**SolarMiles**

**SUSTAINABLE MOBILITY: ELECTRIC VEHICLES – SOLAR PV - SMART CHARGING – CAR SHARING**

**Brief description of the problem**

*SolarMiles* is about charging electric shared vehicles with locally produced solar energy. The goal of the project is to design solutions for sustainable mobility in local communities. With more and more electricity produced with solar PV, the grid will increasingly experience imbalances. Peaks can be lowered by charging the batteries of electric cars.

In *SolarMiles*, new concepts are developed for optimizing the match between the production of solar energy and car charging in such a way that the electricity grid will experience the lowest possible peak load during the day. To realize that, the vehicles should be charged when electricity from solar PV is abundant and/or the existing local electricity demand is low.

To gain insight in the potential of solar charging with electric shared cars, mobility data is collected and the impact of charging behavior on the electricity grid is modelled. To this end, the SparkCity model, an agent-based model with spatial dimensions, is used (see [http://nknl Nederland.nl/projecten/onze-lopende-projecten/simulatiemodel-sparkcity/](http://nklnederland.nl/projecten/onze-lopende-projecten/simulatiemodel-sparkcity/)).
Based on the outcome of the model, service concepts are designed that stimulate users of electric cars to charge the batteries of those cars with solar energy as much as possible.

The change agency sustainable mobility is looking for students who are interested in working on the model as well as on scenarios and concepts for sustainable mobility services. No prior knowledge of energy and/or mobility is required.

### Connected to the themes

*Multiple choices are possible*

- **O** Sustainable Building
- **x** Sustainable Mobility
- **x** Local Communities

### Background (facts, situation sketch and parent/organization goals)

Due to the growing number of solar panels, more and more electricity is generated locally. Unfortunately, up until now, there hasn’t been a solution for the surplus to the grid, which can occur on days with a lot of sun. Researcher Kathelijne Bouw and her team from the Centre of Expertise Energy of the Hanze University of Applied Sciences Groningen are going to investigate whether users of electric cars can play a greater role in solving this problem. The smart charging of batteries may result in a huge improvement of efficiency. The batteries of electric cars can be charged when a surplus of solar energy occurs; through this, peaks in the net can be tempered. The research team from Hanze UAS, together with the Amelander Energie Coöperatie, Gronneger Power, Energy Expo and Enexis, are conducting research for the project SolarMiles on how the demand for mobility by users and the buffer capacity in the grid can be cleverly linked.

The starting point of SolarMiles is that the Amelander Energie Coöperatie and Gronneger Power will use their own solar energy generated from private or collective panels for mobility. Both energy cooperatives want to introduce electric cars, on the island of Ameland and in the city of Groningen respectively, which are charged as much as possible at times when solar panels produce more energy than the demand.

Currently, a new service concept is being developed, which will facilitate the smart charging of electric cars. The concept is being developed by the research team of the Centre of Expertise Energy and Marion van Os’ Center for entrepreneurship, consisting of students, researchers and teachers. Herein, the users play a central role, because they have to adjust their charging behavior to the amount of solar energy available.

### Objective (description of the desired situation)
Based on the outcome of the SparkCity model, a service concept designed that stimulate users of electric cars to charge the batteries of those cars with solar energy as much as possible. New concepts for optimizing the match between the production of solar energy and car charging in such a way that the electricity grid will experience the lowest possible peak load during the day.

### Result deliverable/product (what is ready if the project is finished) with list of part results
Ideally we will start with a multidisciplinary group of students consisting of students with a behavioral or applied psychology background, students with a business or financial background, students with communication background and students with a electrotechnical background.

As a group we will work ourselves through the following stages of service design ([https://www.nngroup.com/articles/5-steps-service-blueprinting](https://www.nngroup.com/articles/5-steps-service-blueprinting))

1. **Find support**: Build a core cross disciplinary team and establish stakeholder support. As a team
2. **Define the goal**: Define the scope and align on the goal of the blueprinting initiative.
3. **Gather research**: Gather research from customers, employees, and stakeholders using a variety of methods.
4. **Map the blueprint**: Use this research to fill in a low-fidelity blueprint.
5. **Refine and distribute**: Add additional content and refine towards a high-fidelity blueprint that can be distributed amongst clients and stakeholders.

In the first collective stage (4 weeks) we as a team will collect all the research that already has been done, perform an extensive literature review, talk to stakeholders and visit if possible reference projects. This will lead to a collective overview of all the relevant information and a preliminary list of requirements and insights.

By analyzing all the gathered insights and information in stage one every discipline will define it’s relevant research or design questions. So in stage two every participant will write his or her research proposal based on the educational background.

In stage three every student will work on his or her own research and/or design process. All the progress and outcomes will be shared continuously amongst the group and stakeholders. This will result in individual research papers and an additional individual written publishable article.

Based on all the knowledge and insights a new program of requirements will be created. As a group we will map the blueprint of the service in stage 4. This will be done by using co-creation techniques that will be facilitated by the members of our group.
In stage 5 we will test, detail and refine the service concept and create high-end prototypes. All the stakeholders will be invited to a final high profiled event in which the students will present the design of a service concept stimulates users of electric cars to charge the batteries of those cars with solar energy as much as possible.

**Suitable for students**

Multiple choices are possible

- **X** MBO
- O BuitenWerkPlaats Built Environment (2nd yr, 1 block, 2nd yr, 4 block)
- O Vastgoedlab V&M (3rd yr)
- X Bachelor graduation assignment (4th yr)
- X Bachelor internship (limited possibility in daily guidance)
- X Research assignment in curriculum year…….
- X Honours research assignment
- X Master thesis

**Requested professions**

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<tr>
<th>Profession</th>
<th>Amount</th>
<th>Assignment</th>
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<tbody>
<tr>
<td>Electrical engineering and/or ICT</td>
<td></td>
<td>Detailed modelling of the load on electricity cables and transformer (sub)station in the Sparkcity model is needed to be able to study the impact of charging behaviour on the grid. The assignment requires some programming as well as a thorough analysis of grid effects.</td>
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<tr>
<td>Marketing &amp; Communication</td>
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<td>Service concepts for sustainable mobility should encourage people to use mobility in an alternative way: electric cars instead of gasoline cars, shared cars instead of personal cars, smart solar charging instead of night time charging etc. How can we motivate people to make use of sustainable mobility services offered in local communities?</td>
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<td>Applied psychology</td>
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<td>To establish smart charging we need to motivate people to change their charging behaviour. We would like to use insights from other projects and scientific literature to gain insight on how to change behaviour. Price incentives that should increase demand response for example, have shown fairly small effects. What are other good ways to influence behaviour into smart charging?</td>
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<tr>
<td>Business, International Business and Management</td>
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<td>Service concepts for sustainable mobility require a good connection between the business model of the car sharing service, the desired behavioural change regarding smart charging and the physical infrastructure (cars, solar panels, charging stations). Scenarios will be developed for the sustainable mobility concept. How can we design a service that is easy for people to charge electric shared cars with solar energy as much as possible? Think of combining solar charging with a work space instead of a house, using public charging while grocery shopping instead of home charging, etc. This</td>
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Civil engineering and/or ICT

Infrastructure is an important aspect of sustainable mobility. Charging infrastructure needs to be developed. But what kind of charging stations need to be placed and on what location? Where should shared cars be placed and how many of them are needed? What is the difference between shared cars and personal cars? Using mobility data, the infrastructure, consisting of charging stations, parking spots and solar PV locations, infrastructure will be designed for our local communities.

Multimedia design and art

Create persuasive and state-of-the art persuasive tools and prototypes for communication.

If you feel your professional background can contribute to the SolarMiles project don’t hesitate to contact Steven de Boer (contact information below).

Competence level

Nature of project

- Complex and authentic
- Multidisciplinary task
- Structured (overall)
- Innovation by service design
- Within a known context
- Participant is able to work independently, proactive, shows initiative, shows vision and is innovative.
- Participant uses applied knowledge in a scientific way, contributes to knowledge development.

Further information

Student will be working in the context IWP Energy Transition at EnTranCe. You will be working in a multidisciplinary team. For detailed information on this assignment contact Steven de Boer (EnTranCe), s.de.boer@pl.hanze.nl, 06-24572781

How to respond to the vacancy

Website: [http://en-tran-ce.org/for-students/assignments/assignments-per-study/](http://en-tran-ce.org/for-students/assignments/assignments-per-study/)