of the total building area. For scenario 2, it is already more than what the government requires, namely for government buildings, 30%.

3.1.6. Economic Sustainability
From an economic point of view, this project’s profits are minimal; as reviewed in the feasibility factor, the profit margin needs to increase, making the solar power plant profitable. Moreover, the payback period will take a long time to benefit if the selling price is still using the same price. If it raises, PBP will be profitable in its 20th year.

3.1.7. Environment Sustainability
The use of renewable energy helps the government to reduce emissions. It can do in various areas, one of which is in the new Bulusulur office by utilizing 9.25% of the roof area with scenario 1, which can help reduce CO\textsubscript{2} emissions by 453.76 ton / kWh per year, whereas when using 43.97% of the area can reduce up to 2166.47 ton / kWh. From the solar panel datasheet Operating Module Temperature: -40 ° C to + 85 ° C, and STC: Irradiance 1000 W / m\textsuperscript{2}, module temperature 25 ° C so that the voltage-current characteristic’s measure at the 25 ° C parameter, which means that the panel temperature conditions are stable at 25 ° C if the average temperature is 26.7 ° C in the Bulusulur area [19]. It affects the output but is still within the operating range of the panel. Other emissions are So\textsubscript{2} and No\textsubscript{x}, So\textsubscript{2} 0.20-0.34 g / kWh No\textsubscript{x} 0.18-0.30 g / kWh, and these values are still lower than those of the Coal and Fossil plants.

4. Conclusion
From the analysis carried out for the installation of Solar Panels in Bulusulur, from two scenarios, Scenario 1 requires lower investment costs than scenario 2. If seen from the LCOE value, everything is in the standard, but scenario 2 is better than scenario 1. However, the funds held for investment need to review; if it is limited, better-used scenario 1. If viewed from a technical feasibility perspective, it is feasible. From an economic perspective, it can consider if it assumes that if the sales cost increases for scenario 1 or 2.

The results of the analysis of the sustainability of social factors have been supportive. Because there is already support from related OPD for installation and government. Technical sustainability can also sustain, and organizational factors can support this, but economic factors are still a little profitable, but this is not a problem. Over time, there will be a decrease in costs and components. There is also a need for government support so that sales costs can be higher than the standard to cover the invasion’s investment cost and provide benefits. Another factor is the environment, although the benefits are not too significant from an economic perspective. From an environmental perspective, it is very much needed because it can help reduce emissions and help office electricity.

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