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Recommended citation:
4 Europe
4.4 Western Europe
4.4.3 France
European Small Hydropower Association, Stream Map

Key facts
| Population | 65,630,692
| Area       | 643,801 km²
| Climate    | Three types of climates may be found; oceanic (west), continental (central, east) and Mediterranean (south), except in the mountainous southwest. ²
| Topography | Mostly flat plains or gently rolling hills in north and west; remainder is mountainous, especially Pyrenees in south and Alps in east ²
| Rain pattern | Annual precipitation ranges from 680 mm in the central and southern region to 1,000 mm around Paris / Bordeaux. In the northern coastal and the mountainous areas precipitation can reach more than 1,120 mm. ²

Electricity sector overview
Electricity generation in France is predominantly based on nuclear energy (figure 1). Renewable energies, especially wind and hydro, account for about 11 per cent of the electricity mix.

<table>
<thead>
<tr>
<th>PV</th>
<th>0.35%</th>
<th>Imported Electricity</th>
<th>1.27%</th>
<th>Wind</th>
<th>2.14%</th>
<th>Hydro</th>
<th>8.90%</th>
<th>Conventional Thermal</th>
<th>9.67%</th>
<th>Nuclear</th>
<th>77.67%</th>
</tr>
</thead>
</table>

Figure 1 Electricity generation in France
Source: Commissariat General au Développement Durable ³

Small hydropower sector overview and potential
In 2010, France had 1,935 small hydropower plants and a total installed capacity of 2,110 MW (6,920 GWh) (figure 2). By 2020, the aim is to have 2,355 small hydropower plants with a total installed capacity of 2,615 MW (8,730 GWh).

In 2012, Union Francaise de l’Électricité (UFE) in association with France Hydro Électricité carried out a map of residual sites for hydro development. A potential of 10.6 TWh was set up. However, the technical feasibility of each site was not analyzed and the option of improving existing hydro plants were not considered, nor energy losses due to the implementation of the EU Water Framework Directive.

Most of the hydro potential can be found in greenfield schemes. Around 500 sites from 300 kW to 50 MW could generate 9.5 TWh. Existing small weirs can be equipped generating 1.1 TWh and be an opportunity to enhance ecological continuity. The Alps, Massif Central and the Pyrenees are the main locations.

For small hydro, the total potential is estimated at about 527 new greenfield sites (1,214 MW and 4,368 GWh) and at equipping 734 of existing small weirs (303 MW and 1,068 GWh). To estimate the feasible potential, the following ratio was applied – cut one third for economic and technical constraints and another third for environmental constraints (revision of classification in course), i.e. 419 power plants, 525 MW and 1,812 GWh by 2020.

A commitment agreement for the development of sustainable hydropower in compliance with aquatic environments restoration was signed in June 2010 to promote hydropower if deemed suitable with environment specifications. A part of the engagement directly concerns the equipment of existing weirs. The methodology and the “suitable conditions” to build a power plant onto existing weirs need to be made more precise.

A guidebook Towards the Hydroelectric Plant of the 21st Century for the development of small hydropower plants with regard to the natural environment is available. It defines standards for the conception of a high environmental quality plant. This guide is recognized and disseminated by national administrations.

The French water administration, drafted an inventory of obstacles in rivers and aims to assess the degree to which those obstacles block the movement of species and sediment. A database was created in May 2012, including more than 60,000 obstacles such as dams, locks, weirs, mills no longer in operation. ⁴ A protocol called Informations sur la continuité écologique (ICE) has been also created to measure the capacity of obstruction of these obstacles. ⁴ This vast project, bringing together a large number of partners, will identify the installations causing the greatest problems.
and make it possible to set priorities for corrective action. It will be also a good tool to identify new potential sites for small hydropower.

Renewable energy policy
A regional plan for climate, air and energy (Schéma régional du climat de l’air et de l’énergie, SRCAE), was jointly developed by the State and the regional authorities. In particular, this plan defines, for 2020 and by geographical area, qualitative and quantitative regional targets for the valorization of potential territorial renewable energy, taking into account the national targets. In practice, this means identifying all sources for the production of renewable energies and of energy savings according to socio-economic and environmental criteria, and defining, in association with the local stakeholders (infra-regional authorities, companies, citizens), the level of regional contribution in achieving the targets set by France. These plans represent a strategic planning tool to guide the activities of local and regional authorities. SRCAE are in process. SRCAE, for hydropower potential, are based on producers’ data and compatibility with lists of no-go rivers and restoration of river continuity priorities.

Legislation on small hydropower
The maximum duration of permits is 75 years for big concessions. For relicensing, the duration is 20 years if there is no particular investment and around 30 to 40 years if there is much investment. France has a lot of perpetual old permits for former mills subject to new environmental prescriptions.

Residual flow regulation exists, i.e. 10 per cent of inter-annual average flow and for modules over 80 m³/s, 5 per cent of the module is admissible. While the minimum (10 or 5 per cent) is set by the law, the adapted minimum ecological flow is set case by case through the environmental assessment. The most used method is the micro-habitats method (EVHA), but there are other possible methods adapted when this one does not fit with the type of river. Since 1984, the reserved flow was around 10 per cent of the average annual flow. Since 2006, 10 per cent is the minimum, and local administrations often ask for more (12 to 17 per cent), without any justification on improvement or maintenance of good ecological status. In the extreme periods of low water level, the Préfet, head of the Department (French subdivision) can decide to lower temporarily the residual flow.  

A feed-in tariff (FIT) for installed capacity not exceeding 12 MW (art. 10 par. 2 Loi n°2000-108; art. 2 Décret n°2000-1196) has been established. H97 is a contract signed in 1997 for 15 years. This was renewed in October 2012 for another 15 years against a plan of investment. H97 FIT is between €55 and €65/MWh (about between 72 and 85 US$/MWh).

H07 is a 20-year contract for new small hydropower plants or for the plants which are renewed (investment of €1,172/kW (about US$1525 /kW). The H07 FIT is between €60 and €100/MWh (between US$78 and US$130/MWh). The tariff is not interesting for plants over 400 kW of installed capacity (threshold effect).

Barriers to small hydropower development
About 2,000 GWh will be lost by minimum flow rising in 2014 for existing plants and due to removals of a few dams. Through the Law about minimum flow, producers accepted a certain loss of production. The loss of production will be compensated by refurbishment (1,000 GWh) and modernization (1,000 GWh).

The French producers who cannot or do not wish to invest to benefit from a new FIT contract will have to sell their production on the market. This new situation worries the small producers who are not able to value their production on a market that does not take into account specificities of the small hydropower production (i.e. the green value and the decentralized production).

Conflict between river protection and hydro development is rising. The French Government is carrying out a pre-planning mechanism. On one side the Government classifies the rivers in order to determine absolute protected rivers for water bodies of very good status, migratory species or ‘biodiversity reservoirs’. At the regional level, areas with renewable potentials are designated.

References