

**Comments by David Lochbaum, Director, Nuclear Safety Project
before the ACRS Subcommittee on Reliability & PRA**

The Cumulative Effects of Regulation (CER) process enhancements and Risk Prioritization Initiative (RPI) will not be successful unless two gaps are eliminated, or at least significantly narrowed:

- 1) Gap between pace resolving nuclear business items and pace resolving nuclear safety issues
- 2) Gap between licensees' perception of risk and NRC's perception of risk

The last sentence of the first paragraph under the Background section on page 2 of the draft SECY paper (ML15036A181) states:

“The goal of RPI is to enable NRC staff and licensees to focus resources on issues that are most significant to public safety using risk insights and incentivize the further use and development of probabilistic risk assessment (PRA).”

Unless the second gap is eliminated or significantly narrowed, the first gap will likely widen to have the opposite effect from this stated goal. It is vitally important that steps be taken to address both these gaps.

GAP BETWEEN NUCLEAR BUSINESS AND NUCLEAR SAFETY ISSUE RESOLUTION

The nuclear industry and the NRC have the capacity to resolve nuclear business issues in a timely, effective manner. Three examples demonstrate this capacity.

Licensing Actions: The NRC issues semiannual status reports to the US Congress. The information provided to the Congress includes the NRC's progress resolving licensing actions. The NRC defines licensing actions to be:

Operating power reactor licensing actions are defined as orders, license amendments, exemptions from regulations, relief from inspection or component testing, topical reports submitted on a plant-specific basis, notices of enforcement discretion, or other actions requiring NRC review and approval before they can be implemented by licensees. (Source: ML14106A293)

Exemptions from regulations, relief from inspection and testing requirements, and notices of enforcement discretion are clearly more nuclear business oriented than nuclear safety oriented. This is not to suggest that nuclear safety is compromised or undermined by exemptions, relief, and non-enforcement, but it would be hard to contend that such efforts improve nuclear safety. At best, they are safety neutral.

Table 1 reflects the NRC's pace in resolving licensing actions from a recent report to the Congress.

Table 1: NRC's Report to Congress on Resolving Licensing Actions FY11 to FY14 (ML14106A293)

PERFORMANCE BUDGET PLAN					
Output Measure	FY 2011 Actual	FY 2012 Actual	FY 2013 Actual	FY 2014 Goals	FY 2014 YTD
Licensing actions completed per year	849	770	668	900	217
Age of licensing action inventory	90.3% ≤ 1 year and 99.9% ≤ 2 years	95.8% ≤ 1 year and 100% ≤ 2 years	95% ≤ 1 year and 100% ≤ 2 years	95% ≤ 1 year and 100% ≤ 2 years	87% ≤ 1 year and 99% ≤ 2 years
Other licensing tasks completed per year	465	674	529	500	402
Age of other licensing tasks inventory	94.2% ≤ 1 year and 99.6% ≤ 2 years	94.6% ≤ 1 year and 100% ≤ 2 years	97.6% ≤ 1 year and 100% ≤ 2 years	97.6% ≤ 1 year and 100% ≤ 2 years	90% ≤ 1 year and 99% ≤ 2 years

The NRC resolves hundreds of licensing actions (a.k.a. nuclear business issues) each year. In fact, the NRC resolves ALL or a very high percentage of nuclear business issues within two years.

License Renewals: While technically a subset of licensing actions because they require license amendments, license renewals are examined separately because they typically involve more resource efforts by licensees and the NRC. Figure 1 shows the time taken by the NRC in approving several license renewal requests.

The NRC has a long, proven track record of approving license renewals within three years. To be sure, there are some exceptions such as Pilgrim and Indian Point, but the majority get approved like clockwork.

Figure 1: Completed License Renewal Applications from
<http://www.nrc.gov/reactors/operating/licensing/renewal/applications.html>

Plant Applications for License Renewal

Completed Applications:

(Includes application, review schedule, supplemental environmental impact statement, and safety evaluation report.)

Plant Name and Unit(s)	Application Received	Renewed License Issued	Date Entering Extended Operation
Calvert Cliffs 1 & 2	04/10/98	03/23/00	07/31/14 (Unit 1) 08/13/16 (Unit 2)
Oconee 1, 2 & 3	07/07/98	05/23/00	02/06/13 (Unit 1) 10/06/13 (Unit 2) 07/19/14 (Unit 3)
Arkansas Nuclear One 1	02/01/00	06/20/01	05/20/14
Turkey Point 3 & 4	09/11/00	06/06/02	07/19/12 (Unit 3) 04/10/13 (Unit 4)
Edwin I. Hatch 1 & 2	03/01/00	06/15/02	08/06/14 (Unit 1) 06/13/18 (Unit 2)
North Anna 1 & 2	05/29/01	03/20/03	04/01/18 (Unit 1) 08/21/20 (Unit 2)
Surry 1 & 2	05/29/01	03/20/03	05/25/12 (Unit 1) 01/29/13 (Unit 2)
Peach Bottom 2 & 3	07/02/01	05/07/03	08/08/13 (Unit 2) 07/02/14 (Unit 3)
St. Lucie 1 & 2	11/30/01	10/02/03	03/01/16 (Unit 1) 04/06/23 (Unit 2)
Fort Calhoun	01/11/02	11/04/03	08/09/13
McGuire 1 & 2	06/14/01	12/05/03	06/12/21 (Unit 1) 03/03/23 (Unit 2)
Catawba 1 & 2	06/14/01	12/05/03	12/05/23 (Unit 1) 12/05/23 (Unit 2)
H.B. Robinson 2	06/17/02	04/19/04	07/31/10
V.C. Summer	08/06/02	04/23/04	08/06/22
R.E. Ginna	08/01/02	05/19/04	09/18/09
Dresden 2 & 3	01/03/03	10/28/04	12/22/09 (Unit 2) 01/12/11 (Unit 3)
Quad Cities 1 & 2	03/03/03	10/28/04	12/14/12 (Unit 1) 12/14/12 (Unit 2)
Joseph M. Farley 1 & 2	09/15/03	05/12/05	06/25/17 (Unit 1) 03/31/21 (Unit 2)
Arkansas Nuclear One 2		06/30/05	07/17/18
D.C. Cook 1 & 2	10/31/03	08/30/05	10/25/14 (Unit 1) 12/23/17 (Unit 2)
Millstone 2 & 3	01/22/04	11/28/05	07/31/15 (Unit 2) 11/25/25 (Unit 3)
Point Beach 1 & 2	02/26/04	12/22/05	10/05/10 (Unit 1) 03/08/13 (Unit 2)

The NRC has a track record over more than a decade of approving license renewals within three years.

Reactor Power Updates: Power uprates are also technically a subset of licensing actions because they too require license amendments. But they are examined separately because they involve considerable resources by licensees and the NRC and often entail plant modifications.

Table 2: Recently Approved Power Uprates (source: ML13098A298)

Table 1 – Power Uprates Approved Since June 15, 2012							
No.	Plant	% Uprate	MWt	Application Date	Acceptance Date	Approval Date	Type
1	Grand Gulf 1	13.1	510	9/08/2010	12/09/2010	7/18/2012	EPU
2	St. Lucie 1	11.9	320	11/22/2010	3/03/2011	7/09/2012	EPU*
3	St. Lucie 2	11.9	320	2/25/2011	6/23/2011	9/24/2012	EPU*
4	McGuire 1	1.7	58	3/05/2012	4/25/2012	5/16/2013	MUR
5	McGuire 2	1.7	58	3/05/2012	4/25/2012	5/16/2013	MUR
		Total	1,266				

The NRC staff, even for extended power uprates, has demonstrated an ability to approve power uprates within two years after receiving the applications.

Contrast the NRC’s pace resolving nuclear business issues with the pace resolving nuclear safety issues.

Table 3: Age of Unresolved Safety Issues

Issue	Beginning Date*	Age, Years	Sources
GSI-191, PWR containment sumps	09/1996	18.4	ML14261A178
GSI-193, BWR suction strainers	05/2002	12.7	ML14261A178
GSI-199, seismic protection	05/2005	9.7	ML14261A178
GSI-204, flooding from upstream dam failure	01/2012	3.1	ML14261A178
NFPA-805 fire protection	07/2004	10.6	Many

* “Beginning Date” is misleading because it refers to when the NRC established a resolution plan rather than when the NRC first recognized the safety implications of the issue (typically several years earlier).

Nuclear safety issues such as those listed in Table 3 are complex. Consequently, UCS does not expect or envision that complex nuclear safety issues can be resolved within the year or two that it takes to resolve nuclear business issues. However, UCS sees no valid justification for the resolution of GSI-191 needing 18-plus years and counting or for it to take longer than a decade for dozens of reactors to achieve compliance with the NFPA-805 regulation.

The process and discipline that licensees and NRC use to resolve nuclear business issues should also be applied to resolving nuclear safety issues. It seems to be a viable, effective model that could be equally effective resolving nuclear safety issues in a timely manner.

More timely resolution of nuclear safety issues would also reduce the resource burdens on licensees and the NRC. Even the best juggler can get too many balls up into the air. Rather than meter putting more

balls up into the air as CER and RPI seek to do, more effort should be focused on retiring some of the balls that have been up in the air for a very long time. Doing so would better serve safety and would free up resources that could be applied to emerging nuclear business and nuclear safety issues.

GAP BETWEEN LICENSEE AND NRC RISK PERCEPTIONS

UCS reviewed yellow and red findings issued by the NRC since the inception of its Reactor Oversight Process in April 2000. As shown in Table 4, the licensees and the NRC did not come close to agreeing on the risk significance of the events.

Table 4: Comparison Between Industry and NRC Risk Estimates				
Event	Licensee ΔCDF	NRC ΔCDF	Risk Difference	Sources
ANO flood protection yellow finding	1.44E-05	1.00E-04	594%	ML14329B209
ANO Stator Drop on Unit 1 yellow finding	4.8E-06	6.0E-05	1,150%	ML14174A832
ANO Stator Drop on Unit 2 yellow finding	1.8E-06	2.8E-05	1,456%	ML14174A832
Browns Ferry Unit 1 RHR Valve red findings	1.0E-06	1.0E-04	9,900%	ML111290482 ML111930432
Fort Calhoun flood protection yellow finding	8.4E-07	3.2E-05	3,710%	ML102800342
Fort Calhoun trip relay contactor white finding	1.0E-06	2.6E-05	2,500%	ML111660027 ML112000064
Indian Point 2 steam generator tube leak red finding	6.6E-06	2.85E-05	332%	ML003770186
Monticello flood protection yellow finding	8.92E-07	3.6E-05	3,936%	ML13233A068 ML13162A776
Oconee safe shutdown facility yellow finding	8.0E-06	1.6E-05	100%	ML102240588
Palo Verde voided ECCS suction line yellow finding	7.0E-06	4.6E-05	557%	ML051010009
Watts Bar flood protection yellow finding	8.15E-09	6.35E-06	77,814%	ML13115A020 ML13071A289

The closest agreement between the licensees’ perception of risk and the NRC’s perception was the safe shutdown facility problems at Oconee. In that case, the licensee’s risk was ONLY half that seen by the NRC. The widest gap involved the flood protection issues at Watts Bar where the licensee’s risk was ONLY three orders of magnitude lower than that estimated by the NRC.

This gap is troubling and must be eliminated or at least significantly narrowed for any CER and RPI efforts to be successful. Otherwise, the NRC might accept the process believing that risks for emerging safety issues will be assigned consistent with their perceptions while licensees will actually assign significantly lower risks (and consequently lower priorities).

Unless this perception gap is eliminated or significantly narrowed, the gap between the pace for resolving nuclear business issues and that for resolving nuclear safety issues will likely only widen. The past shows that licensees value licensing actions like power uprates and license renewals while vastly

underestimating—at least in comparison to the NRC’s perception—the risks from unresolved nuclear safety issues. For the CER and RPI process to truly work, the NRC and its licensees have got to be on the same page—or at least within the same book—when it comes to risk perceptions.

OBSERVATIONS ON THE NEI GUIDANCE AND THE RPI PILOTS

The NRC guidance document (ML14349A378) describes the five factors used to assign the importance ranking of issues: (1) safety, (2) security, (3) emergency planning, (4) radiation protection, and (5) reliability. A mix of quantitative and qualitative analysis is used to rank issues using these factors.

The pilots revealed a problem with the safety factor. Specifically, the NRC staff noted in their report on the pilots (ML14302A222) that:

The NRC Staff noted that for some NFPA 805 modifications, a licensee performed qualitative evaluations for the Safety importance as oppose to quantitative evaluations even though Fire PRA information is readily available. Furthermore, when identifying the “current risk for the issue,” there were instances when a licensee used the total risk of the plant versus using the risk associated with the specific issue. This potential inconsistency may affect the ranking of the results. (page 11)

The cousin of GIGO (Garbage In, Garbage Out) is CICO (Cherry-picked Inputs, Cherry-picked Outputs). The process cannot allow analysts to shop around for the input data that yields the output ranking they desire.

The pilots also revealed a problem with the security factor:

Since compensatory measures are in place for most security weaknesses, the prioritization process does not adequately identify any deltas in risk. (page 9)

The risk analyses must consider the delta risk between the non-conforming and conforming configurations and not between some unregulated mid-point and compliance with security requirements.

And experience reveals a problem with the radiation protection factor. When UCS and others advocated accelerating the transfer of irradiated fuel from overcrowded spent fuel pools into safer and more secure dry storage, the nuclear industry objected on grounds that transferring fuel within six years exposed workers to higher and unnecessary radiation exposures than allowing it to undergo several more years of radioactive decay in the pools.

Yet neither the nuclear industry or the NRC objected to the higher and unnecessary worker radiation exposures from a scheme (ML121230011) whereby Indian Point, with only one high capacity crane between two operating reactors, transfers irradiated fuel from the spent fuel pool at the unit with the low-load crane in small canisters to the spent fuel pool for the unit with the high-load crane which then transfers the irradiated fuel into a normal-sized canister. Upgrading the crane to handle normal-sized canisters would avoid all the radiation exposures to workers from all the inter-units transfers, but apparently costs more than this licensee wants to incur.

And the licensees for San Onofre, Kewaunee, and Vermont Yankee have announced plans to offload the irradiated fuel from spent fuel pools to dry storage as quickly as possible with target completion dates of about six years—the same time frame as we’d advocated, but now it saves licensees money so the worker radiation exposure concern magically disappeared.

Thus, it's clear that radiation protection is highly subjective—being of high concern when licensees want to avoid spending money and being of no concern when licensees want to save money.

It seems apparent that several of the factors used to prioritize issues are subjective enough to skew the rankings. Whether by intent or not, skewed rankings must be avoided. The evidence presented above makes it abundantly clear that skewing is not likely to be in nuclear safety's favor.

UCS echoes and emphasizes this conclusion made by the NRC staff from its monitoring of the pilots:

The process in the NEI draft guidance could result in continual deferral or delay of corrective actions.

(page 7)

As table 3 above illustrates, nuclear safety is not served by enabling delays in the resolution of known safety problems. The NRC must be a protector of public health, not an enabler of licensee dawdling.

If an accident were to occur at a U.S. nuclear power reactor that might have been avoided or mitigated had a known safety issue been resolved rather than delayed, the nuclear industry and the NRC would not be able to look the American public in the eyes and honestly claim to have taken every reasonable measure to protect them. The timely approval of power uprates and license renewals does not protect them, but the timely resolution of known safety issues will. The two gaps must be eliminated or significantly narrowed in order to support timely resolution of known safety issues.