THE CURRENT STATE AND FUTURE PROSPECTS OF THE GERMAN HEAT PUMP MARKET

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Abstract: This paper highlights current heat pump market volumes and market conditions in Germany.
The paper provides background information about the German climate package which promotes a reduction in CO2 emissions and creates advantageous market conditions. It also outlines the Renewable Energies Heat Act (EEWärmeG), part of the climate package, and its stated objective to reach a target of 14 percent of heat produced by renewable energies by 2020. The development of primary energy consumption standards for buildings and information specific to the age of extant German heating installations is also discussed. Moreover, the development of different heating technologies in Germany - with a growing market for heat pumps in recent years - and the share of different heat pumps in Germany are also highlighted. The presentation also illustrates the main distribution channels in Germany and provides a market outlook of heat pump development in Germany in the future. The paper, specifically targeted at foreign companies seeking to enter Germany's/Europe's heat pump sector, outlines important-to-know location factors and business opportunities in Germany.

Key Words: climate package, heat pump market, incentives

This paper aims to reach foreign companies seeking to enter Germany's heat pump sector and outlines the German heating market, important location factors and business opportunities. It also seeks to provide helpful suggestions on establishing a business in Germany.

1 THE EU ENERGY AND CLIMATE GOALS

At the start of 2007, the European Union (EU) increased its ambitious energy and climate change targets. Support for this approach grew within the member states and concrete proposals, including how efforts could be shared among member states to achieve the new targets, were endorsed. This integrated approach aims to combat climate change and to increase the EU's energy security while strengthening its competitiveness. The targets, better known as the "20-20-20" targets are a package of demanding climate and energy targets to be met by 2020. The first target aims at the reduction of greenhouse gas emissions by a minimum of 20 percent compared to 1990 levels. Furthermore, the energy consumption must be covered by 20 percent obtained from renewable energy sources. Additional to the higher share of renewable energies used, primary energy consumption is to be reduced by 20 percent. These measures should be achieved by improving the energy efficiency in all sectors.EU leaders are even willing to reduce their total emissions by 30 percent if all other countries worldwide similarly reduce their emissions by a fair share within the framework of a global climate agreement. The "20-20-20" targets from 2007 were integrated into the "climate and energy package" and became law in the middle of 2009. This "climate and energy

package" will help Europe to become a highly energy-efficient, low carbon economy (European Commission 2010).

2 THE GERMAN ENERGY CONCEPT

The German Federal Government has formulated guidelines for an environmentally friendly, safe and economical energy supply for Germany. This new package of rules and principles, known as the "German government's Energy Concept", is made to support the development of an overall strategy until 2050. It was announced in 2009. The long-term orientation of the concept shows the ambition and the strong will of the German government to follow a detailed road map into the future. Strategy development and continuous monitoring at an early stage helps to identify and correct undesirable progress. The legal base of the "Energy Concept" was set out in the German "Integrated Climate and Energy Programme" in 2007, which itself is based on the European "climate and energy package". It consists of 14 acts and ordinances including, for example, the "Renewable Energy Sources Act" (EEG) and the "Renewable Energies Heat Act" (EEWärmeG). The new "Energy Concept" is therefore an addition with new standards and targets (BMWi and BMU 2010).
The core of the "Energy Concept" comprises nine different fields of activity. One of the main objectives is the expansion of power generation by offshore wind power. At the same time, the German and European power grids should be correspondingly expanded to manage the emergence of electricity from diverse sources. To support the future power grids, energy storage technologies will be established and operating power plants equipped with CCS systems will be supported. Moreover, the strategy also includes a transparent and modern energy certification system and extensive energy saving regulations. Additional to the expansion of the renewable energy infrastructure, nuclear power plant operations will be extended as a bridging technology. The last major objective is to support the introduction of biofuels and electrical vehicles in the transport sector (BMU 2010).
Table 1 shows the stated goals in concrete figures. Compared with the European Commission's "20-20-20" targets, the goals of the German government are significantly higher. For example, the aim concerning CO_2 reduction is targeted at 40 percent by 2020 and 80 percent by 2050. This is double the value required by the EU.

Table 1: Main Objectives of the "German Energy Concept"

Climate protection measures	2020	2050
CO_2 cuts vs. 1990	-40%	-80%
Renewable share of…	**2020**	**2020**
Total energy consumption	18%	60%
Electricity consumption	35%	80%
Heat generation	14%	60%
Energy efficiency measures		
Increase of energy productiveness	2.1% p.a.	
Reduction of energy consumption	-50% (2050 vs. 2008)	
Reduction of electricity consumption	-25% (2050 vs. 2008)	
Renovation rate	2% p.a.	
Reduction of energy for transportation	-40% (2050 vs. 2005)	

The German government has put together a package of acts and ordinances to achieve these ambitious aims. One such piece of regulation is the "Renewable Energies Heat Act" (EEWärmeG). The use of heating systems in new buildings based on renewable energies including heat pumps is obligated and laid down in this act. In order to increase energy efficiency in buildings, energy standards were reduced to 50 kWh/m²/a in 2009. It is planned

to tighten these efficiency standards by a further 30 percent by 2012. This is defined by the Energy Saving Ordinance (EnEV). Complementary to these acts and ordinances, several incentive programs promote efficient and renewable heating and cooling technologies. The "Market Incentive Programme" offers the possibility to apply for investment grants or long-term low-interest loans which include a redemption grant. Table 2 provides an overview of the program. Available funding in 2011 for the program will be EUR 352 million. The financial volume will be incrementally decreased to a sum of EUR 340 million by 2014 (BAFA 2011). The availability of financial incentives that encourage the use of renewable energies for the heating of new and existing residential and non-residential buildings has increased over the past years. These incentives are offered at national and local levels.

Table 2: The German "Market Incentive Program"

	Action	Heat Capacity	Support [1]	Combined Bonus [4]
Heat Pumps	Air/Water-heat pump (electrically driven) APF[2] ≥ 3.5	≤ 20 kW	900 €	€ 600
		> 20 kW	1200 €	
	Air/Water-heat pump (gas-driven) APF ≥ 1.3	≤ 10 kW	2400 €	
	Water/Water- or Brine/Water-heat pumps APF ≥ 3.8	> 10 ≤ 20 kW	2400 € + 120 € per kW [3]	
		> 20 kW ≤ 100 kW	2400 € + 100 € per kW [3], min. 1200 €	

1) For heat pumps in building stock
2) Annual Performance Factor
3) Per additional kW above 10 kW
4) Until 30.12.2011, from 31.12.2011: 500 €

2.1 The German Heating Market

Buildings account for 40 percent of German energy consumption: in private households this figure is as high as 86 percent of total energy consumption. Rising oil and gas prices are particularly noticeable in heating costs. The only alternative is energy efficiency measures and heat produced from renewable energy sources.
Almost 18 million heat generators were installed in 2008. Gas-fired boilers accounted for the major share of these (just over eight million). In the same year, six million oil-fired heating systems were also installed. Today, the majority of heating units are still fossil fuel based. However, the German heating market is particularly dynamic, and the share of heat pumps, biomass boilers, and solar thermal installations is growing.
At present, more than 450,000 heat pumps, 125,000 wood pellet heating systems and 1.35 million solar heating systems are fitted in German households. Furthermore, the German Heating Market generates annual turnover of EUR 11.6 billion, providing employment to a 60,000 strong workforce. Research and development expenditure in this industry segment reached EUR 336 million in 2009. These figures refer to the heating industry only, and do not include installers and planners.
In order to take a closer look at the potential of the German heating market, it is advisable to analyse the average age of heat generators in German houses. Approximately 18 percent of the installed heating systems are older than 24 years of age and have an energy conversion efficiency level below 65 percent. The lion's share (70 percent) of heat generators have a mean age of 10 to 24 years. In comparison to older installations, the efficiency rate rises to around 85 percent. Of the 18 million heating generators in Germany, only 12 percent could be considered to be state-of-the-art. It is expected that around 50 percent of the total building stock will be retrofitted within the next 20 years (BDH 2009). Taking this development into account, significant investment potential can be expected in the decades ahead. Today, more and more heating systems based on renewable energies, for example heat pumps, are installed in new buildings. In 2008, some 26,631 heat pumps were fitted in new buildings in Germany. This amount is only bettered by the number of natural gas-fired heating systems.

In the same period, over 82,000 gas units were installed. Of these, a large share (almost 17,000 units) was equipped with district heating (BDEW 2009).

2.2 The German Heat Pump Market

Germany is the second largest producer of heat pumps in the EU. More than 80,000 heat pumps are produced annually in Germany. 51,000 heat pumps were sold in 2010 (Figure 1), contributing to a total of 450,000 heat pumps installed in Germany by the end of 2010. The market share for heat pumps within the total heat generator market in Germany has increased constantly - from just over one percent to more than 10 percent in the last decade. After the record sales figures of 2008, the market stabilized at a high level in 2009 and 2010, the shortfall being mainly caused by the effects of the global economic crisis.

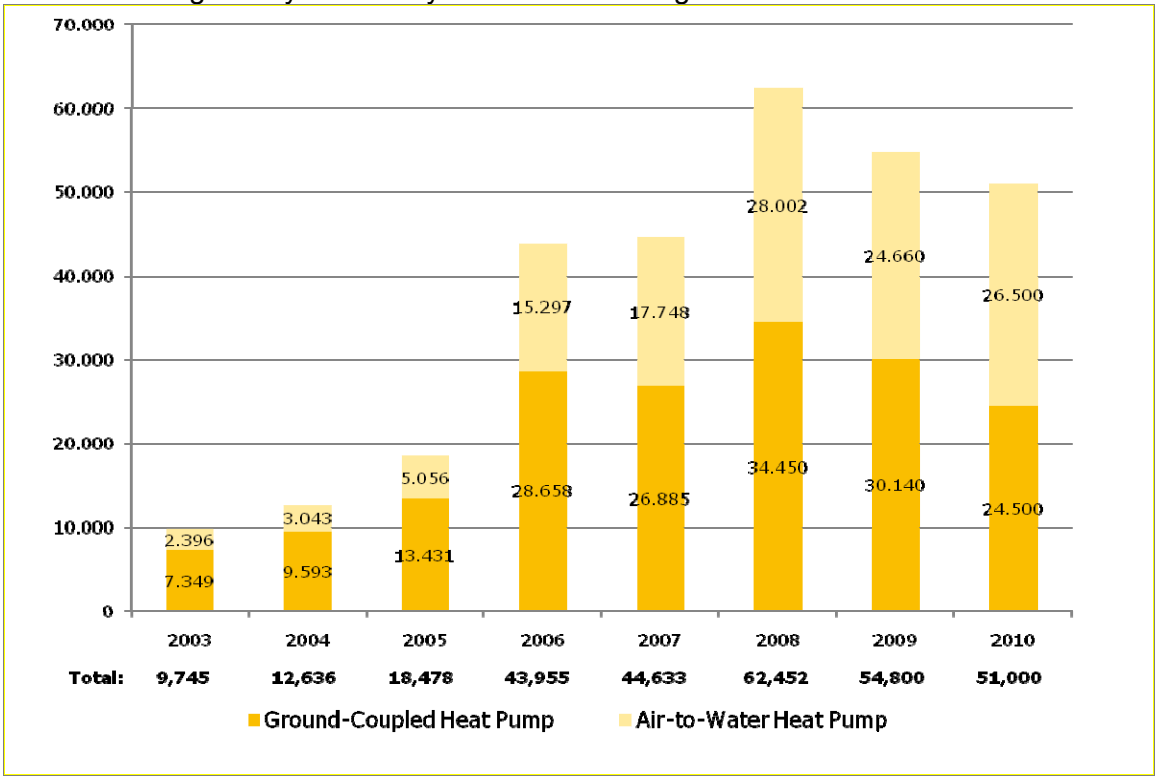


Figure 1: Sales Figures of Heat Pumps in Germany 2003-2010

Like the German market, the European market for heat pumps grew rapidly until 2008. With a total sales volume of 584,649 installations in 2008, the market grew by 50 percent compared to the previous year, with total revenue of USD 4.35 billion. Significant demand for energy efficient heat generators in Germany is driven by strong awareness levels of rising oil prices. State-of-the-art heat pumps provide an attractive alternative to oil and gas boilers. German energy suppliers actively promote commercialization and offer special heat pump rates/tariffs while different industry associations and manufacturer alliances actively support the heat pump market.

The German energy supplier RWE, for instance, provides an incentives program for the installation of new heat pumps in combination with a supply contract of electricity. The German heat pump market is dominated by electrically driven heat pumps. To promote gas-driven heat pumps, the initiative for gas-driven heat pumps (IGWP) was founded by heat pump manufacturers and energy suppliers. Due to the fact that most of the energy suppliers in Germany sell both gas and electricity, there is no real competition between gas and electricity as is the case in other countries.

More than 50,000 installers - with 271,000 employees in total - are active in the HVAC sector in Germany. The main distribution channel in Germany is organized according to a two-level

system. The first level is the step which takes the product from the manufacturer to the wholesaler. In the second level, the product moves from the wholesaler to the contractor. The final step in the process is the installation at the end-user location.

2.3 Outlook and Future Development

The German heat pump market is expected to reach 121,300 installations by 2015 with revenues expected to rise to USD 1.43 billion – equivalent to a growth rate of 12.2 percent (Frost & Sullivan 2009). Another projection forecasts around 940,000 installed heat pumps by 2015 and 1.8 million by 2020 (GZB 2010). The European heat pump market for the period up to 2015 is estimated at USD 7.67 billion (EHPA 2010). Air source heat pumps in particular will increase their share in the upcoming years. The market share for air source technology is expected to be 60 percent of the overall heat pump market by 2030.
The share of heat pumps in newly built houses is relatively high at 19 percent (BDH 2008). This said, the fact that the market for new houses is shrinking (Figure 2) means that the main market for heat generators in Germany is the retrofit market. Approximately 88 percent of the almost 18 million installed heating systems are more than 10 years old and must be replaced within the next years.

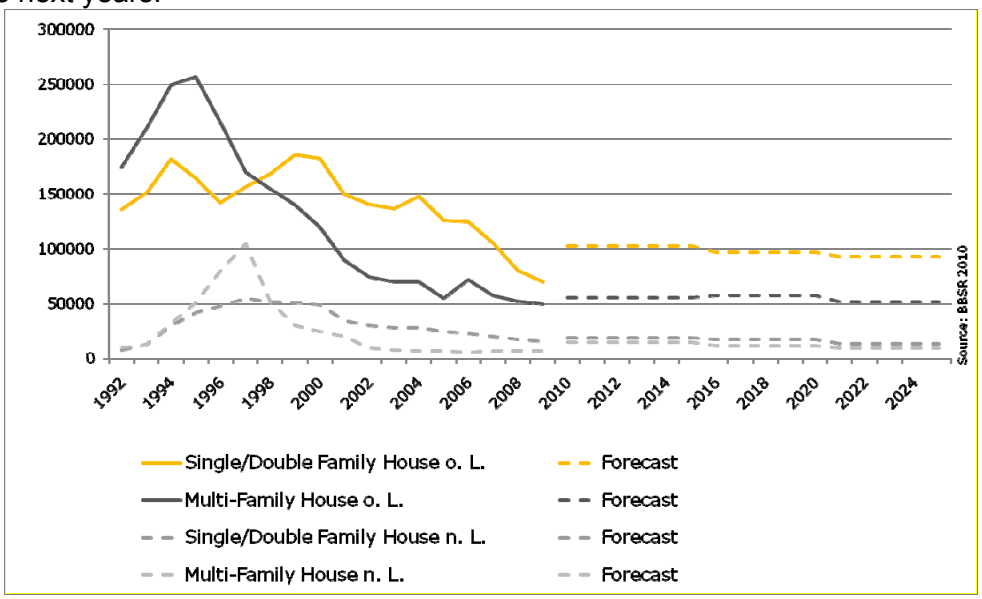


Figure 2: The German New Building Market

Heat pumps are mainly installed for heating purposes in Germany. However, the general expectations for living comfort and the number of internal heat sources including lighting and computers are growing. These factors, allied to developments in modern architecture and construction (e.g. large glass facades) increase demand for cooling and accordingly generate a growing market in both Germany and Europe. To date it has mainly been offices, warehouses and industrial buildings that have been cooled, but it is widely expected that more and more private households will be fitted with cooling systems in the future. In central Europe, the amount of cooling hours in private buildings reaches from 50 to 200 hours annually (Renewable Energies Agency 2011).
The share of renewable energies within the German energy mix is steadily growing. This is good news for the promotion of heat pumps, as heat pump CO2 emissions will be reduced. Grid stabilization remains a challenge due to the fluctuating power levels in photovoltaic and wind power installations. One possible solution to solve this problem could be to integrate heat pumps into a so-called “smart grid”. This concept is currently being tested in a number of demonstration projects.

2.4 Germany's Business Environment

Germany is located in central Europe and since the eastward expansion of the EU it brings north and south, east and west closer together than ever before. With state-of-the-art transportation networks by road, rail, sea, and inland waterways; as well as a dense network of both national and international airports, Germany provides easy access to domestic and international markets (Figure 3). Germany is a global logistics hub. Its share of the European logistics market – around 28 percent – makes it a major player in the economic development of Europe. More goods pass through Germany than through any other country in Europe.



Figure 3: EU's New Geographic Centre is in Germany: Providing rapid & easy access to all European markets

Germany offers a comprehensive raft of different incentives to all investors – regardless of whether they are from Germany or not. Funds are provided by the German government, the individual federal states, and the EU. The numerous incentives programs available can be grouped into two overall packages (Figure 4): the investment incentives package which

includes different measures to reimburse investment costs; and the operational incentives package to subsidize costs once the location-based investment has been realized.

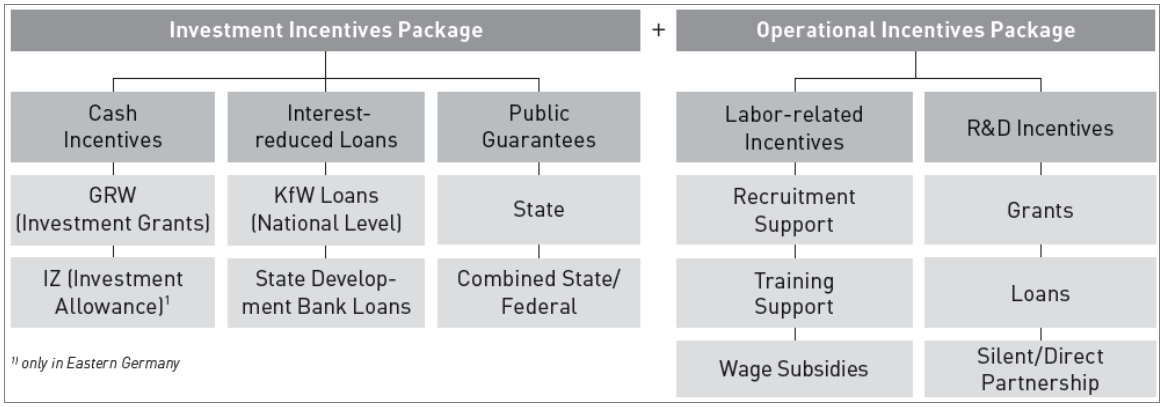
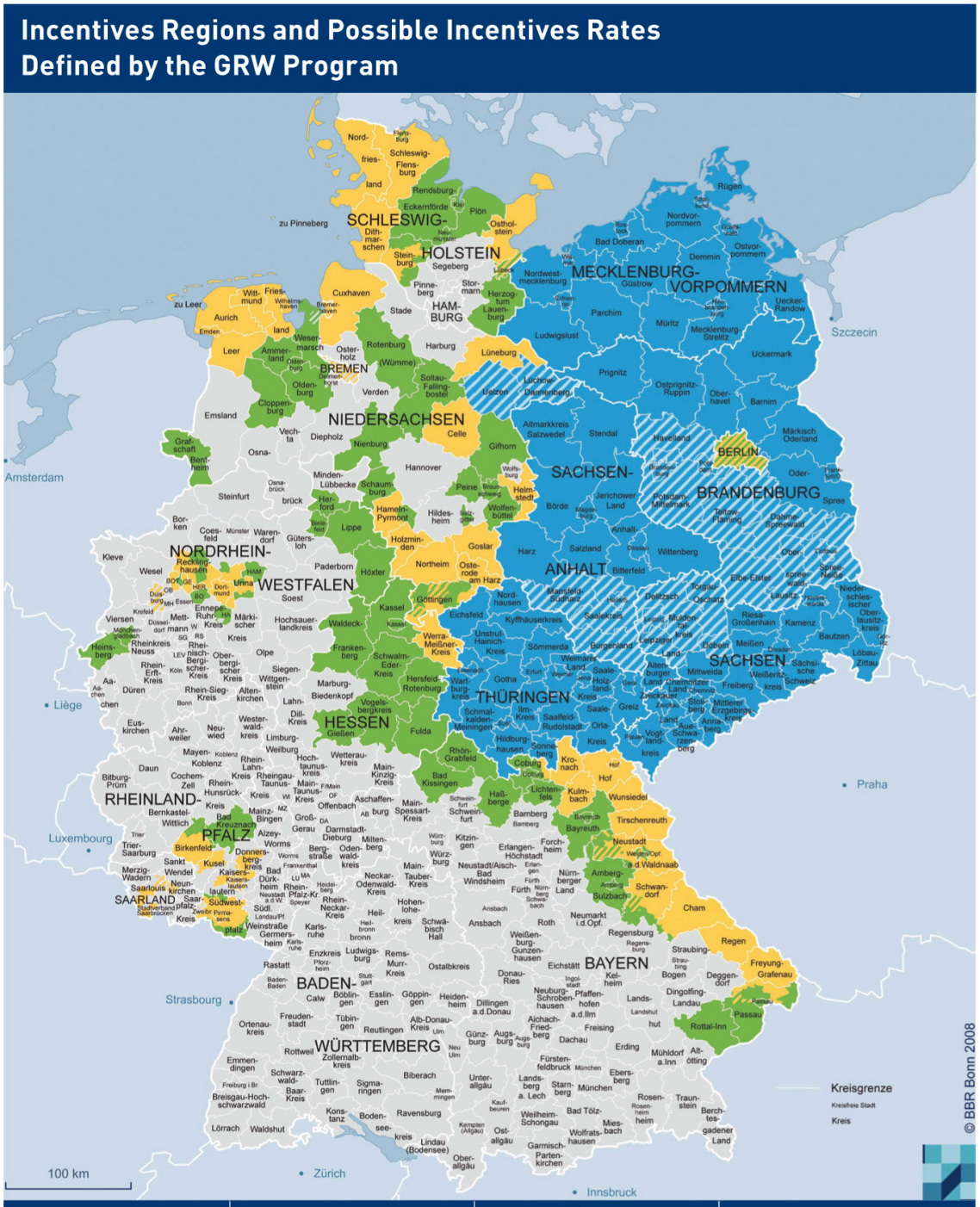


Figure 4: Germany's Different Incentives Packages and Respective Programs

Different criteria are used to determine whether a project is supported and the amount of support it receives. One criterion is company size, with small and medium-sized enterprises receiving the largest levels of support. Other key parameters include the industry targeted, the type and amount of investment and the investment location. The investor's country of origin makes no difference.

Investors planning to build production plants or service centres in Germany are eligible for direct cash grants that need not to be repaid. Particularly in Eastern Germany, the government provides grants of up to 50 percent of eligible investment costs, depending on the company's size, the investment volume and the investment location. Grants of up to 35 percent of eligible expenditures are awarded in selected regions in Germany's western states as well as in Berlin (Figure 5). Interest-reduced loans as well as public guarantees may be an alternative or an additional source of funding for investment projects.



	Regions	Small Enterprises	Medium-Sized Enterprises	Large Enterprises
	A Region	50%	40%	30%
	A Region in Transition	40%	30%	20%
	C Region	35%	25%	15%
	D Region	20%	10%	max. EUR 200,000 within 3 years
	C/D Region	35% / 20%	25% / 10%	15% / max. EUR 200,000 within 3 years

Figure 5: Incentives Regions and Possible Incentives Rates (Defined by the GRW Program)

The public authorities also provide incentives for recruiting, hiring, and training staff - irrespective of a company's size, industry or location. Special emphasis is placed on hiring and training previously unemployed candidates. Foreign investors actively involved in Germany's high-tech industries can apply for research and development grants as an additional means of lowering operating costs. These direct project grants are awarded within the scope of the federal government's "High-Tech Strategy" designed to promote future technologies. Investors can also take out public research and development loans or use a silent partnership. Not least, R&D subsidies are available at the EU level.

Germany is the largest market in Europe. It constitutes 20 percent of European GDP, and is home to 17 percent of the total EU population. Stable annual average GDP growth of 1.8 percent in the five past years provides proof of further economic potential. The German economy is both highly industrialized and diversified; with equal focus placed on services and production.

Germany is well placed to meet the challenges of the future thanks to significant amounts of federal and private funds made available for research and development (R&D) purposes. These funds are also used to explore the major potential in a number of forward-looking industry sectors.

A legal framework providing investment security, a motivated workforce, specialized engineering capabilities, availability of suitable production sites, and an innovative environment are all factors necessary for efficient industry performance. Germany's policy efforts are geared toward encouraging businesses to take risks in order to facilitate breakthroughs.

Taken together, these factors have contributed to Germany's success in the renewable energy sector and are creating a reliable and sustainable industry that offers a number of future growth opportunities for investors worldwide.

2.5 Setting Up Business in Germany

Germany Trade & Invest is the foreign trade and inward investment agency of the Federal Republic of Germany. The agency, with its *Location Services*, aids in identifying project-specific requirements and offers site proposals. Because of their local network and regional expertise, the regional development agencies are incorporated into this process.

There are particular steps to enter the German market through foreign direct investment. All steps are covered by a service infrastructure to support business development. Much of the required information about economic data, the labor market, incentives programs, the tax & legal framework and even related services like *Project Management Assistance*, *Location Services* and *Support Services* are provided free of charge by federal and regional governmental organizations. An example based on practical consultancy experience of *Germany Trade & Invest* is given in Figure 6.

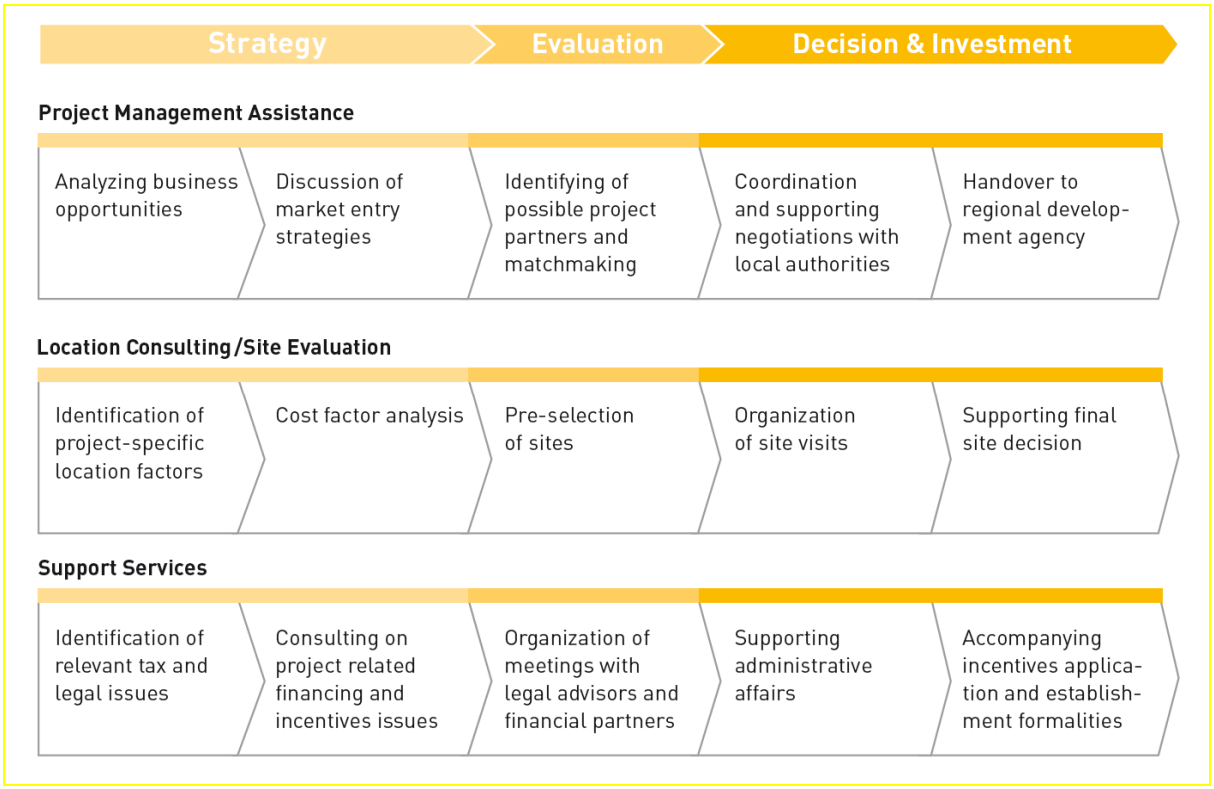


Figure 6: Our Services for Direct Inward Investments

Germany Trade & Invest supports foreign investors with its free of charge consulting services, helping them to enter the market and thereby strengthening the entire industry.

3 REFERENCES

BAFA Federal Office of Economics and Export Control (2011): Market Incentive Programme. http://www.bafa.de/bafa/de/presse/pressemitteilungen/2011/02_map.html, 23.03.2011.

BBSR Federal Institute for Research on Building, Urban Affairs and Spatial Development (2010): http://www.bbsr.bund.de/nn_23744/BBSR/DE/Raumbeobachtung/Glossar Indikatoren/indikatoren__dyncatalog,lv2=104780,lv3=106726.html, 25.01.2011.

BDEW Federal Association Energy- and Watermanagement (2009): http://www.bdew.de/bdew.nsf/id/DE_Energieverschwender_alte_Heizung?open&Highlight=, 19.01.2011.

BDH Association of the German House, Energy and Environmental Technology Industry (2009): Efficient systems and renewable energies. http://www.bdh-koeln.de/html/index.php?site=421_0&lng=de, 28.01.2011.

BMU Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2010): The German government's Energy Concept – September 2010. http://www.bmu.de/english/energy_efficiency/doc/46516.php, 19.01.2011.

BMWi Federal Ministry of Economics and Technology and BMU Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2010): Energy Concept for an Environmentally Sound, Reliable and Affordable Energy Supply – September 2010. http://www.bmu.de/files/english/pdf/application/pdf/energiekonzept_bundesregierung_en.pdf, 20.01.2011.

BWP Ferderal Association of Heat Pumps (2011): Heat Pump Sales Figures 2010. http://www.waermepumpe.de/fileadmin/grafik/pdf/PIs_ab-11-2009/2011-01-27_BWP-PI_Absatzzahlen_2011_final.pdf, 28.01.2011.

EHPA European Heat Pump Association (2010): Outlook 2010 – European Heat Pump Statistics. http://www.ehpa.org/fileadmin/red/Heat_Pump_Statistics/2010_EHPA_Outlook_executive_ summary.pdf, 19.01.2011.

European Commission, DG Climate Action (2010): http://ec.europa.eu/clima/policies/package/index_en.htm, 19.01.2011.

Frost&Sullivan (2009): European Heat Pumps Markets – April 2009.

GZB GeothermalCenter Bochum (2010): Study of the German heat pump market – March 2010. http://www.geothermie-zentrum.de/fileadmin/media/geothermiezentrum/Projekte/WP-Studie/Abschlussbericht_WP-Marktstudie_Mar2010.pdf, 20.01.2011.

Renewable Energies Agency (2011): http://www.unendlich-viel-energie.de/en/heat/cooling-with-heat.html, 19.01.2011.