

Tour of Entergy's Nuclear Power Plant in River Bend



Owner:	Entergy Gulf States Inc.
Reactor Type:	Boiling Water Reactor
Reactor Manufacturer:	General Electric
Turbine Generator Manufacturer:	General Electric
Architect/Engineer:	Stone and Webster
Commercial Operation Date:	June 1986
License Expiration Date:	8/29/25

Student Trip Reports

(edited only for grammar or technical accuracy)

E. K. Ervin

After weeks of planning and class work, we finally got to embark on a mind-blowing field trip to see a nuclear power plant. Plant was Entergy, a Boiling Water Reactor (BWR) type. Built in the 80's, it has continued to provide about 10% of Louisiana State's electricity needs. Ensnared around the Mississippi River Bend down South, the plant boasts of a huge layout and very secure premises. On arrival, we were met by one of the plant's numerous veteran engineers. It's worth pointing out most of the staff of the plant averaged some 50yrs. So refreshing it was when we were introduced to a much younger group of nuclear engineers who were in training to take up the gauntlet after the veterans would have retired. Security clearance to gain access into the plant itself was so tedious that it almost put off all initial enthusiasm. But it was well worth it as the procedures were for both the security and safety of workers and visitors alike.

The actual plant inspection was preceded by a lively power point presentation by one of the veteran plant workers. The presentation gave the nuclear plant engineering basics and built on the foundation already laid in class. We got to see the layout of the plant as well as the basics which were just a mere reinforcement of what we had learned in class (yes we had learned that much!). The plant generates some 1000Mw, enough to cater for about 10% of Louisiana's electricity demands. A particular applied engineering feat is in the design of the Uranium pellets before they are loaded up in the fuel rods. They are shaped in little cylindrical forms with a plate indent on either ends. This design caters for hourglass distortion of the pellets experienced due with the high temperatures associated with the fuels. Spent fuel from the reactor is stored under water. An alternative storage is the dry cask storage which is essentially reinforced concrete containment casks. It was noted no nuke plant is designed to hold its wastes forever. This further enforced what we had learned in class about the Yucca Mountain being considered as a site for permanent deposition of waste nuke material. Reasons to go nuclear in power generation include its zero emissions with no carbon output as nuclear power plants account for 73% of emission free electricity. It is safe and secure and also fuel supply is guaranteed and adequate. The Entergy plant was built over a span of some 13 years (1972-85) in what should have been a maximum of 6 years at a total cost of 14-15 billion US dollars.

We took a lunch break after which the actual plant inspection began armed with the knowledge from the PowerPoint presentation. Prior to this, we were issued and fitted with what is known as a dosimeter, a device designed to monitor dosage of radiation picked up at any point in time. This dosimeter was set to zero to be rechecked after the plant inspection. Our first port of call was the containment building. Access doors are pressurized giving the airlift feel. It was actually awesome being in so close proximity with a real life nuclear reactor. Yet a quick glance to my dosimeter indicated zero radiation picked! Here (containment building) we saw the suppression pool underneath the nuclear reactor was doing its thing. A very cool aspect is the fact that the 90ft

suppression pool water is as old as the plant itself and yet it is as pure as water can get!

Next we went through a maze of connecting flight of stairs with lots of pipes winding round which I found, on further inquiry, to be some sort of cooling systems. The pipes were all held rigidly in place by fasteners and clamps. This I learned was to prevent and protect them from movements in the event of any earth disturbance. Next we were taken to the refueling canal. Here loaded uranium fuel rods are lowered into the reactor. This requires a lot of expertise and is a very delicate operation. We also dropped by the location of the spent fuel (waste) deeply tucked away underneath water after many years of operation. All in all, the entire inspection took about two hours and ended with the inspection and decommissioning of the dosimeters which indicated I picked up zero radiation!

Last point of call was the control room. Here we were treated to a simulation of a plant malfunction and how the plant indeed fortifies itself with no human interference. The control room is filled with lots of monitors and knobs most of which are now fully automated as compared to when the plant was initially built.

Conclusion

Retiring back to our place of abode, my mind was filled with the wonders of nuclear engineering. I could not but marvel about the cleanliness and safety of Nuclear power plants and the obvious enthusiasm the nuke workers bubbled with. This got me thinking where most of the media had their 'negative' nuke stories from. The engineers were so upbeat about the safety and cleanliness of the plant and power produced and this I got to see and appreciate firsthand. Finally, I will like to commend the efforts of Dr. Ervin in enhancing a thorough understanding of nuclear engineering for students. The trip was indeed an eye opener, much educative and very informative.

Thank you.

2

Our class was given the opportunity to tour River Bend Nuclear Plant in St. Francisville, LA. Upon arrival we were given a brief introduction the workings of the plant and its power production. River Bend is a boiling water nuclear reactor and began operation in June of 1986. It produces approximately 1000 MW of power per hour and supplies about ten percent of Louisiana's electricity.

After, our presentation concluded we began the long security process necessary to enter the nuclear plant. First, we were briefed about dosimeters and how we were going be monitored for radiation while on our tour of the plant in the main administration building. Before receiving the dosimeters we passed through an initial scanned to determine a zero base line for measuring the radiation we received while on the tour.

Next, we were escorted from the main administration building to the actual

plant. Then, we went through another check in process at the plant entrance. We presented our Ids, and had to pass through an explosive detector, followed by a metal detector. This process took around two hours to complete. After clearing the security we were given red visitor badges, although we were let into the plant as temporary “rad” workers because they do not allow actual visitors into the plant. Once we passed security, we were given a hard hat, safety goggles, and ear plugs as a safety precaution while we were on the tour.

To begin the tour we had to activate our dosimeters using computers and scanners. Then, we went into an air tight containment room which caused our ears to pop. The majority of the plant was hallways full of interconnecting pipes. The pipes inside the plant were very hot, which unfortunately a couple of students found out by touching before seeing the caution sign five feet from where they were standing. We got to see the spent fuel pool and it was an amazing shade of blue. The pool almost appeared to be sparkling. After seeing the pool we went up one level and were standing on a metal grate that you could look down and see the pool beneath our feet. We were told to be certain not to drop anything on the grate because if it fell through there would be extensive paperwork involved in retrieving it from the pool.

While in the plant there are many regulations that must be adhered to or else reports are filed and the individual in violation must provide their defense to their superior. One regulation that frequently came up on our tour was using the hand rails, and there were even signs indicating the mandatory use of hand rails. Another regulation was that in order to pass through many of the doors within the plant only three visitors at time could swipe their visitor passes and then one escort must swipe theirs in order to open the doors. These regulations are in place in order to keep the plant workers safe while going about the daily work.

Exiting the plant did not take quite as long as entering the plant. We had to empty our pockets, so the contents could be scanned for radiation in a machine. Then we each had to step into a radiation scanner. We each stepped into the machine facing inward first and facing outward second. Once, the scans were completed our dosimeters were updated and the tour concluded.

3

River Bend nuclear power plant was interesting yet different place to visit. The plant was built in the early 1980s. The facilities are highly secured near the actual radioactive parts. The plant seems as if no one works there only because everyone works in a large office building. The outside is fenced in and guarded with guard towers. The guards had the right to shoot if you got in between fences. The funny thing about when you get to the check-in, you are considered a temporary worker. So by that being said, you get treated like a worker but you do not get the pay. The security at the airport doesn't hold a candle to the security at a nuclear power plant. Before leaving to go to the power plant, you have a background check. Once you get there, you go through another few hours of security clearing. By the time you get finished getting cleared, you have to get

the necessary badges to get around the plant, after walking through metal detectors and bomb sniffing machine. Then you get the hardware to get around, which was a hard hat, ear plugs, a dosimeter, safety glasses, and an electronic dosimeter. All of that is easy to say, but it took a total of 2 hours. Then the people there went back over the rules and regulation of safety for the plant. After all that the tour starts.

First thing that was seen was the reactor head and the pool of water above it. It was hard to hear in there because you have to wear the ear plugs due to the loud noise from the turbine. We did not get to see the turbine, but we heard it. Then the piping in which the cooling water goes through was seen as we walked through to see the refueling pool where the fuel is kept. Upon exiting you could see the cooling towers. The cooling towers were five short towers collectively to make one tower. There were 4 cluster towers. Once those things were seen that was the tour of the reactor facility. At the end we saw the simulator room. That was the place where they train the people who work in the real control room.

The best thing was the lunch and the info session at the beginning. The info session help clear up some stuff about the class. It also had shown us that they use a lot of acronyms. The slide show was helpful and funny with a lot of the same slides from class. It also gave a realistic look at how the economic of nuclear energy will save on the watt per hour cost.

4

I really enjoyed the presentation that was given following our luncheon. I asked multiple questions during the presentation in order to broaden my knowledge about the River Bend Facility. I also wanted to gain insight about the Entergy Corporation since I have worked for Southern Company throughout the years in order to develop a comparison of the companies and what their futures hold. One of my first questions I asked was, "What type reactor would you use in new plant design today, an ESBWR or an AP1000 passively safe type reactor?" I quickly found out they are determined to use the General Electric designed ESBWR reactor over the Westinghouse Electric Company's AP1000 pressurized water reactor (PWR). The boiling water reactor at River Bend is a generation VI reactor designed by General Electric and became commissioned in 1986 to produce commercial electricity. The River Bend Facility generates about 971 MW of power on any given day. The plant only has to refuel about every 18 months. Refueling of the reactors takes about 3 months to due in order to make necessary that are also needed that couldn't have been down unless the plant was in shut down mode. Shut down time at the plant is considered to be the most dangerous and busiest time while at the plant. Safety is always the number one priority. One job, one task at a time safely is what should be the main focus of each and every employee.

The River Bend Facility doesn't have the traditionally large cooling towers that can be seen from miles and miles away as most nuclear plants. In order for Entergy to be granted a site permit and for the residents of the area to support it was for them not to be able to see the towers from all over their city as an eye sore. Entergy took this in to consideration and decided it would be best to design the plant with five smaller groups of cooling towers instead of have a couple of traditional large ones. I think this definitely increased the cost of the plant considerably but you need public support in order to for something of this magnitude to be a success. I still think it is irrelevant because the steam can be seen from miles away just as it can from any plant of this magnitude.

The River Bend Facility uses both dry cast storage and spent fuel pools to store their used nuclear spent fuel. A few of the students saw the large dry cast storage containers while driving around the plant. Unlike most dry cast containers, the ones Entergy uses are made off only thick precast concrete. Most dry cast storage containers today contain a wall of concrete and also a layer of lead to ensure the levels of radiation dissipation is kept at a minimum. Our group was able to tour the inside of the plant where the spent fuel pool was located. The pool was not as large as one would probably imagine. However, we were able to see the spent fuel as it was going thru its cooling process at the pool. We were able to see the hydrogen bubbles being released during the cooling process. This is a great experience for our students to see how relatively safe the facility was and how close we were able to come in contact with the spent fuel and no radiation was detected upon checkout. Nuclear can be used as a peaceful and safe way to produce electricity without all of the carbon emissions that come from other types of plants.

I really enjoyed the trip and I think all the students did learn and develop a sense of curiosity about the nuclear industry. I thank you again for taking the time to gain our class access to tour the facility at River Bend and for also trying to help us find a place of employment upon our graduation.

5

On November 16, 2009, our engineering class was able to visit the River Bend Nuclear Generating Station, in St. Francisville, Louisiana. This is a boiling water reactor that is owned by Entergy and began operation in June 16, 1986. It was surprising to learn that this plant generated ten percent of the electricity for Louisiana. This is an outstanding statistic, considering that only 9 more of these could be built in Louisiana and they would be completely non-reliant on any other energy sources. While visiting the plant it was obvious that the entire trip was about the THREE S's: Safety, Security, and Some Radiation. These three things were the core principles that we encountered through our tour of the plant.

To begin the tour of the plant we began with a presentation behind the basics of a nuclear power plant. Fortunately, many of the areas covered in the presentation were already covered by Dr. Ervin. Due to this, it made learning about the plant, and applying what we had learned, a more beneficial process.

As soon as the presentation was complete we were sent to receive our dosimeter. Security is one of the biggest departments on the nuclear reactor site. Initially, after we went through the first barricade, we had to go and get the dosimeter to monitor the amount of radiation we received for the day. After receiving this and a brief we were off to go through the second barricade and see the nuclear reactor. Although we learned previously about the reactor I never realized how much of a big deal it would be if some terrorist got a hold of the nuclear reactor. The security consisted of barricades at the beginning entrance of the plant and also right in front of the plant. Also, there were elevated stands that housed security guards with M-16's.

Once at the nuclear reactor, it was surprising to see just how relatively small the reactor building was. In this small concrete building generated almost 1000 megawatts. The next thing to notice were the cooling towers for the plant. Usually, there is one large cooling tower coming out of the plant. Due to the people of St. Francisville not wanting to see the tower, they built 5 mini towers throughout the outskirts of the plant. Once inside the plant we had to go through security again. Being that I was one of the first four through, we were able to see the actual control room of the reactor. Although you would think it would be a stressful environment sitting on that much power, the room seemed non-stressful. Also, to enter the room it was noted that there was a watertight door, yet no water could reach that high. In case of any attack, such as a terrorist, they could never get inside of the control room to take control of it.

After the control room, we received our safety gear and toured the rest of the plant. One of the first stops was the top of the reactor building. Although we couldn't see the reactor directly, it was amazing to see the water and the top vessel. From there we also saw the used fuel storage. This to me was the most amazing part of the trip; this is because looking down 30 feet into the water, nuclear fission is happening right in front of our eyes. Along the trip we had to go into many pressurized rooms when traversing across the reactor. Also, we had to swipe our card when changing rooms, so security monitored our progress at all times. Along some parts of the reactor that would have yellow and magenta rope for high radiation zones. It seemed surprising that just a few feet of difference in these plants was the matter of high or low radiation. When the tour of the plant was done, I was scanned for radiation and found to be non-radioactive.

For the culmination of our trip, we were able to see the training control room for the plant. One should feel safe knowing the amount of training these men and women go through on a regular basis to keep these reactors running. For every 5 to 6 weeks of operation, an operator goes through 1 week of training. All the workers agreed that this is a clean energy source that needs to be developed around the nation. Altogether I would conclude the trip was a success. We were able to put together what we learned in the classroom and see it in real life. All of the members of the tour guide were extremely helpful and I would recommend future CE 497 classes taking this great trip.

This past weekend we, the people, took an exciting field trip to the River Bend Nuclear power facility in St. Francisville, Louisiana. It was filled with amazing surprises and excessive danger while simultaneously stimulating our minds and probably our bodies with various types of radiation, but I will recount the trip in stunning detail in the following paragraphs.

We were greeted quite warmly with an excellent meal which I promptly spilled on my pants. To add insult to my already bruised ego, I had to wipe it up with LSU napkins. After lunch we were treated to a brief lecture that was very similar to ones we've had in the past in the class I am now writing for. The lecture material included a bit of information about the output of the plant, which we were told was 1,000 mega watts, as well as some basic statistics which we heard before in class.

When the lecture was over, we loaded up into some vans and got to the real meat and potatoes of our tour. The journey through security wasn't a smooth one. For starters, my Bolivian brother seemed to forget his passport. This delay was a definite indication of what was to come. Once through the initial checkpoint, we entered the plant grounds. There we were given a lecture by a grumpy woman (who hated clicking pens) on the strict rules of no wandering off on the carefully guided tour. After the lecture we were given our dosimeter to make sure we maintained a level of wayward neutrons that would not cause us to explode. We then loaded back into the van for the second leg of security.

Along the way we were shown the cooling towers, which looked like giant space shuttle engines, and our driver also drove us by dry storage before we headed deeper into the plant. Another round of security followed which included us going through an x-ray machine and a metal detector. Finally, after being equipped with the necessary safety equipment, we were assigned a Geiger counter of some sort which allowed us to keep track of the radiation dose we were receiving at any given time.

Then our tour began. We were taken into the plant itself, which apparently is kept at a high temperature to make everyone uncomfortable. The best part of the tour, and about the only part that wasn't swiping a card and getting into an air lock, was the spent fuel chamber. It was a dimly lit room filled with water that apparently hadn't been changed in the 20 year existence of the plant which is impressive considering how clean the water looked. Other than that we essentially saw hallways and airlocks and not a soul working.

In conclusion the security at these nuclear facilities appears to be top notch; however, it is clear that they do not deal with tours very often.

The tour of the River Bend nuclear power plant was very interesting. It started out at 5:45 in the morning in front of Vaught Hemmingway stadium. If we were to do this again, I would say that we should leave the day before and stay in the town the night before. This would also facilitate us getting to the plant earlier in the day, so we would have more time to tour the plant. We started the tour on the outskirts of the plant in a conference room with too much eye-burning purple and gold and way too many LSwho napkins. After explaining to them that we were going to win on Saturday and asking why Baton Rouge smelt like corndogs, we finally set off in the company vans to tour the plant.

We got to the guard gate and gave our ids to the guard gate. This part took a solid 30 minutes before we were able to get past these guards with our new shiny id cards. At this point we lost the other van and went the wrong way. When the workers finally found where the other group was, we headed to dosimetry. Here we were sniffed by the radiation machine, issued DLRs, and briefed on what to do while we were in the plant. Once this was finished we went back to the entrance of the plant. We again gave our ids to a person brandishing a handgun through a large plate of glass. An hour later we were given permission to go through the bomb sniffer machine and a metal detector. Once we all passed through this we were issued the ids that we need to swipe at each of the card readers in the plant. Finally when we thought we were going to get in, we were ushered into a room with hardhats, safety glasses and ear plugs. Now it had to be the time to go into the reactor... or so we thought. The final stop before we got in was to get another radiation reader and sync it to DLR. We entered the reactor at the lower part of the building. We had to swipe our cards at every door on our way in and through the reactor. At first, the only noticeable things that we saw were a bunch of pipes and a bunch of doors. After going through a pressure vessel and taking an elevator all the way to top we were able to see the top to the reactor vessel in a pool. We were told it was around 70 feet deep and easily 100 feet across. The thousands of gallons of water in the pool was the same water as that started in the plant 24 years ago. After wandering around multiple corridors, we stopped in the spent fuel pool room. This by far was the most interesting room in the building. It was extremely warm from the amount of spent fuel, and it was even so hot that the water was splitting the oxygen and hydrogen atoms. As we left, we had to again swipe our cards on every door back out.

We finally left the reactor after being scanned again for radiation. We got to the area where we were issued the id cards and they were returned to the lady behind the glass. We piled back into the vans to go back to our original starting point. When we passed the guard gate, instead of returning the temporary ids to the guards we forgot and had to turn around to bring them back. All in all this was a very interesting trip, and I wish we could have spent more time there to see the actual control room instead of the simulator.

The trip to River Bend Station was impressive, enjoyable and comfortable. The tour was very educational, and the Entergy employees were exceptionally welcoming and resourceful. Besides the tedious extreme security measures that Entergy proudly requires, I felt I wanted to stay longer in the containment building. The drive was also enjoyable since I could rest and study; the hotel was pretty nice, and the dinner was pretty good. It was a great learning experience that gave more vividness to my interest in nuclear energy.

I was so exhausted when we started the trip - after forgetting some documents - that I took a well-deserved 5-hour nap. When I woke up, we were already in 1,712-habitant Saint Francisville, LA. An Entergy employee and Ole Miss Alumni warmly greeted us and invited us to have lunch in the training building. An Entergy engineer also gave us a brief introduction of River Bend Station. We had a splashy décor waiting for us in the room where we would have lunch. It turned out that our hosts were LSU fans, and they made sure to show us how proud they were of their song, colors and university. After a healthy lunch of fried chicken and other Cajun fried sides, the plant manager came and talked to us briefly about nuclear energy's history and some challenges like waste storage. His lecture was very familiar since we already knew some facts; however, it was very interesting to understand why Entergy was splitting up in two different companies. Also, I learned that the nuclear industry is different from any other one because the cooperation between the different companies is very important to work more effectively and avoid incidents like the Three Mile Island one. After this, an engineer gave us a brief explanation of nuclear energy. We already knew what he was talking about, and he couldn't answer how many houses there were in the mysterious BWR diagram. However, during the tour, he was exceptionally helpful in guiding, explaining and showing us everything in the plant.

We left the training building and were guided to the actual nuclear plant. The security was impressive starting from the entrance, the paperwork, the check in, to all the security measures in the reactor building. This tedious security process was too long, and I didn't like the lady in the reactor building who took around 20 minutes to check me in. While we were waiting, I got the chance to talk to a civil engineer who had been working for Entergy for 15 months. She explained to me the limited work for that discipline in a nuclear plant. Only 5 engineers, among more than 100, are civil and their work consisted mainly in analyzing the structural members of the different components of the plant any time they change them or fix them. There was also a very nice electrical engineer who was working with Entergy for 10 months and was very enthusiastic to explain what a work day was like in the plant.

After we were given a device that measures the exposure to radiation, we started the real tour into the reactor. We were divided in groups of 4 to fit, along with the guides, into the small compartments inside the reactor building. The building was breathtaking because it had countless pipes, wires, beams, columns, connections, signs, and pumps. It was very interesting to feel the

pressure difference in our ears when we were in the pressure control compartment. After this, we went to the top to the reactor and saw the containment structure. The image is still very clear in my mind, and the water 70 feet above the actual reactor vessel was very thrilling because of the power that it contained. I was fascinated and didn't want to leave after the Entergy engineer gave us a brief explanation of the pool and the equipment that is used when they shut down the plant. River Bend has been working around 3 months after the last shut down, and everything seemed to be in order and they were generating around 1100 MW. After this we went to see another pool yet as impressive as the one before. I was very thrilled when I saw the half-million-each rods that were arranged just like in the many pictures we saw below the water. It was kind of scary because there were some bubbles in the pool. On the way back, I noticed some lead wraps around some pipes that contained some radioactivity.

I felt very safe during the tour and I wish it was longer. I learned a lot and I saw in real life many things that we learned in class. I was very happy and thrilled by all the power that I subjectively felt.

9

This field trip was a very enjoyable experience for me. Over the semester I have learned about the different components of a nuclear power plant, and it was interesting to see some of these components in operation. The nuclear power plant we visited was the River Bend nuclear power plant located in St. Francisville, Louisiana. The plant features a Boiling Water Reactor made by General Electric and generates approximately 978 MW of power. In comparison, 1 MW will power about 500 residential homes. It is owned and operated by Entergy Gulf States inc. and sits on 3300 acres. The river bend power plant started construction in March of 1977 and began operation on June 16, 1986. Currently there is also a proposal for a new more economical 1550 MW reactor in the future.

The majority of the visit to the plant was spent getting through security and getting prepared to go inside. On the way out, we had to go through security also and get scanned for radiation. This required getting two cards and a radiation monitor that monitored the radiation that you were exposed to and the rate of radiation exposure. We also had to wear hard hats, earplugs, and safety glasses. One of the cards had to be used very frequently to get in and out of each location of the plant.

The most interesting thing that I saw at the plant was the storage of the spent nuclear fuel inside the plant. This is known as wet storage. It looked like sticks of dynamite bundled together submerged about ten feet under water, with bubbles coming up every now and then. When I was in this location, the radiation monitor showed that I was receiving 1 mrem/hr. The water in the various pools that were in the plant has never been changed since the plant started operation; it has only been purified over and over again. We also got to

see the dry storage of the spent fuel. These were big concrete cylinders that were welded shut. The fuel is moved to here after it leaves the wet storage facility. One of the most disappointing things about the plant to me was that there was no tall parabolic cooling towers like you see on most nuclear plants. The cooling towers at this plant were shorter and there were around sixteen of them. One thing that I noticed during the tour was a MOV, which is a motor operated valve. This allows a valve to be controlled by a motor rather than manually. I also learned that there are many acronyms in nuclear power. We missed out on going into the actual control room but got to go into the control room simulator. It was composed of mostly digital meters and buttons. I learned that the using the control systems, the plant could maintain itself for about fifteen minutes in the event of an emergency even if there was no one around to operate it.

10

Besides the fact that St Francisville, Louisiana, is located in the middle of nowhere with roughly 300 people and a prison, the actual nuclear plant was really exciting. The staff provided lunch with cold chicken and bread that probably traveled a great distance because this type of high quality food did not exist in this little town. About 30 minutes from LSU, diehard fans played the Tiger theme song as food was prepared, and the tablecloth, napkins, and flatware was purple and gold. For dessert, a LSU cookie was provided. Yum, tiger bait!

A preliminary lecture was given, providing basic information of the River Bend plant which was slightly funny because one of the slides on the presentation was the exact side Dr. Ervin uses in her notes. At this site, Entergy uses a boiling water power plant that produces 1,000 MW of electricity an hour and refuels every 18 months. The rods are arranged in 11x11 arrays. During shut down, it costs about \$35000/hour. Also, instead of one cooling tower, there were four shorter ones on site.

After lunch and the presentation, we loaded two vans and a truck and drove to security. At security, we handed the guard our driver license and he checked them and gave them back along with a green id about ten minutes after we fist handed them to him. Next, we drove to an office building where we stayed for about 30 minutes reading and listening to the rules of the plant, signing things, and writing our social security number. The old lady in charge, first, had a horrible outfit and was very rude. She snatched pens away from anyone clicking the pens and tried to make jokes, but she would be the only one laughing. She said words like "debriefing" and "dosimetry" and used lots of acronyms that made little sense to me. After our lecture we went and stood inside what looked like a metal detector for five seconds and received some type of dosimeter that will track our radiation exposure. We jumped back into the vans and drove to another building, the main building where our tour began. But before it started, we had another two hours of waiting around as one guard checked 15 licenses and once again needed to write our social security numbers. After being cleared by her, we

entered into another metal detector look-a-like, but this time, we stood there with our eyes closed as it puffed air at you and gave cute little speech about nuclear energy. I believe this checked to make sure we were not carrying anything explosive. Then we continued to the actual metal detector and then collected our things that we put through the x-ray machine. We stood on the other side waiting for the same lady that took our licenses to hand them back. She gave them back along with a red badge. The red badge is what sort of gave us clearance to open doors (with the help of our guide). They lead us up some stairs that we HAD to hold onto the rail. The next place gave us a Geiger counter that we had to wear throughout our entire tour. The lady in charge of helping us set it up was very rude, too. She expected me to understand all the acronyms and be able to tell her things that I had no clue. But when she said things like, "They just told you this number," I was able to respond, "Oh, its 1005." But I didn't know 1005 was my RSN number or whatever letters she was asking me. Five hours later after we were cleared by all these places, our 45 minute tour of the plant began. Basically, there were lots of hot pipes, grates, heavy doors that required access cards and lots of blue water.

It was a really cool trip but just took forever to actually see the things we seen in our textbook.

11

On November 16, 2009, I went to tour the nuclear power plant in St. Francisville, Louisiana. The plant that I toured was named River Bend. The plant was the second to last nuclear power plant to open. The nuclear power plant consists of one active boiling water reactor. This one reactor puts out 978 MW (mega watts) of power. The reactor manufacturer is General Electric. The plant also has five water cooling towers.

The security at the plant is very tight. It ended up taking us 2 hours to get through security. We only had 4 hours to get to tour the plant. They took us through steps and rules that we had to follow to be able to the tour the plant. The rules portion of the tour took 45 minutes. So after going through security and rules, we only had a little over an hour to tour the plant.

We were giving our own visitor passes so we could have access to all portions of the plant. Our tour guides, some who really did not want to be there, could only take 3 or 4 visitors with them through doors. It was one of the rules that we had to follow. They also gave us a radiation reader that we keep on our bodies at all times. We had to keep an eye on them during the tour to see if we got radiation. We had to alert the tour guides if we got radiation.

On the tour, we ended up going to the very top of the reactor. The water the surrounded the water would be the cleanest water you could drink if it was drinkable. The water gets filtered out regularly. The water has been in there ever since the plant first opened in 1986. The water has been in circulation for over 23 years, and it was the clearest water I have ever laid my eyes on.

We ended up traveling down the elevator to the spent fuel rod pool. That

was actually the coolest part of the tour. The water was clear all over the plant. We were able to get close to the pool, but we could not get real close because of the radiation coming from the pool. The spent rods were still hot, and you could see bubbles coming from the rods. Couple of people's radiation readers went from 0 to 1. It was no big deal because it was reading in mREMS and not in REMS.

The group I was in was supposed to go see the dry cast storage places and the main control room, but we was not able to get there because our guide wasn't really excited about the tour. I was actually looking forward to seeing the main control room. I figured that would be a part of the tour that I would have really enjoyed. I am a little upset that I wasn't able to see the real control room. They invited us into a test control room where we got to see them solve a problem that could happen in real life. Basically, all the guy did was press a button that made the horn turn off. The goal of the test was to show us that the plant can make itself stable out on in its own.

The plant did not have many workers that worked in the plant. I guess that was because they don't want their workers to expose themselves to the radiation a bunch. At the end of the day, I learned a lot on the tour because of the electrical engineer that walked with us keep showing me stuff. He was the only tour guide that went that acted like he wanted to be there. I enjoyed him pointing stuff out to me and letting me know what he does at the plant. I am thankful for the trip, so I can understand more about the stuff that we were learning about in class. The guides were surprised about how much we knew about nuclear and nuclear power. I enjoyed the trip all in all.