Energy Mission Statement 2020
Roche Basel/Kaiseraugst
**Contents**

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Introduction</td>
</tr>
<tr>
<td>6</td>
<td>Energy Vision</td>
</tr>
<tr>
<td>7</td>
<td>Energy Objectives</td>
</tr>
<tr>
<td>10</td>
<td>Implementing our Energy Objectives</td>
</tr>
<tr>
<td>11</td>
<td>Reduce energy consumption</td>
</tr>
<tr>
<td>14</td>
<td>Sustainable energy sources</td>
</tr>
<tr>
<td>16</td>
<td>Innovative technical solutions</td>
</tr>
</tbody>
</table>

The terms “Basel site” and “Roche Basel” always refer to the sites in Basel and Kaiseraugst, including their ancillary buildings.
“We consciously use new, environmentally friendly technologies and processes so that we can invest and produce sustainably. In this way we have substantially reduced the burden on the environment in the past five years.”
Udo M. Bäckert, Head of Technical Services at the Basel site

Roche has defined specific long-term objectives for energy management in its “Energy Vision”. The Basel site implements these guidelines systematically and with great success. As a consequence, Roche Basel is able to minimise the burden on the environment when investing in and operating new buildings and facilities. The result is a measurable reduction in energy consumption. Per employee, this figure in 2010 was 20 percent lower than in 2005.
Energy Mission Statement

Roche’s Corporate Principles state that “as part of our commitment to sustainable development, we proactively seek to employ new, more sustainable technologies and processes and to minimise our impact on the environment”. The “Roche Group SHE (Safety, Health & Environmental Protection) Goals 2010-2015/2020” specify objectives for the entire Group:

**Increase energy efficiency**
Reduce energy consumption per employee by 20 percent by 2020 compared with the figures for 2010.

**Replace non-sustainable energy sources**
Increase the proportion of total energy consumption accounted for by sustainable energy sources throughout the Group from today’s level of 5 percent to 20 percent by 2020.

Vision

Energy is an indispensable part of every human activity and of life itself. We all depend on a reliable energy supply and expect affordable, safe and environmentally compatible energy to be available on demand.

At Roche we are aware that we need to act now in order to ensure a sustainable energy supply for the future, and we have enshrined this philosophy in our global corporate objectives. We are focusing on the efficient use of energy in our facilities and on increasing our use of energy sources and technologies with a low environmental impact. In doing so we are making the best possible positive contribution to the future of energy. This approach has proven very successful - for years we have held a leading position in the Dow Jones Sustainability Indexes.

Roche invests in renewable energy technologies and purchases "green" energy. We are thus playing our part in bringing about a transition from non-renewable to renewable energy sources and supporting the development and application of innovative technologies. We pursue all promising options and assess selected energy technologies in terms of their social, environmental and economic impact.

At Roche we are fully committed to making our contribution to a sustainable energy future. We are guided by the principle that energy is an issue of global importance that we are advancing locally.

Objectives
**Objectives**

“Laboratory quality control processes only work correctly if the internal environment is stable. We work with the engineers to find ways of minimising energy consumption while still complying with the strictest requirements for the internal environment in our laboratory block.”

Stéfanie Diem, Project Manager

---

**Improve our eco-balance**

Improve our lifecycle assessment per employee by 15 percent between 2010 and 2020.

We measure our total environmental footprint using the “eco-balance” metric developed by the Swiss Federal Office for the Environment. This weights and summarises all relevant environmental impacts to a key performance indicator.

**Roche has committed to further undertakings that are relevant to our energy objectives:**

**Reduction of CO$_2$ emissions**

Roche supports Switzerland’s goals for reducing CO$_2$ and has concluded an agreement to this effect with the Swiss Federal Office for the Environment (FOEN). In this agreement, Roche undertakes to limit CO$_2$ emissions from the use of fossil fuels at its Basel site to 47,700 t/a by 2010.

**Reduction of halogenated refrigerants**

Old chillers will be modernised and natural refrigerants will be used sooner than required by law. By 2008 all large-scale chillers at the Basel site that still contained chlorofluorocarbons (CFCs, e.g. R12) as refrigerants had been replaced. Non-chlorinated refrigerants (HFCs, e.g. R134a) will be reduced to 10 percent (2 t, not including very small units) of the level in 2000, a move that exceeds the statutory requirements.

---

**Eco-balance points per employee Basel site**

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basel</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**CO$_2$ emissions from fossil fuels$^1$ in [1,000 t/a] Basel site**

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basel</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
</tr>
</tbody>
</table>

---

$^1$ Calculated using FOEN method
Implementing our Energy Objectives

“There is nothing that can’t be done better. That’s why we’re constantly looking for ways to optimise things. This is good for our site - and for the environment too.”
Claudio Magoni, Head of Maintenance and Utilities Basel

The Basel site intends to achieve the company’s significant and ambitious energy targets by applying sound technical concepts. These concepts also take into account the expected development of the site and the constantly changing operating environment. Basel relies on highly qualified and committed engineers and technicians to master these dynamic and complex tasks.

The site’s energy mission statement is based on three elements:
1. Reduce energy consumption
2. Use energy from sustainable sources to meet remaining energy requirements
3. Employ innovative technologies to optimise energy consumption

Reduce energy consumption

Personal contribution
Every employee at the site can contribute. Workplace equipment that uses electricity should be switched off when it is not in use. Moderate temperatures should be set in air conditioned rooms. Air travel should be reduced to a minimum and other means of communication, e.g. videoconference facilities, should be used instead.

Interdisciplinary energy-saving team
An interdisciplinary energy-saving team at the Basel site ensures that the local energy-saving process works and that the flow of information between the different business areas is maintained.

The team develops suggestions for improvement and initiates their implementation.

Energy-efficient investments
The process of optimising future operating costs begins in the early planning phase at Roche Basel. A combination of integrated planning, innovative design concepts and materials that are adapted to their purpose is the basis of functional, energy-efficient and economical buildings.

Simulation in the planning phase
Simulations are carried out during the planning phase to achieve optimal energy efficiency in new buildings.

Exposure of façade to solar radiation

Breakdown of energy consumption 2010
Basel site
- Fossil fuels 49%
- Business travel 16%
- Electricity 35%
Energy Mission Statement

Energy-efficient equipment
Roche always gives preference to energy-efficient equipment where possible. This applies both to office equipment (computers, printers, copiers and office lighting) and to laboratory equipment and household appliances such as refrigerators. It also extends to electrical drives, where Roche uses the most efficient motors available. Roche always uses water-cooled equipment where it is available.

Lighting
Roche has adopted the global maximum-efficiency standards for lighting. There are clear internal limits which must not be exceeded.

Commissioning and operation
A well-planned facility with optimised energy parameters needs to be commissioned with care and monitored during its first few years of operation to achieve minimum energy consumption. Experienced specialists optimise parameters such as controller settings and switchover points in heating and cooling systems, ensuring that the facility operates optimally throughout its lifecycle.

Life cycle optimisation
Energy consumption at the Basel site is measured, monitored and evaluated continuously by a state-of-the-art energy measurement system that identifies deviations promptly and initiates the necessary counter-measures without delay. This information also enables us to identify potential for savings on an ongoing basis.

“...we don’t stop monitoring our facilities when they come on stream. We continue monitoring and optimising them for months. In this way we achieve the optimum operating state and avoid malfunctions which would increase energy consumption.”

Olivier Bétrémieux, Project Engineer HVAC
“When outside temperatures are low, we can use free cooling to extract the waste heat not only from the data centre, but from the entire site without a refrigeration system. By doing so we can save up to 300,000 kilowatt-hours of electricity each season.”
Urs Heynen, Specialist Plant Operator, Energy Building Systems

**Sustainable energy sources**

**Groundwater and water from the Rhine**
Roche uses water as a cooling medium. In addition to water from the Rhine, groundwater with a year-round temperature of between 14 and 16 degrees Celsius is available from a number of on-site bore-holes. This water can be used directly to cool new buildings, thus reducing the amount of heat discharged into the Rhine in the summer.

**Free cooling**
In the case of air conditioning systems, ambient air at low temperatures can be used for cooling by increasing the proportion of fresh air relative to the recirculated air.

**Renewable heat sources**
Heat pumps will be used at the Basel site from 2011 to heat buildings by extracting heat from processes and from Rhine water, two sources that are available year-round.

**Electricity from sustainable sources**
All the electricity sourced in Basel from the IWB and in Kaiseraugst from the AEW is produced from renewable, sustainable energy sources.

**Photovoltaics and solar heat**
Roche has installed a pilot photovoltaic plant in Kaiseraugst with the aim of producing its own electricity. Roche examines all new construction and major refurbishment projects to see whether it would be worthwhile and feasible to employ photovoltaics and solar heat.

**Free cooling**
In the case of air conditioning systems, ambient air at low temperatures can be used for cooling by increasing the proportion of fresh air relative to the recirculated air.

**Renewable heat sources**
Heat pumps will be used at the Basel site from 2011 to heat buildings by extracting heat from processes and from Rhine water, two sources that are available year-round.

**Electricity from sustainable sources**
All the electricity sourced in Basel from the IWB and in Kaiseraugst from the AEW is produced from renewable, sustainable energy sources.

**Photovoltaics and solar heat**
Roche has installed a pilot photovoltaic plant in Kaiseraugst with the aim of producing its own electricity. Roche examines all new construction and major refurbishment projects to see whether it would be worthwhile and feasible to employ photovoltaics and solar heat.

**Geothermal energy**
Roche Basel commissioned a study on the use of geothermal energy. It showed that, compared with Rhine water and waste heat recovery using heat pumps, geothermal energy would also not be economical for air conditioning or steam generation at the Basel site.
The search for technical solutions to minimise our energy consumption – in the professional as well as in the private environment – in order to preserve resources for the future generations, represents a real challenge to me.”

Uli Schüler, Head of Engineering HVAC

Innovative technical solutions

Maximum energy standards for new buildings
Roche designs new-build projects for minimal energy consumption. State-of-the-art ventilation systems and high-efficiency heat recovery systems minimise total energy consumption. Roche Basel complies with the Minergie standard for new buildings and uses the LEED Green Building energy performance standard and the Minergie ECO standard as benchmarks. The new high-rise, office Building 1, complies with these standards and is the benchmark leader.

Heated/chilled ceilings
Wherever possible, chilled ceilings are installed in all new-build and refurbishment projects. These radiation ceilings have the additional function of heating the internal environment. Water at a temperature of 40 degrees Celsius or less is warm enough to transport heat. The heat requirement of new office buildings is now so low that there is no need to install conventional radiator systems.

Adiabatic (evaporative) cooling
Indirect adiabatic cooling chills the extracted air from a room by injecting and evaporating water into the air.

The fresh air from outside is cooled indirectly by this cold extracted air through the existing heat recovery system. This method can be used to cool incoming fresh air to a pleasant temperature even during hot summer weather and reduces the amount of electricity that would otherwise be needed for the chillers.

Adiabatic air humidification
An adiabatic humidifier injects pre-treated water into the incoming air and nebulises it without the use of external energy. The water evaporates drawing heat from the humidified air which is returned through a tempered water heating loop. This method of humidifying air with pre-treated water instead of high-energy steam is employed in all new-build projects and reduces the amount of natural gas required to produce steam.

Heated/chilled ceilings
Room
Roche air
28°C
Extracted air
18°C
Adiabatic cooling system
Air
50°C
Water
28°C
Room

Adiabatic air humidification
Room
Roche air
28°C
Extracted air
18°C
Adiabatic humidification system
Water
28°C
Heating loop 40°C
Water
28°C
Roche air
28°C
Cogeneration of heat and power
Roche will use a gas turbine to produce 100 TJ/a of electricity. The gas turbine will burn 240 TJ/a of natural gas and in return produce process steam and hot water equivalent to 110 TJ/a of natural gas which can be used directly on-site. This extremely efficient process makes it ecologically worthwhile for Roche to cогенерate power and heat for as long as the international power grids are not supplied entirely from sustainable sources.

Another major advantage of producing electricity on-site is the contribution it makes to improving the reliability of the power supply to our business-critical processes.

Heat consumption trend at the Basel site: changing requirements facilitate the use of innovative concepts.

The combination of cogenerated heat and power and heat pumps to recover waste heat enables the Basel site to simultaneously reduce its natural gas consumption by 30 percent and electricity consumption by 10 percent, increase the reliability of its energy supply and reduce annual expenditure on energy by several million Swiss francs.