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APPLICATION OF THE NUCMAT SOFTWARE FOR IMPROVING NUCLEAR MATERIALS ACCOUNTING AND CONTROL

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Functional Layers

▶ Safeguards

- Accounting for and reporting of nuclear materials in full compliance with the IAEA requirements

▶ Security

- Interface between nuclear material accounting and protection of nuclear material

▶ Information Security

- Sensitive data protection in multiuser environment against external attacks and inside threat

Technical basis of NUCMAT

- ▶ Web based application (only freely available internet browsers like Google Chrome, Firefox, Internet Explorer are needed to run the program)
- ▶ Based on Microsoft SQL Server 2014 Express
- ▶ Development tool is Microsoft Visual Studio 2013
- ▶ There is no need of license fees and additional program tools – only MS Office
- ▶ Installation on Windows 7, 8, 10, Windows Server 2008 and 2012
- ▶ Installation on 32 and 64 bit computers
- ▶ Installation is simple – one click installation



I. SAFEGUARDS

Basis of NUCMAT

- ▶ NUCMAT was developed with taking into account requirement/rules of following documents:
 - The Structure and Content of Agreements between the Agency and States Required in Connection with the Treaty on the Non-proliferation of Nuclear Weapons, INFCIRC/153
 - Code 10 of General Part of Subsidiary Arrangements to the Agreement between Country and IAEA for the Application of Safeguards in Connection with the Treaty of the Non-proliferation of Nuclear Weapons
 - Format of Accounting Reports Submitted on Magnetic Medium or by e-mail (Fixed Code 10), IAEA
 - Nuclear Material Accounting Handbook, Services Series 15, IAEA, Vienna, May, 2008

Main Capabilities and Features

- ▶ Accounting of NM at all levels
 - State
 - LOF

Main Capabilities and Features

- ▶ Implementation of main inventory change processes of NM
- ▶ Calculation and update of inventory of NM of all types and categories
 - Source Material Accounting
 - Special fissionable materials accounting
- ▶ Calculation/closure of material balance of NM of all types and categories

Main Capabilities and Features

- ▶ Generation of all reports required by IAEA (Code 10 Format)

- ICR
- MBR
- PIL

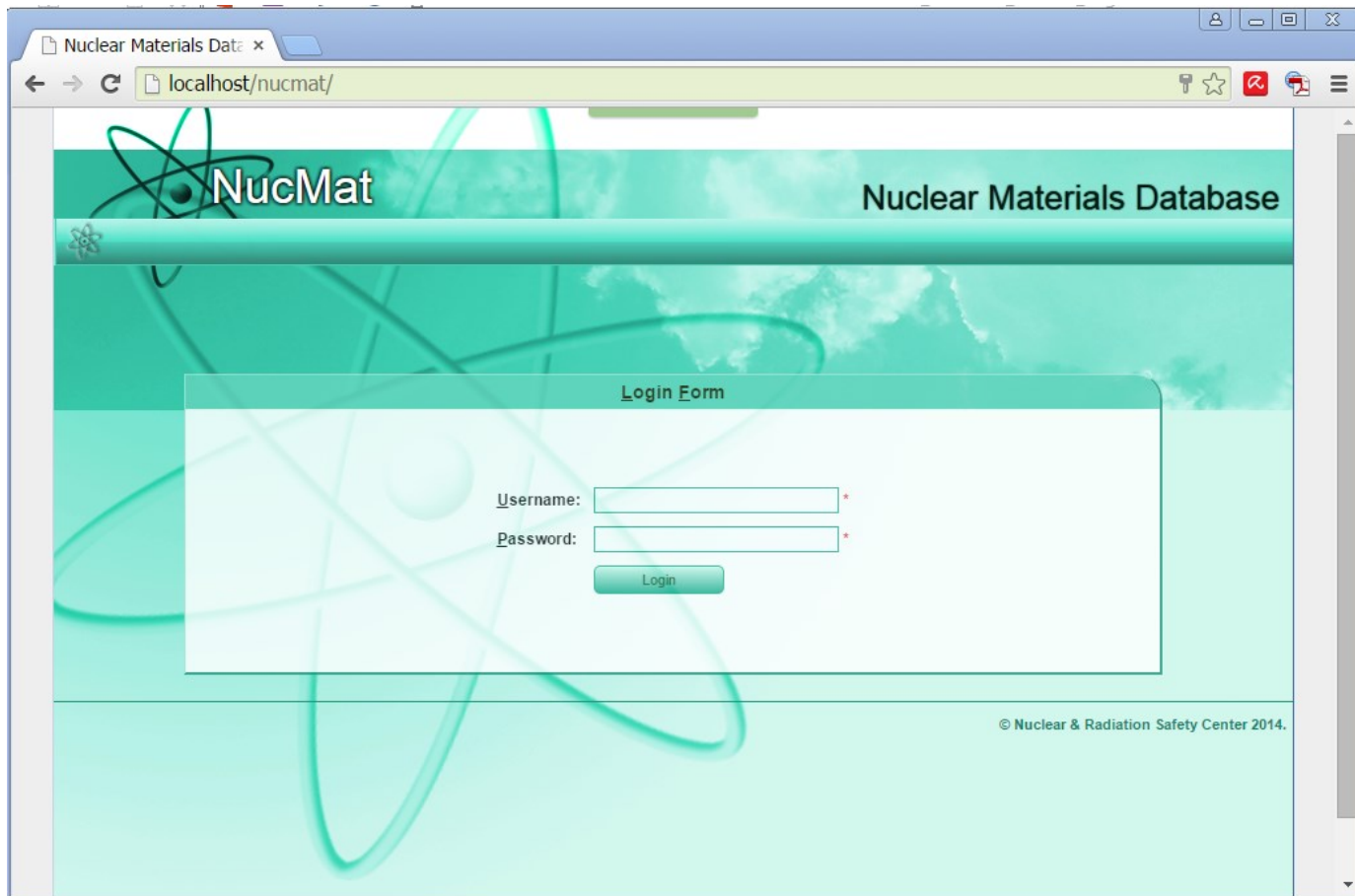
MATERIAL BALANCE REPORT (MBR) FORM R.03										
COUNTRY: NN		REPORTING PERIOD: FROM 020817 TO 031020		FACILITY: NNB		REPORT NO: 53		SIGNATURE		
MATERIAL BALANCE AREA: NN-B		PAGE NO. 1 OF 1 PAGES								
SERIAL CONTINUED	ENTRY NAME	ELEMENT	ACCOUNTANCY DATA		ISOTOPE CODE	CONCISE NOTE	REPORT NO.	ENTRY NO.	G	
			WEIGHT OF ELEMENT (UNIT)	WEIGHT OF FISSILE ISOTOPES (URANIUM ONLY) (G)						
1	PB	E	10000	G	7000					
2	RD	E	500	G	400					
3	LN	E	300	G	200					
4	SF	E	100	G	90					
5	SD	E	200	G	150					
6	BA	E	9900	G	6960					
7	PE	E	9900	G	6960					
8	PB	P	9000	G						
9	NP	P	500	G						
10	SF	P	1000	G						
11	SD	P	2000	G						
12	BA	P	2500	G						
13	PE	P	2500	G						

- ▶ Automatic Management of General Ledger
- ▶ Generation of additional reports like, LII for IAEA and local authorities inspections

MATERIAL BALANCE REPORT (MBR) FORM R.03 (QCVS)									
COUNTRY: AM		REPORTING PERIOD: FROM 141130 TO 150201		FACILITY: AM-A		REPORT NO: 3		SIGNATURE	
MATERIAL BALANCE AREA: T		PAGE NO. 32 OF 32 PAGES							
ENTRY NO	CONTINUATION	ENTRY NAME	ELEMENT	ACCOUNTANCY DATA		ISOTOPE CODE	CONCISE NOTE	REPORT NO.	ENTRY NO.
				WEIGHT OF ELEMENT	UNIT (kg)				
1									
2									
3									
4									
5									
6									
7									
8									
9									
10	1	PB	P		0 g				7
11	2	RD	P		123.6 g				7
12	3	BE	P		123.6 g				7
13	4	DI	P		-10 g				7
14	5	BA	P		113.6 g				7
15	6	PE	P		113.6 g				7
16	7	PB	T		0 kg				7
17	8	GA	T		189 kg				7
18	9	SD	T		189 kg				7
19	10	BE	T		0 kg				7
20	11	BA	T		0 kg				7
21	12	PE	T		0 kg				7
22	13	PB	D		0 kg				7
23	14	EQ	D		12.5 kg				7
24	15	RD	D		123 kg				7
25	16	RF	D		12.5 kg				7
26	17	BE	D		123 kg				7
27	18	BA	D		123 kg				7
28	19	PE	D		123 kg				7
29	20	PB	N		0 kg				7
30	21	BE	N		0 kg				7
31	22	BA	N		0 kg				7
32	23	PE	N		0 kg				7
33	24	PB	E		0 g		0 G		7
34	25	BE	E		0 g		0 G		7
35	26	BA	E		0 g		0 G		7
36	27	PE	E		0 g		0 G		7
37	28	PB	U		0 kg				7
38	29	BE	U		0 kg				7
39	30	BA	U		0 kg				7
40	31	PE	U		0 kg				7
41									7
42									7

Access to NUCMAT

- ▶ Localhost/nucmat or server_address/nucmat



Browsing of Nuclear Materials

▶ Home menu:

NucMat Nuclear Materials Database

Home Nuclear Materials Locations Operations Auxiliary Reports Administration

Home

Location

MBA:* KMP:* Building:* Room: Cabinet: Box:

LOF AANL
Department of
Physics of YSU
Gyumri Oncological
Dispensary

Batch number	Manufacturer	U	U235	Pu	Th	Record date	Status
> 629	629	0	0	0	0	29 Oct, 2010	Active
> 5P9	630	0	0	0	0	29 Oct, 2010	Active
> 5P9	99026335	0	0	0	0	29 Oct, 2010	Active
> IBN-7	443	0	0	11	0	29 Oct, 2010	Active
> IBN-7	348	0	0	11	0	29 Oct, 2010	Active
> IBN-7	347	0	0	11	0	29 Oct, 2010	Active
> IBN-7	359	0	0	11	0	29 Oct, 2010	Active
> IBN-24	12	0	0	44	0	29 Oct, 2010	Active
> IBN-8-7	31	0	0	0	0	29 Oct, 2010	Active
> 4P9	7390	0	0	0	0	29 Oct, 2010	Active

Page size: 10 58 items in 6 pages

Browsing of Nuclear Materials

▶ Nuclear Materials menu:

Logout

NucMat

Nuclear Materials Database

Home Nuclear Materials Locations Operations Auxiliary Reports Administration

Nuclear Materials / All NMs

+ Add new record Refresh

Batch number	Manufacturer	U	U235	Pu	Th	Insertion date	MBA	KMP	Status
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	All	All	<input type="text"/>
1257	10458	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active
10481	10481	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active
10482	10482	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active
1259	10483	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active
1258	10484	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active
1256	10486	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active
1255	10487	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active
1254	10488	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active
1253	10489	0	0	0	0	26 Oct, 2010	LOF	National Institute of Metrology	Active

Browsing of Nuclear Materials

General Ledger (D, N, E, U):

NucMat Nuclear Materials Database

Home Nuclear Materials Locations Operations Auxiliary Reports Administration Activity

AAA [Depleted Uranium](#) / [Natural Uranium](#) / [Enriched Uranium](#) / [Uranium Unified](#) / [Plutonium](#) / [Thorium](#)

Change date	Batch number	Change code	Element code	Items count	Increase		Other		Decrease		Other		Inventory		Items total count
					Receipts		Other		Shipments		Other				
					U	U235	U	U235	U	U235	U	U235			
2015-08-30		BB		0	0	0	0	0	0	0	0	0	0	0	0
2015-08-31	TT03	RD	N	1	85.6	0	0	0	0	0	0	0	85.6	0	1
2015-09-01	TT03	DI	N	1	0	0	52	0	0	0	0	0	137.6	0	1
2015-09-02		BE		0	0	0	0	0	0	0	0	0	85.6	0	1
2015-09-03		BB		0	0	0	0	0	0	0	0	0	85.6	0	1
2015-09-04		BE		0	0	0	0	0	0	0	0	0	85.6	0	1
2015-09-05		BB		0	0	0	0	0	0	0	0	0	85.6	0	1
2015-09-06	HH03	RF	N	2	951	0	0	0	0	0	0	0	1036.6	0	3
2015-09-07	HH03	EQ	N	2	0	0	0	0	0	0	951	0	85.6	0	1
2015-09-08	HH03	DQ	N	2	0	0	951	0	0	0	0	0	1036.6	0	3
2015-09-10	HH03	TW	N	2	0	0	0	0	0	0	951	0	85.6	0	1
2015-09-11	HH03	FW	N	2	0	0	951	0	0	0	0	0	1036.6	0	3
2015-09-14	HH03	SD	N	2	0	0	0	0	951	0	0	0	85.6	0	1
2015-09-15		BE		0	0	0	0	0	0	0	0	0	85.6	0	1
2015-09-16		BB		0	0	0	0	0	0	0	0	0	85.6	0	1
2015-09-17	LL03	RF	N	2	420.3	0	0	0	0	0	0	0	505.9	0	3
2015-09-19		BE		0	0	0	0	0	0	0	0	0	505.9	0	3

Development/update of accounting infrastructure

- Creation/update of MBAs
- Creation update of flow and inventory KMPs
- Creation/update of nuclear material disposition layouts

Generation of Reports: PIL

NucMat Nuclear Materials Database

Home Nuclear Materials Locations Operations Auxiliary Reports Administration

-PIL Reporting Options-

MBA

PIT date

Report number Max report number: 16 Is final

Excel format

PHYSICAL INVENTORY LISTING (PIL) FORM R.02/c															
COUNTRY Armenia							DATE 150717								
FACILITY Location outside Facility							REPORT NO. 16								
MATERIAL BALANCE AREA AM-Z							PAGE NO. 1 OF 9 PAGES				SIGNATURE				
ENTRY NO	CONTINUATION	KMP CODE	NAME OR NUMBER OF BATCH	NUMBER OF ITEMS IN BATCH	MATERIAL DESCRIPTION	ACCOUNTANCY DATA							CORRECTION TO		
						ELEMENT	WEIGHT OF ELEMENT	UNIT, kg/g	WEIGHT OF FISSILE ISOTOPES (URANIUM ONLY) (G)	ISOTOPE CODE	MESUR. BASIS	CONCISE NOTE	REPORT NO.	ENTRY NO.	
1	3	20	21	29	33	37	38	46	48	56	72	73	74	78	80
1		KMP-A	4P9	1	QSOA	P	0	g			M				5
2		KMP-A	5P9	1	QSOA	P	0	g			M				5
3		KMP-A	629	1	QSOA	P	0	g			M				5
4		KMP-A	CINP	1	VOAB	D	0.037	kg			M				5
5		KMP-A	IBN-24	1	QSOA	P	44	g			M				5
6		KMP-A	IBN-7	1	QSOA	P	11	g			M				5

Generation of Reports: ICR

NucMat Nuclear Ma

Home Nuclear Materials Locations Operations Auxiliary Reports Administration

ICR Reporting Options

MBA: Storage

Date: 6/28/2014 to 7/17/2015

Report number: Max report number: 4
12 Is final

Excel format

OK Cancel

INVENTORY CHANGE REPORT (ICR) FORM R.01.1/c																			
COUNTRY Armenia										REPORTING PERIOD, FROM 140628 TO 150709									
FACILITY Location outside Facility										REPORT NO. 5									
MATERIAL BALANCE AREA S										PAGE NO. 1 OF 5 PAGES									
ENTRY NO	CONTINUATION	DATE OF INVENTORY CHANGE	MBA/COUNTRY		TYPE OF INVENTORY CHANGE	KMP CODE	NAME OR NUMBER OF BATCH	NUMBER OF ITEMS IN BATCH	MATERIAL DESCRIPTION	ACCOUNTANCY DATA							CORRECTION TO		
			FROM	TO						ELEMENT	WEIGHT OF ELEMENT	UNIT, kg/g	WEIGHT OF FISSILE ISOTOPES (URANIUM ONLY) (G)	ISOTOPE CODE	MESUR. BASIS	CONCISE NOTE	REPORT NO.	ENTRY NO.	
1	3	4	10	14	18	20	21	29	33	37	38	46	48	56	72	73	74	78	80
1		150330	RUS	S	RF	1	75042	1	BQ1F	E	120685.74	g	4342.31	G	N				2
2		150330	RUS	S	RF	1	75044	1	BQ1F	E	120644.32	g	4344.3	G	N				2
3		150330	RUS	S	RF	1	75045	1	BQ1F	E	120650.48	g	4344.52	G	N				2
4		150330	RUS	S	RF	1	75050	1	BQ1F	E	120721.79	g	4347.19	G	N				2
5		150330	RUS	S	RF	1	75046	1	BQ1F	E	120670.58	g	4343.21	G	N				2
6		150330	RUS	S	RF	1	75048	1	BQ1F	E	120793.06	g	4349.61	G	N				2
7		150330	RUS	S	RF	1	75049	1	BQ1F	E	120610.76	g	4338.06	G	N				2

Generation of Reports: MBR

NucMat Nuclear Ma

Home Nuclear Materials Locations Operations Auxiliary Reports Administration

MBR Reporting Options

MBA: Storage

Date: 5/2/2015 to 5/10/2015

Report number: Max report number: 3
4 Is final

Excel format:

OK Cancel

MATERIAL BALANCE REPORT (MBR) FORM R.03													
COUNTRY AAUSTRIA				REPORTING PERIOD, FROM 141026 TO 141118									
FACILITY				REPORT NO. 3									
MATERIAL BALANCE AREA ABN-Z				PAGE NO. 1 OF 5 PAGES						SIGNATURE			
ENTRY NO	CONTINUATION		ENTRY NAME	ACCOUNTANCY DATA							CORRECTION TO		
				ELEMENT	WEIGHT OF ELEMENT	UNT. kg/g	WEIGHT OF FISSILE ISOTOPES (URANIUM ONLY) (G)	ISOTOPE CODE	CONCISE NOTE	REPORT NO.	ENTRY NO.		
1	3	18		37	38	46	48	56	73	74	78	80	
		PB		P	0.0	g							7
		FW		P	449.1	g							7
		RF		P	449.1	g							7
		TW		P	449.1	g							7
		BE		P	449.1	g							7
		BA		P	449.1	g							7
		PE		P	449.1	g							7
		PB		T	0.0	g							7
		DQ		T	4735.0	g							7

Generation of Reports in MS Excel format, Checking with QCVS

Excel interface showing the 'PHYSICAL INVENTORY LISTING (PIL) FORM R.02/c (QCVS)' report. The active cell is R108.

PHYSICAL INVENTORY LISTING (PIL) FORM R.02/c (QCVS)														
COUNTRY		AM		DATE		150320		REPORT NO.		16		SIGNATURE		
FACILITY		AM-Z		PAGE NO. OF		PAGES		SIGNATURE						
MATERIAL BALANCE AREA		AM-Z												
ACCOUNTANCY DATA														
ENTRY NO.	CONTINUATION	KMF CODE	NAME OR NUMBER OF BATCH	NUMBER OF ITEMS IN BATCH	MATERIAL DESCRIPTION	ELEMENT	WEIGHT OF ELEMENT	UNIT kg/g	WEIGHT OF FISSILE ISOTOPE(S) (URANIUM ONLY) (G)	ISOTOPE CODE	MEASUR BASIS	CONCISE NOTE	REPORT NO.	ENTRY NO.
1		KMF	4P9	1	QSOA	P		0 g			M			5
2		KMF	5P9	1	QSOA	P		0 g			M			5
3		KMF	629	1	QSOA	P		0 g			M			5
4		KMF	CINP	1	VOAB	D		0.037 kg			M			5
5		KMF	IBN-24	1	QSOA	P		44 g			M			5
6		KMF	IBN-7	1	QSOA	P		11 g			M			5
7		KMF	IBN-8-7	1	QSOA	P		0 g			M			5
8		KMF	10481	1	QSOA	P		0 g			M			5
9		KMF	10482	1	QSOA	P		0 g			M			5
10		KMF	1215	1	QSOA	P		0 g			M			5
11		KMF	1216	1	QSOA	P		0 g			M			5
12		KMF	1217	1	QSOA	P		0 g			M			5
13		KMF	1218	1	QSOA	P		0 g			M			5
14		KMF	1219	1	QSOA	P		0 g			M			5
15		KMF	1220	1	QSOA	P		0 g			M			5
16		KMF	1221	1	QSOA	P		0 g			M			5
17		KMF	1222	1	QSOA	P		0 g			M			5
18		KMF	1223	1	QSOA	P		0 g			M			5
19		KMF	1224	1	QSOA	P		0 g			M			5
20		KMF	1225	1	QSOA	P		0 g			M			5
21		KMF	1226	1	QSOA	P		0 g			M			5
22		KMF	1227	1	QSOA	P		0 g			M			5
23		KMF	1228	1	QSOA	P		0 g			M			5
24		KMF	1229	1	QSOA	P		0 g			M			5

Excel interface showing the 'MATERIAL BALANCE REPORT (MBR) FORM R.03 (QCVS)' report. The active cell is A59.

MATERIAL BALANCE REPORT (MBR) FORM R.03 (QCVS)													
COUNTRY		AM		REPORTING PERIOD: FROM		141130		TO		150201		SIGNATURE	
FACILITY		AM-A		PAGE NO. OF		PAGES		SIGNATURE					
MATERIAL BALANCE AREA		T											
ACCOUNTANCY DATA													
ENTRY NO.	CONTINUATION	ENTRY NAME	ELEMENT	WEIGHT OF ELEMENT	UNIT kg/g	WEIGHT OF FISSILE ISOTOPE(S) (URANIUM ONLY) (G)	ISOTOPE CODE	CONCISE NOTE	REPORT NO.	ENTRY NO.			
1		PB				0 g							7
2		RD			123.6 g								7
3		BE			123.6 g								7
4		DI			-10 g								7
5		BA			113.6 g								7
6		PE			113.6 g								7
7		PB			0 kg								7
8		GA			189 kg								7
9		SD			189 kg								7
10		BE			0 kg								7
11		BA			0 kg								7
12		PE			0 kg								7
13		PB			0 kg								7
14		EQ			12.5 kg								7
15		RD			123 kg								7
16		RF			12.5 kg								7
17		BE			123 kg								7
18		BA			123 kg								7
19		PE			123 kg								7
20		PB			0 kg								7
21		BE			0 kg								7
22		BA			0 kg								7
23		PE			0 kg								7
24		PB			0 g						0 G		7
25		BE			0 g						0 G		7
26		BA			0 g						0 G		7
27		PE			0 g						0 G		7
28		PB			0 kg								7
29		BE			0 kg								7
30		BA			0 kg								7
31		PE			0 kg								7
32													7
33													7
34													7
35													7
36													7
37													7
38													7
39													7
40													7
41													7
42													7

II. SECURITY

History of NM

▶ Tracking history of NMs

- All Information about nuclear material even after shipment, loss, exemption , transfer to waste is kept in the history of the nuclear material

>	KK04	KL04	146987.12	4567.12	100.98		31 Mar, 2017				Active	
>	KK01	KL01	134090	3450	0	0	02 May, 2017				Active	
>	DD03	DF03	325000	0			05 Apr, 2017				Inactive	
✓	DD04	DF04	325000	0			28 Mar, 2017				Inactive	
	Batch number	U	U235	Pu	Th	Inventory code	Record date	KMP	Building	Room	Cabinet	Box
	DD04	325000	0	0	0	SD	28 Mar, 2017					
	DD04	325000	0	0	0	RF	27 Mar, 2017	Pool	Rack			

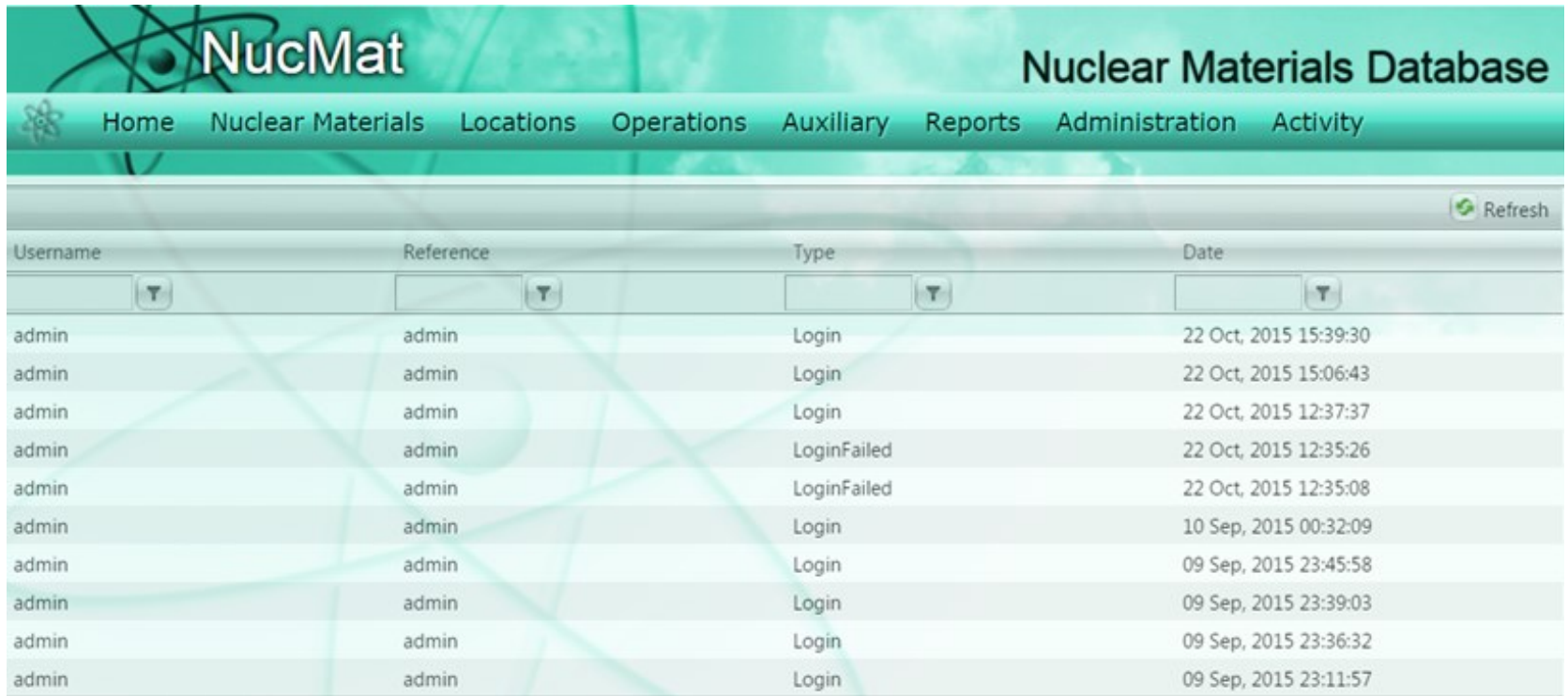
Logs

▶ Inventory Logs

Username	Type	Code	Format	Batch number	Manufacturer	Date
admin	StartingPoint	EDT	Update	JJ01	JK01	09 Apr, 2017 15:30:40
admin	StartingPoint	DEL	Delete	DD02	DF02	09 Apr, 2017 15:24:40
admin	StartingPoint	DEL	Delete			09 Apr, 2017 13:03:08
admin	StartingPoint	EDT	Update	FF01	FG010202	09 Apr, 2017 12:55:00
admin	AccidentalLoss	EDT	None		KL01	09 Apr, 2017 09:29:00
admin	AccidentalGain	INS	None	KK04	KL04	09 Apr, 2017 08:54:49
admin	ReceiptDomestic	RD	Insert	KK03	KL03	09 Apr, 2017 08:52:42
admin	AccidentalGain	INS	None	KK02	KL02	09 Apr, 2017 08:50:16
admin	ReceiptDomestic	RD	Insert	KK01	KL01	09 Apr, 2017 08:48:25
admin	StartingPoint	DEL	Delete			09 Apr, 2017 08:43:25
admin	ShipmentDomestic	SD	Insert		DF04	08 Apr, 2017 02:04:27
admin	ShipmentDomestic	SD	Insert		DF03	08 Apr, 2017 01:58:39
admin	TransferOperation	TRAN	None		FG01	08 Apr, 2017 01:55:49
admin	TransferOperation	TRAN	None		DF03	08 Apr, 2017 01:51:30
admin	TransferOperation	TRAN	None		DF03	08 Apr, 2017 01:38:15
admin	AccidentalGain	INS	None	JJ06	JK06	08 Apr, 2017 01:31:33
admin	AccidentalGain	INS	None	JJ05	JK05	08 Apr, 2017 01:31:19

Logs

▶ Login/Logout

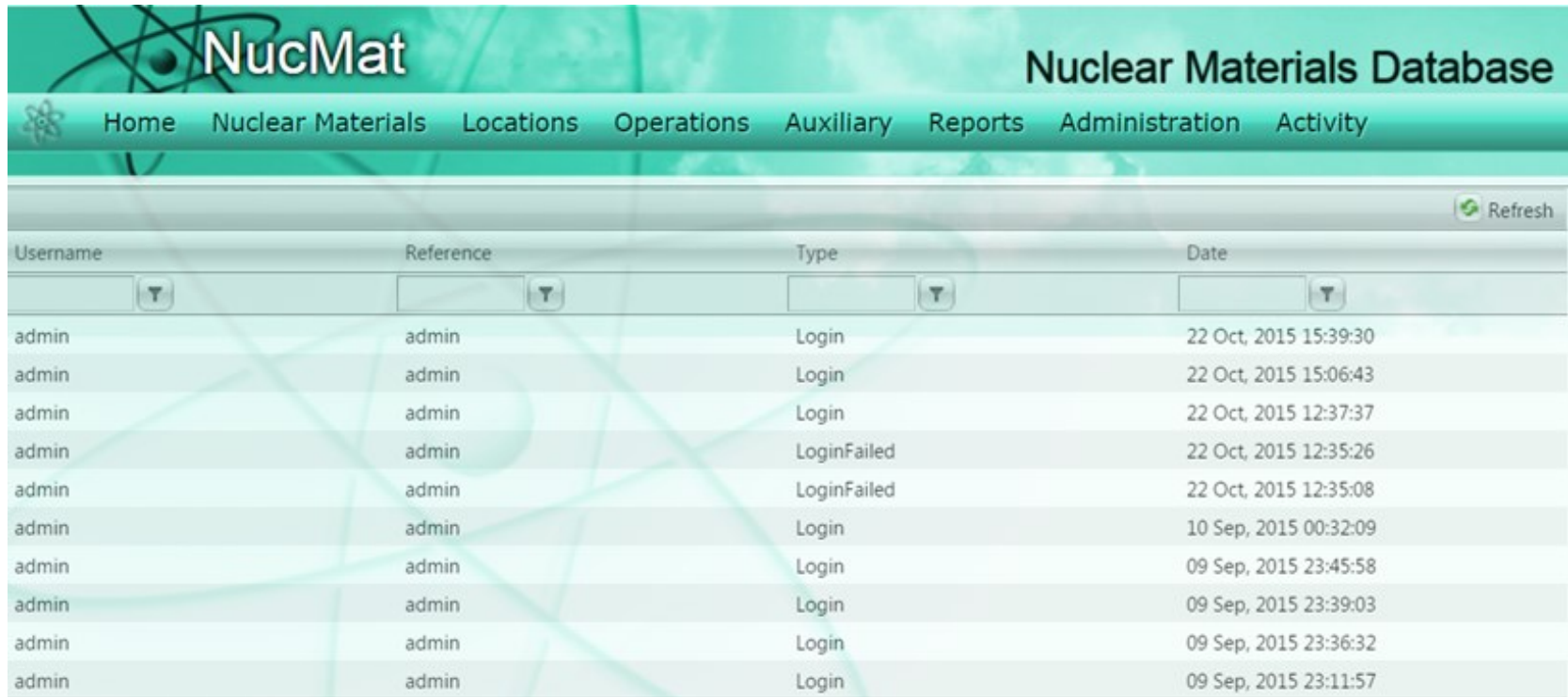


The screenshot displays the NucMat Nuclear Materials Database interface. At the top, there is a header with the NucMat logo and the text "Nuclear Materials Database". Below the header is a navigation menu with links: Home, Nuclear Materials, Locations, Operations, Auxiliary, Reports, Administration, and Activity. A "Refresh" button is located in the top right corner of the table area.

Username	Reference	Type	Date
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
admin	admin	Login	22 Oct, 2015 15:39:30
admin	admin	Login	22 Oct, 2015 15:06:43
admin	admin	Login	22 Oct, 2015 12:37:37
admin	admin	LoginFailed	22 Oct, 2015 12:35:26
admin	admin	LoginFailed	22 Oct, 2015 12:35:08
admin	admin	Login	10 Sep, 2015 00:32:09
admin	admin	Login	09 Sep, 2015 23:45:58
admin	admin	Login	09 Sep, 2015 23:39:03
admin	admin	Login	09 Sep, 2015 23:36:32
admin	admin	Login	09 Sep, 2015 23:11:57

Logs

▶ Backup/Restore



The screenshot displays the NucMat Nuclear Materials Database interface. The header includes the site name "NucMat" and "Nuclear Materials Database". A navigation menu contains links for Home, Nuclear Materials, Locations, Operations, Auxiliary, Reports, Administration, and Activity. A "Refresh" button is located in the top right corner of the table area. The table below lists login events for the "admin" user, including successful logins and failed login attempts.

Username	Reference	Type	Date
admin	admin	Login	22 Oct, 2015 15:39:30
admin	admin	Login	22 Oct, 2015 15:06:43
admin	admin	Login	22 Oct, 2015 12:37:37
admin	admin	LoginFailed	22 Oct, 2015 12:35:26
admin	admin	LoginFailed	22 Oct, 2015 12:35:08
admin	admin	Login	10 Sep, 2015 00:32:09
admin	admin	Login	09 Sep, 2015 23:45:58
admin	admin	Login	09 Sep, 2015 23:39:03
admin	admin	Login	09 Sep, 2015 23:36:32
admin	admin	Login	09 Sep, 2015 23:11:57

Logs

▶ Reports



Username	Type	Format	Date
admin	ICR	CrystalReport	07 Sep, 2015 14:22:20
admin	ICR	CrystalReport	07 Sep, 2015 14:22:17
admin	ICR	Excel	07 Sep, 2015 14:19:40
admin	PIL	Excel	22 Aug, 2015 22:45:18
admin	PIL	CrystalReport	22 Aug, 2015 22:45:15
admin	PIL	CrystalReport	22 Aug, 2015 22:44:54
admin	PIL	Excel	22 Aug, 2015 22:43:09

III. DATA SECURITY

Secure Code

- ▶ Authentication and Authorization
 - Confirmation of the identity of a users
 - determination what user can and can't do within NUCMAT
- ▶ SQL Injection attacks
 - No SQL scripts can be passed (no use of string concatenation)
 - Using stored procedures and SQL parameters
- ▶ Script exploits
 - No possibility to post scripts: ASP.NET prevents users from typing most script code into a form field and posting it to the server.
- ▶ No use of cookies
- ▶ Use of “private” variables in the code instead of “public” variables

Users rights (1 / 2)

- ▶ **Super-admin**
 - Can do everything
- ▶ **Supervisor**
 - User management
 - Log browsing
 - Report generation
 - Browsing of nuclear material inventory
 - NO Inventory changes
- ▶ **Write**
 - Browsing of nuclear material inventory
 - Inventory changes
 - Report generation
 - NO access to Logs
 - NO access to user management
- ▶ **Read**
 - Browsing of nuclear material inventory
 - Report generation

Limited access

- ▶ Limited access to database: Access only to the MBA to which user have access granted

The screenshot displays the NucMat Nuclear Materials Database interface. At the top, there is a navigation bar with the following menu items: Home, Nuclear Materials, Locations, Operations, Auxiliary, Reports, Administration, and Activity. Below the navigation bar, there is a section for adding new records and a table of existing users.

Table of Users:

Username	Firstname	Lastname	Email	User rights	Actions
admin			admin@test.com	SuperAdmin	
rw	Read	Write	test@test.am	Read	

Details for "rw"

Username:* User rights:

Firstname: Description:

Lastname:

Phone: MBA:

Email:

Password rules and requirements (1 / 3)

- ▶ NUCMAT randomly generated passwords
 - Minimal length – 13 symbols,
 - Shall not coincide with name of user,
 - Shall not have meaning,
 - Shall contain elements from ALL following symbols:
 - Upper case character(от А до Z),
 - Lower case character(а до z),
 - Main 10 numbers (0–9),
 - Special symbols (for example, \$, #, %).

Password rules and requirements (2/3)

Username:*	<input type="text"/>	User rights:	SuperAdmin <input type="button" value="v"/>
Firstname:	<input type="text"/>	Description:	<input type="text"/>
Lastname:	<input type="text"/>	MBA:	Storage YerPhl <input type="button" value="v"/>
Phone:	<input type="text"/>		
Email:	<input type="text"/>		
Password:*	<input type="password" value="5]8^w*#XbO9mJ"/> Mask Generate excellent		
Confirm password:*	<input type="password"/>		

Password rules and requirements (3/3)

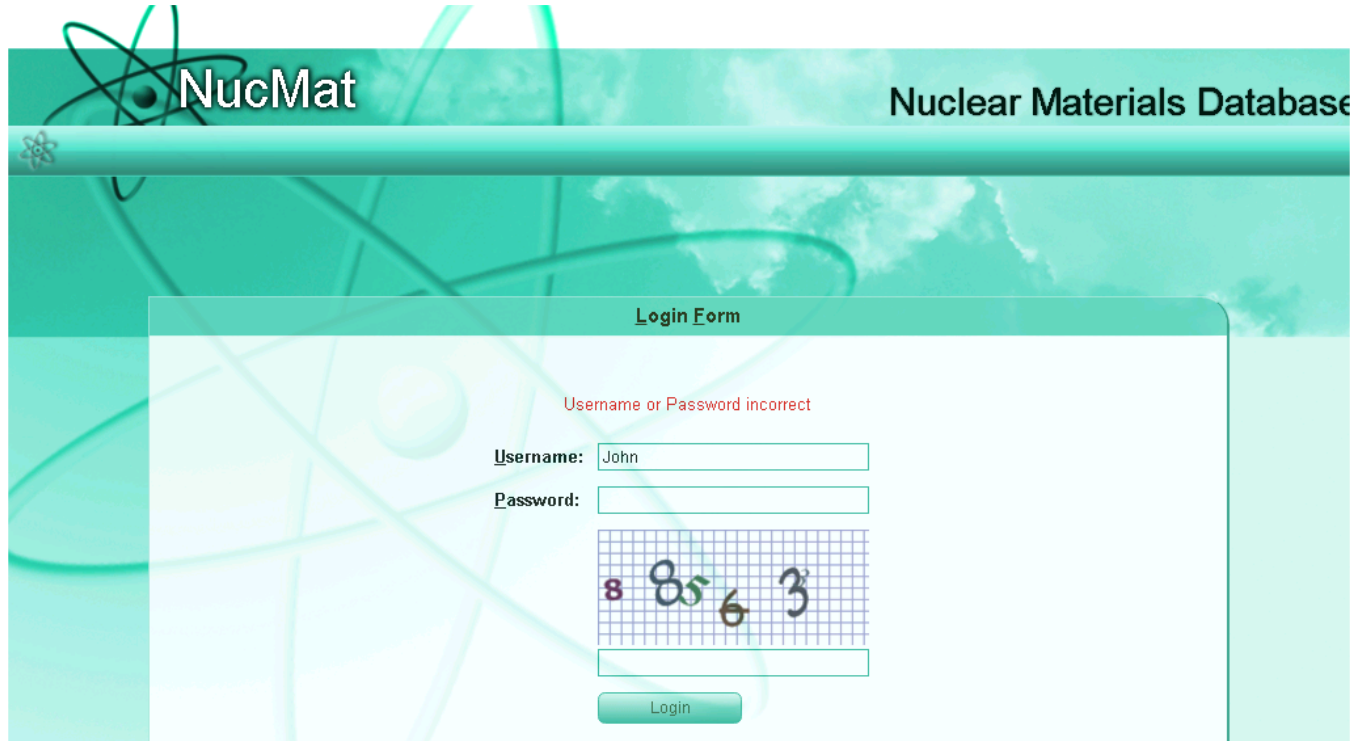
- ▶ User entered password
 - NUCMAT evaluates meeting with above mentioned requirement
 - Users are strongly recommended to use ONLY passwords that get “excellent” grade by NUCMAT

The screenshot displays a web application interface for adding a new user record. At the top, there are search filters for Username, Firstname, Lastname, Email, and User rights (set to 'All'). Below this is the 'Add new record' form. The form contains the following fields and controls:

- Username:** Text input field.
- Firstname:** Text input field.
- Lastname:** Text input field.
- Phone:** Text input field.
- Email:** Text input field.
- Password:** Text input field containing 'ad56Z*3!'. Below the field are links for 'Mask' and 'Generate', and a strength indicator 'medium'.
- Confirm password:** Text input field.
- User rights:** Dropdown menu set to 'SuperAdmin'.
- Description:** Text area.
- MBA:** List box containing 'Storage' and 'YerPhl'.

User Security Controls

- ▶ Protection against robot-attack:
 - CAPTCHA after 3 failed attempts
 - lock out after 10 failed attempts

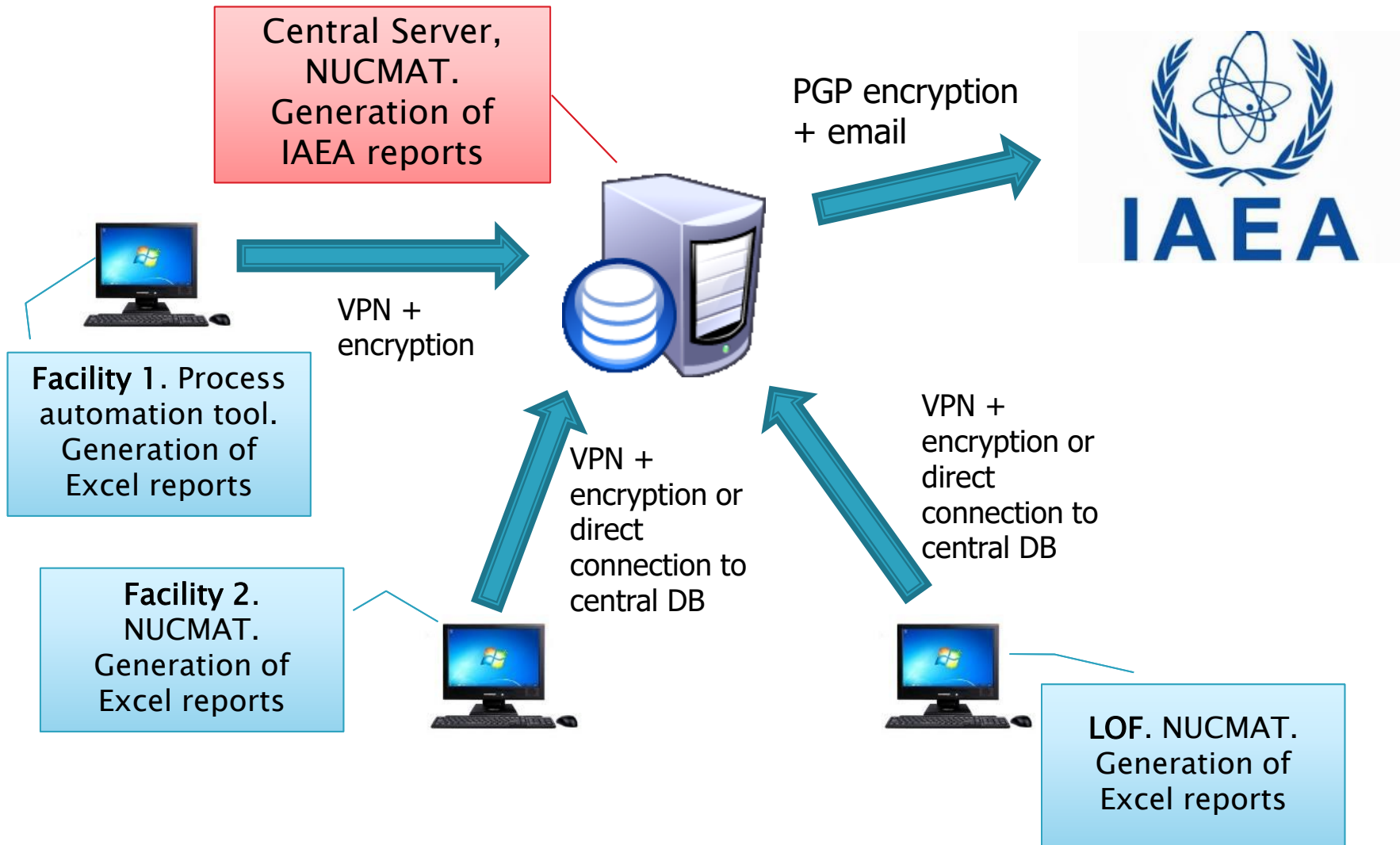


The screenshot displays the NucMat Nuclear Materials Database login interface. The page header includes the NucMat logo and the text "Nuclear Materials Database". The main content area is titled "Login Form" and contains a message: "Username or Password incorrect". Below this message are two input fields: "Username:" with the value "John" and "Password:". A CAPTCHA challenge is presented as a grid of numbers: 8, 8, 5, 6, 3. Below the CAPTCHA is an empty input field for the user to enter the numbers. At the bottom of the form is a "Login" button.

Independent assessment

- ▶ Independent Security Vulnerability Test Result
 - Overall – good
- ▶ Data Encryption

Deployment (example)



Export/Import MBA

- ▶ Export import Facility and LOF information:

The screenshot displays the NucMat Nuclear Materials Database Administration interface. The top navigation bar includes links for Home, Nuclear Materials, Locations, Operations, Auxiliary, Reports, Administration, and Activity. The Administration menu is open, showing options for Users, Backup / Restore, Import, Export MBA (xml), and Import MBA (xml). Below the navigation bar, there is a table of users with columns for Username, Firstname, Lastname, and Email. The table contains three rows: admin (Vinik Puxikyan, admin@internet.com), AnnaM (Anna Melkumyan, AnnaM), and John (John@mail.ru). A 'Details for "John"' link is visible below the table. The interface also features a language dropdown set to English and a Logout button.

Username	Firstname	Lastname	Email	
admin	Vinik	Puxikyan	admin@internet.com	
AnnaM	Anna	Melkumyan	AnnaM	
John			John@mail.ru	

IV. QA/QC

Error Detection During Input

- ▶ Preventing not allowed symbols:
 - Drop down lists, cross-references

The screenshot displays a data entry form for nuclear fuel elements. The form is organized into two columns of input fields. The left column includes: Batch number (text input: TT001), Batch count (text input: 3), Physical form (dropdown: Fuel elements (B)), Element (dropdown: Enriched uranium (E)), Fuel type (dropdown: Please select), Burnup (text input: 12500), Enrichment (dropdown: 1.60 (4)), and Weight (radio buttons for U, U235, Pu). The right column includes: Manufacturer (text input: TR001), Insertion date (calendar icon), Chemical form (dropdown: ADU (K)), Containment code (dropdown: Birdcage (8)), Irradiation status (dropdown: Irradiated fuel (G)), and Measurement basis (dropdown: Labelled (L)). Below these fields is a 'Location' section with a table of input fields: MBA (dropdown: LOF, SEUA, Storage, Test), KMP (text input), Building (text input), Room (text input), Cabinet (text input), and Box (text input). A large text area for 'Description' is located at the bottom of the form.

Save Cancel

Error Detection During Input

- ▶ Preventing not allowed symbols:
 - Customization of the drop down lists

The screenshot displays the NucMat Nuclear Materials Database interface. At the top, there is a navigation menu with options: Home, Nuclear Materials, Locations, Operations, Auxiliary, Reports, and Administration. Below the navigation is a header for "Add new record" with a "Refresh" button. The main form area is titled "Add new record" and contains several input fields and dropdown menus:

- Name:** A text input field.
- Code:** A text input field.
- Country:** A dropdown menu currently set to "AAUSTRIA".
- Establishment date:** A date input field.
- Facility:** A dropdown menu currently set to "Please select".

Below these fields are three columns of dropdown menus for material properties:

- Physical form:** Includes options like Ceramics (J), Coated particles (K), Formed, green (H), Fuel components (D), Fuel elements (B), Liquids (N), and Powder_ceramic (G).
- Fuel element:** Includes options like Depleted uranium (D), Enriched uranium (E), Natural uranium (N), Plutonium (P), Thorium (T), and Uranium, unified (U).
- Chemical form:** Includes options like ADU (K), Al alloys (3), Carbide (W), Carbide/graphite (Y), Dioxide (Q), Elemental (D), and Fluoride (F).

At the bottom, there is a "Default Properties" section with several more dropdown menus:

- Burnup:** A text input field.
- Physical form (repeated):** Same options as above.
- Fuel element (repeated):** Same options as above.
- Chemical form (repeated):** Same options as above.
- Irradiation status:** Includes options like Fresh fuel (F), Heterogeneous (irradiated) (L), Heterogeneous (non-irradiated) (G), Manufactured articles (irradiated), and Manufactured articles (non-irradiated) (K).
- Containment code:** Includes options like Bircage (8), Bottles, fibrepacks, cans (> 1), Bottles, fibrepacks, cans (0.5 - 1), Drums (>20 - 50) (L), Drums (>50 - 100) (M), and Drums_barrels (>100 - 200) (I).
- Measurement basis:** Includes options like Labelled (L), Measured (M), Measured elsewhere (N), and Tagged (T).

At the bottom left of the form, there are "Save" and "Cancel" buttons.

Error Detection During Input

- ▶ Preventing data falling out of acceptable range:

NucMat Nuclear Materials Database

Home Nuclear Materials Locations Operations Auxiliary Reports Administration Activity

Reactor

■ Isotope weight can't be more than 1% of elements weight.

Batch number:* JN01 Manufacturer:* KJ01

Batch count:* 1 Insertion date:* 5/4/2017

Physical form:* Ceramics (J) Chemical form: Carbide/graphite (Y)

Element:* Depleted uranium (D) Containment code: Birdcage (8)

Isotope: U235 only (G) Irradiation status: Description of NM (O)

Weight:* U U235
125000 * 3000 Measurement basis: Labelled (L)

Unit: G Kg

Location

KMP:* Core Fresh_Fuel_Unit Pool	Building:* Rack	Room: 45-09 (Box)	Cabinet:	Box:
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Error Detection During Input

▶ Preventing duplicate serial number:

The screenshot shows the NucMat Nuclear Materials Database interface. At the top, there is a navigation menu with links: Home, Nuclear Materials, Locations, Operations, Auxiliary, Reports, Administration, and Activity. Below the menu, there are input fields for 'From' (sfddg), 'MBA', and 'To' (Reactor). A red error message states: 'Duplicate item. No action'. The main form contains various input fields and dropdown menus for material properties: Batch number (KK04), Batch count (1), Physical form (Ceramics (J)), Element (Depleted uranium (D)), Isotope (U235 only (G)), Weight (U: 345000, U235: 0), Manufacturer (KL04), Insertion date (5/6/2017), Chemical form (Carbide/graphite (Y)), Containment code (Birdcage (8)), Irradiation status (Description of NM (O)), and Measurement basis (Labelled (L)). At the bottom, there is a 'Location' section with dropdown menus for KMP (Core, Fresh_Fuel_Unit, Pool), Building (Rack), Room (67-22 (Box)), Cabinet, and Box. The 'Unit' section has radio buttons for G (selected) and Kg.

User notifications/warnings

NucMat
Nuclear Materials Database

[Home](#) [Nuclear Materials](#) [Locations](#) [Operations](#) [Auxiliary](#) [Reports](#) [Administration](#) [Activity](#)

Date should be higher than last operation date

Reactor

[Depleted Uranium](#) / [Natural Uranium](#) / [Enriched Uranium](#) / [Uranium Unified](#) / [Plutonium](#) / **Thorium**

Change date	Batch number	Change code	Items count	Increase	Other	Decrease	Other	Inventory	Items total count	Comments
				Receipts	Other	Shipments	Other			
				Th	Th	Th	Th			
2017-03-26		BB	0	0	0	0	0	0	0	
2017-03-28	JJ02	GA	1	0	456	0	0	456	1	
2017-03-28	JJ03	GA	1	0	416	0	0	872	2	
2017-04-29	JJ02	RM	1	0	0	0	456	416	1	
2017-04-29	JJ03	RM	1	0	0	0	416	0	0	
2017-04-29	JJ23	RP	2	0	872	0	0	872	2	

1

Page size: 50

8 items in 1 pages

User notifications/warnings

Home Nuclear Materials Locations Operations Auxiliary Reports Administration Activity

Start point
No open inventory for this MBA

MBA:*
Reactor
Storage

KMP:*

Building:*

Room:

Cabinet:

Box:

Manufacturer
No records to display.

Flow KMP

Change date

U

U235

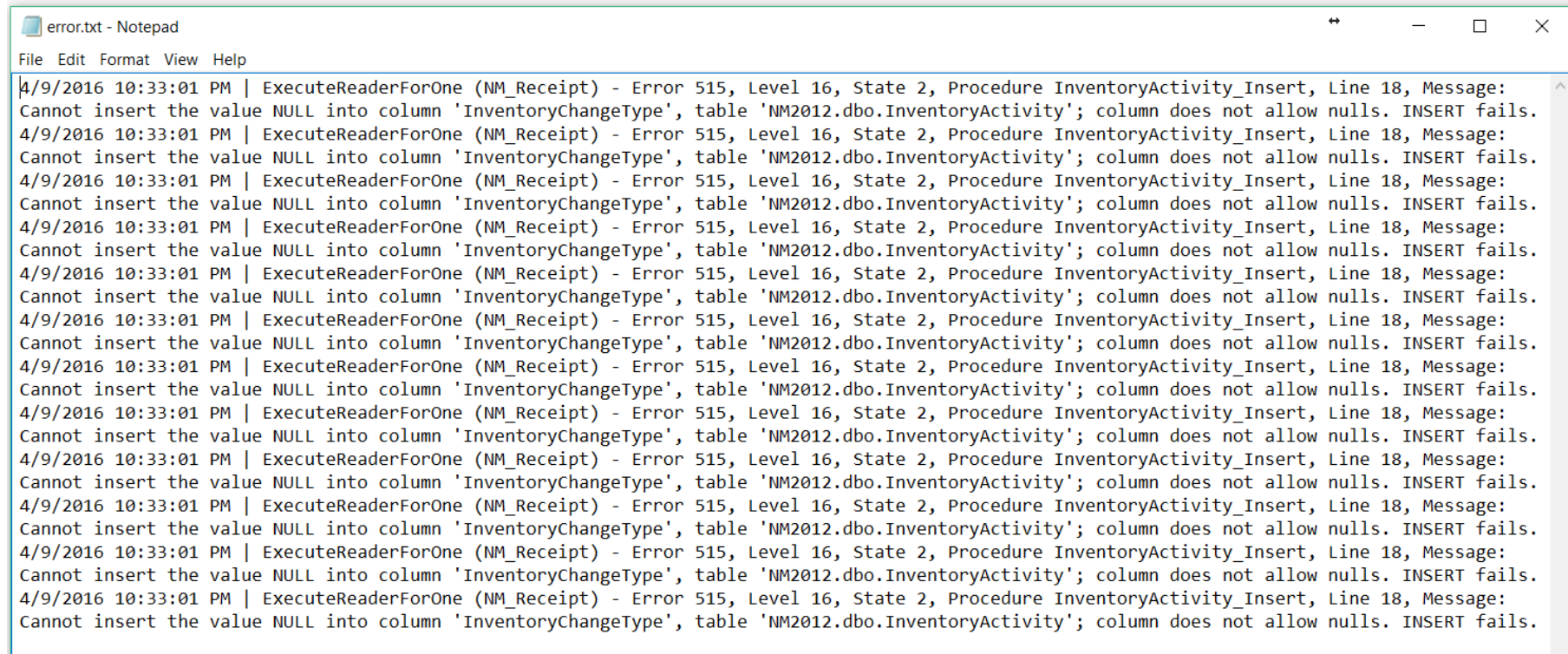
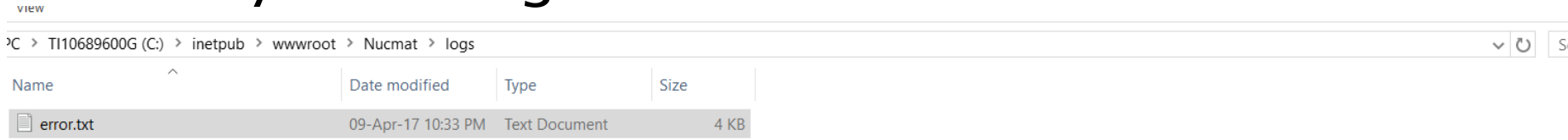
Pu 675.120

Th

Save

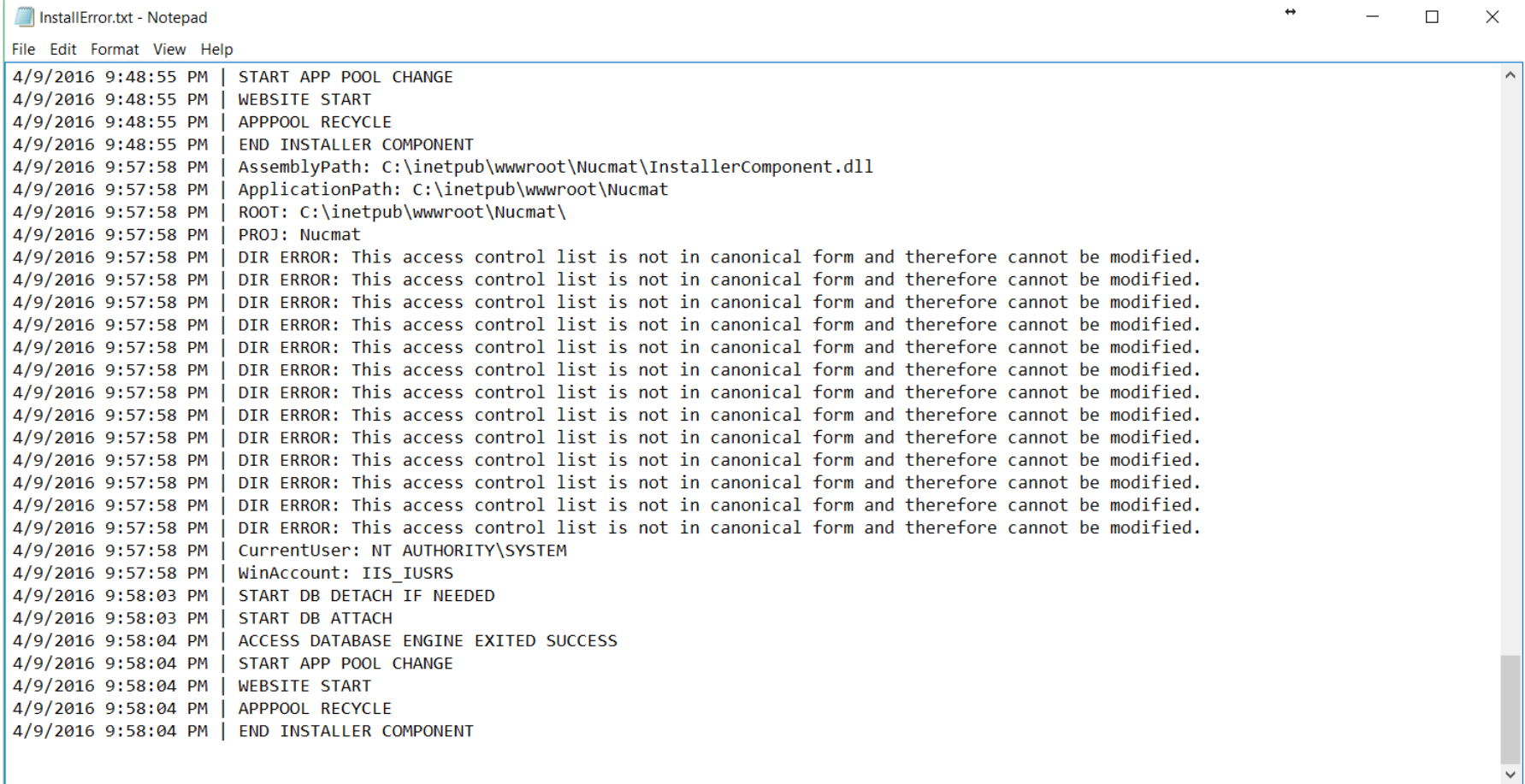
Error logging

▶ Activity error log



Error logging

► Install error log



```
InstallError.txt - Notepad
File Edit Format View Help
4/9/2016 9:48:55 PM | START APP POOL CHANGE
4/9/2016 9:48:55 PM | WEBSITE START
4/9/2016 9:48:55 PM | APPPOOL RECYCLE
4/9/2016 9:48:55 PM | END INSTALLER COMPONENT
4/9/2016 9:57:58 PM | AssemblyPath: C:\inetpub\wwwroot\Nucmat\InstallerComponent.dll
4/9/2016 9:57:58 PM | ApplicationPath: C:\inetpub\wwwroot\Nucmat
4/9/2016 9:57:58 PM | ROOT: C:\inetpub\wwwroot\Nucmat\
4/9/2016 9:57:58 PM | PROJ: Nucmat
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | DIR ERROR: This access control list is not in canonical form and therefore cannot be modified.
4/9/2016 9:57:58 PM | CurrentUser: NT AUTHORITY\SYSTEM
4/9/2016 9:57:58 PM | WinAccount: IIS_IUSRS
4/9/2016 9:58:03 PM | START DB DETACH IF NEEDED
4/9/2016 9:58:03 PM | START DB ATTACH
4/9/2016 9:58:04 PM | ACCESS DATABASE ENGINE EXITED SUCCESS
4/9/2016 9:58:04 PM | START APP POOL CHANGE
4/9/2016 9:58:04 PM | WEBSITE START
4/9/2016 9:58:04 PM | APPPOOL RECYCLE
4/9/2016 9:58:04 PM | END INSTALLER COMPONENT
```

Thank you!

