
1. Description and Evaluation of existing business models and financial structures in the facilitation of communities
   1. Facilitation processes of public and other communities in the commercial context
   2. Overview over major business models/financial models: combined public and third party funded, third party funded and others: description of parties involved (questionnaire, evaluation)
   3. Innovative business and financial models for communities in other countries

2. Overview of cost and benefit structure in existing and future communities
   1. Investment costs of components: supply, control, distribution ➔ collection of cost data for the major components?
   2. Life cycle costs of communities: energy and non-energy related costs
   3. Benefits: appropriate energy production/replacement; energy cost savings, M&R cost savings, other
   4. National and supranational subsidy programs

3. Decision making criteria
   1. Description of major DMC: cash flow, ROI, NPV

4. Risk analysis
   1. Risk scenarios for investment & life-cycle costs, benefits and subsidies

5. Future Business and Financial Models

5. Future Business Models - Future technical and organizational tasks for energy service companies
   1. Storage management
   2. Energy supply management
   3. Energy demand management
   4. Grid interaction management
   5. Resilience / interception service management

6. Implementation of Business and Financial Models in the modeling process
   1. Concept phase
   2. Modeling phase
   3. Calculation tool (tbd)

7. Case studies
Subtask F. Business, Legal and Financial Aspects - Mission and Goals

- technical-organizational structure for implementation models based on the results of A 61 which allows the cash flow based interaction between consumers, storage, production and grids
### Business Model Canvas – Mannheim case study (2018)

<table>
<thead>
<tr>
<th>Key Partners</th>
<th>Key Activities</th>
<th>Value Propositions</th>
<th>Customer Relationships</th>
<th>Customer Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES CO</td>
<td>Energy management of the community: - Storage - Grid intersection - Energy production - Energy demand, load curve management</td>
<td>Optimization of cost-benefits - Capital costs resulting from 1. investment - Operational LC: maintenance/repair, operation - Operational Benefit resulting from service fees, power swap and supply heating supply, storage fees</td>
<td>B2b contracts</td>
<td>Public community owners Public /private community owners (2. priority)</td>
</tr>
<tr>
<td>Grid operator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public building owner</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Resources</th>
<th>Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IT</td>
</tr>
<tr>
<td></td>
<td>tbd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost Structure</th>
<th>Revenue Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>First investment costs, staff costs, operational LC</td>
<td>Service fee, heating &amp; power supply charges</td>
</tr>
</tbody>
</table>

http://www.businessmodelgeneration.com

- Risk analysis, quality assurance - exemplary calculation of default risk values for NZE project facilitation based on a five stage workflow

- **Working level 1 Baselinebuilding phase**
  Baselinebuilding (energy consumption, costs, prices, other LCC, physical baseline values)

- **Working level 2 Decision making phase**
  Technical concept, cost benefit calculation, investment grade, decision making,

- **Working level 3: Implementation phase**
  Detailed planning, procurement, construction, hand-over

- **Working level 4: Operation phase**
  Operation, maintenance, reinvestment, optimization

- **Working level 5: M&V phase**
  Monitoring/Controlling, verification of savings, performance
De-Risking Matrix community refurbishment projects:

- Empiric risk data ➔ proactive evaluation of risks and de-risking processes

### Risk Management Mannheim Case Study (p1 – 6)

<table>
<thead>
<tr>
<th>Risk determination</th>
<th>Input</th>
<th>Empiric risk data</th>
<th>Risk management</th>
<th>gewählt</th>
<th>jähr. Kosten Risikomanagement €/a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy savings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline according to standard VDI 3807</td>
<td>no</td>
<td>0%</td>
<td>2.50%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Energy prices fixed in savings calculation</td>
<td>yes</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Energy prices: volatile /n.volatile</td>
<td></td>
<td></td>
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</table>

### Investment costs

<table>
<thead>
<tr>
<th>Fixed investment cost contract?</th>
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<th></th>
<th></th>
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<tbody>
<tr>
<td>No</td>
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### Subsidies

<table>
<thead>
<tr>
<th>Einschätzung der Stetigkeit von laufenden Subventionen seitens Fördermittelgeber</th>
<th>ja</th>
<th>0%</th>
<th>30%</th>
<th>5%</th>
<th>0</th>
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</thead>
<tbody>
<tr>
<td>Einmalige Förderung: Zuordnung Risiko individuell nach Förderprogramm</td>
<td>ja</td>
<td>KlimaschutzPlus BWL</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Einmalige Förderung: Antragsteller hat bereits erfolgreich Anträge in diesem Programm gestellt, Gegenmaßnahmen gegen Formfehler</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Documentation of cost calculation transparently and cross checked by third party**

- Yes

**Energy prices**: volatile /n.volatile

- No

**Fixed investment cost contract?**

- No

**Documentation of cost calculation transparently and cross checked by third party**

- Yes

**Harmful/toxic material analysis, fire security analysis conducted**

- Yes

**Investment costs**

<table>
<thead>
<tr>
<th>Risk premiums on investment costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
</tr>
</tbody>
</table>

**Abschlag auf Subvention**

| 5% | 0 |

**Empiric risk data**

- Proactive evaluation of risks and de-risking processes

**Risk determination**

- Input /Select

**Empiric risk data**

- Min Risk
- Max Risk

**Risk management**

- Min Risk
- Max Risk
Information Flow for Subtasks A-F

Subtask A
- Standardized spatio-semantic building models including HVAC etc., complemented by cost data and specific building types (military garrisons etc.)
- Development of calibration method for building models
- Identification of mission-critical facilities and corresponding critical (minimum required) load
- Infrastructure Threat and Hazard Analysis and resulting technical constraints

Subtask C
- Database of technologies (including visual representation, technical and economic characteristics, LCC, examples of implementation)
- Input and modules for stand-alone DHC-tool etc.

Subtask E
- Community-wide energy analysis and collection/evaluation of existing EMP-tools (input, analysis steps, outputs, LoD)
- Development of functional modeling tool based upon SMPL-Tool (Big Ladder)

Subtask D
- Develop Guidance for Energy Master Plan

Subtask B
- Collection of case studies (examples of successfully implemented energy master plans)
- Documentation of pilot energy master plans from Annex tools and results

Subtask F
- Business, legal and financial constraints and guidance
<table>
<thead>
<tr>
<th>Subtask F</th>
<th>Country</th>
<th>Name</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>USA</td>
<td>Zhivov</td>
<td>Alexander M.</td>
</tr>
<tr>
<td></td>
<td>USA</td>
<td>Zhao</td>
<td><a href="mailto:alexander.m.zhivov@usace.army.mil">alexander.m.zhivov@usace.army.mil</a></td>
</tr>
<tr>
<td></td>
<td>FIN</td>
<td>Tuominen</td>
<td>Pekka</td>
</tr>
<tr>
<td></td>
<td>FIN</td>
<td>Pekka</td>
<td><a href="mailto:pekka.tuominen@vtt.fi">pekka.tuominen@vtt.fi</a></td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>AUS</td>
<td>Seo</td>
<td>Seongwon</td>
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<tr>
<td></td>
<td>AUS</td>
<td>Bezhad</td>
<td>seongwon <a href="mailto:seo@unimelb.edu.au">seo@unimelb.edu.au</a></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Haase</td>
<td>Matthias</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Matthias</td>
<td><a href="mailto:matthias.haase@sintef.no">matthias.haase@sintef.no</a></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>Fulterer</td>
<td>Anna Maria</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>Anna Maria</td>
<td><a href="mailto:a.m.fulterer@aege.at">a.m.fulterer@aege.at</a></td>
</tr>
</tbody>
</table>
## Operating Agents and Subtasks Co-Leads

<table>
<thead>
<tr>
<th>Operating Agents</th>
<th>Alexander Zhivov (ERDC, USA) and Rüdiger Lohse (KEA, Germany)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtask A:</td>
<td>Scott Bucking (Carleton University, Canada) and Robert Jeffers (Sandia National Lab, USA)</td>
</tr>
<tr>
<td>Subtask B:</td>
<td>Ingo Leusbrock (AEE, Austria), Michael Case, (ERDC, USA)</td>
</tr>
<tr>
<td>Subtask C:</td>
<td>Anders Dyrelund (Ramboll, Denmark) and Domenik Hering (GEF, Germany)</td>
</tr>
<tr>
<td>Subtask D:</td>
<td>Ursula Eicker (Germany) and Alexander Zhivov (ERDC, USA)</td>
</tr>
<tr>
<td>Subtask E:</td>
<td>Peter Ellis (Big Ladder, USA) and Ursula Eicker (HFT-Stuttgart, Germany)</td>
</tr>
<tr>
<td>Subtask F:</td>
<td>Rüdiger Lohse, Matthias Haase</td>
</tr>
</tbody>
</table>
Time Schedule

• Preparation phase - one year (through November 2017)
• Working phase - 3 years (starting February 1, 2018)
• Reporting phase – 1 year
Thank you. Questions??
ST F 1. Template Framework

• Collection of existing legislation of direct relevance for NZE neighborhoods in the spatial planning process:
  • Who provides or denies allowances, obligations by regional agencies for determined areas
  • Which legislative (directly impacting) structures need to be considered when a NZE quartier is facilitated ➔ cooperation with ST B
  • Set of major standards for the design of NZE (BREAM, CIBSE, ASHRAE)
  • Approximative number of NZE neighborhoods initiated in your country
ST F Evaluation of implementation models

• 1: Evaluation of implementation models for NZE Quartiers (Oct. 18- March 19)
  • Description of 1-2 business as usual implementation models in each of the participating countries
  • Acting parties, value generation, monetary flows, contractual structure for the major activities following the structure of a business model template

Subtask F. Business, Legal and Financial Aspects- Mission and Goals

• 4 technical-organisational structure for implementation models based on the results of A 61 which allows the cash flow based interaction between consumers, storage, production and grids
ST F Evaluation of LCC

- 2: Evaluation of Life Cycle Cost and Benefits of NZE Quartiers
  - Template of energetic and non energetic benefits resulting from NZE implementation
  - Description of different LCC and their calculation:
    - Energy: consumption reduction, peak shaving, hourly demand response...
    - Measurement & Refurbishment: avoided maintenance cost building, HVAC
    - Additional LCC: available floorspace, comfort, other functional
  - Additional tools: least cost planning approach (descriptive)
  - Impact on the cost- benefit case: calculation of 2 cash- flows (BUA- Advanced LCC) and evaluation of the impact
  - Summary and calculation table
ST F  Risk evaluation

• 3: Risk evaluation from the perspective of financiers:
  • Evaluation of major activities in 5 acting phases of a NZE development: (baseline building, decision making, planning/design, implementation, operation and M&V)
  • Feed-back process with financiers, ESCos, project facilitators
  • Evaluation of major risks in these 5 acting phases: organizational, design related, technical)
  • De-Risking measures for the major risks (descriptive guidance)
ST F Evaluation of implementation phase

• 4: Practical implementation of results:
  • Description of the experience in the practical implementation of the LCC and framework analysis at the hand of the pilot case study
  • Comparison of BUA and advanced NZE calculation in the decision making process
  • Additional applied strategies for cost reduction such as LCC
  • Short resumee, lessons learnt ➔ ST B, C
ST E Workflow of the scenario development

1. Calculation
   - Manual corrections: delete & add buildings
   - Result 1: Summarized load profile of the existing areal
   - Calibration: at hand of metered data

2. Calculation
   - Manual corrections: delete & add buildings
   - Result 2: Base Case (Status quo): Summarized load profile of the adjusted areal

3. Calculation
   - Preselected Scenarios (combined components) for highly replicable quartiers

Subtask B: Preselected scenarios

Evaluation by decision making criteria: costs, PEE, site energy, resilience

Building model results
Manual corrections
Result 1: Summarized load profile of the existing areal
Preselected Scenarios (combined components) for highly replicable quartiers
### ST A

<table>
<thead>
<tr>
<th>WP A</th>
<th>Outcomes</th>
<th>Activities /Milestones</th>
<th>Time line</th>
</tr>
</thead>
</table>
| A1   | Definition of target values on building (and quartier level?) | • Collection of existing standards  
• Summary of methodologies used  
• Conclusion of methods to be used for buildings (and neighborhoods) | Juli 2018 |
|      | Representative EUIs | • Selection of representative building types/neighborhood types  
• Collection of EUI values (buildings/neighborhoods) | Oktober 18 |
|      | Building energy archetype models | • Definition of parameters for the models  
• Definition of calculation methods  
• Calculation ? | Dec 18 |