*Article*

# The Role and Importance of Experience on Acceptance of Solar Power Plants

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**Abstract:** Institutional and non-cost acceptability is a major factor in the spread and revitalization of renewable energy due to climate change and the will to reduce carbon. The purpose of this study is to analyze the influence of supportive factors (ecosystem, landscape) and experience factors (experience, distance from the facility) on acceptability, which are classified as social acceptability, regional acceptability, and payment acceptability, which are the main acceptability factors in renewable energy generation facilities.

Solar power acceptance was classified into three categories, and the mean values were in the order of social, local, and payment. The correlation analysis showed that perceived risk was negatively related to social and local acceptance and positively related to pay-as-you-go acceptance. In addition, the determinants of social acceptability were: benefit (+) > policy trust (+) > urban area (+) > non-urban area (-) > risk (-) > ecosystem protection (+) > political ideology (+) > age (-). For regional acceptability, the influence of convenience (+) > policy trust (+) > experience distance urban (+) > age (-) > ecosystem protection (+) > risk (-) > political ideology (+) > knowledge (+). In terms of the determinants of acceptance to payment, the order of influence was: convenience (+) > policy trust (+) > experience (+) > experience distance non-urban (+).

For all three types of acceptance, benefits and policy trust are the most important determinants, and publicizing solar benefits, promoting them through incentive policies, and enforcing policies will help to secure high acceptance of the expanded distribution policy. In addition, preventing landscape damage and protecting ecosystems were analyzed as factors that increase receptivity in local receptivity for places where policies are actually implemented, and if policies are established in consideration of these factors in the planning stage and promoted to citizens, the level of receptivity will increase. In addition, experiential factors have a positive effect on receptivity to pay, and providing direct and indirect experiences and information will help to increase receptivity.

**Keywords:** energy transition, solar energy acceptance, and experience factors

## 1. Introduction

The seriousness of climate change has been realized by everyone due to a series of events. In order to prevent this, the international community has agreed to reduce carbon through the Paris Climate Agreement, especially the Long-term low greenhouse gas Emission Development Strategies (LEDS). For the implementation, the goal is to transition to renewable energy, the core of which is solar power generation. In particular, EU, U.S.A., and South Korea see solar power as the main of renewable energy. However, in recent years, the acceptability of solar power facilities has been threatened by collapses, fires, and ESS-related issues.

## 2. Theoretical Background

### *2.1. Acceptance Factors for Existing Generation Facilities*

In many studies, acceptability has been identified as an important factor for settlement success in government policy implementation. Acceptability has been identified as a factor that can resolve conflicts in the construction of power generation facilities (Jung, et al., 2020). In particular, acceptability studies related to power generation facilities have been conducted extensively and variously for dangerous facilities such as nuclear power facilities. In order to explore the acceptability of facilities, the Risk Perception(Psychometric) paradigm is mainly used to explore the factors of acceptability, mainly through perceived risk, perceived benefit, knowledge level of the object, and trust.

*2.2. Acceptance for Renewable Energy Generating Facilities*

Many studies have shown that the acceptability of renewable energy is higher than the acceptability of other facilities. Wüstenhagen et al. (2007) found that differentiated acceptability exists for nuclear power plants, nuclear waste repositories, hydropower plants, and dam siting. In particular, they categorized the types of acceptability into socio-political acceptability, community acceptability, and market acceptability, and explored how each type of acceptability operates separately.

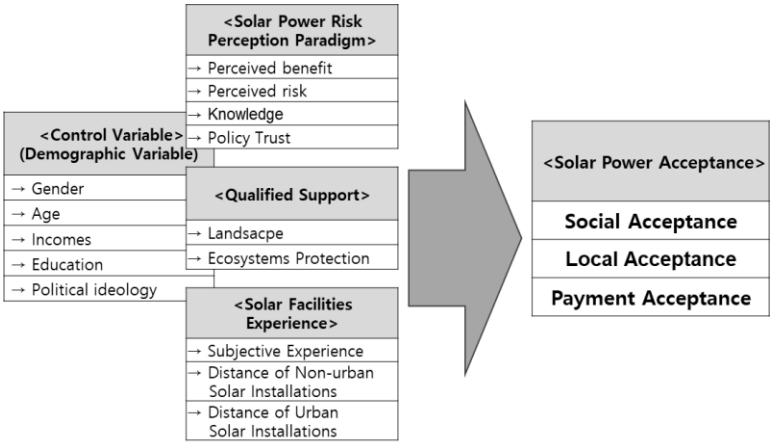
*2.3. The Role of Experience in Acceptance*

"Experience" is probably a major factor in determining acceptability. Two studies, Limanen (1999) and Sjöberg (2004), found that people in the vicinity of power generation facilities have more positive perceptions of the object than people in other areas. We also found that many studies tend to use experience as a variable by measuring it through indirect experience. Indirect experience is mainly measured by variables such as protest experience, local residents, and neighbor contact experience. However, researchers are now pointing out the limitations of indirect experience and trying to analyze it through direct experience, which measures the number of information contacts and the distance of the target from the residence.

**3. Methods & Research Model**

Survey Method: The factors identified in the literature review were used to determine the acceptability of solar power facilities. A web survey was conducted among 1,552 South Korean citizens with proportional sampling by region, gender, and age. (margin of sampling error ±2.5 percentage points at 95% confidence level)

**Figure 1**. The Research Model

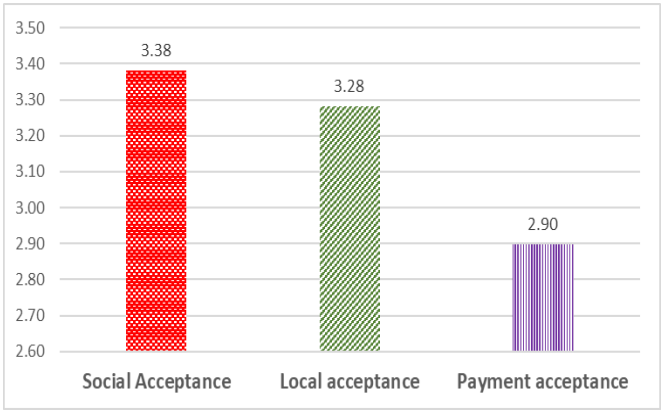



Based on previous studies, the research model was set up. Regression analysis was conducted to examine the causal relationship between the factors by setting three acceptance factors (social, local, and payment) as the dependent variable.

## 4. Results

### *4.1. Acceptance for Solar Power*

**Figure 2**. The mean of Acceptance for Solar Power




Each acceptability was surveyed on a 5-point scale and processed as an average value. The mean values of the acceptability levels were in the order of social acceptability, local acceptability, and willingness to pay for solar energy. Social acceptability (m=3.38) and local acceptability (m=3.28) were above the median of 3, while willingness to pay was relatively low with a mean value of 2.90, below the median.

### 4.2. Analyze the Determinants of Solar Power Acceptance

**Table 1**. The mean of Acceptance for Solar Power

| Concepts | Variables | Social Acceptance | | | Local acceptance | | | Payment acceptance | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | B | S·E | Beta | B | S·E | Beta | B | S·E | Beta |
| Constant | | .736*** | .171 | | .325* | .132 | | -.360† | .207 | |
| Demographic | Gender | .016 | .031 | .009 | -.022 | .024 | -.014 | .006 | .038 | .003 |
| | Age | -.003** | .001 | -.049 | -.004*** | .001 | -.073 | .002 | .001 | .031 |
| | Income | -.020 | .016 | -.023 | .010 | .012 | .012 | .017 | .019 | .018 |
| | Education | -.047 | .032 | -.028 | -.040 | .025 | -.025 | -.033 | .039 | -.018 |
| | Political ideology | .040** | .012 | .058 | .035*** | .010 | .053 | .013 | .015 | .017 |
| Risk Perception (Psychometric) Paradigm | Perceived risk | -.082*** | .023 | -.076 | -.056** | .018 | -.054 | -.001 | .028 | -.001 |
| | Perceived Benefit | .650*** | .023 | .611 | .747*** | .018 | .730 | .529*** | .027 | .455 |
| | Knowledge | .015 | .022 | .015 | .039* | .017 | .041 | .050 | .027 | .046 |
| | Policy Trust | .128*** | .023 | .120 | .094*** | .017 | .092 | .170*** | .027 | .146 |
| Qualified Support | Landscape | -.023 | .022 | -.022 | -.050** | .017 | -.052 | .036 | .027 | .032 |
| | Ecosystems Protection | .067*** | .021 | .059 | .066*** | .016 | .060 | -.032 | .026 | -.026 |
| Solar Facilities Experience | Subjective Experience | .028 | .021 | .030 | .019 | .016 | .021 | .148*** | .025 | .144 |
| | Distance of non-urban | -.063*** | .020 | -.079 | -.030† | .015 | -.039 | .110*** | .024 | .127 |
| | Distance of urban | .090*** | .020 | .108 | .067*** | .015 | .084 | -.009 | .024 | -.010 |
| F value | | 116.133*** | | | 238.308*** | | | 74.177*** | | |
| R-Square | | .514 | | | .685 | | | .403 | | |

***p<.001, **p<.01, *p<.05, †p<0.1

**Social Acceptance :** Benefit(+)>Policy Trust(+)>Experience Urban(+)>Experience Non-urban(-)>Risk(-)>Ecosystem Protection(+)>Political Ideology(+)>Age(-)

**Local Acceptance :** Benefit(+)>Trust in policy(+)>Experience Urban(+)>Age(-)>Ecological protection(+)>Risk(-)>Political ideology(+)>Knowledge(+)

**Payment Acceptance:** Benefit(+)>Policy Trust(+)>Experience(+)>Experience Distance Non-urban(+)

## 5. Conclusion

| Concepts | Variables | Dependent Variable | | |
|---|---|---|---|---|
| | | Social Acceptance | Local Acceptance | Payment Acceptance |
| Demographic | Gender | | | |
| | Age | ↘ | ↘ | |
| | Income | | | |
| | Education | | | |
| | Political ideology | ↗ | ↗ | |
| Risk Perception (Psychometric) Paradigm | Perceived risk | ↘ | ↘ | |
| | Perceived Benefit | ↗ | ↗ | ↗ |
| | Knowledge | | ↗ | |
| | Policy Trust | ↗ | ↗ | ↗ |
| Qualified Support | Landscape | | ↘ | |
| | Ecosystems Protection | ↗ | ↗ | |
| Solar Facilities Experience | Subjective Experience | | | ↗ |
| | Distance of non-urban | ↘ | | ↗ |
| | Distance of urban | ↗ | ↗ | |
| R-Square | | 0.514 | 0.685 | 0.403 |

※ Only variables that are significant at the p<0.05 level were shown

The valid explanatory variables for social acceptability and local acceptability are in the same direction. Acceptance decreases with age, increases with political ideology (liberal vs. conservative), decreases with higher levels of perceived risk, increases with benefits and policy trust, and increases with proximity to solar facilities with an urban component. For local acceptability, which is considered to be more proactive than social acceptability, subjective knowledge of solar energy and perceived landscape degradation have a significant effect compared to social acceptability: higher knowledge increases local acceptability of solar energy, and perceived landscape degradation decreases local acceptability of solar energy. On the other hand, the influence of other explanatory variables differs from that of social and local acceptance, with perceived risk of solar having a non-significant effect, while subjective experience and proximity to a solar facility with non-urban elements have a positive effect on the acceptability of paying for solar.

The benefits of solar are the most influential of the three acceptability dimensions and are found to have a relatively large level of influence, while the perceived risks do not have a significant impact on acceptability. Therefore, promotion of the benefits of solar may be more effective than regulation in solar deployment policies. Incentive policies can also have a significant effect. In particular, experience is a major determinant of solar acceptance. When it comes to enabling institutions, experience increases willingness to pay. Experience will be a key success factor in solar deployment.

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