AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

BPA NO.	1. CONTRACT ID CODE	PAGE	OF
		1	7

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
M002	See Block 15C.	HR-11-045 04/2011	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than Item 6)	CODE
U.S. Nuclear Regulatory Commission Div. of Contracts Attn: Monique B. Williams Mail Stop: TWB-01-B10M Washington, DC 20555	3100	U.S. Nuclear Regulatory Commission Div. of Contracts Mail Stop: TWB-01-B10M Washington, DC 20555	3100

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)	(X)	9A. AMENDMENT OF SOLICITATION NO.
GSE POWER SYSTEMS, INC. 1332 LONDONTOWN BLVD STE 200 SYKESVILLE MD 217846587		9B. DATED (SEE ITEM 11)
		10A. MODIFICATION OF CONTRACT/ORDER NO. NRC-38-10-702
CODE 606797264 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 06-17-2010

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required) 2011-84-17-5-156, X8455, 3142, 31X0200
Amount Obligated: $121,444.00

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER (Specify type of modification and authority) 52.243-3 Changes, Time and Material or Labor Hours

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 01 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

The purpose of this modification number 02 is to modify the contract to add two tasks; one for a BWR/4 Simulator Containment Model (Required Task), and to provide a Reactor Coolant and Core Models for a Full Size ABWR (Optional Task). The price for the BWR/4 Simulator model is $121,444 and for the Full-Size ABWR the price is $290,973. The Price Schedule, B.5 is revised to incorporate these new tasks and to revise the price for Option Years 3 and 4 to reduce the hours from 1,000 hrs. to 400 hrs., price changed to $56,000 and 58,000. This modification also extends the period end date from June 16, 2011 to March 31, 2012; the period of performance for the GE Simulator rehost is extended from June 16, 2011 to October 31, 2011.

Ceiling Price: $1,464,484 (Change)
Total Obligation: $995,511 (Change)
Period of Performance: 6/10/2010 - 3/31/2012 (Change)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)
JAY B UMHOLTZ DIRECTOR, CONTRACTS	Monique B. Williams Contracting Officer
15B. CONTRACTOR/OFFEROR: Jay B Umholtz (Signature of person authorized to sign) — 15C. DATE SIGNED: 5/26/11	16B. UNITED STATES OF AMERICA BY: Monique B. Williams (Signature of Contracting Officer) — 16C. DATE SIGNED: 5/9/2011

NSN 7540-01-152-8070
PREVIOUS EDITION NOT USABLE

STANDARD FORM 30 (REV. 10-83)
Prescribed by GSA - FAR (48 CFR) 53.243

SUNSI REVIEW COMPLETE

TEMPLATE - ADM001

JUN 02 2011

ADM002

1. On page 4, Section B.3, CONSIDERATION AND OBLIGATION—FIRM FIXED PRICE (JUN 1988) revise paragraphs #1 and #2 as follows:

   The total price of this contract (ceiling) for the products/services ordered, delivered, and accepted under this contract is $1,464,484, which covers the base period and options. The tasks authorized are the base period tasks and $121,444 for the Replacement Containment Model for GE BWR/4 Simulator, which totals $995,511.

   The total amount authorized for the base period of performance is $995,511, which is comprised of $967,011 for the firm fixed price portion and $28,500 for the cost reimbursable line items which covers the services outlined in section B.5 Price/Cost Schedule.

2. On page 5, PRICE/COST SCHEDULE, is revised to incorporate tasks for 1) Replacement Containment Model for GE BWR/4 Simulator (121,444); 2) Reactor Coolant and Core Models for Full-Size ABWR (Optional) - $290,973; Option Year 1 – Software Maintenance (Optional) - $13,000; Option Year 2 – Software Maintenance (Optional) - $13,500; Option Year 3 – Software Maintenance (Optional) - $56,000; and Option Year 4 – Software Maintenance (Optional) - $58,000.
   (SEE ATTACHEMENT 1)

3. On page 29, DURATION OF CONTRACT PERIOD, change the sentence to read as follows: The completion date for the base period is extended to March 31, 2012, which changes the overall period of performance from June 17, 2010 to March 31, 2012. The work under the base period for the remodeling of the GE simulator is extended by four (4) months from June 16, 2011 to October 31, 2011. The period of performance for the GE BWR/4 Simulator is June 18, 2011 to March 31, 2012.

   The term of this contract may be extended at the option of the Government for an additional four one-year option periods.

4. On page 7, Statement of Work incorporate the following for TASK 4.2.12REPLACEMENT BWR/4 CONTAINMENT MODEL:

The Contractor shall provide replacement model(s) for the existing containment model for the GE BWR/4 Simulator.

The replacement models shall be based on first principles, and shall provide a solution that:

- conserves energy, mass, and momentum in both gas and liquid states;

- allows for a non-homogeneous mix of liquid and gas in all nodes;

- has sufficient nodalization that the effects of heat transfer from the operation of a single safety relief valve and of natural circulation resulting from suppression pool cooling may be observed; and
- is reconfigurable.

The replacement models shall be developed using the software modeling tools provided under Task 4.2.3.

Notable features of the replacement models shall include:

- Simulation of a GE Mark II Primary Containment and Reactor Building, housing a GE BWR/4 reactor with 3411 MW thermal power, 77 Mlbm/hr rated core flow, 10.5 Mlbm rated steam flow, and 11 safety relief valves.

- The drywell shall have an internal design pressure of 48 psig, a vacuum design pressure of 10 psia, a design temperature of 296°F at 48 psig, a drywell floor design differential pressure of 30 psid, and a free air volume of 192,500 ft^3;

- The suppression chamber shall have an internal design pressure of 48 psig, a vacuum design pressure of 10 psia, a design temperature of 225°F, a free air volume of 134,000 ft^3 at high water level and 138,500 ft^3 at low water level, and a water volume of 81,385 ft^3 at high water level and 76,870 ft^3 at low water level;

- The reactor building shall have a free air volume of 2,000,000 ft^3 and a design inleakage at -0.5 inch H_2O of 50% of its volume per day (approximately 700 cfm);

- Suppression pool temperature monitoring consisting of two divisions of 12 temperature elements each, with 16 of the 24 elements located one foot below normal water level and the other 8 elements located two feet below normal water level;

- A Primary Containment Purge & Supply System and a Hydrogen and Oxygen Recombiner System;

- A Nitrogen Inerting System capable of reducing the oxygen concentration in the drywell and suppression chamber from a normal concentration of 21% to less than 4% (by volume) within 10 hours;

- Reactor Building Normal and Standby Ventilation Systems capable of maintaining reactor building internal pressure at -1.5 inch H_2O.

The models shall also include simulation of the following:

- Drywell and Reactor Building floor drain and equipment drain sumps;

- The effects of drywell cooler operation on the drywell atmosphere (temperature changes and vapor condensation), with cooler drains routed to the Drywell equipment drain sump;

- As a minimum, hydrogen, oxygen and nitrogen for non-condensable gases;
- Nitrogen-16, noble gases, iodine, and particulate radioactive species in the drywell and reactor building atmospheres;
- The heat generated due to the compression of the suppression chamber atmosphere during loss of coolant accidents; and
- The effects of operation of the containment spray system on the drywell and suppression chamber.

The Contractor shall be responsible for integrating the replacement models with the remainder of the GE BWR/4 simulation software and with the simulator benchboard controls and indications.

The Contractor shall provide NRC with full source code and all applicable licenses and rights to use the source code for all software delivered under this task.

TASK 4.3.3 FULL-SIZE ABWR REACTOR COOLANT AND CORE MODELS (Optional Task)

The Contractor shall develop and provide models for an ABWR reactor core and an ABWR reactor coolant system, using publicly-available information. The ABWR reactor core model shall produce a rated core thermal power of 2436 MWth. The ABWR reactor coolant system model shall have a rated core flow of 115 Mlbm/hr.

The Contractor shall develop these models using the same basis models as used to provide the replacement thermal-hydraulic model and replacement reactor core model for the GE BWR/4 simulator under Tasks 4.2.10 and 4.2.11, respectively (i.e., RELAP5 and REMARK).

The Contractor shall provide NRC with full source code and all applicable licenses and rights to use the source code for all software delivered under this task.

<u>Full-Size ABWR Reactor Core Model Specification</u>

The full-size ABWR reactor core model shall produce a rated core thermal power of 3926 MWth. Notable features of this ABWR model shall include:

- The use of 872 fuel assemblies of the GE-14 fuel design, which includes part-length fuel rods;
- The use of 205 control rods positioned by fine-motion control rod drives in 0.75" increments;

- Ten fixed (i.e., non-movable) in-core source range flux detectors, each located slightly above the midplane of the fuel region, capable of providing indication up to 15% of rated power;

- Fixed (i.e., non-movable) in-core power range flux detectors, with four axially-spaced detectors in each detector string, with 52 radially-spaced detector strings.

The Contractor shall provide stable initial conditions for:

- Full power operation (i.e., 100% rated core thermal power) at beginning of core life, middle of core life, and end of core life, with core life defined as 18 months of continuous full power operation; and

- Cold shutdown (i.e., all control rods fully inserted with reactor coolant temperature at 180°F) at beginning of core life, middle of core life, and end of core life as defined above.

Full-Size ABWR Reactor Coolant System Model Specification

The full-size ABWR reactor coolant system model shall have a rated core flow of 115 Mlbm/hr. Notable features of this ABWR model shall include:

- Ten variable speed reactor internal pumps, taking suction directly from the bottom of the reactor annulus, only 9 of which are required for full power (100% core flow – 115 Mlbm/hr) operation;

- Each reactor internal pump shall have the following design characteristics: 33,900 gpm rated flow; rated head of 131 feet;

- The reactor internal pumps may be controlled individually or ganged with any or all of the remaining pumps;

- Natural circulation flow shall be approximately 20% of rated core flow;

- The reactor vessel shall have no penetrations below the top of active fuel that are larger than 2 inches, resulting in a core re-flood volume that is to the top of active fuel;

- The reactor vessel shall have a height of 827 inches and an internal diameter of 292 inches;

- The sizes and elevations of the reactor vessel penetrations and the design, sizes and specifications of the reactor vessel internals shall be determined from the ABWR Design Control Document;

- The Contractor shall be responsible for providing the models for the reactor internal pumps and their motors;

- The Contractor shall not be responsible for providing the various logic systems necessary to operate the valves and controls associated with the reactor coolant system.

B.7 DELIVERABLES

Add the following:

Task 4.2.12 – Replacement Mark II containment model fully integrated with the rest of the simulator models, and all associated source code.

Task 4.3.3 (Optional) – Full-size ABWR reactor coolant and core models and all associated source code.

5. In Section B.5 – Incorporate the Payment Schedule below for the BWR/4 Simulator Containment Model:

Milestone:	Percentage	Amount
1. Baseline Data Collected	15%	$18,217
2. Model Development Complete	60%	$72,866
3. Site Acceptance Test Complete	25%	$30,361

All other terms and conditions remain unchanged

Replacement Containment Model for GE BWR/4 Simulator (POP: 6/18/2011 - 3/31/2012)

CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
014	Provide a Replacement Containment Model for the GE BWR/4 Simulator	1	LOT	$ 117,944.00	$ 117,944
	TOTAL FIRM FIXED PRICE				$ 117,944
CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
	COST REIMBURSABLE LINE ITEMS				
015	Travel Costs - The government will pay up to the rates specified in the Government Federal Travel Regulations (FTR) for travel destinations. Contractor will be reimbursed for actual costs only, with back-up documentation/receipts attached to the invoice.	1	LOT	$ 3,500.00	$ 3,500
	TOTAL COST REIMBURSEMENT COSTS:				$ 3,500
	TOTAL PRICE FOR GE/BWR/4 CNTMT MODEL:				$ 121,444

Software License (Optional Task)

CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
016	FIXED PRICE LINE ITEMS				
	Each Additional Software License (Firm Fixed Price)				
	a. GSE JADE Software (Run-time License)	1	each	$ 37,500	$ 37,500
	TOTAL PRICE OPTIONAL SOFTWARE LICENSES				$ 37,500

Reactor Coolant and Core Models for Full-Size ABWR (OPTIONAL TASK)

CLIN	DESCRIPTION	HOURS	UNIT	UNIT PRICE	AMOUNT
	FIXED PRICE LINE ITEMS				
017	Provide a Reactor Coolant and Core Models for a Full-Size ABWR	1	LOT	$ 284,673.00	$ 284,673
	TOTAL FIRM FIXED PRICE				$ 284,673
CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
	COST REIMBURSABLE LINE ITEMS				
018	Travel Costs - The government will pay up to the rates specified in the Government Federal Travel Regulations (FTR) for travel destinations. Contractor will be reimbursed for actual costs only, with back-up documentation/receipts attached to the invoice.	1	LOT	$ 6,300.00	$ 6,300
	TOTAL COST REIMBURSEMENT COSTS:				$ 6,300
	TOTAL PRICE FOR ABWR RCS AND CORE:				$ 290,973

OPTION YEAR 1 - Software Maintenance : (POP: Twelve months from Date of Award)

CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
019	Software Maintenance and Offsite Archival Storage	100	hrs.	$ 130.00	$ 13,000
	TOTAL PRICE OPTION YEAR ONE:				$ 13,000

OPTION YEAR 2 - Software Maintenance: (POP: Twelve months from Date of Award)

CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
020	Software Maintenance and Offsite Archival Storage	100	hrs.	$ 135.00	$ 13,500
	TOTAL PRICE OPTION YEAR TWO:				$ 13,500

OPTION YEAR 3 - Software Maintenance: (POP: Twelve months from Date of Award)

CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
021	Software Maintenance and Offsite Archival Storage	400	hrs.	$ 140.00	$ 56,000
	TOTAL PRICE OPTION YEAR THREE:				$ 56,000

OPTION YEAR 4: (Period of Performance: Twelve months from Date of Award)

CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
022	Software Maintenance and Offsite Archival Storage	400	hrs.	$ 145.00	$ 58,000
	TOTAL PRICE OPTION YEAR FOUR:				$ 58,000

GRAND TOTAL BASE YEAR AND OPTIONS: $ 1,464,484