

In the United States Court of Federal Claims

No. 04-09C

(Filed: November 30, 2012)

PORTLAND GENERAL ELECTRIC
COMPANY, CITY OF EUGENE,
OREGON, acting by and through the
EUGENE WATER AND ELECTRIC
BOARD, and PACIFICORP,

Plaintiffs,

Government Contracts; Spent
Nuclear Fuel; Nuclear Waste;
Nuclear Repository; Damages;
Pickup Exchanges

v.

THE UNITED STATES,

Defendant.

Brad Fagg, Washington, DC, for plaintiffs. *Paul M. Bessette*, of
counsel.

Patrick B. Bryan and *Luke A.E. Pazicky*, United States Department
of Justice, Civil Division, Washington, DC, with whom were *Stuart F.*
Delery, Acting Assistant Attorney General, *Jeanne E. Davidson*, Director,
Harold D. Lester, Jr., Assistant Director for defendant. *Andrew P.*
Averbach, Senior Trial Counsel, *Alexis J. Echols*, *Jeremiah M. Luongo*, and
Shari A. Rose, United States Department of Justice, Civil Division, *Jane K.*
Taylor, United States Department of Energy, Office of General Counsel, of
counsel.

OPINION

BRUGGINK, *Judge*.

This is an action for partial breach of contract based on the Department of Energy's ("DOE") failure to pick up and dispose of spent nuclear fuel from plaintiffs' nuclear-fueled electric generation facility beginning on January 31, 1998. A number of related cases have been decided by the court. Liability was established previously and is not at issue. *See Me. Yankee Atomic Power Co. v. United States*, 225 F.3d 1336, 1337-40 (Fed. Cir. 2000) ("Maine Yankee"); *N. States Power Co. v. United States*, 224 F.3d 1361, 1367 (Fed. Cir. 2000). A two-week trial on damages was held October 31, 2011, to November 10, 2011, with additional testimony heard on January 5, 2012. The parties have submitted post-trial briefing, and post-trial oral argument was heard June 5, 2012. For the reasons set out below, plaintiffs are entitled to judgment pursuant to the rulings herein, but in an amount to be determined with further input from the parties.

BACKGROUND

Plaintiffs are joint owners of the Trojan Nuclear Power Plant ("Trojan") near Rainier, Oregon. Portland General Electric Company operated Trojan on behalf of its fellow owners from 1975 until its shutdown and defueling in January 1993. The plant was originally licensed to operate until February 8, 2011, but was shut down earlier for reasons not related to defendant's breach.

I. The Standard Contract

In 1982, Congress enacted the Nuclear Waste Policy Act ("NWPA"), 42 U.S.C. §§ 10101-10270 (2006). The NWPA codified the federal government's "responsibility to provide for the permanent disposal of high-level radioactive waste and such spent nuclear fuel as may be disposed of in order to protect the public health and safety and the environment." *Id.* § 10131(a)(4). The NWPA provided a process for storage and disposal of high level waste and spent nuclear fuel (hereafter referred to collectively as "SNF"). The NWPA authorized the Secretary of Energy to enter into contracts with owners and generators of SNF to dispose of such material. Pursuant to section 302 of the NWPA, the Standard Contract for the disposal of SNF was developed; it is published at 10 C.F.R. § 961.11 (2012).

On June 13, 1983, Portland General Electric Company ("PGE"), on behalf of itself, the Eugene Water and Electric Board, and Pacific Power &

Light (a predecessor-in-interest of PacifiCorp), entered into a written contract with defendant known as the “Contract for Disposal of Spent Nuclear Fuel and/or High Level Radioactive Waste, U.S. Department of Energy Contract No. DE-CR01-83NE4406” (the “Standard Contract”). The material terms of the Standard Contract are published at 10 C.F.R § 961.11. In this contract, plaintiffs agreed to purchase DOE’s services for disposal of SNF produced by the Trojan facility. The contract required defendant to begin disposing of SNF by January 31, 1998. 42 U.S.C. § 10222(a)(5)(B). Defendant has not yet begun disposal of SNF. That start date was shared with the entire nuclear industry. Article VI.B.1 of the Standard Contract established the Oldest Fuel First (“OFF”) priority system. Under that schedule, in conjunction with the 1987 Annual Capacity Report¹ rate, DOE should have picked up the last of Trojan’s fuel in 2010.

The Standard Contract also contains a provision allowing utilities, with DOE’s approval, to exchange their allocated SNF pickup dates. That provision states that the “Purchaser shall have the right to exchange approved delivery commitment schedules with parties to other contracts with DOE for disposal of SNF and/or HLW; provided, however, that DOE shall, in advance have the right to approve or disapprove, in its sole discretion, any such exchanges.” Standard Contract, art. V(E). In referring to this provision, the Federal Circuit noted, “[t]he Standard Contract included provisions setting priority for acceptance of waste (generally through an oldest fuel first (OFF) scheme) and allowed utilities to swap approved delivery commitment schedules (the Exchanges provision).” *Pac. Gas & Elec. Co. v. United States*, 536 F.3d 1282, 1285 (Fed. Cir. 2008).

Courts have held that the NWPA created a duty on the part of the DOE to begin disposing of SNF. In *Indiana Michigan Power Co. v. Department of Energy*, 88 F.3d 1272 (D.C. Cir. 1996), utility companies challenged DOE’s interpretation of the NWPA. The agency had taken the position that it would be unable to accept SNF by early 1998 and that it had no duty to do so in the

¹ The 1987 DOE Acceptance Priority Ranking and Annual Capacity Report (“1987 ACR”) detailed the “projected annual waste receiving capacity for DOE and the annual acceptance ranking relating to DOE contracts for the disposal of SNF.” *Yankee Atomic Elec. Co. v. United States*, 679 F.3d 1354, 1358 (Fed. Cir. 2012). The Federal Circuit has held that the 1987 ACR accurately reflects the parties’ intentions at the time of contract. *Pac. Gas & Elec. Co. v. United States*, 536 F.3d 1282, 1291-92 (Fed. Cir. 2008).

absence of a functioning nuclear repository. The D.C. Circuit disagreed and held that section 302(a)(5)(B) of the NWPA created an obligation on the part of DOE, reciprocal to the utilities' obligation to pay, to start disposing of SNF by January 31, 1998. *Id.* at 1277.

Despite the ruling in *Indiana Michigan*, DOE informed utility companies that it would not begin to collect the SNF by the 1998 deadline. The companies then sought a writ of mandamus to compel DOE to dispose of the SNF. In *Northern States Power Co. v. United States Department of Energy*, 128 F.3d 754, 756 (D.C. Cir. 1997) ("*Northern States I*"), the D.C. Circuit reaffirmed its ruling in *Indiana Michigan*, noting that "[p]etitioners have established that they have a clear right to relief." *Id.* at 756. The court refused to grant the broader mandamus relief sought by the utilities, however, noting that the Standard Contract "provides a potentially adequate remedy if DOE fails to fulfill its obligations by the deadline." *Id.* Nevertheless, it held that the petitioners' ability to enforce the contract "would be frustrated if DOE were allowed to operate under a construction of the contract inconsistent with [its] prior conclusion that the NWPA imposes an obligation on DOE 'without qualification or condition.'" *Id.* at 759 (quoting *Indiana Michigan*, 88 F.3d at 1276). Consequently, the court ordered "DOE to proceed with contractual remedies in a manner consistent with the NWPA's command that [DOE] undertake an unconditional obligation to begin disposal of the SNF by January 31, 1998." *Id.* at 760. The mandamus "preclude[d] DOE from concluding that its delay [was] unavoidable on the ground that it has not yet prepared a permanent repository or that it has no authority to provide storage in the interim." *Id.*

II. Plaintiffs' Mitigation Efforts

Plaintiffs made the decision to close and then fully decommission the Trojan plant in 1993. By the mid-1990s, PGE had no confidence that DOE would begin picking up spent fuel in 1998 or anytime soon thereafter. Stephen M. Quennoz, Vice President of Nuclear Operations and Generation at PGE, testified that PGE estimated it to be at least 16 years before a DOE facility would be operational. Tr. 1637-38. PGE performed a risk-adjusted economic analysis of five storage options and came to the conclusion that dry storage was the most efficient option. PX 173 (PGE ISFSI Authorization for Project)²;

² "PX" refers to Plaintiffs' Exhibit and "DX" refers to Defendant's (continued...)

Tr. 1640-43 (Quennoz). The resulting report, presented to PGE's board of directors, assigns a probability to DOE's picking up fuel in a specific year. For 1998 to 2003, PGE assigned a two percent chance and from 2004 to 2019, a six percent chance. Mr. Quennoz explained that, as a result of the low likelihood of DOE performance, dry storage was the most beneficial option because, "the longer the fuel stays in dry storage, the more the savings would accrue with regard to that system over wet storage." Tr. 1643. PGE witnesses were unequivocal in their testimony that they would not have built a dry storage facility absent defendant's breach.

PGE ultimately decided to construct and license an independent spent fuel storage installation ("ISFSI") system for both SNF storage and for later transport to DOE's storage facility. This dual purpose approach would allow the additional efficiency of only packing the Trojan fuel into a canister once. By using a dry storage canister designed and licensed for transport, PGE hoped that DOE would accept the canisters and transport them offsite without further modification or replacement.

PGE selected Sierra Nuclear Corporation ("SNC") as its dry cask vendor and awarded the contract in 1995. It began construction in 1996 by removing an existing waste storage building, a portion of a maintenance building, and several smaller maintenance structures used by on-site contractors. This was done to clear space for the ISFSI pad and associated buffer zone. The project hit an early snag. SNC experienced internal financial difficulties in early 1996, to which PGE responded by sending its own staff to assist SNC and by holding meetings with SNC's CEO and owner John Massey to "keep him focused on the engineering details" of the Trojan project. Tr. 1650 (Quennoz). Mr. Quennoz explained that because Mr. Massey was the sole owner of SNC, his attention was often diverted by other concerns such as marketing his company's products elsewhere. *See* Tr. 1651. SNC's and PGE's efforts were further complicated when the NRC rejected SNC's use of its zinc-based coating for the carbon steel interior of Trojan's canisters.

By 1997, it was clear to PGE that SNC was not meeting necessary quality standards. PGE and the NRC caught several errors in SNC's licensing applications. Tr. 1560 (Nicholson). SNC also failed to insure quality standards from its suppliers, which resulted in SNC replacing its quality

² (...continued)

Exhibit.

assurance management at PGE's insistence. Tr. 1662-63 (Quennoz). PGE went so far as to issue a stop work order to SNC on July 15, 1997. *See* PX 216 at PGE317623. PGE was aware at the time it awarded the contract to SNC that a nuclear fuel and energy company owned by the British government had an option to purchase SNC. That fact played a part in assuring PGE that SNC could meet its contractual obligations, and PGE required British Nuclear Fuels Limited ("BNFL") to act as a financial backer of SNC for the contract. *See* Tr. 499-500 (Lackey); 1747 (Quennoz). After the license application errors and stop work order, PGE pressured BNFL to backstop SNC by purchasing it.

SNC was purchased by an affiliate of BNFL in March of 1998 and was subsequently renamed BNFL Fuel Solutions ("BFS"). Despite an infusion of new resources and a re-staffing at BFS, problems continued with the Trojan ISFSI project. Mr. Quennoz described the root of the continued problems as a lack of adequate funding. *See* Tr. 1667-68. Despite its backing, BNFL did not fund BFS to the level that PGE anticipated. The problems came to a head in July of 1999 when PGE attempted to load the first spent fuel assemblies into a SNC/BFS-made cannister. A problem with the new chrome-based interior coating caused the water in the wet pool to become so cloudy from rapid corrosion that PGE abandoned loading the cask. This eventually lead BFS to halt remaining fabrication of the casket interiors in March 2000 after nearly 70 percent of the interior assemblies were completed. PX 255 at PGE100596 (Completion of the Trojan ISFSI Project - A Supplier Evaluation, Sept. 18, 2000). The loading failure touched off investigations by PGE, BFS, and the NRC.

In January 2000, PGE undertook a rigorous investigation of the circumstances surrounding the loading failure. This "root cause analysis" was centered on PGE's own involvement and what it could have done better to prevent the failure but not what SNC could have done to prevent it. PX 245 at PGE088989-088990. The root cause analysis "start[ed] from the ISFSI container's [failure] . . . And work[ed] back to the point when PGE selected [SNC] as its vendor." *Id.* at PGE088989. It "focused on those factors within the control of PGE management to correct." *Id.* at PGE088990. The executive summary of the findings states that those causes of the failure within PGE's control were "inadequately implemented policies for business risk assessment and chartering of project personnel, and less than adequate identification and use of readily available technical information during the project." *Id.* at PGE0088988; Tr. 1563-65 (Nicholson). The report also identified schedule pressure resulting in limited "questioning or high level consideration of

complex issues.” PX 245 at PGE089004. There was an inadequate balance between schedule and quality assurance. The investigators did not, however, find fault in PGE’s selection of SNC as its cask vendor given the immature state of the industry at the time. *See* Tr. 1559 (Nicholson).

NRC’s investigation resulted in a Notice of Violation which identified PGE as having submitted “inaccurate information to the [NRC]” regarding the “implementation of the quality assurance requirements during the coating qualification program.” PX 288 at PAC007099 (August 6, 2002 Notice of Violation). The NRC did note that PGE was not aware that the testing of the interior container coating was inadequate, and it did not assess a fine for the violation, citing PGE’s rapid and comprehensive corrective action and its excellent record with the NRC prior to the investigation. *See id.* at PAC 007100.

BFS withdrew its application for a transportation license from the NRC in late 1999 and then repudiated its contract with PGE. PGE hired outside counsel and threatened BFS with legal action. PGE estimated that it would incur \$24-\$40 million in extra wet storage costs due to the ISFSI construction delay. TR. 1681 (Quennoz); PX 249 at PGE317082. PGE eventually settled its dispute with BFS for \$9,000,000 and, critical in PGE’s view, it received the equipment, intellectual property, and proprietary data generated or used by SNC/BFS on the project.

Given the slippage of time and BFS’ inadequate performance, PGE considered finishing the ISFSI project with a new contractor. It eventually selected Holtec International as its casket vendor after receiving proposals from one other vendor and considering finishing the project with BFS. The contract was awarded to Holtec on March 7, 2001. PX 268 at PGE273840. Of importance to PGE was that Holtec already held both NRC licenses (storage and transportation) necessary for its casket design. Tr. 1260 (Nichols). The Trojan ISFSI³ was completed and casket loading began anew on December 31, 2002. PGE completed the loading in early September 2003. The Trojan facility was officially decommissioned when the NRC approved

³ The completed ISFSI held 34 casks, each of which holds up to 24 spent fuel assemblies. The project was originally designed to hold two additional casks, which were meant to store the most highly radioactive parts of the reactor vessel and internal components. PGE decided to keep the reactor vessels in whole form and ship them offsite as low level waste.

the termination of the Trojan operating license in 2005.

DISCUSSION

Plaintiffs claim damages of \$112,664,532 caused by DOE's failure to remove and dispose of spent nuclear fuel beginning January 1, 1998, as required by DOE's Standard Contract. The claimed damages represent plaintiffs' cost to mitigate damages from the breach. Plaintiffs' claim consists of \$77,581,895 related to ISFSI construction costs through 2009, \$20,691,537 for ISFSI operations costs through 2009,⁴ and wet storage costs of \$40,482,068 from 2000 to 2003. It reduces the total by \$11,190,968 for a pollution control facility tax credit and \$14,900,000 for the cost to exchange allocations.

This court has jurisdiction over plaintiffs' claim pursuant to the Tucker Act, 28 U.S.C. § 1491(a) (2006). *See PSEG Nuclear, LLC v. United States*, 465 F.3d 1343 (Fed. Cir. 2006). Defendant's liability for partial breach of contract has been established. *See Maine Yankee*, 225 F.3d at 1337-40; *N. States Power*, 224 F.3d at 1367. Damages are therefore the only issue left for decision.

The witnesses in order of appearance during trial were Jay P. Fischer, Trojan ISFSI Manager; Michael Lackey, former Trojan General Manager; Frank C. Graves, Principal of The Brattle Group and plaintiffs' expert; Kevin Poirer, Specialist in PGE's Power Supply Engineering Support Group and Lead Accountant; Steven B. Nichols, former Trojan ISFSI Project Manager and former General Manager; Joseph M. Mihelich, former Manager of Engineering at Trojan; Jerry C. Cooper, former engineer and former Special Nuclear Materials Custodian at Trojan; William O. Nicholson, Vice President of Distribution Operations for PGE; Stephen M. Quennoz, Vice President of Power Supply and Vice President of Nuclear Operations and Generation at PGE; Steven A. Schneider, former Trojan Operations Department Manager; Dr. Jonathan Neuberger Ph.D., Principal of Economists Inc. and defendant's expert; Warren Brewer, Consultant and Principal of ABZ, Inc.; Robert A. Peterson, Managing Director of LitCon Group LLC; and David Zabransky, Director Office of Standard Contract Management.

⁴ This includes an \$83,000 deduction for the cost of Northwest Demolition and Dismantling.

I. Standards for Review

“The remedy for breach of contract is damages sufficient to place the injured party in as good a position as it would have been had the breaching party fully performed.” *Ind. Mich. Power Co. v. United States*, 422 F.3d 1369, 1373 (Fed. Cir. 2005) (citing *San Carlos Irrigation & Drainage Dist. v. United States*, 111 F.3d 1557, 1562 (Fed. Cir. 1997)). It is incumbent upon the non-breaching party to establish that: “(1) the damages were reasonably foreseeable by the breaching party at the time of contracting; (2) the breach is a substantial causal factor in the damages; and (3) the damages are shown with reasonable certainty.” *Id.* (citing *Energy Capital Corp. v. United States*, 302 F.3d 1314, 1320 (Fed. Cir. 2002)). “[T]he general principle is that all losses, however described, are recoverable.” *Id.* (quoting Restatement (Second) of Contracts § 347 cmt. c (1981)). The non-breaching party may therefore recover its mitigation losses and its general losses.

A. Foreseeability

Foreseeability is determined at the time the contract was executed. *See Ind. Mich. Power Co.*, 422 F.3d at 1373; *Bohac v. Dept. of Agric.*, 239 F.3d 1334, 1340 (Fed. Cir. 2001); *Prudential Ins. Co. v. United States*, 801 F.2d 1295, 1300 (Fed. Cir. 1986); *N. Helex Co. v. United States*, 524 F.2d 707, 714 (Ct. Cl. 1975). The non-breaching party must demonstrate that both the magnitude and type of damages or injury were foreseeable at the time of contract formation. *See Landmark Land Co. v. FDIC*, 256 F.3d 1365, 1378 (Fed. Cir. 2001); *Wells Fargo Bank v. United States*, 88 F.3d 1012, 1023-24 (Fed. Cir. 1996). However, the non-breaching party need not demonstrate that a particular means of responding to the breach was foreseeable. *See, e.g., Citizens Fed. Bank v. United States*, 474 F.3d 1314, 1321 (Fed. Cir. 2007) (citing Joseph M. Perillo, 11 Corbin on Contracts § 56.7 at 108) (“What is required is merely that the injury actually suffered must be one of a kind that the defendant had reason to foresee and of an amount that is not beyond the bounds of reasonable prediction.”); *see also S. Nuclear Operating Co. v. United States*, 77 Fed. Cl. 396, 405 (2007) (“While the general response to a breach must be foreseen, the particular way that a mitigating decision is implemented need not.”).

B. Causation

The potential standards by which this court may determine causation are the “but for” test and the “substantial factor” test. The “but for” test finds the breaching party liable for damages that it directly caused. *See Citizens Fed. Bank*, 474 F.3d at 1318. The “substantial factor” test holds the breaching party liable if the breach was a substantial causal factor of the damages. *Ind. Mich. Power Co.*, 422 F.3d at 1373 (citing *Energy Capital*, 302 F.3d at 1320). “That is not to say that the breach must be the sole factor or sole cause in the loss of profits. The existence of other factors operating in confluence with the breach will not necessarily preclude recovery based on the breach.” *Cal. Fed. Bank v. United States*, 395 F.3d 1263, 1268 (Fed. Cir. 2005) (citing Farnsworth on Contracts § 12.1, at 150-51 (3d ed. 2004)); *see also Bank of Am., FSB v. United States*, 70 Fed. Cl. 246, 251 (2006). This court may select an appropriate causation standard in its discretion. *Citizens Fed. Bank*, 474 F.3d at 1318. The court will apply the “but for” test.

C. Reasonable Certainty

Reasonable certainty as to the amount of damages is also a question of fact. *Bluebonnet Sav. Bank, F.S.B. v. United States*, 266 F.3d 1348, 1356-58 (Fed. Cir. 2001). “Certainty is sufficient if the evidence adduced enables the court to make a fair and reasonable approximation of the damages.” *Locke v. United States*, 283 F.2d 521, 524 (Ct. Cl. 1960). Further, it is established that “where responsibility for damages is clear, it is not essential that the amount thereof be ascertainable with absolute exactness or mathematical precision.” *San Carlos Irrigation & Drainage Dist.*, 111 F.3d at 1563 (citing *Elec. & Missile Facilities, Inc. v. United States*, 416 F.2d 1345, 1358 (Ct. Cl. 1969)). “Proof need only support a fair and reasonable approximation of its damages.” *Dairyland Power Co-op. v. United States*, 90 Fed. Cl. 615 (2009) (citing *Energy Capital Corp.*, 302 F.3d at 1329; *Hughes Commc’n Galaxy, Inc. v. United States*, 271 F.3d 1060, 1067–68 (Fed. Cir. 2001); *Ace-Fed. Reporters, Inc. v. Barram*, 226 F.3d 1329, 1333 (Fed. Cir. 2000); *Locke*, 283 F.2d at 524). Recovery for speculative damages, however, is precluded. *San Carlos Irrigation & Drainage Dist.*, 111 F.3d at 1563; *see also Ind. Mich. Power Co.*, 422 F.3d at 1373.

D. Application of Standards for Review

As we have found on numerous occasions previously in SNF cases, the cost of prolonged onsite fuel storage is foreseeable when the other party breaches its agreement to pick up, transport, and store that fuel elsewhere.

Defendant has not meaningfully challenged any particular element of plaintiffs' claim as unforeseeable and we need not address it further; we find that the cost of wet pool storage as well as building and operating a dry storage facility was foreseeable to defendant at the time of contract.

Defendant challenges causation and the reasonable certainty of various elements of plaintiffs' claim, primarily the propounded damages model based on an accelerated pickup schedule made possible by the robust exchange of DOE pickup allocations.⁵ In defendant's view, under the OFF schedule, Trojan's fuel would not have been picked up entirely until 2010, which means that Trojan would have had to store fuel onsite until then irrespective of whether DOE performed. Defendant also challenges many elements of the Graves Model as speculative and therefore lacking the requisite certainty required to award damages based on it. We turn now to the particulars of the damages model and apply the standards for causation and reasonable certainty below.

II. Exchanges Provision

Integral to plaintiffs' claim is the proposition that a robust market to exchange DOE acceptance allocations would have developed among the various utilities in the "but-for" world. This would have been driven, in plaintiffs' view, by an industry-wide incentive to maximize efficiency through consolidation of DOE pickups and the sale of unneeded early pickup allocations. At trial, plaintiffs offered a model for the exchange market that allows PGE to buy allocations resulting in the pick up of all of Trojan's fuel by the end of 1999, an acceleration of 11 years as compared to the OFF schedule. The testimony at trial and the focus of the briefing post-trial centered on the hypothetical exchange market and the parties' disagreement as to how helpful it would have been to plaintiffs, both in the availability of allocations and their cost.

Plaintiffs' model was sponsored by its expert, Mr. Frank Graves, a professional economist, and a principal of the consulting firm, The Brattle Group. Mr. Graves has multiple academic degrees and the court qualified Mr.

⁵ Defendant also challenges causation and reasonable certainty of several more specific cost items claimed by plaintiffs. We examine these items after dealing with the more general issues presented by the exchange model.

Graves as an expert in energy industry economics, electric utility practices, and markets and modeling. Mr. Graves has extensive experience as a testifying expert witness in spent nuclear fuel damages cases.⁶ He takes the position that, in the “but for” world of DOE full performance, plaintiffs would have used the exchanges provision to advance their place in the OFF Schedule so that all of their spent nuclear fuel would have been removed by 1999, the second year of full DOE performance. He projects that it would have cost plaintiffs \$14.9 million to purchase earlier slots in the pickup queue from other utilities.

Mr. Graves described his model as an attempt to quantify the

reasonable expectation that nuclear utilities could have had as to what DOE performance would have looked like in the non-breach world and what the implications of that would have been for the fuel outdates, that is the year in which a utility could have expected DOE to remove all of its spent fuel.

Tr. 558. We will refer to this as the “Graves Model.” The Graves Model is based on Mr. Graves prediction of how the forces of supply and demand for DOE SNF acceptance allocations would have created a market for their exchange. Mr. Graves drew upon pool capacity data and ISFSI data at various sites. To estimate cost, Mr. Graves used utility cost data from the public domain for four categories of costs. Tr. 560 (Graves). In 2007 nominal dollars, his estimates are as follows,

1. Wet pool operations and maintenance costs - \$8.7 million per year;
2. Dry storage operations and maintenance costs - \$4.4 million per year;
3. ISFSI construction costs - \$43.3 million;
4. Variable cask costs (the cost of adding a cask) - \$800,000.

Tr. 870-71 (Graves).

⁶ Notably, Mr. Graves has presented similar testimony and a similar economic model regarding the exchanges provision in several cases. *See* Tr. 555-56.

Demand in Mr. Graves' model is driven by the existing SNF storage space at the various nuclear utilities at any one time during the years in question. He identified those points in time when "there will be a constraint faced by either an operating pool or a shutdown facility that creates an economic need for spent fuel removal." Tr. 587, 599. That is to say, he identifies when plants would either run out of storage space or cease operation, giving the operator the economic incentive to dispose of its spent fuel as quickly as possible.⁷ Mr. Graves refers to this fuel as "must move" fuel. He then took representative operations and maintenance ("O&M") wet pool costs, the cost of building an ISFSI, and the cost of maintaining an existing ISFSI, or adding a storage cask to an ISFSI, to estimate the costs facing utilities in a "must move" situation. By combining the "must move" needs and representative costs, Mr. Graves asserts that it is possible to sort utilities and rank them on the basis of their willingness to pay to move up in the queue. The Model assumes that those who would "presumptively have sought and negotiated and prevailed in a market process to obtain rights if they were fungible" are the utilities willing to pay the most. Tr. 637 (Graves); *see also generally* PX 334 at PGE_EXP000013.

The "supply" side of the model is provided by the available DOE acceptance allocations, as identified in the 1987 ACR. *See* PX 107. The Graves Model assumes that any utility without "must move" needs would be willing to sell its pickup allocations.⁸

That assumption in place, Mr. Graves found the intersection of the supply and demand curves and calculated a clearing price for the exchanges market. According to Mr. Graves, the clearing price is the price at which actors in a rational market would agree to exchange their allocation rights. *See* Tr.

⁷ We agree with his assumption that, once a plant ceased operating, it had every incentive to hand its fuel over to DOE so that it could eliminate as much of its operating cost as possible. A non-operating plant cannot defray the expense of storing spent fuel through revenue. It thus makes economic sense for a closed plant to trade for the earliest pickup allocations available.

⁸ A "must move" need is when a utility loses the storage capacity to unload its current reactor core into a wet pool in the event of emergency, and thus needs to either move fuel offsite or store it elsewhere onsite, such as an ISFSI.

605. Mr. Graves then applied that cost “annually to the rights that [each nuclear reactor site] would need to buy or sell in order to cure their problems in a timely fashion.” Tr. 605.

The available capacity of the program for each year is then applied to the above-described ranking of utilities “in the market” who would be seeking acceptance allocations for their must move fuel that year. In the case of Trojan, the Graves Model predicts that the net price to PGE to purchase acceptance allocations sufficient for all 359 MTU’s of its SNF to be removed by the end of 1999 would be \$14.9 million. PX 1 at Graves22. The importance of an earlier fuel-out date is that it allows plaintiffs to claim as damages all real world costs incurred after the date of projected pickup.

Defendant opposes any award of damages based on an exchange model. It thus did not offer a competing model. Instead, defendant argues that the Graves Model is unreliable and does not satisfy the test for reasonable certainty. The Federal Circuit has upheld damages awards based on the exchanges clause and the Graves Model, *see Yankee Atomic Elec. Co. v. United States*, 679 F.3d 1254, 1359-60 (Fed. Cir. 2012); *Dairyland Power Co-op. v. United States*, 645 F.3d 1363 (Fed. Cir. 2011), although the model has not met with uniform enthusiasm in this court, *see Kan. Gas & Elec. Co. v. United States*, 95 Fed. Cl. 257, 291 (2010), *aff’d in part and rev’d in part by F.3d 1361* (Fed. Cir. 2012) (reversing trial court’s refusal of certain overhead costs and affirming the rest).

Defendant insists that the OFF Schedule is the only reliable method for determining when DOE would have picked up the last of plaintiffs’ spent fuel. According to defendant, in the “but-for” world, plaintiffs would have been required to operate a wet pool until DOE picked up the last of the SNF from Trojan in 2010. Defendant attacks the assumptions behind Mr. Graves’ exchange market in principle and also challenges the sufficiency of his data sampling for several key model inputs.

These competing arguments leave this court with the task of determining what would have happened had DOE performed according to the standard contract. This requires the court to determine whether a market for DOE SNF pick-up allocations would have developed, whether PGE would have participated in this market, how much it would have cost, and when allocations would have been available to PGE. We turn first to the question of whether an exchange market would have developed.

A. The Exchanges Market

Defendant begins its assault on the Graves Model by pointing out that, under the Standard Contract, DOE could refuse in its sole discretion to allow an exchange request for any purpose. DOE encouraged utilities to pursue exchanges, however, by creating an electronic bulletin board to facilitate exchanges. And both DOE and the utilities would benefit from economic efficiencies of scale in a reduced number of pick-up trips per year. *See* Tr. 2730-31 (Zabransky). Keith Klein, who was the manager of DOE's Richland Operations Office in Richland, WA from 1999 to the present, testified that the exchanges provision allowed for the operation of "common sense" in DOE's pickup of spent fuel assemblies. Pls' Designated Testimony A-17. He explained that strictly following the OFF schedule would have been "difficult to implement" and that it did not make sense operationally. *Id.* In Mr. Klein's view, the development of an allocation exchange was a potential amelioration to the operational difficulties presented by the OFF schedule. He stated that DOE was open to the exchange of allocations as long as it did not increase DOE's pickup costs. *See id.* at A-17 to A-18.

We are entitled to assume that DOE would cooperate in good faith to benefit its utility customers, taxpayers, and itself. We also credit the evidence that DOE would have encouraged exchanges and been cooperative with exchange requests. There would have been no incentive for it not to have cooperated.

As for potential political and community pressures to remove spent fuel as soon as possible, we have no reason to think that those pressures would be greater than the political and community desire to eliminate exposure to SNF during repeated shipments. Certainly, SNF contained in a controlled pool and shipped in fewer trips, most likely one trip, is at least as desirable as SNF contained in a controlled pool and shipped in partial loads over ten years. Thus the court credits evidence that political and community pressures would not prevent the operation of a SNF pickup allocation exchange market.

Nor do we accept defendant's criticism that plaintiffs should identify specific trading partners that would have exchanged SNF allocations with PGE. DOE was to begin performance in 1998 and has yet to begin. DOE has not provided a reliable estimate of when it will begin picking up SNF. For plaintiffs to have any opportunity to identify SNF exchange partners, the nuclear industry would need some indication that DOE will perform and when.

“The defendant who has wrongfully broken a contract should not be permitted to reap advantage from his own wrong by insisting on proof which by reason of his breach is unobtainable.” *Locke*, 283 F.2d at 524. Defendant’s breach is the reason that plaintiffs cannot identify specific trading partners. It is sufficient if plaintiffs can show the economic likelihood of an allocation market and the absence of serious impediments to their participation.

Defendant’s chief expert, Dr. Neuberger, agreed that the exchanges provision of the Standard Contract made the exchange market both possible and likely. Tr. 2082. He also confirmed that a shuttered plant that held insufficiently cooled spent fuel would be likely to trade any pickup allocation of which it could not actually make use. He further confirmed the economic value of an exchange market to utilities such as PGE who were further down the pickup queue.

We find that the exchanges provision would most likely have been used by the utilities in the “but-for” world of DOE performance to establish a market for exchanging allocations. Evidence was presented to establish that nuclear utilities actively sought and bargained for the addition of the exchanges provision to the Standard Contract. It is no stretch of imagination to find that all parties involved would have been willing to exchange allocations to maximize savings and efficiency. We conclude that utilities would have taken advantage of the exchanges provision and that DOE would have cooperated, as it started to do in 1995 when it created its electronic bulletin board.

That is not to say, however, that the exchange market would have operated precisely as Mr. Graves posits in his model. Defendant presented the court with a number of criticisms aimed at critical points of the operation of Graves Model. We examine those below.

B. Defendant’s Arguments Against The Graves Model

1. Mr. Graves Has Inconsistently Predicted Trojan’s Year Of Fuel Removal

Mr. Graves has testified in a number of SNF cases and presented varying iterations of his model. Of necessity, Trojan’s behavior is predicted in those

models. Defendant points out that the “base case”⁹ in the Graves Model has inconsistently predicted Trojan’s fuel-out date. In previous cases, the Graves Model predicted that Trojan would not have its fuel removed before 2000 or 2001.¹⁰ Defendant asserts that because plaintiffs’ “base case” fluctuates, plaintiffs have failed to carry their burden to prove that the Graves Model is reliable or that plaintiffs would have utilized exchanges to achieve a 1999 fuel-out date at a cost of \$14.9 million.

Plaintiffs respond by explaining that Trojan’s fuel-out date of 2000 presented in *Kansas Gas* and *Pacific Gas* was due to 19 MTUs that spilled over into that year. Plaintiffs argue that any differences between those earlier cases and the current case reflects increased precision as the model has been refined and improved. Plaintiffs further explain that the Graves Model was adjusted by switching from an “MTU based model” to one in which individual assemblies are the unit of input, providing more precision. *See* Tr. 809 (Graves). In addition, plaintiffs explain that the spillover “might easily have been accommodated in other ways that did not imply any difference in removal date –e.g., with the +/- 20% ‘swing’ in acceptance volume that the Contract allows utilities to exercise.” PX 354 at PGE2-00000080. Plaintiffs explained that the 2001 Trojan fuel-out date predicted in *Yankee Atomic* was due to “overly conservative assumptions” about how much the GE/Morris facility would be willing to pay to have fuel its removed. Pls’ Reply Br. 17 (citing Tr. 810 (Graves)). Mr. Graves explained that, in *Yankee*, he treated the costs of storage at the GE/Morris facility as equal to the costs that the plaintiff there incurred for wet pool storage, resulting in GE/Morris being willing to pay more than it otherwise might have and thus taking allocations otherwise available for purchase by Trojan. *See* Tr. 810-11.

⁹ The term “base case” refers to that iteration of his model that Mr. Graves presented to be the most likely scenario.

¹⁰ *Portland Gen. Elec. Co. v. United States*, 100 Fed. Cl. 46 (2011) (1999 Trojan fuel-out date); *Kas. Gas and Elec. Co.*, 95 Fed. Cl. 257 (2010) (“*Kansas Gas*”) (2000 Trojan fuel-out date); *Pacific Gas and Elec. Co. v. United States*, 92 Fed. Cl. 175 (2010) (“*Pacific Gas*”) (2000 Trojan fuel-out date); *Yankee Atomic Elec. Co. v. United States*, 94 Fed. Cl. 678 (2010) (2001 Trojan fuel-out date); *see* Tr. 824-26 (Graves) (Mr. Graves’ testimony concerning his estimate of Trojan’s fuel-out date in prior cases).

We are not entirely comforted by these explanations. To the court, they illustrate the fragility and elasticity of the model. Plaintiffs barely fit into the 1999 pickup allocations in Mr. Graves' model. We are considerably less sanguine than him that his pick should be treated with total certainty.

2. The Graves Model Assumes Universal Participation

Defendant asserts that the Graves Model assumes universal participation in the market for exchange of SNF allocations. Defendant points to plaintiffs' use of a "sensitivity analysis" that assumes only half participation in the market as a tacit admission by plaintiffs that the "base case" assumes universal participation. Defendant further argues that the assumption of universal participation makes the Graves Model unreliable because of various market risks that would discourage some utilities from participating in the exchange market.

Plaintiffs respond that the Graves Model does not assume universal participation in the market, pointing to testimony of Mr. Graves, *see* Tr. 642-43, 830-31, but he admitted that it is likely that less than 100 percent of utilities would have participated in the market: "Sure. In the end, some wouldn't need to buy or sell to change their position and you'd get a similar outcome to my model."¹¹ Tr. 834. Plaintiffs dismiss this as not fatal to the Graves Model because the non-participation rate would be low. Plaintiffs direct the court to Dr. Neuberger's agreement that exchanges of DOE acceptance allocations would, in fact, enable utilities to reduce or avoid certain important types of risk, which is to say that the incentive to exchange allocations applied across the industry and supports the assumption of a high level of participation in the market. *See* Tr. 2088, 2090-91 (Neuberger). "High" participation is not universal participation, however, and Mr. Graves' model is so tightly wound that we are unwilling to accept his assurance of its precision.

¹¹ Plaintiffs further point out that, although defendant asserts that political, social, and economic risks may have prevented utilities from participating in an exchanges market, defendant makes no attempt to model those risks or explain how those risks would affect the Graves Model.

3. Omission of the Limited Supply Scenario Presented in Earlier Cases

Another scenario was projected by Mr. Graves in *Pacific Gas* and *Kansas Gas*. There, plaintiffs included a limited supply sensitivity analysis that resulted in a Trojan fuel-out date of 2005. That scenario was presented in those cases to address “a number of potential barriers to exchanges, including the potential that some exchanges may not have been approved by DOE, or that some utilities may have been unwilling to offer their rights for exchange, or other reasons that the market may not have been perfectly competitive or efficient.” DX 165 at A-13. The scenario was one “with severely restricted supply of exchanges.” *Id.* The scenario used a DOE acceptance rate half that of the rate established in the 1987 ACR as a “conservative proxy” for a situation in which many utilities are “entirely unwilling” to sell their allocations. *Id.*

Plaintiffs respond by citing testimony from Mr. Graves in which he explains that the Limited Supply Scenario described in those cases presented a severe case in which the market was only half of what it would actually be under the 1987 ACR rates. *See* Tr. 812. He believes the sensitivity scenarios presented in this case are more directly responsive to defendant’s specific critiques. *See* Tr. 811. We consider the omission of this scenario in our holding below.

4. Storage Cost Estimates Are Unreliable

One specific sensitivity in the Graves Model concerns the cost of storing SNF at various utilities across the country because it represents a figure that utilities would have sought to avoid by purchasing allocations. It is thus very important to Mr. Graves’ estimate of how much the utilities would have paid to purchase the allocations. Defendant contends that the storage costs used in Mr. Graves’ model are unreliable because (1) they are estimates of costs across the entire industry rather than any one utility’s actual costs, (2) they are derived from a very limited data sample, and (3) three of the data points used to average wet pool O&M costs across the industry are miscalculated.

The fact that Mr. Graves employs estimates derived from samples across the industry, which are then applied to specific utilities individually to model their individual economic behavior, is inappropriate in defendant’s view. For defendant, specific costs for a specific utility ought to have been used,

especially for PGE because plaintiffs have actual cost data for Trojan. Further, defendant views the number of utilities from which Mr. Graves drew data to be wholly insufficient.¹² Mr. Graves testified that he employed three data points for the category of wet pool O&M costs and 14 data points for ISFSI costs. *See, e.g.* Tr. 871-72,874. This is wholly inadequate when the universe of U.S. nuclear utilities is approximately 120, in defendant's view. Defendant also challenges Mr. Graves' estimate of wet pool costs based on Mr. Neuberger's testimony that Mr. Graves seriously miscalculated those costs from the three data points he used. Dr. Neuberger testified that, had Mr. Graves corrected these errors, the costs of wet pool O&M would have risen by "35 to 45 percent," which would have "increase[d] . . . exchange costs" for PGE due to its specific sensitivity to wet pool costs at Trojan. Tr. 2041. Defendant urges the court to reject the Graves Model based on these defects.

Plaintiffs respond that Mr. Graves used 100 percent of the available data at the time he created the model. There were only 14 utilities segregating wet pool costs at the time and only six operating dry storage facilities. Based on this, plaintiffs argue that Mr. Graves performed as thorough and accurate an estimate as possible. Plaintiffs point out that neither Dr. Neuberger nor anyone else presented by defendant provided additional or different data points that would call in to question Mr. Graves' work. Mr. Graves responded to the assertion that it would have been more appropriate to use actual costs by arguing that utilities were not aware of their actual costs for operating wet pool facilities or constructing ISFSIs because utilities with operating wet pools did not break out their costs in that manner and because very few ISFSIs existed, meaning that the utilities have been operating with gross estimates themselves in determining their willingness to pay for exchanges.

Mr. Graves did admit that one of his inputs for wet storage costs had an inconsistency in its accounting for inflation. He testified that the other two inputs used to estimate wet storage costs were accurate. He explained that the data with which he had to work was incomplete and immature due in large part to the fact that, prior to the late 1990s, utilities did not break out wet storage costs from other O&M costs. Tr. 898. In order to demonstrate that such errors

¹² Defendant also questions whether this was truly all of the information that was readily available to plaintiffs. In its post-trial briefing, defendant suggests a variety of tactics that might have been employed to gather greater cost information, most of which have to do with plaintiffs' counsel's representation of other utilities or Mr. Graves' work for other utilities.

were minor in impact, Mr. Graves ran various sensitivity analyses to consider a range of costs—up to double those used in the base case. The result was “very insignificant” in his view: a 1999 to 2000 fuel-out date and a range of costs from \$6.4 million to \$25.4 million. We take this range of outcomes into consideration in our finding regarding the fuel out date and cost to exchange.

5. The Model Assumes Utilities Would Maximize Their Pool Capacity

Defendant argues that the Graves Model is unreliable because it uses the maximum capacity data from DOE’s 1995 Spent Fuel Storage Requirements report (“SFSR”). Using the maximum capacity data assumes that all utilities would be able to license their spent fuel pools up to their maximum capacity and would pursue this strategy regardless of cost. The 1995 SFSR maximum capacity data was excluded pursuant to Federal Rule of Evidence 702 in *Kansas Gas* because the court found it to be unreliable, both because plaintiff assumed that this extra space was available and would be used by all of the other utilities in the industry and because reliance on it would cause inaccurate estimates of the utilities’ need to move their fuel or lose adequate reserved storage space. *See* 95 Fed. Cl. at 289-91. Defendant also asserts that Mr. Graves could have obtained updated discharged data from his clients and from information now available about the actual operation of the nuclear power industry more generally.

Plaintiffs respond by reiterating that the purpose of using the 1995 SFSR data is “to determine when each facility would [have] face[d] a constraint requiring spent fuel removal, identifying the timing and the quantity of fuel that would need to be removed to resolve the Must Move condition.” PX 334 at PGE_EXP000010.28. Plaintiffs further contend that DOE developed the data for the purpose of determining when utilities’ wet pools would reach capacity and when they would have had to explore other storage options. Dr. Neuberger conceded that he had not collected any updated pool capacity data, “so [he does not] know exactly how they would . . . push the model.” Tr. 2095-96. In response to the court’s exclusion of the 1995 SFSR in *Kansas Gas*, Mr. Graves compared what the 1995 SFSR predicted and what actually happened in hindsight as to when storage capacities were reached at the various utilities. He found that “the difference between actual and projected discharges is less than two percent cumulatively, in any year between 1993 and 2002.” Tr. 747-48. Mr. Graves concluded that a model based on the 1995 SFSR data was very accurate even 10 to 15 years after the date of the data. *See* Tr. 747-48.

Plaintiffs further present a sensitivity scenario that uses the licensed capacity data from the 1995 SFSR. Under sensitivity scenario number 3, using the licensed capacity instead of maximum capacity, the result for Trojan is that the final fuel-out date slips to 2001, and the net cost of exchanges remains the same, \$14.9 million. PDX 1 at Graves²⁷ (see “case 3”); *see also* PX 334 at PGE_EXP000027. We find the assumption made by Mr. Graves’ is relevant to our need to adjust this model as we do below.

6. Unreliable Discharge Data

Defendant criticizes Mr. Graves’ use of discharge data from the 1995 SFSR in his model, which, like the maximum capacity data, influences the model’s projection of when a utility would reach its storage capacity and need to move its fuel. This was the same approach taken by Mr. Graves’ firm in the *Kansas Gas* case. Defendant points out that the evidence at trial in *Kansas* showed a very different fuel-out date for the relevant plant as compared to the date presented by the 1995 SFSR. In that case, Dr. Murphy (Mr. Graves’ colleague) manually adjusted the fuel-out date in his model but did not adjust other dates presented by the SFSR. Defendant posits that this shows the SFSR discharge data to be an unreliable basis from which to derive industry demand in the present case.

Plaintiffs answer that Mr. Graves, in response to this criticism, compared the 1995 discharge data in his model with the actual discharge data gleaned from the 2004 DOE ACR. He found that the difference between the two was “less than two percent cumulatively, in any year between 1993 and 2002.”¹³ Tr. 747. This factor is considered in our adjustment of the model below.

7. Treatment of Fuel Labeled “DOE/Other”

Defendant also challenges Mr. Graves’ treatment of the “DOE/other” fuel category in his model as if it were fuel from a single site. The DOE/other

¹³ Defendant also argues that Mr. Graves’ comparison of the 1995 SFSR data and the 2004 ACR is not very probative because the 2004 ACR only reports discharge data through 2002, *see* Tr. 2063-64 (Neuberger), which is well before the discrepancy between the 2006 and 2009 fuel-out dates in *Kansas Gas*.

category in fact represents spent fuel stored at various sites¹⁴ around the country, the largest of which is at a facility known as “GE Morris.” GE Morris is a commercial SNF storage facility operated by General Electric and located in Morris, Illinois. Mr. Graves treats all of the fuel from the “Doe/other” sites as one site and uses his \$8.7 million wet pool O&M costs figure for one site to determine how much the owners would pay to avoid continuing to store the fuel located at the various sites. Defendant insists that this treatment allows Trojan an earlier fuel removal date under the Graves Model than Trojan would have had if the actual costs for the various component sites were employed in the model. It is unreasonable, in defendant’s view, for Mr. Graves to treat all of this fuel as having only one \$8.7 million cost to be avoided. Defendant argues that this artificially lowers the price that might have otherwise been paid by the various owners of the DOE/other fuel, which inures to plaintiffs’ benefit in the Graves Model by reducing competition and lowering the price that PGE would have had to pay to have the Trojan fuel picked up early.

Defendant also avers that Mr. Graves treated the DOE/other fuel differently in the *Yankee Atomic* case. Dr. Neuberger stated that, in *Yankee*, Mr. Graves used the actual costs paid by his client to store fuel at GE Morris and used some separate costs associated with other sites as well in ranking the utilities’ willingness to pay for earlier allocations. *See* Tr. 2051. Dr. Neuberger stated that the result in the *Yankee* case was that several utilities moved in front of Trojan in Mr. Graves’ ranking of willingness to pay to buy early pickup allocations. Thus, in defendant’s view, the application of that more precise data to the Graves Model presented in this case would move Trojan’s pickup date later than 1999.

Plaintiffs respond that the DOE/other fuel category in Mr. Graves model is a good estimate because approximately 90 percent of the spent fuel within that data point is stored at the GE Morris facility, and much of the remaining 10 percent is owned by DOE, therefore treatment of “DOE/other” as a single site provides the best representation of how it would act in the exchanges market. Plaintiffs state that the storage costs for GE Morris cited by defendant “are breach world costs in a situation where utilities with spent fuel stored at Morris lack alternatives for having that fuel removed, and there is no assurance the costs would have been the same in the non-breach world.” PX 354 at PGE2-00000081. Additionally, Mr. Graves performed a “double expanded

¹⁴ Dr. Neuberger testified that the DOE/other category represented fuel from “eight or more sites.” Tr. 2045.

storage O&M cost” sensitivity case, which “more than subsumes what would happen if all that other waste that we know is paying fees [to GE] tried to get out ahead of Trojan.” Tr. 781 (Graves); *see generally* PX 354 at PGE2-0000081-82; PX 334 at PGE_EXP000041. That sensitivity scenario reflects a fuel-out date of 2000 and a net cost to Trojan of \$12.9 million, which plaintiffs state cannot justify wholesale rejection of the Graves Model. We have considered the effect of this scenario in our holding below.

8. Accounting for Incentive to Consolidate Shipments to DOE

Defendant asserts that the various utilities’ individual incentive to consolidate shipments would create additional demand for exchange allocations. Under defendant’s theory, utilities would be motivated not just by must-move considerations but also by a desire to combine shipments even if it meant moving some SNF early. This makes the Graves Model unreliable because Mr. Graves did not take into account the additional demand this could generate and the impact it would have on costs and availability to PGE for early allocations.

Plaintiffs agree that exchanges of DOE acceptance allocations would result in consolidation of shipments, to the benefit of both the industry and DOE. Plaintiffs argue that this incentive supports the dynamics behind the Graves Model. Additionally, plaintiffs state that defendant has presented no evidence showing how the incentive to consolidate would effect the model one way or the other and point to various attempts at trial to get Dr. Neuberger to do so. *See* Tr. 2092-93 (Neuberger) (made no effort to quantify such an impact); Tr. 2093:11-15 (Neuberger) (could not say “which way incorporation of those convenience costs might push the model.”).

Other utilities’ incentives to consolidate shipments to DOE is not a reason to reject the Graves Model. It does, however, also mean that higher demand may have limited supply, especially earlier in time. We take that into consideration below.

9. DOE Approval of Exchanges

Defendant also asserts that the Graves Model does not account for the risk that DOE might have disapproved certain exchanges. Defendant points to the result of the limited supply scenario presented by Mr. Graves’ firm in previous SNF cases that predicted Trojan’s fuel-out date as 2005 as evidence that the Graves Model is unreliable. That scenario was presented as an answer

to the possibility, among other things, that DOE might disapprove of various exchanges in the *Pacific Gas* case. *See* DX 165 at A-13 (Graves' Expert Report in *Pacific Gas*)

Plaintiffs respond that the Graves Model does not require 100 percent DOE approval of exchanges because, although "there could be disallowances," there are "many possible exchanges that would achieve the same ultimate result." Tr. 713-14 (Graves). They note that Dr. Neuberger declined to model the effects of DOE disapproval and that he did not know what effect it would have had on exchanges "one way or the other." Tr. 2133. Plaintiffs also direct the court to our decision *Dairyland*, in which we found a similar government criticism to be unavailing:

The Government complains that Mr. Graves did not take into account the possibility that DOE might not approve of a requested exchange or the costs to DOE of facilitating exchanges. However, the Court cannot see a realistic way for Mr. Graves to have incorporated the possibility of non-approvals or Government costs of approvals into his model, and the Government has not offered any suggestion of how it could have done so.

Dairyland, 90 Fed. Cl. at 633 (citations omitted).

We find that DOE's contractual right to disapprove of exchanges is not a reason to reject the Graves Model. The industry and DOE shared similar incentives to consolidate shipments and thus exchange allocations. Additionally, we agree with the statement in *Dairyland* that the government has not offered a suggestion of how it should affect the model and thus we decline to do so as well, other than to say that the possibility of disapproval is not a reason to reject the exchanges model.

10. Treatment of Failed Fuel

Dr. Neuberger observed that there is no separate treatment of failed fuel in the Graves Model. *See* Tr. 2068. As mentioned earlier, Mr. Zabransky testified that failed fuel required different licensing and handling. These differences might have required DOE to accept failed fuel on a basis other than plaintiffs' exchange-accelerated schedule. This, in defendant's eyes, casts doubt on Mr. Graves' model, making it an unreliable scenario on which to base a damages award.

Plaintiffs respond by arguing that defendant did not nor could it allege how failed fuel would actually affect the pickup schedule or the exchange of allocations. Plaintiffs point out that nearly every nuclear power generating facility has some sort of failed fuel, which did not appear particularly to trouble DOE when it established the OFF schedule nor should it affect the schedule after allocations were exchanged. Plaintiffs also remind us of the testimony of Mr. Fisher that, in the real world, PGE was able to handle the Trojan failed fuel without any special accommodation. *See* Tr. 145, 151; *see also* Tr. 1728 (Quennoz). In addition, there was testimony that “virtually every plant in the country has some type of failed fuel.” Tr. 2843 (Zabransky). We agree with plaintiffs that there is no reason to think that the storage and shipment of failed fuel will present a problem that renders the exchange market inadequate for PGE and other utilities’ needs.

11. Mr. Graves’ Sensitivity Scenarios

The government argues that Mr. Graves’ various sensitivity scenarios do not bolster his model because each scenario only takes into account one particular criticism or eventuality in isolation. The argument is that the model fails to account for multiple uncertainties working in combination. Defendant further posits that the scenarios demonstrate that the base case is highly sensitive, especially with regard to changes in cost. *See* PX 334 at PGE_EXP000035; Tr. 934-35 (Graves). Defendant points to testimony from Mr. Graves and Mr. Neuberger concerning the previously mentioned analysis performed by Mr. Graves in other litigation in which he presented a scenario that modeled the cumulative effect of multiple errors (limited supply scenario), resulting in a Trojan fuel-out date of 2005.

Plaintiffs reply that Dr. Neuberger made no attempt to model the cumulative effect of any combination of difficulties that might have faced PGE. Plaintiffs further rely on our conclusion in *Dairyland* when faced with a similar scenario:

Of course, had the Government wanted to show the Court that a perfect model, one that accounts for every conceivable contingency, yields different results from those of Mr. Graves, the Government was free to present the Court with a superior study of its own. But the Government elected not to do so. Instead, the Government seeks only to show that Mr. Graves’s study is completely unreliable and of no value whatsoever. It has not succeeded.

90 Fed. Cl. at 634. We consider the cumulative effect of the sensitivity scenarios below.

C. Our Holding

The parties' respective views of the pickup date for Trojan's spent fuel lie to each end of the spectrum of possible DOE performance. Plaintiffs claim that all of Trojan's SNF would be picked up in 1999, the second year of DOE performance; defendant argues that we must not deviate from the OFF schedule, resulting in a final Trojan pickup in 2010. We are reminded of the *Winstar* litigation and the Federal Circuit's admonition in *Glendale Federal Bank, FSB v. United States*, 378 F.3d 1308 (Fed. Cir. 2004), that "[i]t would benefit the [utilities] and the Government, since it is not in the interest of either to have endless litigation, for both to stop arguing extreme positions and promptly resolve these cases in a fair and even-handed manner." *Id.* at 1313-14. Because the parties have indicated that such resolution is not possible, we are left to deduce damages based on a reasonable approximation.

We begin by accepting the basic premise of Mr. Graves' model: it is more likely than not that an exchange would have developed. We reject defendant's contention that DOE would have exercised its contractual right to reject exchanges in general or any in particular. On the other hand, we reject Mr. Graves' assertion that the exchange model would have operated, as he proposes, with the predictability of a Swiss train.

Plaintiffs' model operates under extremely close tolerances. Even though PGE's position in the OFF scheme assured it of no sooner than a 2010 final pickup date, plaintiffs' model assumes that all of Trojan's 359 MTUs would be picked up in the first year after DOE was scheduled to begin picking up, 1999, despite the fact that only 2400 MTUs (1200 in 1998 and 1200 in 1999) were available for all utilities interested in accelerating their pickup schedule during the first two years. *Jt. Stip.* ¶ 8 (1987 ACR). A slight change in numbers and the projected pickup would roll into 2000. Under the OFF schedule, Trojan was only scheduled to have one half of one MTU, or one spent fuel assembly, removed by the end of 2001. *Id.*

Another general observation we have is that the constituent elements of the Graves Model are very precise, and indeed critical numbers, but their specificity belies the imprecision of their development. Defendant has prodded the Graves Model sufficiently to create doubt as to whether Trojan would have had all of its SNF removed by 1999. This does not mean that the model must be rejected in whole. The Federal Circuit has instructed that:

[t]he ascertainment of damages is not an exact science, and where responsibility for damage is clear, it is not essential that the amount thereof be ascertainable with absolute exactness or mathematical precision: “It is enough if the evidence adduced is sufficient to enable a court or jury to make a fair and reasonable approximation.”

Bluebonnet Sav. Bank, 266 F.3d at 1355 (citing *Elec. & Missile Facilities, Inc. v. United States*, 416 F.2d 1345, 1358 (Ct. Cl. 1969)). As our predecessor court explained, “[i]n estimating damages, the Court of Claims occupies the position of a jury under like circumstances; and all that the litigants have any right to expect is the exercise of the court’s best judgment upon the basis of the evidence provided by the parties.” *Specialty Assembling & Packing Co. v. United States*, 355 F.2d 554, 573 (Ct. Cl. 1966) (citing *United States v. Smith*, 94 U.S. 214, 219 (1876)).

Mr. Graves’ sensitivity scenarios present the court with an array of options to assess defendant’s concerns about the operation of a “but for” world and arrive at a reasonable estimation of plaintiffs’ damages. The sensitivity analyses predict an array of fuel-out dates from 1999 to 2002 based on changes in discharge and capacity data, storage costs, strategic behavior, and uneconomic behavior. These analyses also predict that the supply of DOE allocations would exceed demand for the allocations, somewhere between 2002 and 2005. We are also presented with costs for the purchase of exchange allocations in a range between \$6.4 million and \$25.4 million.

As noted earlier, defendant’s own economic expert, Dr. Neuberger, admitted that he believed an exchange market would develop. We reject, however, Mr. Graves’ pick of 1999 as the most likely date all of plaintiffs’ SNF would have been picked up. That year represents what might have happened in the very most optimistic scenario conceivable, and one in which there would be 100 percent market participation. In other words, Mr. Graves’ less-than-complete data on each utility’s precise economic circumstances lead to what he

offers as a perfect guess. In order to reach a 1999 fuel-out date, however, we would have to accept that none of the potentially contrary judgment factors discussed above would slow down any utility's enthusiasm for exchanging 100 percent of its "unneeded" capacity; we would have to ignore Mr. Graves' prior guesses as to Trojan's fuel-out date; we would have to assume that utilities would have modified their storage pools if necessary to line up their actual and licensed capacities; and that the advantages of consolidation would not increase the cost to purchase allocations in a market comprised of similarly situated utilities. We would similarly be forced to rely on Mr. Graves' use of discharge data that was based on the assumption of maximum rather than licensed pool capacity; we would have to accept without question his treatment of the "DOE/other" fuel category as one consolidated site rather than as scattered about the country as it actually is; and we would be forced to endorse his treatment of storage costs as uniform across the industry. Each of these assumptions is problematic; collectively they create significant doubt about Mr. Graves' conclusion.

Mr. Graves' analysis shows that the supply of exchange allocations would exceed demand for them at some point prior to 2005. In short, under no circumstances would the last date for removal of SNF be later than 2005. 1999 is a date too soon, however, because it would require us to ignore too many potential difficulties, as described above. 2000 and 2001 were alternative dates in Mr. Graves' model presented in other cases. He also presented information showing that, even if utilities acted at least partially against their economic interest by purchasing more exchange allocations than necessary, Trojan would have been able to purchase sufficient exchange allocations to have all of its SNF picked up by the end of 2002. Tr. 721 (Graves) (accelerated demand scenario).

By 2002, in the "but for" world, DOE would have been picking up SNF for four years. This would have allowed the exchange market time to develop and the utilities time to become comfortable with DOE performance. The utilities would most likely have sought to exchange unneeded allocation rights prior to 2005 when the value of allocation rights would have dropped to a nominal value because the current supply would have exceeded demand. We also note that the latest fuel-out date predicted by Mr. Graves is 2002. We therefore find that plaintiffs have proved to a reasonable certainty that, but for defendant's breach, all of Trojan's SNF would have been picked up by the end of 2002. Any date in advance of that is subject to too much doubt.

The price to exchange must also be adjusted from the Graves Model. Mr. Graves' opinion that avoided costs would not be the defining factor in setting the price of allocations notwithstanding, the testimony by PGE officials as to what they would have been willing to pay in order to avoid the cost of storing the fuel is more convincing. That suggests to the court that the starting point for the price to exchange is avoided costs. Here, Mr. Lackey testified that the number was around \$90 million. Tr. 536-37; *see also* Tr. 1735-37 (Quennoz). That number must then be adjusted downwards to account for competition in the marketplace and to credit Mr. Lackey's testimony that many utilities would not have had must move conditions early in the schedule, *see* Tr. 535, which would have increased the supply and driven down the price. The value of the allocation rights would have further decreased as the market developed and DOE continued with full performance. This would have had a substantial impact on the price of exchange rights by 2002 as the date in which supply would have exceeded demand approached. The value of allocation rights would have approached a nominal value once supply exceeded demand. We therefore assign a cost of \$20 million to the allocation rights that plaintiffs would have needed to spend in order to have all SNF picked up by 2002.

Plaintiffs claim that each year of delay in picking up Trojan's SNF caused approximately \$10 million per year in additional wet pool operation costs. The 2002 fuel out date would therefore reduce Trojan's damages claim of \$112,664,532 by \$30,360,351 (\$10,120,117 per year for 2000, 2001, 2002). *See* Jt. Stip. ¶ 25. Additionally, plaintiffs accounted in their claim for \$14.9 million to account for the avoided cost of purchasing allocations; we increase that amount to \$20 million as explained above. This results in a net reduction of \$35,460,351 million from plaintiffs' damages claim.

III. Other Costs

Defendant's have challenged a litany of other costs in plaintiffs' damages claim. Although several of these costs have been accepted repeatedly in prior SNF litigation, defendant continues to deny the recoverability of those costs. We will address the disputed costed costs in turn below.

A. Fuel Loading Costs, Fuel Building Modifications and Cask Pit Clean-Up, and Costs Associated with Modifying Crane

Defendant challenges the \$12,905,449 in costs associated with removing spent fuel from the wet pool and loading it into multipurpose canisters,

\$547,783 in costs related to fuel building modifications and cleaning, \$37,126 for cask pit cleanup, and \$928,440 for costs related to crane modifications and heavy load analyses. Defendant asserts that plaintiffs would have incurred these costs in the world of DOE performance and therefore the costs are not recoverable. Although plaintiffs do not deny that they are contractually obligated to load the SNF when DOE performs, they assert that DOE has made no effort to establish what type of costs it will require. As we held previously when considering similar circumstances, “[t]he uncertainty inherent in the type of cask DOE would have used as well as the method of collecting the SNF thwarts the requirement of reasonable certainty necessary for defendant’s proposed reduction. *Dominion Res., Inc. v. United States*, 84 Fed. Cl. 259, 278 (2008) (citing *Sys. Fuels, Inc.*, 79 Fed. Cl. at 71). Consequently, this court “has uniformly rejected defendant’s proposed reduction for loading costs in previous spent fuel decisions because ‘these loading costs have merely been deferred’ not avoided.” *Id.* (quoting *Carolina Power & Light Co.*, 82 Fed. Cl. at 52), *see also Sys. Fuels Inc.*, 79 Fed. Cl. at 70-71; *Sys. Fuels, Inc. v. United States*, 78 Fed. Cl. 769, 797 (2007); *N. States Power Co. v. United States*, 78 Fed. Cl. 449, 468-69 (2007); *Pac. Gas*, 73 Fed. Cl. at 416; *Sacramento Mun. Util. Dist. v. United States*, 70 Fed. Cl. 332, 372 (2006); *Tenn. Valley Auth.*, 69 Fed. Cl. at 542.

Plaintiffs attempted to obtain clarification on whether the multi-purpose canisters would be accepted by DOE and were informed in writing that they were not acceptable under the current contract. *See* PX 193 at PGE117991; *see also* Tr. 2753 (Zabransky). Plaintiffs may have avoided these costs or plaintiffs may have to reproduce these activities in the future. This uncertainty was created by defendant’s breach. We find that all of these costs are substantially related to plaintiffs’ loading of the SNF. In view of defendant’s inability to specify what DOE performance will entail, what kind of casks DOE will provide, and when performance will begin, we find that, but for defendant’s breach, plaintiffs would not have incurred these costs. These costs are fully recoverable.

B. Spent Fuel Pool Cleanup and Rack Removal

The government seeks a deduction from plaintiffs’ claim of \$344,257 for costs stemming from the 1998 removal of two of the twelve racks in the fuel pool. Removing the two racks allowed PGE to inspect and clear the pool of fuel pellets leaked from damaged assemblies, which was important because PGE wanted “to make sure that all fuel-related components had been collected

for placement in the ISFSI.” Tr. 361 (Fischer). Defendant contends that removal of these racks would have been required even if DOE had performed because PGE would have to clean the pool before loading the final cask irrespective of whether the casks were meant for shipment to a DOE facility or storage onsite at the Trojan ISFSI.

Plaintiffs respond that the cost of removing the racks and cleaning the pools are properly charged to the ISFSI loading project as they were necessary steps for loading the fuel to the ISFSI. Plaintiffs explain that \$17,524 of the government’s reduction is related to the purchase of containers for shipping and disposal of the removed fuel racks. *See* DX207 at EPG014 000161. Plaintiffs further informed the court that \$226,733 is the cost of the Holtec loading crew’s demobilization during the pool cleanup and subsequent re-mobilization afterwards.¹⁵

Plaintiffs’ citations to Mr. Fischer’s testimony are unconvincing. He testified that the removal of the top two racks was necessary to ensure that all SNF materials were placed in casks and loaded to the ISFSI. *See* Tr. 361. He did not, however, testify that this step was unique to PGE’s loading of the fuel to the ISFSI. The fact that this was done in connection with the ISFSI loading project is insufficient to prove causation. Mr. Fischer, in fact, confirmed on cross-examination that removal of the racks to clean the pool would have been necessary regardless of DOE’s breach. *See* Tr. 375. Mr. Nichols confirmed that the rack removal was necessary for Trojan decommissioning. He testified that all 12 racks had to be removed and shipped offsite for storage in order to decommission the plant.¹⁶ Tr. 1309-10. Whether it would have been necessary to demobilize the Holtec crew for a period of time absent the breach was a question that Mr. Nichols was not clear in answering:

Q. So if DOE had performed, Trojan would have to demobilize and remobilize in order to do the pool survey, right?

¹⁵ Holtec performed the actual loading of the fuel from the pool to the ISFSI. The Holtec crew had to be put on stand-by while PGE cleaned the pool. \$226,733 is that cost. *See* Tr. 1313-15 (Nichols).

¹⁶ We also note that plaintiffs have not claimed costs associated with the removal of the 10 other fuel racks from the cooling pool nor costs associated with the general cleanup of the pool.

A. Potentially. I guess it depends on the schedule, what the schedule for off-load was under DOE's scenario as compared to what we actually did. You would have to go essentially through the same activities. Whether in that process you'd actually have to demobe and remobe without really looking at how the process and schedule works, I couldn't give you a good answer.

Tr. 1316-17. Defendant's expert on spent fuel management and decommissioning activities, Warren Brewer, a nuclear engineer and principal at a nuclear industry consulting firm, was asked to opine on what the decommissioning and fuel transport process would have looked like in the world of DOE performance. As part of that work, he considered the necessity of demobilizing and re-mobilizing the loading crew had DOE performed. He concluded that, if DOE performed under the OFF schedule, multiple mobilizations and demobilizations would have been necessary over the 10-year period that DOE would have picked up the Trojan SNF. Tr. 2255-56. In the event that the exchange market provided for a rapidly accelerated pickup schedule, Mr. Brewer thought that the increased level of activity in the pool would lead to the necessity of at least one demobilization to allow the rack work necessary for pool survey and cleanup. *See* Tr. 2254-55. He also concluded that Mr. Nichols' possible scenario that a demobilization of the loading crew might not be necessary in a world of DOE performance would depend entirely on a low level of activity at any one time in the fuel pool, which Mr. Brewer explained was entirely inconsistent with the idea of the rapidly accelerated pace posited by the Graves Model. Tr. 2254-55.

We agree with defendant that rack removal and pool cleanup were necessary steps regardless of DOE performance. The cost of removing and shipping the two racks removed during ISFSI loading is properly borne by plaintiffs. The cost of demobilizing and re-mobilizing the Holtec loading crew is likewise not properly charged to defendant. That cost was associated with the rack removal and pool cleanup, which we find to be generic to the Trojan decommissioning process and not specific to the ISFSI project. Mr. Nichols was unable to state that demobilization would be unnecessary had DOE performed, and Mr. Brewer explained the high likelihood that it would be necessary. In sum, the cost of removing and shipping two racks (\$17,524) and the cost of the resulting demobilization of the loading crew (\$226,733) were not proven to be caused by DOE's breach.

That leaves a \$100,000 invoice from Holtec for radiation technicians used during the rack removal. *See* DX 115 at PGE006805. Defendant accepts that PGE did pay \$100,000 to Holtec for decommissioning costs in 2003, but it argues that plaintiffs have not provided support for the \$100,000 claimed as an expense of the ISFSI project in 1998. Plaintiffs have not responded to this assertion. We were unable to find a connection specifically between the \$100,000 invoice and the ISFSI project in the record other than the general need to remove the racks as a part of Trojan decommissioning, which, as we explained above is not a result of DOE's breach. Plaintiffs have not established their entitlement to reimbursement of this cost.

C. Fees Assessed by the NRC or Oregon Department of Energy

Defendant challenges plaintiffs' claim for \$1,422,250 in fees they paid to the Nuclear Regulatory Commission ("NRC") as well as \$873,350 in fees paid to the Oregon Department of Energy ("OOE") because, if DOE had picked up Trojan's fuel pursuant to the OFF schedule, plaintiffs would have incurred the same NRC and OOE fees that they are claiming in this litigation. As we have previously stated, Trojan's fuel would not have been picked up according to the OFF schedule. Trojan would have acquired allocation rights through the exchanges market so that all of Trojan's SNF would have been picked up by the end of 2002. We find, therefore, that the fees paid after 2002 are fully recoverable by plaintiffs.

Defendant also challenges the OOE fees on the additional ground that the amount of fees attributable to DOE's partial breach cannot be determined with reasonable certainty. Evidence was presented to establish that OOE sent invoices to plaintiffs to cover the cost of overseeing and regulating Trojan. Tr. 178:10-20 (Fischer). Plaintiffs received the invoices, and their licensing department then split the bills, allocating a portion of the fees to the ISFSI project and a portion of the fees to general decommissioning accounts. Tr. 191-92; 283 (Fischer). There is no record evidence, however, of how that split was determined or why that split was used by the licensing department. *See* Tr. 282, 285 (Fischer). In response, plaintiffs presented the testimony of Mr. Poirer to explain how the licensing department would split the fees between the various cost centers. Mr. Poirer was not the employee that made the allocation of fees, however, and he could not explain the rationale behind the fee split. Nor did plaintiffs present testimony from a Mr. Dusek who was responsible for the allocation of OOE fees. We therefore agree with defendant that plaintiffs have not demonstrated with reasonable certainty what portion of the OOE fees

is attributable to defendant's breach. Thus plaintiffs cannot recover the \$873,500 for the OOE fees.

D. Certain Security Costs

Defendant questions \$70,585 related to security upgrades made by plaintiffs in 1997, contending that these upgrades were related to general plant decommissioning and not the ISFSI project. Plaintiffs responded with the testimony of Mr. Mihelich to the effect that the upgrades were to allow the ISFSI to be monitored from the Access Control Facility ("ACF"), which was the secured entry point to the protected areas of the Trojan facility. Tr. 1381-82. Plaintiffs also point out that one would have to travel through the ACF in order access the ISFSI, which leads to the conclusion that the security upgrades were a result of the ISFSI project. *See* Tr. 1470 (Mihelich) (stating that one had to travel through the protected areas to reach the ISFSI).

After a review of the testimony of Mr. Mihelich and the documentary record, we conclude that defendant is correct that the 1997 security upgrades were not related to ISFSI construction. In 1997, Matrix Systems, Inc. upgraded Trojan's access system at the ACF to use a key card system. PX 208 (purchase orders and Matrix Proposal for key card access upgrade). Mr. Mihelich confirmed that the upgrades related to moving the security monitoring function to the ACF and upgrading the access system there, which was part of the general decommissioning project. Tr. 1469. The fact that access to the ISFSI is also tied to the ACF is insufficient to establish the necessary causal link between DOE's breach and 1997 upgrade because the upgrades to the access system would have been necessary absent the breach.

In 1999, PGE installed the ISFSI security system, including routing the security camera feeds to the ACF. PX 234 (description of 1999 security upgrade); Tr. 1381-82 (Mihelich). Plaintiffs conflated this project with the 1997 key card access system installation in their briefing. The 1999 upgrade is not challenged by defendant. We find that the 1997 security upgrade was part of the general Trojan decommissioning project and thus not a result of the breach. \$70,585 must be subtracted from plaintiffs' claim.

E. Maintenance of Trojan Facilities

Defendant asserts that \$280,368 in direct costs, and \$6,659 in indirect labor costs claimed by plaintiffs for maintenance of three buildings at the

Trojan site from 2000 to 2003 are not related to the breach.¹⁷ Defendant alleges that the testimonial and documentary evidence shows that these buildings were used primarily for functions related to the general decommissioning project and not ISFSI construction or operation. Defendant points to testimony that the buildings were used to store documents related to other litigation and other PGE facilities as well as used to hold training for the general decommissioning project.

Plaintiffs counter that two of the buildings were used to store documents related to Trojan's NRC operating license for the wet pool, which would have been unnecessary after 1999 in plaintiffs' "but for" world. Plaintiffs also allege that the buildings were used to store records for the ISFSI license and to hold training regarding ISFSI operation and maintenance.

There is no dispute that costs associated with the ISFSI operation and maintenance are chargeable to the government when properly supported. At least two of the buildings were used for functions related to the ISFSI.¹⁸ Defendant is also correct, however, in pointing out that the buildings were used for purposes not related to the breach. Given sufficient proof, some of the claimed costs would be attributable to defendant. We have no basis from the record, however, to say what percentage of those costs resulted from the breach and what would have been borne by plaintiffs absent the breach. Thus plaintiffs have not established these costs to a reasonable certainty, and they must be subtracted from plaintiffs' damages.¹⁹

F. NUPIC and Sciencetech Dues

Defendant seeks to bar plaintiffs' recovery of dues paid to two voluntarily joined organizations. The first is the Nuclear Procurement Issues Committee ("NUPIC"), a group made up of utilities that share costs by pooling

¹⁷ These buildings are the Trojan North Building, Trojan Training Building, and Trojan Visitor Center.

¹⁸ It is not clear from the record what functions were performed at the Trojan Visitor's Center.

¹⁹ It also bears noting that our holding that Trojan's fuel would not have been picked up until 2002 moots most of this issue because plaintiffs would not be entitled to costs prior to the end of 2002.

resources to audit vendors and supply materials as required by the NRC. The second voluntary association is Scientech, which is a technical information provider that apprises its customers of developments in the industry. There is no suggestion that these dues were not an appropriate and cost effective way to address nuclear regulatory compliance. Mr. Fischer testified that there would have been no need to remain a member of these groups after DOE picked up the Trojan fuel.

We see no reason to question the appropriateness of these costs as they were both related to efficient operation of the plant. Plaintiffs are not, however, entitled to recoup dues paid prior to the end of 2002 given our holding regarding Trojan's fuel-out date. We were not presented with a break down of these fees by year and thus have no ability to separate the costs not associated with defendant's breach. The parties are directed to consult and propose the correct allocation.

G. Legal Costs

Defendant next challenges legal department direct costs, overheads, and outside counsel fees. These legal costs are claimed by plaintiffs to be related to the maintenance of the NRC license of the wet pool. Defendant avers that plaintiffs would have maintained its Part 50 wet pool license for 20 months after the fuel was removed,²⁰ which, even under Mr. Graves' schedule would have been August 2001 at the earliest. Defendant argues that it is not responsible for the cost of maintaining the license that PGE planned to maintain regardless of DOE's performance. Plaintiffs' answer is simply that these costs were related to wet pool operation and were charged as they were incurred to that project.

We agree with defendant. PGE had a duty to maintain its Part 50 license as long as it operated a wet pool. Our finding of a 2002 fuel-out date necessitates that legal costs related to maintaining that license prior to the end of 2002 are not chargeable to defendant's breach. We accept defendant's suggestion of 20 months as the likely delay in approval time. The parties are directed to consult and propose an apportioned amount of legal fees to be deducted from the claim.

²⁰ Defendant draws the additional 20 months from Mr. Fischer's testimony that it took the NRC 20 months to approve the termination of the operating license. Tr. 175.

H. Inspecting Trojan's Top Nozzles

The government seeks to deduct \$56,382 for costs related to the top nozzle inspections plaintiffs conducted in 2002, contending that plaintiffs would have performed those inspections even if DOE had timely performed. In response to an NRC Information Notice in 2002, PGE visually inspected the top nozzles of 93 fuel assemblies using a camera system purchased from Everest VIT. PX287 at PGE095642-43. Because the court has found that Trojan's fuel would not have been removed until 2002, Trojan would have incurred these costs in the "but for" world. Trojan, therefore, cannot recover the \$56,382 related to the top nozzle inspections.

I. Failed Fuel Canisters and Fuel Characterization

The government proposes a deduction of \$156,254 for failed fuel cans, because it asserts plaintiffs would have stored Trojan's failed fuel in such containers as part of the decommissioning process, regardless of the timing of DOE's performance. Even assuming that were true, the government cannot affirmatively state that those same failed fuel cans used at Trojan will fit into a DOE-supplied cask, because DOE has not provided plaintiffs any information on either the type of cask it will supply or the specifications of the failed fuel containers plaintiffs need to supply. Tr. 150-51 (Fischer); *see also* Tr. 1842 (Schneider). DOE has an express contractual duty to provide "specifications on Purchaser-furnished canisters for containment of failed fuel." PX100 at PGE2-000001077. If DOE had not breached, plaintiffs would have used the supplied cans. No deduction for the cost of failed fuel cans is warranted in these circumstances. *See Dominion Res.*, 84 Fed. Cl. at 275.

Defendant also asserts that \$193,853 in fuel characterization costs should be deducted from plaintiffs' claim because plaintiffs would have incurred these costs even if DOE had performed. Plaintiffs do not dispute that they would need to conduct some type of fuel inspection before loading Trojan fuel to a DOE cask. It is unknown, however, whether that inspection would be the same inspection actually performed. DOE has not provided fuel classification criteria guidance. Plaintiffs have no way of knowing whether they will be required to perform this exercise in the future or to what extent. "We view the fuel characterization costs as conceptually similar to costs for loading fuel." *Id.* at 279. Plaintiffs remain contractually obligated to perform necessary characterization prior to loading SNF when DOE performs. We view these costs not as avoided but deferred. They are thus fully recoverable.

J. Internal Overhead Costs

Defendant's position is that \$13,574,866 in overhead costs claimed by plaintiffs are not attributable to DOE's failure to pick up Trojan's SNF. The bulk of these costs, \$12,846,640, are related to corporate administrative and general overhead ("A&G"). The rest are charged as general site materials costs of \$728,226, which arise from the operation of a warehouse of general supplies used for the operation of the Trojan facility. Defendant's general challenge is that these two categories of costs were not proven to have been resulted from the breach.

We are reminded of our holding in *Dominion Resources*: "If overhead costs were not allowed, '[p]laintiffs' other projects would be more expensive than anticipated.'" 84 Fed. Cl. at 281 (quoting *Carolina Power & Light Co.*, 82 Fed.Cl. at 48). "Absent DOE's partial breach, plaintiffs could have allocated their resources to other projects. Accordingly, costs associated with overhead shall be included in the damages award." *Id.* The only difference here is that our holding regarding the fuel-out date necessitates that three years of overheads are not chargeable to the government. The parties are thus directed to propose properly reduced overhead costs.

K. Various Specific Invoices

Lastly, defendant objects to \$618,479 in costs associated with work performed by third-party contractors at Trojan.²¹ This challenge is based on Mr. Peterson's review of plaintiffs' documentary evidence. In his opinion, plaintiffs ought to be required to show evidence documenting the scope of work performed, that the work was performed, and that payment was in fact made. *See* Tr. 2462-63. Defendant believes that plaintiffs' internal accounting system is insufficient to meet the burden of proof because it is subject to human error.

Plaintiffs answer that defendant asks the court to impose an evidentiary standard beyond what is required by the law. They posit that no particular documentation is required as long as what is supplied by plaintiffs is a "reliable indicator of incurred costs." P.'s Post Trial Br. 114 (quoting *System Fuels v.*

²¹ Some of these costs are also challenged for other reasons as expressed above.

United States, 79 Fed. Cl. 37, 59-60 (2007)). Plaintiffs argue that PGE's accounting system is just that, a reliable indicator.

We are again reminded of our holding in *Dominion Resources*, in which we stated that it would be ideal for a cost to be proven by both an invoice and proof of actual payment, but we would accept testimony as to the overall reliability of claimant's accounting system, in combination with either of those forms of documentation. *See* 84 Fed. Cl. at 284. Plaintiffs here presented extensive cost reports and testimony from Mr. Poirier as to the creation of those reports along with invoices for all but two of these challenged costs. We reject defendant's argument and find that these costs are supported sufficiently in the record.

IV. Costs Associated with the Failure of the SNC/BNFL Dry Storage System

It is unnecessary for the court to determine the impact, if any, of delay in completion of the ISFSI due to problems with SNC. The questioned costs are all associated with wet storage. Because the court has found that plaintiffs' SNF would not have been picked up until 2002, they would have been required to maintain a wet pool during this time in the but for world.

CONCLUSION

Plaintiffs have proved that use of an exchange would have accelerated pickup so that all SNF would have been gone from the Trojan facility by the end of 2002. Plaintiffs were therefore only responsible for wet pool storage costs through 2002. This results in a reduction from plaintiffs' claim of \$35,460,351. Other claimed costs which are disallowed: \$344,257 for costs stemming from the 1998 removal of two of the twelve racks in the fuel pool; \$70,585 for 1997 security upgrade; \$873,500 for OOE fees; NRC fees prior to 2003; legal costs related to maintaining PGE's nuclear license prior to the end of 2002, and for 20 months thereafter; \$280,368 in direct costs, and \$6,659 in indirect labor costs for maintenance of three buildings at the Trojan site from 2000 to 2003; \$56,382 related to top nozzle inspections; dues paid to NUPIC and Scientech for 2000, 2001, and 2002; that portion of plaintiffs' overhead costs associated with the years 2000, 2001, and 2002. All other claimed costs are allowed. The parties are directed to consult and propose by January 7, 2013, a figure for plaintiffs' recovery which implements the court's ruling.

s/ Eric G. Bruggink
Eric G. Bruggink
Judge