COMMISSION BRIEFING SLIDES/EXHIBITS

BRIEFING ON THE STATUS OF

NEW REACTOR LICENSING ACTIVITIES

MAY 29, 2002

New Reactor Licensing Activities

James Lyons, NRR
Farouk Eltawila, RES

Presentation Overview

- Recent products
- Current activities
- Stakeholder interactions
- Schedule and workload uncertainty
- Technical and policy issues
- Upcoming products

Recent Products

- SECY-01-0188, "Future Licensing and Inspection Readiness Assessment," October 12, 2001
- SECY-01-0207, "Legal and Financial Issues Related to Exelon's Pebble Bed Modular Reactor," November 20, 2001

Recent Products, cont.

- SECY-02-0059, "Use of Design Acceptance Criteria for the AP1000 Standard Plant Design," April 1, 2002

Recent Products, cont.

- SECY-02-0067, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for Operational Programs (Programmatic ITAAC)," April 15, 2002

Recent Products, cont.

- **SECY-02-0076, "Semi-annual Update to the Future Licensing and Inspection Readiness Assessment," May 8, 2002**
- **SECY-02-0077, "Proposed Rule to Update 10 CFR Part 52," May 8, 2002**

Current Activities

- PBMR pre-application
- AP1000 design certification
- GT-MHR pre-application
- Early site permit application preparation
- Infrastructure development

PBMR Pre-application

- On April 16, Exelon withdrew from the PBMR project
- Plans for closing out pre-application activities
- Recommendations on modular and merchant plant issues - August 2002

AP1000 Design Certification

- March 28, 2002 application
- Acceptance review to be completed shortly
- SECY-02-0059 on the use of design acceptance criteria
  - Instrumentation and controls
  - Control room
  - Piping design

GT-MHR Pre-application

- General Atomics licensing plan submitted February 18, 2002
- Staff response May 14, 2002

Early Site Permits

- Three sites identified
  - Clinton (Exelon), June 2003
  - Grand Gulf (Entergy), June 2003
  - North Anna (Dominion), Fall 2003
- Staff review areas
- Pre-application activities

Infrastructure Development

- Rulemaking
- Construction inspection program
- Advanced reactor research plan
- Related activity
  - Risk-informed framework

Stakeholder Interactions

- Public
- Industry
- ACRS
- Within NRC
- Interagency
- International

Schedule and Workload Uncertainty

- Impact of PBMR decision
- Simultaneous ESP reviews
- ESBWR
- SWR 1000
- GT-MHR

Technical & Policy Issues

- Key LWR policy and technical issues
- Plan to address gas cooled reactor technical and policy issues
- Regulatory framework
- Upcoming products

AP1000

- NRC and DOE collaborating on integral testing for the AP1000 at the Oregon State University APEX facility
- NRC beyond design basis tests will start in October 2002

ESBWR & SWR 1000

- **Build upon existing LWR technology**
  - **Design basis accidents and acceptance criteria**
  - **Severe accidents and requirements**

ESBWR & SWR 1000

- Incorporate passive safety features
- Passive safety systems reliability
  - Perform beyond design basis accident tests to establish margins

ESBWR & SWR 1000

- In-vessel melt retention
- Drywell flooding for core melt accident
- Acceptance of Codes and Standards not endorsed by NRC

ESBWR & SWR 1000

- Upgrade NRC PUMA facility
  - Perform scenario-specific tests
- TRAC-M code validation and improvements

Gas Cooled Reactors

- Potential policy issues
  - Event selection and safety classifications
  - Fuel performance and qualifications
  - Source term

Gas Cooled Reactors

- **Potential policy issues, cont.**
  - **Containment performance**
  - **Emergency evacuation**
- **Stakeholder engagement**
- **Recommendation to Commission – Fall 2002**

Framework

- **Develop risk-informed, performance-based criteria for advanced reactors**
- **Criteria could be**
  - **Generic**
  - **Design-specific**
  - **Combination of the above**

Framework

- For gas cooled reactors
  - Need to develop Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) as surrogates to the Commission Safety Goals

Selected Technical Issues

- **Status paper on key gas cooled reactor technical issues – June 2002**
  - **Fuel quality and performance**
  - **Fission products release**
  - **High temperature materials and design**

Upcoming Products

- **Key policy issues on High Temperature Gas Cooled Reactor (HTGR), June 2002**
- **Key HTGR technical issues, June 2002**
- **Risk-informed Regulation Implementation Plan Update, June 2002**

Upcoming Products, cont.

- Recommendations on modular and merchant plants, August 2002
- NEI petitions recommendations, September 2002
- Recommendations on HTGR policy, Fall 2002
- Advanced Reactor Research Plan, Fall 2002

COMMENTS ON NEW REACTOR LICENSING

Presented at
Commission Briefing
May 29, 2002

T. S. Kress
ACRS

My views have the benefit of:

- ACRS Subcommittee on Advanced Reactors
- ACRS Workshop on Future Reactors (June 2001)
- Workshop on High Temp. Gas-Cooled Reactor Safety and Research Issues (October 2001)
- Discussions at ACRS retreat (January 2002)

Certification of new-technology reactors could take either of two courses:

- Fit into current regulatory structure with risk-informed modifications [AP1000; IRIS; PBMR; GA-MHR]
- Await the recrafting of the regulatory system to be technology neutral

A major impediment could be the lack of high-level risk acceptance criteria for the full range of regulatory objectives:

- CDF & LERF are insufficient

- **Acceptance criteria on frequency of release of any magnitude [e.g. F-C Acceptance Curves] is needed. These could be made consistent with the frequency-cost product of the prompt fatality safety goal**

Other impediments could be:

- Defense in Depth (setting necessary and sufficient limits)
- Criteria for selecting design basis accidents (DBA)

The objective of selecting DBA is that:

When these are "dealt with" according to the requirements of the regulations, the excluded low-frequency severe accident events will also be "dealt with" by the same safety provisions to the extent that the summation of risk contributions over all events renders an acceptable risk level.

SELECTING DBA WILL REQUIRE:

1. Identifying the initiating event frequencies
2. Selecting a cut-off value
3. Developing a design according to DBA Regulatory Requirements
4. Developing a design-specific PRA

5. Having high-level frequency acceptance criteria for the full range of consequences
6. Iterating on items 2 to 5 above until risk acceptance criteria are met

Stakeholder Briefing on New Nuclear Plants

NRC Commission Briefing

May 29, 2002

NEI

Building Stakeholder Confidence in Part 52

- Efficient, predictable processes for early site permits and combined licenses
- Efficient construction inspection and ITAAC verification processes
- Predictable and transparent transition to operation
- Completion of Part 52 "lessons-learned" rulemaking, including related petitions

NEI

Towards an Efficient, Predictable ESP Process

- Management of multiple concurrent ESP applications and reviews
  - Efficient use of industry and NRC resources
  - Open /transparent process for all stakeholders
  - Development of industry guidance for ESP submittals
  - Coordinated interactions on common issues via NEI
  - Use of license renewal experience, including development of a nominal schedule for ESP reviews
  - Timely documentation of issue resolutions to support preparation of ESP applications

Efficient NRC CIP and ITAAC Verification

- NRC staff comments on Nov. 20, 2001, draft industry white paper
- Goals for detailed follow-up:
  - Provide input to NRC development of updated inspection guidance
  - Documentation via SECY/SRM of common understandings on 10 CFR 52.99 & 52.103 implementation
- Key policy issue: Appropriate finality of NRC ITAAC sign-offs

NEI

Predictable and Transparent Transition to Operation

- Comprehensive industry white paper also addresses:
  - NRC verification of operational program readiness
  - Transition to operation under Part 52
- Key policy issue: Required scope of COL ITAAC ("programmatic" ITAAC)
- Additional policy issue:
  - Need for NRR approval of low power testing and full power operations
  - Part of COL form and content approved in Sept. 5, 2000, SRM on SECY-00-0092

NEI

Part 52 Notice of Proposed Rulemaking

- Expected focus on Part 52 "lessons learned," enhancements and clarifications
- Need timely disposition of July 2001 petitions for rulemaking and integration, as appropriate, in the final Part 52 rule
  - Elimination of duplicative NRC reviews and hearings (PRM-52-1)
  - Elimination of reviews for alternate sites, sources and need for power (PRM-52-2)

NEI

Keys Going Forward

- Continued NRC leadership in maintaining safety while ensuring efficient licensing processes
- Constructive industry and stakeholder interactions with NRC
- Vigilance to ensure safety focus, efficiency and certainty

NEI

GREENPEACE
702 H Street, NW, Suite 300, Washington, DC 20001
Tel: 202-462-1177 • Fax: 202-462-4507
www.greenpeaceusa.org

Statement of James Riccio
Nuclear Policy Analyst
Greenpeace
Before the
U.S. Nuclear Regulatory Commission
On
The Status of New Reactor Licensing Activities

May 29, 2002

Good Morning, my name is James Riccio. I am the nuclear policy analyst for Greenpeace. Greenpeace was founded in 1971 and since then has been campaigning for an end to the nuclear era. I thank the Commission for this opportunity to present our views on the NRC's new reactor licensing activities.

I realize that the purpose of this mornings meeting is to discuss the status of new reactor licensing activities and not to question the wisdom of those that would construct new nuclear plants while terrorists are targeting those reactors that already exist. If, however, the agency and the industry continue their efforts to foist a second generation of nuclear reactors upon an unsuspecting public, the process should at least be legitimate.

Removing the Public From the Process Will Not Improve Nuclear Economics

Over the last decade, the agency has systematically diminished the public's role in the licensing of nuclear reactors. The NRC has removed the public's rights to hearings and diminished the quality of the hearings they may grant by removing the public's right to cross examination and discovery. The nuclear industry is again pressuring the NRC to streamline the already streamlined licensing process for new nuclear reactors. Unfortunately, it seems the nuclear industry has begun to believe its own propaganda that public participation was the cause of the economic problems with the first generation of nuclear reactors.

However, a streamlined, sanitized, licensing process devoid of meaningful public participation will not improve the dismal economics of nuclear power. As Forbes Magazine recognized years ago, it wasn't the public that caused the economic meltdown of the nuclear industry. It was the industry's inability to manage the construction and operation of reactors that led Forbes to conclude that nuclear power was the greatest managerial disaster in the history of American business. [1]

Public participation has been used as a scapegoat by the nuclear industry in an attempt to avoid the blame for this economic disaster of monumental proportion. According to an analysis of nuclear power plant construction costs by the DOE, the nuclear industry experienced a $100 billion cost overrun for the first 75 reactors constructed in the U.S. [2]

Public participation was not the cause of the construction delays and massive cost overruns. In fact, the NRC has testified to this fact and that public participation has made the current generation of reactors less dangerous than they might otherwise have been. In testimony before the House Subcommittee on Energy Conservation and Power, former NRC Commissioner Peter Bradford stated that:

> (c)ontrary to the popularly held myth, the public hearings aspects of the licensing process has never delayed a single nuclear power plants operation by a single week. In deed one reads the many pages of industry, NRC and DOE testimony in vain for a single specific illustration of a licensing delay....[3]

Mr. Bradford wasn't the only NRC Commissioner to hold this view. In testimony before the House Committee, Chairman Palladino & Commissioners Asselstine and Gilinsky also debunked the industry myth.

> Representative Swift: How often have intervenors or hearings delayed the start up of a reactor past the time when construction ahs been completed?
>
> Former NRC Chairman Palladino: Mr. Chairman, I guess the answer is really none, in the end, has been held up....
>
> Former Commissioner Asselstine: I think the answer to your question is clearly no. There aren't any cases in which we can point to hearing-caused delays in the operation of a plant....
>
> Former Commissioner Gilinsky: On the subject of delays, Mr. Chairman, there was a good deal of talk about this a couple of years ago, about impending delays that were about to come upon us, and all these things that needed to be done to make sure that 33 plants got licensed in the following 2 years. Well, we are at the end of that process and it turns out that none of the plants were delayed by NRC proceedings....It turned out that the schedules that had been given us were simply wildly optimistic. [4]

Additional streamlining of the licensing process for nuclear reactors of questionable safety will only further undermine public confidence in the NRC and the nuclear industry. From what I've seen of the Nuclear Energy Institute's (NEI) proposed changes to the licensing regulations under 10 CFR part 52 it is evident that the industry is attempting to change the licensing requirements to meet the limited operating history of these advanced designs. As Former Commissioner Gilinsky noted, the construction and

licensing schedules provided by the industry "were simply wildly optimistic." Once again the nuclear industry is pressing forward with essentially untested reactor designs with pre-licensing schedules which appear again to be "wildly optimistic." The irrational exuberance being displayed over these advanced reactor designs surprises me. Especially when one considers that members of the ACRS are questioning whether some of these designs are even certifiable under existing U.S. regulations.

The Industry Is Pursuing Reactor Designs Of Questionable Safety & Economics

The NRC has already certified several new nuclear plant designs. However, none have yet been constructed here in the U.S. Westinghouse is in the process of certifying the AP-1000 design despite the fact that it could not find a market for the AP-600.

General Atomics continues to pursue the Modular High Temperature Gas-cooled Reactor (MHTGR) or as they are now touting it the Gas-Turbine Modular High-Temperature Reactor (GT-MHR). Which ever name General Atomic finally decides upon it will not alter the fact that the Advisory Committee on Reactor Safeguards (ACRS) concluded years ago that the lack of containment on this and other Department of Energy (DOE) sponsored designs constituted a "major safety trade-off."[5]

Exelon, which until recently had been touting the Pebble Bed Modular Reactor, wasn't promoting the Pebble Bed Modular Reactor (PBMR) because it was the best design but because it was the cheapest. Dr. Powers of the Advisory Committee on reactor Safeguards has addressed the questionable safety and design characteristics of the PBMR in a report on his trip to Germany. Dr. Power report concluded that:

- As currently designed, the Pebble Bed Modular Reactor does not conform with the defense in depth regulatory philosophy of the Nuclear Regulatory Commission and could not be certified.
- The Pebble Bed Modular Reactor core may be susceptible to neutronic instabilities.
- The shutdown system for the current Pebble Bed Modular Reactor is not adequate.
- The Pebble Bed Modular Reactor is not proliferation resistant. [6]

In a post September 11th world, where terrorists and rogue states are attempting to secure fissile material in order to make nuclear weapons, I believe that this last point can not be over emphasized. According to Dr. Power's report, "the Pebble bed modular reactor is tailor made for the facile production of weapons grade plutonium."[7] This fact alone should preclude further examination of this reactor design.

Why would these limited liability nuclear corporations pursue reactor designs of such questionable safety? I believe it has to do with a statement I heard at the NRC's research conference a couple of year ago. A gentleman from ABB stated that there would not be any new nuclear construction in the United States unless construction costs could be cut by one third. I can only conclude that the industry isn't pursuing these designs because

they are safe but because they're cheap. This same mistake got the nuclear industry in trouble years ago when Westinghouse and General Electric started designing reactors with pressure-suppression containment systems in order to shrink the size of containment structures and drop the cost of their reactors. The NRC is still struggling to address the safety problems introduced by these cost saving designs. The NRC and the nuclear industry should not make similar mistakes with the PBMR, the MHTGR, or other so-called advanced reactor designs.

NRC Staff Has Concerns Over the Pedigree and Veracity of Licensee Submittals

The NRC staff has raised concerns over the quality of the data the industry submits in support of the Early Site Permit. The staff has raised concerns over the pedigree of the data and the veracity of the industry's submittals. After witnessing Exelon's performance at the New Reactor Licensing workshop and other meetings held this spring I can understand the staff's concerns.

Exelon contended that the Pebble Bed Modular Reactor had a containment.

According to Exelon's representatives, the "design for the PBMR includes the containment building. So, the issue of not having containment is really a red herring. Our design includes a containment building. It has included a containment building from the beginning."[8]

However, as noted in Dr. Power 's report, "the Pebble Bed Modular Reactor is to have a confinement rather than a containment."[9]

Exelon stated that there had been no accidents with the Thorium High Temperature Reactor (THTR), one of the two reactors who's operating history Exelon is heavily leaning upon in its pre-licensing activities with the NRC staff.

According to Exelon, the THTR "ran for a couple of years and then . . . it shut down because basically there was no market for it, at that time in Germany, or in the world." [10] Exelon's representative continued to claim on the record that "(a)s far as I know from the operation of the THTR...there was no accident there."[11]

In fact, the THTR was taken offline on May 4, 1986 after an accident caused a leak of the helium coolant and spread radiation up to two kilometers from the facility. Apparently one of the 675,000 tennis ball sized graphite spheres became stuck in the pipe feeding it into the reactor. It was freed by a blast of helium. The fuel spheres failed to contain the radiation as advertised and to make matters even worse officials attempted to hide the leak amidst the fallout from Chernobyl.[12] One would have thought that Exelon and the NRC would have been more aware of the operating history of this predecessor to the Pebble Bed Modular Reactor. Either they were unaware of the accidental release of radiation into the environment, or they chose not to address it, neither of these explanations is acceptable.

Additionally, several other safety and operational problems were identified by the NRC staff during its visit to Germany in July of 2001. According to the NRC's report, these problems included:

> breakage of fuel elements caused by insertion of the in-core control rods, failure of the bolts in the thermal insulation of the hot gas ducts due to an elevated temperature gradient at the core exit, difficulties with fuel handling system that initially limited refueling activities to less than 40% power, and larger than anticipated quantities of graphite dust in the primary system.[13]

Despite the fact that the "premature shutdown of the THTR was discussed." There is no mention, in either NRC's trip report or in Exelon presentations to the NRC, of the radioactive leak that precipitated the shut down of the THTR.

Considering the fact that the industry is attempting to use probabilistic risk assessments to justify operation of these designs, one would expect that Exelon and the rest of the nuclear industry would be more familiar with the operating history of the designs they wish to duplicate. As the Commission is well aware, I am no fan of risk based and or risk informed regulation. As far as I can tell it appears to be a justification for exposing the public to more risk while exposing the nuclear industry to less regulation. However, if the NRC is going to place its faith in probabilistic risk assessments of these advanced designs these assessments should at least have some basis in fact.

CONCLUSIONS

In conclusion, Greenpeace believes that the NRC's limited resources could be better spent assuring that the current generation of nuclear reactors does not pose an undue risk to the public health and safety. While I realize that the purpose of this mornings meeting is not to question the wisdom of those that would construct new nuclear plants while terrorists are targeting those reactors that already exist. I feel it is incumbent upon me to state unequivocally that we are opposed to any new nuclear construction. The safest nuclear reactor is the one that's never built.

If however, the NRC continues to oblige the nuclear industry in its pursuit of new nuclear plant licenses, the Commission should be aware that:

- NRC's limited resources are being squandered by the nuclear industry on new reactor designs of questionable safety and economic value.

- A streamlined, sanitized, licensing process devoid of meaningful public participation will not improve the dismal economics of nuclear power.

- The nuclear industry is either unaware of the accidents at the German THTR or has chosen not to discuss them. Neither of which is acceptable.

- Additional streamlining of the licensing process for new nuclear reactors will only further undermine public confidence in NRC and the nuclear industry.

I thank the Commission for your time and consideration of our comments.

ENDNOTES:

---

[1] James Cook, "Nuclear Follies," *Forbes*, February 10, 1985.

[2] U.S. Department of Energy, Analysis of Nuclear Plant Construction Costs, DOE/EIA-0485, 1986.

[3] NRC Licensing Reform: Hearing Before the House Subcommittee on Energy Conservation and Power of the Committee on Energy and Commerce, 98th Cong., 1st Sess. 164,(1983).

[4] NRC Licensing Reform: Hearing Before the House Subcommittee on Energy Conservation and Power of the Committee on Energy and Commerce, 98th Cong., 1st Sess., pp. 104 – 105, (1983).

[5] U.S. Nuclear Regulatory Commission, Advisory Committee on Reactor Safeguards, Report On Key Licensing Issues Associated With DOE Sponsored Reactor Designs, July 20, 1988.

[6] U.S. Nuclear Regulatory Commission, Advisory Committee on reactor Safeguards, Trip Report, Travel by D.A. Powers to Attend the High-Temperature Gas-Cooled Reactor Safety and Research Issues Workshop Rockville, Md., October 10-12, 2001, pp. 4-5.

[7] Id. at p. 5.

[8] U.S. Nuclear Regulatory Commission, Legal and Financial Issues Related to Exelon's Pebble Bed Modular Reactor, Public Workshop, Project No. 713, March 27, 2002, p. 44.

[9] U.S. Nuclear Regulatory Commission, Advisory Committee on reactor Safeguards, Trip Report, Travel by D.A. Powers to Attend the High-Temperature Gas-Cooled Reactor Safety and Research Issues Workshop Rockville, Md., October 10-12, 2001, p. 6.

[10] U.S. Nuclear Regulatory Commission, Legal and Financial Issues Related to Exelon's Pebble Bed Modular Reactor, Public Workshop, Project No. 713, March 27, 2002, p. 44.

[11] Id. at p. 45.

[12] "German Nuclear Leak Inflames Post-Chernobyl Passions, New Scientist, June 12, 1986; "Fury over 'hidden leak' at German nuclear reactor: Concealment at Hamm Station causes uproar," The Guardian, June 2, 1986.

[13]U.S. Nuclear Regulatory Commission, Summary of the NRC Delegation Visit To Germany On Safety Aspects of High Temperature Gas-cooled Reactor Design and Technology, September 25, 2001, p. 14.

New Reactor Licensing Activities - Update

NRC Commission Briefing by

Eugene S. Grecheck

Vice President-Nuclear Support Services

May 29, 2002

PP583.1

Dominion ESP Project Objectives

- Maintain the nuclear option
- Evaluate advanced reactor technologies
- Demonstrate the Part 52 licensing process

PP583.2

Nuclear Option

- NEI Plan to Enable New Nuclear Business Decisions (Vision 2020)
  - NEI New Plant Executive Task Force
  - Early Site Permitting Task Force
  - Part 52 Task Force
- DOE's "Nuclear Power 2010" initiative
- Industry new generation advisory committees and boards

PP583.3

Reactor Technologies

- Currently evaluating a variety of
  - Evolutionary light water reactor designs
  - Advanced modular gas and water-cooled reactor designs
- Dominion has not selected a preferred technology

PP583.4

Accomplishments

- Completed Dominion sites feasibility study
- Selected North Anna as preferred ESP demo site
- Informed NRC of intent to apply for ESP
- Received DOE award (co-funding) to evaluate feasibility of federal sites
- Submitted proposal for DOE co-funding to support North Anna ESP application

Current Activities

- Preparing North Anna ESP application
- Evaluating feasibility of selected DOE sites
- Continuing to evaluate reactor technologies

PP583.6

Challenges

- Obtaining NRC approvals in timeframes that support business decision-making
- Reducing uncertainty to enable business decisions
- Developing and using guidance specific to the ESP process
- Maintaining good communications with all stakeholders

PP583.7

NRC Review Schedule

- Leveraging NRC familiarity with existing site
  - NRC has inspected the North Anna site for three decades
  - Recent licensing actions contribute to the staff's institutional knowledge and public record
    - North Anna ISFSI
    - North Anna license renewal
- NRC needs to have appropriate and adequate review resources

PP583.8

ESP Target Schedule

- NRC review activities, products, and processes under Part 52 have parallels in license renewal
  - Environmental impact statement
  - Safety evaluation report
  - Opportunities for public involvement
  - Opportunities for hearings

PP583.9

Target Schedule

- NRC performance has consistently bested its license renewal schedules
- NRC can achieve similar performance in ESP process

NRC Activity	NRC License Renewal Schedule	Proposed ESP Target Schedule
Issue SER	17 to 20 Months	18 Months
Issue EIS	16.5 to 19 Months	18 Months
Hearing	2 to 7 Months	2 Months
	Overall ESP Target Schedule	20 to 25 Months

- Detailed schedule comparison provided to NRC staff

PP583.10

NRC Guidance

- Substantial portions of existing guidance are difficult to effectively and efficiently utilize
  - Dated, and/or founded in the Part 50 process
  - Tends to assume the reactor technology is known
  - Intended as staff guidance, but used by industry
  - Written to support other licensing actions
- Applicants will work with staff to revise guidance
- Industry should benefit through reduced NRC fees for first-wave applicants

PP583.11

Communications

- Maintaining commonality with other announced ESP applicants
  - Improve efficiency and effectiveness
  - Reduce NRC review time
  - Coordinate through NEI
- Fostering early interaction with NRC staff
  - Senior management forum
  - Joint kick-off meeting
  - Common technical issues meetings
- Keeping stakeholders informed
  - Support NRC near-site public meetings at appropriate times

PP583.12

Looking Ahead

- At the threshold
- Much accomplished. Much to do
- Common industry approach through NEI
- NRC and industry need to work together to ensure that every element of Part 52 is
  - Stable
  - Predictable
  - Timely

PP583.13