



LIFE99ENV/E/347

INFORME LAYMAN

19/09/2002


**RECUPERACIÓN INTERNACIONAL DEL RÍO MIÑO: UN EJEMPLO DE
APOVECHAMIENTO HIDRÁULICO SOSTENIBLE**

Datos del Proyecto

Localización del proyecto:	CH Frieira, Ourense
Fecha inicio del proyecto:	20/09/1999
Fecha fin del proyecto:	20/12/2001 Fecha de la prórroga: 20/06/2002
Duración total del proyecto:	27(meses) Prórroga en meses: 6 (meses)
Coste total:	1.278.875€
Contribución UE:	291.342 €
(%) del total de los costes:	27,5 %
(%) de los costes elegibles:	50%

Datos del Beneficiario

Nombre del Beneficiario:	UNIÓN FENOSA Generación
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The LIFE99ENV/E/347 project was presented by the Union Fenosa, S.A. company and the environment, being this a pioneering and innovative association in the Spanish State in means of recuperation and restoration of a fluvial environment.

Since the project presentation Union Fenosa, S.A., has reorganized in a holding of Companies, with in which Unión Fenosa Generation, S.A. has been constituted as the electricity generator company within the group, that at present manages 39 dam and diversion dams. Throughout the Spanish geography.

In the last years U.F. Generation, S.A., shows an increasing worried about the integration of the environment aspects in its productive processes, as it can be understood by the inversions that is making in such aspects, as well as the attainment of each of the production systems units of environment management as ISO 14000.

The Galicia government, (Xunta de Galicia), has competence conferred in the subject of the environment protection and in order and management of fish resources. The planning and execution of the environment policy of the Galicia government is responsibility of the environment department.

The Spanish energetic policy in the beginning of the economic and industrial development of the country centered great part of its objectives on the usefulness of the hydroelectric potential of the majority of the Spanish rivers. In this context, between the years 1950 and 1990, 939 were built in the whole world, being 46 them are in Galicia.

In those days the energetic plannings did not integrate the environment principles and as a consequence of it, the great dams even now a days show negative environment effects that in nearly no cases were mitigated or minimized. This is the case of the denominated “barrier effect” that interrupts the continuity of the fluvial ecosystems and stops the migrations of the fish species.

In the case we are dealing with, the Frieira dam, first obstacle of the mayor hydrographic basin of Galicia, prevents the reproductive migration of the salmon, the “alosas”, eel and the lamprey (specie included in the attached II of the board of directors 92/43/CEE), at the same time negatively affects the trout vital cycle, the “ciprinidos” and other environment elements some mollusc as Margarita sp. And the fish predators like the otter, the heron, etc.

Year after year, during the migration periods, on the foot of the press there is a production of fish unable to go up the river, that in this way its divided between a low part where there is abundant migratory species but not in the optimal area for beeding and a high part with great reproduction potential and the breedings who the reproducers cannot reach.

This problem has mean a remarkable loss of specific richness water up the press of Frieira and an improverishment of the fish use and the economic and social activities related with them.

One of the main negative effects of the big dams, the impossibility of going up, hardly dealt with, due to a complex technique that supposes the construction of a freeing device in dam already in used.

Until the execution of this project the Frieira dam maintain, as well as the majority of the dams, the same infrastructure used to built slight punctual modifications of small impacts made mainly in the last years.

That device of freeing will have within the next years undeniable positive effects water up the dam, in the main couse as well as in the flowings.

The implantation of a fish go up system in the Frieira dam will allow a fluvial ecosystem badly affected for more than 30 years to substantially recuperate, fulfilling some of the community environment policy objectives, within them, the directives 74/409/CEE y 91/43/CEE.

HISTORY AND CHARACTERISTICS OF THE FRIEIRA PRESS

The built of the Frieira dam was finished in 1970 between the towships of Padrenda and Crecente. It's a gravity dam of 33 meter high with 194 meter long at the top. It retains a total of 44.41 hm³ flooding a surface of 466 hectare. Its desteny is the production of electric energy, not being very big its capacity of water storage, for what it can be considered a functioning in a running system. The central is equiped with 2 Kaplan turbines of vertical axis and 5 turbine blades, able to turbine a volume of 320 m³/s each; the external diameter is of 6.55 meter and its rotation speed of 93.75 rpm. The passage of fish through these type of turbines obtain a survival of aproximately 75% (depending on the fish size and the specie) by which, now a days, there is still a migration water down, specially of adult eels.

The situation of this press is at about 68 Km from the flow into the river Miño in the Atlantic Ocean and constitutes the first transverse obstacle for the movement of the migratory fish. Until the construction of the goup, it was only crossed by a limited number of eels that were crossed by a small scale of poor efficiency. The rest of the migratory species (atlantic salmon, sea trout or reo, lamprey, alosa and sábalos) saw their reproductive migration water up stopped, being out of their reach the traditional spawn zones.

In the locking of the press the area basin slope is of 15.178 Km²; water up this dam exists another two resources that stops the fish access to headwaters, although the crossing of the Frieira dam gives them two subasins, The Avia river (37 Kms of main course, with an area basin of 643 Km²) and The Arnoia river (58 Kms of main course and 923 Km² of basin) as well as other three of less entity (Deva, Cierves y Brull) but used long ago by the mentioned migrators.

With the execution of this project it is being trying to correct the environment impact produced by the explotation of the Frieira installations, reinstituting the free circulation of the migratory fish water up the storage dam; In this way, it has been recuperated for these populations courses of the basin that were used for the reproduction and breeding before the dam construction.



TECHNICAL DESCRIPTION OF THE PROJECT

The freeing device consists of three well differentiated parts: the scale of troughs in the lower part, the elevation system and a restoration fish channel in the upper part.

SCALE OF TROUGHS

This scale is presented in the photograph attached, which was dimensioned to be effective independently of the water level under the dam. When the hydro station works well load with turbined course of 611 m³/s, the storage level of area free of the water delivery exist is in 44.48 m. This storage level lows down at 40.84 m when free only the 30 m³/s of the ecologic course. It is not desirable that this difference in storage level is saved totally by the elevation system, by the exaggerated depth that would need the well that shelters the elevation cage. That is why a small scale of troughs was built to save the unevenness.

The flow called to the scale is supplied from waters up the dam by means of a pipe of 900 mm of diameter and 350 m length. This pipe takes the water flow from the restoration channel itself at the height of 63 m above sea level and allows the transport by gravity of this flow until the recuperation camara of energy in the scale of troughs. This pipe ends in a jet valve and manual working, that allows to regulate the flow and to adapt it to the needs in function of the year period and the species in period of migration.

ELEVATION SYSTEM


The solution adopted consists of an aerobicable transport system, by means of a basket of aproximately 2000 litres of capacity, full of water where the fish fauna is transported from the capture trough situated in waters under the Frieira dam, until the restoration branch channel situated water up the dam.

The installations functioning is automatic from the load of the fish on the capture trough until the unloading in the restoration channel.

The elevation system functioning consists of making trips from the capture trough, with the fish in the transport basket, until the upper unloading trough, where the fish are placed, to go back again to the capture trough.

The installation fonctionning speed is adjustable so that in the process of transportation from one trough to another is of 0,5 m/s while in the process of loading and unloading the speed decreases down to 0.2 m/s.

The process of loading is made synchronizing the basket entrance movement in tne transport capture trough simultaneous opening of the basket lid and the capture rake. In this process the installation speed is 0.2 m/s to avoid possible disturbances in the water flowing in the capture trough. Once the basket is in the water and the



rake low, there is a period of waiting of 10 minutes so that the fish get into the basket.

After the process of loading the installation inverts the way of moving and starts to move towards the unloading trough. When this movement starts, the rake moves in order to stop new fish going into the capture zone.

The distance to save by the elevation system is 250 m, and the way is therefore done in about 8 minutes. The usage of a bikey system assures the basket stability during the transport without transverse or longitudinal inclinations.

When the installation reaches the restoration channel the fish unloading process this consists on tilting the basket 45° with the horizontal, at the same time opening the lid, which assures a fish total emptiness. During this process the installation speed is 0,2 m/s to avoid possible disturbance in the water running.

After the unloading process the installation changes the way and starts to move towards the capture trough. The trip back takes about 8 minutes.

RESTORATION CHANNEL

The restoration channel offers the fish that join in from the elevation system a route to the dam. The deposit is of rectangular section, the inner dimensions are 4,30 m x 2,9 m with 5 m high, the thickness of the boxes are 20 cm and the reinforced supports of 25 cms. The base extremes will be leaned on two beams of square section of 40 cm x 40 cm that will be the lintels of two porticos with the same distance with a crossbeam that joins the pillars'heads.

In the plans it can be observed with more details the deposit and the reinforced of the support wall. The channel is 1,25 m wide and 125 m long, part of the height 63 m above sea level and it goes up to a height of 69 m above sea level, being able to be operative if the dam works in that border. This channel goes completely closed at the top with tramex.

THE PROJECT BENEFITS

Due to the nature of this project, made to avoid the barrier effect in the Frieira dam, the benefits that will be obtained are basically environmental, although we cannot forget the economic benefits that will also bring. In general, it can be affirmed that with a small initial inversion and puntual in time in a mid-term period (10 years) notable benefits will be obtainable for the whole region, not only environmental, but also economical:

As the first benefit hoped. The number of members to go up the dam will increase enormously, because up to now it is only ready a scale of eels and a going up replacement in the dam.

As indicators species the salmon, reo, alosas, and lamprey are proposed because with this species is very feasible to make a recount by means of a future device of automatic counting.

The expected results are shown in the following table:

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
SALMÓN	150	150	300	450	1.000
REO	3.000	5.000	12.000	25.000	25.000
ALOSA	30.000- 40.000	100.000- 200.000	>250.000	>250.000	>250.000
LAMPREA	1.000	1.500	2.000	3.000	3.000

Another benefit will consist of the increase of biomass water up the dam, direct consequence of an increasing number of members going up the dam. It will be favoured other elements of the ecosystem that depend on a certain way in the fish, such as the otter and the heron.

On the other hand it will increase the relation between the area of potential spawn and the area of real spawn water up the dam. At present part of the spawn areas of the Arnoya, Deva and Avia rivers are not being used by the salmons, in this way using the available facts in the inventory of the environment department it can be verified the predicable increase in the potential spawn areas.

A part form the evident environmental benefits, it is hoped to obtain an increase on the economical activities related to fishing. This increase is easily verified by means of statistics on sales of fishing permits.

The dispatch of season licence and the number of hotel booking with the consequent increase of working posts in the affected area. The recuperation of the fluvial ecosystems affected by the Frieira dam will have effects on several economic sectors favourable in the area, favouring the development of the rural turism related with fishing and the recuperation of tradicional, old fisheries. These fisheries in many cases use small hydraulic infrastructures that are from ancient times, and that sometimes are included in the catalogues of our cultural and artistic heritage. It is obvious the importance of all these factors in the development of the area and in the recuperation of the environment.