

<u>System No.</u>	<u>Description</u>
1	labs, synthesis quantities
2	labs, prepared compounds
3	labs, very small quantities
4	nuclear medicine, generator
5	diagnostic nuclear medicine, w/o generator
6	therapeutic nuclear medicine
7	brachytherapy - seeds
8	brachytherapy, manual
9	brachytherapy, LDR
10	brachytherapy, HDR
11	brachytherapy - Sr-90 eye applicator
12	teletherapy - single source
13	teletherapy - gamma stereotactic
14	human use research
*39	diagnostic device, fixed
15	nuclear pharmacy
16	veterinary
17	well-logging, tracers etc
18	well-logging, sealed sources
19	radiography, shielded room
*40	radiography, field site
20	irradiators, pool
21	irradiators, self-shielded
22S	fixed gauges etc, gamma
22G	fixed gauges etc, gamma
23S	fixed gauges etc, beta
23G	fixed gauges etc, beta
24S	portable gauges
24G	portable gauges
25	animal research
26S	measuring systems - X-Ray Fluorescence Analyzer
26G	measuring systems - X-Ray Fluorescence Analyzer
27S	measuring systems - Gas Chromatograph
27G	measuring systems - GC Chromatograph
28S	measuring - other
28G	measuring - other
29S	other small sealed sources
29G	other small sealed sources
30	very small sealed sources
31	manufacturers/distributors - sealed sources
32	manufacturers/distributors - unsealed solids
33	manufacturers/distributors - unsealed liquids
34	manufacturers/distributors - unsealed gases
35	waste disposal - incineration
36	waste disposal - compacting
37	waste disposal - packaging
38	waste - other, solidification

\* system number out of order, grouped with like systems  
S = specifically licensed; G = generally licensed

## Matrix Summary of Risk Assessment Results for Byproduct Materials Activities

Risk Type	System 1	System 2	System 3	System 4	System 5	System 6
a. Radiological, individual workers, normal conditions (mrem/y)	10	2	0.005	70	500	300
b. Radiological, individual public, normal conditions (mrem/y)	6	1	0.004	3	8	300
c. Radiological, individual workers, off-normal conditions (mrem/y)	0.2	0.08	0.0001	30	0.4	100
d. Radiological, individual public, off-normal conditions (mrem/y)	0.02	0.05	0.00009	0.05	0.005	0.7
e. Radiological, industry-wide, workers, normal conditions (rem/y)	1000	300	0.5	20	6000	900
f. Radiological, industry-wide, public, normal conditions (rem/y)	100	20	0.1	0.7	10000	3000
g. Radiological, industry-wide, workers, off-normal conditions (rem/y)	20	6	0.01	9	5	500
h. Radiological, industry-wide, public, off-normal conditions (rem/y)	0.5	0.3	0.002	0.01	0.06	1
i. Financial risk of accidents	L	L	L	M	M	M
j. Financial risk of lost or stolen sources.	L	L	L	L	L	L
k. Regulatory burden costs to licensees and regulators.	H	H	H	H	H	H
l. Risk of contamination (cost of decontaminating).	M	M	M	L	L	L
m. Non-radiological health risk.*	M	M	M	M	M	M
n. Value of use of the system	H	H	H	H	H	H
o. Perceived risk of use of the system.	H	H	H	M	M	M
p. Assurance level for barriers (max)	H	H	M	M	M	M
q. Radiological consequences that cannot be tolerated, even with very low probabilities.	No	No	No	no	no	no

Radiological risk = annual dose consequences [mrem/y or rem/y] x probability[unitless]

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\* there is insufficient data for these conclusions

Risk Type	System 7	System 8	System 9	System 10	System 11	System 12
a. Radiological, individual workers, normal conditions (mrem/y)	100	800	100	50	0	800
b. Radiological, individual public, normal conditions (mrem/y)	10	10	7	7	0	90
c. Radiological, individual workers, off-normal conditions (mrem/y)	0.9	60	9	2	0.002	5
d. Radiological, individual public, off-normal conditions (mrem/y)	0.08	0.03	0.2	0.2	0.00004	100
e. Radiological, industry-wide, workers, normal conditions (rem/y)	100	2000	50	20	0	200
f. Radiological, industry-wide, public, normal conditions (rem/y)	100	200	4	4	0	20
g. Radiological, industry-wide, workers, off-normal conditions (rem/y)	0.9	100	3	0.9	0.006	1
h. Radiological, industry-wide, public, off-normal conditions (rem/y)	0.04	0.7	0.1	0.1	0.006	30
i. Financial risk of accidents	L	L	L	M	L	M
j. Financial risk of lost or stolen sources.	L	H	L	M	L	M
k. Regulatory burden costs to licensees and regulators.	H	H	H	H	M	H
l. Risk of contamination (cost of decontaminating).	L	L	L	L	L	L
m. Non-radiological health risk.*	M	L	M	M	M	M
n. Value of use of the system	H	H	H	H	H	H
o. Perceived risk of use of the system.	M	M	M	M	M	M
p. Assurance level for barriers (max)	H	H	H	M	H	VH
q. Radiological consequences that cannot be tolerated, even with very low probabilities.	No	no	no	no	no	possible

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Risk Type	System 13	System 14	System 39	System 15	System 16	System 17
a. Radiological, individual workers, normal conditions (mrem/y)	100	200	30	50	800	900
b. Radiological, individual public, normal conditions (mrem/y)	30	4	20	10	90	2
c. Radiological, individual workers, off-normal conditions (mrem/y)	0.3	0.1	0.3	10	2	9
d. Radiological, individual public, off-normal conditions (mrem/y)	6	0.02	0.2	0.01	2	0.003
e. Radiological, industry-wide, workers, normal conditions (rem/y)	30	300	60	100	80	100
f. Radiological, industry-wide, public, normal conditions (rem/y)	2	200	60	10	2	20
g. Radiological, industry-wide, workers, off-normal conditions (rem/y)	0.06	0.1	0.8	30	0.2	1
h. Radiological, industry-wide, public, off-normal conditions (rem/y)	0.3	0.02	0.8	0.1	0.05	0.02
i. Financial risk of accidents	M	M	L	M	L	L
j. Financial risk of lost or stolen sources.	M	L	M	M	L	L
k. Regulatory burden costs to licensees and regulators.	H	H	H	H	H	H
l. Risk of contamination (cost of decontaminating).	L	L	L	L	L	L
m. Non-radiological health risk.*	L	M	L	M	M	M
n. Value of use of the system	H	H	H	H	M	H*
o. Perceived risk of use of the system.	M	M	M	H	M	M*
p. Assurance level for barriers (max)	VH	M	H	H	M	H
q. Radiological consequences that cannot be tolerated, even with very low probabilities.	Possible	no	no	no	no	no

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Risk Type	System 18	System 19	System 40*	System 20	System 21	System 22S
a. Radiological, individual workers, normal conditions (mrem/y)	600	200	2000	30	400	60
b. Radiological, individual public, normal conditions (mrem/y)	1	30	20	4	10	10
c. Radiological, individual workers, off-normal conditions (mrem/y)	1	60	20	0.2	0.3	0.03
d. Radiological, individual public, off-normal conditions (mrem/y)	2	40	30	0.02	2	0.007
e. Radiological, industry-wide, workers, normal conditions (rem/y)	400	100	5000	7	200	600
f. Radiological, industry-wide, public, normal conditions (rem/y)	20	50	2000	0.6	20	200
g. Radiological, industry-wide, workers, off-normal conditions (rem/y)	0.7	3	50	0.04	0.5	20
h. Radiological, industry-wide, public, off-normal conditions (rem/y)	0.7	2	40	0.003	10	0.9
i. Financial risk of accidents	L	M	M	M	M	L
j. Financial risk of lost or stolen sources.	H	M	H	L	L	M
k. Regulatory burden costs to licensees and regulators.	H	H	H	M	L	M
l. Risk of contamination (cost of decontaminating).	L	L	L	L	L	L
m. Non-radiological health risk.*	M	M	M	M	M	M
n. Value of use of the system	H*	H*	H*	H	H*	M*
o. Perceived risk of use of the system.	M*	M*	M*	H	M*	M*
p. Assurance level for barriers (max)	VH	VH	H	VH	VH	VH
q. Radiological consequences that cannot be tolerated, even with very low probabilities.	possible	possible	possible	yes	possible	possible

Radiological risk = annual dose consequences [mrem/y or rem/y] x probability[unitless]

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Risk Type	System 22G	System 23S	System 23G	System 24S	System 24G	System 25
a. Radiological, individual workers, normal conditions (mrem/y)	80	200	90	200	50	40
b. Radiological, individual public, normal conditions (mrem/y)	20	30	20	7	2	1
c. Radiological, individual workers, off-normal conditions (mrem/y)	0.01	0.0003	0.0001	1	20	0.7
d. Radiological, individual public, off-normal conditions (mrem/y)	0.004	0.0001	0.0001	0.03	0.4	0.2
e. Radiological, industry-wide, workers, normal conditions (rem/y)	2000	6000	6000	3000	500	30
f. Radiological, industry-wide, public, normal conditions (rem/y)	800	2000	3000	300	70	0.5
g. Radiological, industry-wide, workers, off-normal conditions (rem/y)	30	0.01	0.01	70	100	0.5
h. Radiological, industry-wide, public, off-normal conditions (rem/y)	2	0.01	0.02	4	10	0.1
i. Financial risk of accidents	L	L	L	L	L	L
j. Financial risk of lost or stolen sources.	M	L	L	H	H	L
k. Regulatory burden costs to licensees and regulators.	M	M	M	M	M	H
l. Risk of contamination (cost of decontaminating).	L	L	L	L	L	M
m. Non-radiological health risk.*	M	L	L	L	L	M
n. Value of use of the system	M*	M*	M*	M*	M*	M
o. Perceived risk of use of the system.	M*	M*	M*	M*	M*	H*
p. Assurance level for barriers (max)	VH	M	M	VH	VH	M
q. Radiological consequences that cannot be tolerated, even with very low probabilities.	possible	no	no	no	no	no

Radiological risk = annual dose consequences [mrem/y or rem/y] x probability[unitless]

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Risk Type	System 26S	System 26G	System 27S	System 27G	System 28S	System 28G
a. Radiological, individual workers, normal conditions (mrem/y)	40	50	0.3	0.3	600	1
b. Radiological, individual public, normal conditions (mrem/y)	0.8	1	0.2	0.2	30	0.01
c. Radiological, individual workers, off-normal conditions (mrem/y)	0.1	0.1	0.001	0.001	0.002	0.0001
d. Radiological, individual public, off-normal conditions (mrem/y)	0.01	0.01	0.0007	0.0006	0.0003	0.00003
e. Radiological, industry-wide, workers, normal conditions (rem/y)	300	600	9	20	100	0.6
f. Radiological, industry-wide, public, normal conditions (rem/y)	10	40	9	20	9	0.01
g. Radiological, industry-wide, workers, off-normal conditions (rem/y)	0.7	2	0.04	0.08	7	0.00007
h. Radiological, industry-wide, public, off-normal conditions (rem/y)	0.1	0.3	0.04	0.07	7	0.00003
i. Financial risk of accidents	L	L	L	L	L	L
j. Financial risk of lost or stolen sources.	L	L	L	L	L	L
k. Regulatory burden costs to licensees and regulators.	M	M	M	M	M	M
l. Risk of contamination (cost of decontaminating).	L	L	L	L	L	L
m. Non-radiological health risk.*	L	L	L	L	L	L
n. Value of use of the system	M*	M*	M*	M*	M*	M*
o. Perceived risk of use of the system.	M*	M*	L*	L*	M*	M*
p. Assurance level for barriers (max)	H	H	M	M	H	M
q. Radiological consequences that cannot be tolerated, even with very low probabilities.	no	no	no	no	no	no

Radiological risk = annual dose consequences [mrem/y or rem/y] x probability[unitless]

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Risk Type	System 29S	System 29G	System 30	System 31	System 32	System 33
a. Radiological, individual workers, normal conditions (mrem/y)	10	9	NA	400	700	500
b. Radiological, individual public, normal conditions (mrem/y)	2	2	3	2	7	3
c. Radiological, individual workers, off-normal conditions (mrem/y)	0.00001	0.000007	NA	1	0.04	0.02
d. Radiological, individual public, off-normal conditions (mrem/y)	0.002	0.00002	0.01	0.5	0.2	0.009
e. Radiological, industry-wide, workers, normal conditions (rem/y)	4	100	NA	200	200	80
f. Radiological, industry-wide, public, normal conditions (rem/y)	0.5	30	40000	0.02	0.03	0.01
g. Radiological, industry-wide, workers, off-normal conditions (rem/y)	0.09	3	NA	0.3	0.01	0.003
h. Radiological, industry-wide, public, off-normal conditions (rem/y)	0.01	1	4	0.07	0.0008	0.004
i. Financial risk of accidents	L	L	L	H	H	H
j. Financial risk of lost or stolen sources.	L	L	L	H	M	M
k. Regulatory burden costs to licensees and regulators.	M	M	L	H	H	H
l. Risk of contamination (cost of decontaminating).	L	L	L	L	L	L
m. Non-radiological health risk.*	L	L	L	M	M	M
n. Value of use of the system	L*	L*	H*	H*	H*	H*
o. Perceived risk of use of the system.	M*	M*	L*	H*	H*	H*
p. Assurance level for barriers (max)	M	M	H	H	H	VH
q. Radiological consequences that cannot be tolerated, even with very low probabilities.	no	no	no	no	no	no

Radiological risk = annual dose consequences [mrem/y or rem/y] x probability[unitless]

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Risk Type	System 34	System 35	System 36	System 37	System 38	
a. Radiological, individual workers, normal conditions (mrem/y)	600	3	40	70	40	
b. Radiological, individual public, normal conditions (mrem/y)	4	3	5	6	2	
c. Radiological, individual workers, off-normal conditions (mrem/y)	0.1	4	0.07	0.7	0.5	
d. Radiological, individual public, off-normal conditions (mrem/y)	0.2	1	0.005	0.06	0.07	
e. Radiological, industry-wide, workers, normal conditions (rem/y)	90	0.07	2	10	2	
f. Radiological, industry-wide, public, normal conditions (rem/y)	0.02	0.09	0.1	0.6	0.2	
g. Radiological, industry-wide, workers, off-normal conditions (rem/y)	0.02	0.3	0.004	0.7	0.04	
h. Radiological, industry-wide, public, off-normal conditions (rem/y)	0.0008	0.009	0.0002	0.006	0.006	
i. Financial risk of accidents	H	H	H	H	H	
j. Financial risk of lost or stolen sources.	M	L	L	L	L	
k. Regulatory burden costs to licensees and regulators.	H	H	H	H	H	
l. Risk of contamination (cost of decontaminating).	L	H	M	M	M	
m. Non-radiological health risk.*	M	M	M	M	M	
n. Value of use of the system	H*	M*	M*	M*	M*	
o. Perceived risk of use of the system.	M*	H*	M*	M*	M*	
p. Assurance level for barriers (max)	VH	M	M	H	M	
q. Radiological consequences that cannot be tolerated, even with very low probabilities.	no	no	no	no	no	

Radiological risk = annual dose consequences [mrem/y or rem/y] x probability[unitless]

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