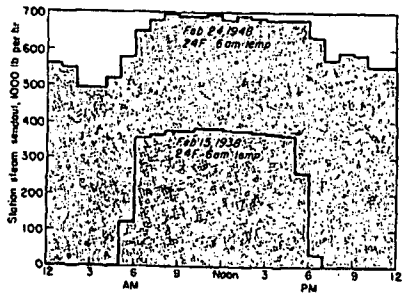
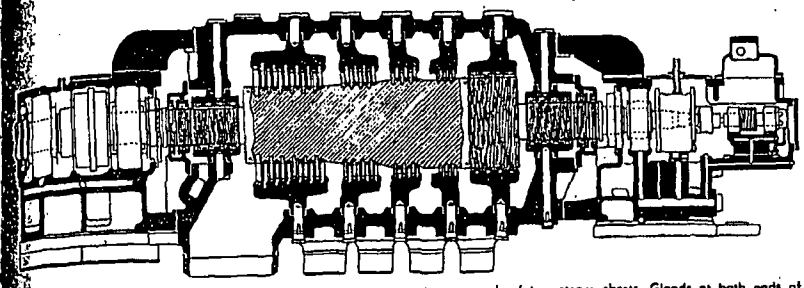


EAST RIVER STATION—S UNIT OPERATION

Period	Service hours	Output, kwhr	Operating capacity factor, %
December, 1947*.....	364.25	2,590,000	94.8
January, 1948.....	615	4,720,000	97.5
February, 1948.....	552.5	4,220,000	101.8
March, 1948.....	628.25	4,760,000	101.0

* Unit was placed in service on Dec 16, 1947.

EAST RIVER STEAM SENDOUT, left, for two typical heating season days reflects increased use of the plant for economy



BACKPRESSURE TURBINE OF 7500-KW unit has 16 reaction stages, four steam-admission belts, four governor-controlled valves on each of two steam chests. Glands at both ends of turbine shaft are combined labyrinth and carbon-ring type

densing units or as sendout to street steam mains. The diversity in times of occurrence of the steam and electrical peak loads allows using the exhaust steam as capacity for both the steam *and electrical) peak loads.* (See "Consolidated Edison Lays Plans to Complete Waterside Modernization", pp 64-7, August 1946, POWER.)

By operating the steam and electrical systems as a unit, with due regard for loading economy, the maximum over-all efficiency for the combined systems can be obtained.

As a part of the general modernization program, the "S" unit installation at East River Station obtains additional economy from byproduct electrical generation incidental to the delivery of steam sendout. The table on p 101 shows the growth of the steam system and the extent to which it has been economical to supply steam from the Edison electric plants.

System Development. The New York Steam Corporation, largest district-steam supplier in the world, serves an extensive area in Manhattan with steam generated in several sources. The principal stations and the 54 miles of underground steam mains are shown on the map. The system has developed in two areas known as the downtown and uptown districts. A steam main ties the district together and permits a limited supply of steam to the downtown district from uptown plants.

Burling Slip Station supplies the bulk of the downtown district steam, supplemented by a small plant in the basement of the Woolworth Building on Park Place and by customer-leased plants.

Four plants owned by the Steam Corp serve the uptown district. The Edison-owned Ravenswood gas plant in Queens supplies additional firm capacity through a 20-in. steam main tying into the system at East River Drive and East 71st Street. Customer-leased plants also supplement the capacity in the *uptown district. The two Edison owned* plants, Waterside and East River, serve primarily as a source of economy supply although steam capacity is available on a non-firm basis when not otherwise needed for the electrical system. Steam sendout from the East River Station began in the spring of 1932.

East River Development. With growth of the steam system load, there has been an increase in the economy sendout from East River as shown by the curves for two typical heating season days, at top of this page. At East River, steam pressure drops about 200 *psi between* boiler and street mains, as on the Moller chart, top of p 99. Compared to usual turbine practice the amount of energy available per lb of steam is small, but conservative estimates of probable station sendouts showed that *a turbine to accommodate a flow of* about 500,000 lb per hr would be the most economical size. This led to selecting a 7500-kw turbine-generator.

The map, p 99, shows East River connected to the steam-distribution system through a 24-in. main cutting across *Manhattan from east to west.* Completion of the Stuyvesant Town and Peter Cooper Village housing development, by the Metropolitan Life Insurance Co, directly adjacent to the station will increase the quantity of steam that can be supplied economically from East River. These projects, partially completed, are supplied through an additional 24-in. main, which is being extended up First Ave to connect to Kip's Bay before the end of this year.

This main will ultimately increase East River sendout capacity to about 900,000 lb per hr and permit greater flexibility in the loading of the three major stations supplying the uptown district. It will also provide extension *of service to prospective consumers* a reasonable distance from the main.

The S Units. The new unit at East River was placed in operation December 16, 1947. Since then it has operated at practically maximum output. Outages have been limited to adjustments usually needed for initial operation to reap maximum benefit from its byproduct generation.

The unit consists of a 7500-kw 3600-rpm turbine driving a 3-phase 60-cycle 13.8-kv 0.8-pf generator. Turbine-throttle steam conditions are 375 psig *and 700 F exhausting to pressures vary*ing from 140 to 180 psig. Allis-Chalmers Manufacturing Co built the unit. Turbine performance depends markedly on the backpressure for this short expansion range as shown by the *flow chart,* below. Exhaust steam must be desuperheated before delivery to the street.

The high-pressure cylinder and exhaust end comprise the turbine casing, both being split horizontally. Steam from the two steam chests enters the *turbine's* four steam belts through flexible piping connected to both upper and lower halves of the casing, see the cross section above. Each steam chest has four governor-controlled valves regulating *steam* admission into the 16-stage reaction-bladed turbine.

Being bolted solidly at the low-pressure end, the turbine casing expands toward the high-pressure or thrust end. Flexibility of the webs supporting the thrust end permits free expansion of the turbine cylinder.

The labyrinth seals on each end of the shaft are made up of several rows of radial spring-backed labyrinth strips having several sealing edges. A leak-off at *about* 10-psig pressure *between* the labyrinth and carbon rings vents to the *station* auxiliary exhaust header. A leakoff at slightly less than atmospheric pressure between the two outside rows of each gland prevents steam leakage into the turbine room. An eductor withdraws the steam *from* these points.

Governing. Each of the two steam chests has a throttle valve of the single-seat balanced type with built-in pilot valve that trips on overspeed or by manual operation. Each steam-admission valve, built as a separate assembly and spring loaded, opens and closes by cam action. An operating mechanism connects the cams to the power cylinders.

A standard Allis-Chalmers governor gear operates a power oil relay, which in turn controls the power cylinders. A flyball-type overspeed governor operates mechanically the throttle-valve tripping mechanism.

Normally the *backpressure* regulator controls the turbine-steam exhaust pressure to match the sendout requirements, varying the electrical output to suit, and the regular turbine-speed governor supervises the overspeed control. A backpressure regulator opens the steam-inlet valves on a *drop* in system pressure. In an abnormal drop, such *as a main* break, the load-limit regulator functions to adjust the inlet valves and prevent an overload on the unit.

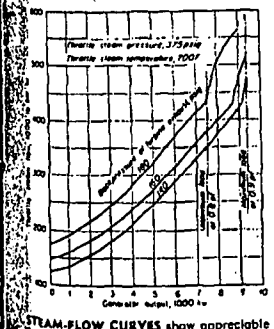
Generator. A 45-kw 250-v main exciter and 3.5-kw 250-v pilot exciter serve the generator on this unit. The unit is air-cooled by a closed system using a 2-section finned-tube cooler. Fresh makeup water for the main station serves as the cooling medium, discharging to the station storage tanks from the generator air cooler.

Since East River is a 25-cycle station, this 60-cycle unit ties into the Waterside Station bus through a 13.8-kv feeder over a mile long. A pushbutton automatic synchronizer phases the generator to the bus.

New York Steam Corp Station Sendout Capacity

Station	Lb per hour
Kip's Bay.....	2,070,000
Burling Slip.....	1,550,000
59th Street.....	165,000
60th Street.....	340,000
66th Street.....	255,000
Park Place.....	125,000
Ravenswood.....	620,000
Leased plants.....	2,767,000
Total.....	7,892,000
Waterside..... East River.....	2,300,000*

*Available when not required for electrical production.



STEAM-FLOW CURVES show appreciable increased output from lower backpressure

NEW YORK STEAM CORPORATION LOAD GROWTH

Year	Total sendout, million lb	Sendout from Edison plants: Million lb	Sendout from Edison plants: % of total	Peak sendout rate, lb per hr
1925.....	6,060	.....	.....	1,762,000
1930.....	12,916	707	5.5	4,728,000
1935.....	14,755	1,046	7.1	5,773,000
1940.....	14,095	1,915	13.6	4,849,000
1945.....	17,903	7,845	43.8	7,432,000
1947.....	18,272	8,974	49.1	6,966,000

Note: All-time peak sendout of 7,781,000 lb per hr occurred between 8 and 9 am on Feb 16, 1948 with 13-F morning temperature.