Danish Energy Agency

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EMBASSY OF DENMARK
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Viet Nam

Technology Catalogue

In brief

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VIETNAM TECHNOLOGY CATALOGUE - IN BRIEF

The Vietnam Technology Catalogue for power generation and storage 2019 is the solid foundation for enlightened policy development. The Technology Catalogue ensures high quality and publicly accessible data on power generation and storage technologies. The data is key input to power system modeling and is relevant for Vietnamese authorities, academia, private energy companies and other organisations. The technology catalogue and the process of making it is a common reference point for energy planning ensuring a transparent discussion on technology costs and energy modeling results.

What is a Technology Catalogue?

A Technology Catalogue (TC) is a description of a number of energy technologies, divided in a qualitative and quantitative part for each case. The qualitative part describes how the technology works, inputs and outputs, advantages and disadvantages, environmental impact, maturity of the technology and examples of applications. The quantitative part is a generic data sheet containing key technical and financial data for the technology at present and the expected development in the future. The Vietnamese TC includes the follow technologies:

- Coal fired power plants
- Gas fired power plants
- Biomass fired power plant
- Hydro power
- Photovoltaics
- Wind turbines
- Waste fired power plant
- Biogas fired power plant
- Diesel fired power plant
- Geothermal power plant
- Pumped hydro storage
- Lithium-ion batteries

What is the Purpose of a Technology Catalogue?

The purpose of a TC is to have a common point of reference for energy technology data used for national and regional energy planning by the government, the TSO and other authorities. The TC is publicly available, thus it can be used by consultancies, private energy companies, universities and other organisations. The benefit of a common point of reference is that the assumptions behind the analyses are well known, hence the discussion of system analyses can rise above data input and focus on more interesting issues. Other sources of technology data already exists, as for instance IEA, IRENA and BNEF. However, they do not always include all the needed data; the assumptions behind the estimates are not aligned across the institutions; and, they do not necessarily represent local characteristics such as low/high wind speeds, legal/environmental restrictions and regulatory incentives to deviating solutions.

The TC strives for comprehensive and consistent data sets of all relevant technologies, for which both technical and economic parameters are evaluated based on the same assumptions. Moreover, the owner of the TC can choose to update existing technologies and include new technologies whenever deemed necessary.

Who publishes the Technology Catalogue?

The owner of the TC in Vietnam is EREA, who is also the main user. EREA publishes the TC, which is developed by a consultancy firm. Importantly, many stakeholders have delivered input to the TC, as described below.

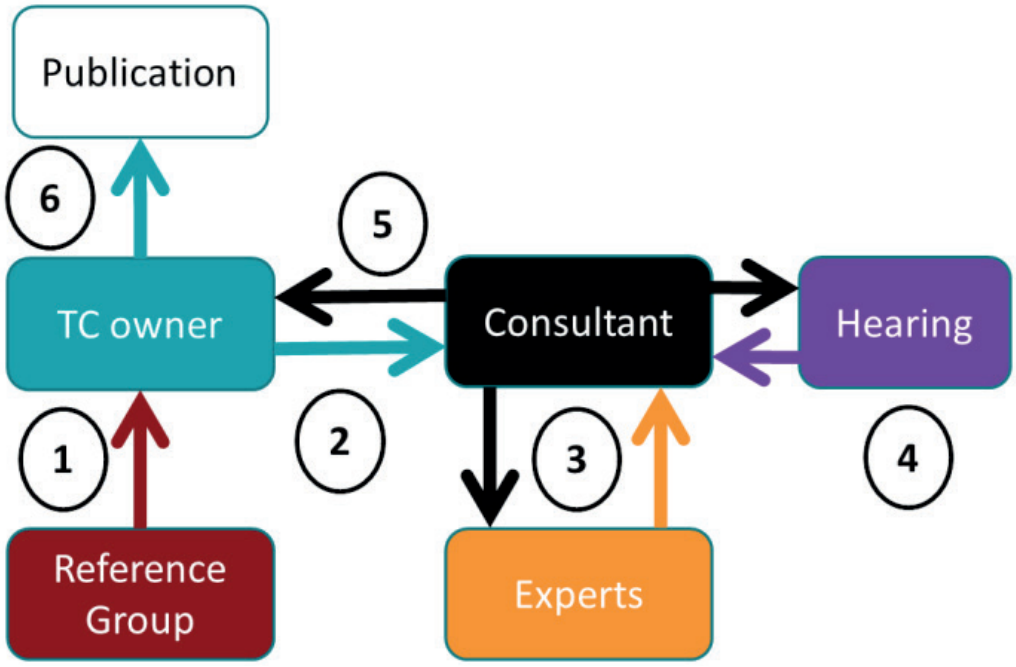

Figure 1: The process of forming and updating the Technology Catalogue

How is the Technology Catalogue formed?

The forming of the TC is a long and inclusive process as described in Figure 1. In order to establish the TC as a common point of reference in the energy sector, it needs to be recognized by the sector as valid. Therefore a reference group is formed consisting of energy system experts and TC users. The reference group advises the TC owner on how to improve the TC (1). Furthermore, all relevant stakeholders are invited to one or more workshops (3) where the draft updates are presented and discussed. Afterwards there will be a written public hearing (4) of the updated TC where all relevant stakeholders once again are encouraged to give input to the TC.

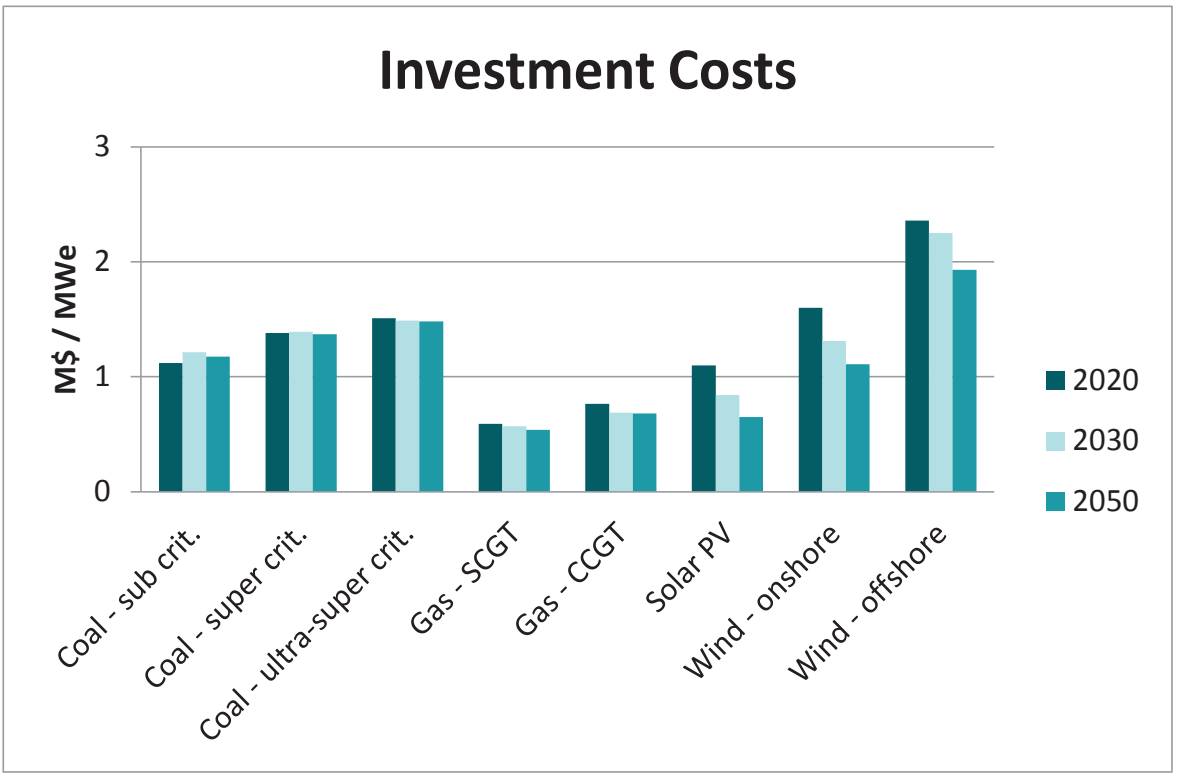

Figure 2: Projected investment costs per technology for the years 2020, 2030 and 2050

Examples of content

Figure 3 shows the data sheet for subcritical coal fired power plants. It is divided in technical-, ramping-, environmental- and financial data. The data covers both the near future (2020) and the expected development in a far future perspective (2050). A range of uncertainty is included in 2020 and 2050 do illustrate the uncertainty and to offer alternative parameters e.g. to be used in sensitivity analyses. Since the data sheet is generic for all technologies, there are some parameters which are not relevant for some technologies, in this case capacity factors are not described for dispatchable technologies. Thermal power plants can be contracted for a number of full load hours but since the TC only describes the technology data, these data are not included here.

Technology	Subcritical coal power plant								
	2020	2030	2050	Uncertainty (2020)		Uncertainty (2050)		Note	Ref
Energy/technical data				Lower	Upper	Lower	Upper		
Generating capacity for one unit (MWe)	600	600	600	100	650	100	650		1
Generating capacity for total power plant (MWe)	1,200	1,200	1,200	100	1,500	100	1,500		1
Electricity efficiency, net (%), name plate	37	37	37	30	38	33	39		1;2;3
Electricity efficiency, net (%), annual average	35	35	36	29	37	32	38		1;2;3
Forced outage (%)	7	5	3	5	20	2	7	A	1
Planned outage (weeks per year)	6	5	3	3	8	2	4	A	1
Technical lifetime (years)	30	30	30	25	40	25	40		1
Construction time (years)	3	3	3	2	4	2	4		1
Space requirement (1000 m^2/MWe)	-	-	-	-	-	-	-		
Additional data for non thermal plants									
Capacity factor (%), theoretical	-	-	-	-	-	-	-		
Capacity factor (%), incl. outages	-	-	-	-	-	-	-		
Ramping configuration									
Ramping (% per minute)	1	3.5	3.5	1	4	2	4	B	1
Minimum load (% of full load)	67	25	20	25	70	10	30	A	1
Warm start-up time (hours)	5	3	3	1	5	1	5	B	1
Cold start-up time (hours)	10	8	8	5	10	5	12	B	1
Environment									
PM 2.5 (mg per Nm^3)	70	70	70	50	150	20	100	A;E	2;4
SO_2 (degree of desulphuring, %)	86	80	95	73	95	73	95	A	2;4
NO_X (g per GJ fuel)	152	150	38	263	263	263	263	A;C	2;4
Financial data									
Nominal investment (M$/MWe)	1.12	1.21	1.18	0.80	1.29	0.80	1.29	D;G	1;3
- of which equipment (%)									
- of which installation (%)									
Fixed O&M ($/MWe/year)	39.400	38.200	37.000	29.600	49.300	27.800	46.300	F	1;3
Variable O&M ($/MWh)	0,70	0,12	0,12	0,09	0,70	0,09	0,15	F	1;3
Start-up costs ($/MWe/start-up)	300	110	110	50	300	50	200		5

Figure 3: Example of data sheet from the Technology Catalogue. The sheet provides an insight to expected development on coal power plants from 2020-2050.

Background Information

The TC is developed in cooperation between EREA and The Danish Energy Agency (DEA), holding many years of experience of developing TCs. The TC is part of a larger cooperation under the Danish Energy Partnership Programme, in which the end product will be an Energy Outlook Report for Vietnam illustrating cost-efficient pathways for a green transition of the energy system towards 2050.

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.

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

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