EnAlgae policy landscape analysis for

Germany

Landscaping of national policies of Germany that can have an impact in algae cultivation revealed a number of strategies, mandates, and economic incentives for biomass energy and bioeconomy. Many of the identified policies are in fact response mechanisms to EU-level overarching strategies and targets. Nevertheless, each country can set its own priorities and strategies in order to reach EU targets. For this, we have looked upon Germany’s federal policies that could stimulate investment for algae cultivation.

Production of Energetic Algae (or algae for production of fuels and energy) is a concept currently under development in Germany, and themajority of existing bioenergy and environmental strategies were not found to be actively supportive to energetic algae. The only exception was the national Bioeconomy strategy (2014) that made a clear reference to algae as important marine biomass species for production of biofuels (biomethane and biokeroseneTo identify other policies that could affect energetic algae, research was focussed on generic biomass, bioenergy and environmental strategies.Such an example is the National Biomass Action Plan (2009) that encouraged exploitation of unused biomass potentials for energy production, especially those that do not have competitive market uses. Algae clearly fall in this category.

With regard to energy targets, Germany has a primary obligation set in the EU Renewable Energy Directive (RED) to source 19.6% of its energy use from renewables by 2020, including 10% in the transport sector. In response to RED targets, Germany plans to source38.6% of electricity, 15.5% of heatconsumption from renewable sources.In a national level, Germany has developed a strategic framework for building a competitive biobased economy by 2030. Because biomass refining was identified as a strategic pathway for German bioeconomy to reach its targets, a Biorefinery Action Plan was set in 2012. Advanced bioenergy technologies that German policies strategically support, for reducing their emissions and increasing the share of renewables in the energy mix, are primarily biogas, biomethane, and biomass Combined Heat and Power (bio-CHP), and transport biofuels among others. Yet energy technologies for transport biofuelhave strong potential to use algae as biomass feedstocks.

Germany plans to support all these strategic energy technologies by providing financial support, and underpinning technology development. Uptake of strategic energy technologies is supported mainly by feed-in tariffs schemes, secured loans, and subsidies.

Critical eligibility criterion for government funding is the compliance with binding sustainability criteria of advanced energy technologies. Since 2010 in order to claim any form of government funding, the energy producers need to provide sustainability certificates for their products (electricity, heat, or fuels). These certificates can be issued by private certification bodies.

In this context, recovery and use of bioheat produced during burning biomass, biogas, or biomethane is very important efficiency aspect and in many cases was identified as a requirement for government financial support (tariffs, subsidies).

In the following section, findings from landscape analysis of German legislation are listed by topic. First are presented the overarching strategies and acts, which are then followed by targeting incentives.

## General Policy Framework

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| Policy | Key Measures/Aims |
| National Renewable Energy Action Plan[[1]](#footnote-2) | Germany is obliged to meet an overall target of 19.6% energy from renewable sources by 2020, which is broken down into38.6% of electricity, 15.5% of heat, and 10% in the transport sector. Germany also has to develop its own Action plan, which outlines, how this goal can be achieved.  |
| National Biomass Action Plan for Germany[[2]](#footnote-3)2009 | This Biomass Action Plan sets out the potential for the use of biomass in Germany, quantifies the biomass share in meeting current demand and identifies available reserves. It also describes the German government’s strategies towards promoting bioenergy use in the heating, electricity and fuel sectors, and the measures it intends to take in implementing them. This includes: increased production of heat from biomass, exploitation of unused biomass potentials, reduction/ avoidance of competition of uses, sustainability of biomass production, regulations of biomass imports, increased feeding of bio-methane into natural gas grids, reduction of GHG emissions for biofuels. With this plan the Federal Government is supporting the EU Commission which, in its Biomass Action Plan published in 2005, called upon the EU member states to draw up national action plans for the energy use of biomass. |
| National Research Strategy BioEconomy 2030[[3]](#footnote-4)2010 | With the "National Research Strategy BioEconomy 2030", the Federal Government is laying the foundation for realizing a vision of a sustainable bio-based economy by 2030 which produces sufficient healthy food to feed the world and supplies quality products made from renewable resources. The Federal Government pursues the aim of harnessing research and innovation to facilitate a structural transition from an oil-based to a bio-based industry which will also offer great opportunities for growth and employment. The research strategy therefore sets five priorities to continue to develop Germany into a knowledge-based, internationally competitive bioeconomy: global food security, sustainable agricultural production, healthy and safe food, industrial use of renewable resources and biomass-based energy sources. |
| Renewable Energy Heat Act (EEWärmeG)[[4]](#footnote-5)[[5]](#footnote-6) (2009, last amended 2011) | Renewable Energies Heat Act aims to increase the share of renewable energies in heat provision to 14% by 2020. The Act makes the use of renewable energy for space and hot water heating mandatory for new buildings. It also stipulates budget requirements to this end for the Market Stimulation Programme.After the amendment the Act stipulates to use a share of renewable heat or cold, also for existing public buildings undergoing major renovations. New buildings are obliged by the EEWärmeG to use a certain percentage of renewable energy for heating purposes (water and space heating).[[6]](#footnote-7) The minimum percentage depends on the renewable energy technology used, as follows:-Gaseous biomass: 30% (under certain restrictions);-Other biomass installations, use of liquid biomass, ambient heat: 50%. The Federation shall provide need-based funding for the utilisation of renewable energies for the generation of heat and cold of up to 500 million euro per year between 2009 and 2012. |
| German Roadmap Biorefinery2012 | It is published by Federal Ministry for Food, Agriculture and Consumer Protection, Federal Ministry for Education and Research, Federal Ministry for Environment, Federal Ministry for Economy. This roadmap outlines the strategy for development and implementation of the biorefinery concept until 2030. It describes the most important biomass value-chains in the context of biorefineries, highlights the research and development needs, pays attention to expected economic results of different biorefinery concepts and summarises the political framework and sustainability aspects that influence this development. The algae lipid biorefinery is one of the described biorefinery concepts.  |
| Biomass Ordinance (BiomasseV)[[7]](#footnote-8) (2001, 2012) | This ordinance defines the scope of the Renewable Energy Act in regard to:Clear definition of the “biomass” considered in the EEGFor which biomass-application there is a financial incentiveEnergetic reference valuesTechnical requirements for electricity production from biomassSustainability requirements for production of electricity from biomass |
| National Policy Strategy – Bioeconomy[[8]](#footnote-9) (2014) | Itsets priorities for advancing towards a knowledge-based bioeconomy and it highlights areas that require action. The aim is for the guiding principles, strategic approaches and measures to contribute to making use of the areas of potential for the bioeconomy in Germany, and also help to strengthen the structural transition to a biobased economy. The strategic approaches are to be further developed to match the long-term goals and to adapt to new challenges. The degree of success achieved by the strategy is to be examined in a Progress Report.The strategy highlights the potential of algae species for the production of food, platform and fine chemicals, as well as biofuels (such as biomethane through AD and biokerosene, through hydrothermal conversion) and bioenergy (CHP), while it reduces the land competition with terrestrial biomasses. |

## Bioenergy

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| Policy | Key Measures/Aims | Mechanism | Financial Incentives |
| Biomass Power Sustainability Ordinance (BioSt-NachV)[[9]](#footnote-10)(2009/2010) | This ordinance is intended to ensure that all biomass used for electric power generation and heating is produced in compliance with binding sustainability criteria.  | As of 1 January 2010 eligibility (with regard to bioliquids) for basic tariff pursuant to the EEG will be tied to documentation of compliance with the defined sustainability requirements. Relevant monitoring is carried out by private certification bodies. | Proof of sustainability will, from 1 January 2010, be a necessary prerequisite to receive the basic remuneration and bonuses under the Renewable Energies Act (Erneuerbare-Energien-Gesetz - EEG). Consequently, bioliquids that are produced in non-sustainable ways will in future no longer be eligible for the pertinent payment framework under the EEG. |
| Renewable Energy Sources Act (EEG) (2009, last amended 2012)[[10]](#footnote-11)[[11]](#footnote-12)[[12]](#footnote-13) | The act aims to increase the proportion of electricity from renewable energy sources in total energy supply from at least 35% in 2020 to at least 80% by 2050 and to integrate these quantities of electricity in the electricity supply system. | The most important measure to promote electricity from renewable sources is the feed-in tariff.The tariff levels will decrease every year to provide an incentive to reduce costs through technological innovation. New plants will receive the tariff level applicable on the day they are put into operation, and this tariff level will apply for the entire payment period, i.e. for 20 years.In regard to the use of biomass, it includeselectricity from biogas, biomethane and solid biomass CHP.Capacity limits: Electricity generated by a biomass plant put into operation after 31 December 2013 will be eligible only if the installed capacity does not exceed 750 kW.Generators will receive the full tariff only if a certain percentage (usually 60% for biomethane plants and 100% for biowaste plants) is generated by CHP, or if the amount of manure used to produce the biogas is at least 60 mass percent.Liquid biomass is ineligible for the biomass feed-in tariff.  | The amount of tariff for a given plant is the tariff level as defined by law minus the degression rate, which depends on the year in which the plant was put into operation.BiomassFiT: 6–14.3€ct per kWh (according to plant size), plus (if applicable) bonus of 2.5 – 8 €ctper kWh for use of special substances.Biogas from biomass: 6–25€ct per kWh (according to plant size and fuel). |
| Premium tariff I (market premium)[[13]](#footnote-14) | The act aims to increase the proportion of electricity from renewable energy sources in total energy supply from at least 35% in 2020 to at least 80% by 2050 and to integrate these quantities of electricity in the electricity supply system. | Instead of receiving the feed-in tariff for electricity from renewable sources, a plant operator may choose to sell his electricity directly, and claim the so-called market premium from the grid operator. The amount of the market premium shall be calculated each month. Biogas, biomethane, and biomass are eligible. The following restrictions apply:Electricity from biomethane is eligible only if generated by CHP.Liquid biomass is ineligible for the tariff. No maximum capacity for large biogas plants. Unlike the feed-in tariff, the market premium will still be available for large biogas plants (capacity > 750 kW) put into operation after 31 December 2013. | The amount of the market premium is calculated every calendar month and includes the following elements: 1. The difference between the feed-in tariff for the specific technology as set out in the EEG and the average stock market price, which is calculated every month ex post and corrected by a factor reflecting the stock market value of the specific technology. 2. On top of the market premium, eligible plant operators receive a so-called management premium which covers the costs for variations of the actual grid exports compared to the forecast and for stock market participation. |
| Premium tariff II (Flexibility premium)[[14]](#footnote-15) | On-demand renewable electricity (not regular) from biogas is supported from this premium scheme. This premium may be received on top of and separately from the market premium and only for biogas. | The flexibility premium shall be paid for a period of ten years.Eligibility criteria are as for Premium tariff I plus:All electricity generated by a plant shall be sold directly for the purpose of claiming the market premium or for other purposes.Plants shall be equipped with technical devices that enable the grid operator to increase and reduce output by remote means at any time.The rated annual capacity of a plant shall amount to at least 0.2 times the installed capacity of the plant. | The amount of the flexibility premium is calculated every calendar year. |
| Loan (KfW Financing Initiative Energiewende)[[15]](#footnote-16) | Support investments on purchasing and setting up renewable electricity projects. | The KfW Financing Initiative Energiewende gives low interest loans for investments in installations for electricity production from biomass and biogas in accordance with the EEG. It is a long-term loan with an interest period of up to 20 years including a repayment-free start-up period of maximum 3 years. The plant operator or investor signs a contract with the bank (Hausbank) specifying the terms of contract. | The credit amount may vary between minimum EUR 25 million and maximum EUR 100 million for the investment project covering up to 50% of the investment costs in case of direct credits granted by a consortium of banks which the KfW is part of.The terms and conditions of the loan including interest rates for direct credits depend on the terms agreed. Interest rates are fixed over 10 years. For loans exceeding 10 years, the interest rate will be redefined after 10 years. Commitment fees amount to 0.25% per month. |
| Loan (KfW Renewable Energy Programme – Standard)[[16]](#footnote-17) | Support investments on purchasing and setting up renewable electricity projects (biomass and biogas). | Biomass or biogas plants erected abroad are eligible for the loan if they are constructed close to the German border and thus, indirectly have an impact on the improvement of the environment in Germany, or if the investment is done abroad by a German company. It is a long-term and low-interest loan (effective interest rate of 1.0% per year) with a fixed interest period of 5 or 10 years including a repayment-free start-up period (KfW Renewable Energy Programme Standard). | Up to 100% of the investment costs eligible for financing (without VAT), however, not more than EUR 25 million per plant/project. It is a long-term and low-interest loan with a fixed interest period of 5 or 10 years including a repayment-free start-up period. A fixed interest period of up to 20 years can be granted. |
| Loan (KfW Renewable Energy Programme- Premium)[[17]](#footnote-18) | KfW provides low-interest loans and grant repayment support | KfW provides low-interest loans with grant payback support for the development and expansion of heat installations/plants. The installations need to be erected in Germany and have to be operating for at least 7 years.A combination with other support is not possible, if not otherwise stated. Eligible projects can be:Plants for the purification of biogas to natural gas quality and biogas pipelines for non-purified biogas.Plants with automatic feeding for the burning of solid biomass for thermal use >100 kW nominal heat output including hot water storage.CHP using solid biomass including buffer storage | Biomass plants with automatic feeding grant repayment of €20 per kW installed nominal heat output, max. €50,000 per plant.Innovation support can be granted in case of: 1) additional hot water storage capacity (€ 30 per kW installed nominal heat output) or 2) extra low emission (€ 40 per kW installed nominal heat output). Both support schemes can be cumulated; however, the maximum support is € 100,000 per plant.CHP with a maximum nominal heat output ≤ 2000 kW receive €40 per kW if electrical efficiency is >10% and overall efficiency is >70%.Biogas pipelines for biogas that has not been purified to biomethane with a length of 300m including gas compressors etc. are supported for up to 30% of eligible net investment costs. |
| Subsidy (Investment Support, BAFA)[[18]](#footnote-19) | Provides investment support is given for heat produced in existing buildings. | Installations in new buildings are only eligible if process heat is used. The investment support is divided into basic support, bonus support and innovation support. Installations need to be erected in Germany and have to be operating for at least 7 years. A combination with other support schemes is possible.The following technologies are supported:Plants with automatic feeding for the burning of solid biomass for thermal usage ≤ 100 kW nominal heat output.Low emission logwood boilers ≤ 100 kW nominal heat outputSecondary measures for emission reduction and efficiency of plants with ≤ 100 kW nominal heat output. | Basic support:Plants with a capacity between 5kW – 100kW using wood pellets: € 36 per kW installed capacity at least:€ 1,400 pellet boilers with water bag; € 2,400 pellet boiler; € 2,900 pellet boiler with new buffer storage volume of at least 30 l / kW- Plants with a capacity between 5kW – 100kW (with buffer storage volume of at least 30 l / kW) using wood chips: € 1,400 per plantLow emission logwood boilers with a capacity between 5kW – 100kW: € 1,400 per installationBonus:Efficiency bonus is 0.5 times the basic support but only for Installations with a capacity between 5kW – 100kW using wood pallets. In case of simultaneous installation of solar collectors the bonus support of € 500 is granted.Innovation support:Installation or retrofitting firing solid biomass with < 100 kW nominal heat output: €750 and for newly erected installations €850. |

## Biofuels

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| Policy  | Aim | Mechanism | Financial Incentives |
| Biofuels Sustainability Ordinance (Biokraft-NAchV)[[19]](#footnote-20) | According to the ordinance, all biofuels must comply with the binding sustainability criteria, as of January 2011.  | The biofuels must be certified by accredited institutions. It must be proven that all sustainability requirements have been met in the entire production process (including GHG reduction of 35% compared with fossil-based equivalent | Biofuels that do not fulfil the sustainability standards cannot profit from tax reduction or biofuel quota |
| Biofuel quota act (BioKraftQuG)[[20]](#footnote-21)[[21]](#footnote-22) (2007) | It is order and regulation of admixture of biofuels to (fossil-based) transportation fuels.By 2015, emissions have to be reduced by 3%, by 4,5% from 2017 on and by 7% from 2020 onwards. From 2015, a greenhouse gas reduction quota will replace the biofuel quota. | The mechanism obliges companies importing or producing petrol, gas or diesel fuels to ensure that biofuels make up a defined percentage of the company’s total annual sale of fuel. Obliged fuel suppliers may assign this obligation to other companies. The minimum share of biofuel can be fulfilled by: blending biofuel with diesel fuel (share of 4.4% until 31.12.2014 ) or gasoline (share of 2.8% until 2014), circulating pure biofuel, adding biomethane to natural gas fuel. The minimum share of biofuels as part of the total volume of diesel and gasoline (overall quota) shall be 6.25% until 2014. From 2015, a greenhouse gas reduction quota will be introduced, where the allowed share of greenhouse gases discharged from diesel and gasoline is being reduced in form of a quota, meaning that the usage of biofuel is only indirectly stimulated.  | If a provider fails to fulfil the quota a penalty is charged based on the amount of biofuel that has been missed. The amount of the penalty varies, depending on whether the provider was supposed to replace diesel-fuel or petrol-fuel. For the gasoline quota, the fine is € 43 per gigajoule, for diesel and the overall quota the fine is €19 per gigajoule.  |
| Tax regulation mechanism (Reduced tax rate for biofuels) | The tax relief for biofuels varies depending on the type of biofuel and is only granted if the produced biofuel does not fall under the biofuel quota obligation. | Conventional biofuels (biodiesel, vegetable oil fuel) are eligible for proportional tax redemption until end of 2012. Second generation biofuels, biogas, bioethanol fuel (E85) are tax deductible until 2015. Pure fuels exempted from this rule are :  Synthetic hydrocarbons or synthetic hydrocarbon mixtures which are obtained by thermochemical conversion of biomass.Alcohols that have been produced through biotechnological processes to reveal cellulose. | According to the Biofuel Quota Authority, the tax relief is calculated as the difference between the amount of tax set out in §2 EnergieStG and the eligible relief. Tax relief is granted only in case of pure biofuels containing the following substances: 1) fatty acid methyl ester (1000 l): €21.40 2) vegetable oil (1000 l): €21.40  |

1. <http://ec.europa.eu/energy/renewables/action_plan_en.htm> [↑](#footnote-ref-2)
2. [http://www.erneuerbare-energien.de/unser-service/mediathek/downloads/detailansicht/artikel/bmu-broschuere-nationaler-biomasseaktionsplan-fuer-deutschland-beitrag-der-biomasse-fuer-eine-nachhaltige-energieversorgung/?tx\_ttnews[backPid]=89](http://www.erneuerbare-energien.de/unser-service/mediathek/downloads/detailansicht/artikel/bmu-broschuere-nationaler-biomasseaktionsplan-fuer-deutschland-beitrag-der-biomasse-fuer-eine-nachhaltige-energieversorgung/?tx_ttnews%5bbackPid%5d=89) [↑](#footnote-ref-3)
3. <http://www.bmbf.de/de/1024.php> , <http://www.bmbf.de/pub/biooekonimie.pdf> [↑](#footnote-ref-4)
4. <http://www.gesetze-im-internet.de/bundesrecht/eew_rmeg/gesamt.pdf> [↑](#footnote-ref-5)
5. <http://www.bmub.bund.de/fileadmin/bmu-import/files/english/pdf/application/pdf/ee_waerme_2010_en.pdf> [↑](#footnote-ref-6)
6. Renewable Energy Heat Act: <http://www.iea.org/textbase/pm/?mode=re&id=4168&action=detail> [↑](#footnote-ref-7)
7. Biomass Ordinance: <http://www.gesetze-im-internet.de/bundesrecht/biomassev/gesamt.pdf> [↑](#footnote-ref-8)
8. <http://www.bmel.de/SharedDocs/Downloads/EN/Publications/NatPolicyStrategyBioeconomy.pdf?__blob=publicationFile> [↑](#footnote-ref-9)
9. <http://www.gesetze-im-internet.de/bundesrecht/biost-nachv/gesamt.pdf> [↑](#footnote-ref-10)
10. <http://res-legal.de/en/search-for-countries/germany/legal-source/land/deutschland/instrument/premium-tarif-gruener-bonus/ueberblick/rechtsquelle.html?bmu%5BlastPid%5D=43&bmu%5BlastShow%5D=1&bmu%5BlastUid%5D=33&cHash=4f104238b52d37f1cf211fb4f83cf298> [↑](#footnote-ref-11)
11. <http://international.fnr.de/renewable-resources/legal-framework/the-renewable-energy-sources-act-eeg/> [↑](#footnote-ref-12)
12. <http://www.res-legal.eu/search-by-country/germany/single/s/res-e/t/promotion/aid/feed-in-tariff-eeg-feed-in-tariff/lastp/135/> [↑](#footnote-ref-13)
13. <http://www.res-legal.eu/search-by-country/germany/single/s/res-e/t/promotion/aid/premium-tariff-i-market-premium/lastp/135/> [↑](#footnote-ref-14)
14. <http://www.res-legal.eu/search-by-country/germany/single/s/res-e/t/promotion/aid/premium-tariff-ii-flexibility-premium/lastp/135/> [↑](#footnote-ref-15)
15. <http://www.res-legal.eu/search-by-country/germany/single/s/res-e/t/promotion/aid/loan-kfw-financing-initiative-energiewende/lastp/135/> [↑](#footnote-ref-16)
16. <http://www.res-legal.eu/search-by-country/germany/single/s/res-e/t/promotion/aid/loan-kfw-renewable-energy-programme-standard/lastp/135/> [↑](#footnote-ref-17)
17. <http://www.res-legal.eu/search-by-country/germany/single/s/res-hc/t/promotion/aid/loan-kfw-low-interest-loan/lastp/135/> [↑](#footnote-ref-18)
18. <http://www.res-legal.eu/search-by-country/germany/single/s/res-hc/t/promotion/aid/subsidy-investment-support/lastp/135/> [↑](#footnote-ref-19)
19. <http://www.gesetze-im-internet.de/bundesrecht/biokraft-nachv/gesamt.pdf> [↑](#footnote-ref-20)
20. <http://www.zoll.de/DE/Fachthemen/Steuern/Verbrauchsteuern/Energie/Besonderheiten/Biokraftstoffquote/Allgemeines/Biokraftstoffquotengesetz/biokraftstoffquotengesetz_node.html> [↑](#footnote-ref-21)
21. <http://www.res-legal.eu/search-by-country/germany/single/s/res-t/t/promotion/aid/biofuel-quota-3/lastp/135/> [↑](#footnote-ref-22)