

“TAMING THE WATERFALLS”

Rjukan/Notodden and Odda/Tyssedal Industrial Heritage Sites

Hydro electric power and chemical industry in the Norwegian
Counties of Telemark and Hordaland

Mission Report by request of Riksantikvaren Oslo/Norway
On-site-review 3.-10.11.2010

Prior to application of the above names properties as Cultural World Heritage
Sites

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“TAMING THE WATERFALLS”

Norway’s Water Power and Chemical Industry complex in the early 20th century
as World Heritage Site

Located around the Hardangervidda, Europe’s largest mountain plateau and fed by its enormous water resources that gather within a plane situated between 1200 and 1400 meters above sea level, a pioneer harnessing of water power of exceptional force has occurred that formed the base for the likewise pioneering development of large scale chemical industries of a so far unknown capacity.

In terms of history of technology and economic history this constituted the end of a worldwide dependency on Chilean saltpetre imports (cf. 2005 World Heritage Site Humberstone and Santa Laura saltpeter works) and step by step enabled Europe to produce its own fertilizers and other basic chemical materials.

This in turn led shortly after 1900 to the explosive growth of places like Odda in the South-West and Notodden and Rjukan in the South-East of Hardangervidda within the span of only a few years. Next to the hydro-electric power stations, big chemical complexes came into existence as well as the necessary housing complexes and far-ranging transport networks based on rail and water transport.

BASICS

a)

What it is all about

Roughly contemporary with the formation of a Norwegian National State shortly after the beginning of the 20th century, a domestic initiative initiated the harnessing of the extraordinary large potential of the country's water power resources to the production of electrical currency. Together with the ensuing development of the large-scale manufacturing of a number of chemical and metal products, this signifies the beginning of the domination of the industrial sector over the so far most important agrarian economy on the national level.

b)

Second Industrial Revolution

With these two ranges of technology we can register the classical criteria of what the history of economy calls the "Second Industrial Revolution", where the so far leading sectors of the use of coal and the large-scale production of iron and steel was superseded by the production of electricity and the large-scale production of chemical goods.

c)

Norway as Spearhead

Norway can be said to have formed the spearhead of this development on an international scale. Due to an extraordinary amount of natural power sources needed to generate electricity that put the country in the forefront of nations making use of this possibility, all that energy was harnessed to the energy-hungry sector of producing chemical goods, mainly fertilizer based on nitrogen. Two main processes evolved here around 1900, both of which were employed nationally.

Two Norwegian figures played a prominent role in that development. Sam Eyde as entrepreneur and Kristian Birkeland as physicist together in 1905 presented an electric-arc process for the production of saltpetre fertilizer, although the financial base was established by Swedish and French sources. The production of fertilizer from newly developed water power sources took place on both sides of the Hardangervidda that formed the central resource of natural energy for both locations: one in the western province of Hordaland and to the east in Telemark.

d)

Continuation

The scale of production in Notodden and Rjukan from the beginning reached international levels and thus established considerable export activities.

In the late 1920ies again it was a Norwegian protagonist, Erling Johnson, who developed a method to acidify phosphate rock to produce calcium nitrate. Although this process was since and is still called the "Odda Process" it was never employed locally but is still today employed worldwide.

e)

Specific Way

The Norwegian development set against the background of other, but now coal-based large-scale chemical production processes such as for example the AEG activities in Bitterfeld/Germany represents a unique course of a technological, economic and social process that was entirely based on the specific territorial possibilities of the country at the specific moment in time when technology offered electricity-based fundamentals.

So in two main respects, Norwegian developments originating after the turn of last century in the East and West of the Hardangervidda in a unique way influenced the history of the modern industrial world in the second phase of the Industrial Revolution. At the same time this innovative wave laid the foundation of Norway's industrialization.

f)

What is there

The physical remains of this development, completed by an elaborate network of transport systems by road, rail and water in their present state form an eminently comprehensive network of industrially determined landscapes, production sites, power plants as the necessary base for production, transport networks and infrastructural features such as worker's dwellings and entire company towns together with the necessary ancillary institutions like administration buildings, entrepreneur's residences, gathering places etc.

One quite unique feature is the involvement of part of this railway-ferry transport system in world history for a short moment in time. Represented by the sabotage-sunken ferry boat Hydro, that is still in its place at the bottom of Tinnsjøen, the run of the participants of World War Two for the components to produce an atomic bomb is mirrored by the dramatic events that led to the sinking of a cargo of heavy water as a by-product of the chemical production at Rjukan. Here, in a tangible, if submerged object, a decisive moment of 20th century history is frozen in time.

g)

Quality argument

Another important aspect is the architecture of the power plants, but also that of many of the production buildings, represent an early state-of-the-art use of modern construction materials such as reinforced concrete and bear the handwriting of eminent architects of the first thirty years of the 20th century, that have been called "the heroic phase". Frequently also the capacity of the power generation due to the extraordinary hydraulic potential of the country East and West of the Hardangervidda make quite a few of the plants the largest worldwide at the time of their erection.

h)

How it fits

Regarded in “strategical” terms, the Norwegian submission to UNESCO of the electro-chemical complex of the early 20th century is suited to form a convincing link between the earlier stage of supplying the world with fertilizer as is documented with the 2005 inclusion of Chilean saltpetre works of Humberstone and Santa Laura and forthcoming activities to protect places of the history of electricity on the worldwide map.

Norway’s application forms a worldwide “First” in the field of generating electricity by water power (or any other source of energy) that astonishingly enough is as a token of the Second Industrial Revolution not yet represented on the list of world heritage sites.

If a Berlin attempt is successful to put “Berlin Electropolis” into the list, the electricity theme could be perfectly covered from its water power to its fossil fuel based line of technology spanning the period between the late 19th and the interbellum period and insofar the entire span of this new energy’s phase of changing the world.

1)

AUTHENTICITY

At this moment, it can be said that different groups of objects, if they will be included in the application in their present state, fulfil the UNESCO's demand for **authenticity** as outlined in the Operational Guidelines of 2008 under ciphers II.E 79-86.

Elements of a high degree of authenticity:

Grønnebyen dwellings Notodden
Tinfos II power station
Transport chain with railway, train ferries, material
Tinnoset station and harbour area
Mæl station and harbour area
Saaheim power plant
Vemork power plant
(dam systems above Rjukan?)
Ringedalsdammen
Tysso I power plant
Lilletop
Tveitahaugen dwellings

2)

INTEGRITY

Concerning the UNESCO concept of **integrity** as defined under ciphers II E 87-95 in the Operational Guidelines, very much will depend on the question whether the following definition is fulfilled:

“For properties nominated under criteria

*(i) to (vi):A **significant proportion of the elements necessary to convey the totality of the value conveyed by the property should be included.** Relationships and dynamic functions present in cultural landscapes, historic towns or other living properties should also be maintained” (89).*

Elements of a high degree of Integrity:

Grønnebyen dwellings

Tinfos II power station

Transport chain with railway, ferries, material

Tinnoset station and harbour area

Mæl station and harbour area

Vemork power plant

Rjukan company town

Ringedalsdammen

Tysso I power plant and Lilletop

Tveitahaugen dwellings

As can be seen by a comparison between authentic and integral elements, many objects can fulfil both demands of the UNESCO concepts, which should be a very favourable position.

3)

OUTSTANDING UNIVERSAL VALUE

During the fact finding mission in November, we have made as we think unambiguously clear that we consider the complex Hardangervidda/Notodden/Tinfos/transport line to Rjukan/Rjukan/Odda/Tyssedal to be of outstanding universal value.

The thematic core:

- a)
the development of water power use on an previously unprecedented scale,
- b)
the following harnessing of the created electricity to mass production of chemical goods, also on a previously unprecedented scale
- c)
and the involvement of genuine Norwegian personnel and know-how in this development
- d)
plus the connected creation of infrastructure both in the fields of transport and the development of company-town-style dwellings
- e)
and the embedding of all these phenomena into a unique topographical context

form the convincing base for the existence of an outstanding universal value.

One decisive aspect of the concept of **OUV** however is outlined in cipher 53 of the Operational Guidelines:

Nominations presented to the Committee shall demonstrate the full commitment of the State Party to preserve the heritage concerned, within its means. Such commitment shall take the form of appropriate policy, legal, scientific, technical, administrative and financial measures adopted and proposed to protect the property and its outstanding universal value.

It will with absolute certainty be asked whether there is a convincing “commitment... in the form of political, legal, scientific, administrative and financial measures”. Here, from our points of view based on the fact finding mission of November 2010, some more work has to be done, as outlined under the rubrum “**Recommendations for things to do**” in the paragraphs of the individual sites.

4)

INTERNATIONAL COMPARATIVE ANALYSIS

This analysis can either be geared to comparing single outstanding elements of the application, like i.e.

water power plants,
transport systems,
chemical production processes,
company towns
e.a.

and/or it can be harnessed to looking for comparable cultural or industrial landscapes in their coherent complexity.

Both approaches will lead to the conclusion that the combination of these elements and furthermore their setting in a specific cultural landscape, including important natural, industrial and social elements, is so far unique on the World Heritage List.

It will be very important however to do a thorough research, because many of the single and combined aspects have not been examined and described before in the international context.

5)

APPLICABILITY OF THE NOMINATION

The entire application will with the utmost probability be able to move within the boundaries of the internationally approved criteria for the definition of a World Heritage Site.

A)

The relevant notions of the “Cultural landscape” apply as newly outlined in the proposed amendments to paragraphs 8 and 10 of Annex 3 from June, 18th 2010 :

8. The term "cultural landscape" embraces a diversity of manifestations of the interaction between humankind and its natural environment, including urban areas as intensive forms of this interaction.

10 (ii) The second category is the organically evolved landscape. This results from an initial social, economic, administrative, and/or religious imperative and has developed its present form by association with and in response to its natural environment. Such landscapes reflect that process of evolution in their form and component features.

(Here, from the viewpoint of the authors of this report, we would like to add the concept of

“technological”

to the enumeration of “imperatives”: “social, economic, administrative and/or religious”. This criterion seems to be constitutive for the new type of World Heritage Sites that fall within the definition of the ICOMOS agenda of “Filling the Gaps”.

It has to be critically remarked that not even in the year 2010, more than a decade after the agenda was approved, appropriate criteria are developed to correctly describe this new type of site.)

B)

The terms of a serial application apply as well,

as outlined in § 137 a-c of the Operational Guidelines (Version 2008):

a) the same historico – cultural group;

b) the same type of property which is characteristic of the geographical zone;

c) the same geological, geomorphological formation, the same biogeographic province, or the same ecosystem type;

HARDANGERVIDDA

“Cultural landscape”

Cultural landscapes are cultural properties and represent the "combined works of nature and of man" designated in Article 1 of the *Convention*. They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.

Hardangervidda represents in the exact sense of the definition “opportunities presented by...natural environment and of successive...economic forces”. Under “economic forces” we understand the selective transformation of the gigantic natural water reservoir of Hardangervidda under the auspices of a methodical winning of power to create electricity. (WHC Operational Guidelines 2008, para. 47).

Europe’s largest elevated plain of 8.000 square kilometres, roughly half of which falls under nature conservancy, was from around 1900 on seen as a vast natural store of water power, waiting to be exploited by turning it into electricity, which after the developments since the late 1860ies became technically viable at the end of the 19th century. From then on the natural system of glaciers, lakes and rivers was harnessed to optimize the power source in order to maximize the production of electricity using the considerable amount of the hydraulic gradient to the east as well as to the west of Hardangervidda.

Hardangervidda may also be a specific document of industrialisation using water power and the controversial discussion about the conservation of nature in a National Park: While nothing is allowed to be changed or built inside the Park, the use and harnessing of the water streams begins directly at its borders. Also the unique ability of Hardangervidda to serve as a giant power accumulator – in form of glaciers, snow and lakes – is an ability much more sought for in a carbon-free future.

NOTODDEN

The site of Notodden is the direct indicator of the very beginning of Norway's hydro-powered chemical industry inseparably associated with the names of Sam Eyde and Kristian Birkeland. The complex at Notodden's "Tinnesandbukta" forms an impressive waterfront dominated by industrial buildings from the period from 1907 till the 1920ies. The theme of workers' dwellings is represented in a convincing form and Sam Eyde's villa illustrates the social role of the entrepreneur.

It is a cultural remarkable fact, that the city's coat of arms from 1939 combines the Tinnåa River with the symbol of electricity, the flashes of lightning.

RECOMMENDATION FOR THINGS TO DO:

1)

Here the state of stocktaking and establishing an inventory of both the outside and inside of the industrial buildings seems incomplete, if not only in its very beginnings. The stately group of partly reinforced concrete buildings shows handsome detailing such as segmental or round arched windows as well as skilful vertical structuring. Some of the buildings have already found new uses, most others are fit to be reused also, preferably in connection to existing cultural activities such as the Blues Festival that in 2011 will be held for the 24th time.

The tentative submission of November 2009 does not specify the specific value of the industrial site both in historical and architectural terms and neither the workers' dwellings and the entrepreneurs (Sam Eyde's as the decisive figure) mansion, which is also interesting from an history-of-art-standpoint.

2)

Additionally the railway infrastructure such as station buildings, turntable and others as part of the Rjukan-Notodden transport axis establish additional value. Here, a new use obviously is at hand integrating the transport theme into a touristic concept as part of a possible master plan. Furthermore, the former rail connection between the main line and the industrial zone and harbour area should be reconstructed or at least indicated, since the rail connection was an integral part of the industrial venture.

3)

The topic of wood transport as an activity that illustrates pre-chemical commercial activities is also lively present at the site next to the railway area and still used today.

4)

The museum on the site of the original nitrate factory offers values that could be built upon, no matter whether it stays on the site or perhaps is moved to Tinfoss, although a continued presence on the site could – in a modernised form - add to the attraction of the place.

Furthermore it is proof of the fact that there is a regional consciousness of the importance of both people and developments at Notodden that can serve as an argument in the submission to UNESCO.

5)

Grønnebyen workers' dwelling constitutes a very positive example of preserving a historic complex of this kind. It should accordingly be presented in the application. In the international context, it characterises state-of-the-art conservation policy.

TINFOS

Tinfos draws its meaning as the place for the provision of electricity to Notodden. Some characteristic features of Norwegian industrial life both before and after 1900 come together here as well as a couple of buildings of significant architectural and cultural value such as the power station Tinfos 2 with its intricate historicist appearance, the administration building of Tinfos Papirfabrik with its citation of vernacular ornamental motifs, the well reused buildings of the former paper factory itself and the wooden scaffolds of the log runs following Tinnåa river connected to the age old method of transporting wood.

It is a culturally remarkable fact that the coat of arms of the city of Notodden, part of which is Tinfos, shows the symbolic strokes of lightning. This motive can also be found at the banisters of the stairs of Tinfos 2 power station.

RECOMMENDATION FOR THINGS TO DO:

1)

Establish beyond doubt whether the Tinfos 1 power station of 1901 and the Tinfos 2 station of 1912 are to be linked to the Norsk Hydro establishment.

2)

The architectural merit of Tinfos 2 is on equal terms with that of the historicist water power stations along the river Adda from the same period that provide Milan with electricity. Here, like in Italy, an enormous effort was made to embellish and ornament the interior of the power station. Important is the survival of the original Siemens&Schuckert generators here.

3)

But also the building shell of Tinfos 1 is significant enough to merit its inclusion in the application. Its façade ornamentation with the classical symbol of electricity, the bolt of lightning, clearly speaks of its purpose.

**RAIL AND SHIP TRANSPORT
RJUKANBANEN
TINNSJØEN FERRIES WITH TINNOSET AND MÆL**

The industrial transport chain established by Norsk Hydro features some elements and solutions which make it outstanding in itself. Products from Rjukan were transported by rail to Mæl, by rail ferry to Tinnoset, by rail to Notodden to be delivered to the Notodden industry or by ship via the Telemark canal to Skien and the Skagerrak.

A)

Railway

Rjukanbanen was inaugurated in 1909 and helped in the construction of the power plants, the industry and the town herself. As early as 1911 the line was electrified with 10kV 16 2/3 Hertz alternating current, the second rail electrification in Norway after the meter-gauge - also industrial - Thamshavnbanen near Trondheim from 1908. Both were real pioneer ventures, as main line electrification trials in Prussia with high currency started only in 1911, which led to an agreement for a standardized current of 15kV and 16 2/3 periods between Germany, Austria, Switzerland, Sweden and Norway one year later. Rjukanbanen ran as an isolated system until 1920, when it was finally connected to the state railway network, including rebuilding of Notodden station. The Notodden – Tinnoset section was taken over by the state railways and updated to the standard current. The first electric locomotive Rjb No. 1 is conserved in the National Railway Museum in Hamar, while a sufficient representation of rolling stock from early times until cessation of regular traffic can still be found in Rjukan, Mæl and Tinnoset.

B)

Railway Ferries

Railway ferries on inland lakes in Europe were first used on Lake Constance in 1869, connecting Austria, Switzerland and Germany. The ferries over Lake Tinnsjoe followed the example of the already developed open sea ferries.

First vessel was a special built wooden ferry appropriately named Tinnsjoe with two railway tracks, loaded over the bow, which set the standards for the landing areas until today. The development went to ever larger ships – in total five - with three of them conserved.

“Hydro” from 1915 could transport 15 wagons and sunk 1944 after the sabotage to the ground of Tinnsjoe, where she should be seen as a testimony of the German quest for heavy water and the subsequent sabotage action.

“Ammonia” from 1929 was larger, is today probably the last steam driven railway ferry in the world and still in operative condition.

“Storegut” as the largest ferry, built in 1955, is still in use and a high value example of shipbuilding architecture and techniques of her time.

The Tinnsjoe ferries are the last inland lakes railway ferries in Europe, as the Lake Constance services closed in 1976. Worldwide, other examples can be found in Turkey at Lake Van, opened only in 1975. If the railway ferries in the Caspian Sea (opened 1962), on the Great

Lakes in North America, on Lake Titicaca in South America (opened 1971) and on Lake Victoria in Africa (1966) are still working is unknown. These facts position the Norwegian examples between older specimens that do not exist any more and more modern installations that date definitely after the latest Norwegian ferry from 1955. So the Norwegian example might be the oldest survivor of this type.

C)

Installations and facilities

Most elements of Rjukan station are still in place like the station building, the goods shed, the loco shed and most of the tracks. An important feature is the electrical signal box inside the station building, dating from the 1950s and quite unusual for a branch line, documenting the importance of the railway and the high technical level and modernity of her installations and material. Due to the dismantling of tracks the connection between rail and industry is not longer clearly visible.

The old and new Mæl station buildings are conserved. The ferry jetty with the hinged and movable loading bridge, an important element of railway ferry infrastructure, is still in working order as is her counterpart in Tinnoset. The slipway, workshops, storages and the building to care for ship personal, which had to overnight here are still intact and usable. The Tinnoset station building in vernacular architecture is private property and well kept.

Notodden has also an old station, dating from the opening of the railway and situated in the industrial area, and a new station from 1920, built when the connection to the national railway network was accomplished. There is also a turntable and a modern engine shed. The rail connection to the industrial area got lost due to road and building development.

RECOMMENDATION FOR THINGS TO DO

1)

Demonstrate the tourist possibilities of reopening the railway line

2)

Documenting what already has been done in keeping the ferries in perfect shape, past activities involving the ferries

3)

Commemorating the Hydro incident in a more eye-catching way

4)

Protect a collection of the unique railway carriages and special wagons from weather deterioration under a roof

5)

Relocate the locomotive Rjukanbanen No.1 to her authentic and original place of use from Hamar to Rjukan

6)

Repair and use some of the original “Norsk Hydro” modern diesel- and electric locomotives

7)

Secure the future of Tinnoset station building

RJUKAN

Rjukan still today shows all the classic signs of a company town. The rise in the number of inhabitants is a clear proof of the *raison d'être* of this settlement. In 1907 there were just 50 families here. In 1917 Rjukan had already 10.000 inhabitants.

Strung between the two majestic power plants of Vemork of 1911 and Saaheim in 1915, the long lines of workers' housing can easily be perceived in their regularity from the roof of Saaheim power station.

Rjukan thus represents the company town of the Second Industrial Revolution as opposed to places like Cromford, New Lanark or Saltaire that demonstrate entrepreneur's strategies to house their workers in the first half of the 19th century. Comparable phenomena to Rjukan we find for example in French settlements for the chemical industry (Solvay) from the 1920ies. Important accents are given by public buildings like the school, the cinema/theatre complex or the administration building and guest house of Norsk Hydro.

Concerning the production area of Norsk Hydro, it has to be stated that the quality of industrial architecture matches the best examples worldwide with the additional quality that here, the idiom of a specific Nordic design in utilitarian architecture comes to a culmination.

A quite unique feature in the field of paternalistic welfare measures is the private teleferic of Krossobanen, established in 1928 to transport Norsk Hydro's workers up into the sun.

RECOMMENDATION FOR THINGS TO DO

1)

Stress the early (1983) establishment of an industrial museum supported by the trade unions that today is in the Vemork power station since 1988. Here one could see room for an amplification of the thematic scope of the whole tapestry of development that is incorporated into the application to include early Norwegian industrialisation as a World Heritage complex.

2)

Stress the strategy of the community to help the inhabitants of the workers' houses to preserve them in their original state

3)

Continue the inventorising and listing process of the key elements of the company town such as workers' housing and community buildings and describe and exhibit the "best practice" examples of conservation, rehabilitation and rebuilding to original outlines

4)

Continue the listing and protecting process of the relevant buildings of the now "Hydro Industrial Park". Mainly the five-part brick-covered complex of the furnace house-main storage with its combination of rounded and triangular pediments is of an outstanding architectural quality as well as the amply windowed narrow workshop building. The long-stretched building tracts of Nitrogen plant, synthesis plant and compressor house with their characteristic roof ventilation profiles represent a typical Northern architectural solution.

5)

Watch for the development of the cavern power plant above Saaheim. With its machinery it establishes another visitors attraction beside the two power plants Vemork and Saaheim.

6)

Research the possibility of including Mår power station as an example of early cavern stations with specific history (German beginnings in 2nd World War, Norwegian completion until 1954, largest fresco painting in Norway) in the application

7)

Research the inclusion of Tinn Museum as document of pre-industrial time.

TYSSDAL

The hydro-power landscape in and around Tyssedal, encompassing now more than 100 years of construction of water power plants, is a most impressive witness to the long history of utilizing the regional water power to create electricity.

The high-pressure 1906 plant Tyso I with its background in the endeavour to produce carbide since 1905 and cyanamide since 1908 as well as many other products later on lies at the roots of Norwegian 20th century industrialization.

Part of the stages to enlarge Tyso I was the construction of the Ringedals dam, Norway's largest at the time of building. The power station itself representing different stages of amplification is an impressive example of industrial architecture and can claim a prominent place in the range of international examples of buildings for that purpose. Its unaltered state of equipment singles it out even more. Together with the Lilletopp installations the historic technology can be impressively demonstrated.

The Tyssedal locality itself offers many witnesses to the company-town-style growth of the town. Hotel, congregation house/church, school and impressive corporate housing blocks (Tveitahaugen as an example of the design of workers' dwellings that absorbed elements of the contemporary concepts of the "garden city") contribute to this picture. A special asset can be seen in the survival of the historic power lines further illustrating the early history of the use of electricity in the country.

RECOMMENDATION FOR THINGS TO DO

1)

Stress the importance of the 2000 protection of the power plant Tyso I and its subsequent opening in 2005 as Norwegian Museum of Hydropower and Industry. It demonstrates an awareness of the national importance of this technology.

Here, efforts should be made to coordinate the strategies of Vemork in Rjukan and Tyso in Tyssedal to give an integrated picture of Norwegian industrialization.

2)

A comprehensive scheme should be developed that comprises also the more modern places of water power use to stress the continuity of this theme for Norway's technological and economic situation.

3)

A trail should be produced that guides the visitor to all places of historic importance in Tyssedal and demonstrate the character of the place as industry-driven settlement. The old tourist trail from 1904 might be included and rehabilitated for this purpose.

4)

The structures of contemporary production in Tyssedal are - compared to the historic places connected to the reclamation of water power - of minor importance. Within the area occupied by Eramet there are an old workshop and a warehouse of around 1925 that might be protected to give an impression of the continuity of water-power-based production for nearly one hundred years. Their localization within the works' premises should make preservation easily possible.

5)

If possible, a preservation strategy should comprise also traits of the pre-industrial history of the region that saw a considerable amount of tourism. The outlining of the pre-industrial part of the region's history would be an impressive way of illustrating the drastic changes industrialization brought to this part of the country.

ODDA

In the course of the 19th century, Odda started a significant career as tourist destination. Visits ranged from English pioneers around 1830 to German Emperor Kaiser Wilhelm II., who visited Odda every year between 1891 and 1914. This led to the construction of several hotels amongst which Hotel Hardanger won prominence.

The construction of the Tyssedal water power plant in steps from 1906-1918 harnessing the water of the Tyso and Mågeli River via the Skjeggedal and its magnificent Ringedalsdam initiated a second flowering of Odda. Within a few years the number of Odda's inhabitants rose from 600 to 4000.

The base for this growth lay in the 1906-08 start of a large scale production of calcium carbide with a capacity of 32.000 tons a year. At the same time, the production of calcium cyanamide was initiated, using calcium carbide as raw material with the aim of producing 12.000 tons a year, both productions reputedly making the Odda plant the largest of its kind in the world.

The economic depression in the early 1920ies stopped this production. In 1924 Odda Smelteverk is founded. In 1927 Erling Johnson developed a new process to produce fertilizer that after its place of invention was called the "Odda-Process". It was never employed in Odda however, but licensed to Norsk Hydro and some German companies. Production on this important site went on till 2003.

What makes Odda smelteverk so important and central to the application of Norway's hydro power sites and pioneer chemical industry as a World Heritage Site is the fact that here in an internationally unique way the physical remains of an early chemical production process are still present.

Worldwide the chemical industry is characterized by "cannibalizing" its production sites for ever newer processes and not retaining any traces of historical production methods.

Thus a period that is called "The Second Industrial Revolution" which occurred around the year 1900, being characterized

- a) by the employment of electricity and
- b) the rise in chemical production of all kinds of goods

is, what concerns chemical production, only very rarely represented in terms of physical evidence of its development and history.

The enormously large oven houses of "Cyanamiden" with their 320 furnaces representing the Frank-Caro type production method applied in the 1920ies establish a very rare exemption to that rule. In the context of the different production stages, represented by buildings around the oven complex such as the lime kilns, and carbide furnace, the Linde building and the big storage roof, the process is still represented from the delivery of the raw material to the storing of the finished product, representing a timespan of production from 1906 to the late 1950ies.

The skyline of this industrial enterprise not only signifies Norway's pioneering role in the development of a modern chemical mass industry, but it also gives the city of Odda its characteristic profile in a similar way as the blast furnace works and coal mines in Germany define their respective surroundings. This fact has been honoured by the declaration of Völklinger Hütte and Zollverein Coal Mine as World Heritage Sites in 1994 and 2001 respectively.

Nearby Tyssedal with its complex systems of water management rounds up this leitmotif of representing the Second Industrial Revolution with Norway spearheading the development. The Tyssedal power plant (Tyso I) as a further advantage presents a historic water power site in its original state within a building of significant architectural value.

Together with Notodden, Rjukan and the Hardengervidda, Odda with its authentic remains of the cyanamide production process itself following the Frank-Caro method necessarily rounds up the thematic core of Norway's application for a World Heritage Site "Taming the Waterfalls":

The industrial heritage of Odda Smelteverk

The history and development of the smelter works in Odda comprises the timespan from 1906 to today. Many buildings and installations from the early period have survived, objects from later periods are also still existing.

Today, parts of the carbide production, the complete dicyanamide production, parts of the infrastructure and of the shipping installations have already been demolished. The greatest loss is constituted by the destruction of the two older carbide ovens.

An existing concept for the preservation of Odda Smelteverk by Rijksantikvaren focusses on a comprehensible representation of the former production line, i.e. from the landing of the raw materials to the shipping of the final products. This „production line concept“ includes buildings of very different age and importance.

Important parts of the plant:

On page 13 of the documentation (Schjelderup, H.: Odda Smelteverk. Vurdering av verneverdier. Man. Stavanger 2006.) the six major parts of the plant are described as:

1. Import of raw materials,
2. Carbide production,
3. Cyanamide production,
4. Dicyanamide production,
5. Infrastructure,
6. Export shipping.

1. Import of raw materials:

These installations include the import quay area, the unloading facilities, the harbour silo building, the aerial ropeway to the storage area with protective roof over the main road - all

dating from the middle of the 1950s, the small suspended bridge and a transformer building, built in 1906. All elements are still intact, but the harbour silo is derelict. With this exception, all these objects are protected by a Cultural Heritage Act.

2. Carbide production:

The most prominent buildings in the Smelteverk area constitute a line of landmarks for Odda. They served the carbide production, including the large concrete roof over the storage area, the three lime kilns and the remaining carbide oven, all protected by a Cultural Heritage Act. The storage and the lime kilns were constructed in the middle of the 1950s, the carbide oven dates from 1976. The modern carbide storage at the export quay has been demolished.

3. Cyanamide production:

The main buildings of this production are the oven halls with their 320 cyan ovens and adjacent buildings for storage and preparation. In the nearby „Lindehouse“ nitrogen was produced for the production process. All these buildings are protected by a Cultural Heritage Act. The Lindehaus is already in use for theater purposes.

4. Dicyanamide production:

All buildings and installations for this production have already been demolished with the exception of the „dicylager“ from 1907 at the harbour, now reused for concerts and exhibitions.

5. Infrastructure

Many auxiliary buildings like offices, laboratory, smithy, storages and workshops, mostly dating from the first production period, are already protected as monuments by state or local regulations and partly adaptively reused. Some newer and more modern installations have been demolished.

6. Export Quay:

The quay is intact and may be reused.

Future of the plant area:

The whole area of the former Smelteverk is the object of three diverging proposals:

- a protected monument area under the Cultural Heritage Act documenting the former production and importance of this industry;
- an area for reuse under the proposed concept of „Odda Real“, dating from March 2006;
- an urban redevelopment area as described in the „reguleringsplan“ of the community, dating from June 2006.

There are some difficulties and contradictions between these proposals, which should be described in the view of the protection of the monuments:

The „reguleringsplan“ is to be understood as a more abstract proposal for the use of the area and spaces, but shows little respect for buildings and installations protected by the Cultural Heritage Act. While entrance buildings, Linde plant and the carbide production are conserved inside public-use-areas and the oldest brick buildings seem to be preserved for adaptive reuse, the arbitrary – and probably only provisional - positioning of a new road system destroys the

entire historical environment and its interrelations. A car park is planned in place of the historically most important cyanamide plant.

The proposed concept of „Odda Real“ in contrast shows much more respect for the historic context, even if some of the concept ideas for reuse seem to be too farfetched or optimistic. The proposed road system is of small scale and carefully fitted in between the existing buildings. The largest and fundamental problem is the installation of a partly new built COOP shop in the place of the dicyanamide plant, which would mean the total loss of the important oven installations.

The production units protected by the Cultural Heritage Act follow the „production line“-concept, but the historic production line is already disrupted by the demolition of important parts, especially the older carbide ovens and their infrastructure. The lime kilns on the other hand seem to be of no specific value, because they are of common and widespread construction and still in use in many other places.

In a first conclusion, the most important elements for the documentation and protection of the industrial heritage of Odda Smelteverk are carbide oven no. 3 and the cyanamide plant. They form the historic core of the chemical production process in the version mainly of the 1920ies and are therefore most important in the context of the arguments for a world-level importance of the Norwegian historic chemical production based on waterpower. Auxiliary buildings like offices, workshops, infrastructure installations et.al. establish the necessary functional context and are partly of importance for the development of industrial architecture in the second half of the 20th century. They generally seem to face no serious dangers of further demolition.

Preservation and reuse problems:

The conservation and preservation of most of the older brick buildings is not a difficult problem, tried and proven methods can be used under the survey of Rijksantikvaren or local experts. Some of the buildings are very well kept and do not even need more special care or treatment.

A different problem will arise with conservation works and possible reuse for the more purely technical structures, like the large storages, ovens, kilns and production halls. Starting with the import silos and the filling station of the aerial ropeway, it is obvious that the already partly derelict building can be reduced to the mere document of the function as loading point for raw materials and starting point of the ropeway. The ropeway itself will show a serious future conservation problem, especially the ropes, which tend to rust and break in a short time. The concrete masts otherwise are very solid and can survive without care for longer periods. The protection roof over the road must be cleaned from young trees to keep the roof cover intact. The open raw material storage for lime and coke „Skalltaket“ is a concrete building of high material and architectural quality and shows no signs of the usual damages by carbonisation and rusting steel reinforcements. The large roof can easily cover new uses, since the space formerly filled by raw materials could be used for low-level building without altering the character of this magnificent open structure unduly.

The three lime kilns are located in mostly open steel structures, which will pose another long-term conservation problem. Exposed structures like these will heavily suffer from the elements, especially in hard wet climates and salty sea air. Anti-corrosion measures are costly because of the very complex construction, adaptive reuse is nearly impossible.

Much better is the situation for the conservation of the carbide oven. Although built up in a similar steel skeleton construction it is protected with an almost intact steel cladding and roof, which protects the structure from rain and water and therefore corrosion. Again this object cannot be reused, but its historic importance should lead to a museum-like approach, which means a light cleaning and the installation of safe walkways for guided tours.

The large hall of the cyanamide production with the 320 ovens is covered by a steel shed roof. This building is relatively easy to maintain, as long as no other uses are planned, which are mostly impossible since the important ovens and the structure have to be kept as an integral monument in the light of its outstanding importance for the pioneer history of the Norwegian chemical industry as part of the World Heritage concept.

The buildings around this core item on the other hand can adaptively be reused, because their importance is not so significant.

Finally, the two silos for the raw cyanamide, functionally and spatially connected to the above mentioned objects, are important landmarks for the industrial area, but difficult to reuse – the concept of „Odda Real“ presents here two ideas. As the younger silo from 1917 is in a very bad state, at least the older one from 1907, which is of significantly higher architectural quality, should be conserved.

Conclusion:

The Odda Smelteverk is an important document of the former carbide and cyanamide industry and therefore integral element in the pioneering phase of the waterpower-based Norwegian chemical industry. Most of the pertinent buildings and installations can be reused or preserved as exhibition or museum pieces. The most debated object is the cyanamide plant with his 320 ovens. The plans for new development in this specific area should not be accepted because of the decisive character of this element for the development of Norway's industrialization and history of technology. It definitely might do harm to the success of the World Heritage application.

In other parts more flexibility might be possible, for example in the area of the lime kilns. A concentration for larger- scale developments in this southern part, including adaptive reuse of the large concrete roof of the lime and coke storage, might be the preferable option.

RECOMMENDATION FOR THINGS TO DO

Even if the conservation of the important parts are rejected by the Community, local politicians and economic forces, Rijksantikvaren should keep a strong long-term attitude towards the preservation. Experience shows that forces against the conservation may be of short life and can change very fast.