### N.N.Agapov

# Infrastructure developments, including the Nuclotron

Approved

Blex V.Kekelidze

### (report with emphasis on the impact of the pandemic situation)

### **Outline:**

- + Construction of new buildings
- Upgrading of plants for liquid helium and nitrogen production
- + Modernization of power supply systems

#	NICA project Key Milestones	Week	Responsible
	2020		
1	MPD hall ready for magnet assembly	22	A. Dudarev, N. Topilin
2	W arc & Nuclotron-collider tunnels ready for equipment installation	29	A. Dudarev, N. Topilin
3	Booster synchrotron commissioning with a beam	30	A. Butenko
4	MPD SC-solenoid delivered to the LHEP JINR	38	N. Emelianov
5	Construction of the cryogenic compressor station completed	49	N. Agapov, L. Tikhomirov
6	Center NICA project approved by the Main State Expertise	51	A.Trubnikov, L. Tikhomirov
	2021		
7	SPD CDR completed	04	A.Guskov
8	Booster-Nuclotron channel commissioning	06	A. Butenko
9	E arc and straight sections ready for Collider equipment installation	12	A. Dudarev, N. Topilin
10	Stage 1 of the NICA computer cluster and network completed	26	Yu. Potrebenikov, A. Dolbilov
11	Central cryogenic plant (bld. 1B) commissioned (refrigeration capacity 6000 W at 4.5K)	29	N. Agapov
12	LHEP main electrical Sub-station of 40.8 MW commissioned	30	B. Gikal
13	New Compressor station commissioned	31	N. Agapov
14	Booster + Nuclotron with a beam at BM@N put in operation	38	A. Butenko
15	BM@N run with heavy ion beams started	40	M. Kapishin
16	Reconstruction of Bld for applied researches completed	42	L. Tikhomirov, A. Trubnikov
17	Commissioning of MPD	47	V. Golovatyuk
18	Production and testing of Collider magnets completed	49	S. Kostromin, H. Khodzhibagiyan
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23	Collider cryo-magnetic system commissioned	28	A. Butenko
24	Start of the Collider Run#1	36	A. Butenko, I. Meshkov
25	Center NICA put into operation	45	A. Trubnikov, L. Tikhomirov
26	NICA accelerator complex commissioned	49	N. Agapov, V. Kekelidze
27	Registration of 1 <sup>st</sup> event @ MPD — Start of NICA international research program	50	V. Kekelidze, G. Trubnikov



# New buildings of the NICA complex



Monday, 29 June 2020

# Key milestones

## May 2020 - MPD hall is ready for magnet assembly

# July 2020 - Western halfring of building 17 and Nuclotron-Collider channels are ready for equipment installation



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# Key milestones

# December 2021 - Collider building is fully commissioned

### March 2021 - Eastern half-ring of building 17 and Collider straight channels are ready for equipment installation



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# **Progress of the MPD hall construction**





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# **Progress of the western half-ring construction**





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# **Construction of the Nuclotron-Collider channels**





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# **NICA innovation center**



In addition to the main contract there are two agreements which shift the deadline for the submission of design documentation until September 2020. The main reason for the delays was obligation to bring the concept and architectural decisions of the building in line with the amount of the planned funding. Design Institute of Unique Construction "ARENA" Contract No. 1 / 03-2018 of 04/11/2018





#### Key milestones

Approved

V.Kekelidze

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1 MPD 2 War 3 Boos 4 MPD	2020 hall ready for magnet assembly rc & Nuclotron-collider tunnels ready for equipment installation ster synchrotron commissioning with a beam	22 29	A. Dudarev, N. Topilin
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## Main points for the NICA innovation center

### 2020 December Center NICA project approved by the Main State Expertise

### 2022 November Center NICA put into operation



#### Nitrogen turbo compressor "Aerocom2-179/18"

Capacity of compressor, Nm <sup>3</sup> /h	10740
Inlet pressure, MPa	0.102
Inlet temperature, °C	30
Outlet pressure, MPa	1.8
Outlet temperature, °C	40
Temperature of cooling water, °C	20
Installed power of electric motor, kW	1800



### New Compressor Building

SATIR



Helium screw compressors "Kaskad-110/30"

Outlet pressure (MPa)3.Total power of electric motors16	0
Total power of electric motors 16	<u></u>
	υυ Ι
(kW)	
Voltage (V) 60	00
Number of compression 2	2
stages	
Speed (rpm) 29	70
Flow rate of cooling water, 7	8
m <sup>3</sup> /h	

Nitrogen turbo compressors SAMSUNG SM-5000

Nitrogen receivers



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#### Key milestones

Approved

V.Kekelidze

Blen

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## <u>Key milestones for the new</u> <u>compressor building</u>

### 2020 December Construction of the cryogenic compressor station completed

2021 August New compressor station commissioned



# **Progress** of the New Compressor Building construction





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N.Agapov, PAC PP

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+ Construction of new buildings

+ Upgrading of plants for liquid helium and nitrogen production

+ Modernization of power supply systems



# New Cryogenic Equipment of the NICA Complex

	1000 m <sup>3</sup> helium gasholder	Operating temperature, [K]	4.5
	ion in the galaxies	Refrigerating capacity at 4.5 K, [W]	10000
		Total capacity of the compressors, [Nm3/h]	28680
		Total power of electric motors, [kW]	7200
		Flow rate of cooling water, [m3/h]	390
		Total «cold» mass, [t]	290
Central cryogenic plant (bld. 1B)			
40 m <sup>3</sup> liquid helium tank			
New compressor hall			
1000 m <sup>3</sup> nitrogen gashol	der Bld. 17		



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# **Central Cryogenic Plant (bld. 1B)**



# **New Compressor Hall**





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# **Cryogenics in the building 17**

500 kg/h nitrogen recondenser RA–0.5 of the collider

2x2 kW satellite refrigerators RSG-2000/4.5 of the collider

30 m<sup>3</sup> liquid nitrogen tank



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2020 December Construction of the cryogenic compressor station completed

2021 July Central cryogenic plant (bld.1B) commissioned

2021 August New compressor station commissioned

2022 June NICA cryogenic system fully commissioned (10000 W at 4.5K)

Key milestones for the NICA cryogenic system

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NICA



+ Construction of new buildings

+ Upgrading of plants for liquid helium and nitrogen production

+ Modernization of power supply systems



# Future Power Distribution of JINR Transformer Station GPP-1

	Consumer	Power, MW
1	Booster	1.6
2	Collider	11.0
3	New compressor hall	7.6
4	Computer cluster	1.0
5	Nuclotron	1.4
6	Channels of the bld. 205	1.6
7	Facility for assembling and cryogenic tests of the SP magnets bld. 217	1.1
8	VBLHEP infrastructure	4.4
9	Eastern thermal station	0.8
10	Centre of innovative developments	1.8
11	Consumers in the city	8.5
	TOTAL	40.8
$\cap$		





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Commissioning dates of 6 kV substations being modernized and newly created

Substation 15 (8,0 MW) March 2021

Substations of Bld. 17 (5 unit, total 11,0 MW) December 2021 Substation 21 (14 MW) June 2021

Substation 12 (1,7 MW) November 2020



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# Installation of the distribution - transformer substation (ΡΤΠ1) at building 17.





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# Installation of the transformer substation (TΠ2) at the collider building.







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### Existing electrical supply scheme of JINR



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## 2021 July LHEP main electrical Sub-station of 40,8 MW commissioned



# Thank you for your attention!



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