AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT		1. CONTRACT ID CODE	PAGE 1 OF 15
2. AMENDMENT/MODIFICATION NO. M004	3. EFFECTIVE DATE 01-04-2012	4. REQUISITION/PURCHASE REQ. NO. HR-12-026 & HR-12-053 12/29/2011 & 12/28/2011	5. PROJECT NO. (If applicable)
6. ISSUED BY CODE 3100 U.S. Nuclear Regulatory Commission Div. of Contracts Attn: Monique D. Williams Mail Stop: TWB-01-B10M Washington, DC 20555		7. ADMINISTERED BY (If other than Item 6) CODE 3100 U.S. Nuclear Regulatory Commission Div. of Contracts Mail Stop: TWB-01-B10M Washington, DC 20555	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

GSE POWER SYSTEMS, INC.

1332 LONDONTOWN BLVD STE 200

SYKESVILLE MD 217846587

CODE 606797264 FACILITY CODE

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

x 10A. MODIFICATION OF CONTRACT/ORDER NO. NRC-38-10-702

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)
2012-84-17-5-156, X8455, 3142, 31X0200
Amount Obligated: $413,000.00
NAICS Code: 541512

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)
52.243-1 Changes - Fixed Price

E. IMPORTANT: Contractor [ ] is not, [X] 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 04 is to modify the Statement of Work to incorporate AP1000 Systems Model Development (Task 4.2.15). The Ceiling Price for authorized tasks is changed from $1,473,595 to $2,486,561, an increase of $1,012,966, the total Ceiling Price is increased from $1,942,568 to $2,942,534, an increase of $999,966, and The Total Obligation is changed from $1,473,595 to $1,886,595, an increase of $413,000.

This modification also exercises option year 1 for software maintenance and offsite archival storage.
Total Ceiling Price: $2,942,534 (Change)
Total Ceiling Authorized to Date: $2,486,561 (Change)
Total Obligation: $1,886,595 (Change)
Period of Performance: 6/10/2010 - 11/30/2012 (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)	
JEFFERY G. HOUGH CFO		Monique B. Williams Contracting Officer	
15B. CONTRACTOR/OFFEROR Jeffery G. Hough (Signature of person authorized to sign)	15C. DATE SIGNED 1/4/12	16B. UNITED STATES OF AMERICA BY Monique B. Williams (Signature of Contracting Officer)	16C. DATE SIGNED 12/29/2011

NSN 7540-01-152-8070 STANDARD FORM 30 (REV. 10-83)

SUNSI REVIEW COMPLETE JAN 4 2012

TEMPLATE - ADM001 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 $2,942,534. Of that amount the total ceiling authorized to date totals: $2,486,561 which is comprised of $2,422,711 for the fixed price portion; $50,850 for the cost reimbursement portion (Travel); and $13,000 in labor hour (CLIN 021) for software maintenance and archival storage.

   The CLINs authorized under this contract are as follows:
   1) CLINs 001 – 013 for GE Simulator Rehost;
   2) CLIN014 -015 for Replacement Containment Model for GEBWR.4 Simulator; and
   3) CLINs 019-020 for AP1000 Reactor Core Model and Reactor Coolant and Passive Core Cooling Systems;
   4) CLIN 021 – Option Year 1 - Software Maintenance and Offsite Archival Storage; and
   5) CLIN 025-030 – AP1000 Model Development and Travel

   The total obligation to date is $1,886,595; and this modification obligates FY2012 funds in the amount of $413,000.

2. On page 5, PRICE/COST SCHEDULE, is revised to incorporate tasks for: AP1000 Model Development ($992,616) and Travel (7,350). (See Attachment - I for Revised Price Schedule)

   Incorporate the Payment Schedule below for AP1000 Systems Model Development as follows:

Milestone:	Percentage	Period
Submit Preliminary Design Specification	[redacted]	3 months
Model Design Development Complete		10 months
Stand Alone Unit Test Complete		11 months
GSE Model Integration Complete		12 months

   Time period starts after receipt of order from Contracting Officer's Representative (COR)

3. On page 29, DURATION OF CONTRACT PERIOD, change the section to read as follows: The overall period of performance on this contract is changed to June 17, 2010 to November 30, 2012.

   - The base period of performance for the rehost and model upgrade of the GE simulator is June 17, 2010 to October 31, 2011;
   - The period of performance for the GE BWR/4 Simulator containment model replacement is from June 18, 2011 to March 31, 2012.
   - The period of performance for the AP1000 Reactor Core Model and Reactor Coolant and Passive Core Cooling System is from September 12, 2011 to June 11, 2012.
   - Software Maintenance and Archival Storage period of performance is November 1, 2011 – October 31, 2012.

- AP1000 Model Development period of performance is January 4, 2012 to November 30, 2012.

4. On page 7, Section B.6 - Statement of Work incorporates the following for Tasks 4.2.15:

<u>AP1000 Systems Model Development</u>
The Contractor shall provide the option to develop models for the AP1000 systems included in each of the sub-tasks listed below. The models shall be developed using the GSE Jade modeling tools provided under Task 4.2.3 and shall be capable of providing a realistic representation of all pertinent system parameters for each respective model which would be visible in the control room and/or are necessary for the simulation of malfunctions, local operator actions, and interfacing systems.

The Contractor shall be responsible for integrating the models developed for each exercised sub-task listed below with each other and with the AP1000 core and thermal hydraulic models developed under Tasks 4.2.13 and 4.2.14. The Contractor shall not be responsible for interfacing the models it develops with any AP1000 simulation models developed by the NRC.

The models shall be capable of running in real-time on the computer system and simulator executive system provided under Tasks 4.2.2 and 4.2.3 of this contract.

The Contractor shall develop the models using publicly available information. The Contractor is expected to use information contained in the AP1000 Design Control Document (DCD) Revision 19 or later. (The DCD is available at http://www.nrc.gov/reactors/new-reactors/design-cert/amended-ap1000.html.) The NRC will provide any necessary non-publicly available data, if possible. Provision of such data will be dependent on its availability to the NRC, and will require the execution of nondisclosure agreement(s) for that information which is proprietary and official authorization for any information which is security-related. In cases where required data is not available, the Contractor will be expected to develop the models using best estimates and engineering judgment.

The Contractor shall be responsible for providing the DCS software necessary to provide controls and indications for the systems and equipment simulated in the models developed or adapted for each exercised sub-task.

The Contractor shall be responsible for modifying a copy of the Instructor Station provided under Task 4.2.5 of this contract as necessary to provide system P&IDs, malfunctions, overrides, and local operator actions needed for the system models developed or adapted for each exercised sub-task. The specific malfunctions, overrides, and local operator actions to be included will be determined through discussion between NRC and Contractor personnel when a sub-task is exercised.

The Contractor shall provide the NRC with full source code and all applicable licenses and rights to use the source code for all software delivered under this task. This source code shall include all FORTRAN and/or C source files as well as all other files generated using the GSE Jade modeling tools.

Containment System (CNS), Passive Containment Cooling System (PCS)

The Containment System (CNS) and the Passive Containment Cooling System (PCS) are described in the AP1000 DCD Tier 1 Sections 2.2.1 and 2.2.2, and DCD Tier 2 Sections 3.8 and 6.2.

The CNS model shall include the following major design features:

1. The carbon steel containment vessel has an inside diameter of 130' and is 215'-4" tall (including the ellipsoidal upper and lower heads). It is designed for a maximum internal pressure of 59 psig, a design temperature of 300°F, an external differential pressure of 2.9 psid, and a net free volume of 2.06E+06 ft^3.

2. The heads are ellipsoidal with a major diameter of 130' and a height of 37'-7.5".

3. The wall thickness in the majority of the vessel is 1.75". The thickness of the lowest course of the cylindrical shell is 1.875" to allow for potential corrosion near the point where the vessel is embedded. The heads are 1.625" thick.

4. For reference, the lowest point of the bottom head is at plant elevation 66'-6". The two equipment hatches have centerline elevations at 112'-6" and 141'-6" and inner diameters of 16'. The two personnel airlocks have centerline elevations at 110'-6" and 135'-3" and inner diameters of 9'-10".

5. The bottom head is embedded in concrete.

6. A steel and concrete shield building with an inside diameter of 139' surrounds the containment. Above elevation 132'-3", there is an annulus between the containment vessel and the shield building to provide for an upward flow of air to cool the containment (in conjunction with PCS). An air baffle within the annulus between the containment vessel and the shield building defines the cooling air flow path.

7. Normal containment heat removal is provided by the containment air recirculation cooling system.

8. Emergency containment cooling is provided by the PCS (see below).

9. Engineered safeguards and containment isolation signals automatically isolate process lines that are normally open during operation. Isolation conditions are:
   a. Manual isolation;
   b. Manual initiation of Passive Containment Cooling;
   c. Safeguards actuation, which is in turn generated by:

1) Low pressurizer pressure;
2) Low steam-line pressure;
3) Low T_{cold}
4) High containment pressure
5) Manual safeguards actuation.

10. The containment vessel has sub-compartments for the recirculation loops and pressurizer.

11. The containment is equipped with both hydrogen recombiners and hydrogen igniters.

The PCS models shall include the following major design features:

1. The PCS includes a Primary Containment Cooling Water Storage Tank (PCCWST), incorporated into the shield building above the containment; a water distribution system to distribute the flow of PCCWST water down the exterior of the containment; standpipes and valves in the PCCWST discharge piping; and an annulus between the shield building and the containment vessel for air flow.

2. A normally isolated line from the PCCWST provides an alternate source of water for the spent fuel pool.

3. The PCS also includes a Primary Containment Cooling Ancillary Water Storage Tank (PCCAWST) with recirculation pumps capable of supplying additional water to the PCCWST and acting as a backup supply of water to the fire protection system.

4. The PCCWST sits at the top of the shield building with an outer diameter of 90', a height of 35'-3" at the outer diameter, and a 32'-diameter opening in the center to allow for air flow. The PCCWST contains a minimum of 756,700 gallons of demineralized water.

5. Drainage from the PCCWST is by gravity flow through four standpipes of varying heights. Draining through all standpipes provides the maximum flow rate at the beginning of drawdown, and the uncovery of standpipes provides lesser flow rates as the drain continues. Weirs, collection boxes, and distribution troughs encircle the upper elliptical head of containment at two different heights; they ensure largely uniform wetting of the outside of the containment. The PCCWST can provide continuous wetting flow for at least 72 hours following actuation.

6. The PCCAWST has a nominal volume of 780,000 gallons. Two recirculation pumps are provided to maintain circulation and to provide for longer-term operation of the PCS by refilling the PCCWST.

B. Main and Startup Feedwater System (MFS), Condensate System (CDS), and Main Condenser

The Main and Startup Feedwater System (MFS) is described in the AP1000 DCD Tier 1 Section 2.4.1 and in Tier 2 Sections 10.4.7 and 10.4.9.

The Condensate System (CDS) and Main Condenser are described in the AP1000 DCD Tier 1 Section 2.4.6 and in Tier 2 Sections 10.4.1 and 10.4.7.

The MFS, CDS and Main Condenser models shall incorporate the following features:

1. Condensate collected in the main condenser is pumped by three condensate pumps (two of which are normally operating at high loads) through a condensate polishing system or its bypass, the gland steam condenser, three parallel strings of two low-pressure heaters (stages 1 and 2), two parallel strings of two low-pressure heaters (stages 3 and 4), and into an open deaerator storage tank (stage 5).

2. Condensate flow is also provided to two SG blowdown heat exchangers in a parallel flowpath starting at a point upstream of the gland steam condenser and ending at the deaerator storage tank.

3. All MFS and CDS pumps are electrically driven.

4. Three parallel feedwater booster / main feed pump assemblies take suction on the deaerator storage tank and pump feedwater through two parallel strings of two high-pressure heaters (stages 6 and 7). All three pump assemblies are operating at high loads.

5. Feedwater is pumped to each steam generator through a flow venturi, control valve, feedwater isolation valve, and feedwater check valve.

6. The plant is capable of operating at 70% of rated power with one booster / main feedwater pump assembly out of service, and 100% of rated power with one condensate pump out of service.

7. The plant is capable of operating at greater than 70% of rated power with one feedwater heater string out of service.

8. The condenser hotwells are designed to have a capacity equivalent to full flow operation of the condensate system for 3 minutes. Table 10.4.1-1 of the DCD Tier 2 Chapter 10 provides condenser specifications.

9. Three recirculation paths (a hotwell recirculation loop, a deaerator recirculation loop, and a third recirculation loop from downstream of the 7th stage feedwater heaters) provide for water cleanup and chemical maintenance.

10. The low-pressure feedwater heaters are of the shell-and-tube type and are heated by extraction steam and equipped with cascading drains. Stages 1 and 2 are located in the condenser necks.

11. The high-pressure feedwater heaters are also of the shell-and-tube type; each drains to the deaerator storage tank.

12. The deaerator storage tank / heater is supplied by high pressure turbine exhaust steam or, during startup, by auxiliary steam. Its purpose is to remove non-condensable gases and to provide suction head for the feedwater booster / main feed pump assemblies.

13. Condensate flow to the deaerator storage tank is regulated, in order to control deaerator level, by two split-ranged control valves located upstream of the deaerator. During normal power generation, the valves are regulated by a three-element control system: total feedwater flow is used as a feed-forward demand signal, and the control is trimmed by measured feedback of total condensate flow and deaerator storage tank level.

14. The startup feedwater pumps take suction from the condensate storage tank. The pumps have a capacity of 520 gpm (each). The two pumps can provide approximately 4% of rated feedwater flow.

15. The main feedwater pumps can supply the SGs via the startup feedwater lines through a cross-connect into the common discharge header from the startup feedwater pumps.

16. The startup feedwater pumps automatically start when there is insufficient main feedwater flow to the SGs. The automatic pump start signal is generated by the Plant Control System (PLS). The signal occurs on low main feedwater flow coincident with low SG level. A second automatic start signal is generated on low SG level alone, at a setpoint below that for the coincident logic.

17. DCD Tier 2 Figures 10.4.7-1 provides the MFS and CDS piping and instrumentation diagrams.

C. Main Steam System (MSS), Main Turbine System (MTS) and Main Turbine Control System

The Main Steam System (MSS) and Main Turbine System (MTS) are described in the AP1000 DCD Tier 1 Section 2.4 and in Tier 2 Chapter 10.

The Main Turbine Control System is described in the AP1000 DCD Tier 1 Section 2.5 and in Tier 2 Section 10.2.

The MSS model shall incorporate the following features:

1. The MSS consists of the following major components:
   a. Steam piping from the steam generator (SG) outlet nozzles up to the main turbine stop valves;
   b. One main steam isolation valve (MSIV) and one MSIV bypass valve per steam line;
   c. Main steam safety relief valves;
   d. Power operated relief valves;
   e. Turbine bypass valves (i.e. steam dump valves).

2. Rated main steam flow is 14.97 Mlbm/hr. Full plant load steam pressure is 836 psia; no-load (hot standby) steam pressure is 1106 psia.

3. The two main steam lines are cross-connected in a common header just before branching to the main turbine stop valves.

4. Branch piping to the main turbine bypass valves is provided between the MSIVs and the main turbine stop valves.

5. Each main steam line is equipped with six safety relief valves: 4 with nominal set pressures of 1185, 1197, 1209, and 1221 psig, and 2 with the same nominal set pressure of 1232 psig. Each valve is rated with a maximum flow rate of 1.37 Mlbm/hr at 110% of design pressure.

6. Each main steam line is equipped with one power-operated relief valve with a nominal set pressure of 1138 psig. The valve is rated with a maximum flow rate of 1.02 Mlbm/hr at 1200 psia inlet pressure.

7. The power-operated relief valves are automatically controlled by steam pressure during power operation, modulating open to exhaust to atmosphere when pressure exceeds the setpoint.

8. During plant cooldown, the power-operated relief valves automatically operate in response to a pressure setpoint which is periodically decreased manually in the control room.

9. Each power-operated relief valve is equipped with a safety-related solenoid valve to vent air from the valve operator and automatically close the valve to terminate a steam line depressurization transient. The solenoid actuation signal is an Engineered Safety Feature (ESF) actuation function.

10. The MSIVs and MSIV bypass valves automatically close on receipt of isolation signals, initiated by:
    a. Low steam line pressure in one of two loops;
    b. High containment pressure;
    c. High negative steam pressure rate in one of two loops; and
    d. Low T_{cold} in either reactor coolant loop.

11. Although nominally not a part of MSS, the steam generator blowdown isolation valves automatically close on receipt of:
    a. Actuation of the Passive Residual Heat Removal system;
    b. Containment isolation; or
    c. High blowdown system radiation, temperature, or pressure.

    The SG blowdown system is described in the AP1000 DCD Tier 2 Section 10.4.8.

12. DCD Tier 2 Figures 10.3.2-1 and 10.3.2-2 provide the MSS piping and instrumentation diagrams.

The existing MTS model and the turbine electro-hydraulic control (EHC) system model shall either be adapted for the AP1000 system or replaced with new models. The models shall have the following features:

1. One single high-pressure dual flow turbine and three low-pressure dual flow turbines, controlled by a digital electro-hydraulic control system (D-EHC).

2. One direct-driven generator rated at 1375 mega-volt amps (MVA) at 0.9 PF, equivalent to 1237.5 megawatts (MW).

3. Exhaust from the high pressure turbine flows through two moisture separator/reheaters. The first stage reheater uses extraction steam for the high pressure turbine. The second stage reheater uses a portion of main steam.

4. Extraction steam and high pressure turbine exhaust provide heating steam for the seven stages of feedwater heating. High pressure turbine exhaust is supplied to the 5th stage heater/deaerator.

5. The digital EHC system provides speed control, acceleration, and overspeed protection functions. Its load control function develops signals to regulate unit load and provide for automatic turbine control, if desired.

The existing MTS and analog EHC system models may be adapted for use on the AP1000 system.

D. Chemical and Volume Control System (CVS), Normal Residual Heat Removal System (RNS)

The Chemical and Volume Control System (CNS) is described in the AP1000 DCD Tier 1 Section 2.3.2 and in Tier 2 Section 9.3.6.

The Normal Residual Heat Removal System (RNS) is described in the AP1000 DCD Tier 1 Section 2.3.6 and in Tier 2 Section 5.4.7.

The CVS model shall incorporate the following features:

1. CVS provides for reactor coolant purification, reactor coolant system inventory control and makeup, chemical shim and chemical control, oxygen control, filling the reactor coolant system, borated makeup to auxiliary systems, and pressurizer auxiliary spray.

2. Normal CVS purification flow is achieved using the developed head of the reactor coolant pumps as the motive force. Coolant is normally circulated through a regenerative heat exchanger, non-regenerative heat exchanger, a mixed bed (or, optionally, cation bed) demineralizer, and a filter prior to its return via the regenerative heat exchanger to the suction of a reactor coolant pump. During periods when the reactor coolant pumps are not operating, RNS provides the necessary motive force.

3. DCD Tier 2 Figure 9.3.6-1 provides the CVS piping and instrumentation diagram.

4. The CVS provides a means to add and remove mass from the RCS, as required, in order to maintain the programmed pressurizer water level during normal plant operations.

5. Two parallel centrifugal makeup pumps are provided with design flow rates of 140 gpm each. A recirculation (minimum flow) path with heat exchanger is provided for each pump.

6. The CVS is used to vary the boron concentration in the RCS in order to maintain the desired control rod position with core depletion. The system is also used to control the pH of the RCS by maintaining the proper level of lithium hydroxide and to control the oxygen level in the RCS by maintaining the appropriate concentration of dissolved hydrogen.

7. The CVS provides borated water makeup to the passive core cooling system accumulators, core makeup tanks, in-containment refueling water storage tank, and the spent fuel pool.

8. The CVS is designed to automatically address a boron dilution accident by closing redundant safety-related valves, tripping the makeup pumps and/or aligning the suction of the makeup pumps to the boric acid tank.
   a. If the dilution event occurs at power (assuming no operator action), a reactor trip is initiated on either an overpower trip or an overtemperature ΔT trip. After the reactor trip signal, the line from the demineralized water system is isolated by closing two safety-related, air-operated valves, and the makeup pump suction is aligned to the boric acid tank.

b. If the dilution event occurs during shutdown, the source range flux doubling signal is used to isolate the makeup line to the RCS by closing the two safety-related, motor-operated valves, to isolate the line from the demineralized water system to the makeup pump suction by closing two safety-related, air-operated valves, and to trip the makeup pumps.

9. DCD Tier 2 Table 9.3.6-2 provides nominal data for the heat exchangers, pumps, filters, and boric acid tank.

The RNS model shall incorporate the following features:

1. RNS provides for heat removal from the core and reactor coolant system and provides for cooling of the in-containment refueling water storage tank (IRWST).
2. RNS provides a path for long-term post-accident makeup to the RCS.
3. RNS can also cool the spent fuel pool when one of the RNS trains is not needed for removing heat from the RCS.
4. RNS is capable of cooling the RCS from 350°F to 125°F within 96 hours with both trains in operation.
5. RNS can supply low pressure RCS makeup.
6. RNS consists of two parallel trains of mechanical equipment with a common suction from the loop 2 RCS hot leg and a common discharge to both direct vessel injection lines.
7. Each train contains a pump and a residual heat removal heat exchanger cooled by component cooling water. Each pump is equipped with a minimum flow path with recirculation back to the pump suction.
8. DCD Tier 2 Tables 5.4.13 and 5.4.14 contain RNS design data.
9. DCD Tier 2 Figures 5.4.6 and 5.4.7 provide one-line and piping and instrumentation diagrams for RNS.

E. Incore Instrumentation System (IIS)

The Incore Instrumentation System (IIS) is described in the AP1000 DCD Tier 1 Section 2.5.5 and in Tier 2 Section 4.4.6.1.

Simulation of the IIS in-core flux detectors and core exit thermocouples which are part of the IIS is included in the AP1000 core models provided under Task 4.2.13 of this contract. The IIS models to be developed under this task shall incorporate the following features:

1. The current signals from the 42 incore self-powered neutron detector strings (each consisting of seven vanadium detectors), or assemblies, are digitized and then used in an algorithm to generate three-dimensional flux maps in either a graphical or tabular form.

2. Data provided by the IIS is used to generate a visual alarm display which alerts the reactor operator in the event of potential or existing Technical Specifications reactor operating limit violations. The 3-D core power distribution is used to calculate actual core margins such as minimum DNBR (departure from nucleate boiling ratio) and maximum linear heat rate. The margins to these limits are displayed on a continual basis to permit assessment of actual core conditions and to provide alerts of low margin or limit violations.

3. The 42 detector assemblies are divided into two groups of 21 assemblies equally divided between the core quadrants. These two groups are processed by separate signal processing equipment such that any equipment or component failure resulting in the loss of up to 50% of the assemblies will not result in unacceptable uncertainty in the measurement of the core power distribution.

4. The incore instrumentation signal processing equipment is capable of processing updated digitized current values from every flux detector at intervals of less than 1 second.

5. There are at least two Class 1E instrument assemblies (detector string and thermocouple) in each core quadrant.

6. IIS provides safety-related signals from thirty-eight of the core exit thermocouples to the Protection and Safety Monitoring System (PMS) and nonsafety-related signals from four of the thermocouples to the Diverse Actuation System (DAS). Further processing of the core exit temperature signals is performed by these systems.

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	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
014	Provide a Replacement Containment Model for the GE BWR/4 Simulator	[redacted]	LOT	$[redacted]	$ [redacted]
	TOTAL FIRM FIXED PRICE				$ 117,944
CLIN	DESCRIPTION	ESTIMATED	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.	[redacted]	LOT	$ [redacted]	$ [redacted]
	TOTAL COST REIMBURSEMENT COSTS:				$ 3,500
	TOTAL PRICE FOR GE/BWR/4 CNTMT MODEL:				$ 121,444

Software License (Optional Task)

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

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

CLIN	DESCRIPTION	ESTIMATED	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
017	Provide a Reactor Coolant and Core Models for a Full-Size ABWR	[redacted]	LOT	$[redacted]	$ [redacted]
	TOTAL FIRM FIXED PRICE				$ 284,673
CLIN	DESCRIPTION	ESTIMATED	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.	[redacted]	LOT	$[redacted]	$ [redacted]
	TOTAL COST REIMBURSEMENT COSTS:				$ 6,300
	TOTAL PRICE FOR ABWR RCS AND CORE:				$ 290,973

AP1000 Reactor Core Model and Reactor Coolant and Passive Core Cooling System

CLIN	DESCRIPTION	ESTIMATED	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
019	Partial Scope AP1000 Reactor Core Model	[redacted]	LOT	[redacted]	$ [redacted]
	Partial Scope AP1000 Reactor Coolant & Passive Core Cooling System		LOT		$
	TOTAL FIRM FIXED PRICE				$ 463,084

CLIN	DESCRIPTION	ESTIMATED	UNIT	UNIT PRICE	TOTAL AMOUNT
	COST REIMBURSABLE LINE ITEMS				
020	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.	[redacted]	LOT	$ [redacted]0	$ [redacted]
	TOTAL COST REIMBURSEMENT COSTS:				$ 15,000
	TOTAL PRICE FOR REACTOR CORE MODEL				**$ 478,084**

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

CLIN	DESCRIPTION	ESTIMATED	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
021	Software Maintenance and Offsite Archival Storage	[redacted]	hrs.	$ [redacted]	$ [redacted]
	TOTAL PRICE OPTION YEAR ONE:				$ 13,000

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

CLIN	DESCRIPTION	ESTIMATED	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
022	Software Maintenance and Offsite Archival Storage	[redacted]	hrs.	$ [redacted]	$ [redacted]
	TOTAL PRICE OPTION YEAR TWO:				$ 13,500

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

CLIN	DESCRIPTION	ESTIMATED	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
023	Software Maintenance and Offsite Archival Storage	[redacted]	[redacted]	$ [redacted]	$ [redacted]
	TOTAL PRICE OPTION YEAR THREE:				$ 56,000

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

CLIN	DESCRIPTION	ESTIMATED	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
024	Software Maintenance and Offsite Archival Storage	[redacted]	hrs.	$ [redacted]	$ [redacted]
	TOTAL PRICE OPTION YEAR FOUR:				$ 58,000

AP1000 Model Development

CLIN	DESCRIPTION	ESTIMATED HOURS	UNIT	UNIT PRICE	TOTAL AMOUNT
	FIXED PRICE LINE ITEMS				
	AP1000 System Model Development				
025	Task A - (CNS, PCS) *	[redacted]	LOT	$ [redacted]	$ [redacted]
026	Task B - (MFS, CDS, Main Condenser)		LOT	$	$
027	Task C - (MSS, MTS, Main Turbine Control)			$	$
028	Task D - (CVS, RNS)			$	$
029	Task E - (IIS)			$	$
	TOTAL FIRM FIXED PRICE				$ 992,616
CLIN	**DESCRIPTION**	**ESTIMATED HOURS**	**UNIT**	**UNIT PRICE**	**TOTAL AMOUNT**
	COST REIMBURSABLE LINE ITEMS				
030	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.	[redacted]	LOT	$ [redacted]	$ [redacted]
	TOTAL COST REIMBURSEMENT COSTS:				$ 7,350
	TOTAL PRICE FOR REACTOR CORE MODEL				**$ 999,966**

* Task A includes a 15% discount The figure is reduced from $198,691.37 to $168,766.16

GRAND TOTAL BASE YEAR AND OPTIONS: $ 2,942,534