TVO

Pocket Guide 2012

Teollisuuden Voima Oyj

Company

Teollisuuden Voima Oyj (TVO) is a non-listed public company founded in 1969 to produce electricity for its shareholders at cost price. TVO's nuclear power plant produces about one sixth of the electricity consumed in Finland. Electricity is generated at the two Olkiluoto nuclear power plant units Olkiluoto 1 and Olkiluoto 2 (OL1 and OL2) in Eurajoki and at the Meri-Pori coal-fired power plant in Pori. A one-megawatt (MW) wind power plant also produces electricity in Olkiluoto. A new unit, Olkiluoto 3 (OL3), is under construction. In 2011 Olkiluoto 4 project proceeded to the bidding and engineering phase.

We support wellbeing of the society by producing electricity to Finnish people through a safe, economical and environmentally benign process. Our vision is to be an acknowledged Finnish nuclear power company. Our operation is based on our vision, ethnical principles and values, and the high level safety culture that we maintain. Our safety culture consists of practices, procedures and attitudes. The promotion of safety culture is one of our most important tasks.

The Olkiluoto nuclear power plant produced ca. 14.2 TWh electricity in 2011. This was about one sixth of all electricity used in Finland. TVO´s share of the electricity produced at the Meri-Pori coal-fired plant was ca. 0.8 TWh. The production of the wind power plant totaled 0.002 TWh.

The electrical output of OL1 and OL2 is 880 MW each. TVO´s share of the electricity produced at the Meri-Pori coal-fired power plant is 45%.

COMPANY SHAREHOLDERS AND HOLDINGS 31 DECEMBER, 2011

HOLDING %	A SERIES	B SERIES	C SERIES	TOTAL
EVP Energia Oy	6.5	6.6	6.5	6.5
Fortum Power and Heat Oy	26.6	25.0	26.6	25.8
Karhu Voima Oy	0.1	0.1	0.1	0.1
Kemira Oyj	1.9	-	1.9	1.0
Oy Mankala Ab	8.1	8.1	8.1	8.1
Pohjolan Voima Oy	56.8	60.2	56.8	58.5
	100.00	100.00	100.00	100.00

The A series shares entitle the shareholders to the electricity generated by the current plant units, the B series shares to the electricity by the new plant unit OL3, and the C series shares to the electricity generated by the Meri-Pori coal-fired power plant.

The nuclear power generated by TVO produces wellbeing to ca. 140 municipalities through direct shareholders. These municipalities own shares in the more than 50 energy companies, which distribute electricity from Olkiluoto throughout Finland.

Industry shareholders in TVO:

Kemira Oyj
(incl. Pension Fund)
Oy Metsä-Botnia Ab
M-Real Oyj
Myllykoski Oyj
Outokumpu Oyj
Rautaruukki Oyj
Stora Enso Oyj
UPM-Kymmene Oyj
Kumera Oy
Yara Suomi Oy
(incl. Pension Fund)

Electricity and energy company shareholders in TVO:

Helsingin Energia
Vantaan Energia
Kymenlaakson Sähkö
Kerava Energia
Mäntsälän Sähkö
Nurmijärven Sähkö
Porvoon Energia
Sallila Energia
Paneliankosken Voima
Lammaisten Sähkö
Leppäkosken Sähkö
Vatajankosken Sähkö
Lankosken Sähkö
Pori Energia
Rauman Energia
Kymenlaakson Sähkö
Suur-Savon Sähkö
Lahti Energia
Haminan Energia
Kaakon Energia
Imatran Seudun Sähkö
KSS Energia
Pohjois-Karjalan Sähkö
Etelä-Savon Energia
Savon Voima
Alajärven Sähkö
Järviseudun Sähkövoima
Lehtimäen Sähkö
Korpelan Voima
Kokkolan Energia
Kruunupyyn kunta
Pietarsaaren kaupunki
Seinäjoen Energia
Nykarleby Kraftverk
Vaasan Sähkö
Vetelin Sähkölaitos
Vimpelin Voima
Hiirikosken Energia
Ääneseudun Energia
Iin Energia
Oulun Seudun Sähkö
Oulun Energia
Rovakaira
Torniojokilaakson Sähkö

Important dates for Teollisuuden Voima Oyj

23.1.1969 Teollisuuden Voima Oy was founded by 16 companies.
31.1.1974 The Ministry of Trade and Industry granted a construction license for Olkiluoto 1 (former TVO I) pursuant to the Atomic Energy Act.
1.2.1974 The construction of the OL1 started.
12.8.1974 OL1's foundation stone was laid.
4.8.1975 The Ministry of Trade and Industry granted construction license for Olkiluoto 2 (former TVO II) in accordance with the Atomic Energy Act.

Important dates for Teollisuuden Voima Oyj

28.8.1975 Construction of OL2 unit was started.

6.7.1978 The Council of State granted an operation licence for OL1.

2.9.1978 OL1 was connected to the national grid for the first time. The power plant unit achieved full capacity for the first time in January 8, 1979.

1.9.1979 The Council of State granted an operation licence for OL2.

10.10.1979 OL1 was introduced into commercial operation.

18.2.1980 OL2 was connected to the national grid for the first time. The power plant unit achieved full capacity for the first time in November 11, 1980.

1.7.1982 OL2 was introduced into commercial operation.

17.5.1984 The Council of State granted permission for increased power level for both power plant units.

29.9.1987 Spent fuel was transferred for the first time from the plant to the Interim Storage Facility for Spent Fuel (KPA-Store).

29.3.1988 Agreement on the participation with a 45 per cent share in the Meri-Pori coal-fired power plant project was signed.

15.12.1988 The Council of State granted an operation licence for 10 years for both power plant units in accordance with the Nuclear Energy Act.

29.9.1989 Total production of Olkiluoto nuclear power plant reached 100 TWh.

16.3.1990 Training simulator was taken into use at Olkiluoto.

8.5.1992 The first waste transfer to the low and medium-level nuclear waste repository (VLJ) was made.

26.9.1993 Meri-Pori coal-fired power plant produced electricity to the national grid for the first time.

1.1.1996 The company taking care of the final disposal of the spent nuclear fuel of its shareholders Olkiluoto and Loviisa nuclear power plants. Posiva Oy started operation.

19.3.1998 Total production of Olkiluoto nuclear power plant reached 200 TWh.

20.8.1998 The Council of State granted a new operation licence for both power plant units and the KPA-store as well as for the low and medium-level waste interim storages.

1998 Modernization programme of the power plant units, which lasted four years, was completed. After the modernization, the power level is 840 MW it is 18.3 per cent higher than the earlier nominal power level.

15.11.2000 Application for Decision in principle concerning the new nuclear power plant unit was submitted to the Council of State.

18.5.2001 The Finnish Parliament ratified the Decision in principle made by the Council of State supporting Posiva Oy to construct a final repository for spent nuclear fuel at Olkiluoto in Eurajoki.

19.7.2001 The Finnish Environment Institute registered TVO in the EMAS system (Eco Management and Audit Scheme).

24.5.2000 The Finnish Parliament ratified the Decision in principle made 17th January 2002 by the Council of State supporting the construction of a new nuclear power plant unit either at Olkiluoto, Eurajoki or at Hästholmen, Loviisa.

16.10.2003 Olkiluoto was chosen for the location site for the new power plant unit.

18.12.2003 TVO's Board of Directors decided to invest in the new nuclear power plant unit Olkiluoto 3 (OL3). The Company signed a contract for the construction of a pressurized water reactor plant unit of some 1,600 MW with the consortium comprising AREVA NP GmbH, AREVA NP SAS and Siemens AG.

16.2.2004 The excavation work at the OL3 site was started.

15.11.2004 TVO´s wind power unit at Olkiluoto was consecrated.

17.2.2005 The Council of State granted the construction licence for the OL3.

26.4.2005 Total electricity production of OL1 and OL2 reached 300 TWh.

12.9.2005 The OL3 foundation stone was laid.

31.1.2006 Olkiluoto´s new Visitor Center was consecrated.

1.6.2006 Modernization programme of the Olkiluoto power plant units was completed. After the modernization the nominal power level is 860 MW.

19.11.2007 The Olkiluoto 100 MW gas turbine plant jointly constructed by Fingrid Oyj and TVO was inaugurated.

31.12.2007 TVO has been registered in the trade register as a public company. The official name of the company is Teollisuuden Voima Oyj.

25.4.2008 TVO filed to the Government an application for a decision-in-principal to construct a fourth nuclear power plant unit (OL4) at Olkiluoto. Simultaneously Posiva Oy filed an application-in-principal to expand its for spent fuel for OL4.

2.9.2008 The anniversary of 30 years of nuclear energy production at Olkiluoto took place. During the three decades Olkiluoto has produced 350 TWh of electricity.

May 2009 The Association for Finnish Work awarded the Key Flag, a symbol of Finnish know-how, to electricity generated by TVO.

11.11.2009 Olkiluoto 3 site reached rooftop height.

18.2.2010 Olkiluoto 2 plant unit has produced electricity to the national grid for 30 years.

1.7.2010 The Finnish Parliament ratified the Government's favourable decision-in-principles on the construction of the new Olkiluoto 4 (OL4) plant unit in Olkiluoto, Eurajoki.

31.12.2010 The total electricity production of TVO's nuclear power plant units OL1 and OL2 amounted to 14,144 TWh (billion kilowatt hours), which is about one sixth of the electricity consumed in Finland. The overall production of the plan units during their service life exceeded 380 TWh.

2011 In 2011 Olkiluoto 4 project proceeded to the bidding and engineering phase.

2011 The largest ever annual maintenance and modernization project were completed in Olkiluoto. As a result of the upgrades, the rated net electric output of the plant units was increased to 880 MW.

KEY FIGURES

	2011	2010
Electrical output TWh		
Olkiluoto	14.2	14.1
Olkiluoto wind power plant	0.002	0.001
Olkiluoto gas turbine plant	0.0003	0.001
Meri-Pori	0.8	1.6
Turnover (EUR million)	347	355
Loan portfolio (EUR million)	2.922	2.684
Investments (EUR million)	314	339
Deposits in the State Nuclear Waste Management Fund (TVO's share, EUR million)	1.145	1.123
Personnel, average	813	798

Nuclear Waste Management

The Company funds the Finnish state Nuclear Waste Management Fund. The Ministry of Trade and Industry confirmed the Company´s end-of-year liability for nuclear waste management at EUR 1,145 (1,086). TVO´s share corresponds to the future costs of the management of waste generated by the end of 2011.

Olkiluoto Nuclear Power Plant

The nuclear power plant of Teollisuuden Voima Oyj is located at Olkiluoto, Eurajoki, on the west coast of Finland. There are two existing nuclear power plant units on the site, Olkiluoto 1 (OL1) and Olkiluoto 2 (OL2). The plant units were delivered by the Swedish AB ASEA-ATOM (nowadays Westinghouse Atom Electric Company).

The third unit, Olkiluoto 3 (OL3), is under construction. It is supplied by Consortium of AREVA NP GmbH, AREVA NP SAS and Siemens AG.

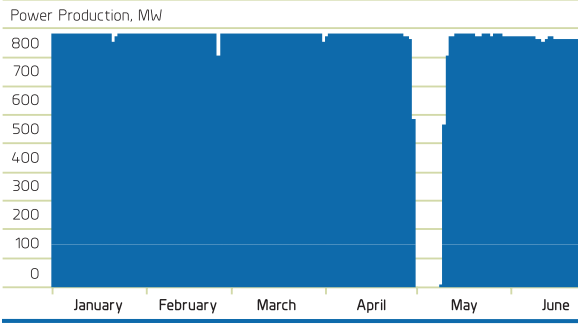
Electrical output of Olkiluoto 1 and Olkiluoto 2 in 2011

In 2011 the Olkiluoto 1 unit produced 7.3 TWh of electricity and the capacity factor was 94,8 per cent.

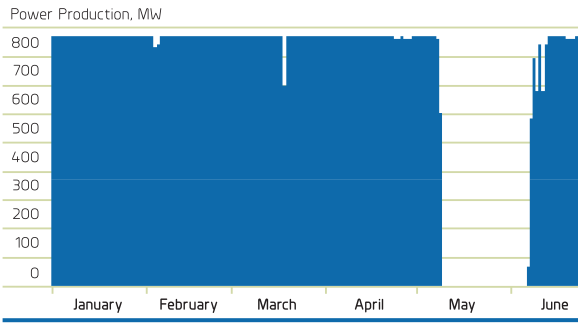
In 2011 the Olkiluoto 2 unit produced 6.9 TWh of electricity and the capacity factor was 90,9 per cent.

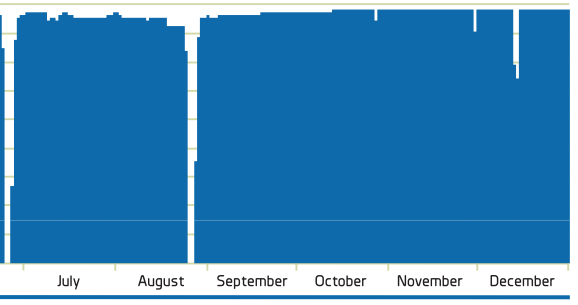
The total production of the Olkiluoto nuclear power plant reached 100 TWh on 29.9.1989. A production volume of 200 TWh was reached on 19.3.1998 and 300 TWh on 26.4.2005. On January 13th 2012 OL1 unit reached 200 TWh.

OLKILUOTO 1



OLKILUOTO 2




July
August
September
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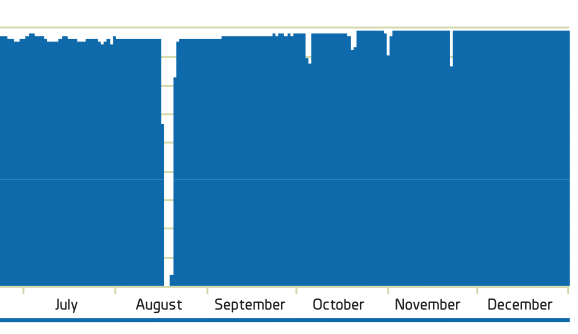
December


July
August
September
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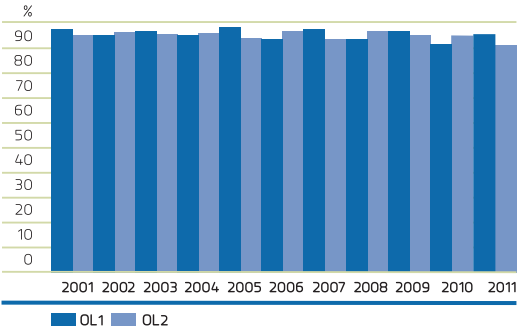
CAPACITY FACTORS OF OL1 AND OL2 UNITS

IN 2001–2011



OUTAGE LENGHTS AND COSTS OF OLKILUOTO NPP

IN 2001–2011

YEAR	DURATION, DAYS OL1	OL2	COSTS OL1 + OL2, EUR MILLION
2001	8	15	13
2002	13	8	15
2003	10	14	15
2004	16	9	14
2005	7	21	15
2006	22	8	15
2007	9	17	12
2008	20	8	13
2009	8.5	16.5	17
2010	26.5	11.5	17
2011	9	29	17

Technical data on Olkiluoto 1 and Olkiluoto 2 NPP*

Electric output, net, MW	880
Reactor thermal power, MW	2,500
Number of fuel assemblies	500
Total fuel amount, tU	86-90
Average power density, kW/kgU	24-25
Number of control rods	121
Reactor pressure vessel	
- inner diameter, mm	5,540
- inner height, mm	20,593
Reactor pressure, bar	70
Steam flow, kg/s	1,260
Turbine rated speed, rpm	3,000
Generator, water cooled	
- OL1, MVA	950
- OL2, MVA	1,100
Cooling water flow, m^3/s	38
Volume of plant buildings	
- OL1, m^3	483,000
- OL2, m^3	475,000
Containment	
- design pressure, bar	4.7
- gas volume, m^3	7,375
- water volume, m^3	2,700

* The figures are the same for both plant units, except for those separately defined.

Key figures of Olkiluoto 3

Electrical output, net, MWe	about 1,600
Reactor thermal power, MW	4,300
Total efficiency %	over 37
Annual electricity generation, TWh	ca. 13
Reactor pressure, bar	154
Total fuel weight, t	128
Annual fuel consumption, t	ca. 32
Volume of plant buildings, m^3	950,000
Reactor pressure vessel, height, m	13
Reactor containment building, height, m	63

NUCLEAR POWER PLANTS IN THE WORLD

AT THE END OF 2010

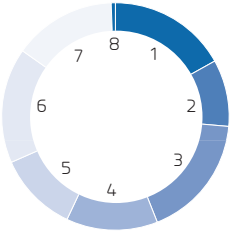
COUNTRY	REACTORS IN OPERATION		REACTORS UNDER CONSTRUCTION	
	Number of Units	Total Capacity MW(e)	Number of Units	Total Capacity MW(e)
Argentina	2	935	1	745
Armenia	1	376		
Belgium	7	5,943		
Brazil	2	1,901	1	1,405
Bulgaria	2	1,906		
Canada	17	12,044	3	2,190
China	15	11,881	26	27,640
Czech Rep.	6	3,764		
Finland	**4**	**2,741**	**1**	**1,700**
France	58	63,130	1	1,720
Germany	9	12,003		
Hungary	4	1,880		
India	20	4,385	6	4,600
Iran, Isl. Rep.	1	915		
Japan	51	44,642	2	2,756
Korea Rep.	21	18,785	5	5,800
Mexico	2	1,600		
Netherlands	1	485		
Pakistan	3	725	1	340
Romania	2	1,310		
Russia	33	24,164	9	7,960
Slovakia	4	1,816	2	880
Slovenia	1	696		
South Africa	2	1,800		
Spain	8	7,448		
Sweden	10	9,399		
Switzerland	5	3,252		
Taiwan, CN	6	4,927	2	2,700
UK	18	10,745		
Ukraina	15	13,168		
USA	104	101,607	1	1,218
Worldwide	434	370,373	61	61,654

Source: WNA, January 2012
While drawing this table there was an active discussion about the future of the Japanese reactors due to the Fukushima accident in 2011. The table used as a reference has not been altered.

Electricity in Finland

ELECTRIC ENERGY SUPPLY IN 2011

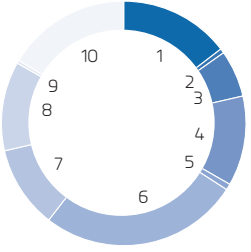
TOTAL 84.4 TWH



1	TVO	**16.9%**
2	Other nuclear power	**9.5%**
3	Back pressure (district heating)	**17.6%**
4	Back pressure (industry)	**13.0%**
5	Condensing etc.	**11.4%**
6	Net import	**16.4%**
7	Hydro power	**14.6%**
8	Wind power	**0.6%**

ELECTRIC ENERGY SUPPLY BY SOURCES IN 2011

TOTAL 84.4 TWH



1	Hydro power	**14.6%**
2	Wind power	**0.6%**
3	Peat	**6.2%**
4	Bio fuel	**11.9%**
5	Waste fuels	**0.8%**
6	Nuclear power	**26.4%**
7	Natural gas	**10.9%**
8	Coal	**11.8%**
9	Oil	**0.4%**
10	Net import	**16.4%**

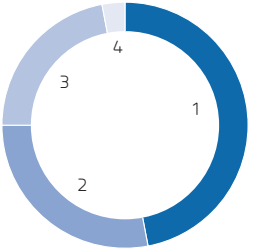
Total electricity consumption 2011

The total electricity consumption was 84.4 TWh in Finland in 2011. Industry accounts for 48% of electricity consumption in Finland. Electricity is needed, for example, for driving processes and equipment, lightning, heating and communication. Households use electricity mainly for refrigeration devices and heating.

As with renewable energy sources such as hydropower, wood and wind nuclear power provides a way to produce electricity with no carbon dioxide emissions to boost the greenhouse effect. Nuclear power is a very competitive alternative to produce electricity.

TOTAL ELECTRICITY CONSUMPTION 2011

TOTAL 84,4 TWH

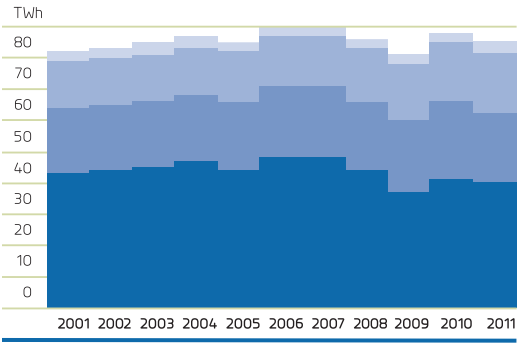


1	Industry	**48%**
2	Households and agriculture	**27%**
3	Service and construction	**22%**
4	Losses	**3%**

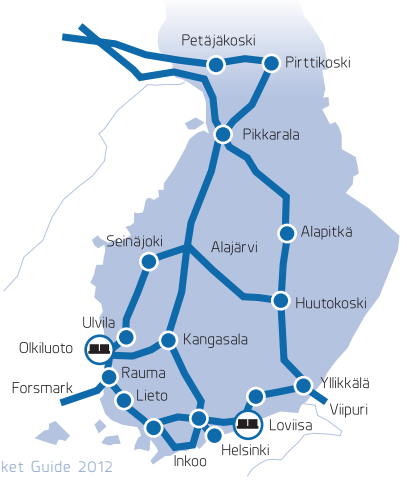
Source: Finnish Energy Industries, 2012 January

TOTAL CONSUMPTION OF ELECTRICITY IN FINLAND

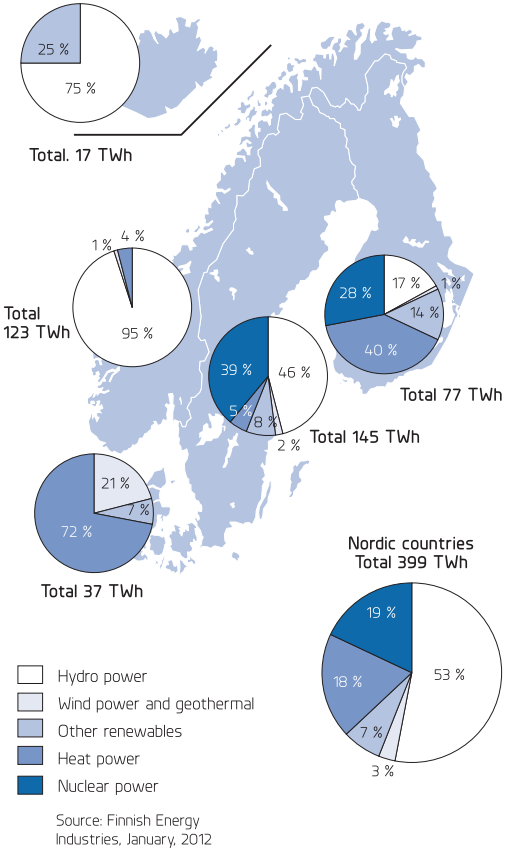
IN 2001–2011, TWH



The national 400 kV grid of Finland



Electricity generation in the Nordic Countries 2010 (%)



Source: Finnish Energy Industries, January, 2012

Glossary

ALARA
(As Low As Reasonably Achievable): An internationally used principle regulating the amount of radiation doses at nuclear power plants.

EPR
European Pressurized water Reactor

Euratom
A unit of the EU Commission that supervises nuclear material.

IAEA
International Atomic Energy Agency.

WANO
World Association of Nuclear Operators.

INES
(International Nuclear Event Scale): A seven-level scale used internationally to depict the seriousness of accidents and incidents at nuclear power plants. The lower levels (1–3) depict incidents that have weakened plant safety and the upper levels (4–7) accidents that could cause emissions into the environment that require protective measures against radiation.

Boiling water reactor, BWR
A light-water reactor in which water used as the coolant boils as it passes through the reactor core. The steam generated rotates the turbine.

Pressurized water reactor, PWR

A light-water reactor with such a high reactor pressure that water used as the coolant does not boil in the reactor. The hot water is conducted from the reactor to a steam generator in which the water in the secondary circuit evaporates and the steam is led to rotate the turbine.

Capacity factor

The capacity factor is the energy produced in a year by a power plant as a percentage of the energy it would have produced had it been operating at full capacity for the entire year.

Megawatt, MW

A unit of power. One megawatt equals to 1,000 kilowatts alias 1,000,000 watts.

Gigawatt, GW

A unit of power. One gigawatt equals to one million kilowatts.

Terawatt-hour, TWh

A unit of energy. One terawatt-hour equals to one billion kilowatt hours.

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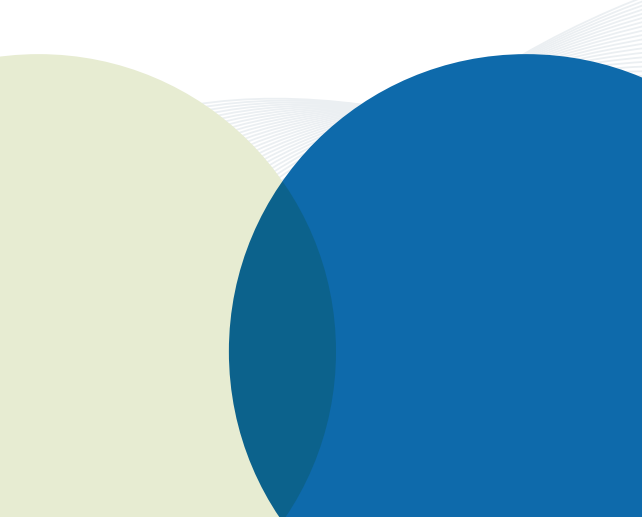

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