

NRC Knowledge Management
U.S. NRC Region 1
05 MAY 2022

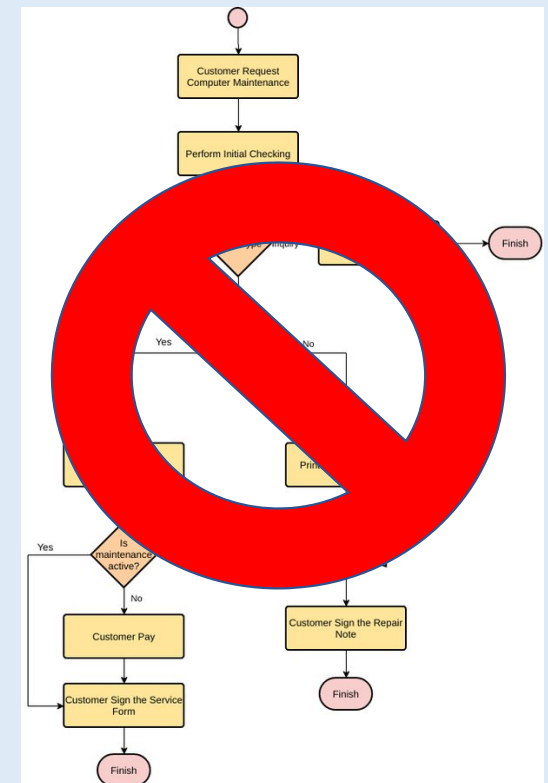
Communicating Technical Information to the Public

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- Please leave your chat box open to view all questions and answers posed during the session.

Agenda

- A few basic principles
- A few effective techniques
- Lots of examples



Some Basic Principles to Consider

- We must understand our audience
- We must understand the environment that we are working in (whether we like it or not...)

Face reality as it is, not as it was or how you want it to be.

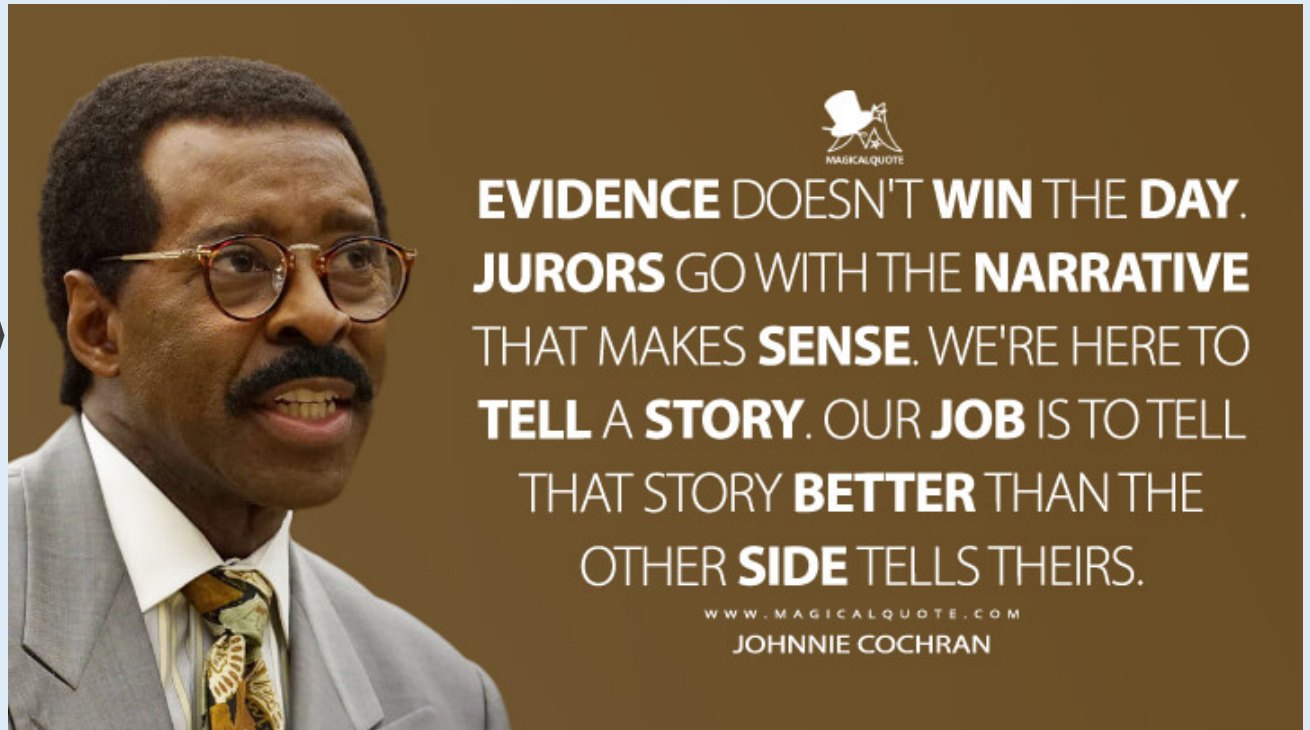
- Jack Welch, CEO of General Electric

Basic Principles - 1

The O.J. Simpson Trial (my personal journey)

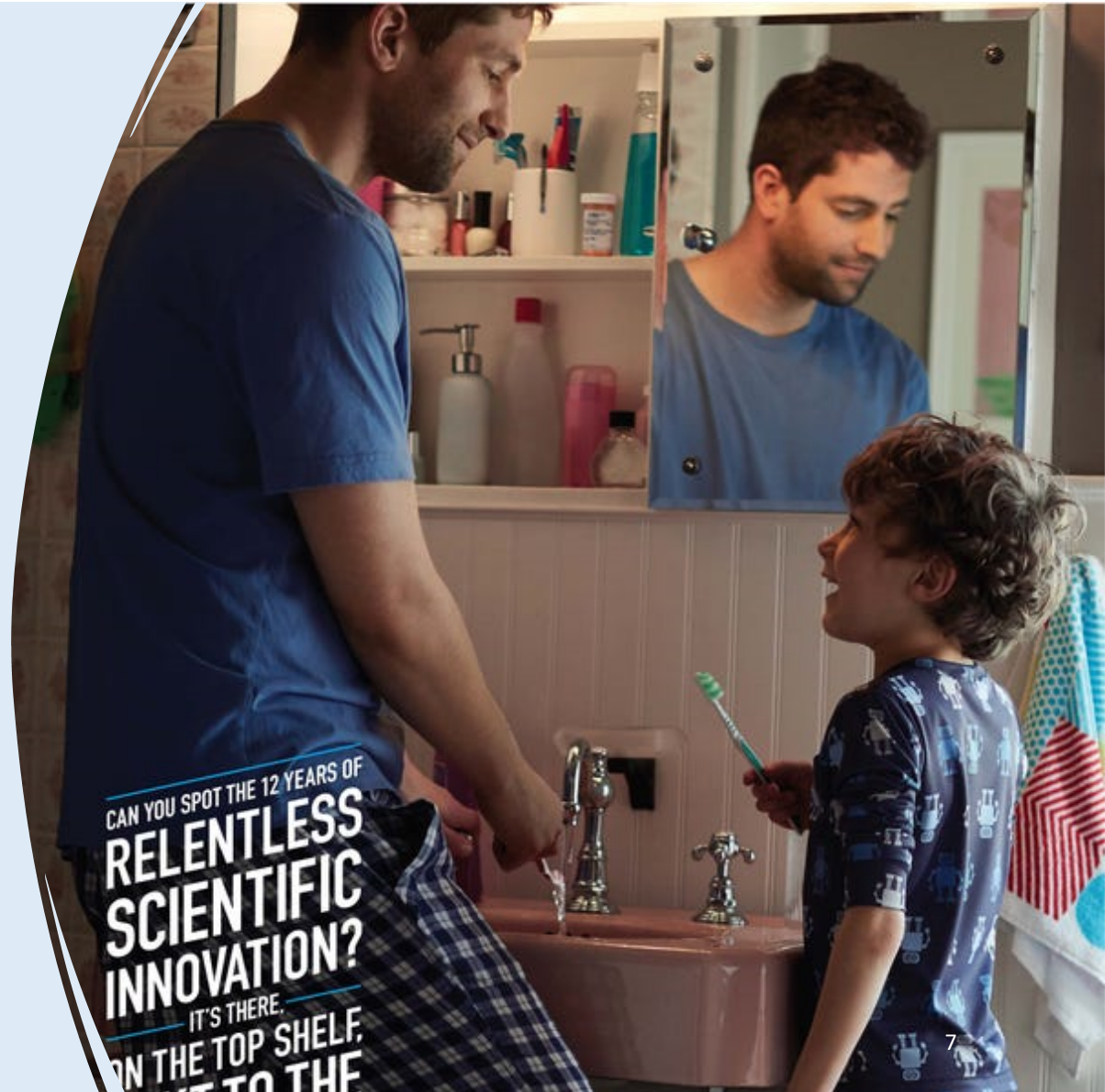


Basic Principles - 1



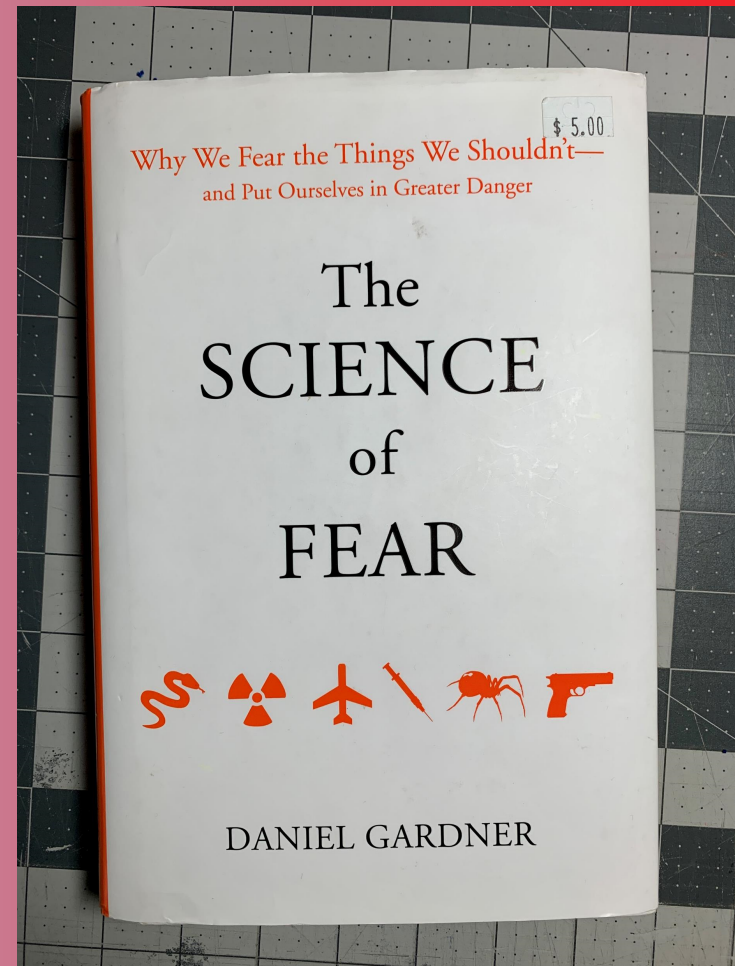
Basic Principles - 2

- We are emotional beings
- Generating an emotional response sells products..... and ideas
- Can you spot the facts and data in this advertisement?



Basic Principles - 3

- **Fear** is the most powerful human emotion
- **Fear** motivates
- **Fear** generates urgency
- **Fear** shuts-down rational thinking



Basic Principles - 4

His primary rules were: ...people will believe a big lie sooner than a little one; and if you repeat it frequently enough people will sooner or later believe it.

We respond **STRONGLY** to repetition, repetition, repetition, repetition, repetition...
(aka the availability bias)



Basic Principles - 5

- Is it SAFE ?!?
- As scientists and engineers, this is a mathematical question (warranting scientific scrutiny)
- To the public, this is an **EMOTIONAL** question
- Scientific answers will be unsatisfying...



*Safety is the
freedom from undue
risk or harm*

Who determines what is “undue”?
How is risk determined?

NEWS

'Not one drop': Hundreds rally in Plymouth to prevent dumping radioactive water into ocean



Hongyu Liu

The Patriot Ledger

Published 12:53 p.m. ET April 10, 2021

[View Comments](#)



"Will you bring your grandkids to swim nearby? Are you going to eat a shellfish, or lobster out of Cape Cod Bay when there is a hint of radioactive matter in the water?" he asked. "It will be devastating."

PLYMOUTH – About 250 residents gathered at the Town Wharf in Plymouth Saturday to protest possible nuclear waste dumping by Holtec International into Cape Cod Bay off the Plymouth coast.

"Not one drop!" the crowd chanted in opposition to a proposal to dump a million gallons of contaminated water from Plymouth's decommissioned Pilgrim Nuclear Power Station.

"We are America's hometown, not Holtec's dumping ground," said Betty Cavacco, a member of the Plymouth Select Board.

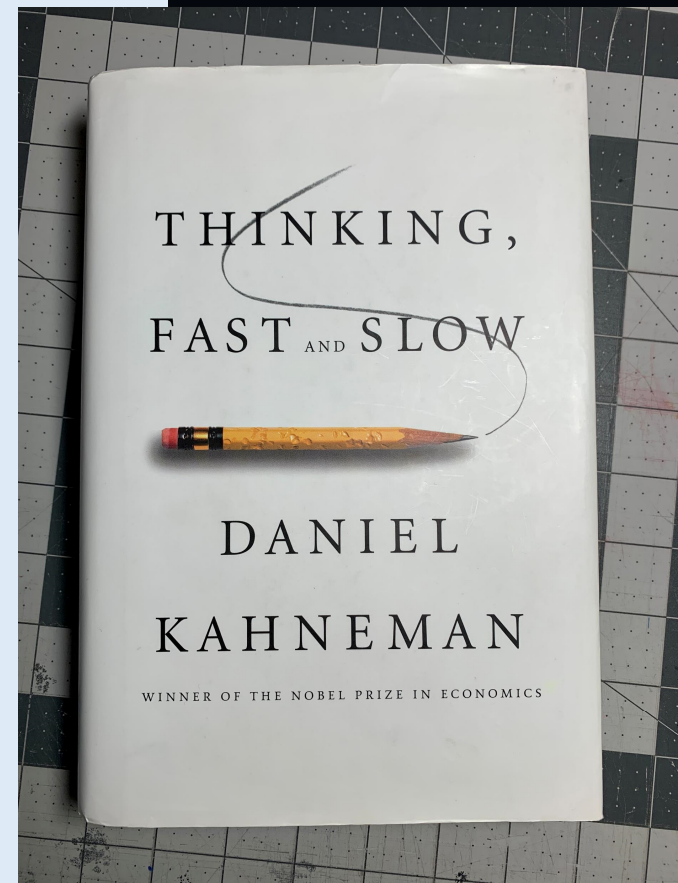
Basic Principles - 6

- WE ALL have difficulty in comprehending very **BIG** and very small numbers.



Basic Principles - 7

- Economic theory always assumed that consumers are rational decision makers; they will always act in their own best interest
- Kahneman won the Nobel Prize for proving conclusively that this is not true
- Advertisers, magicians, and politicians have always known this...
- We all **act on a set of biases** (heuristics)
- **Thoughtful decision making is rare** and takes significant mental energy



Basic Principles - Closing

It is important to understand how people (including scientists and engineers) **actually make decisions**

We must design our presentations in a manner that incorporates this understanding

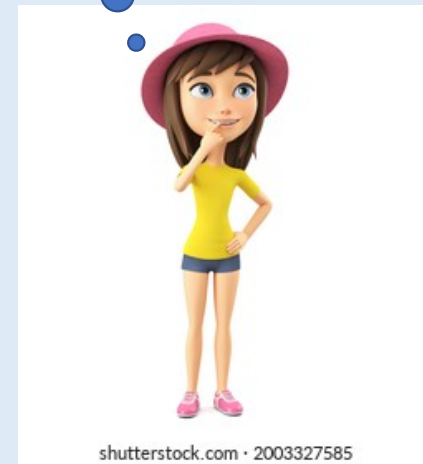
We have a duty to remain ethical in what we say and how we say it, regardless of the environment we are working in

Some Effective Communication Techniques



Disclaimer

- I DO want to share some personal examples that were effective
- I **DO NOT** want to make this presentation about ME
- I apologize in advance if, at times, it sounds that way. It is not my intention.



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Technique - 1

- **Impressions** are formed in the first 5 minutes, and it is very hard to repair a poor start
 - Tell a story
 - Be conversational
 - Give a sense of “who you are” as a person
 - Grab their interest
 - Show that you have done your homework (where appropriate)
 - Skip the lengthy resume...

Technique - 1

- Example: Phones on vibrate
- Example: Johnny and the bombing range
- Example: Greeting

Principles 1 & 2



Greeting and Welcome!

Technique - 2

Avoid reading from your slides (it's
sooooooooooooo boring).

Talk about them!

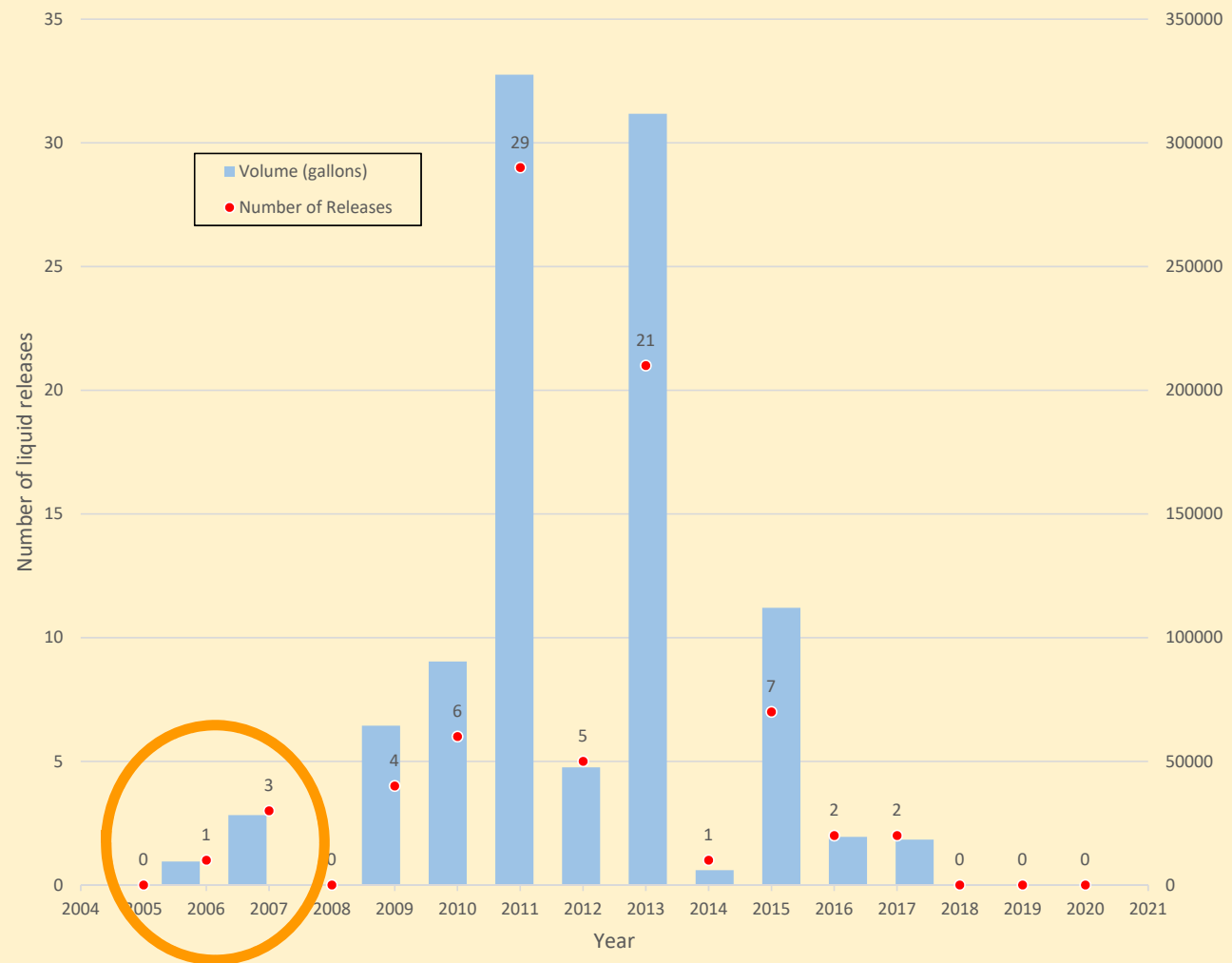


Technique - 3

Use graphs and graphics, but **explain them** (they are NOT self-evident)



Number of Liquid Releases & Volume - Pilgrim Station





Technique - 4

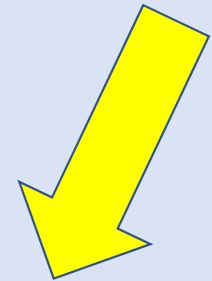
Provide links to references

Radioactive Effluent and Environmental Reports

Each commercial nuclear power plant is required to submit two annual reports, which detail (1) the radioactive effluents discharged from the site, and (2) the effects (if any) on the environment. In addition to these two annual reports, in 2007 each power plant voluntarily submitted answers to a questionnaire related to the voluntary initiative on groundwater protection, initiated by the commercial nuclear power industry.

To see these reports and questionnaires for a particular nuclear power plant, select the plant name from the following table.

Alphabetical List of Operating Nuclear Power Reactors		
A - G	H - P	Q - W
Arkansas Nuclear One 1 & 2 Beaver Valley 1 & 2 Braidwood 1 & 2	H.B. Robinson 2 Haddam Neck* Hope Creek 1	Quad Cities 1 & 2 River Bend 1



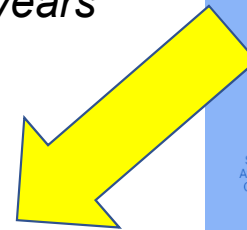
Publicly available at: <https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info.html>

The Earth's Nuclear Reactor ?!?

*A fossil **natural nuclear fission reactor** is a uranium deposit where self-sustaining nuclear chain reactions have occurred. The phenomenon was discovered in 1972 in Oklo, Gabon by French physicist Francis Perrin*

Oklo is the only known location for this in the world and consists of 16 sites with patches of centimeter-sized ore layers. Here self-sustaining nuclear fission reactions are thought to have taken place approximately 1.7 billion years ago, and ran for a few hundred thousand years.

https://en.wikipedia.org/wiki/Natural_nuclear_fission_reactor



Technique - 5

Show actual clips of the regulations or reports rather than re-typing them or reading them off-screen




NRC – 10 CFR 20

PART 20—STANDARDS FOR PROTECTION AGAINST RADIATION

Subpart K—Waste Disposal

20.2001 General requirements. 

20.2002 Method for obtaining approval of proposed disposal procedures.

20.2003 Disposal by release into sanitary sewerage. 

20.2004 Treatment or disposal by incineration.

20.2005 Disposal of specific wastes.

20.2006 Transfer for disposal and manifests.

20.2007 Compliance with environmental and health protection regulations. 

20.2008 Disposal of certain byproduct material.

§ 20.2001 General requirements.

(a) A licensee shall dispose of licensed material only—

(1) By transfer to an authorized recipient as provided in § 20.2006 or in the regulations in parts 30, 40, 60, 61, 63, 70, and 72 of this chapter;

(2) By decay in storage; or

(3) By release in effluents within the limits in § 20.1301; or



§ 20.2007 Compliance with environmental and health protection regulations.

Nothing in this subpart relieves the licensee from complying with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of under this subpart.

EPA – 40 CFR 190

PART 190 - ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR NUCLEAR POWER OPERATIONS

Authority: Atomic Energy Act of 1954, as amended; Reorganization Plan No. 3, of 1970.

Source: 42 FR 2860, Jan. 13, 1977, unless otherwise noted.

Subpart A - General Provisions

§ 190.01 Applicability.

The provisions of this part apply to radiation doses received by members of the public in the general environment and to radioactive materials introduced into the general environment as the result of operations which are part of a nuclear fuel cycle.

Sample Results – Surface Water 2020

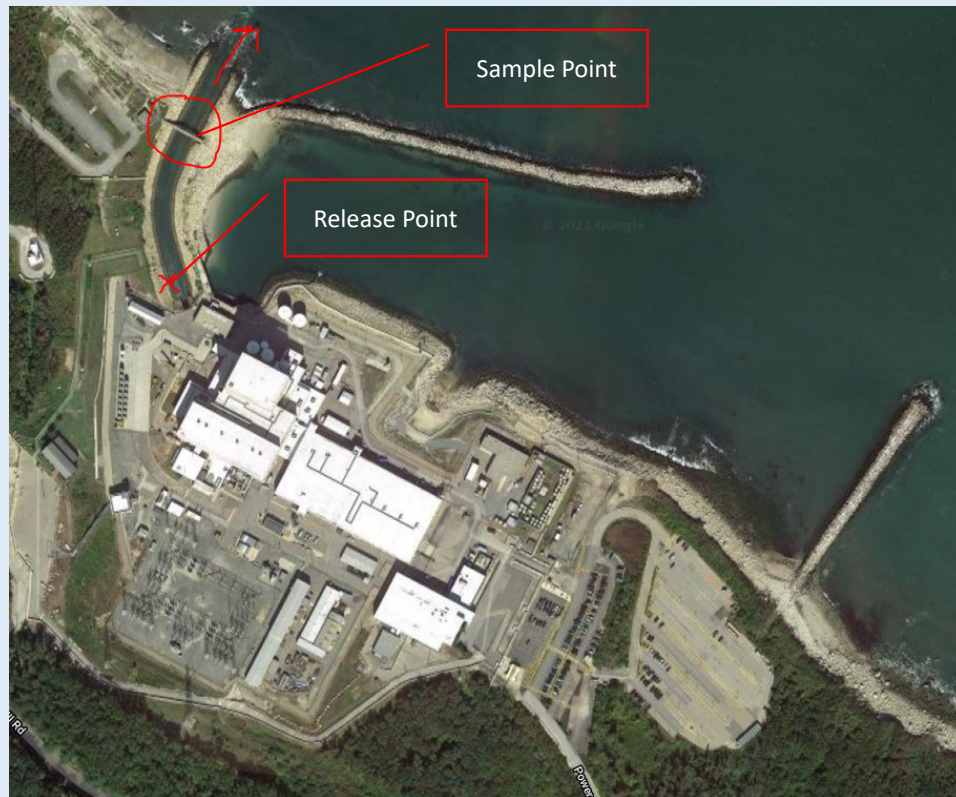


Table 2.8-1
Surface Water Radioactivity Analyses

Radiological Environmental Program Summary
Pilgrim Nuclear Power Station, Plymouth, MA
(January - December 2020)

MEDIUM: Surface Water (WS) UNITS: pCi/L

Radionuclide	No. Analyses Non-routine*	Required LLD	Indicator Stations Mean \pm Std.Dev. Range Fraction>LLD	Station with Highest Mean Station: Mean \pm Std.Dev. Range Fraction>LLD
H-3	8 0	3000	4.9E+1 \pm 1.3E+2 -7.5E+1 - 2.1E+2 0 / 8	PwtPt: 4.9E+1 \pm 1.3E+2 -7.5E+1 - 2.1E+2 0 / 4
K-40	24 0		2.8E+2 \pm 3.4E+1 2.1E+2 - 3.3E+2 12 / 12	PwdPt: 2.9E+2 \pm 2.4E+1 2.4E+2 - 3.3E+2 12 / 12

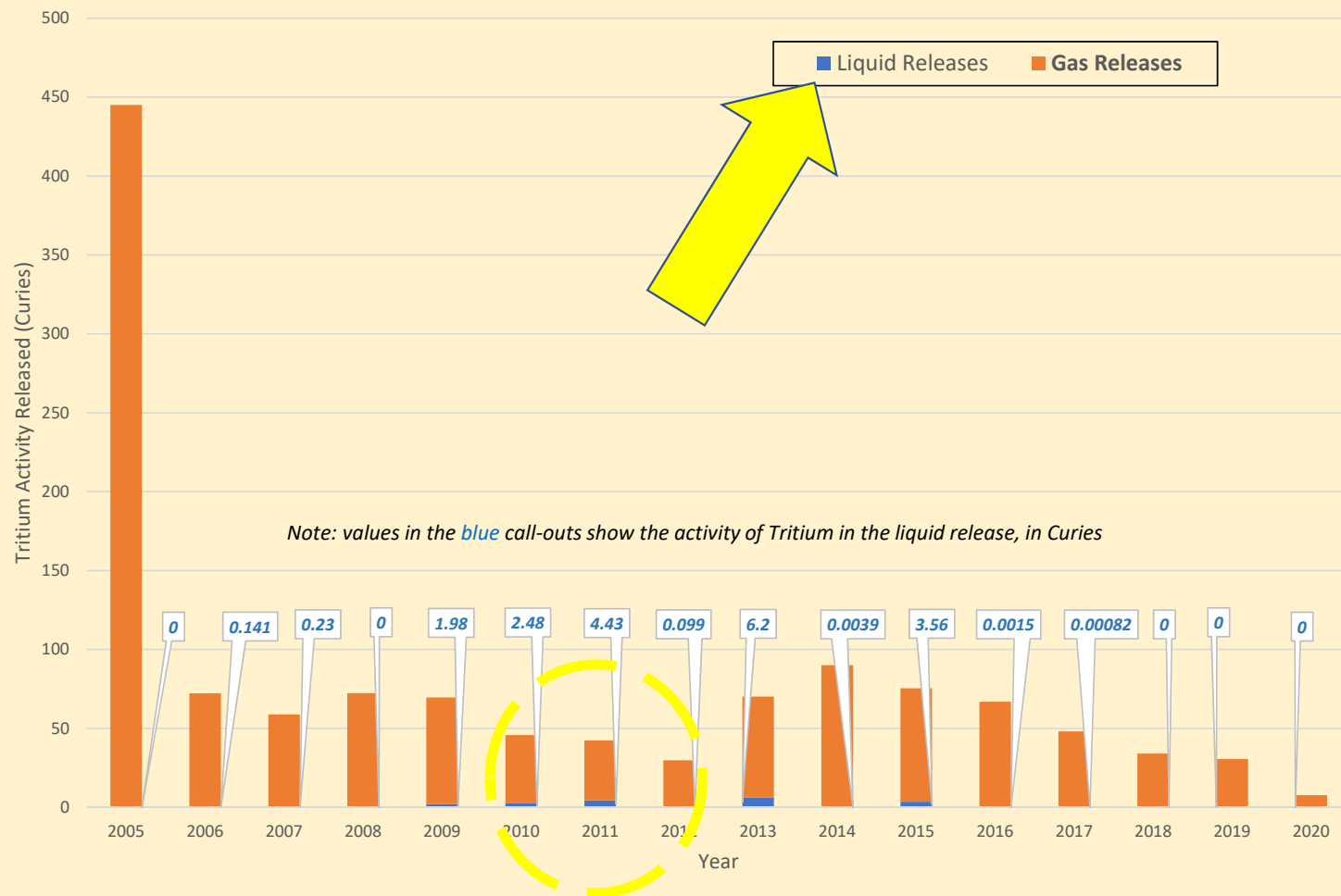
Note: No H-3 (tritium) was detected in 2011, the year with the largest number of liquid releases

Technique - 6

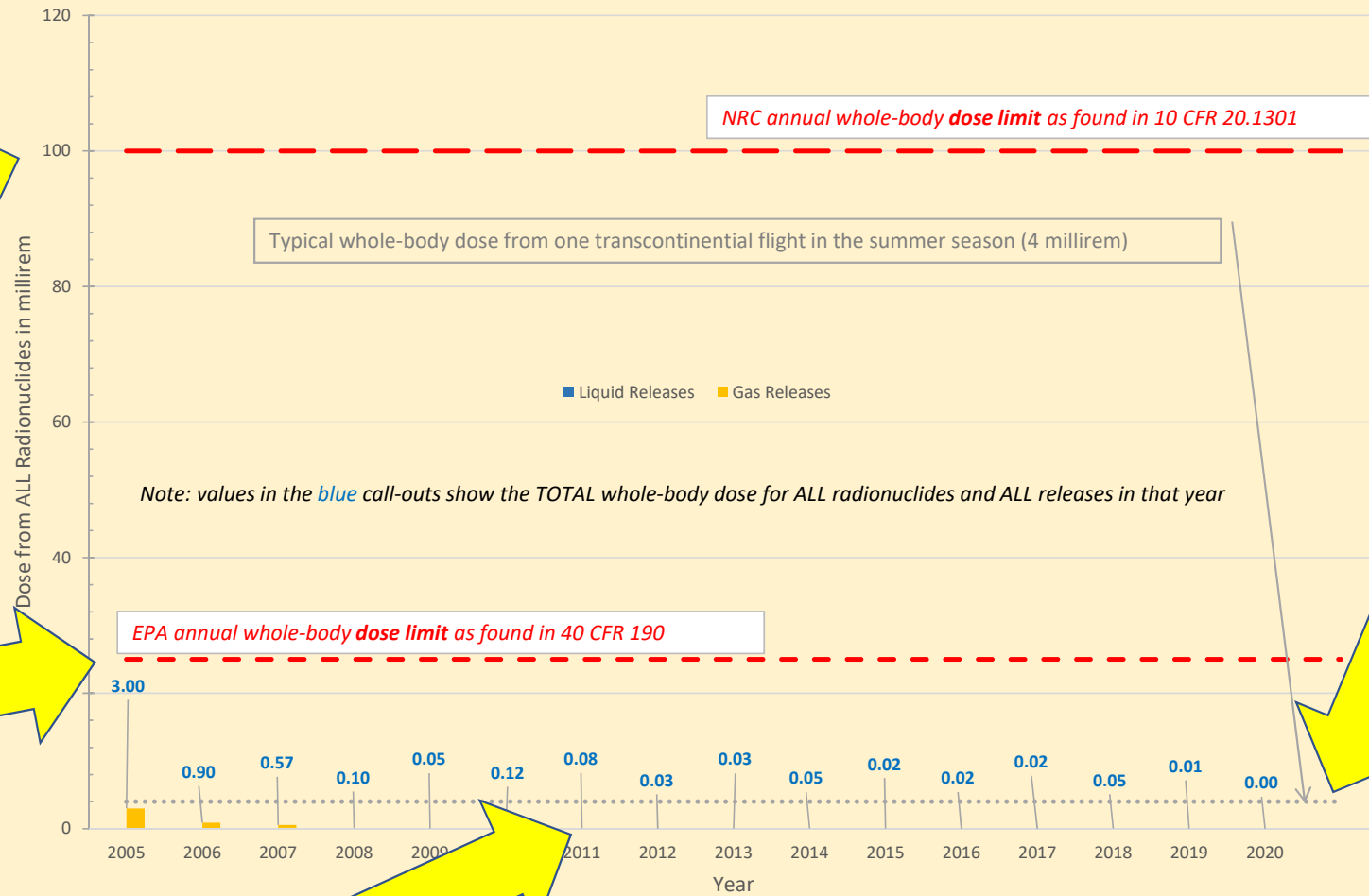
- Put color and scale to good use
 - to put relative amounts into perspective
 - to create a “visceral” impact

NOTE: a good graphic “tells the story”

Comparison of Annual Tritium Releases, Gas & Liquid - Pilgrim



Comparison of Liquid and Gas Releases to Limits - Pilgrim



Technique - 7



Use props (ethically)

- Drinking a sample of radioactive water to show that it is “safe”? That is a stunt. It will backfire.
- Spilling 10,000 pennies onto a table to show what \$100 looks like?

Example: Radioactive Food

Acknowledge uncertainty

Technique - 8





Discussion

