Научно-технический центр
Единой энергетической системы

ПОЛИТЕХ
Санкт-Петербургский
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Петра Великого

INVESTIGATION OF DANGEROUS DISTURBANCES OF LARGE POWER UNITS

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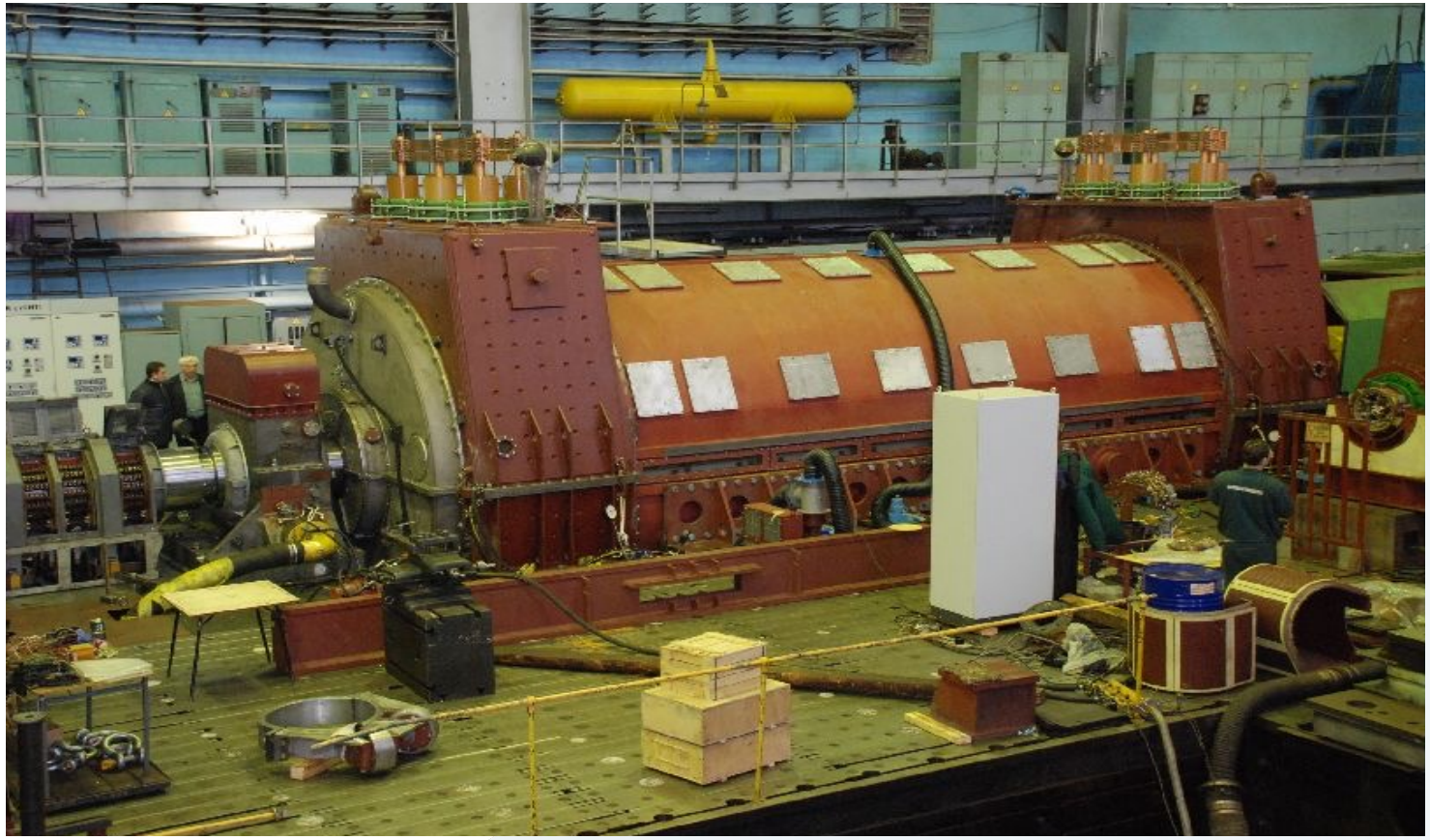
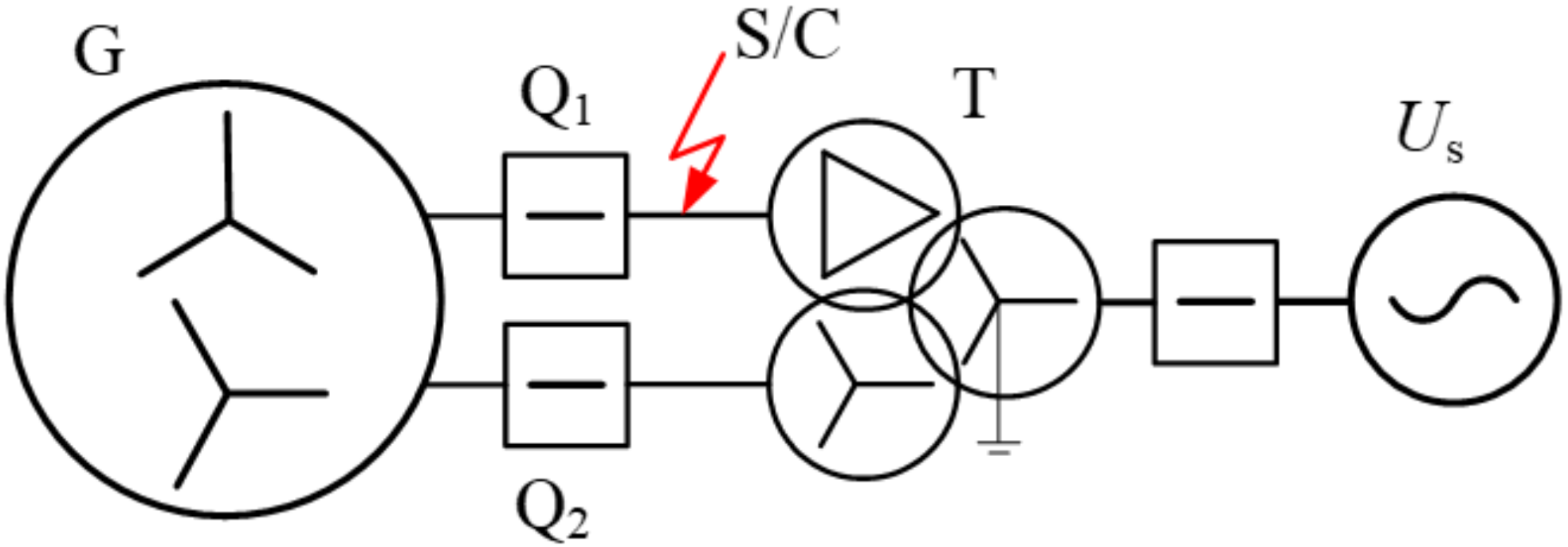
1200 MW/1333 MWA T3V turbogenerator on the plant's test site



Main parameters of the demonstration model

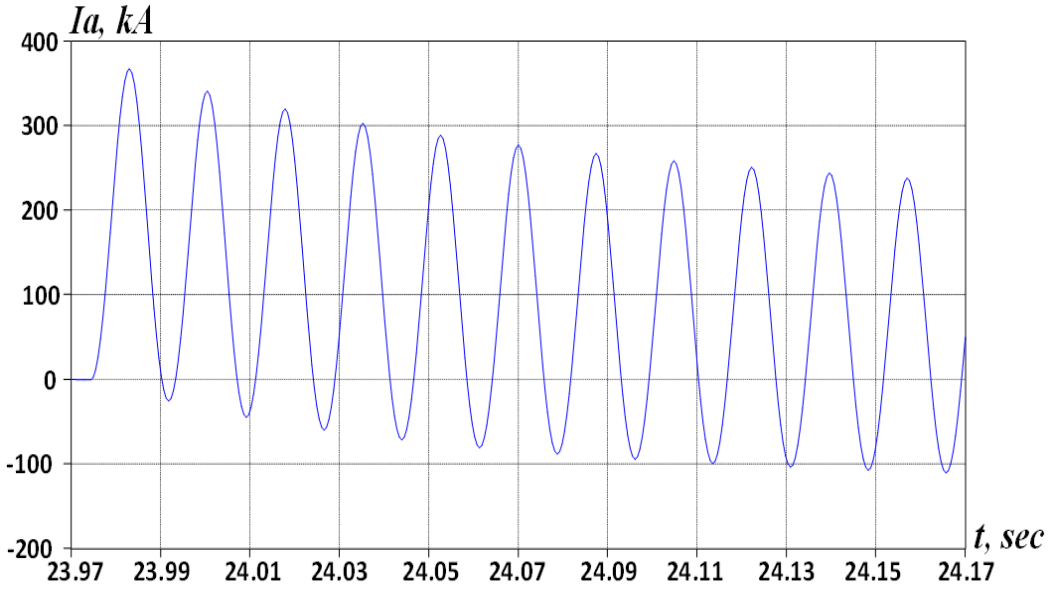
1	Total rated power	Sr	MVA	1333
2	Rated voltage	Ur	kV	24
3	Rated current	Ir	A	16 000 · 2
4	Stator windings connection			Two wyes with a shift of 30°

Connection diagram of the T3V-1200-2 generator to the network



Short circuit in idle mode

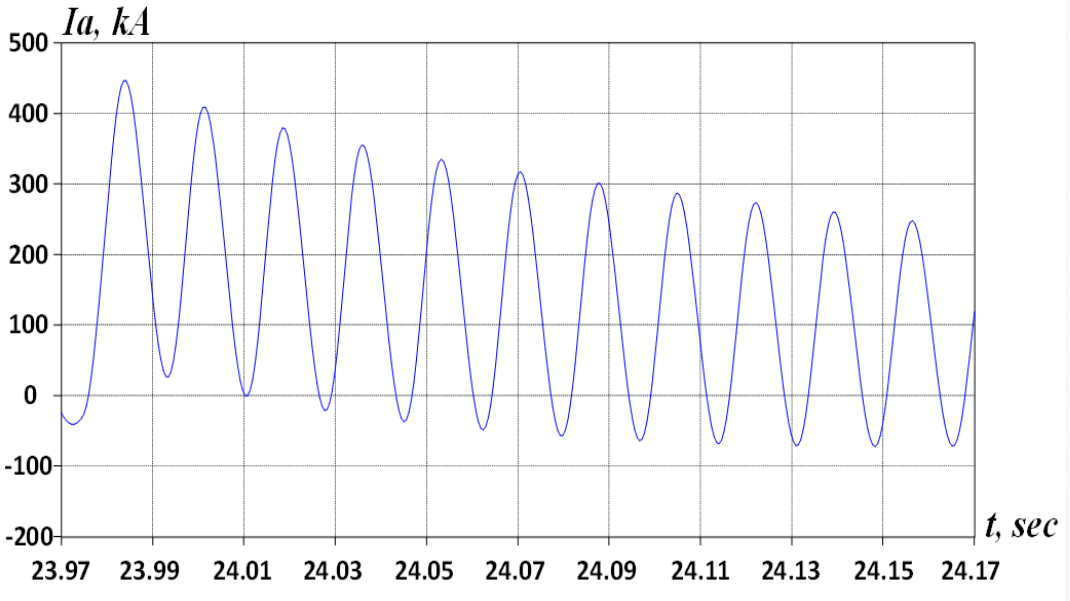
Type of accident	I_s, kA	$I_{s/c}/I_{system}$, kA	$I_{winding}$, kA	T_{e1}, p.u.	T_{e2}, p.u.
Three-phase s/c on one of the three-phase systems	367,2	619/251,8	77,6	4,165	-0,97
Two-phase s/c passing to three-phase s/c	432,2	727,2/295	90,2	5,88	-1,35



Phase A current at three-phase s/c in idle mode, Iamax = 367,2 kA

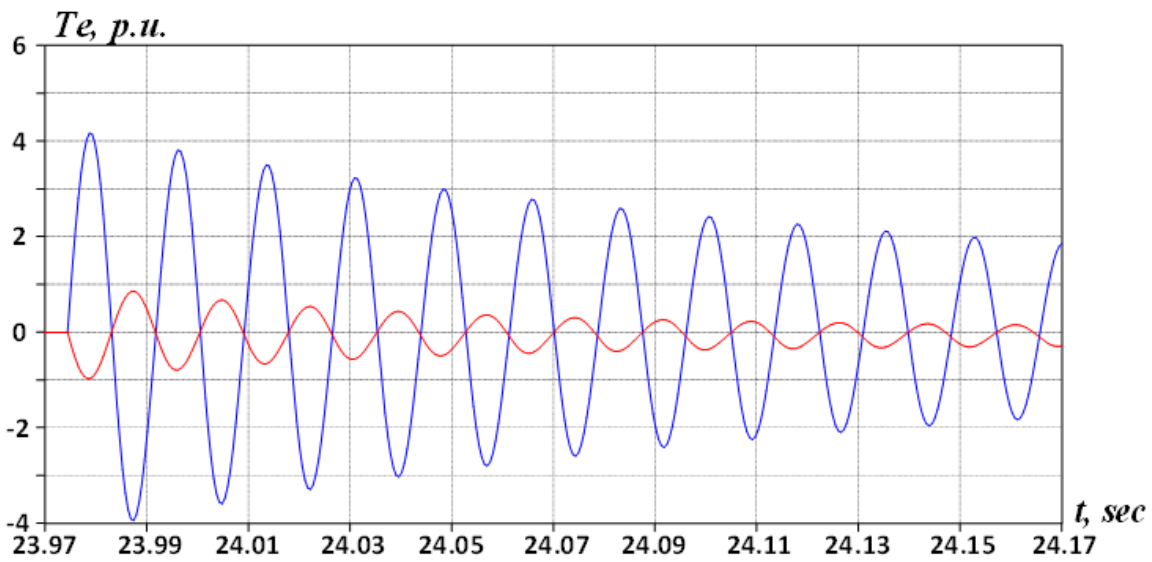
Short circuit in rated load mode

Type of accident	I_s, kA	$I_{s/c}/I_{system}$, kA	$I_{winding}$, kA	T_{e1}, p.u.	T_{e2}, p.u.
Three-phase s/c on one of the three-phase systems	377,6	617,2/239,6	86,6	4,7	-0,52
Two-phase s/c passing to three-phase s/c	446,6	731/284,4	99,6	6,73	-0,91



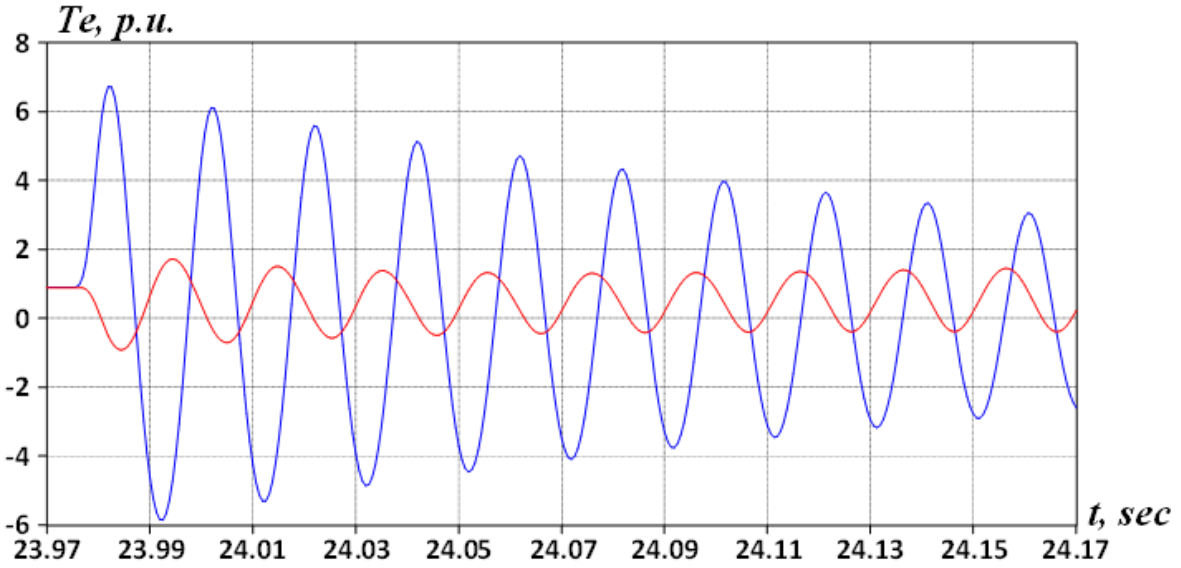
Phase A current with a two-phase s/c passing into a three-phase s/c, Iamax = 446,6 kA

Electromagnetic torques



Change of electromagnetic torques created by three–phase systems in idle mode (blue curve – emergency winding, red curve - circuit-free winding)

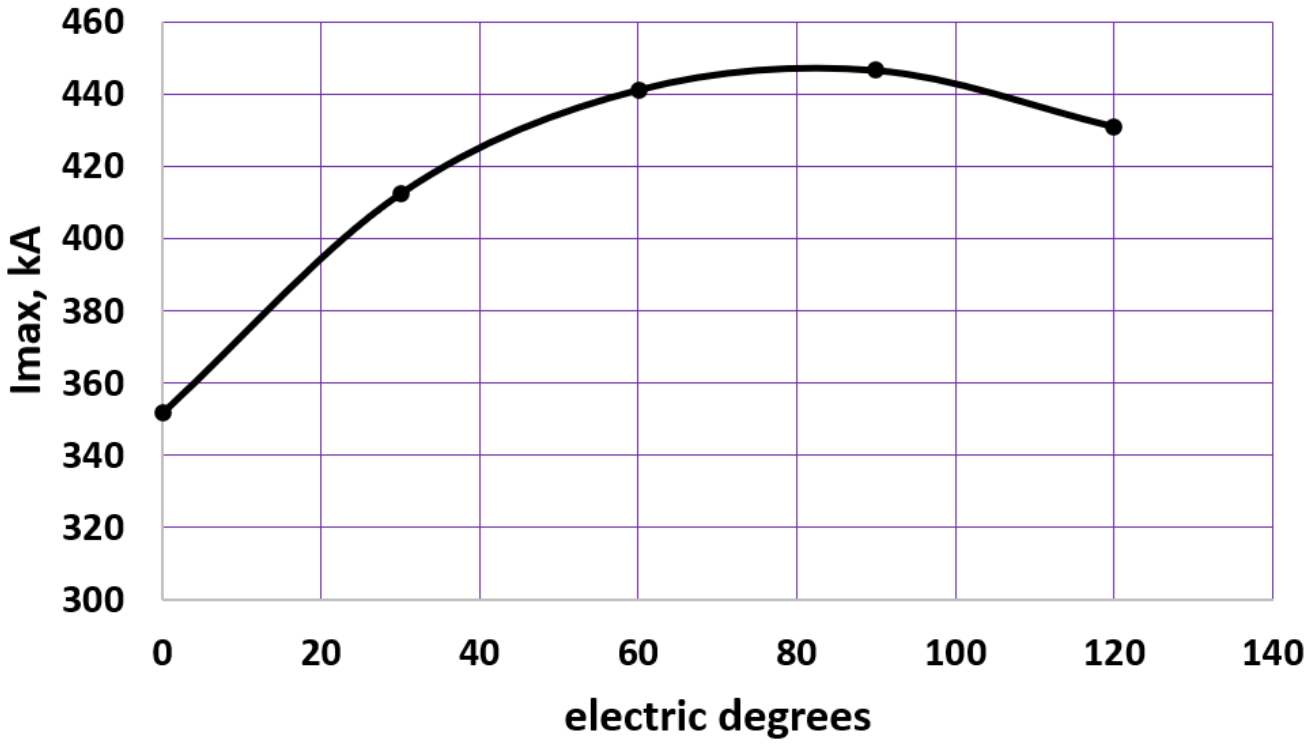
Te1max = 4,165; Te2max= – 0,97



Electromagnetic torques generated by currents of three-phase systems with a two-phase short circuit passing into a three-phase short circuit in rated load mode

Te1max = 6,73; Te2max = – 0,91

The dependence of the value of the s/c current amplitude value of a two-phase s/c passing into a three-phase s/c on the time delay of the transition



Angle value corresponding to the maximum is 90 degrees

Conclusion

1. Calculations of sudden short circuits at the terminals of the T3V-1200-2A generator have been performed to determine the most adverse emergency effects, which is necessary, among other things, to assess the requirements for generator switches and their control devices.

2. It is shown that the most dangerous accident from the point of view of the occurrence of extreme values of currents and torques is a two-phase short circuit in the rated load mode, which turns into a three-phase short circuit within a quarter of the alternating current period. The shock current at this disturbance exceeds the corresponding value for a three-phase short circuit by 18%. This ratio remains the same for a short circuit in the idle mode and in the rated load mode.

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Thank you for your attention!

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