

## Education and Outreach

### *UFTR Digital Control System Upgrade for Education and Training of Engineers and Operators*

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**Description:** The goal of this project is to contribute to a major initiative on design, licensing and construction of a fully digital control system for the University of Florida Training Reactor (UFTR). This makes the UFTR the first operating nuclear power plant in the United States that uses a fully digital control system. This facility will provide for the training and education of the necessary workforce in the area of digital control and instrumentation for nuclear reactors. With this effort, a new focus/certificate on digital control and instrumentation will be developed at the Nuclear and Radiological Engineering (NRE) Department. Further, the UFTR facility will offer training courses for community colleges (Central Florida, Indian River, and Jacksonville) in the State of Florida, personnel from nuclear utilities and government agencies including the Nuclear Regulatory Commission (NRC). The project has already received significant funding from industry and government in form of grants, contracts, equipment/systems, and engineers' time.

**Budget:** \$308,000

**Universities:** UF

**External Collaborators:** Several engineers from AREVA NP Inc & Siemens Corporation

## Progress Summary

In order to make the UFTR capable of offering training to engineers and operators, it is necessary to receive approval from NRC on reactor relicensing application and on the Licensing Amendment Request (LAR) for the digital control upgrade. Then install and test the new digital system. Thus far, we have been working on:

- i) Licensing applications (submitted to NRC)
    - a. UFTR Relicensing Application
    - b. LAR for digital protection system
  - ii) Basic Design Documentation (submitted/to be submitted to AREVA)
  - iii) Application Software Development
- i) a. UFTR Relicensing Application

In August, 2011 a NRC team performed an Audit. The first part of the audit, August 1-3, was dedicated to UFTR license renewal. The discussion comprised the current version of the proposed UFTR technical specifications and the draft request for additional information in order to complete the review for the UFTR relicensing.

A new set of RAI is expected from the NRC.

i) b. LAR for the digital protection system

August 3 -5, 2011, the NRC has been conducted an audit of the UFTR application for a license amendment to install a Digital Control System Upgrade.

The intent of the audit was to gain understanding of the project progress and current facility status. In addition, it was identified information required to be docketed in order to support the basis of the licensing decision. The regulatory audit will allow the NRC staff to more efficiently gain insights on the UFTRs software development programs and processes.

An Audit Summary is expected from NRC with recommendation of the approach for completion of the LAR Application.

A paper entitled Implementation of Digital Upgrades to the UFTR Protection and Control Systems was submitted and accepted for presentation at the American Nuclear Society Meeting in Washington DC, in November.

ii) Basic Design Documentation (submitted/to be submitted to AREVA)

We have prepared the documents in support of TXS protection system manufacturing in Germany, as part of the Basic Design Documentation and submitted to AREVA for review.

iii) Application Software Development

We have been working on the *FunBase* and *SPACE* software tools. The former tool was used in support of document preparation, particularly the Software Requirements Specifications, and latter tool is used to prepare network diagrams, and eventually the necessary *object* file for operating the TXS system. Here, currently we are training ourselves and trying to determine the limitations and capabilities of the two tools.

## 2011 Annual Report

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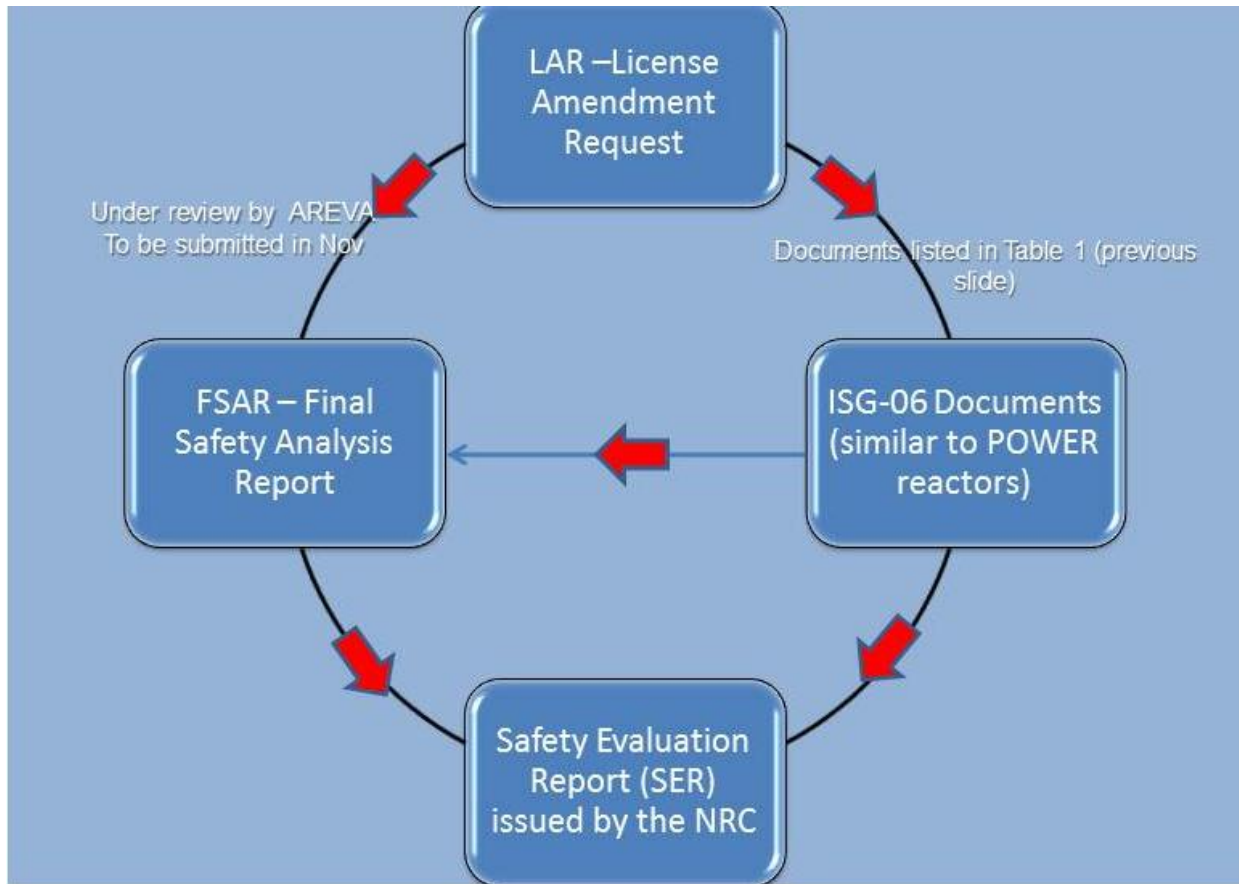
i) a. UFTR Relicensing Application

The work was completed in 2010. In August, 2011 a NRC team performed an Audit to the UFTR and has dedicated time for reviewing the license renewal. The discussion comprised the current version of the proposed UFTR technical specifications and the draft request for additional information in order to complete the review for the UFTR relicensing.

A new set of RAI is expected from the NRC.

i) b. LAR for the digital protection system

We are following the following licensing approach for which we have submitted a modified Final Safety Analysis Report (FSAR) based on NUREG 1537 “Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors,” and referenced various documents related to licensing of a digital protection system. Figure 1 below depicts this process:



**Fig. 1:** New licensing process for the UFTR Digital Control upgrade

Up to now, we have prepared the modified FSAR and completed 20 documents from which 17 documents have been submitted to the NRC (Table I).

**Table I - List of Documents for the UFTR LAR on Digital Upgrade**

#	Document ID	Document Title	Status/Due Date
1	UFTR-QAP	UFTR QA Program	Done
2	UFTR-QAP-01-P	Conduct of Quality Assurance	Done
3	UFTR-QA1-QAPP	Quality Assurance Project Plan (QAPP)	Done
4	UFTR-QA1-01	Software Quality Assurance Plan (SQAP)	Submitted
5	UFTR-QA1-02	Software Configuration Management Plan (SCMP)	Submitted
6	UFTR-QA1-03	Software Verification and Validation Plan (SVVP)	Submitted
7	UFTR-QA1-05	Software Safety Plan (SSP)	Submitted
8	UFTR-QA1-06.1	Software Test Plan – SIVAT Plant	Submitted
9	UFTR-QA1-06.2	Factory Acceptance Test (FAT) Plan	Submitted
10	UFTR-QA1-07	Software Installation Plan	Work in progress
11	UFTR-QA1-08	Software Integration Plan	*
12	UFTR-QA1-09	Software Operations and Maintenance Plan	Submitted
13	UFTR-QA1-10	Software Training Plan	Submitted
14	UFTR-QA1-11	Software Reviews and Audit	Submitted
15	UFTR-QA1-12	System Description	Submitted
16	UFTR-QA1-14	Safety System Design Basis	Submitted
17	UFTR-QA1-100	Functional Requirements Specification (FRS)	Submitted
18	UFTR-QA1-101.1	List of I/O (with the FRS)	Submitted
19	UFTR-QA1-102.1	Software Requirements Specifications (SRS)	AREVA review
20	UFTR-QA1-102.3	ID Coding	Submitted
21	UFTR-QA1-103	Diversity and Defense-in-Depth (D3) Analysis	Submitted
22	UFTR-QA1-105	Teleperm XS Cyber Security	Submitted
23	UFTR-QA1-109	Software Library and Control	Submitted
24	UFTR-QA1-110	Software Generation and Download	Work in progress
25	UFTR-QA1-111	Interface Specification	Work in progress
26	UFTR-QA1-112	HW Requirement Spec (HRS)**	**
27	UFTR-QA1-113	System Architecture.	AREVA review
28	UFTR-QA1-114	QDS Software Requirement Specification (QDS SRS)	Work in progress
29	UFTR-QA1-115	HW Design Solution (HDS)	Work in progress
30	UFTR-QA1-116	Component Arrangement Specification	Work in progress
31	UFTR-QA1-117	Hardware Parameters Listing	Work in progress
32	UFTR-QA1-118	Periodic Test Concept and Operation and Maintenance	Work in progress

\*Postponed to the later phase

\*\* Not needed

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An Audit Summary is expected from NRC with recommendation of the approach for completion of the LAR Application.

A paper entitled “Implementation of Digital Upgrades to the UFTR Protection and Control Systems” was submitted and accepted for presentation at the ANS Meeting in Washington DC, November 2011.

In November 2010 also, a paper was presented to the ANS Winter Meeting and Nuclear Technology Expo, in Las Vegas, NV: “Digital Upgrade of the UFTR Protection and Control Systems.”

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