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## France: Impact, compliance and control of legislation

This paper discusses how compliance and control of legislation concerning energy performance of buildings regulations is handled in France. It describes the legal mechanisms and measures that have been defined mainly since 2002 to improve the energy performance of new and existing buildings.

### 1 > Background

There has been a regulation framework for the energy performance of new and non-residential buildings in France for many years. This framework started in 1974, and went through 2 major revisions in 1982 and 1989, which lead in 2000 to a new regulation based on a calculation method that takes into account summer comfort. Parallel to the directive, many national initiatives (Air Law (1996), Climate act (2004), POPE law (2005), Grenelle law (2009)) established converging objectives with those of the directive. Therefore, the impact of the EPBD alone for the past 7 years is difficult to isolate.

To be more precise about the French energy performance regulation, the idea is to compare the energy performance of the building in project, with the performance of a theoretical building, called the reference building (notional building). This reference building has the same geometry as the project, but its thermal characteristics are set at the reference level of the regulation (envelope, systems). Once the calculation is done, to comply with the regulation, the energy consumption of the project must be lower than that of the reference. The idea is similar with summer comfort where temperatures reached during a hot period are compared. The project characteristics are therefore free, the obligation being the results achieved in consumption and summer comfort. Nonetheless, to prevent too inefficient designs or products, (for example, a minor insulation level balanced by high-performance systems), minimum requirements are established, on envelope elements and on systems, and have all to be met.

### 2 > Impact of the EPBD on the national requirements

#### Status

The implementation of the EPBD (but also national action plans) have lead to effective measures for energy efficiency.

For example for new buildings :

- > More stringent requirements on energy consumptions: -15% compared to RT 2000
- > Global minimum requirement on consumption for residential buildings expressed in kWh/m<sup>2</sup>/year
- > Feasibility studies on RES for buildings over 1000 m<sup>2</sup>
- > Energy Performance Certificate

And for existing buildings :

- > Energy Performance Certificate when a building or an apartment is rented or sold
- > A regulation for existing buildings, similar to new buildings for major renovations, and based minimum requirements otherwise
- > Feasibility studies on RES for buildings over 1000 m<sup>2</sup> in case of important energy renovation
- > Energy Performance Certificate for public buildings

These measures are accompanied by fiscal and financial schemes in order to get owners, especially for private housing, to build or renovate according these requirements (lower taxes, fiscal deductions, soft loans...).

### **What is the actual impact of the implementation of the EPBD in terms of energy efficiency?**

The strongest effect of EP regulation reinforcement is to encourage the development of more efficient designs and products. In some cases, it leads to the decline of some systems (e.g., direct electric heating), and the generalisation of others (e.g., humidity-controlled ventilation). For the first time with RT 2005, the regulation tries to influence the design (orientation, structural choices) through the climatic conception of the reference building, but it remains possible to compensate a poor design with good systems. Also, good air-tightness can be rewarded through a measurement or an approved quality management approach, otherwise a default value is used whatever the quality of the construction is. In sum, although the strengthening between the 2000 and 2005 regulations was calibrated to lead to 15% savings on energy consumption, complying 2005 regulation requires neither a technical nor a design breakdown compared to the previous regulation. Campaigns of controls still reveal non-compliances, and buildings built with no EP compulsory study, but depending on building types (single housing, collective, or non-residential), the compliance rate lies between 80% to 90% of the sample.

One first really significant step towards higher energy performance lies in the definition of the French low energy building certification "*BBC - Bâtiment Basse Consommation*" and local incentive programmes (e.g., PREBAT demonstration buildings) to support the first buildings aiming this level of performance. This label is strictly based on the French regulation, i.e., the calculation procedure is identical; it is promoted through the *Effinergie association* in accordance with the French Ministry for Energy. For residences, it requires that the calculated primary energy use (including heating, cooling, auxiliaries, domestic hot water, lighting) be smaller than 50 kWh-pe/m<sup>2</sup>/year. To reach this high performance, innovative systems are entering the market: solar collectors combined with a heat pump for heating and DHW, heat pumps for DHW, combined ventilation and heat pump systems coupled with ventilation with heat recovery...

The "*Grenelle de l'Environnement*" in 2008, really spread climate change and sustainable development concerns among a wide audience. Many projects now plan higher energy performance than the minimum required by regulation; many anticipate the 2012 EP regulation level which will correspond to the BBC-certification level. Energy efficiency improvements in all types of existing buildings has also become an important market for craftsmen, engineers and architects. This market will continue to grow as social housing estates and State properties have the objective to cut their consumption by 40% in 2020 and by 4 in 2050. In private existing houses, investments in heat pumps, solar collectors, wood-burning stoves or boilers, condensing boilers have also considerably increased thanks to various financial incentives.

### **What is the actual impact of the implementation of the EPBD in terms of indoor climate?**

Main points in EP regulations related to indoor climate are :

- > Consideration of summer comfort in new buildings, especially through indoor temperature for unconditioned buildings (calculated temperature with an hourly method)
- > Compliance of airflow rates with applicable regulations (minimum ventilation airflow rate) before calculation of the energy consumption

Those points were already quoted in the former regulation.

### **What regulations related to energy efficiency and indoor climate are there besides explicitly demanded by the EPBD (EP-label, inspection of systems and regulations related to renovation)?**

- > Air conditioning for comfort can be used and kept in operation only when the room temperature is over 26°C: the lower authorized set point, except for some uses that require lower temperatures, is 26°C
- > Provisions must be made in electric-heated (direct) buildings so that another energy source can be used
- > Regulation for renovations of small buildings (< 1000 m<sup>2</sup>), which is not required by the EPBD
- > Feasibility studies on RES for buildings over 1000 m<sup>2</sup> in case of important energy renovation, when EPBD only requires these studies for new buildings.

### **What are the already uptaken technical measures for better energy performance since the implementation of the EPBD?**

RT 2005 included a timetable for the reinforcement of some requirements, for example:

- > requirements on thermal bridges have been strengthened in 2008
- > oil or gas-fired boilers performance have been raised in 2008
- > air conditioning consumption, in buildings or rooms where air conditioning is not indispensable, has to be balanced by lowered consumptions for heating, lighting, water heating since 2008.

### **How has the implementation of the EPBD affected the building prices, the building market and the building products?**

A study was ordered by the administration to evaluate the cost overrun of a RT2005 compliant building compared to a RT2000 compliant one. Conclusions are the following: with good design, the increase of building price compared to a RT2000 compliant building is low. An average increase of 2% was expected, which has to be compared in euros with energy savings that should reach 15%. The cost increase will probably be the highest for buildings where a new technology will have to be used, but this increase should remain under 5%.

### **Are there any minimum ventilation requirements for certain building types and ventilation systems?**

As mentioned above, compliance of airflow rates with applicable regulations (minimum ventilation airflow rate) is required before calculation of the energy consumption. Moreover, there are additional minimum requirements for ventilation :

- > To prevent excessive air humidification
- > To use independent systems when emissions are very different between zones (non-residential buildings)
- > To reduce airflow rates to minimum ventilation airflow rate when unoccupied (non-residential buildings)
- > To time-control manual increase of airflow rates

- > To insulate ducts in unconditioned spaces
- > To prevent air pre-warming during non-heating seasons

In case of renovation, measures are required to ease the future use of a ventilation system (for example, to provide air intakes in main rooms windows, when no supply system is installed), and to prevent a decrease of indoor air quality and avoid damages.

**Are there additional regulations related to renewable energy, e.g. the obligation to use a renewable energy source and what types of renewable energy sources are taken into account?**

First note that the kernel of the calculation method is identical for new and existing buildings, and for feasibility studies on RES. RES taken into account in this kernel are : DHW solar collectors, photovoltaics, biomass boilers, heat pumps.

Innovative systems that have become more and more common since 2005 are now covered by calculations defined in accordance with the equivalence principle (called « *Titre V* » in France) (wood-burning stoves, underground heat exchanger, heat pumps for DHW, cogeneration, underground heat exchanger). The integration of these systems and others will naturally be integrated in the next version of the regulation.

Today, it is not required to use RES, but there are incentives (notional building based on solar collectors for DHW in residential buildings). The compulsory use of RES in 2012 is foreseen. Besides, energy performance quality labels encourage the use of RES.

**What is the policy on renewable energy (solar collectors, photovoltaic, heat pumps, waste heat from industry, biomass, heat recovery from ventilation or other sources ...) and which conversion factors are used to convert from delivered to primary energy?**

France commitments on RES are written down in several energy and climate change related laws. In 2005, POPE law raised the objective of 21% of electricity consumption coming from RES in the year 2010. The Grenelle Law in 2009 sets the objective of 23% of RES in the energy consumption (all energy count) in the year 2020. Other ambitious objectives concerning each renewable source are also written down in technical works preparing the law.

Conversion factors are 2.58 for electricity, 0.6 or 1 for wood, 1 for other sources of energy. Conversion factor for photovoltaic electricity is 2.58, as a convention in the calculation method of the EP regulation, so that the production of the building can be directly deducted from its consumption.

**What is the impact of the implementation EPBD on the independence and qualification requirements for energy experts for certification process?**

The directive requires independence and qualification of assessors and inspectors in art.10 « independent experts ». French regulation already establishes in Housing and Building Code independence criteria for real-estate diagnostics (asbestos, lead diagnostics...). They are identical for assessors and inspectors. They also must be qualified and they receive this qualification after training with a body approved by the state.

Regulation concerning boiler inspections and air conditioning systems aren't available yet : therefore no control is required.

### 3 > Compliance and control<sup>1</sup>

#### How is compliance of the EP requirements for buildings handled?

The building owner signs a commitment to comply with regulations with the building permit. Therefore, he is legally responsible for the compliance with the EP regulation. The authorities have the legal power to proceed with a control on his building. When controlled, the owner must be able to prove that his building complies with the regulation through supply of calculation notes and written proofs, often helped by his engineering team.

For existing buildings, in case of important renovation, the building owner is also responsible and signs commitment to comply with regulations with building permit (if the renovation requires a permit). In case of lighter energy performance renovation, the owner has to choose insulation products and systems that comply with minimum requirements; especially financial subsidies are only granted when these requirements are met (fiscal deductions, soft loans). If the owner is not a professional of the building field (e.g., a private individual for his house), craftsmen and architects have the duty to advise him to meet the regulations requirements.

Concerning compliance with EP regulation, for new buildings, controls are performed by state employees in CETE, appointed to record breach of the housing and building code. They are allowed to visit any building during three years after it is finished. Control campaigns are annual, and the sample of operations is extracted with representative criteria. Several regulations can be controlled, including EP regulation. Regarding control of EP regulation, the control is based on :

- > Analysis of plans, specifications, calculations
- > Visit on site to check insulation
- > Visit at commissioning

The objective of visits is to check if calculation hypothesis comply with products really used in the building. After visits, in case of differences, calculation has to be updated and performance justified by technical papers. The control doesn't consist in a new calculation, but in checking the validity of the hypotheses.

A national method to perform EP regulation controls and computer tools were released in 2008. It is operational and used by state controllers; it is available for private building inspectors.

One of the difficulties in this procedure is to evaluate the impact of mishandled products (insulation mostly) on the performance and to prove that it constitutes a non-compliance from the EP regulation point of view, since calculation methods consider the resistance of the product. It is also difficult to prove non-compliance on the consumption when it relies on calculation because the controller would have to be sure of each data, which requires expertise.

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<sup>1</sup> Compliance means the fulfilment of EP requirements and EP certification process while control is the mechanism for checking the validity of the design, assessment and certification process.

Another question, which is under study, is to improve the selection of the sample. Currently, selection relies on quantitative criteria (proportion in the building stock, proportion in the local area), but there are no quality criteria on the estimated performance or the results of previous controls on the same building team. Highly efficient buildings, with almost no risk of non-compliance, are controlled as well as just-compliant ones. However, the control strategy should be improved thanks to a first screening of the selected operations based on compulsory justifications (calculation standard synthesis and /or compliance certificate) that the owner has to produce. This screening will enlarge the number of operations going under control and help focusing control on the ones showing a higher risk of non-compliance. Some regions have already implemented this strategy (Bourgogne, Limousin...) but it still has to gain more experience.

The various calculation methods of energy consumption on which are based some non-regulatory labels such as Passiv-Haus or Minergie, sometimes confuse the owners who often regret to have to pay for two studies: the one required by regulation and the other one required for the label.

Concerning existing buildings, housing and building code also allows to perform controls but there is not yet any scheme to perform them like on new buildings.

#### **How is compliance of the EP certification process handled?**

About certificates, they must be provided when renting (residential) or selling (residential and others), and for every new building. When renting or selling, the certificate must be attached to contract. The owner or landlord has to pay for it and make it available to candidates for buying or renting. The qualification of assessors has to be certified by a certification organisation itself certified by an independent committee. Administration defines certification criteria, especially skills that must be proofed during the exam. The certification is valid 5 years.

Concerning EP certificates, the lawyer verifies its availability for sales. But in case of renting, there isn't always an independent authority to control that the document is really available. Many contracts are signed between two private individuals. Nonetheless, assessors are controlled by the organization that provided the certification during the 5 years, on a certain number of certificates whose validity is examined.

**Are there additional incentive policies related to the EPBD (e.g. financial schemes like subsidies, fiscal deduction, favourable interests, soft loans, third party financing, taxes ...)?**

There are a great number of incentive schemes for energy performance in buildings granted by the State or local authorities.

- > Tax deduction and soft loans, e.g. for solar collectors, heat pumps, low-energy label
- > Possibility to increase of 20% the ratio of land built subjected to energy performance requirements
- > Many local authorities and the national energy agency (ADEME) subsidy the installation of RES. Electricity produced with photovoltaic panels which are well integrated to the building is bought by French electricity company EDF at a very incentive financial level.
- > Many local authorities have launched innovative techniques application programmes or low energy building programmes with specific funding schemes, in general with national energy agency (ADEME)
- > Some urban or rural areas chosen by local authorities to receive energy renovation: the idea is to trigger renovations by the owners through different incentive measures like professional support, study and work funding...

The administration subsidises or encourages building techniques based uniquely on criteria stated in official documents derived from laws. The performance of products and materials must be proofed with French “*Avis technique*” notes or European Technical Approvals. Techniques and energy sources are developed by companies or unions that must make sure that performance are sufficient and justified to comply with regulations.

**How is the certification market organised in practice:**

- ✓ **the role of specialised consultancy firms is important?**
- ✓ **the large size of projects results in a better compliance?**
- ✓ **the requirements by insurance companies result in more attention for energy regulations (e.g. by imposing the use of certified products only)?**
  - > The role of specialized consultancy firms is important because to prove the compliance with the EP regulation, for new or existing buildings, a calculation is almost systematically necessary
  - > Requirements set by insurance companies have little to do with energy performance since guarantees regard more structure safety and solidity, and proper use of the building. Nonetheless, insurance in case of innovative products is granted only if an independent technical note on the product is available.
  - > In France, EP quality labels are defined by the regulation for projects with better performance than the regulation minimum requirements. But to deserve this label, the building has to be energy efficient, but also respect conditions about safety and quality of energy performance systems, and other criteria of construction global quality. These EP quality labels are given by certification organizations as an option of standard quality labels (an EP label can not be given without a standard label).

**What happens in practice if during the construction or after the completion of a building the proper authorities find out that the building doesn't comply with the EP requirements?**

Non-compliance with construction regulation is an offence with financial penalties up to 45000 € against the building owner. Controllers have the duty to write down a report when they record a breach, and they must send it to the attorney general to require that the owner undertake remedial actions to comply with regulation. To start, the procedure is out of court with the owner who has to justify the corrective actions for a given due-date. If there is no action or non-satisfactory ones during the given period, the attorney general starts the justice procedure and decides of the prosecutions: new due-date, contractor designated to proceed with remedial actions on the owner's debt, or if it is too late for corrective measures, he sets the financial sanction. The attorney general has the power to require the building demolition. In general, problems are solved during the informal procedure.

**Do the proper authorities have enough expertise to check in practice (so not only the paper calculation, but also at the construction side) if buildings and certificates comply with the regulations and standards?**

As the EP regulation gets more complex, and the turnover of state agents is high, the administration has settled a qualification procedure of controllers before they receive their assignment by the ministry to proceed to the controls. This procedure is precisely written down in a reference document that mentions trainings (technical, legal) to follow, library and tools necessary (legal texts, control manuals, report models...) and the number of training controls to do with a senior controller. A controller qualifies as a senior when he has three years long experience

Concerning visits, there is at least the commissioning visit and sometimes a site visit. A computer tool helps controller to prepare the visit and to point out which hypotheses should be checked in priority. The main difficulty is the control of systems in non-residential buildings and the development of non-traditional techniques always more numerous, especially regarding RES. About envelope control, detecting defects in the layout of insulation products requires a certain experience.

Nonetheless, the role of the controller is to check out products on the building and compare with the hypothesis of the calculation. Moreover, after visits, the controller also relies on technical papers to find out main characteristics. And controllers also form a network and can share difficulties.

Concerning certificates, assessors must be certified by a certification organization itself certified by an independent committee. The certification is valid 5 years. During this period, the assessor must provide the certification organization a certain number of certificates to be examined (this examination is defined by the certification organization, counter visit is not compulsory).

**How is compliance and control of the experts regarding the independence and qualification organised in your country?**

State employees are subjected to rules, and in particular to independence and objectivity. Controllers have to take a pledge in court et their personal responsibility can be charged. Hierarchy also has a role to make sure that controls are done properly.

Concerning qualification, it mainly consists in the first qualification

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training. There is no exam to pass (neither theoretical nor practical) at the end of the qualification process to assume if the agent is ready to perform controls. The senior controller does not decide whether the junior controller is ready or not. But the hierarchy can judge the aptitude regarding the first works during the training. Once qualified, there is no specified scheme to follow independence and qualification. For instance, no counter control is performed. But specific quality control procedures (e.g., under ISO 9001) may be defined.

For assessors, certification relies on theoretical and practical examination, which has to be renewed every 5 years. Controls are performed by the organization that has issued the certification of the inspector on a sample, and the certification organization defines rules to suspend certification when necessary. Nonetheless, obligation of independence towards the owner or buyer, or any contractor or architect that is involved in the works, is clearly specified by the regulation. The violation of obligations of qualification, certification and insurance for issuing certificates is punished by a 1500 € fine for the assessor as well as the owner who uses an unqualified person. However, no control of the obligations stated in this paragraph are not controlled with a national scheme yet.

#### 4 > References

1. <http://www.rt-batiment.fr/>, French administration website on energy performance regulations, in French.
2. <http://www.ademe.fr/>, "Agence de l'Environnement et de la Maîtrise de l'Energie", national energy agency website, information on subsidies and low energy buildings programme.
3. <http://www.effinergie.org/>, "Effinergie" association website promoting the French "BBC-Bâtiments Basse Consommation" certification for low energy buildings.

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