Bruce Power

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Mr. B. Torrie
Director General, Regulatory Policy Directorate
Canadian Nuclear Safety Commission
P.O. Box 1046
280 Slater Street
Ottawa, Ontario
K1P 5S9

Dear Mr. Torrie:

Bruce Power comments on DIS-16-02, Radiation Protection and Dosimetry

The purpose of this letter is to comment on this Discussion Paper, which describes the CNSC's intent to update and consolidate existing regulatory information on radiation protection and dosimetry into two new Regulatory Documents (REGDOCs).

At the outset, let me reaffirm Bruce Power's support for the CNSC's ongoing efforts to reduce red tape within its regulatory framework. Succinct, clearly-written REGDOCS can improve nuclear safety when they establish well-defined guidance that is easily understood, accessed and updated to help licensee's comply with requirements set out in the Regulations.

Within that context, Bruce Power is concerned some proposals in this paper are premature and potentially counter-productive to the efficiencies the CNSC seeks. These concerns first emerged during an extensive, internal review by our team of radiation and dosimetry experts and were later affirmed during a joint review with industry peers and an information session with CNSC staff. Detailed comments generated during those sessions are listed in Appendix A along with suggestions to help improve any REGDOCs that may emerge from this process.

For the balance of this letter, let me highlight some of our most significant concerns:

Consolidation may not produce desired efficiencies

The benefit of consolidating existing requirements and guidance into two new REGDOCs is unclear. Consolidation runs the risk of creating unwieldy documents of such massive breadth their effectiveness is unintentionally diminished.

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As the CNSC is well aware, our radiation and dosimetry experts work in fields of continuous improvement. As such, licensees are concerned that documents of this size are difficult to review comprehensively or update at sufficient intervals to keep pace with international best practices or evolving science. As discussed at the information session, Bruce Power encourages the CNSC to ensure that the REGDOCs are logically organized into Parts or Chapters. This will assist with the review, revision and referencing of the mandatory Parts or Chapters within licences.

Guidance required for Section 21 of the *Radiation Protection Regulations*

Section 21 of the ***Radiation Protection Regulations (RPR)*** covers the posting of signs at boundaries and points of access and states:

Every licensee shall post and keep posted, at the boundary of and at every point of access to an area, room or enclosure, a durable and legible sign that bears the radiation warning symbol set out in Schedule 3 and the words "RAYONNEMENT-DANGER-RADIATION", if

> *(a) there is a radioactive nuclear substance in a quantity greater than 100 times its exemption quantity in the area, room or enclosure; or*
>
> *(b) there is a reasonable probability that a person in the area, room or enclosure will be exposed to an effective dose rate greater than 25 μSv/h.*

Historical interpretation of this requirement has had the posting in the immediate area of the dose rate. This has proven to be problematic at nuclear power plants in areas where the effective dose rate fluctuates with time. This has resulted in numerous reports of non-compliances with the *RPR* due to the fluctuating dose rates in various areas of the nuclear power plant. Bruce Power suggests guidance be developed and included that will allow an interpretation that will avoid these low-safety significant reports. One possibility would be to post at a zone boundary (nuclear power plants are divided into zones based on radiation hazards) such that any fluctuating radiation fields within the highest zone would not result in non-compliances with the *RPR*.

It is premature to adopt proposed dose of the eye limits

As discussed with CNSC staff in August 2016, industry believes it is too early to reduce the dose limit to the lens of the eye. At this time, there is no evidence of increased health impacts to Canadian nuclear energy workers and research results have been inconclusive with large uncertainties at the very low exposure levels (0-1 Gy). In addition, there is no available instrumentation to measure lens of eye dose with any type of accuracy or precision in the power industry.

Faced with these realties, we strongly urge the CNSC to implement regulations only when solid evidence is provided to support changes in the dose limits for lens of eye and approved methods for workplace monitoring and measurement are developed.

Once again, we appreciate the opportunity to provide comment on this Discussion Paper and encourage the CNSC to continue to engage licensees further as these proposed REGDOCs are developed. If you require further information or have any questions regarding this submission, please contact Maury Burton, Manager, Nuclear Regulatory Affairs, at (519)-361-5291, or maury.burton@brucepower.com.

Yours truly,

Frank Saunders
Vice President Nuclear Oversight and Regulatory Affairs
Bruce Power

cc: CNSC Bruce Site Office (Letter only)
K. Lafrenière, CNSC Ottawa
K. Owen-Whitred, CNSC Ottawa

Attach.

Attachment A

Bruce Power comments on DIS 16-02, Radiation Protection and Dosimetry

Bruce Power comments on DIS 16-02, Radiation Protection and Dosimetry

#	Document/ Excerpt of Section	Industry Issue	Suggested Change (*if applicable*)	Major Comment/ Request for Clarification[1]	Impact on Industry, *if major comment*
1.	**General**	The timing of the proposed documents is premature because the new RP regulations have not been finalized. The stated purpose of the proposed documents is to "align with and provide relevant information to licences for meeting the new requirements resulting from the forthcoming amendments to the Radiation Protection Regulations." Since these have not been published, it is difficult to provide many specific comments on potential points that need clarification or further information in the proposed documents.	Industry suggests the CNSC defer the discussion on the proposed documents until the new RP regulations have been adopted.	**MAJOR**	Industry is unable to fully assess the potential impact of the documents because the revised RP regulations have not been published.
2.	**General**	There appear to be a number of new topics in the proposed documents, particularly proposed **REGDOC-2.7.1** ***Radiation Protection***, that do not relate to the regulations, but to the generic science of radiation protection. The need for a number of sections of **REGDOC 2.7.1** is unclear. For example, the CNSC has stated it will not adopt the concept of Dose Constraint in	Limit the scope of the documents to areas directly tied to the RP regulations.	**MAJOR**	As stated, the proposed content of **REGDOC 2.7.1** could introduce a number of unnecessarily prescriptive practices that are not needed nor tied directly to implementing the radiation protection regulations.

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		DIS-13-01: ***Proposals to Amend the Radiation Protection Regulations.*** Given this, why is this section in the document? This reinforces industry's view that it is not possible to fully comment on this document because the revisions to the RP regulations have not been published. Other than the sections on exceedances of dose limits, it is not clear what would be covered in the section on radiation dose limits that wouldn't be covered in the regulations. Most of the sections of Control of Radiological Hazards are likely to be facility-specific and/or matters of general science. For example, shielding, ventilation, dust control, various types of monitoring and control, radiation protection equipment and instrumentation.			
3.	**General**	The scope of the document is very large, especially when all additional regulatory documents referenced are considered. This makes it difficult to provide	Industry seeks assurance that there will be extended discussion periods when the actual regulatory guides are developed, including workshops particularly for any new content.	**MAJOR**	The CNSC's expectations will create a resource burden for licensees who will find it difficult to provide needed resources to properly assess the large scope of the documents in a short period

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		comprehensive and meaningful comments on any concerns with these referenced documents. Despite this, the paper says the "CNSC would like to hear comments on the CNSC's assessment of each existing documentation for inclusion in the regulatory documents and the proposed updates").			of time.
4.	**General**	Industry questions the fundamental benefit of consolidating these REGDOCs.	Rather than create two large REGDOCs, industry suggests they be divided into a series of smaller, more user-friendly documents with logical chapters or parts.	**MAJOR**	As stated earlier, this document is very broad in terms of content and scope. As a result, both guidance documents will be very large. Making changes to a 20-page document requires significant effort and time. By extension, documents of the breadth and size of the proposed documents will be a massive undertaking to update and keep current with evolving science and/or international recommendations. Consolidation runs the risk of creating documents that are so large they cannot be reviewed comprehensively and updated at sufficient intervals to be aligned with current best practices.
5.	**Section 3.1, page 3**	Under 'Changes to international benchmarks,' industry has concerns with the line, "These revised international benchmarks need to be reflected in the	Industry believes it is premature to adopt proposed dose of the eye limits until existing technical and operational issues are resolved. The CNSC is urged to implement regulations only when solid evidence is provided to support changes in the dose	**MAJOR**	The Nuclear Regulatory Commission in the United States has not accepted the International Commission on Radiological Protection recommendation and will not be changing the dose limits to the lens of the eye. As such, it is too

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		Radiation Protection Regulations." This is particularly true with regard to dose limits to the lens of the eye. As discussed with CNSC staff in August 2016, industry believes it is too early to reduce the dose limit to the lens of the eye for the following reasons: • There is no evidence of increased health impacts to Canadian nuclear energy workers. • Research results have been inconclusive and contain large uncertainties at the very low exposure levels (0-1 Gy). • The instrumentation is not currently available to measure lens of eye dose with any type of accuracy or precision in the power industry.	limits for lens of eye and approved methods for workplace monitoring and measurement of lens of eye dose are developed.		soon for the Canadian industry to adopt all of the proposed limits as written. For example, the instrumentation is not currently available to perform workplace monitoring and measure lens of eye dose with any type of accuracy or precision in the power industry. The substantial costs licensees would incur to measure and control the eye dose appear out of line with the detriment compared to other potential safety improvements.
6.	**Section 3.2, Strengthening existing CNSC documents**	It is not clear what the references for "current best practices" are for the development of meaningful action levels. How will CNSC staff determine current best practices?		*Clarification*	
7.	**Section 3.2**	Currently, **G-91** provides	If there are intended changes regarding how G-91 is	*Clarification*	

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	G-91, Ascertaining and Recording Radiation Doses to Individuals	sufficient guidance as well as flexibility to make decisions on a risk based approach that is appropriate for each site. It also acknowledges there needs to be some flexibility on reasonableness with regard to use of a dosimetry service for internal dosimetry. For implementation purposes, it is important for this flexibility to remain. Industry awaits further information regarding "additional guidance clarifying the interpretation of section 5 (e.g., "direct measurement" and "estimation") and section 8 (i.e., use of licensed dosimetry services) of the *Radiation Protection Regulations."*	applied then further discussions are required with industry.		
8.	**Section 3.2 G-129: Keeping Radiation Exposure and Dose ALARA**	The CNSC has stated it will not be introducing dose constraints into the RP regulations. Therefore, industry does not believe dose restraints should be introduced into a regulatory guide document as a mandatory requirement. Beyond the comment above, this document currently provides good general guidance and framework for	Industry recommends the document remain largely as is, though items that may strengthen it include: • Introduction of the monetary cost per rem concept (for individual and collective dose); how it is derived and applied in dose optimization and cost-benefit analysis. • Guidance on how to keep dose ALARA for different phases of the plant, e.g. Commissioning, Operation, Decommissioning and Waste Management. • Provide examples of what good looks like, including good and best practices.	*Clarification*	

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		an ALARA program.			
9.	**Section 3.2 General -G-147, Radiobioassay Protocols for Responding to Abnormal Intakes of Radionuclides**	Industry awaits further information.	Provide additional information.	**MAJOR**	Industry will be better able to assess the impact of potential changes once a detailed draft is made available for comment.
10.	**Section 3.2 GD-150, Designing and Implementing a Bioassay program**	Industry awaits further information.		**MAJOR**	Industry will be better able to assess the impact of potential changes once a detailed draft is made available for comment.
11.	**Section 3.2 G-218**	**G-218** is acceptable as currently written. It provides sufficient guidance along with the recognition that a Code of Practice can be quite site dependent. Specifically, it provides a well-worded summary of action levels, including the recommendation they should be linked to effective dose as		*Clarification*	

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		this is a useful indicator of a potential loss of control. If any additional detail or guidance is added, care must be taken to avoid reducing the flexibility in the existing text.			
12.	**Section 3.2, G-313 Radiation Safety Training Program for Workers Involved in Licensed Activities with Nuclear Substances and Radiation Devices and with Class II Nuclear Facilities and Prescribed Equipment**	This has the potential to create confusion and duplication of information. Industry maintains both NSRD and /or Class II licences and its training programs include elements of the appropriate regulations and recommended training content.	Do not include G-313 in proposed REGDOC .This is covered under **REGDOC-2.2.2 *Personnel Training***. It is suggested that using an Annex similar to what was done for the Workers Involved in Licensed Activities with Nuclear Substances and Radiation Devices, and with Class II Nuclear Facilities and Prescribed Equipment may be appropriate	**MAJOR**	Consolidating G-313 with **REGDOC-2.2.2** will avoid confusion and duplication of information.
13.	**Section 3.2, GD-314, Radiation**	Industry awaits further information. Industry may have comments when the	Provide additional information.	*Clarification*	

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	Protection Programs for the Transport of Nuclear Substances	draft changes are incorporated into the Packaging and Transport regulatory document.			
14.	**Section 3.2, RD-58 Thyroid Screening for Radioiodine**	Industry awaits further information.	Provide additional information.	**MAJOR**	Industry will be better able to assess the impact of potential changes once a detailed draft is made available for comment.
15.	**Section 3.2, S-106, rev. 1, Technical and Quality Assurance Requirements for Dosimetry Services**	Industry does not agree with the inclusion of this document in **REGDOC-2.7.2** because **S-106** is the license document for dosimetry lab licensees and is detailed, specific and focused on dosimetry labs. Industry does not feel it is appropriate for dosimetry labs to be audited against other elements of **REGDOC 2.7.2**.	**S-106** should be integrated into a separate REGDOC or a specific chapter within the proposed document.	**MAJOR**	Placing this QA document into a larger guidance document would impact the dosimetry licencing process and lead to potential confusion of requirements.**S-106** would become applicable to companies who are not actually licensed operators under any additional regulations. Combining it with all other content listed in these documents would be difficult and confusing for those companies.
16.	**S-106, rev. 1, Technical and Quality Assurance Requirements for Dosimetry**	The proposed replacement for existing performance criteria: **DIS 16-02**, does not specifically identify the document. When this paper says, "New performance criteria for bioassay have recently been published by	It is strongly recommended that references and the basis of **ANSI/HPS N13.30-2011** be scrutinized to prevent inadvertent consequences or to become incompatible with current accepted practices. Industry should be consulted to identify what problems are being solved.	*Clarification*	

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	Services	the American National Standards Institute in 2011" is it referencing **ANSI/HPS N13.30-2011 *Performance Criteria for Radiobioassay*?** If so, industry is concerned that adopting the ANSI standard would lead to additional administrative burden with no improvement to safety and quality.			
17.	**Section 3.2, S-106, rev. 1, Technical and Quality Assurance Requirements for Dosimetry Services**	On page 6, this paper says, "clarifications regarding CNSC expectations with respect to quality assurance programs for licensed dosimetry programs are proposed to be included."	Industry requests guidance on how missing dosimeter results constitute a test failure, as well as how to deal with cases where the group/ organization exposing dosimeters (or providing bioassay performance test samples) provide incorrect values.	*Clarification*	
18.	**Section 3.2, S-106, rev. 1, Technical and Quality Assurance Requirements for Dosimetry Services**	Some jurisdictions are moving towards implementing only one primary dosimeter, and it is electronic.	Include guidance for using electronic personal dosimeters as primary dosimeters for whole body, skin, extremity and lens of the eye.	*Clarification*	
19.	**Section 3.2, S-106, rev. 1,**	Current industry dosimetry service licence conditions specify that events which	Define what standard of reliability is expected in dosimetry service.	*Clarification*	

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	Technical and Quality Assurance Requirements for Dosimetry Services	affect the reliability of dosimetry results obtained shall be reported.			
20.	**Section 3.2, S-106, rev. 1, Technical and Quality Assurance Requirements for Dosimetry Services**	Re Section 4.2.7.2: In industry's experience, this particular test has been historically problematic to coordinate and evaluate. As a result, one has not taken place in more than five years.	Industry recommends eliminating this section from **S-106.**	**MAJOR**	There will be an additional burden with no corresponding improvement to safety or quality.
21.	**Section 3.2, S-106, rev. 1, Technical and Quality Assurance Requirements for Dosimetry Services**	Industry will need to know the performance and type test criteria for lens of the eye dosimetry.	Please address: • What phantom to use (for a dosimeter specifically designed for the lens, a variant of the ORAMED cylindrical phantom is suggested, but for using existing WB TLDs, a 15 cm x 30 cm x 30 cm PMMA water-filled phantom is appropriate to minimize re-doing type testing). • What Dose Conversion Factors to use, for beta and photons, for the two phantoms. • How to do beta type testing, when only the Beta Secondary Standard 2 (BSS2) Sr/Y-90 beta source is the only one available. • Accuracy and precision specifications for lens dosimetry. • Specific requirements for use of existing $H_P(3)$ lens dose results from WB TLDs.	**MAJOR**	This will be required so licensees can either amend their dosimetry service licences or enable them to be smart buyers of these services.
22.	**Section**	The current version of **S-260**	• Define what constitutes a dose correction.	**MAJOR**	There will be an additional burden with

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	3.2,S-260, Making Changes to Dose-Related Information Filed With the National Dose Registry,	treats all dose record changes as a dose correction. There is no provision for making changes that are purely of an administrative nature and should not require CNSC approval. These administrative changes include such things as: • Wrong employer serial number • Late submission/report • Change to dose data as a result of error in quantities used to obtain analytical result (e.g. TLD ECC, calibration data) • Correction made to a dose algorithm These points should be considered dose record changes and not a dose correction.	• Add the concept of an administrative change that does not require CNSC approval. • Remove CNSC authorization of dose corrections to the NDR for licenced facilities. Rephrase from worker approval to worker notification.		no corresponding improvement to safety or quality.
23.	**Section 3.2,S-260, Making Changes to Dose-Related Information Filed With the**	Industry supports a streamlined process to address "mass changes" to dose records. Currently, each dose record change requires completion of a CNSC Dose Information Correction Form, which requires CNSC approval to proceed with a	Streamline the process to address "mass changes" to dose records.	*Clarification*	

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	National Dose Registry,	change to dose previously submitted to NDR. There is no provision for processing large numbers of dose corrections, without use of the form for each record.			
24.	**Section 3.2, S-260, Making Changes to Dose-Related Information Filed With the National Dose Registry,**	Re Section B of the CNSC Dose Information Change Request Form: This form requires the person to acknowledge and accept in writing that a change is being made to their dose information filed in the NDR. The form further requires that Section B must be completed before industry may submit the request. While industry believes in the necessity of notifying an individual that a correction to their data filed in NDR has been made and why, it is very difficult to comply with this requirement when the person has left a facility and has not provided a forwarding address or contact or when the person is: • A contractor to a facility and has left the site, • Retired from a facility , or • Deceased. Further, there is an implication that if the person	Remove the requirement that workers must accept dose record change. Require workers to acknowledge being told record has been changed and why. The NDR should flag dose corrections in their system for communication to the worker.	*Clarification*	

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		does not accept the change, then the process ends and no change is made. Making this change will result in improved timeliness in processing dose corrections.			
25.	**Section 3.3, Improvement opportunities**	The CNSC has identified a number of specific improvement opportunities, the first three of which relate more directly to radiation protection programs while the others relate to radiation dosimetry. As previously stated, the intent to combine all regulatory guidance into two documents may generate an exceedingly long document or omit significant relevant detail if the individual documents are shortened in the process. Another challenge with large documents is that their very size and wide range of topics make the revision process problematic.	Industry would like the CNSC to provide: examples where the proposed approach has worked well; more information regarding the standards or international guidance upon which they are based.	*Clarification*	
26.	**Section 3.3, Improvement opportunities**	All of the elements listed in this section may have an impact on industry. See specifics in the comments below.	Where appropriate, it may be beneficial to identify an existing, recognized external standard and identify the extent to which licensees are expected to follow those documents. Industry also asks for guidance on using electronic personal dosimeters as primary dosimeters.	**MAJOR**	Any changes may require licence amendments and significant resource commitments with no corresponding improvement to safety or quality. Industry will be better able to assess the impact of potential changes once a detailed draft is

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					made available for comment.
27.	**Section 3.3 Radiation Protection program design and associated processes**	Licensees have invested large amounts of time, expertise and experience to develop their RP programs. CNSC acceptance/ notification are required for key program documents. Revisions need to respect the maturity and robust design of the NPP programs and the safety culture that uses and depends upon them. Revisions must not impede the progressive changes to program design which allow refinement of their Nuclear Safety Culture. They must reflect the business need to align with **CSA N286-12**. As an inclusion to **REGDOC-2.7.1**, it should be as guidance only.	Any changes need to acknowledge that licensees have invested significant resources to develop mature RP programs that will need to evolve over time to align with other standards and refine their nuclear safety culture	**MAJOR**	Any changes may require licence amendments and significant resource commitments with no corresponding improvement to safety or quality. Industry will be better able to assess the impact of potential changes once a detailed draft is made available for comment.
28.	**Section 3.3 Calibration and maintenance of radiation protection equipment**	Technology in the radiation protection equipment area is developing quickly and regulators need to keep pace. Given the speed of technological advancements, licensees need the ability to develop acceptance criteria and adopt these unforeseen technologies.	Guidance is sought on the framework of acceptable processes including the following attributes: QA; use of secondary standards; frequencies.	*Clarification*	\

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29.	**Section 3.3 Radiation dose rate and contam control program**	Industry seeks guidance only that allows flexibility of application. NPPs already invest significant effort with CANDU owners, nuclear vendors and INPO/WANO to develop excellence in dose rate and contamination control.	Any changes need to acknowledge that licensees have invested significant resources to develop RP programs that are mature and already recognized as effective by the CNSC	*Clarification*	
30.	**Section 3.3 Ascertaining radiation doses to workers, when no licenced dosimetry service is utilized**	Maturity of existing programs should be recognized. The stations already have a requirement to know their source term, and should be considered a mature program. This program can be utilized to ascertain or estimate radiation doses to workers.	Define trivial dose (no further action required) and provide guidance on use for dose calculations. Industry recommends 1 mSv per year or less than 0.1 mSv per event.	**MAJOR**	Any changes may require licence amendments and significant resource commitments with no corresponding improvement to safety or quality. Industry will be better able to assess the impact of potential changes once a detailed draft is made available for comment
31.	**Section 3.3 Use of monitoring results from direct reading dosimeters**	The guidance document should allow licensees to pursue use of direct reading dosimeters as licenced dosimetry.	The guidance document should allow licensees to pursue the use of electronic direct reading dosimeters as licenced dosimetry. A different set of standards/technical requirements (Specific section is **REGDOC 2.7.2** as a licenced dosimeter) will be required for the acceptance of electronic direct reading dosimeters.	*Clarification*	
32.	**Section 3.3 Dose calculation methods for skin contamination, multiple**	NPPs are rarely limited by skin dose limits given the protections used when conducting work. Thus, unlicenced dosimetry should be considered. Using available reference material,	Guidance is sought on what would constitute unlicenced dosimetry for these situations. Criteria for current multiple badging should remain unchanged.	*Clarification*	

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	badging and non-uniform exposures	simple field instruments should be permitted to give initial dose estimates. And, similar to derived activities for internal dosimetry, combinations of field instrument results and exposure times should be used to determine if further dose investigation is required.			
33.	**Section 3.3 Radionuclide-specific methods for internal dosimetry (for example, dose assessments for transuranics, uranium compounds, and tritium)**	Industry does not concur with radionuclide-specific methods detailed in a guidance document. The pressure to measure for trivial hazards will increase.	It is the licensee's responsibility to define the hazards and provide adequate dosimetry for them. The guidance document should, at a high level, detail these dosimetry requirements. Some improvements could be made to the dosimetry methods mentioned in guidance documents. Ratio analysis is not covered, whereby hard-to-detect nuclide dose can be computed from known ratios to indicator nuclides. A graduated response is necessary for hard-to-detect nuclides since it's not reasonably likely for exposures over 1mSv/annum to occur. Personal Air sampling is the easiest technique to screen for intakes of TRU. The field of internal dosimetry for TRU is too complicated for a regulatory document. High level guidance based on a graduated response similar to other internal hazards should be considered, but this document should not delve too deeply into internal dosimetry considerations. This is not done for other readily available nuclides, (Cobalt, Zirconium) and should not be specified here.	**MAJOR**	Any changes may require licence amendments and significant resource commitments with no corresponding improvement to safety or quality. Industry will be better able to assess the impact of potential changes once a detailed draft is made available for comment.

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			Any internal dosimetry section should be able to encompass all nuclides of concern. At best, some distinction for radiation types which drive appropriate analytical types can be made.		
34.	**Section 3.3 Ascertaining the equivalent dose to the lens of the eye**	Clear language is needed to allow the licensee to correctly determine the required dosimetry protocols. Clear methods of calculation are desirable in tabular format to provide clear go/no-go criteria for selection of estimates or direct measurements requirements (align with table 1 of CNSC e Doc:4894468)	Line 4 of table 1 of eDoc:4894468 might imply that estimates or computations of Hp(3) using Hp(10) and Hp(07) might be acceptable. Line 9 suggests that direct measurements will be mandated for beta if there is energetic beta, safety glasses but no further protections. This intent needs to be clarified. Provide standards for protective eye wear for prevention of lens of eye dose.	**MAJOR**	The language chosen for the document -- estimate vs direct measurement -- has a significant impact on resource and implementation cost. Estimating from available dosimetry systems would minimize the costs of implementation. Direct measurement would be very costly to implement. The determination of which is acceptable must be very clear so the additional costs are justified.
35.	**Section 3.3 Methods for monitoring neutron dosimetry**	Neutron dose is difficult to accurately measure in fields with 7 decade spectrums. Industry has few options.	Clear guidance on acceptable protocols for use-of-stay times, survey meters or personal dosimeters is required.	*Clarification*	
36.	**Section 3.3 Use of radiation personal protective equipment and respiratory protection**	Choice and selection of RP personal protective equipment and respiratory protection needs to be guidance only and give licensees the flexibility to meet work requirements and adopt/develop new equipment. If equipment or protections provided to workers reduce	Clarification is requested in that if a-priori dose estimates indicated worker exposure to less than trivial levels, no dosimetry is required unless protections fail.	*Clarification*	

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		the dose estimates to less than trivial dose levels, dosimetry is not required unless those protections fail. Current guidelines state that dosimetry is recommended if respiratory protection is worn to protect a worker against a given hazard. The term 'recommended' is too restrictive. If it can be demonstrated that the exposure to the worker is less than trivial values, it is not ALARA to go further with dosimetry unless those protections fail.			
37.	**Section 3.3**	Thoughts on additional guidance	Industry requests guidance on how to ascertain eye dose for workers originating from other countries that are not required to adhere to the lens of eye dosimetry requirements. It is believed the USA and other countries may not implement the new lens of eye dosimetry limits, which would imply that workers who have worked in those countries will not have lens of eye dose on their dose records.	*Clarification*	
38.	**Section 4.1 General**	There is significant danger of 'scope creep' in the inclusion of existing regulatory documents with clearly defined scopes, e.g. G-313, into a common document with potential applicability across all licensees.	Provide a scope of applicability (i.e. to whom does the section apply) before each section in the REGDOC	*Clarification*	

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		Applicability of each section may not be consistent across industries and licensees, resulting in confusion. Also, if documents such as **RD/GD-369** continue to exist, there will be redundant information and potential confusion since two documents will provide guidance on the same thing. Some of the proposed new content and referenced documents for inclusion are not applicable across all licensees. For example, **G-313**, thyroid screening, training, etc. How is content from this regulatory guide to be applied to all licensees if they do not all have the same risks and or requirements?			
39.	**Section 4.1 Content from G-129, rev. 1 will be adopted & refined to provide guidance on the framework for radiation**	Additional guidance and definitions are required.	A definition of trivial dose, i.e. dose at which further RP efforts are not required is requested. Maintain the management commitment statements which translate into effective action.	**MAJOR**	Significant station resources are spent considering trivial doses. If there were hard guidelines stating these values, once that level is achieved, efforts at further protections could be put to more productive use.

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	protection including the application of the ALARA principle				
40.	**Section 4.1 Content from G-313 on categories of workers and corresponding radiation protection training topic areas (skills and knowledge) will be adopted and refined**	This has the potential to create confusion and duplication of information. Industry maintains both NSRD and /or Class II licences and its training programs include elements of the appropriate regulations and recommended training content.	Do not include **G-313** in proposed REGDOC .This is covered under **REGDOC-2.2.2** ***Personnel Training***. It is suggested that using an Annex similar to what was done for the Workers Involved in Licensed Activities with Nuclear Substances and Radiation Devices, and with Class II Nuclear Facilities and Prescribed Equipment may be appropriate.	**MAJOR**	Consolidating **G-313** with **REGDOC-2.2.2** will avoid confusion and duplication of information.
41.	**Section 4.1 CNSC guidance for principles of worker**	Better definitions sought.	Define trivial dose (no further action required) and provide guidance on use for dose calculations. Industry recommends 1 mSv per year or less than 0.1 mSv per event. Define "component" in G-91 table in section 7.	*Clarification*	

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	dose control will be established and aligned with CNSC's G-91, RD-58, G-121, G-147, G-150, and RD/GD-369 (section 11)				
42.	**Section 4.1 Thoughts on additional guidance**	Consider alignment with **CSA N286-12, *Management System requirements for nuclear facilities***	.	*Clarification*	
43.	**Section 4.1 Content from G-91 will include the interpretation of section 5 of the Radiation Protection Regulations (e.g. "direct measurement" and**	Industry agrees with integrating the document if it is maintained in its entirety	If there are intended changes regarding how **G-91** is applied, then further discussions are required with industry.	*Clarification*	

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	"estimation "), and section 8 of the Radiation Protection Regulation s (when a licensed dosimetry service must be used to ascertain workers' doses)				
44.	**Section 4.1 Guidance on ascertainin g doses from intakes of radionuclid es will be aligned with GD-150 and G-147**	**G-147** 1. Ascertaining of dose, dose interpretation as it pertains to assignable dose, or dose below the minimum recordable dose or below the derived activities, to be clarified. 2. The specific mention of Ce144 is difficult to achieve in practice. There are other nuclides which are more readily detectable by commercially field instrumentation (NaI based) and have higher fission yields (Zirconium,	**G-147** 1. A table with these various levels, (dose from special, dose from routine) above and below MRD, and derived activities as well as actions and required NDR reporting would clarify these issues. 2. It would be better to incorporate statements of known source term ratios to other, easily identifiable nuclides which may be in the source term. 3. As far as common terminology, section 4.3 could be aligned better with **GD-150** and the use of derived activities which drives facility response based on bioassay results.	**MAJOR**	**G-147** • NPPs maintain a source term characterization that produces actual ratios of all nuclides to each other in different areas of the plant. Ce144 is difficult to detect by WBC and is rarely found in these surveys. More useful nuclide and the concept of indicator nuclides and known source term ratios would better serve the NPP industry. • Use of derived activities for all internal dosimetry is ALARA and would be of benefit to the NPP industry. Derived activities shows true understanding of internal dosimetry. Routine sampling does not know the date of intake, and

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		Cesium). Ce144 gamma emissions are below manufacturer's specified detection capabilities for many NaI based in-vivo counting systems. With the low to no dose assignments estimates for WBC, resource commitments to move to more sensitive/expensive instrumentation does not meet G91 ALARA principles. 3. Common terminology			derived activities take this into consideration. A positive sample does not automatically result in dose assignment because if the intake occurred recently compared to sample submission, the dose is small to trivial. The derived activity protocol as defined in GD-150 then collects a second sample. If the intake was worthy of dose computation and assignment, it will still be observable in the second sample. If the intake was recent compared to the first sample, the second will not likely detect it given the intervening time between samples. This is especially of use for fecal sampling when the periods of intake concern may extend over many months. For low intakes the bioassay sample quickly falls to less than detection limits. For larger intakes, it will be observable for many months.
		GD-150 Industry seeks clarity on language and limits for a number of items. In this guidance document.	**GD-150** Clear language and limits are required for: • **Routine bioassay samples** are submitted on a set frequency. They are intended to be set for workers who are possibly exposed to internal radiation hazards. They can be analyzed by licenced or unlicenced laboratories. • **Screening bioassay samples** use protocols which may not meet the 1 mSv per year or 0.1 mSv per infrequent event, but the licensee has demonstrated that such exposures are not reasonably probable.	MAJOR	**GD-150** • The section on of derived activities is found to be a good ALARA practice. It drives appropriate station response based on bioassay findings. It reflects a good understanding of internal dosimetry specifically excretion characteristics. For example real significant intakes are observable many months after exposure. Routine samples do not

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			• **Licenced dosimetry** is a statement of quality assurance of the laboratory. Licenced dosimetry is to be used if the anticipated hazard will expose the worker to more than 5 mSv, or 1 mSv if there are combinations of hazards which may expose the worker to more than 5 mSv. • **Unlicenced dosimetry** services do not need to demonstrate the quality assurance as required for licenced dosimetry. • **Dose Estimate** is a preliminary calculation of the dose to a worker in an actual or theoretical scenario. If the estimate is below threshold levels, no further refinement or protections are required. The threshold levels are to be tied to 1 mSv/annum. Estimates can be reported to the NDR as dose records. • **Ascertaining dose** is a methodology to calculate a dose which will be reported to the national Dose Registry. It is to be performed by qualified individuals using approved protocols. The protocols may or may not be considered licenced dosimetry. • **Reportable doses** are those required to be sent to the National Dose Registry. They may come from licenced or unlicenced protocols. All dose estimates over 1 mSv per year must be considered reportable doses. • **Trivial dose** is a dose, possibly from an estimate which warrants no further consideration. This is taken to be 0.10 mSv per event or 1 mSv per annum. The application of this is varied but could include items such as the GD-150 recommendation for bioassay samples if PPE is worn to protect against a hazard. If the PPE reduces the dose estimate to less than trivial levels, then no bioassay is recommended (unless the PPE fails). • **Reasonably probable** is a professional judgement that a given event could occur in a given time frame.		know the intake date. To find out the station response to a sample over the DA is to obtain another sample. This involves a time delay. For a real significant intake, this sample too will be positive. If the intake was recent, then it will not be observable, the dose is small (trivial?) and no further action including non-reporting to the NDR is appropriate.

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			Historical or mathematical arguments can be used for this determination. For routine sampling considerations, this could be considered annually for example. If an event does not occur in a given year with many challenges to that event occurring, it should be considered not reasonably probable. For example if no dose has been assigned via a methodology type which has a routine frequency by many workers, exposure to that hazard is not reasonably probable, and the dosimetry should be unlicenced and or reduced from routine to screening at best. • Maintain the preference for PAS for the screening of intakes. Fecal is not appropriate for screening. • Could expand definition of what screening implies, where it can be used and dose response if positive. Screening is useful when anticipated dose is < 1 mSv/annum or 0.1 mSv per infrequent event. Licenced screening methods are not required (though they can be used)		
45.	**Section 4.1 S-106 Rev. 1 will be incorporated, with changes reflecting the updates described in section 3.2 of the discussion paper**	Industry does not agree with the inclusion of this document in **REGDOC-2.7.2** because **S-106** is the license document for dosimetry lab licensees and is detailed, specific and focused on dosimetry labs. Industry does not feel it is appropriate for dosimetry labs to be audited against other elements of **REGDOC 2.7.2**. Also, the proposed replacement for existing	**S-106** should be integrated into a separate REGDOC or a separate chapter. Industry also recommends strongly that references and the basis of **ANSI/HPS N13.30-2011** be scrutinized to prevent inadvertent consequences or to become incompatible with current accepted practices. Industry should be consulted to identify what problems are being solved.	**MAJOR**	There will be an administrative burden with no improvement to safety and quality if this standard is adopted Placing this QA document into a larger guidance document would impact the dosimetry licencing process and lead to potential confusion of requirements.S-106 would become applicable to companies who are not actually licensed operators under any additional regulations. Combining it with all other content listed in these documents would be difficult and confusing for those companies.

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		performance criteria: DIS 16-02, does not specifically identify the document. When this paper says, "New performance criteria for bioassay have recently been published by the American National Standards Institute in 2011" is it referencing **ANSI/HPS N13.30-2011 *Performance Criteria for Radiobioassay***? If so, industry is concerned that adopting the ANSI standard would lead to additional administrative burden with no improvement to safety and quality.			Depending on the extent that **ANSI/HPS N13.30-2011** is to be followed, industry will be better able to assess the impact of additional changes.
46.	**Section 4.1 Thoughts on additional Guidance**	Consider alignment with **CSA N286-12, *Management Systems requirements for nuclear facilities.***			
47.	**Section 4.2 – New Content**	Under new content, the first bullet suggests the use of licensed dosimetry services for annual doses to extremities greater than 50 mSv. This is acceptable to industry.			
48.	**Section 4.2**	Regarding the second bullet, the current proposal for the			

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	–	new RPRs specifies a fixed 5-year dosimetry period. Industry suggests users also be allowed to use a 5-year rolling average dose to determine compliance with dose limits.			
49.	**Section 4.2 – New Content**	Please provide a definition of the hands and feet, otherwise known as extremities.	In the past (circa 1997), extremities included the elbows and knees (see **ANS/HPS N13.41 (1997)**). Current thinking does not include the elbows and knees (see **ANS/HPS N13.41 (2011)**).	*Clarification*	
50.	**Section 4.2 – New Content**	Industry supports limiting intakes to infants from breast feeding parents.			
51.	**Section 4.2 – New Content**	What is being included in radiation protection equipment and instrumentation? Other than the requirements for the annual calibration of radiation instruments, the current regulations are vague on requirements.	Any guidance provided should not preclude the use of new and innovative technology to enhance the safety of workers. If defined, the document should provide guidance only.	*Clarification*	
52.	**Section 4.2 – New Content**	The latest ICRP recommendations (ICRP 103, OIR, and associated documents) might be considered by the CNSC for adoption in Canada. Before we adopt them, we need to understand their implications. Any discrepancy or misalignment between the	Industry requires that it be consulted prior to consideration of the latest ICRP.	**MAJOR**	Implementation of the new/revised dosimetry regulatory documents with recommendations for the use of revised ICRP dosimetric and biokinetic models as presented in the ICRP OIR series of documents will have significant impact on Industry's licenced internal dosimetry services. Industry's internal dosimetry program and its technical basis document was developed using IMBA

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		new regulatory document and the ICRP recommendations may result in regulatory requirements that may not be technically sound. The impact of such situations on industry is difficult to assess at this point, but it is clearly not desirable for such discrepancies to exist.			(Integrated Modules for Bioassay Analysis) Professional software, which is based on dosimetric and biokinetic models as per recommendations in ICRP60 publication. With the CNSC recommendation for use of the latest ICRP dosimetric and biokinetic models as presented in the ICRP103 publication, industry will be required to re-model its current internal dosimetry program and technical basis document to conform to the new models. ICRP dosimetric and biokinetic models are relatively complex mathematical compartmental models and require sophisticated software to complete the calculations. Industry will be required to find and purchase software, which would incorporate the latest ICRP dosimetric and biokinetic models. This poses a significant challenge that cannot be addressed until the updated software can be obtained. If adopted following consultation with industry, licensees request the CNSC allocate an adequate amount of time to implement and comply with the revised dosimetry regulatory documents.
53.	**Section 4.2 – New Content**	It was noted that neutron and eye dosimetry were listed in topics under New Content in the discussion paper, but do not appear to be covered in	Industry notes the CNSC has issued a separate technical document on eye dosimetry. As this is a dynamic area, both from a scientific and licensing perspective, it is recommended this topic not be incorporated into this	**MAJOR**	Any changes may require licence amendments and significant resource commitments with no corresponding improvement to safety or quality. Industry will be better able to assess the impact of

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		the table of contents of either proposed guidance document.	guidance until it is more stable.		potential changes once a detailed draft is made available for comment.
54.	**Section 4.2, Provide guidance for new requirements stemming from the amendments to the Radiation Protection Regulations:**	Technology of RP instruments is rapidly developing, some of it unforeseen. Any guidance needs to allow these improvements to be engaged within a managed framework It will be difficult to include all of the relevant guidance on requirements for radiation protection equipment and instrumentation. Perhaps this aspect could be separated from the proposed new document and issued as a stand-alone guidance document (considering that CNSC staff previously compared the proposed requirements to those outlined in the IAEA Safety Series Report No.16).		*Clarification*	
55.	**Section 4.2 Provide guidance for ascertaining and recording the**	As discussed with CNSC staff in August 2016, industry believes strongly that it is too early to reduce the dose limit to the lens of the eye for the following reasons: - There is no evidence of increased health impacts to	Industry believes it is premature to adopt proposed dose of the eye limits until the existing technical and operational issues are resolved. Clear direction on expectations will eventually be needed. What is the process to evaluate this? Provide criteria at which estimates are acceptable. If estimates are low enough, is there a trivial dose whereby further considerations and protections are not required? What doses are sent to the NDR? What methods for	**MAJOR**	The substantial costs licensees would incur to measure and control the eye dose appear out of line with the detriment compared to other potential safety improvements. There would be a large variation in implementation costs depending on the language chosen in the guidance document, estimate vs direct

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	equivalent dose to the lens of the eye and methods to afford worker protection with regard to the lens of the eye	Canadian nuclear energy workers. - Research results have inconclusive and large uncertainties at the very low exposure levels (0-1 Gy) - The instrumentation is not currently available to measure lens of eye dose with any type of accuracy or precision in the power industry. Lens of eye dosimetry, if fully developed will render the requirement for whole body dosimetry redundant. Eye dose is everywhere and always more than Whole body dose, and with the same dose limits; eye dose therefore becomes the limiting dose for the human person.	estimates are acceptable; is a skin dose reading from the head location acceptable and up to what dose? Industry also requests language which would permit the application of eye dosimetry to be pinpointed to only those workers who may have eye dose greater than whole body dose. Provisions are needed to drop whole body dose monitoring if lens of eye dosimetry is implemented.		measurement.
56.	**Section 4.2, Provide guidance for principles of radiological hazard control…**	Licensees have mature programs developed with the CNSC and industry peers. NPPs need to have flexibility to design controls based on work to support their ALARA principles.	Provide high level guidance only	*Clarification*	

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57.	**Section 4.2 Provide guidance on methods for monitoring for neutron exposures**	Accurate neutron dosimetry is still a challenge to the NPP industry. Ascertaining neutron dose from stay times and pre-determined dose rates are questionable given the large and generally conservative, uncertainties in time, and generally conservative uncertainties in geometry between where the pre-determined dose rate measurement occurred and where the worker generally is.	Clarification is required in **S-106** to permit personal neutron dosimeters. If there are intended changes, then further discussions are required with industry.	*Clarification*	
58.	**Section 4.2 Provide guidance on ascertaining the equivalent dose to the skin as a result of nuclear substances deposited on or absorbed in the skin (i.e. skin contamination)**	Guidance is needed. It must be a graduated response, with low level dose estimations first coming from field instrumentation possibly in the form of CPM by a pancake. This can then be graduated based on defined dose estimates to nuclide identification, specific shielding calculations etc. What are the exact NDR reporting criteria? Consideration should be given for available software to perform dose calculations.		*Clarification*	

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59.	**Section 4.2, page 9**	What standards or international guidance is the proposed guidance on monitoring for neutron exposures and wearing of multiple badges based?		*Clarification*	
60.	**Section 4.2, page 9**	What are the certain dosimetry types not typically part of a licensed dosimetry service?		*Clarification*	
61.	**Section.5.1, Operational and administrative burden**	**REGDOC-2.7.2, *Dosimetry*** - - For the QA requirements, define an equivalency statement to align with existing standards (e.g., ISO 17025)		*Clarification*	
62.	**Section 5.1/6.0**	While it is impossible to accurately assess the operational and/or administrative burden without clarification on some of the points expressed in these comments, industry believes they would be significant. Industry will only be able to ascertain the full cost when the CNSC distributes draft version(s) of the new document(s) for review and comment.	Industry recommends updating the existing regulatory and guidance documents rather than consolidating them..	**MAJOR**	Industry has a mature program developed with the CNSC and industry peers. Any change will have a significant administrative impact just to respond to the change. Operational burden can't be determined due to the breadth of the proposals. Implementation challenges would include documentation changes and change management as well as potential requirement to purchase new equipment. The true impact is impossible to assess at this stage of the consultation process.
63.	**Section 6, Implementa**	Consolidation runs the risk of creating documents that are	Undertake proper R&D and technical basis development before making changes.	**MAJOR**	The substantial costs licensees would incur to measure and control the eye

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	tion Challenges with REGDOC-2.7.2, Dosimetry	so large they cannot be reviewed comprehensively and updated at sufficient intervals to be aligned with current best practices. As detailed earlier, there would also be significant challenges to implement specific items such as eye dosimetry. It is simply too soon to impose changes at a time when there is no method of measuring accurately or any proven, licenced technology.			dose appear out of line with the detriment compared to other potential safety improvements. There will be significant start-up costs if new dosimetry systems are to be specified, designed, type tested, tested, and implemented. All procedures relative to ALARA and work planning will require revision. Training will require revision. Software will have to be revised to include data fields for lens of eye dosimetry. The National Dose Registry will also have to revise its data handling protocols to receive new lens of eye dosimetry fields.
64.	**Section 7**	**REDOC- 2.7.2 *Dosimetry*** Proposed Table of contents	Under "Requirements for Licenced Dosimetry Services, external radiation" – add new section for Electronic Dose Control Devices		
65.	**Appendix A**	All of the following proposed new elements will have an impact on industry: • **Justification, Limitation, Optimization, and dose constraints**. As stated above, there are many different opinions on how to implement the concept of dose constraint. This would lead to significant administrative burden to demonstrate regulatory compliance.	If there are intended changes then further discussions are required with industry.	**MAJOR**	Industry will be better able to assess the impact of potential changes once a detailed draft is made available for comment.

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		• **Radiation Protection Training and Qualification** Training requirements for Class II and NSRD licences should be included in their respective Regulations. Adding them to this regulation may conflict with OPGs Systematic Approach to Training (SAT) requirements for its Class I operating licenses. • **Radiological personal protective equipment**. What new requirements will be added regarding RPPE, as the current regulations and regulatory documents provide minimal guidance on their use? • **Respiratory protection for airborne nuclear substances**. Respiratory protection is generally addressed by meeting CSA standards. Will this model continue or will there be new requirements? Design features / engineered			

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		controls for radiation protection (shielding, ventilation, dust control).Will the CNSC be introducing requirements over and above what has currently been accepted? If so, the changes could introduce significant monetary burdens upon licensees. • **Classification of Areas and Access Control.** The requirements Classification and Access control has historically been set by licensees Radiation Protection programs. This should be left as such, as changes to engineered systems are cost intensive. • **Labelling of containers and devices containing nuclear substances** The requirement for labelling containers and devices in the RPRs conflicts with the requirements in the NSRD regulations. An exception should be added to not require			

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		labelling on containers or devices that are exempt under the NSRD regulations (e.g. a radium watch). • **Radiation protection equipment and instrumentation.** Depending on what is meant by RP equipment and instrumentation, this could introduce a significant regulatory burden on licensees (e.g. decontamination kits or chemistry stack monitors being considered radiation protection equipment).Clearance of persons and materials from regulatory control. This heading is not addressed in the discussion paper, but could introduce a significant impact on current industry programs.			