



Feed-In Tariffs: Making CHP and DHC Viable - Portugal Case Study

Feed-in tariffs (FITs) are an energy output-based mechanism designed to:

- Provide direct operational support for CHP / DHC plants.
- Encourage investment, and so accelerate commercialisation, in emerging CHP / DHC technologies.
- Improve the competitive position of CHP / DHC in the market.

FITs usually take the form of a bonus added to the market electricity price paid to CHP / DHC plant operators for each kWh of electricity they generate or export to the grid. The bonus can be fixed, be defined as a share of the electricity price, or be indexed against fuel prices. FITs can also be fixed independently from the electricity price.

The costs of FITs, which can be borne by government or passed through to end consumers, will depend on several variables, including time periods for support and the tariff level. They can also be phased out when no longer required. However, it is not always easy to know what the overall cost of the programme will be if the number of projects that will benefit from it is uncertain.

A. Overall Goals of the Policy:

To provide greater certainty for investors in CHP / DHC

FITs can provide a secure, predictable cashflow for CHP / DHC plants over a known time period. This helps investors by reducing risk and improving returns, and is a means for policymakers to promote energy efficiency and achieve cost-effective GHG emission savings.

To increase the operational efficiencies of new and existing CHP plants

Feed-in tariffs can be designed to incentivise highly efficiency CHP / DHC plants, for example by ensuring they reach a minimum efficiency threshold to qualify for support. High efficiencies can further be encouraged by linking the level of bonus to the efficiency.

B. Departmental Responsibilities:

Lead policy maker: Energy and/or Environment Departments

Supporting agencies: Market regulator

C. Benefits for CHP:

Increasing economic performance

The commercial viability of CHP / DHC plants is improved by increasing the value of the most economically valuable output of CHP / DHC plants – electricity.

D. Status and Implementation:

FITs have been widely used, primarily to incentivise investment in renewable energy projects, but also for CHP / DHC. They have been particularly popular with policymakers in continental Europe; the EU-funded European

Local Energy Production (ELEP) project provides a good overview of the use of FITs for distributed generation and renewables.

Effectiveness

Evidence suggests that interest and investment in CHP has increased in countries that have adopted FITs, most notably in Germany (biogas CHP) and Portugal. FITs have also been highly effective in supporting renewable energy. Germany saw its installed capacity of wind power more than double year-on-year since the Electricity Feed-in Law (EEG) was passed. However, due to their success, they can be expensive to implement, either requiring significant government budget, or raising electricity prices.

Key success factors

- The tariff must be set sufficiently high to allow for an attractive return on investment. This should also involve linking the tariff to the price of fuel to avoid, as far as possible, fuel-price risk.
- The feed-in contract should be of sufficient length to provide investor confidence. The typical term of these arrangements is 10 to 20 years.
- The remuneration should as far as possible reflect the environmental, social and network benefits that CHP / DHC provides.

Best-practice examples

- Portugal: The Portuguese Cogeneration Law has provided an innovative FIT that has sparked much interest in CHP and played a part in stimulating steady growth in the market. In 2003, distributed generation, of which cogeneration represents approximately 80%, accounted for about 12% of electricity production. A detailed case study follows.
- Germany: Biogas CHP receives an extremely favourable FIT through the Erneuerbare-Energien-Gesetz (EEG) (2002), adding up to €19.5 per kWh to the electricity price. This policy has boosted biogas capacity in Germany from less than 200 MWe in 2000 to 650 MWe in 2006.
- Maharashtra, India: 2003 saw the introduction of an attractive FIT policy for bagasse fuelled cogeneration.

Policy Case Study – Portugal

A. Policy Information

Policy name: The Portuguese Cogeneration Law¹ (implemented as part of the European Cogeneration Directive)

Policy type: Feed-in Tariff

Jurisdiction: National Government

Government bodies: Portuguese Directorate General for Geology and Energy (DGGE)

B. Brief Description

Scope

The Portuguese Cogeneration Law creates a mechanism for determining the monthly remuneration CHP plants receive for the electricity they export to the network. This is based on the principle of avoided costs, which compares the system costs of CHP to those of conventional generation through a centralised gas-fired CCGT power plant.

¹ For further details, see http://www.diramb.gov.pt/data/basedoc/TXT_LN_24309_1_0001.htm. Contact: Cogen Portugal at cogen.portugal@cogenportugal.com

FIGURE 1
THE BASIS OF THE PORTUGAL FIT: AVOIDED COSTS IN THE ELECTRICAL SYSTEM

$$RV_m = [FT + VT + ET] \times f_{\text{losses}}$$

| | | | | |
|----------------------------------|---------------|------------------|-----------------------|--------------------------------------------------------------------|
| Monthly Remuneration Value | Fixed Term | Variable Term | Environmental Term | Correction factor corresponding to grid network losses |
|----------------------------------|---------------|------------------|-----------------------|--------------------------------------------------------------------|

SOURCE: COGEN PORTUGAL

The avoided costs included in the calculation are:

- Avoided capital investment
- Avoided electricity production costs (fuel, O&M)
- Avoided costs of network losses (investment, O&M, losses)
- Avoided environmental costs (CO₂)

The formula rewards CHP plants principally for efficient operation through the environmental costs term and for avoided network costs.

The tariffs are paid monthly, and apply for a period of 10 years. It is indexed against the price of fuel (oil or gas), to reduce fuel-price risks.

CHP plants are allowed to export up to 100% of electricity produced to the network.

Eligibility criteria

CHP plants must achieve a minimum Electrical Equivalent Efficiency (EEE), taking into account both the heat and electrical efficiency, to qualify for support through the Cogeneration Law (Table 1).

TABLE 1
ELECTRICAL EQUIVALENT EFFICIENCY REQUIREMENT CRITERIA FOR DIFFERENT FUELS

| Fuel Used for Generation | EEE Threshold Required |
|---------------------------------------------------|------------------------|
| Natural gas, LPG, liquid fuels excluding fuel oil | ≥ 55% |
| Heavy fuel oil | ≥ 50% |
| Biomass | ≥ 45% |

Beneficiaries

All new and existing CHP plants meeting the efficiency criteria can receive payment for exported electricity through the Cogeneration Law.

Policy duration:

The policy was introduced in 2001 and will expire when new legislation is introduced to alter/replace it.

C. Policy Context

Reason for adoption of the policy

The Portuguese government decided to support CHP plants through the Cogeneration Law because it was faced with tight emission commitments for the Kyoto Protocol (maximum growth of 27% over 1990 levels by 2008-2012), and projections of strong energy demand growth (14% increase predicted between 2002 and 2010).

The government recognised that CHP is the most efficient way of generating electricity and heat, and therefore aimed to significantly increase its share in the electricity system.

Policy objectives

- To attract new CHP investment by ensuring attractive plant profitability.
- To achieve higher performance efficiencies of cogeneration schemes.

Related Targets:

The Portuguese Government aims to achieve a total of 2,000 MW of installed CHP capacity by 2010. Current capacity stands at approximately 1,200 MW.

D. Effectiveness

Impact of the policy

Since the introduction of the policy in 2001, the share of decentralised generation (of which cogeneration accounts for over 80%) has increased steadily, despite the limited availability of natural gas.

Natural gas only became available in Portugal in 1997, and the network is still being developed. CHP plants therefore often have to pay both for the gas infrastructure and for connection to the electricity network. The policy has also been criticised for ignoring potential additional network costs, and the delay in adjusting the tariff to fuel price changes. These issues are currently being reviewed.

Key success factors

- The FIT scheme rewards CHP for its environmental and avoided network costs.
- The FIT scheme incentivises improved CHP efficiencies by setting a minimum required EEE and rewarding higher efficiencies with increased remuneration.
- All electricity generated by eligible CHP plants can be sold to the grid.

E. Lessons & Replication

Key lessons

- The tariff should be made sufficiently flexible to accommodate potential barriers such as a high gas prices.
- FIT schemes should reward increases in efficiency by equivalent increases in tariff.

Potential for replication

This policy can be applied widely.

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For More Information about the IEA's International CHP/DHC Collaborative:

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The International CHP/DHC Collaborative

The International Energy Agency launched the International CHP/DHC Collaborative in March 2007 to help evaluate global lessons learned and guide G8 policy makers, industry and other nations as they attempt to assess the potential of CHP and district energy as an energy technology solution.

The Collaborative includes the following activities:

- collecting global data on CHP/DHC
- assessing growth potentials for key markets
- developing country scorecards with data and relevant policies
- documenting best practice policies for CHP and DHC
- convening an international CHP/DHC network, to share experiences and ideas

Participants in the Collaborative include government and industry Partners, as well as over 300 government, industry and non-governmental organizations that provide expertise and support via the Network.

If you are interested in participating in the Collaborative or want more information, please visit www.iea.org/G8/CHP/chp.asp.