

US EPA ARCHIVE DOCUMENT

**Georgia-Pacific Corporation
Big Island, Virginia
Project XL
Amendment to Final Project Agreement**

INTRODUCTION

On May 8, 2000, the U.S. Environmental Protection Agency (EPA) published in the *Federal Register*, a notice of availability (66 *FR* 16400) of a Project XL Final Project Agreement (FPA) between EPA, Georgia-Pacific Corp. (G-P), U.S. Department of Agriculture Forest Service, the Virginia Department of Environmental Quality (VA DEQ) and other stakeholders. No adverse comments on the proposed FPA were received and the agreement was signed on May 31, 2000. On March 26, 2001, EPA published in the *Federal Register* a project XL Site Specific rule that provided the flexibility Georgia-Pacific needed under the federal regulations in order to implement the project according to the terms defined in the FPA.

This FPA allowed Georgia-Pacific to replace two semi-chemical black liquor smelters with a PulseEnhancedTM, steam reforming black liquor gasification system, developed by Stone Chem, Inc. that will become the first commercial application of this innovative technology at a pulp and paper facility in the U.S. G-P utilized the XL process to accomplish this installation for the following reasons:

1. To be able to operate the existing smelters past the otherwise applicable date for compliance with a federal Clean Air Act regulation based on Maximum Achievable Control Technology (MACT) standards for pulp and paper mill combustions sources, commonly called MACT II, if necessary and during Kraft liquor trials.
2. To assure that if the gasification system fails, G-P would be allowed to operate its existing smelters, as necessary, past the MACT II compliance date, while it constructs a conventional recovery furnace.
3. To allow steam generated by the new process to be used in other parts of the mill.

NEED FOR A PROJECT AMENDMENT

The schedule in the original FPA for the Black Liquor Gasification Project was based upon the Stone Chem process design. As a result of this being the first commercial installation of this technology, during the detail design phase of the project, the project team identified a number of major process changes that were necessary to make this process viable. These issues have all been resolved and the project is moving forward, but there has been a significant impact of additional time required on the schedule. The following is a summary of some of the major process design issues that have been addressed.

1. Sulfur Emissions: Control of sulfur emissions was originally based on scrubbing hydrogen sulfide (H₂S) from the product gas using green liquor. After determining that this was not feasible, several alternative H₂S removal processes were evaluated (e.g., LoCAT elemental sulfur removal, scrubbing with sodium hydroxide, etc). It was subsequently determined that there were no economically viable H₂S removal processes and the decision was made to remove the sulfur with a sulfur dioxide (SO₂) scrubber following combustion of the product gas. This change had a major impact on process design and equipment layout.
2. Nitrogen Dioxide (NO_x) Emissions: While test firing natural gas in the clean-coal pulse heater demonstration unit, Stone Chem determined that NO_x emissions could be controlled with the addition of a flue gas recirculation system and a similar system was designed for the Big Island project. During subsequent design reviews, it was determined that steam injection would be a more reliable means of controlling NO_x emissions and the design was changed.
3. Green Liquor Filtering: The system originally proposed for filtering the green liquor from the reformer would not meet the necessary quality standards required for the mill. Alternative filtering processes had to be identified and trial runs at the Mill were necessary to verify that the quality standards could be met. Once alternatives were proven viable, competitive bids were obtained, a supplier was selected and the system was re-engineered.
4. Reformer Vessel Design: The design and operating characteristics of the reformer vessel are unique and a substantial amount of time was required to complete design reviews for materials of construction, mechanical design, fabrication procedures, refractory lining system, etc. The recent issues with the black liquor gasifier vessel at the New Bern facility emphasized the importance of performing an extensive design review of this vessel. The vessel at New Bern failed as the result of stress assisted corrosion cracking of the stainless steel shell caused in part by the refractory design.
5. Pulse Heater Design: Long-term reliability of the pulse heaters is essential for the successful operation of the steam reformer process. Design of the heater assemblies is complex and several major design issues were identified during the initial design reviews. Design of the heaters was further complicated when Stone Chem added the requirement to water cool the pulse heater combustion chamber tube sheets. This required integration of the heaters into the water circuitry for the heat recovery steam generators and made the heater assemblies subject to ASME pressure vessel codes. The high heat fluxes in the heaters also raised the limits on feedwater quality and resulted in the addition of a separate feedwater treatment facility rather than using water from the Mill's existing feedwater system. Pressure limitations on the pulse heaters required addition of a second steam system operating at a lower pressure.

In all, the project team identified over 20 major changes to the process and equipment that had to be addressed in the design phase to assure that the project will ultimately

succeed. The effect of these changes was frequently compounded by the impact they had on the balance of system.

As described in the Quarterly Technical Progress Report posted on the internet at www.gp.com/containerboard/mills/big, the G-P project team has successfully resolved all of these issues and is proceeding with equipment procurement and construction. Process engineering activities are now completed, procurement of the major equipment is complete and construction of the gasification system is almost complete. Because the issues have been successfully resolved, a third party review conducted at the request of the Department of Energy concluded there is a very low likelihood that any additional significant changes will be required to implement the process technology and therefore the expected mechanical completion date of August 2003 should be met.

However, as a result of the above mentioned process design changes and our better understanding of the construction and commissioning phases, Georgia-Pacific is convinced that a longer commissioning period than originally expected will be required, in addition to the time added to the construction schedule.

To reflect the modified project scope and schedule, the FPA has been amended. The amendment procedures set forth in Section VIII of the original FPA were followed: (1) The parties to the agreement – G-P, EPA, the Forest Service and VA DEQ – worked together to develop an amendment that meets Project XL acceptance criteria. (2) The proposed amendment was discussed with the other regulatory agencies and stakeholders. (3) The general public received notice of the amendment and be given an opportunity to comment, as appropriate. Following is the proposed amendment, as discussed by the parties to the agreement on April 3, 2003.

AMENDED SECTIONS

The following sections of the original FPA are being amended. The language of the original FPA being modified is designated in ~~strikethrough~~ mode and the amended language is shown in ***bold Italics***.

I. Introduction to the Agreement

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II. Detailed Description of the Project

C. Specific Project Elements

5. Project Element 5: Start-up

a. Gasification System

For this innovative XL project, *and to reflect the one year extension of the project schedule*, start-up of the gasification system will occur at the end of the commissioning phase and in any event no later than ~~three~~ **four** years following the execution of the Department of Energy Cooperative Funding Agreement for this project. For the purposes of this FPA, the term “start-up” refers to the gasification system unless otherwise noted. This start-up date will trigger the 180-day period for performance testing as may be required by the site-specific MACT II.

6. Project Element 6: Kraft Liquor Trials

As a condition of receiving DOE funding, there also will be a trial on Kraft black liquor. This trial will be detailed at a later date; however, it is anticipated that the trial will take place after start-up of the gasification system and not last more than three weeks (500 operating hours). Georgia-Pacific anticipates some gasification system downtime during the Kraft liquor trial, such as to make adjustments to optimize gasification operations. As a result, the total time period encompassing the 500-hour Kraft trial could be as much as 1500 hours. During the trial, the Mill will process the Kraft liquor through one of the gasification vessels, while the other vessel remains out of service. ~~The Kraft liquor feed to the gasification system will be limited to allow the gas clean-up equipment to maintain adequate performance.~~

During the project design and Project XL process, the importance of demonstrating the technology on Kraft liquors was identified. A Kraft liquor trial was designed and incorporated into the project. Due to the nature of this steam reforming process, as the sulfur content of the liquor increases a corresponding increase in H₂S content of the Product Gas will occur. The original intent of the trial was to operate at the maximum capability of the system within the parameters allowed by the environmental regulations. During the Kraft trials, the liquor processing in the steam reformers would be limited based on the sulfur scrubbing capability of the system.

It was G-P's intent to scrub the H₂S from the Product Gas prior to combustion in the Reformer Boiler or Pulse Heaters. Due to technology limitations, scrubbing the Product Gas prior to combustion is not feasible. As a result, the process has been modified to burn the Product Gas then scrub the resulting SO₂ in a conventional scrubber. The Kraft trial will still proceed as planned and result in sulfur emissions within the environmental regulations. It is still G-P's intent to limit the Kraft liquor processing rate to that which can be scrubbed by the equipment installed. Georgia-Pacific will maintain the emissions from the stack at or below the total levels stated in the construction permit for the gasification system. This will be accomplished by a combination of limiting the amount of Kraft liquor processed as well as temporary modifications to the equipment or process. During the trial phase, it will be necessary to maintain separation of the process chemicals of the trial liquor and the Mill liquor. To do that, the smelters will need to be operated during this time period to process the Mill's black liquor. Therefore, the Mill will be processing more liquor during this time period than is normal and the emissions will increase as well. The excess green liquor produced, as well as any sulfur containing green liquor from the H₂S Absorber, will be returned to the facility that supplies the Kraft liquor. *As explained above, the H₂S Absorber has been replaced by a conventional SO₂ Scrubber.* Flexibility required for this project element is described in Section IV.A. Georgia-Pacific will work with the Forest Service to determine the time that will have the least impact on the Class I Wilderness area and will attempt to hold the trials at that time.

Project Element 8: Time Flexibility

~~Should the commissioning phase (Project Element 4) extend past the as otherwise applicable MACT II compliance date, the Mill will require regulatory flexibility in order to continue to operate the smelters, whose operation is necessary to keep the Mill running.~~

The G-P project team has developed a revised project schedule shown in Appendix 1 of the FPA Amendment. In this revised schedule, the commissioning phase may extend until 3/1/05, which is beyond the applicable MACT II compliance date of March 13, 2004. The VA DEQ has extended the compliance date for the Big Island facility to 3/1/05 as provided in the General Provisions to the Federal MACT standards (40 CFR 63.6(i)(4)).

Project Element 9: Failure Contingency

Should the gasification technology fail, Georgia-Pacific expects to install alternate technology (Conventional Recovery Boiler) in its place. The smelters will need to be operated during the recovery boiler construction period to maintain Mill operation.

Assuming MACT II has been made final, the smelters will be operating after the as otherwise applicable MACT II compliance deadline.

To reflect the change in schedule and to be consistent with Project Element 8 above, Georgia-Pacific's deadline to install a conventional recovery furnace in the event of gasification technology failure must be extended beyond the March 1, 2007 date in EPA's existing site specific amendment to the MACT II rule. The March 1, 2007 date was based on the previous Georgia-Pacific success/failure decision date of March 1, 2004 plus three years to install a conventional recovery furnace that can meet the MACT II standard. EPA is in the process of amending the original site-specific MACT II amendment to allow Georgia-Pacific's Big Island facility until March 1, 2008 to meet the MACT II standard in the event the gasification system is deemed to have failed.

Georgia-Pacific anticipates that it will take three years from the date it determines that the gasification system has failed to construct the recovery boiler and make it operational.

The stakeholders recognize that Georgia-Pacific intends to make a significant commitment of time and resources to the implementation of the project. The stakeholders also recognize that ultimately Georgia-Pacific alone will define and decide the success or failure of the gasification project, including how much Georgia-Pacific effort, manpower and assorted resources it should continue to invest in the project if Georgia-Pacific experiences difficulties in its construction or operation. Georgia-Pacific recognizes that in the event it determines that construction of the gasification system will be delayed, or that a conventional recovery boiler system must be installed, the stakeholders should receive a full explanation of the basis for Georgia-Pacific's decision.

In assessing the success/failure of the project Georgia-Pacific will consider the project's ability:

- (1) to achieve and maintain continuous compliance with environmental requirements,
- (2) to operate in a fashion that does not present unreasonable risks to human life, health, or property,
- (3) to support the Mill's requirements for the recovery of process chemicals, and
- (4) to operate economically, considering relative energy, operating and maintenance costs.

~~No later than 6 months after Start up, Georgia-Pacific will determine whether the project is successful or must be replaced with alternative technology.~~ *As the project now stands, the end of commissioning and Georgia-Pacific's determination as to whether the gasification system is successful will occur no later than March 1, 2005.* Once this determination has been made Georgia-Pacific will send written notification to all of the stakeholders. ~~If the project is deemed a failure, a three-year period to install this technology will be started at this time.~~ *If the project is deemed to be a failure, Georgia-Pacific's Big Island facility will need three years beyond the decision date, or as late as March 1, 2008, to install conventional recovery technology.*

III. How the Project Will Meet the XL Acceptance Criteria

A. Superior Environmental Performance

To reflect updated calculations for emissions from the gasification project and the Big Island mill, updated Tables 1,2 and 3 along with a discussion of the changes from the original FPA are included in Appendix 3. The Parties continue to believe that the revised figures show that gasification will further reduce emissions from a conventional recovery furnace and is a more desirable technology for Big Island. (Note: the text accompanying Tables 1, 2 and 3 in the Original FPA is not being replaced, the explanatory notes in Appendix 3 describe only the reasons for the change in numeric values.)

[Last paragraph of Section III.A]

~~Additionally, there is potential environmental benefit in using the residue from the green liquor filtration system as an agricultural soil amendment. Initial analyses indicate a high calcium carbonate content in this residue. Once the system is operational, samples will be collected and analyzed to determine its potential use. This could divert an estimated 20 cubic yards of waste per day from the Georgia Pacific landfill.~~ *During the detailed process engineering phase of the project, the engineers calculated the amount of “dregs” from the green liquor filtration system since the design of this system was changed as explained above. They determined that the amount of dregs was very small, much less than the 20 cubic yards per day estimated in the Original FPA, and it would not be economically viable to handle this stream for reuse as an agricultural soil amendment.*

G. Monitoring, Reporting, Accountability, and Evaluation Methods

[Third Paragraph] The reductions in carbon dioxide anticipated from this project at Big Island will be a result of not burning auxiliary fuel to sustain black liquor combustion and because the project offsets approximately 50,000 lbs per hour of steam currently generated by another natural gas fired boiler. In order to document the future reduction of CO₂ and the increased efficiency of energy conversion, Georgia-Pacific must establish a baseline for current emissions and a reporting mechanism for future emissions. An estimation of the reduced CO₂ emissions from not burning auxiliary fuel will be documented. CO₂ data will be collected during normal operation of the gasification system. This can then be compared to baseline CO₂ data from the smelters. Increases in thermal efficiency can be ascertained by measuring the increase in steam output per unit fuel input in the chemical recovery process.

Georgia-Pacific has updated the energy reduction calculations for the gasification project. The revised calculations confirm that the steam reformer system will offset approximately 489,000,000 cubic feet of natural gas per year, which is equivalent to 50,000 lbs of steam per hour. Further, the project will reduce the mill’s annual

consumption of fuel oil by approximately 6,800 barrels, which is the amount of auxiliary fuel currently required in the smelters. In addition, Georgia-Pacific has calculated a total economic benefit for installing the gasification system as compared with operation of the existing smelters. The components of the benefit are reduced fuel costs, less labor required to operate the gasification system, improved efficiency of chemical recovery and slightly higher maintenance cost of the new system. In total, the annual operating cost of the gasification system is approximately \$2.7 million less than the existing smelter system.

H. Avoidance of Shifting the Risk Burden to Other Areas or Media

[Second Paragraph]

An area of concern is the potential risk of failure of the black liquor gasification system and the subsequent construction of a recovery boiler. During this construction period the smelters would be operated to maintain production at the Mill. This time period could very possibly run past the MACT II compliance date. There then is a risk that total emissions over the project period would exceed emissions if the project were not pursued and conventional technology was put into place by the compliance date. The following relative time line and data table (*an updated relative time line reflecting the schedule extension is presented in Appendix 2*) will help clarify the project schedule and its potential effect on overall project emissions. Table 4 shows emissions in total tons for a set period of time during the project under ~~four~~ *three* different scenarios. *An updated Table 4 and explanation are shown in Appendix 3.*

IV. Description of the Requested Flexibility and Legal Implementing Mechanisms

B. Legal Implementing Mechanisms

[Second Paragraph]: ~~VADEQ intends to incorporate the federal MACT II rule, including the site specific provisions, into the State regulations and thus be granted delegation of this program from the EPA, per the April 20, 1998 delegation agreement. Virginia DEQ has incorporated the federal MACT II rule into its State regulations and has full delegated authority from EPA to administer/enforce the rule. As discussed in II.C Project Element 8 above, VA DEQ has extended the MACT II compliance date for the Big Island facility from 3/15/04 to 3/1/05, which will accommodate the project scope changes and lengthened commissioning time required to implement the gasification project. This compliance date will apply if startup of the gasification system is successful. On March 26, 2001, EPA published in the Federal Register a Project XL site-specific rule that provided the additional flexibility Georgia-Pacific needed to implement the project according to the terms defined in the FPA (i.e., an extension of the MACT II compliance date until 3/1/07 in the event of gasification system failure). EPA is in the process of writing an amendment to the site-specific rule that will provide for a one-year extension to the 3/1/07 compliance date (to 3/1/08), should the gasification system fail and a conventional recovery furnace be built in its place.~~

[Third paragraph]: ~~Additionally, to accommodate the requested flexibilities and implement this XL project, VADEQ intends to propose and issue a permit to construct and operate a new chemical recovery system at Georgia-Pacific's Big Island facility.~~

Finally, VADEQ expects to: (1) modify the steam utilization requirements in the current permit for the mini Mill, and (2) undertake an approval process, separate from the permit for the new chemical recovery system, to allow for the limited duration Kraft liquor trial. ***Additionally, VADEQ has issued a permit to construct and operate the new chemical recovery system and has included a permit condition to allow a limited duration Kraft liquor trial as defined in Section II. C. Project Element 6 in the FPA. Modification of the steam utilization requirements in the current permit for the Mini-Mill at G-P will be considered after start-up of the gasification project.***

[Paragraph 1.b.i] ~~If paragraph a.i above applies, the extended compliance date would be based on a period consistent with the amount of delay experienced in construction of the gasification system, or the time needed to effect modifications to the gasification system that will lead to start up. EPA does not expect to extend the compliance date beyond 03/01/04 (presuming the promulgated MACT II compliance date precedes 03/01/04. If it does not precede 03/31/07, it is believed that flexibility will not be needed).~~ ***If paragraph a.i above applies, the extended compliance date will be March 1, 2005.***

[Paragraph 1.b.ii] ~~If paragraph a.ii above applies, and Georgia Pacific determines that the gasifier project has failed, the rule will provide Georgia Pacific an extension to the MACT II compliance date of three years from the date of its notification of failure to EPA. This will allow Georgia Pacific to operate the existing smelters while a new conventional chemical recovery system is installed. EPA does not expect to extend the compliance date beyond 3/31/07.~~ ***If paragraph a.ii above applies, the extended compliance date will be March 1, 2008.***

V. Discussion of Intentions and Commitments for Implementing the Project

B. EPA's and VADEQ's Intentions and Commitments

1. ~~EPA intends to propose and issue (subject to applicable procedures and review of public comments) site specific regulations within the MACT II rule (40 CFR part 63 subpart MM), to provide a compliance date extension for the Georgia Pacific Big Island pulp and paper Mill for the situations described in Section IV.B of this FPA. Specifically, EPA intends to amend 40 CFR Sections 63.861, 63.863, and 63.867 (as presently proposed) to allow implementation of this gasification system project and to allow for various contingencies surrounding the project's success or failure. Appendix 4 contains a description of anticipated rule making.~~

2. ~~The VADEQ intends to propose and issue (subject to applicable procedures and review of public comments) a construction permit for the gasification system project under 9 VAC 5-80-10 incorporating all relevant applicable requirements for the SIP and a separate permit action to provide for the Kraft Liquor Trials. Furthermore, VADEQ intends to propose and issue (subject to applicable procedures and review of public comments) a change to the construction permit for the Mini Mill under 9 VAC 5-80-10 incorporating all relevant applicable requirements for the SIP.~~

1. On March 26, 2001, EPA promulgated in the Federal Register a site-specific amendment to the MACT II rule (40 CFR part 63 subpart MM), which provided a

compliance date extension for the Georgia-Pacific Big Island facility for the situations described in Section IV.B of this FPA. EPA is in the process of writing an amendment to the site-specific rule that will add an additional year (from 3/1/07 to 3/1/08) to the original compliance date extension, in the event the gasification system fails and conventional recovery system must be built.

2. Additionally, VADEQ has issued a permit to construct and operate the new chemical recovery system and has included a permit condition to allow a limited duration Kraft liquor trial as defined in Section II. C. Project Element 6 in the FPA. Modification of the steam utilization requirements in the current permit for the Mini-Mill at G-P will be considered after start-up of the gasification project.

C. Proposed schedule of Major Events and Milestone Performance Targets

~~See Appendix 2.~~

To reflect the anticipated schedule changes discussed above, a new Schedule and Milestones chart is shown in Appendix 1.

APPENDIX 1
Schedules and Milestones

	<u>ORIGINAL FPA</u>		<u>FPA AMENDMENT</u>	
	<u>Start</u>	<u>Completion</u>	<u>Start</u>	<u>Completion</u>
1. Negotiation of Project XL FPA	02/18/99	05/03/00	02/18/99	05/03/00
2. DOE Solicitation and Contract	01/04/00	06/15/00	01/04/00	02/15/01
3. Project XL FPA signing time frame	05/31/00	07/03/00		05/31/00
4. VADEQ Construction Permit review	01/21/00	06/01/00	01/21/00	08/31/00
5. Project XL Federal Register/ EPA Response to Public Comment	05/08/00	07/30/00		03/26/01
6. Detailed Engineering	05/01/00	12/30/00	05/15/01	04/01/03
7. Procurement of Major Equipment	08/01/00	12/30/00	11/01/01	08/15/02
8. Purchase Remaining Equip. and Mat'l.	08/01/00	02/28/01	11/01/01	01/01/03
9. MACT II Promulgation		12/15/00		01/12/01
10. Project XL Stakeholder Update meeting	02/20/01	02/25/00		08/01/01
11. Select Construction Contractors	03/01/01	02/28/02	07/01/01	10/15/02
12. Construction/ Equipment Installation	09/01/01	08/30/02	09/17/01	08/15/03
13. Project XL Stakeholder Update meeting	02/18/02	02/22/02		02/20/02
14. Commissioning/Modifications/Training	08/01/02	09/01/03	08/15/03	03/01/05
15. DOE Demonstration and Final Report	02/01/03	05/30/05	03/01/05	04/14/07
16. Project XL Stakeholder Update	02/17/03	02/21/03		04/03/03
17. Gasification system Start-up (latest)		09/01/03		03/01/05
18. MACT II Performance Testing	09/01/03	03/01/04	03/01/05	09/01/05
19. Kraft Liquor Trial (~ 500 hours)	09/01/03	05/01/04	10/15/05	05/15/06
20. Project XL Stakeholder Update meeting	02/16/04	02/21/04	03/01/05	09/01/05
21. Final success/failure decision date for the Gasification System*		03/01/04		03/01/05
22. Modify State Const/Operating Air Permit	02/28/04	05/30/05	09/01/05	12/01/06
23. Decommission Existing Smelters*		05/01/04*		09/01/06
24. Final EPA Project XL Stakeholder Update		09/30/04		04/14/07
25. Estimated latest MACT II compliance date		03/01/07		03/01/08

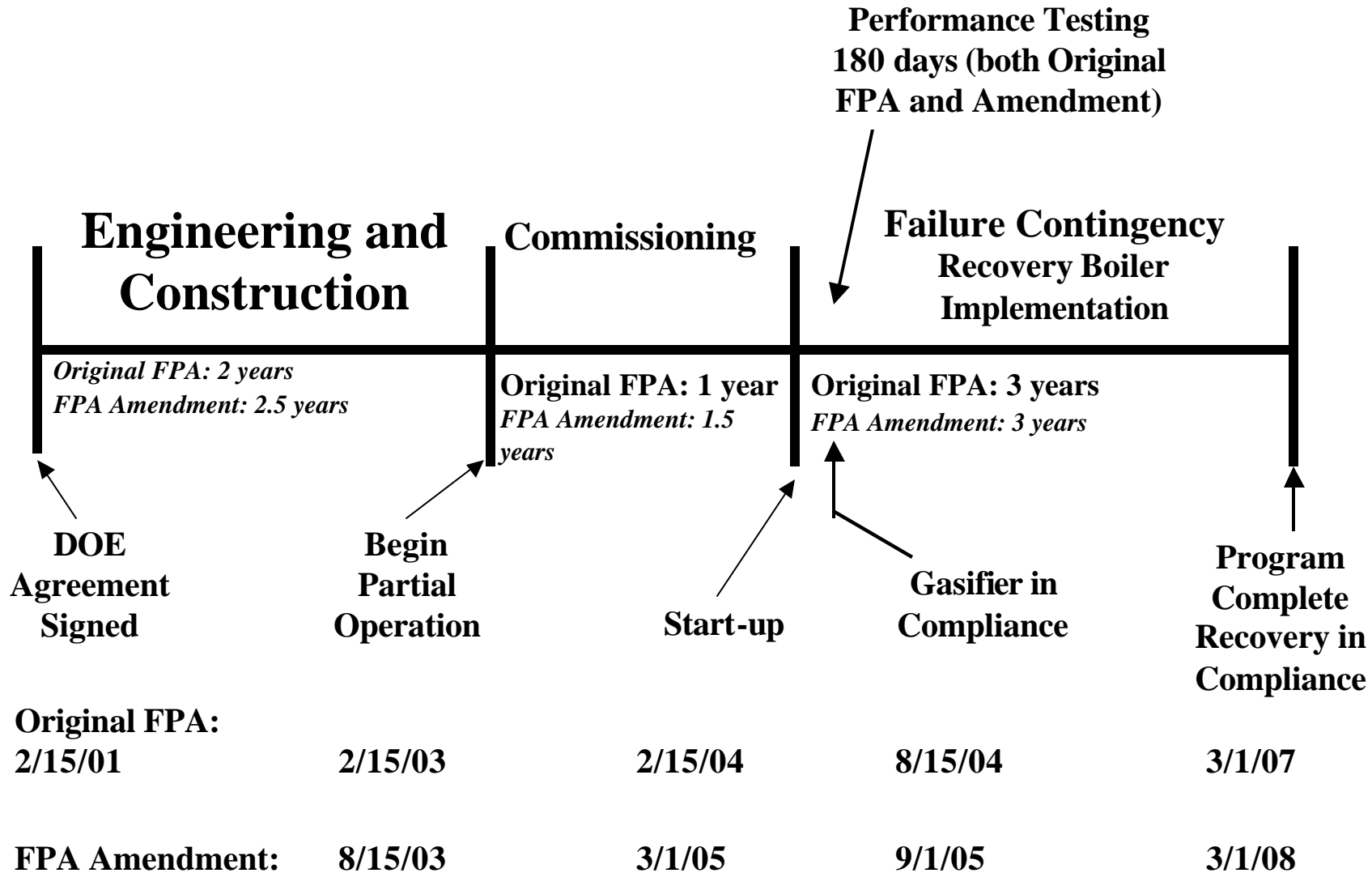
No later than 6 months after **By** Start-up, G-P will determine whether the project is successful or must be replaced with alternative technology. If the project is deemed a failure, a three-year period to install conventional recovery boiler technology will be started at this time, and de-commissioning of the existing smelters will occur not later than ~~03/01/07~~ **03/01/08**.

Description of the Schedule Activities

17. Start-Up: For this innovative XL project, start-up of the gasifier system will occur at the end of the commissioning phase and in any event no later than ~~three~~ *four* years following the execution of the Department of Energy Cooperative Funding Agreement for this project. For the purposes of this FPA, the term “start-up” refers to the gasifier system unless otherwise noted. This start-up date will trigger the 180-day period for performance testing as required by the site-specific MACT II.

APPENDIX 2

Relative Project Timeline



APPENDIX 3

**Table 1
Comparison of Chemical Recovery Units**

Original FPA

FPA Amendment

Pollutant	Smelter	Without Project XL	With Project XL	Smelter	Without Project XL	With Project XL
		Recovery Boiler	Gasification System		Recovery Boiler	Gasification System
		tons/year			lbs/ton BLS	
NOx	168	90.4	19.3	4.9	2.5	0.53
SO ₂	13	10.3	1.1	0.39	0.28	0.03
CO	7,592	146.1	11.7	221	4.0	0.3
CO ₂	103,450	117,800	96,662	3,015	3,227	2,648
VOC	1,646	7.5	0.88	47.9	0.21	0.02
Particulate	440	14.8	1.88	12.8	0.41	0.05

Note: BLS - Black Liquor solids. Table assumes 800 tons per day of semi-chemical virgin pulp production, or 400,000 pounds per day of BLS.

Note: BLS - Black Liquor solids. Table assumes 800 tons per day of semi-chemical virgin pulp production, or 400,000 pounds per day of BLS.

Based on the limited data available from the gasification system pilot trials to date, emissions were estimated and compared to those estimated from a conventional recovery boiler with current Best Available Control Technology (BACT) type controls. A comparison of predicted emissions from the current technology (smelters), black liquor gasification system technology, and a conventional recovery boiler is listed [above]:

The values in Table 1 of the FPA Amendment have been updated to reflect several changes since the Original FPA was published:

- ***Since the Original FPA, more accurate emission factors have been developed for the smelters that are consistent with current EPA guidelines. Therefore, the baseline emission numbers in the Smelter column of Table 1 have reduced slightly to reflect these changes, other than SO₂, which increased slightly.***
- ***As discussed above, there have been several design changes to the gasification system since the Original FPA. Also, more technical information relating to emissions from gasification systems has been developed since the Original FPA was written in 2000.***

Therefore, Georgia-Pacific has updated the estimated emissions from the gasifier as reflected in the “With Project XL Gasification System” column above. These numbers are consistent with information presented to VADEQ.

The Parties continue to believe that the revised figures show that gasification will further reduce emissions from a conventional recovery furnace and is a more desirable technology for Big Island.

APPENDIX 3

**Table 2
Annual Mill Emissions, Tons/Year**

Original FPA				FPA Amendment			
Parameter	Estimated Total Mill	Without Project XL	With Project XL	Parameter	Estimated Total Mill	Without Project XL	With Project XL
		Recovery Boiler	Gasification System			Recovery Boiler	Gasification System
NOx	988	922	849	NOx	974	897	832
SO2	1,324	1,322	1,312	SO2	1,356	1,353	1,350
CO	8,121	1,288	1,148	CO	8,011	770	719
CO2	N/A	N/A	N/A	CO2	N/A	N/A	N/A
VOC	2,149	561	544	VOC	2,119	526	520
Particulate	475	97	84	Particulate	467	55	42

The effect on total Mill emissions is another way of evaluating the benefit of the gasification project. The table [above], (Table 2) reflects how this XL Project will impact the total Mill emissions. The emissions are estimated assuming 800 tons per day production from the pulp Mill and the new steam generated will offset steam from the natural gas boiler. The first column represents what the emissions would be if the Mill continued to use it's existing technology (smelters). The second column shows what the emissions would be without Project XL (Conventional Recovery Boiler) and the third column show emissions with a successful XL Project (Gasification System).

The values in Table 2 of the FPA Amendment have been updated to reflect several changes since the Original FPA was published:

- *As noted above for Table 1, more accurate emission factors have been developed for the smelters that are consistent with current EPA guidelines.*

- *Also, EPA has updated emission factors for the gas and coal/wood boilers used by the mill. Therefore, the total emissions baseline (a combination of the smelters and boilers) in the first column of Table 2 has been changed to reflect these changes. In all cases other than for SO₂, the values have decreased slightly.*
- *Because the baseline emission values have changed, the overall mill emissions in the second column have been recalculated, although the actual projected emissions from a recovery furnace itself has not changed (as shown in Table 1).*
- *As discussed above, the emission estimates for the gasifier have been changed to reflect design changes and better information. The third column has been updated to reflect these changes and the baseline changed as discussed above.*

APPENDIX 3

**Table 3
Steam Generation Scenarios
Tons/Year**

Original FPA				FPA Amendment			
Parameter	Estimated Total Mill	Using Gasification System Steam to replace natural gas steam	Using Gasification System Steam to replace Coal and Refuse Steam	Parameter	Estimated Total Mill	Using Gasification System Steam to replace natural gas steam	Using Gasification System Steam to replace Coal and Refuse Steam
NOx	988	849	729	NOx	974	826	706
SO2	1,324	1,312	1,144	SO2	1,356	1,349	1,181
CO	8,121	1,148	1,121	CO	8,011	703	677
CO2	N/A	N/A	N/A	CO2	N/A	N/A	N/A
VOC	2,149	554	548	VOC	2,119	634	628
Particulate	475	84	83	Particulate	467	42	42

In addressing the ability to use the steam generated by the gasifier anywhere in the Mill, data was generated to compare the effect on emissions depending on which existing boiler's steam is offset with the new steam. The table [above] (Table 3) shows this comparison. The data reflects estimated emissions assuming a pulp Mill production rate of 800 tons per day. The first column shows what the emissions would be if the Mill continued to use its existing technology (smelters). The second column shows the total emissions if steam from the natural gas boiler was replaced by steam from the gasification system. The ability to replace this more costly steam is necessary to make this project economically feasible. The final column shows what the emissions would be if the gasification system steam was used to offset steam from the coal and refuse boilers.

The values in Table 3 of the FPA Amendment have been updated to reflect several changes since the Original FPA was published:

- The estimated total mill emissions in column 1 have been transferred directly from Table 2 above.*
- The emissions from the gasification system when its steam is used to replace steam from the natural gas boiler (second column) and from the coal and refuse boilers (third column) have been changed to reflect the changes discussed for Tables 1 and 2 above.*

Even though the emissions are lower if steam from the gasification system were used to displace coal and refuse boiler steam rather than natural steam, this would result in a potential loss of fuel savings.

APPENDIX 3

Table 4

Comparison of Different Project Scenarios

Original FPA					FPA Amendment			
Potential Total Project Emissions in Tons from 1/1/01 to 3/1/07					Total Project Emissions in Tons from 1/1/01 to 3/1/08			
Parameter	Gasification Project Successful startup 4/04	Gasification fails, Replace with Recovery Boiler, Boiler startup 3/07	No Project XL, Recovery Boiler startup 3/03	No Project XL, Recovery Boiler startup 3/05	Parameter	Gasification Project Successful startup 4/05	Gasification fails, Replace with Recovery Boiler, Boiler startup 3/08	No Project XL, Recovery Boiler startup 3/04
NOx	402	828	759	869	NOx	789	1,206	900
SO2	30	66	71	75	SO2	82	100	89
CO	14,461	34,867	20,389	30,956	CO	32,049	53,506	24,570
CO2	600,812	632,229	685,370	665,004	CO2	735,544	750,013	807,413
VOC	3,127	7,546	4,334	6,659	VOC	6,900	11,607	5,233
Particulate	880	2,023	1,203	1,806	Particulate	1,842	3,091	1,446

Table 4 shows emissions in total tons for a set period of time during the project under ~~four~~ **three** different scenarios. ~~The first column shows the total emissions estimated if the gasification project is successful. The second column shows estimated emissions if the project fails and a recovery boiler is built, during which time the smelters would continue to operate. The third column is an estimate of the emissions if gasification technology is not pursued and the MACT II promulgation date occurs in December 2000. The fourth column of data shows total emissions if Georgia-Pacific does not pursue gasification technology and the smelters continue to operate until replaced by a recovery boiler in 2005.~~ **The emission estimates in Table 4 of the FPA Amendment now cover a period of 8 years compared to the 7 years in the Original FPA reflecting the schedule changes described earlier in this FPA Amendment. The first column, showing the total emissions estimated if the gasification project is successful has been extended one year. The second column, showing estimated emissions if the project fails and a recovery boiler is built, has been extended reflecting the additional one-year during which time the smelters**

would continue to operate. The third and fourth columns of the Original FPA, estimating emissions if Georgia-Pacific had not pursued gasification technology and the smelters continued to operate until replaced by a recovery boiler started up one year prior to and one year after the MACT II implementation date, have been deleted since they are no longer relevant to the project. These two are replaced in the FPA Amendment by the last column of data showing total emissions if the smelters continued to operate until replaced by a recovery boiler in 2004 (the MACT II implementation date).

The Parties continue to agree that the potential benefits in pursuing this project out-weigh the small potential additional pollutant burdens (CO, VOC and particulate matter).