The Danish Energy Agency's Centre for Global Cooperation supports emerging economies to combine sustainable future energy supplies with economic growth. The initiative is based on four decades of Danish experience with renewable energy and energy efficiency, transforming the energy sectors to deploy increasingly more low-carbon technologies.

In total, Denmark's partnership countries account for 60 percent of global greenhouse gas emissions and encompass roughly half the world's population. Furthermore, our partner countries were responsible for 72 percent of global investments in renewable energy, in 2017.

**World population**

- Partner countries: 47%
- Rest of the world: 53%

**Global GHG-emissions**

- Partner countries: 40%
- Rest of the world: 60%

**Global investments in Renewable energy**

- Partner countries: 28%
- Rest of the world: 72%

Source: IEA, 2017
Source: Bloomberg, 2017
What
The DEA Energy Partnership Programme (DEPP) is part of the Danish commitment to fulfil the agreements under the Copenhagen Climate Summit in 2009 and subsequent climate conferences, assisting a number of emerging economies in their low carbon transition. Under the Global Frame of the Climate Envelope, support has been rendered to DEA Energy Partnership Programme (DEPP) in the Ministry of Energy, Utilities and Climate and DEA is currently engaged in bilateral cooperation with China, Mexico, South Africa and Vietnam in order to promote the use and awareness of the Danish energy experiences as an inspiration for green transition through a unique approach in a government-to-government cooperation. The current and second phase of DEPP is running from July 2017 until June 2020. DEA is also involved in partnerships with Ukraine, Indonesia, Turkey, India and Ethiopia. Furthermore, Denmark collaborates with countries like Germany, the UK and the US, in order to share valuable knowledge and experiences.

Why
Denmark offers cooperation within a variety of planning tools from the Danish energy model based on 40 years of transition and ambitious policy targets on renewable energy and a proven, flexible energy system. In 2017, more than 43% of Danish electricity consumption was based on wind while keeping the security of supply is among the most reliable globally. The Danish TSO has a unique experience in providing support to flexibility in the power system and stability in the transmission system. The Danish energy system has been awarded the best in the world and the recent in-depth review of the Danish system by the IEA proved that Denmark has managed to green the energy system cost-effectively while keeping a safe and reliable energy supply. Furthermore the green transition has had a positive impact on the economy, creating new green jobs and businesses proving that “going green” can benefit both the environment and the economy.

The experiences and lessons-learned the transitioning Danish energy system is now shared with other governments to inspire them to green their economies and energy systems. Working together in the government-to-government partnerships allow ministries, agencies and policy makers in other countries access to peers and experts from the Danish government.
How
The toolbox of the Danish government-to-government partnership approach includes collection and processing of data, long term scenario analysis including levelized cost of energy and externalities; supporting partner countries in establishing strategic (Renewable) Energy Outlooks 2030/50; energy technology assessment which feeds into technical assistance; capacity building on short- and long-term energy planning and finally results in new regulation; analysis of power systems and support for more flexibility including forecasting and auxiliary services; etc. The Danish energy model provides politicians and regulators with a solid base for discussing the consequences of the energy policy carried out and thereby provide the needed assistance for integrating larger shares of renewable energy and other measures while keeping the energy-sector as cost-efficient as possible.

DEA has four priority areas in providing technical assistance and capacity building:

1) Support for holistic and long term energy targeting and planning – a.o. in order to support implementation of the Paris Agreement. This includes improving of data and analysis as well as support to more strategy oriented approaches like annually Renewable Energy Outlooks for partner countries. Analysis on real cost of energy – the levelized cost of energy approach – as well as externalities is an integrated part of the modelling assistance and capacity building. Also, this preferably includes modelling and strategies on national, conditional Paris Agreement stepping up targets.

2) Support for more RE penetration by identifying and removing barriers for especially more wind and biomass/biogas in national energy systems in the short, medium and long term. This also includes introduction of Levelized Cost of Energy approach, modelling and Outlooks (cf 1) above) including analysis on external costs, identification of specific barriers like biased support schemes, ensuring transparent and simple framework conditions, reducing risk for investors, one-stop-shop approach, support for tendering procedures and formats, etc.

3) Support for flexibility in power sector to avoid curtailment and instable power system operations, support for power market reforms, TSO-support including forecasting and auxiliary services, etc.

4) Energy efficiency with priority to energy management within industry, excess heat, district heating and building standards.

The Danish Partnership programme is based on an inclusive, demand-oriented, flexible co-operation model including:
• Political support and commitment through Memorandum of Understandings at government-to-government level

• Long term programmes (at least 3-year programmes) which are established in a very close dialogue with partner institutions based on Theory of Change approach

• Joint high-level Steering Committee with minister/vice-minister/DG/ambassador participation to follow partner program progress, including approval of annual work programmes, monitoring, budget decisions etc

• Danish senior long term energy advisors/experts embedded in the partner institutions or at the embassy to coordinate program and provide direct technical assistance in high-priority areas

• Active involvement of local Danish Embassy including direct dialogue with local partner authorities

• Technical assistance from DEA and the Danish TSO according to agreed work programme and specific outputs within the Theory of Change framework

• Supplementary support from international and local consultants according to programmes and budgets

• Programme implementation, progress and monitoring is ensured by joint management group and implementation groups with partner institution.

DEA engages actively in donor coordination to ensure synergy and avoiding overlap in international technical assistance programmes in the partner country.

US
Regulatory streamlining for offshore wind development, strategic energy planning and evaluation of district energy systems in cities.

MEXICO
Energy efficiency in industry and buildings, integration of renewable energy and climate policy.

GERMANY
District heating networks and strategic energy planning with a focus on framework conditions for increasing the share of district heating systems.

UK
District heating networks and strategic energy planning with a focus on framework conditions for increasing the share of district heating systems.

Ukraine
Improving security of energy supply and lower greenhouse gas emissions through energy planning, modelling of energy efficient scenarios and integration of renewable energy.

Turkey
Establish district heating law, district heating mapping and development of district heating incl. EE.

UKRAINE
Improving security of energy supply and lower greenhouse gas emissions through energy planning, modelling of energy efficient scenarios and integration of renewable energy.

INDIA
Wind energy and integration of RE. Topics to be further elaborated.

UKRAINE
Improving security of energy supply and lower greenhouse gas emissions through energy planning, modelling of energy efficient scenarios and integration of renewable energy.

TURKEY
Establish district heating law, district heating mapping and development of district heating incl. EE.

CHINA
Denmark’s largest and most comprehensive bilateral climate and energy cooperation. Focus is on mitigation of greenhouse gas emissions through transition to more renewable energy, especially wind, energy efficiency and district heating.

INDONESIA
Long term energy planning including integration of renewable energy, energy efficiency and climate policy.

VIETNAM
Energy modelling and analysis of scenarios, RE integration in the power system and energy efficiency in the industrial sector.

SOUTH AFRICA
Transition from coal to renewable with a special focus on capacity building in energy sector planning and RE integration into the power system.

ETHIOPIA
Shaping procedures and framework conditions for extension of wind power.

USA
Enhancing policies and frameworks for offshore wind development and strategic energy planning.
DEA has had close energy cooperation with China since 2006. Firstly, through the Sino-Danish Wind Energy Development Programme 2006-2009 (DKK 45 million). This programme was followed by the Sino-Danish Renewable Energy Development programme (DKK 100 million) in 2009 where one of the aims was to establish China National Renewable Energy Centre (CNREC). This Centre has successfully been established during the Sino-Danish Renewable Energy Programme.

DEA is currently assisting CNREC for a 3-year period from June 2017 to June 2020. New partners have been introduced to consolidate the work of CNREC and China's National Energy Conservation Centre (NECC). Most importantly, the international NGO Children's Investment Fund Foundation (CIFF) established a 5-year programme 2015-2019 to support CNREC (and involved NREL in the partnership) by establishing a programme 'Boosting Renewable Energy' programme; CIFF supports the programme with 16.6 million USD from 2015 to 2019. In 2017, Germany also became a partner in CNREC.

DEA-support to CNREC includes development of long term scenarios for RE integration, grid planning, flexibility on power plants, heat planning, etc. One of the main outputs from the cooperation with CNREC is the China Renewable Energy Outlook (CREO) which has been published both in 2016 and 2017 and will be published annually in the future.

CNREC is playing a key role as a think-tank for the National Energy Administration (NEA) and the National Development and Reform Committee (NDRC) in terms of setting targets for renewable energy in the national planning and the formulation of policies for increasing the deployment of renewable energy. It had a key role in providing inputs to the 13th Five-Year Plan (FYP) and will deliver input for the upcoming 14th FYP.

NEA and DEA have recently established the Quality Offshore Wind Project, aiming to transfer Danish best-practice experiences from 30 years of offshore development to China. The project comprises 3 tracks, a regulatory dialogue, a test and certification track as well as a final track looking at the possibilities for establishing Danish-Chinese project consortia, which will be jointly develop demonstration plants.

DEA has together with the National Energy Administration (NEA) in China established a separate programme focusing on power plant flexibility. This programme, China Thermal Power Transition (CTPT) is financed by CIFF and is based on a Sino-Danish Memorandum of Understanding. As a part of the NEA's focus on power flexibility and reducing high China curtailment rate, 22 power plants has been dedicated to a pilot project also supported by the CTPT.

This programme constitutes the platform for the ongoing Sino/Danish/German led CEM campaign on Power Flexibility.

Furthermore, DEA cooperates with China’s National Energy Conservation Centre (NECC) on energy efficiency. NECC is placed directly under NDRC and is responsible for a large portfolio within the field of energy efficiency in China. The cooperation covers energy efficiency in industries, energy efficient district heating and excess heat from industrial processes. As a part of this cooperation, a joint Sino-Danish pilot project on excess heat and district heating is under establishment.

To support the work done within district heating at both NECC and CNREC a new Danish long-term energy advisor has been posted to Beijing in March 2018.
MEXICO

The MX-DK energy and climate programme at DKK 34.1 million (2017-2020) comprises three development engagements:

1. Efficient integration of additional renewable energy into the power sector, anchored with the Mexican Ministry of Energy (SENER)

2. Cooperation to increase energy efficiency, anchored with the National Commission for Energy Efficiency (CONUEE)

3. Support to Climate Change Mitigation Measures, anchored with the Mexican Ministry of Environment and Natural Resources (SEMARNAT), and in collaboration with the National Institute of Ecology and Climate Change (INECC).

There are two international DEA programme advisors, one stationed with SENER and one with SEMARNAT.

The programme with SENER focuses aims at enhancement of capacity of Mexican institutions within: energy modelling and long-term scenario for renewable energy planning; mapping, planning and deployment of biomass resources and technologies; within transmission grid planning and operation and efficient integration of variable renewable energy in the power system – through a technical cooperation between system operator CENACE (Mexico) and Energinet (Denmark).

The programme with CONUEE aims for development and implementation of incentive scheme for industries to implement energy management systems based on Danish experience with voluntary agreements. In addition, the Danish Energy Agency works with CONUEE and selected local level governments to integrate energy efficiency requirements into building codes for new buildings, and to enforce the building codes. Thirdly, there is collaboration on end-use energy efficiency modelling and system for data acquisition.

The programme with SEMARNAT aims at supporting Mexico in identification and initiation of additional measures to reach un-conditional climate targets and in identification of the most cost-effective pathway to achieve conditional targets in line with the NDC-target. It includes updating the national climate change strategy; development of NDC-plan; costing of measures; and engaging state-level in dialogue on planning and implementation of NDC-measures.
DEA has had close energy cooperation with Vietnam since 2013. DEA now cooperates with the Ministry of Industry and Trade (MOIT) in Vietnam through the joint Danish/Vietnam DEPP programme.

The program will support three development engagements as follows:

- Capacity development for long-range energy sector planning with the Electricity and Renewable Energy Authority (EREA)
- Capacity development for Renewable Energy Integration into the Power System with the Electricity Regulatory Authority of Vietnam (ERAV)
- Low carbon development in the industrial sector with the Energy Efficiency and Sustainable Development Department (EESD)

There is a DEA advisor posted in Vietnam who’s primarily supporting capacity development for long-range energy sector planning and modelling. The support includes implementation of the Balmorel power sector optimisation model as well as other model tools. The cooperation resulted in the publication of the first Energy Outlook Report for Vietnam in 2017, which was a joint report by DEA and MOIT.

The DEA is also supporting ERAV in improving forecast of load and of generation from variable RE as well securing availability of ancillary services.

The cooperation with EESD is focused on improving the regulatory framework for energy efficiency in industry.
**SOUTH AFRICA**

DEA cooperated with South African partners in the EUR 5.4 million Danish-South African Renewable Energy Programme from 2013 – 2017. The Programme had three main focus areas:

- Providing funding and technical assistance to the Department of Energy on energy efficiency and renewable energy and climate change activities in order to enable and strengthen comprehensive energy planning capabilities.

- Funding and facilitating further development of the South African Wind Atlas (WASA) in cooperation with SANEDI.

- Providing funding and technical assistance to ESKOM for integration of renewable energy into the power system.

The programme coordination was placed at the Danish Embassy in Pretoria and with the programme’s energy advisor at South Africa’s Department of Energy (DoE). Added to this is DEA technical assistance provided as in-kind.

The programme is expected to continue with a new 3-year programme until mid-2020 with a focus on long term energy modelling with Department of Energy and power plant flexibility with ESKOM.
The Ukrainian-Danish Energy Centre (UDEC) was established in 2015 and is based in the Ministry of Energy and Coal Industry in Kiev. A Danish Chief Advisor has been posted to UDEC since then and will provide technical support during the next three year period (2018-2020). DEA experts will provide insights from Danish experience to the Ukrainian experts.

The energy cooperation aims to support the new Energy Strategy of Ukraine towards 2035 including ambitious targets of 25% of energy to be met by renewable energy sources and enable Ukraine to create a long-term framework for energy planning and policy.

DEA will support UDEC within six main areas towards 2020:

- Monitoring of implementation of New Energy Strategy 2035
- Smart power system; reserves, balancing and storage and forecasting
- Structure for support to investors in Energy Efficiency and Renewables
- Implementation of EE Action Plan 2020 and support to new plan towards 2035
- Implementation of RES Action Plan 2020 and support to new plan towards 2035
- Short- and long-term forecasting and modelling
- DEA experts will provide insights from Danish experience to the Ukrainian experts.
The Danish government has initiated a government-to-government cooperation with Indonesia on energy to strengthen the partnership between the two countries. A Memorandum of Understanding was signed between the Ministry of Energy and Mineral Resources, MEMR, and the Ministry of Energy, Utilities and Climate on October 22, 2015.

The objective of the Strategic Sector Cooperation on energy (SSC) is to assist Indonesian government agencies and other relevant stakeholders in developing relevant policies, strategies and solutions to increase the electrification rate and to achieve the government’s long-term RE and EE objectives.

The cooperation is on both technical and institutional level and the main outcome of the SSC will be support to improved modelling and energy planning, extended integration of RE in the energy system and reduction of the energy demand through EE measures. The three-year work programme (2016-2018) has been developed in close cooperation with MEMR and the National Energy Council and it is also foreseen that for example the Ministry of Industry will be actively involved. The work programme is divided into three main components:

- Modelling and long term energy planning
- Renewable energy integration
- Energy efficiency

A new 3-year Danish/Indonesian energy programme 2019-2021 will be established during 2018 and is also planned to have a focus on

- long term energy modelling and transition including Paris Agreement implementation
- power plant flexibility
- energy efficiency in buildings
- local energy planning to support national energy RE and EE targets.

A Danish long term energy advisor is placed at the Danish Embassy to provide support to the Indonesian Ministry of Energy and Mineral Resources and other partner institutions.
Denmark has a long tradition in collaborating with India on wind energy. Back in the 1980’s Denmark financed pilot projects and during the early 1990’s Danish wind turbine manufactures established joint ventures. A joint Indian/Danish high-level Working Group on Energy was established in 2008 as a part of the Joint Indian/Danish Commission between the ministers of Foreign Affairs. Also, the Danish Technological University (DTU) has supported the establishment of the Indian National Institute for Renewable Energy, (NIWE).

Lessons learned from the Danish energy transition are of great interest to Indian partners at the central government level and at state level. This was confirmed in meetings in January 2017 between the Danish Minister of Energy, Utilities and Climate and the Indian Minister of Power, Coal, New and Renewable Energy, and Chief Minister of Gujarat.

An Energy Counsellor is now employed at the Danish Embassy in New Delhi as part of initiating new three year energy sector cooperation between the Indian Ministry of New and Renewable Energy (MNRE) and the Danish Energy Agency (DEA) to commence by mid-2018. A scoping mission in December 2017 showed a keen interest in the Danish experience with green transition including offshore wind and flexibility in the power sector.

The focus will likely be related to framework conditions for renewable energy including enhancements of technical and regulatory issues in order to minimize risks and reduce costs. To follow up a high-level Indian delegation visited Denmark in February 2018 and received a first-hand impression of the Danish experiences with the expansion of offshore wind and renewable energy in general.

India has an ambitious target of 175 GW of RE in 2022 out of which 60 GW is designated to onshore wind. Today they are around half way with app. 33 GW onshore. In December 2017 an additional target for 5 GW of offshore wind energy by 2022 was announced. To kick start the offshore wind development an Expression of Interest for the Development of 1 GW Offshore Wind in the State of Gujarat was announced in April 2018. This is an invitation for the wind industry and international project developers to engage in the commercial scale offshore wind projects in India.

An updated Memorandum of Understanding (MoU) is now being prepared between DTU and NIWE. An existing MoU with MNRE is in place and a new MoU with the Ministry of Power is in the process of being signed focusing on RE integration and establishing flexibility in the thermal power sector. In the medium term, there is high-level support for the establishment of a joint Indo-Danish Wind Centre.
The Danish Ministry of Energy, Utilities and Climate and the Turkish Ministry for Energy and Natural Resources (MENR) have signed a Turkish-Danish energy cooperation program in March 2017. The current phase of the project is planned to be completed in December 2019; and is expected to be prolonged with a new 3-year period. An Energy Counsellor is employed at the Danish Embassy in Ankara.

A Danish-Turkish Energy Cooperation Memorandum of Understanding was ratified in 2013. This Strategic Sector Cooperation intends to establish long-term bilateral relations between public authorities in Turkey and Denmark and through public and private partnerships contribute to a joint goal of more sustainable and green energy sector in Turkey.

The overall objective of the program is to

- assist the Turkish government in developing relevant policies, strategies and solutions to enable a low carbon transition of their energy sector;

- achieve the government’s long term objectives for energy efficiency and district energy (district heating and cooling);

- and increase the capacity of implementation of planned new legislation on heat supply.

Turkey possesses large untapped potentials for supply of waste heat from existing power plants, large industries, municipal waste incineration and geothermal energy. Cost efficient use of these potentials requires large and coherent heat markets, based on district heating. District heating in Turkey has today only a very limited dissemination. Further, the current regulation of the heat market in buildings has so far been limited to energy performance standards of new buildings and compulsory central heating in new buildings having an area of more than 2000 m².

One key activity is to prepare a draft primary heat supply act for Turkey. Progress in this activity has a top priority in the work programmes for 2017 and 2018, because a draft Heat Supply Act is requested to be completed by mid-2018, ready for public consultations. Discussions of the direction and the structure in a future heat supply regulation as well as initial specific drafting are ongoing. The drafting is based on Danish experiences, however adapted to Turkish conditions. In a second phase of the cooperation, there may be a need for Danish support to secondary legislation.
DEA cooperates with Ethiopia as partners in the Accelerated Wind Power Generation in Ethiopia Programme (AWPGE) which has been designed and managed by the Danish Embassy in Ethiopia. The AWPGE Programme is funded with EUR 3.8 million out of the Danish Climate Envelope. It is a three year programme that was initiated in 2017 and will run until the end of 2019. Compared to the other bilateral cooperation the Ethiopian program is highly focused to wind power and integration of wind power.

The AWPGE Programme has three main focus areas:

- Wind measurement: High quality and validated wind resource assessments, at a number of prioritised sites, made public.


- System integration: Improved system integration of wind power in the Ethiopian power system.

Apart from extensive Danish experiences in auctioning of large scale wind projects and integration of wind power in a power system dominated by hydro power DEA is including leanings of framework from other parts of the world including African experiences.

The on-going programme coordination is placed at the Danish Embassy in Addis Ababa in close cooperation with the DEA senior energy advisor at Ethiopian Ministry of Water, Irrigation and Electricity (MoWIE). Added to this is DEA technical assistance provided as in-kind.
**The 360° Approach**

Partnerships are based on vertical collaboration between governments. The Danish energy minister, for instance, meets with the energy minister in the partner country, mirroring management hierarchies at relevant levels.

The Danish Energy Agency places a high-level liaison officer in the partner country for three years to transfer Danish best practices and expertise, while respecting the structural and cultural differences between the two countries.

With this 360° approach, our partners go green faster and better together with Denmark by their side.

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**Danish Energy Agency**

The Danish Energy Agency was established in 1976, and is an agency under the Ministry of Energy, Utilities and Climate.

The work of the Danish Energy Agency involves matters relating to energy production, supply and consumption, as well as Danish efforts to reduce carbon emissions. The Agency is also responsible for supporting the economical optimisation of utilities that in addition to energy includes water, waste and telecommunication.
Danish Energy Partnership Programme

Learn more at our website:
https://ens.dk/en/our-responsibilities/global-cooperation

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