VER PROJECT DESIGN DOCUMENT FORM

CONTENTS

Annexes

PDD Version 01

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SECTION A. General description of the project activity

A.1 Title of the project activity:

Title: Monte Rosa SAC Hut
Version: Version 02
Date: September 4, 2013

A.2. Description of the project activity:

The Swiss Federal Institute of Technology Zurich (ETH Zurich) and the Swiss Alpine Club (SAC) planned and built a hut in the high alpine area of the Monte Rosa Massif. The goal was to realize a mountain hut conforming to the most advanced methods of building service architecture and energy self-reliance. The project activity involves the construction and installation of the equipment for electricity and heat supply. In the planning phase, simulations of energy demand showed that the net energy required by the hut sums up to 38 MWh/y. Of this amount, over 90% was planned to be provided by renewable energy sources (excluding the energy for cooking).

The first Monte Rosa SAC hut was built in 1895. In the years 1918, 1930, 1939 and 1984 various extensions and modifications were made in the hut and to its energy equipment without altering the overall fundamental structure. Major shortcomings had been registered concerning the fundaments and the roof. The windows were poorly isolated and the energy supply was inefficient due to several small modifications. The energy supply of a remote system such as the Monte Rosa hut, which cannot be linked to an electricity and energy grid, usually relies on fossil fuels and/or wood, because of their flexible use. Therefore the level of energy self-sufficiency is very low, which was also the case for the old Monte Rosa hut and would have remained the case without the project activity as is shown in this document.

In the summer 2003, the chair for architecture and construction at the ETH Zurich received the mandate to develop a scenario for the planning and implementation of a new hut located northeast of the old hut. The team, working on this task, included the Department for Computer Aided Architectural Design (CAAD), the Department for Energy and Sustainability, the Centre for Integral Building Services Engineering of the HTA Luzern and many other experts and students.

In the project activity, the use of fossil fuels such as diesel and heating oil (see baseline in Section B.5.) are replaced by the installation of photovoltaic and thermal solar panels. As a backup, a combined heat and power plant (CHP plant) operating on biofuel or fossil fuels is installed. The energy intensive snow melting during the winter months will be replaced by the construction of a water reservoir. Propane gas is used in cooking devices as it was in the old hut.

As the monitored and calculated emission reductions shall be conservative, the hut's modern construction, architecture, state-of-the-art heat insulation and functionality are not considered in the calculation of the emission reductions. The building structure of the new hut is assumed to be equal to the baseline scenario (B.5.), which leads to a very conservative emission reduction calculation. This is even more the case as the new reservoir has also not been considered. The calculated and verified emission reductions may therefore be far below the really achieved emission reductions.

Besides carbon emission reductions following additional positive effects by the project are to be expected:

- The air quality is expected to improve since combustion emissions from fossil fuels are avoided by the use of renewable energy such as solar energy.

- In the situation prior to the project and in the baseline scenario, fuels are transported to the hut by helicopters. The number of helicopter flights shall be reduced by the project activity compared to the baseline scenario (assuming the same building and the same amount of guests).
- The project's futuristic architecture and energy self-sufficiency will certainly inspire similar projects.
- Due to its pioneering character the project enhances the attractiveness of the region and has positive impacts on the regional economy.
- An educational path will be established around the hut to inform visitors about the innovative project and promote climate protection.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public enty(ies) project participants (as applicable)
Switzerland (host)	Swiss Alpine Club (SAC)
Switzerland	Swiss Federal Institute of Technology Zürich (ETH Zürich)
Switzerland	Foundation myclimate – The Climate Protection Partnership

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Switzerland

A.4.1.2. Region/State/Province etc.:

Valais

A.4.1.3. City/Town/Community etc:

Untere Plattje

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity :

The new Monte Rosa Hut will be located northeast of the old hut, on the granitic ledge Untere Plattje embedded between the Gorner Glacier, Grenz Glacier and Monte Rosa Glacier at an attitude of 2883 m above sea level. Departing from Zermatt the Monte Rosa Hut can be reached with the Matterhorn Railway and a subsequent 2.5 h hike along the glacier path.

The latitude and longitude of the project site are 45° 57' 28.70" N and 7° 48' 44.58" E.

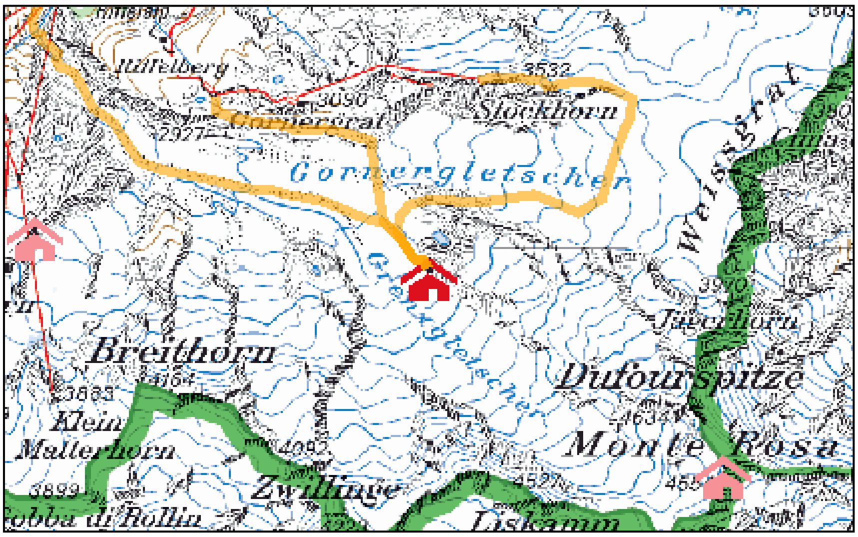

Figure 1: Site of the project activity (Monte Rosa Hut in the middle)

A.4.2. Type and category(ies) and technology/measure of the project activity:

The project activity includes the implementation and operation of the following emission reduction measures:

Type I (UNFCCC): Renewable Energy Projects:

Electricity generation using renewable energy (solar energy)
Based on following CDM methodology: AMS I.A. Version 14: Electricity generation by the user

Thermal energy generation using renewable energy (solar energy)
Based on following CDM methodology: AMS I.C. Version 19: Thermal energy for the user with or without electricity

All technical elements and plants that are used in the project activity and that are relevant for generating emission reductions (see the project boundary in Section B.3) including their key properties are listed below:

- A 122.1 m2 photovoltaic plant of mono crystalline cells (inclination 66°, degree of efficiency: ca.14.6 %) is installed and supplemented with the respective electric facility and cables. Each of the 100 modules has a surface of 1.16m2 (1417mm x 819mm, 60 cells, 0.125m x 0.125m). The power is 15.58 kWp.
- Lead-acid accumulators with a nominal lifetime of 15 years and a capacity of 255 kWh will enable electricity storage.
- Thermal solar panels with an overall surface of 60.5 m2 (inclination 60°) are installed on the rocks outside the building. They will provide hot water and thermal heat of approximately 20MWh/y.
- The ventilation system will provide the building with fresh air while the air heat is used for heat recovery.
- A water reservoir with a volume of 200 m3will be storing snowmelt from the surrounding area. A substantial amount of energy, required in the past to melt snow during the cold season, can now be saved.

- A combined heat and power plant (CHP plant) with a nominal capacity of 12 kWel / 27 kWth is installed as a backup to provide electricity and heat during unfavourable weather periods. In case that biofuels are used in the plant, emission reductions generated by using biofuels are not taken into.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The expected emission reductions generated by the project amount to 23 tCO_2/y. Emission reductions over the ten years crediting period amount to approximately 230 tCO_2.

Year	**Annual estimation of emission reductions in tonnes of CO_2e**
2010 (1.3.2010- 31.12.2010)	23
2011	23
2012	23
2013	23
2014	23
2015	23
2016	23
2017	23
2018	23
2019	23
2020 (1.1.2020- 29.2.2020)	23
Total estimated reductions (tonnes of CO_2e)	230
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	23

A.4.4. Confirmation that the project activity is not a debundled component of another project activity:

The proposed project activity is not a debundled component of another project activity.
There is no VER/JI registered project activity nor an application is made to register another project activity:

- by the same project participants;
- in the same project category and technology/measure;
- registered within the previous 2 years; and

whose project boundary is within 1 km from the project boundary of the proposed project activity at the closest point.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

The project activities are referring to the following small scale baseline and monitoring methodologies and methodological tools in accordance with Appendix B of Simplified Modalities and Procedures for CDM Project Activities:

AMS I.A.; Version 14: Electricity generation by the user
AMS I.C.; Version 19: Thermal energy for the user with or without electricity

Methodological tool: Combined tool to identify the baseline scenario and demonstrate additionality

B.2 Justification of the choice of the project category:

Justification for using the approved methodology SSC-I.A.:

1. The project is a renewable energy generation activity.
2. The Monte Rosa hut is located at 2883 m above sea level and is not connected to a grid.
3. Since the nominal capacity for electricity generation of 15.58 kW_p is far below the small-scale limit in the methodology of 15MW.

Justification for using the approved methodology SSC-I.C.:

1. The heat generated by the thermal solar panel is replacing heating oil.
2. The panels are expected to produce an annual heat of 20 MWh and the capacity is therefore far below 45MW.

B.3. Description of the project boundary:

The project boundary includes emissions related to the operation of the hut. It contains the heat generation for heating and cooking and the electricity consumption in the hut. Therefore emission reductions from the PV panels and solar thermal panels are taken into account.

For calculating the generated emission reductions, the project emissions from the operation of the combined heat and power plant (CHP plant) and the baseline emissions from the operation of diesel generators and fossil heating have been considered, monitored and calculated.

Cooking devices and helicopter flights are not taken into account. They are assumed to be part of the baseline (see B.4. and B.5.). This is a conservative assumption as less helicopter flights are necessary in the project activity.

In order to avoid a complicated baseline assessment and monitoring process and to be conservative the water reservoir is assumed to be part of the baseline and shall not lead to verified emission reductions.

B.4. Description of baseline and its development:

The baseline analysis is performed according to the UNFCCC methodological tool „Combined tool to identify the baseline scenario and demonstrate additionality“ (Version 3.0.1). The results of the analysis show that fossil fuels would be used for heating and electricity generation in the baseline, in absence of the project.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered project activity:

According to the UNFCCC methodological tool „Combined tool to identify the baseline scenario and demonstrate additionality“ (Version 3.0.1), a stepwise approach is applied as summarized in this chapter:

1a. Identification of alternative scenarios

A1: The project is implemented without carbon revenues.
A2: The existing situation, the old hut, is left unchanged.
A3: The old hut will be equipped with renewable energy plants in order to secure heat and electricity production.
A4: The new hut is built as in the project activity. The energy (without cooking) is provided by using oil (heat) and diesel (electricity). The water is provided by melting snow with diesel based electricity. For cooking electricity and propane gas is used.
A5: The new hut is built as in the project activity. The energy (without cooking) is provided by a combination of oil, diesel and renewable energy (solar thermal). A water reservoir is installed. For cooking electricity and propane gas is used.
A6: The new hut is built as in the project activity. The energy (without cooking) and water are provided by using oil (heat) and diesel (electricity). A water reservoir is installed. For cooking electricity and propane gas is used.

Renewable energy supply by wind power or hydropower is not considered due to obvious geographical conditions and financial attractiveness.

1b. Are the alternatives in compliance with prevailing or anticipated mandatory legislation or regulation?

All scenarios comply with the Swiss and the canton Valais specific mandatory legislations and regulations.

1. Barrier analysis: do barriers constituting insurmountable obstacles prevent any of the alternatives?

A2 and A3 are not considered as feasible alternatives because of existing damages and the high risks of blackouts. According to the SAC (stated also on the website www.neuemonterosahuette.ch) , the old hut had to be renovated or substituted in the near future. Each of the remaining scenarios builds on a renovated hut but different energy supply facilities.

2. Investment analysis: which alternative scenario is economically or financially the most viable?

The financially most viable scenario is the one using only fossil fuels without a water reservoir. In the investment analysis the 4 remaining scenarios are assessed by the annuity and NPV method. Since in each of the 4 scenarios a renovated building is assumed, the analysis is reduced to the energy supply facilities.

The results of the analysis are presented in the following figure and the detailed calculations are provided to the validation and verification entity. Since solar heat represents the financially most interesting renewable energy it is a conservative approach to take only this technology into account in scenario A5. The results and the parameters used reflect the situation at the date, when the project decision was made, thus in 2006/2007.

		A1	A4	A5	A6
Capital costs	CHF	109’389	45’629	82’390	69’041
Operation and maintenance	CHF	30’461	23’587	26’443	24’496
Energy costs	CHF	620	21’031	7’493	9’211
Total costs	CHF	140’470	90’247	116’326	102’747
Energy unit cost	CHF/kWh	0.373	0.239	0.309	0.273

It is evident from the table above that scenario A4 including oil heating, diesel generator but no water reservoir is financially the most viable in terms of total costs as well as in terms of energy unit costs. The project activity without carbon finance is the most expensive alternative (A1). Nevertheless, due to the geographical situation (surrounded by glaciers), difficult financial assessments of water melting processes and in order to avoid difficult monitoring procedures and to be conservative the baseline with water reservoir is chosen. The baseline scenario is therefore A6.

Carbon revenues have been considered prior to the project implementation and were taken into account in the construction decision.

3. **Common practice analysis: have activities similar to the proposed project activity been previously implemented?**
The project activity is the first of its kind. There are no similar activities of similar scale and in a comparable environment known to the project participants.

According to the analysis above, the proposed project activity is additional.

B.6. Emission reductions

B.6.1. Explanation of methodological choices:

The annual emission reductions are the baseline emissions minus direct project emissions and leakage. The emission reductions are the result of the following measures:

- **a)** Replacement of a diesel generator by photovoltaic energy -> Methodology AMS.I.A.
- **b)** Replacement of oil heating by thermal solar energy -> Methodology AMS.I.C.

As described before the calculation does not include the water reservoir and the cooking devices as they are also part of the baseline.

Emission reductions in year *y* from a certain measure *i* are calculated as shown in equation 1:

(1) $$ER_{y,i} = BE_{y,i} - PE_{y,i} - L_{y,i}$$

Where:

$BE_{y,i}$:	Baseline emissions of activity *i* in year y, tCO2e
$PE_{y,i}$:	Project emissions of activity *i* in year y, tCO2e
$L_{y,i}$:	Leakage due to activity *i* in year y, tCO2e

In our specific case $i = \in (el, th)$ for the baseline emissions and $i = \in (CHP)$ for the project emissions. Further, it can be shown that $L_{y,i} = 0$ (see below).

Baseline emissions

The baseline emissions are caused by a diesel generator for electricity production and an oil heating for thermal energy needs. The emissions can be expressed as shown in equation 2:

(2) $$BE_{y,i} = BE_{y,el} + BE_{y,th}$$

Where:

$BE_{y,el}$:	Electricity baseline emissions in the year y, tCO2e
$BE_{y,th}$:	Thermal baseline emissions in the year y, tCO2e

a) Emissions of diesel generator:

Baseline emissions of the diesel generator to cover electric energy needs can be calculated using equation 3:

(3) $$BE_{y,el} = E_{y,el} * EF_{el}$$

Where:

$E_{y,el}$:	Annual energy baseline in year y, kWh
EF_{el}:	Emission factor for diesel generator systems, t CO_2/kWh

(4) $$E_{y,el} = EG_{BL,y} / (1 - l_{el})$$

Where:

$EG_{BL,y}$:	Total baseline electricity generation in year y, kWh
$l_{el} = 0$:	Average technical distribution loss that would have been observed in the hut powered by a diesel generator. It is a conservative approach to assume no losses.

The total baseline electricity generation can be calculated by using the monitored real energy generation from the project (see also Section B.7.) and can be expressed as:

(5) $$EG_{BL,y} = EG_{PV,y} + EG_{CHPel,y}$$

Where:

$EG_{PV,y}$:	Total electricity generation PV in year y, kWh
$EG_{CHPel,y}$:	Total electricity generation CHP plant in year y, kWh

b) Emissions of oil heating:

Baseline emissions from the oil heating to cover thermal energy needs can be calculated using equation 6:

(6) $$BE_{y,th} = HG_{BL,y} * EF_{th} / \eta_{th}$$

Where:

$HG_{BL,y}$:	Total baseline heat generation in year y, kWh
EF_t :	Emission factor of heating oil, t CO2/kWh
η_{th}:	Efficiency of the oil heating plant in the baseline.

The total baseline heat generation can be calculated by using the monitored real heat generation from the project (see also Section B.7.) and can be expressed as in formula 7. As, in the project, there is a surplus of heat, which is delivered to the water reservoir this amount must be subtracted in order to get the heat generated only for heating the building.

(7) $$HG_{BL,y} = HG_{SC,y} + HG_{CHPth,y} - HL_{Cav,y}$$

Where:

$HG_{SC,y}$:	Total heat generation solar collectors in year y, kWh
$HG_{CHPth,y}$:	Total heat generation CHP plant in year y, kWh
$HL_{Cav,y}$:	Total heat for the reservoir in year y, kWh

Project emissions

Project emissions consist of the real electricity and thermal energy production by the combined heat and power plant (CHP plant). As discussed in Section B.3., helicopter flights and cooking devices are not considered. As the CHP plant is operated electricity-driven and the electricity generation of the CHP plant is monitored, the electrical efficiency factor is used to calculate the project emissions.

The project emissions are:

(8) $$PE_{y,i} = PE_{y,CHP} = \frac{EG_{CHPel,y}}{\eta_{CHP,el}} * EF_{th}$$

Where:

$EG_{CHPel,y}$:	Total electricity generation CHP plant in year y, kWh
$\eta_{CHP,el}$:	Electrical efficiency factor CHP plant
EF_t :	Emission factor of heating oil, t CO2/kWh

Leakage effects

Leakage refers to indirectly induced emissions. Emissions generated at the origin location by the replacement of a facility from the origin location to another location have to be accounted for. The approved methodologies SSC-I.A and SSC.I.B state: „If the energy generating (or efficiency technology) equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered." In the current project activity neither facilities nor parts of them are provided by other activities or removed from them. So we can assume that:

(9) $$L_{y,i} = L_{y,el} = L_{y,th} = 0$$

Where:

$L_{y,el} = 0$: Leakage due to measure a), in year y, tCO2e
$L_{y,th} = 0$: Leakage due to measure b), in year y, tCO2e

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	EF_{el}
Data unit:	kg CO2/kWh
Description:	Emission factor for diesel generator systems
Source of data used:	SSC-I.F Version 2, Table I.F.1
Value applied:	1.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	As indicated in SSC-I.A on page 4:."A small-scale project proponent may, with adequate justification use a higher emissions factor from table I.F.1 under category AMS I.F." In table I.F.1 the category <15kW and a load factor of 50% have been chosen due to the small size and the infrequent use of the generator in this remote area.
Any comment:	<15kW and load factor 50% according to the technical consultants of the HTA

Data / Parameter:	EF_{th}
Data unit:	kg CO2/kWh
Description:	Emission factor of heating oil
Source of data used:	BAFU: Worksheet emission factors combustion, October 2005 (Arbeitsblatt Emissionsfaktoren Feuerungen (Stand Oktober 05)
Value applied:	0.2653[1]
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the value published by the Swiss DNA (Federal Office for the Environment).
Any comment:	

[1] Published value of 73.7 tCO2/TJ was converted applying $1\frac{kgCO_2}{kWh} = 277\frac{tCO_2}{TJ}$

Data / Parameter:	η_{th}
Data unit:	%
Description:	Efficiency of the oil heating plant
Source of data used:	Merkblatt für das Inverkehrbringen von Öl- und Gasfeuerungen nach Artikel 20 LRV, Table 4
Value applied:	93%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The required value by legislation for a new oil heating plant is 93% - 94 %. www.bafu.admin.ch/luft/00632/00638/index.html
Any comment:	

Data / Parameter:	$\eta_{CHP,el}$
Data unit:	%
Description:	Electrical efficiency factor CHP plant
Source of data used:	Martin Meyer, 2011: Das Energiesystem der Neuen Monte Rosa-Hütte – Planung, Realität und Zukunft. Master thesis ETH Zürich.
Value applied:	20.3%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The electricity demand cannot be fully covered by the photovoltaic panels so that the CHP plant is operated electricity-driven during the year.
Any comment:	In a collaboration of the manufacturer of the CHP plant (KW Energie Technik) and an ETH master student, the efficiency factor was determined.

B.6.3 Ex-ante calculation of emission reductions:

The values chosen in the ex-ante calculation are listed and justified either in Section B.6.2 or B.7.1. In order to estimate the electricity and thermal energy demand and generation of the hut, mean values of the years 2010 to 2012 have been considered.

Baseline Emissions

Applying equation 5, 4 and 3 the electricity baseline emissions can be calculated:

$$BE_{y,el} = E_{y,el} * EF_{el} = EG_{BL,y} * EF_{el} = 22411*1.4 = 31375 \text{ kg CO2/y}$$

The thermal energy baseline emissions can be calculated wit equation 7 and equation 6:

$$BE_{y,th} = HG_{BL,y} * EF_{th} / \eta_{y,th} = 26179*0.2653/0.93 = 7468 \text{ kg CO2/y}$$

Therefore the total baseline emissions are:

$$BE_{y,i} = BE_{y,el} + BE_{y,th} = 31375 + 7468 = 38843 \text{ kg CO2/y}$$

Project Emissions

The project emissions are calculated using the electricity generation of the CHP plant applying formula 8:

$$PE_{y,i} = \frac{EG_{CHPel,y}}{\eta_{CHP,el}} * EF_{th} = \frac{11857}{0.203} * 0.2653 = 15496 \text{ kg CO2/y}$$

Emission reductions

Thus, using equation 1, the ex-ante emission reductions achieved due to the project activity in year y are:

$$ER_{y,i} = BE_{y,i} - PE_{y,i} - L_{y,i} = 38843 - 15496 - 0 = 23347 \text{ kg CO2/y}$$

B.6.4 Summary of the ex-ante estimation of emission reductions:

The estimated emission reductions from the project activity are:

Year	**Expected Baseline Emissions (t CO_2-eq.)**	**Expected Project Emissions (t CO_2-eq.)**	**Leakage (tCO2-eq)**	**Project Emission Reduction (t CO_2-eq.)**
2010	38	15	0	23
2011	38	15	0	23
2012	38	15	0	23
2013	38	15	0	23
2014	38	15	0	23
2015	38	15	0	23
2016	38	15	0	23
2017	38	15	0	23
2018	38	15	0	23
2019	38	15	0	23
Total	**380**	**150**	**0**	**230**

B.7 Application of a monitoring methodology and description of the monitoring plan:

Monitoring is applied according to the CDM Methodologies SSC-I.A and SSC-I.C.

B.7.1 Data and Parameters monitored:

Data / Parameter:	$EG_{PV,y}$
Data unit:	kWh
Description:	Total electricity generation by the PV panels
Source of data to be used:	Electric meter measuring the energy output from the PV panels to the hut
Value of data	Expected output: 10554 kWh (see comment)
Description of measurement methods and procedures to be applied:	The parameter is measured continuously. The proportion of data to be monitored is 100%. Data to be aggregated yearly. Signals of the electric meters are remotely transferred to ETHZ and saved.
QA/QC procedures to be applied:	All meters were calibrated before the installation. As different parameters are monitored energy balances can be calculated and can be used as cross-checks. As soon as there are inaccurate and incomprehensible values the monitoring method and the technical system is checked and adapted accordingly.
Any comment:	Estimated value in the ex-ante calculation is 10554 kWh according to the measurements in the first three years of operation from 2010 to 2012.

Data / Parameter:	$HG_{SC,y}$
Data unit:	kWh
Description:	Total heat generation by the solar thermal panels
Source of data to be used:	Electric meter measuring the thermal output from the solar collectors.
Value of data	Expected heat: 18104 kWh (see comment)
Description of measurement methods and procedures to be applied:	The parameter is measured continuously. The proportion of data to be monitored is 100%. Data to be aggregated yearly. Signals of the electric meters are remotely transferred to ETHZ and saved.
QA/QC procedures to be applied:	All meters were calibrated before the installation. As different parameters are monitored energy balances can be calculated and can be used as cross-checks. As soon as there are inaccurate and incomprehensible values the monitoring method and the technical system is checked and adapted accordingly.
Any comment:	Estimated value in the ex-ante calculation is 18101 kWh according to the measurements in the first three years of operation from 2010 to 2012.

Data / Parameter:	$EG_{CHPel,y}$
Data unit:	kWh
Description:	Total electricity generation by the CHP plant
Source of data to be used:	Electric meter measuring the electric energy output from the CHP to the hut.
Value of data	Expected output: 11857 kWh (see comment)
Description of	The parameter is measured continuously. The proportion of data to be monitored

measurement methods and procedures to be applied:	is 100%. Data to be aggregated yearly. Signals of the electric meters are remotely transferred to ETHZ and saved.
QA/QC procedures to be applied:	All meters were calibrated before the installation. As different parameters are monitored energy balances can be calculated and can be used as cross-checks. As soon as there are inaccurate and incomprehensible values the monitoring method and the technical system is checked and adapted accordingly.
Any comment:	Estimated value in the ex-ante calculation is 11857 kWh according to the measurements in the first three years of operation from 2010 to 2012.

Data / Parameter:	$HG_{CHPth,y}$
Data unit:	kWh
Description:	Total heat generation by the CHP plant
Source of data to be used:	Electric meter measuring the thermal energy output from the CHP to the hut.
Value of data	Expected heat: 21415 kWh (see comment)
Description of measurement methods and procedures to be applied:	The parameter is measured continuously. The proportion of data to be monitored is 100%. Data to be aggregated yearly. Signals of the electric meters are remotely transferred to ETHZ and saved.
QA/QC procedures to be applied:	All meters were calibrated before the installation. As different parameters are monitored energy balances can be calculated and can be used as cross-checks. As soon as there are inaccurate and incomprehensible values the monitoring method and the technical system is checked and adapted accordingly.
Any comment:	Estimated value in the ex-ante calculation is 21373 kWh according to the measurements in the first three years of operation from 2010 to 2012.

Data / Parameter:	$HL_{Cav,y}$
Data unit:	kWh
Description:	Total heat for the reservoir (cavern)
Source of data to be used:	Electric meter measuring the thermal energy provided to the cavern.
Value of data	Expected heat: 13340 kWh (see comment)
Description of measurement methods and procedures to be applied:	The parameter is measured continuously. The proportion of data to be monitored is 100%. Data to be aggregated yearly. Signals of the electric meters are remotely transferred to ETHZ and saved.
QA/QC procedures to be applied:	All meters were calibrated before the installation. As different parameters are monitored energy balances can be calculated and can be used as cross-checks. As soon as there are inaccurate and incomprehensible values the monitoring method and the technical system is checked and adapted accordingly.
Any comment:	Estimated value in the ex-ante calculation is 21373 kWh according to the measurements in the first three years of operation from 2010 to 2012.

B.7.2 Description of the monitoring plan:

Data and parameters to be monitored are provided in section B.7.1.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completing the baseline and monitoring sections:
September 9, 2013

Name of person/entity determining the baseline:
Thomas Finsterwald
myclimate

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

22/08/2008 (begin construction)

C.1.2. Expected operational lifetime of the project activity:

> 20 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/03/2010

C.2.2.2. Length:

10 years

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project owner

Organization:	Swiss Alpine Club (SAC)
Street/P.O.Box:	Monbijoustrasse 61 / Postfach
Building:	
City:	Bern
State/Region:	
Postfix/ZIP:	3000
Country:	Switzerland
Telephone:	+ 41 (0)31 370 18 18
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	Jenatsch
Middle Name:	
First Name:	Reto
Department:	
Mobile:	
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Annex 1
PROJECT INFORMATION

From the website www.neuemonterosahuette.ch

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Schweizer Alpen-Club SAC
Club Alpin Suisse
Club Alpino Svizzero
Club Alpin Svizzer

Beautifully efficient: the New Monte Rosa Hut

The Swiss Federal Institute of Technology Zurich (ETH Zurich) and the Swiss Alpine Club (SAC) are intending to set a new milestone in Alpine building with the New Monte Rosa Hut. The foundation stone was laid in August 2008.

The mountain hut is one of many projects initiated to mark the 150^{th} anniversary of the ETH Zurich. It is an ambitious building project for a forward-looking SAC hut on 2883 metres above sea level, sustainable in terms of energy and ecology. The SAC was quick to agree to the project. The internationally known Monte Rosa area in the Swiss Canton of Valais, framed by the Matterhorn and the Dufourspitze, was chosen for the planned hut. The existing hut there is in need of refurbishment, and so the project partners decided to replace it with the New Monte Rosa Hut.

In the winter term 2003/2004, the Studio Monte Rosa at the ETH Zurich's architecture and construction department was set up. Working over four terms, a total of over thirty students devised a design for the New Monte Rosa Hut. The student's ideas developed into a feasible project with the support of professors and experts from various disciplines.

So now a five-storey timber construction is to be built on stainless steel foundations thrusting down into the rock. Its metallically shimmering aluminium outer covering and unusual polygonal shape make it look like a rock crystal. The guest rooms can accommodate a total of 120 people, and the enchanting surroundings are effectively invited in as well, by a cascade of steps and a wide window facade.

An ambitious target: 90 per cent energy self-sufficiency

But the new hut is not intended to convince in aesthetic terms alone, but above all through its resource- and energy-friendly construction and operation. 90 per cent self-sufficiency in energy is the ambitious target. Solar energy for sewage treatment equipment, lighting and household appliances etc. is gained from an 85 m^2 photovoltaic plant built into the south facade of the building. Excess energy is stored in valve-regulated lead-acid accumulators, which guarantee continuity of supply even when the sky is overcast. A rapeseed oil-fired combined heat and power plant is used as an additional power source for peak demand periods. Thermal energy from waste air is recovered by a heat reclamation process. The heat emitted by people also makes a considerable contribution to covering the room heating needs. If a great deal of heat energy is required or there are few people staying in the hut, additional solar energy is needed for heating, and this is provided by 35 m^2 of thermal solar collectors.

Energy management will have an important part to play in achieving a high degree of self-sufficiency. It is not just a matter of optimising individual components; optimising the way these components work together leads to increasing efficiency for the system as a whole. In this way, optimised energy management links technology that is conventional and tried-and-tested as such to form a complex overall system, resulting in a high level of energy efficiency. So data such as weather forecasts and expected visitor numbers are fed in the energy management system as contributions to 'model predictive control', in other words dynamic marginal conditions are also taken into consideration. In comparison with the old Monte Rosa Hut, this package of measures reduces CO_2 emissions created by running the building by about two third per guest per night.

The New Monte Rosa Hut is also perceived as a research station investigating the efficient use of energy and resources. So the project will not be over for the ETH Zurich when the hut is opened. There will be a second research and development phase to examine how all this building technology proves its worth in the everyday operation of the New Monte Rosa Hut. Only then can it be established whether and how energy management can be further optimised. New research and development insights can be applied to running the hut and their efficiency measured in terms of energy self-sufficiency levels. The results of that process can then be applied to increasing energy efficiency for lowland buildings.

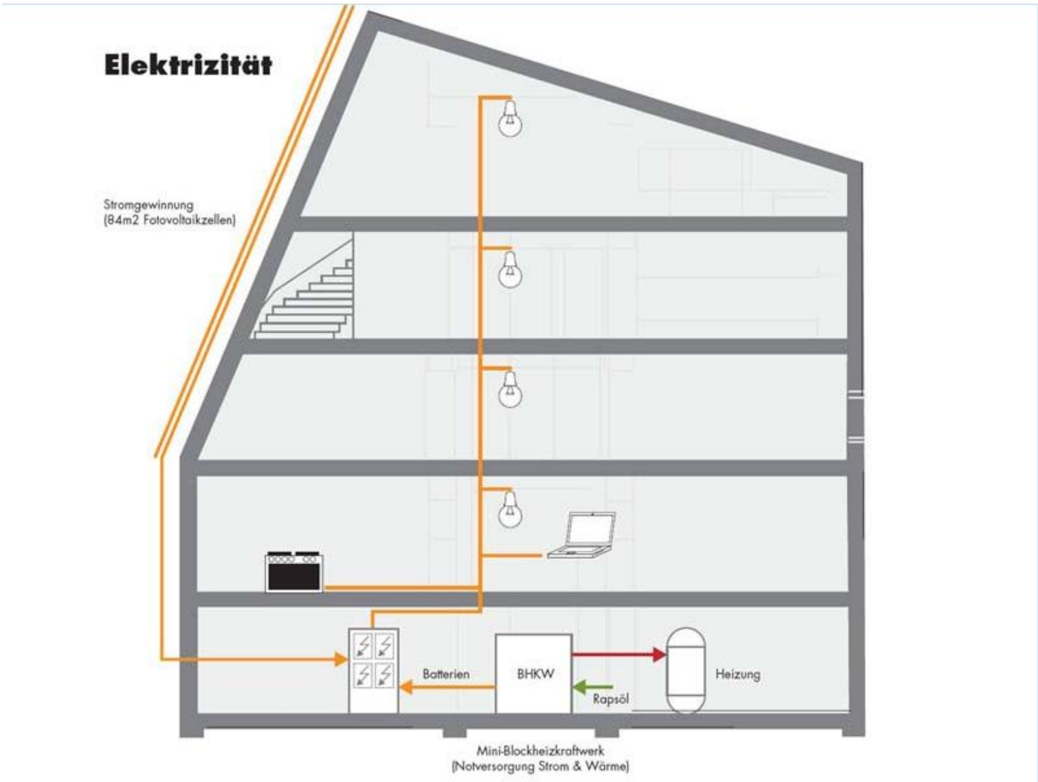
Sustainability from cradle to grave

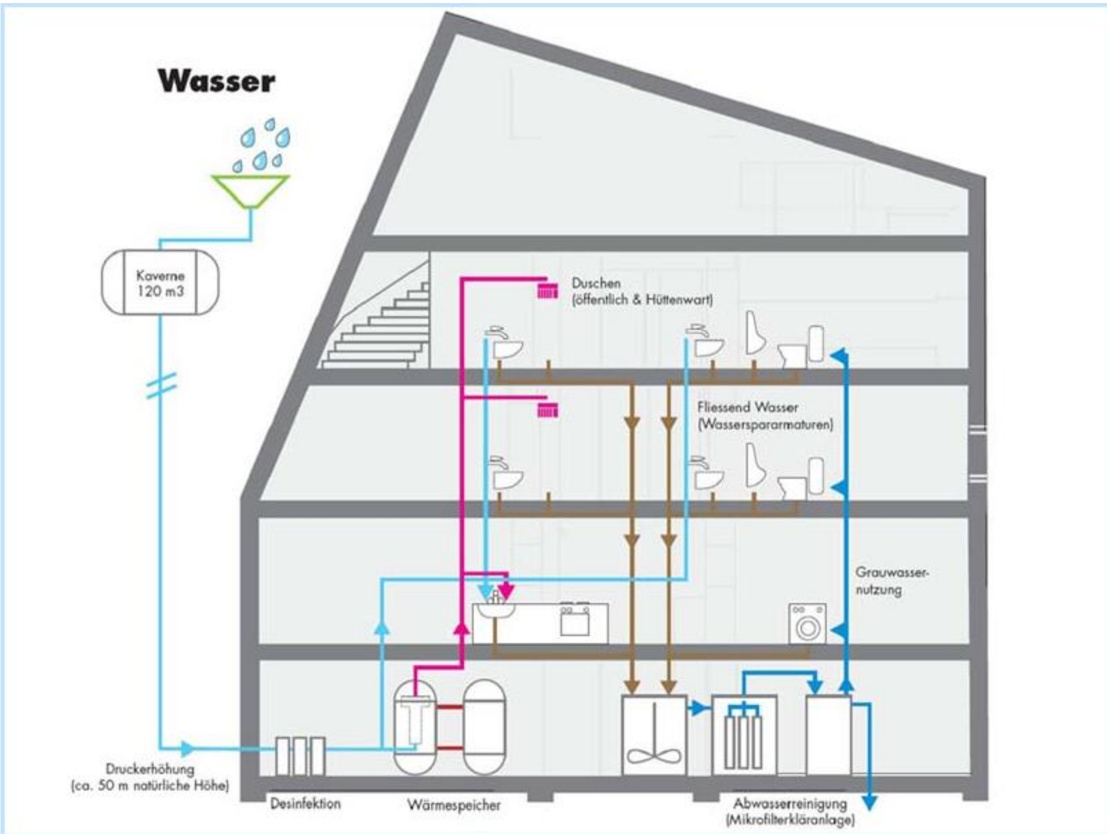
The old hut will be demolished by 2010, after the New Monte Rosa Hut is opened. But thought is also being given to the end of the planned new hut's life. Researchers in the ecological system design department are assessing the building with the aid of cradle-to-grave life-cycle analyses. Holistic analysis of this kind guarantees forward-looking and full ecological optimisation of the building and the way it is run, and sets standards for sustainable planning.

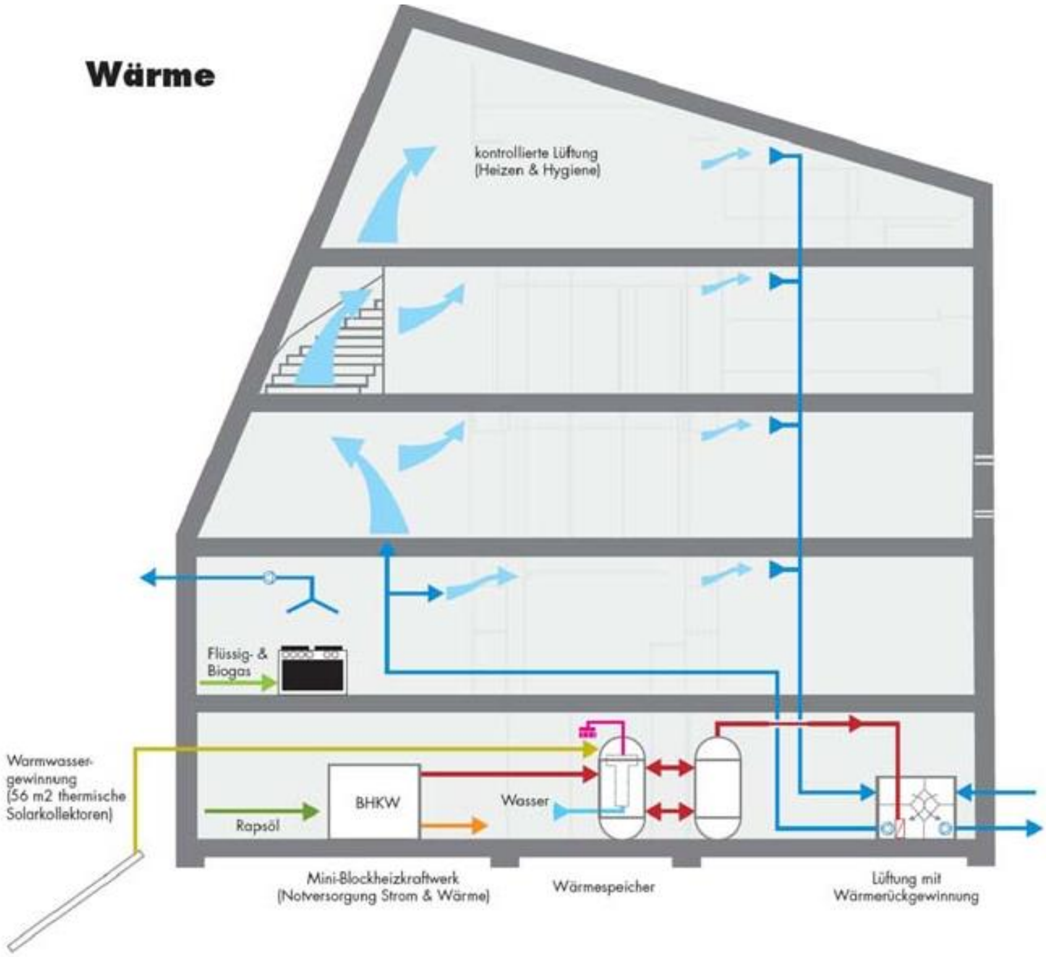
The structural components are made using CAAD production methods, paying attention to the efficient use of materials. The range of construction possibilities is extended, and justifies a particular kind of architectural statement through logic applied directly in terms of materials and manufacture. Computer calculation also makes it possible to achieve the ideal component size and weight. This is in its turn very important for transport, as there is no road to the site. When the old Monte Rosa Hut was built in 1895, mules were used to carry the components across the glacier, the last leg of the journey. This option was also examined for the New Monte Rosa Hut, but rejected on grounds of time and expense. Helicopters will now be used instead of animals.

This ambitious building project has its price. It will cost about 6.4 million Swiss francs to build the hut. The SAC is contributing about 2.15 million. The ETH Zurich has received the rest of the money from numerous benefactors and sponsors from all sorts of sectors. Walkers and mountaineers are delighted with this successful co-operation: they will be able to use the new hut from autumn 2009.

The New Monte Rosa Hut in splendid isolation between mountain tops (in the background the most famous of all, the 4487 m high Matterhorn) and glaciers (digital visualisation).


Elektrizität
Stromgewinnung
(84m2 Fotovoltaikzellen)
Batterien
BHKW
Heizung
Rapsöl
Mini-Blockheizkraftwerk
(Notversorgung Strom & Wärme)


Wasser
Kaverne
120 m3
Duschen
(öffentlich & Hüttenwart)
Fliessend Wasser
(Wassersparamaturen)
Grauwasser-
nutzung
Druckerhöhung
(ca. 50 m natürliche Höhe)
Desinfektion
Wärmespeicher
Abwasserreinigung
(Mikrofilterkläranlage)


Wärme
kontrollierte Lüftung
(Heizen & Hygiene)
Flüssig- &
Biogas
Warmwasser-
gewinnung
(56 m2 thermische
Solarkollektoren)
BHKW
Rapsöl
Wasser
Mini-Blockheizkraftwerk
(Notversorgung Strom & Wärme)
Wärmespeicher
Lüftung mit
Wärmerückgewinnung