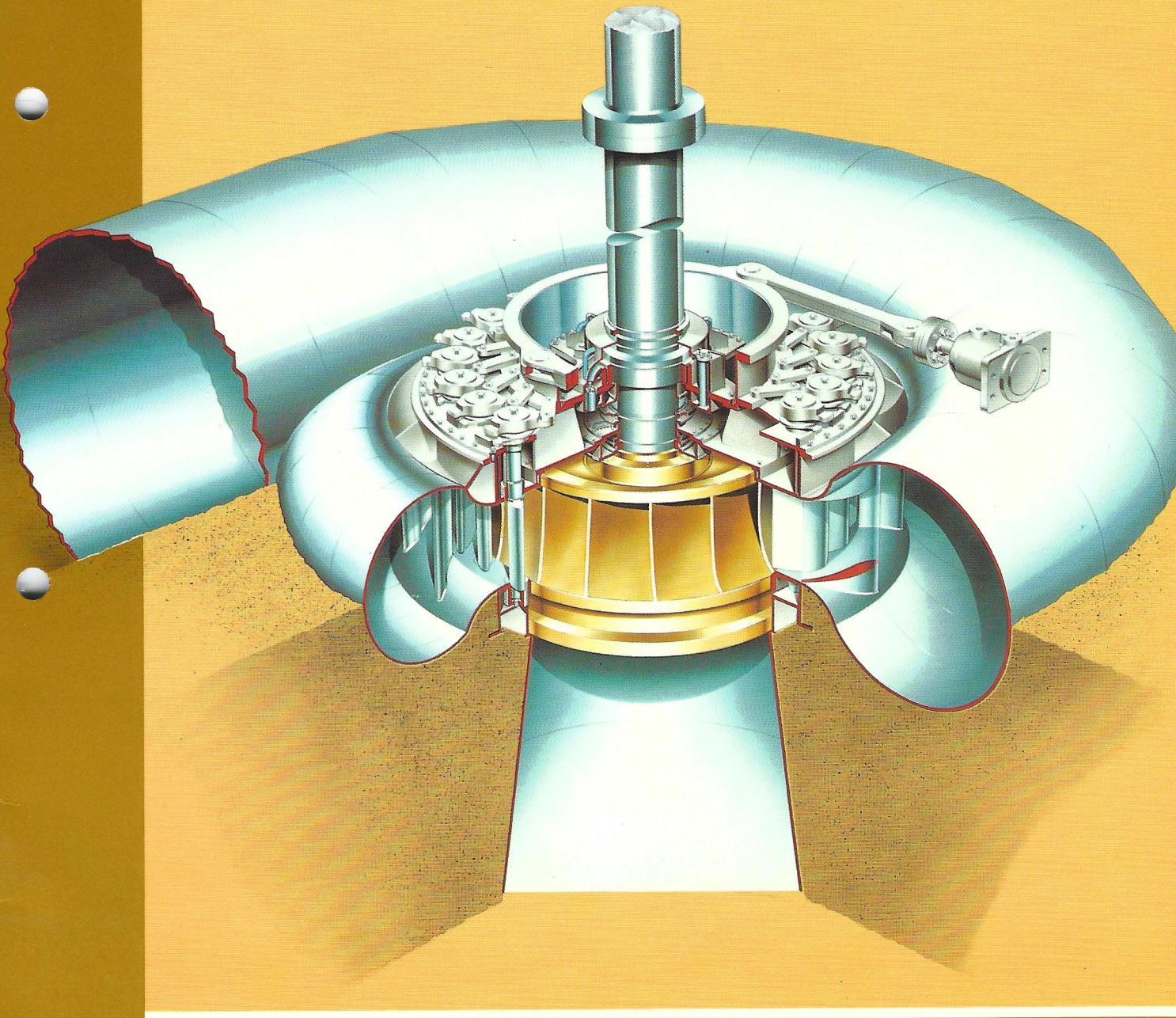


Kvaerner Hydro

KVÆRNER

FRANCIS TURBINES



R E F E R E N C E L I S T

KVÆRNER

FRANCIS TURBINES

Kvaerner Hydro is the organisation comprising those divisions within Kvaerner Brug A/S of Norway, which are concerned with Hydro Electric Power and Water Control applications and its subsidiaries Sørumsand Verksted A/S in Norway, NOHAB-KMW Turbin AB in Sweden, Kvaerner Hydro Power Inc. in the U.S.A. and Boving & Co. Limited and Boving Newton Chambers Ltd., in the United Kingdom.

Kvaerner Brug is one of the main companies of the privately owned Kvaerner Industrier A/S, which is amongst the largest industrial groups in Norway, with activities ranging from oil and gas to fish processing and environmental protection as well as shipping and shipbuilding.

The operation of all the Kvaerner Hydro companies is closely co-ordinated and the technology and experience of each is available to all. Products available include:

Hydro turbines	Pelton, Francis, Reversible Pump, Kaplan, Propeller and Bulb.
Valves	Spherical, Butterfly and Flow Control Valves.
Governors	All electro-hydraulic types
Penstocks	Surface mounted or covered, tunnel and pressure shaft linings, bifurcations and trifurcations.

Gates All Hydro Power and Water Control types.

Trash Rack
Cleaning Equipment Various types and sizes.

Fishway Services Fish Passes and Fish Gates

Services, Repair,
Refurbishment and
Upgrading

Training
All services associated with hydro installations.

Since 1848, when our first turbine was delivered, Kvaerner Hydro companies have delivered thousands of hydro turbines, totalling over 80,000 MW in output. Continuous improvement and development enables us to offer hydro turbines of all types and associated mechanical equipment of the most modern design for the smallest as well as the largest projects.

Hydraulic and mechanical research, development and design is carried out in our modern laboratories and by experienced engineers using the latest computer techniques.

Brochures giving descriptions of our laboratory facilities and all of our products are available on request.

FRANCIS TURBINES

We have been designing and manufacturing Francis type water turbines since 1897 and since this early beginning have improved and developed our designs until we are now one of the world leaders in the production of this type of water turbine.

The brochure on our Hydraulic Turbine Laboratory illustrates our excellent facilities for model testing Francis turbines.

The mechanical and hydraulic design of Francis turbines has proceeded in parallel. We are confident that we have sufficient knowledge and experience to satisfy all customer requirements for this type of turbine.

This reference list gives the main design data of all Francis turbines with an output of more than 10MW ordered since 1946 which have been designed and/or manufactured completely or partly by ourselves.

Column headings in the table refer to:

Year: The year in which the order was received.
 Head: Rated net head.
 Output: Maximum power developed during continuous operation.
 Runner diameter: The smallest inside diameter of the band.

* Denotes a joint project order in collaboration with another manufacturer.

SOME NOTABLE EARLY INSTALLATIONS

Year	Power Station	Country	Head m	Output MW	Notes
1907	Trollhättan	Sweden	31	9.2	Our first big double runner horizontal shaft Francis turbines.
1919	Rånåsfoss	Norway	12.3	8.8	Among the biggest double runner horizontal shaft Francis turbines in the world.
1925	Imatra	Finland	24	20	Vertical shaft Francis turbines for large output.
1933	Krångede	Sweden	57.7	34.8	Vertical shaft high head Francis turbines for large output.
1935	Untra	Sweden	14	11.4	The biggest double runner horizontal shaft Francis turbine in the world.
1945	Hjälta	Sweden	82	66.5	Vertical shaft Francis turbines for 87.6m max. head.

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1946	North of Scotland Hydro-Electric Board	Clunie, Scotland	3	50.3	21.4	214.0	2.60	
1946	State Hydro-Electricity Department, Christchurch	Waitaki, New Zealand	1	21.3	16.9	125.0	3.75	
1946	Hjälta AB	Hjälta 3, Sweden	1	82.0	66.3	187.5	3.02	
1946	Nord-Trøndelag El.v	Fiskumfoss, Norway	1	34.3	13.6	187.0	2.82	
1946	Vinstra Kraftselskap	N. Vinstra, Norway	1	420.0	50.0	500.0	1.10	
1947	Compañía Anónima Mengemor de Electricidad	Tranco de Beas, Spain	2	97.7	16.7	375.0	1.45	
1947	Swedish State Power Board	Harsprånget, Sweden	2	105.0	98.0	167.0	3.60	
1947	V/O Machinoimport	Nr.1468682, USSR	2	285.0	57.5	428.0	1.65	
1947	North of Scotland Hydro-Electric Board	Errochty, Scotland	3	160.0	26.1	428.0	1.56	
1947	State Electricity Commission of Victoria	Kiewa 4, Australia	3	186.7	15.8	600.0	1.08	
1947	V/O Machinoimport	Narjad, USSR	2	60.3	17.5	187.5	2.27	
1947	Bergenshalvøens komm kr.v	Fosse, Norway	1	86.0	19.2	300.0	1.83	
1947	Swedish State Power Board	Porjus 9, Sweden	1	55.0	27.57	214.0	2.05	
1947	Aust-Agder kr.v.	Dynjanfoss, Norway	3	75.0	11.0	375.0	1.52	
1948	Tåsans Kraft AB	Tåsan, Sweden	1	261.0	37.2	500.0	1.42	
1948	Swedish State Power Board	Kilforsen, Sweden	3	95.0	89.2	167.0	3.60	
1948	Fuerzas Eléctricas del Noroeste	Los Peares, Spain	3	93.3	55.0	214.0	2.60	
1948	Iberduero S.A.	Salto de Castro, Spain	2	38.0	43.4	107.0	4.40	
1948	Sunnhordland Kraftlag L/L	Blåfalli, Norway	1	325.0	16.9	600.0	0.88	
1948	Hydro-Electric Commission Tasmania	Tungatinah, Australia	3	285.0	26.1	600.0	1.14	
1948	Voss Komm. El.v	Hodnaberg, Norway	1	300.0	14.7	600.0	0.88	
1949	North of Scotland Hydro-Electric Board	Quoich, Scotland	1	83.5	20.9	300.0	1.85	
1949	State Electricity Commission of Victoria	Kiewa 4, Australia	1	186.7	15.8	600.0	1.08	
1949	Hydro Electric Commission Tasmania	Tungatinah, Australia	1	290.0	26.1	600.0	1.14	
1950	Salto del Sil S.A.	San Esteban, Spain	4	103.0	66.8	214.0	2.80	
1950	Sogsvirkjunin (The Hydro-El. Developm. of Sog)	Irafoss-Kistufoss, Iceland	2	36.8	16.2	187.5	2.55	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1950	New Zealand Hydro Electricity Department, Christchurch	Waitaki, New Zealand	2	21.4	17.1	125.0	3.75	
1950	Statkraft	Ranaverkene, N. Rössåga Norway	3	226.0	36.8	428.0	1.42	
1950	Oslo Lysverker	Hol I, Norway	2	350.0	49.3	500.0	1.28	
1950	Vest-Agder E. verk	Skjerka, Norway	1	320.0	16.9	600.0	0.88	
1950	Vinstra Kraftselskap	Nedre Vinstra, Norway	1	420.0	50.0	500.0	1.10	
1951	AB Electro-Invest	Jajce I, Yugoslavia	2	91.5	26.5	300.0	1.96	
1951	Krångede AB	Ramsele, Sweden	3	74.0	55.5	187.5	3.00	
1951	State Electricity Commission of Victoria	Eildon, Australia	1	71.6	61.3	150.0	3.40	
1951	State Electricity Commission of Victoria	Eildon, Australia	1	23.5	11.3	150.0	3.40	
1951	Machinoimport V/O	Paleiozersk, USSR	2	28.0	10.22	167.0	2.60	
1951	Trondheim E. Verk	Svean 3, Norway	1	50.0	11.0	300.0	1.54	
1951	Swedish State Power Board	Harsprånget, Sweden	2	105.0	97.8	167.0	4.10	
1952	Hydro Electric Commission of Tasmania	Tungatinah, Australia	1	290.0	26.1	600.0	1.14	
1952	Krångede AB	Storfinnforsen, Sweden	3	48.5	34.6	150.0	3.30	
1952	Swedish State Power Board	Porjus 3, Sweden	1	54.0	17.0	250.0	1.70	
1952	Sunnhordland Kraftlag L/L	Blåfalli 2, Norway	1	325.0	16.9	600.0	0.88	
1952	Vinstra Kraftselskap	Nedre Vinstra, Norway	1	420.0	50.0	500.0	1.13	
1953	Hissmofors AB	Hissmofors 4, Sweden	1	18.0	15.1	125.0	2.80	
1953	Harrsele AB	Harrsele, Sweden	3	52.6	70.2	125.0	4.15	
1953	Blåsjön Kraftaktiebolag	Blåsjön, Sweden	1	82.0	63.7	214.0	2.85	
1953	Stockholms Superfosfat Fabriks AB	Laforsen, Sweden	2	32.4	15.08	150.0	2.85	
1953	Vest-Agder El.v	Håverstad, Norway	1	79.0	22.8	300.0	21.30	
1954	Iberduero S.A.	Salto de Castro, Spain	1	38.0	43.4	107.0	4.40	
1954	North of Scotland Hydro-Electric Board	Shin, Scotland	2	76.2	13.4	375.0	1.45	
1954	Central Electricity Generating Board	Dolgarrog, Wales	1	236.0	10.4	750.0	0.84	
1954	Norsk Hydro-Elektrisk Kvaestofaktieselskab	Skafså 2, Norway	1	89.4	15.56	375.0	1.55	
1954	V/O Machinoimport	USSR	1	44.85	17.65	187.5	1.70	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1954	Kristiansand E. verk	Steinfossen, Norway	1	54.5	23.5	214.0	2.26	
1954	Nord-Trøndelag E. verk	Fiskumfoss, Norway	1	34.3	13.6	187.0	2.76	
1954	Oslo Lysverker	Djupedal (Hol 2), Norway	1	46.4	27.9	166.0	3.09	
1954	Oslo Lysverker	Kleivi (Hol 3), Norway	2	94.0	30.5	300.0	2.14	
1954	Tafjord Kraftselskap	Kaldhuseter, Norway	1	315.0	16.2	600.0	0.88	
1955	Nord-Trøndelag El-verk	Aunfoss, Norway	2	27.0	14.0	150.0	2.90	
1955	Balmi Kraftlag A/S	Daja, Norway	2	149.0	12.6	500.0	1.1	
1955	Kristiansand E. verk	Steinfossen, Norway	1	54.5	23.5	214.0	2.26	
1955	Statkraft	Ranaverkene, N. Rössåga Norway	1	226.0	36.8	428.0	1.42	
1955	Opplandskraft K/L	Øvre Vinstra, Norway	2	320.0	67.6	428.0	1.56	
1955	Vest-Agder E. verk	Skjerka, Norway	1	320.0	16.9	600.0	0.88	
1956	Price Brothers & Company Ltd through A. Johnson & Co. Canada Ltd.	Willson, Canada	1	80.3	60.3	180.0	3.00	
1956	Federal Power Board	Kariba, Zimbabwe	5	94.5	104.5	167.0	3.70	
1956	Empresa Nacional de Electricidad S.A.	Pullinque, Chile	3	47.5	17.1	250.0	2.20	
1956	Stora Kopparbergs Bergslags AB	Trångslet, Sweden	2	120.0	104.0	214.0	2.98	
1956	Fuerzas Eléctricas Del Noroeste S.A.	Eume, Spain	2	245.0	28.6	600.0	1.28	
1956	Fuerzas Eléctricas Del Noroeste S.A.	Belesar, Spain	3	133.0	77.4	214.0	2.75	
1956	Norsk Hydro-Elektrisk Kvaelstofaktieselskab	Mael, Norway	1	42.8	34.75	150.0	3.40	
1956	Bergenshalvøens komm. Kraftselskap	Hodnaberg, Norway	1	300.0	14.7	600.0	0.88	
1956	Trondheim E. verk	Nea, Norway	3	362.0	47.8	500.0	1.21	
1957	Aust-Agder Kraftverk	Hógefoss, Norway	1	59.0	18.3	250.0	2.23	
1957	Statkraft	Tokkeverkene, Dalen, Norway	4	377.0	110.3	375.0	1.78	
1957	Oslo Lysverker	Hemsil 1, Norway	2	510.0	35.7	750.0	0.86	
1957	Sunnhordland Kraftlag L/L	Blåfalli 2, Norway	1	325.0	16.9	600.0	0.88	
1957	Stockholms Superfosfat Fabriks AB	Parteboda, Sweden	2	32.0	17.9	167.0	2.80	
1957	Vest-Agder Elektrisitetsverk	Håverstad, Norway	1	19.0	25.75	300.0	2.00	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia. m	Notes
1958	AB Mölnbacka-Trysil, Höljes Kraftverk	Höljes, Sweden	2	86.5	68.0	187.5	3.00	
1958	Hydro Electric Commission of Tasmania	Catagunya, Australia	2	44.2	25.0	187.5	2.75	
1958	Swedish State Power Board	Stalon, Sweden	1	190.0	115.5	250.0	2.86	
1958	Central Electricity Generating Board	Cwm Rhiedol, Wales	2	192.0	19.5	600.0	1.20	
1958	Federal Power Board	Kariba, Zimbabwe	1	94.5	104.5	167.0	3.70	
1958	Central Electricity Generating Board	Dinas, Wales	1	71.0	13.3	333.0	1.63	
1958	Iberduero S.A.	Sobron, Spain	2	37.9	13.6	214.0	2.35	
1958	Norsk Hydro-Elektrisk Kvaelfstofaktieselskab	Svaelffos 3, Norway	2	68.0	44.1	187.5	2.95	
1958	Bardufoss Kraftlag A/S	Bardufoss, Norway	1	47.5	19.1	214.0	2.62	
1958	Statkraft	Ranaverkene, Ø Rössåga, Norway	2	125.0	55.1	250.0	2.45	
1958	Ramfoss Kraftlag	Ramfoss, Norway	2	22.5	10.3	150.0	3.15	
1958	Sundsford Kraftlag I/S	Sundsford, Norway	2	320.0	33.5	600	1.10	
1959	Queensland Electricity Generating Board	Barron Gorge, Australia	2	284.6	31.3	600	1.25	
1959	Swedish State Power Board	Stornorrfors, Sweden	3	73.0	131.0	125	4.80	
1959	Bergenshalvøens komm. Kraftselskap	Matre, Norway	1	450.0	60.3	500.0	1.24	
1959	Nord-Trøndelag E. verk	Tunnsjødal, Norway	4	220	36.8	428.0	1.50	
1959	Nord-Trøndelag E. verk	Tunnsjø, Norway	1	53.0	25.7	214.0	2.77	
1959	Trondheim E. verk	Hegsetfoss, Norway	1	62.0	33.1	214.0	2.77	
1960	Saskatchewan Power Corporation through A. Johnson & Co. (Canada) Ltd.	Squaw Rapids, Canada	6	32.0	38.3	120.0	4.00	
1960	New Zealand Electricity Department	Aratiata, New Zealand	3	33.5	31.3	136.4	3.55	
1960	Bowater Power Co. Ltd.	Humberarm, Canada	1	77.1	10.5	375.0	1.46	
1960	Arendal Fossekompagni A/S	Bøylefoss, Norway	1	58.0	11.0	375.0	1.66	
1960	Bergenshalvøens komm. Kraftselskap	Matre, Norway	1	450.0	60.3	500.0	1.24	
1960	Midt-Helgeland Kraftlag A/L	Grytåga, Norway	1	180.0	47.8	333.0	1.90	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1960	Statkraft	Ranaverkene, Ø Rössåga Norway	1	125.0	55.1	250.0	2.45	
1960	Sunnhordland Kraftlag L/L	Blåfalli 2, Norway	1	325.0	16.9	600.0	0.88	
1961	Swedish State Power Board	Gallejaure, Sweden	1	78.0	128.0	150.0	4.00	
1961	Norges Vassdrags-og Elektrisitetsvesen	Langvatn, Norway	2	39.0	51.5	125.0	3.95	
1961	Sogsvirkjunin- (The Hydro- Electric Development of Sog.)	Irafoss-Kistufoss 3, Iceland	1	36.8	16.2	187.5	2.55	
1961	Korssselbrånna Aktiebolag	Korssselbrånna 1, Sweden	1	108.0	61.71	214.0	2.75	
1961	Swedish State Power Board	Tuggen, Sweden	1	26.6	50.24	125.0	5.70	
1961	Snowy Mountains Hydro-Electric Authority	Murray 1, Australia	8	513.0	119.2	500.0	1.63	
1961	Eidefoss A/S	Nedre Tessa, Norway	1	300.0	14.7	600.0	0.87	
1961	Statkraft	Tokkeverkene, Vinje Norway	3	209.0	102.9	250.0	2.55	
1961	Sunds fjord Kraftlag I/S	Sunds fjord, Norway	1	320.0	33.5	600.0	1.10	
1961	Sør-Trøndelag E. verk	Sokna, Norway	1	176.0	25.7	500.0	1.33	
1961	Trondheim E. verk	Nea Kraftverk, Tya, Norway	1	193.0	33.5	375.0	1.65	
1961	Vest-Agder E. verk	Finnsåen, Norway	1	280.0	20.6	600.0	0.96	
1961	Øvre Otra I/S	Brokke, Norway	3	286.0	77.2	375.0	1.74	
1962	Centrais Elétrica de Furnas SA	Furnas, Brazil	4	94.0	154.5	150.0	4.35	
1962	Korssselbrånna Aktiebolag	Korssselbrånna 2, Sweden	1	108.0	58.25	214.0	2.75	
1962	Swedish State Power Board	Messaure, Sweden	2	86.0	143.92	150.0	4.35	
1962	Linnvasselv Kraftlag	Linnvasselv, Norway	1	108.0	53.4	250.0	2.45	
1962	Linnvasselv Kraftlag	Linnvasselv, Norway	1	108.0	27.5	300.0	1.90	
1962	Bergenshalvøens komm. Kraftselskap	Kaldestad, Norway	1	75.0	22.8	300.0	2.11	
1962	Buskerud Kraftverker	Mykstufoss, Norway	2	57.5	25.7	250.0	2.53	
1962	Drammens E. verk	Kaggefoss, Norway	1	68.0	25.7	250.0	2.39	
1962	Kvaenangen Kraftverk	Kvaenangbotn, Norway	2	305.0	22.1	750.0	0.91	
1962	Statkraft	Tokkeverkene, Songa Norway	1	264.0	121.3	300.0	2.30	
1962	Statkraft	Innsetverk. Straumsmo, Norway	2	210.0	66.2	333.0	2.00	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1962	Oslo Lysverker	Usta, Norway	2	510.0	91.9	500.0	1.35	
1963	Snowy Mountains Hydro-Electric Authority	Murray 1, Australia	2	513.0	119.2	500.0	1.63	
1963	Government of Rajasthan through A. Johnson & Co. (Canada) Ltd.	Rana Pratap Sagar, India	4	49.7	55.0	125.0	3.80	*
1963	Aktiebolaget Rottneros Bruk	Rójdåfors, Sweden	1	176.5	34.5	428.0	1.60	
1963	Centrais Elétrica de Furnas SA	Furnas, Brazil	2	94.0	154.5	150.0	4.35	
1963	Arendal Fossekompani	Bóylefoss, Norway	1	58.0	11.0	375.0	1.67	
1963	Róldal-Suldal Kraft A/S	Suldal I, Norway	2	300.0	80.9	428.0	1.61	
1964	AB Storboforsen	Sállsjó, Sweden	2	175.0	91.5	300.0	2.38	
1964	Dunedin City Council	Waipori 2A, New Zealand	1	195.0	22.2	600.0	1.2	
1964	Bowater Power Co. Ltd	Humberarm, Canada	3	77.1	10.5	375.0	1.46	
1964	Asker og Baerum Kraftselskap	Uvdal 1, Norway	1	565.0	47.1	500.0	1.94	
1964	Asker og Baerum Kraftselskap	Uvdal 2, Norway	1	190.0	21.0	500.0	1.20	
1964	Fellesskapet Vikfalli	Målset, Norway	1	172	20.6	600.0	1.16	
1964	Statkraft	Auraverkene, Trollheim, Norway	1	370.5	126.5	375.0	1.97	
1964	Statkraft	Ranaverkene, Rana, Norway	2	495	121.3	428.0	1.60	
1964	Oslo Lysverker	Nes, Norway	4	265	65.4	428.0	1.55	
1964	Róldal-Suldal Kraft A/S	Róldal I, Norway	2	330.0	80.9	428.0	1.56	
1964	Róldal-Suldal Kraft A/S	Novle, Norway	1	280.0	40.1	600.0	1.25	
1964	Sór-Tróndelag E. verk	Håen, Norway	1	205.0	25.7	500.0	1.25	
1965	Centrais Elétricas Brasileiras S.A. through Mecanica Pesada S.A.	Peixotos, Brazil	2	45.0	61.0	138.5	3.95	*
1965	COMEPA, Sao Paulo through Mecanica Pesada S.A.	Jaguari, Brazil	2	56.0	15.4	300.0	1.70	*
1965	The Hydro-Electric Commission Tasmania	Devils Gate, Australia	1	67.2	63.0	166.7	3.35	
1965	Canadian Commercial Corp. Ottawa	Kundah, India	1	64.0	56.0	157.9	3.40	
1965	Fellesskapet Vikfalli	Refsdal, Norway	2	500.0	40.4	750.0	0.91	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1965	Statkraft	Tokkeverkene, Byrte Norway	1	266.0	20.5	600.0	0.96	
1965	Statkraft	Tokkeverkene, Lio, Norway	1	335.0	44.1	600.0	1.24	
1965	Røldal-Suldal Kraft A/S	Suldal 2, Norway	1	545.0	70.6	600.0	1.16	
1965	Sira-Kvina Kraftselskap	Tonstad, Norway	2	430.0	165.4	375.0	1.98	
1965	Sunnhordland Kraftlag L/L	Blåfalli 3, Norway	1	310.0	50.4	500.0	1.34	
1965	Sør-Trøndelag E. verk	Såa, Norway	1	262.0	36.8	500.0	1.22	
1966	NOVACAP through Mecanica Pesada S.A.	Paranoa, Brazil	1	105.5	10.0	514.3	1.12	
1966	Bowater Power Co. Ltd.	Humberarm, Canada	3	77.1	10.5	375.0	1.46	
1966	Companhia Paranaense de Energia Elétrica through Mecanica Pesada S.A.	Chopim, Brazil	2	55.7	28.0	225.0	2.35	*
1966	Bajina Basta Hydroelectric Power Plant	Bajina Basta, Yugoslavia	4	65.1	88.32	136.4	4.10	
1966	City of Seattle	Boundary, USA	4	76.2	155.17	120.0	4.98	
1966	Saudefaldene A/S	Sauda 4, Norway	2	215.0	23.9	600.0	1.16	
1966	Stensjøens Kraft AB	Stensjøfallet, Norway	1	292.0	95.6	375.0	1.91	
1966	Tafjord Kraftselskap	Kraftstasjon 4, Norway	2	420.0	51.5	600.0	1.17	
1967	Swedish State Power Board	Letsi, Sweden	2	135.0	150.0	187.5	3.70	
1967	Swedish State Power Board	Seitevare, Sweden	1	171.0	222.2	200.0	3.70	
1967	City of Tacoma	Mossyrock, USA	2	94.5	167.5	128.6	4.67	
1967	Oppland Fylkes Elektrisitetsverk	Kalvedalen, Norway	1	240.0	18.8	750.0	0.93	
1967	Norsk Hydro-Elektrisk Kvaelfstofaktieselskab	Kvanndal, Norway	1	300.0	40.8	600.0	1.18	
1967	Eigersund E. verk	Øgreyfoss, Norway	1	62.0	11.8	375.0	1.68	
1967	Felleskjøpet Vikfalli	Hove, Norway	2	300.0	31.3	600.0	1.08	
1967	Kvaenangen Kraftverk A/S	Småvatna, Norway	1	255.0	19.6	750.0	0.98	
1967	Statkraft	Ranaverkene, Rana, Norway	1	495.0	121.3	428.0	1.60	
1967	Statkraft	Auraverkene, Gråsjø, Norway	1	52.0	12.1	300.0	1.85	
1967	Skiensfjordens komm. Kraftselskap	Sundsarm, Norway	1	460	102.9	500.0	1.52	
1967	Vestfold Kraftselskap	Fjone, Norway	1	250.0	50.0	500.0	1.50	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1968	New Zealand Electricity Dept.	Maraetai 2, New Zealand	5	59.5	36.8	187.5	2.85	
1968	Aust-Agder E. verk	Jórundland, Norway	1	265	48.5	500.0	1.50	
1968	Kristiansand E. verk	Hovatn, Norway	1	485.0	44.1	750.0	1.00	
1968	Nord-Trøndelag E. verk	Bogna, Norway	1	270.0	58.8	500.0	1.50	
1968	Statkraft	Ranaverkene, Bjerka Norway	1	345.0	20.6	1000.0	0.79	
1968	Ramfoss Kraftlag	Ramfoss, Norway	1	22.5	10.3	150.0	3.15	
1968	Zambia Electricity Supply Corporation Ltd (ZESCO)	Kafue Gorge, Zambia	4	387.0	154.4	375.0	1.98	
1968	Sira-Kvina Kraftselskap	Tonstad, Norway	2	430.0	165.4	375.0	1.98	
1968	Sira-Kvina Kraftselskap	Åna-Sira, Norway	2	46.0	50.0	150.0	4.10	
1968	Sydsvenska Kraft AB	Råtån, Sweden	2	59.0	29.74	200.0	2.70	
1968	Korsselbränna Aktiebolag	Bergvattnet, Sweden	1	70.0	21.2	300.0	1.95	
1969	Hidronor S.A.	El Chocon, Argentina Units 1-3	3	61.3	222.8	88.3	6.35	
1969	Bålforsens Kraft AB	Dabbsjö, Sweden	1	50.0	27.3	167.0	2.95	
1969	Kraftlaget Opplandskraft	Rendalen, Norway	1	180.0	97.8	300.0	2.38	
1969	Swedish State Power Board	Gejmån, Sweden	1	245.0	65.0	500.0	1.65	
1969	Norsk Hydro A/S	Vemork, Norway	2	282.0	89.7	375.0	1.91	
1969	Rórdal-Suldal Kraft A/S	Suldal 2, Norway	1	545.0	80.9	600.0	1.16	
1969	Sör-Trøndelag E. verk	Driva, Norway	2	540.0	71.3	600.0	1.16	
1969	Trondheim E. verk	Vessingfoss, Norway	1	48.0	38.6	214.0	3.00	
1970	Fuerzas Eléctricas Del Noroeste S.A.	Albarellos, Spain	1	153.0	63.9	333.3	2.20	
1970	Hidronor S.A.	El Chocon, Argentina Unit 4	1	58.4	200.0	88.3	6.35	
1970	Swedish State Power Board	Letsi, Sweden	1	135.0	150.0	187.5	3.70	
1970	Bremanger Smelteverk A/S	Svelgen, Norway	1	350.0	49.3	600.0	1.24	
1970	Finnmark Fylkes E. forsyning	Adamselv, Norway	2	195.0	25.7	500.0	1.33	
1970	Sira-Kvina Kraftselskap	Tjørhom, Norway	2	158.0	60.3	300.0	2.17	
1970	Sunnhordland Kraftlag L/L	Blåfalli 3, Norway	1	310.0	50.4	500.0	1.34	
1970	Troms fylkes Kraftforsyning	Dividalen, Norway	1	270.0	25.7	750.0	1.03	
1970	Vestfold Kraftselskap	Finndøla, Norway	2	295.0	51.5	500.0	1.34	
1971	Kema Nord AB	Ljunga, Sweden	2	47.5	29.6	166.7	2.95	
1971	Bergvik & Ala AB	Mittån, Sweden	1	203.0	98.2	333.3	2.38	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1971	Bergvik & Ala AB	Lossen, Sweden	1	115.0	68.0	272.7	2.48	
1971	Trångfors Kraft AB	Trångfors, Sweden	1	79.0	75.7	187.5	3.20	
1971	Trångfors Kraft AB	Flåsjö, Sweden	1	40.0	28.5	150.0	2.95	
1971	Stora Kopparbergs Bergslag AB	Trångslet 3, Sweden	1	130.0	131.6	230.8	3.15	
1971	Hidronor S.A.	El Chocon, Argentina Units 5 & 6	2	58.4	203.0	88.3	6.35	
1971	Snowy Mountains Engineering Corporation	Kangaroo Valley, Australia	2	453.2	92.4	500.0	1.63	
1971	Swedish State Power Board	Vietas, Sweden	2	67.0	163.0	107.1	5.30	
1971	Bergenshalvøens komm. Kraftselskap	Ulvik, Norway	1	370.0	17.6	1000.0	0.73	
1971	Bergenshalvøens komm. Kraftselskap	Stordal, Norway	1	110.0	25.7	375.0	1.70	
1971	Helgeland Kraftlag A/L	Sjona, Norway	1	255.0	51.5	500.0	1.50	
1971	Sira-Kvina Kraftselskap	Solhom, Norway	2	210.0	105.0	300.0	2.33	
1971	Sogn og Fjordane Kraftverk	Åskåra 2, Norway	1	530.0	39.7	750.0	0.91	
1972	Bålforsens Kraft AB	Oldån, Sweden	1	252.0	68.9	500.0	1.65	
1972	Bålforsens Kraft AB	Långsån, Sweden	1	180.0	52.6	428.6	1.75	
1972	Swedish State Power Board	Rebnis, Sweden	1	81.0	62.7	214.3	2.90	
1972	Swedish State Power Board	Torpshammar, Sweden	1	123.0	63.0	250.0	2.50	*
1972	U.S. Army Corps of Engineers	Lost Creek, U.S.A.	2	88.1	25.2	240.0	2.39	
1972	Hidronor S.A.	Planicie Banderita, Argentina	2	71.5	241.0	93.75	6.35	
1972	Swedish State Power Board	Bastusel, Sweden	1	67.8	112.5	136.4	4.35	
1972	Corporacion Dominicana de Electricidad	Tavera, Dominican Republic	2	110.5	41.3	257.1	2.45	
1972	Statkraft	Kobbvatn, Norway	1	200.0	30.9	500.0	1.33	
1972	Sulitjelmakraft I/S	Fagerli, Norway	2	227.0	24.0	600.0	1.16	
1972	Trondheims E. verk	Nedalfoss, Norway	1	91.0	25.0	375.0	1.75	
1972	Vest-Agder E. verk	Bjelland, Norway	2	84.0	27.9	333.0	2.00	
1973	KemaNord AB	Ljunga, Sweden	2	47.5	29.6	166.7	2.95	
1973	Swedish State Power Board	Ritsem, Sweden	1	145.0	339.0	166.7	4.73	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1973	AB Skandinaviska Elverk	Järnvågsforsen, Sweden	2	78.0	59.2	214.3	2.95	
1973	Övre Otra I/S	Brokke 4, Norway	1	270.0	102.2	375.0	2.00	
1973	Centrais Elétrica de Furnas	Furnas, Brazil	2	88.90	154.5	150.0	4.35	
1974	Bergenshalvøens komm. Kraftselskap	Haugsdal, Norway	1	200.0	37.0	500.0	1.43	
1974	Statkraft	Leirdøla, Norway	1	445.0	100.0	500.0	1.52	
1974	Zambia Electricity Supply Corporation Ltd (ZESCO)	Kafue Gorge, Zambia	2	387.0	156.6	375.0	1.98	
1974	Røldal-Suldal Kraft A/S	Svandalsflona, Norway	1	200.0	19.5	750.0	1.02	
1974	Sør-Trøndelag Kraftselskap	Mørre, Norway	1	76.0	13.6	428.0	1.54	
1974	Trondheim E. verk	Bratsberg, Norway	2	130.0	60.0	300.0	2.40	
1974	Tussa Kraft L/L	Amela, Norway	1	518.0	33.1	1000.0	0.78	
1974	Swedish State Power Board	Harsprånget 4, Sweden	1	103.0	182.8	166.7	4.15	
1974	Swedish State Power Board	Harsprånget 5, Sweden	1	103.0	469.0	107.1	6.60	
1974	State Electricity Commission, Victoria	Dartmouth, Australia	1	150.0	181.3	214.3	3.35	
1975	Swedish State Power Board	Porjus 11, Sweden	1	59.5	241.2	83.3	6.90	
1975	Bureau of Reclamation	Teton, USA	2	69.6	10.0	450.0	1.37	
1975	Statkraft	Oksla, Norway	1	435.0	206.0	375.0	2.08	
1976	Administración Nacional de Electricidad	Acaray 2, Paraguay	2	81.0	63.1	176.5/ 211.7	3.00	
1976	Skandinaviska Elverk	Järnvågsforsen, Sweden	2	78.0	54.0	214.3	2.95	
1976	Statkraft	Kjela, Norway	1	174.0	62.0	375.0	2.05	
1976	Statkraft	Kvilldal 4, Norway	2	520.0	315.0	333.0	2.40	
1976	Statkraft	Hylen, Norway	2	66.0	81.6	136.0	4.30	
1976	Statkraft	Rana 4, Norway	1	495.0	121.0	428.0	1.60	
1976	Salten Kraftsamband A/S	Lomi, Norway	2	560.0	59.0	750.0	1.00	
1976	Saudefaldene A/S	Sauda 2, Norway	1	180.0	23.0	500.0	1.33	
1976	Troms Fylkes Kraftforsyning	Skibotn, Norway	1	430.0	72.0	600.0	1.29	
1977	Hedmark Kraftverk	Nye Osa, Norway	1	192.0	45.0	428.0	1.64	
1977	Vest-Agder E. verk	Laudal, Norway	2	33.0	16.2	187.0	3.25	
1977	Abjörkraft	Kolsvik, Norway	2	495.0	64.0	600.0	1.16	

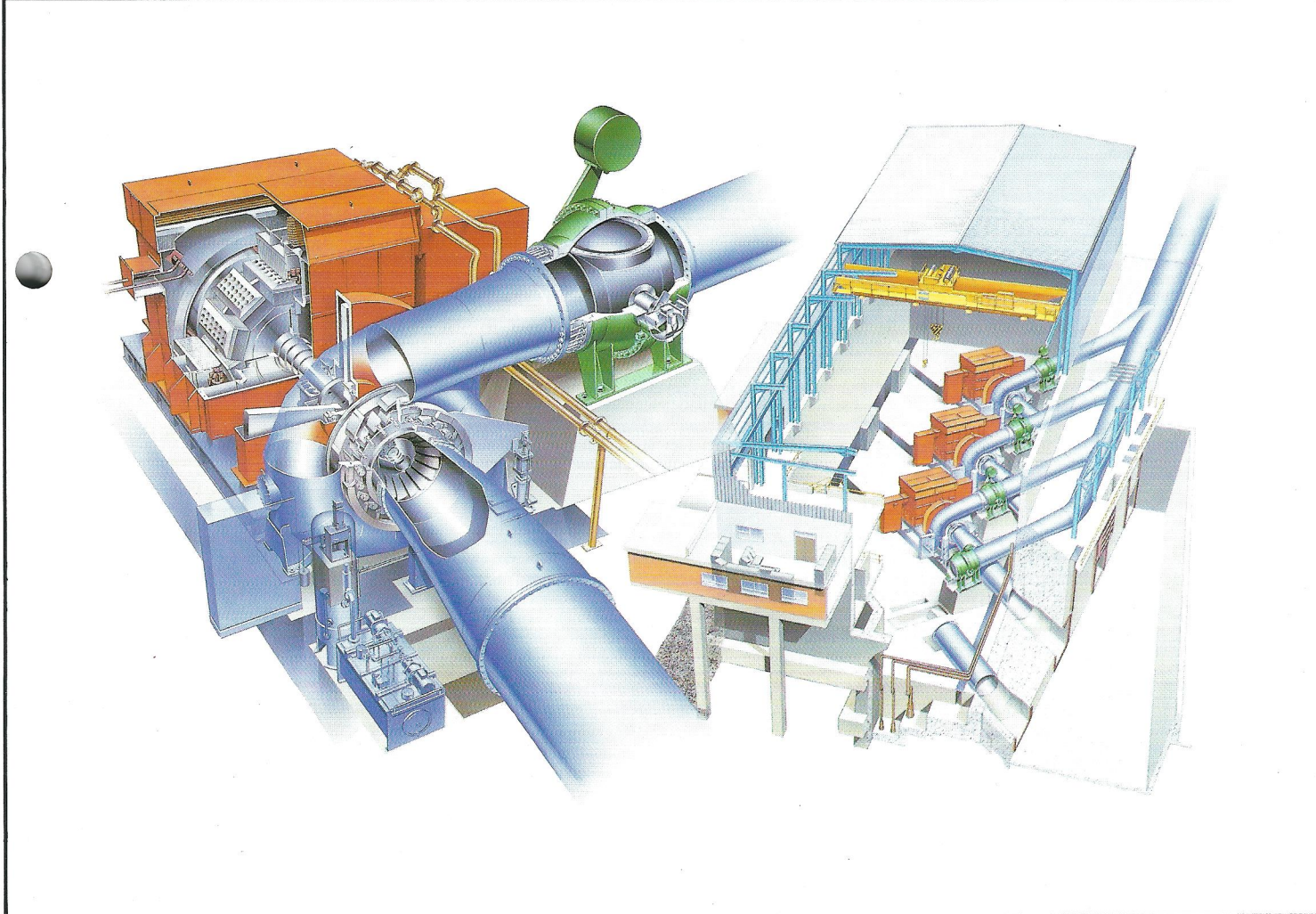
Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1977	Sira-Kvina Kraftselskap	Rosskrepp, Norway	1	83.0	50.0	250.0	2.71	
1977	Ardal og Sunndal verk	Høyanger 5, Norway	1	550.0	60.0	750.0	1.03	
1978	Bergenshalvøens komm. Kraftselskap	Steinsland, Norway	2	430.0	73.5	500.0	1.36	
1978	Landsvirkjun. (The National Power Company)	Hrauneyjafoss, Iceland	2	86.0	72.0	200.0	3.15	
1978	Devlet Su Isleri	Aslantas, Turkey	3	53.0	41.1	166.7	3.20	
1978	Sira-Kvina Kraftselskap	Kvinen, Norway	1	116.0	81.6	250.0	2.92	
1978	Øvre Otra I/S	Holen, Norway	2	225.0	87.0	375.0	3.05	
1978	AB Kallstrømmen	Anjan, Sweden	1	41.2	26.9	166.7	3.10	
1979	Swedish State Power Board	Porjus 12, Sweden	1	59.2	241.2	83.3	6.90	
1979	Kraftverkene i Orkla	Grana, Norway	1	450.0	75.0	600.0	1.29	
1979	Bodo E. verk	Heggmoen, Norway	1	107.6	10.25	600.0	1.07	
1979	Oslo Lysverker	Aurland II, 1, Norway	1	500.0	72.0	600.0	1.24	
1979	Oslo Lysverker	Aurland II, 2 & 3, Norway	2	100.0	30.0	333.0	1.96	
1979	Rotorua AEA	Wheao, New Zealand	2	123.0	11.4	428.0	1.27	
1979	Sunnhordland Kraftlag L/L	Blåfalli 4, Norway	1	165.0	13.5	600.0	1.04	
1979	Instituto de Recursos Hidráulicos y Electrificación	La Estrella, Panama	2	370.0	21.0	900.0	0.76	
1979	Instituto de Recursos Hidráulicos y Electrificación	Los Valles, Panama	2	285.0	24.9	900.0	0.96	
1980	Landsvirkjun. (The National Power Company)	Hrauneyjafoss, Iceland	1	86.0	72.2	200.0	3.15	
1980	Mahaweli Authority of Sri Lanka	Victoria, Sri Lanka	3	190.0	83.0	333.3	2.25	
1980	Newfoundland and Labrador Hydro	Hinds Lake, Canada	1	214.0	77.3	360.0	2.15	
1980	Kraftverkene i Orkla	Brattset, Norway	2	255.0	40.0	600.0	1.30	
1980	Kraftverkene i Orkla	Litjefossen, Norway	1	276.0	75.0	428.0	1.71	
1980	Nordkraft A/S	Sørfjord, Norway	1	485.0	60.0	750.0	1.06	
1980	Statkraft	Kvilldal 2, Norway	2	520.0	315.0	333.0	2.40	
1980	Nord-Salten Kraftlag	Slunkajavrre, Norway	1	245.0	21.0	600.0	1.06	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1980	Hol kommune	Ustekveikja, Norway	1	111.0	33.0	375.0	1.95	
1981	Bergen Lysverker	Kvittingen, Norway	1	246.0	42.0	500.0	1.56	
1981	Kraftverkene i Orkla	Svorkmo, Norway	1	94.0	34.0	333.0	2.10	
1981	Kraftverkene i Orkla	Svorkmo, Norway	1	94.0	20.5	428.0	1.63	
1981	Mesna Kraftselskap	Mesna, Norway	1	353.0	25.0	750.0	0.87	
1981	Mesna Kraftselskap	Mesna, Norway	1	353.0	12.5	1000.0	0.87	
1981	Nord-Trøndelag E. verk	Mosvik, Norway	1	200.0	37.0	500.0	1.43	
1981	Statkraft	Saurdal 1 & 2, Norway	2	425.0	160.0	428.0	1.88	
1981	Oppland Fylkes E. verk	Lomen, Norway	1	300.0	54.5	500.0	1.40	
1981	Salten Kraftsamband A/S	Sjónstå, Norway	2	120.0	34.5	375.0	1.81	
1981	Sognekraft A/S	Årøy, Norway	1	144.0	72.5	300.0	2.28	
1981	Sognekraft A/S	Årøy, Norway	1	146.5	20.0	600.0	1.18	
1981	Mahaweli Authority of Sri Lanka	Kotmale, Sri Lanka	2	201.5	82.1	375.0	2.05	
1981	Empresa Nacional de Energía Eléctrica	El Nispero, Honduras	1	155.0	23.4	514.3	1.34	
1981	Swedish State Power Board	Stornorrfors 4, Sweden	1	74.7	187.0	115.4	5.30	
1982	Swedish State Power Board	Sådva, Sweden	1	50.0	33.5	187.5	2.85	
1982	OK Tedi Mining Ltd through Bechtel	OK Menga, Papua New Guinea	2	192.0	29.84	600.0	1.30	
1982	Transkei Electricity Supply Corporation, though NEI Parsons Peebles Ltd	Collywobbles, Transkei	3	135.0	14.5	600.0	1.15	
1982	Perusahaan Umum Listrik Negara (PLN)	Mrica, Indonesia	3	85.0	61.5	214.0	2.92	
1982	Graningeverkens AB	Ledinge, Sweden	1	71.0	10.1	428.6	1.38	
1982	Kraftverkene i Orkla	Ulset, Norway	1	312.0	35.0	750.0	1.09	
1982	Vest-Agder E. verk	Smeland, Norway	1	91.0	23.3	250.0	2.05	
1983	Swedish State Power Board	Messaure 3, Sweden	1	88.5	156.8	150.0	4.35	
1983	Statkraft	Kobbelv, Norway	2	590.0	150.0	500.0	1.55	
1983	Statkraft	Stólsdal, Norway	1	80.0	17.0	375.0	1.64	
1983	Selbu komm.	Slind, Norway	1	175.0	20.0	600.0	1.19	
1983	Gidekraft AB	Björna 2, Sweden	1	37.8	11.2	200.0	2.2	
1983	Gidekraft AB	Gideå, Sweden	1	40.0	11.75	200.0	2.2	
1983	Sunnhorland K.L.	Eikelandsosen, Norway	1	500.0	30.0	1000.0	0.78	

Year	Customer	Power Station/Country	Number of Units	Head m	Output per unit MW	Speed r.p.m.	Runner dia.m	Notes
1984	Mahaweli Authority of Sri Lanka	Kotmale, Sri Lanka	1	201.5	77.4	375.0	2.05	
1984	Bergenshalvøens komm. Kr.s.	Myster, Norway	1	240.0	100.0	333.0	2.17	
1984	Statkraft	Alta 1, Norway	1	170.0	51.0	428.0	1.76	
1984	Statkraft	Alta 2, Norway	1	170.0	102.0	300.0	2.50	
1984	Ente Ejecutivo Presa de Embalse Casa de Piedra	Casa de Piedra, Argentina	2	38.0	31.0	157.9	3.4	*
1984	Sogn og Fjordane Energiverk	Sagefossen, Norway	1	61.0	10.0	375.0	2.14	
1984	TanESCO	Mtera, Tanzania	2	92.0	40.0	300.0	2.25	
1984	Øvre Otra I/S	Holen 3, Norway	1	610.0	154.0	500.0	1.61	
1985	China National Technical Import & Export Corporation	Lubuge, Peoples Republic of China	4	312.0	153.0	333.0	2.28	
1985	Electricidad de Misiones SA	Urugua-I, Argentina	1	87.1	60.0	250.0	2.80	*
1985	Sira-Kvina Kr.s.	Tonstad 5, Norway	1	430.0	330.0	300.0	2.68	
1985	Swedish State Power Board	Sillre, Sweden	1	175.0	11.7	750.0	0.97	
1985	Swedish State Power Board	Vargfors, Sweden	1	48.0	61.67	136.4	4.1	
1985	Swedish State Power Board	Gallejaur, Sweden	1	79.0	102.3	166.7	3.8	
1985	Østfold kr.f.	Stuvane, Norway	2	159.3	19.0	600.0	1.19	
1985	Pacific Gas & Electric Company	Grizzly, U.S.A.	1	210.0	20.6	450.0	1.22	
1985	Allegheny Electric Cooperative	Raystown, USA	1	54.86	15.0	277.0	1.88	
1986	Nord-Trøndelag El.v	Ormsetfoss, Norway	1	375.0	40.0	750.0	1.01	
1986	Tafjord kr.s.	Ny. Tafjord 1, Norway	1	150.0	20.0	428.0	1.39	
1986	Oppland Energiverk	Dokka, Norway	2	122.0	22.3	428.0	1.54	
1986	Oppland Energiverk	Torpa, Norway	2	430.0	75.0	600.0	1.30	
1986	Vinstra Kraftselskap	Nedre Vinstra 2, Norway	1	425.0	100.5	425.0	1.54	
1987	Electricity Commission of Papua New Guinea	Yonki, Papua New Guinea	2	185.0	15.0	750.0	1.0	



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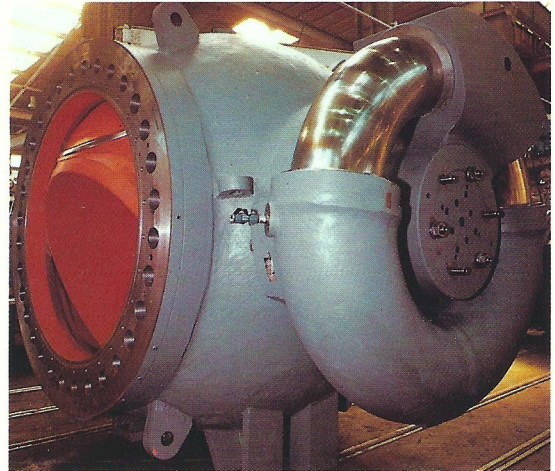
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