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**Do not include proprietary materials.**

DATE OF MEETING

12/16/2002

The attached document(s), which was/were handed out in this meeting, is/are to be placed in the public domain as soon as possible. The minutes of the meeting will be issued in the near future. Following are administrative details regarding this meeting:

Docket Number(s) Proj 689

Plant/Facility Name \_\_\_\_\_

TAC Number(s) (if available) \_\_\_\_\_

Reference Meeting Notice 12/9/02

Purpose of Meeting  
(copy from meeting notice) Westinghouse will provide an overview of the

construction scheduling techniques that they intend

to use for new reactor construction to NRR management

NAME OF PERSON WHO ISSUED MEETING NOTICE

Joseph Sebrosky

TITLE

Senior Project Manager

OFFICE

NRR

DIVISION

NRLPO

BRANCH

Distribution of this form and attachments:

Docket File/Central File  
PUBLIC

D046

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# CONSTRUCTION SCHEDULING SOFTWARE AND TECHNIQUES



Slide 1



## Westinghouse Presenters

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### ● Presenters

- Ed Cummins
  - Director, AP600 & AP1000 Projects
  - 412-374-6211 - cumminwe@westinghouse.com
- Jim Winters
  - Manager, Passive Plant Projects
  - 412-374-5290 - winterjw@westinghouse.com

### ● Drivers

- Jill Clelland
  - AP1000 Computer Systems
  - 412-374-4142 - clellaja@westinghouse.com
- Jean-Luc Foret
  - EdF Representative for AP1000
  - 412-374-4931 - foretjl@venus.pgh.wec.com



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## Meeting Objectives

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- **Demonstrate:**
  - A technique for visualizing the construction of a nuclear power plant (4D)
  - A technique for more rapid construction of a nuclear power plant (modularization)
- **Answer:**
  - Your questions on the techniques



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## Background

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- **3D plant model is AP1000, based on AP600**
- **Schedule is for AP1000, based on AP600**
- **Demonstration of 4D is live**
- **Development of the 4D technique was supported by EPRI, Intergraph and BNFL**



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## AP1000 Primavera Standard Construction Schedule

- Prepared in Primavera
- Prepared by MK Ferguson, now Washington Group
- Prepared in parallel with AP600 design
- Includes activities from site selection through plant turn over
- Currently on Primavera P3, version 3.1
- One Standard Schedule with custom variants



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## AP1000 Primavera Standard Construction Schedule

- Logic Based
- Durations established by constructors
- 5 10 hour days per week
- Inspections and setup on back shifts
- Modular construction approach
- Nth plant - 5 year overall, 18-36-6
- 5700+ activities
- About "Level 3"



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## AP1000 Primavera Standard Construction Schedule Construction Activities

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- **Smallest time increment = 1 day**
- **Smallest work group = 1 crew**
- **Standard US (Westinghouse) calendar**
- **Real time activities (concrete curing, for example) modified to reflect work calendar**
- **Most activity codes used**
- **Subschedules integrated by logic**



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## AP1000 Primavera Standard Construction Schedule Current Subschedules

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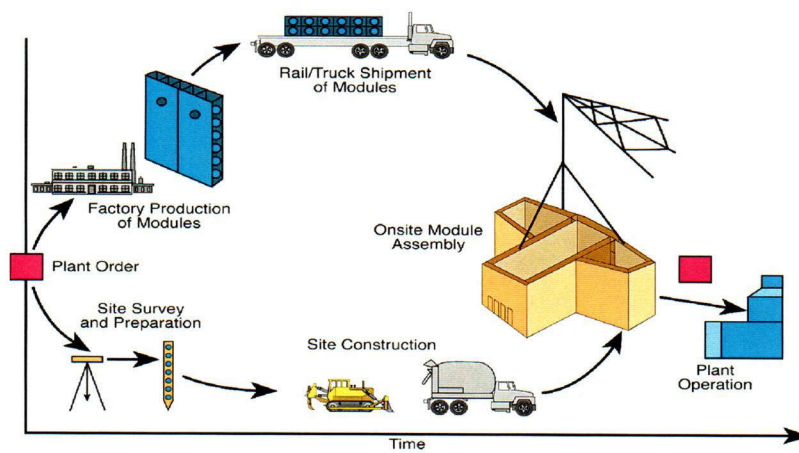
- **Licensing**
- **Procurement**
- **Engineering**
- **Yard and Site Preparation**
- **Nuclear Island - Areas**
- **Nuclear Island - Containment**
- **Nuclear Island - Auxiliary Building**
- **Annex Building**
- **Turbine Building**
- **Diesel Building**
- **Radwaste Building**
- **Test and Startup**



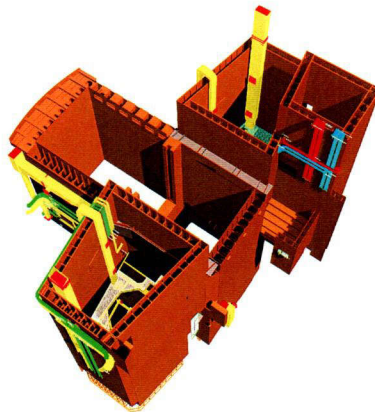
Slide 8



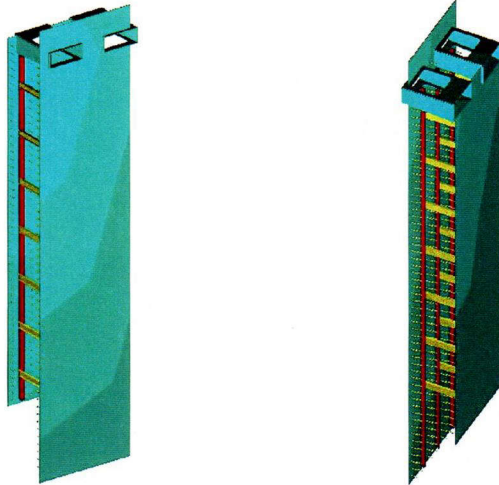
## Modular Construction



## Structural Module Includes Outfitting With Associated Equipment



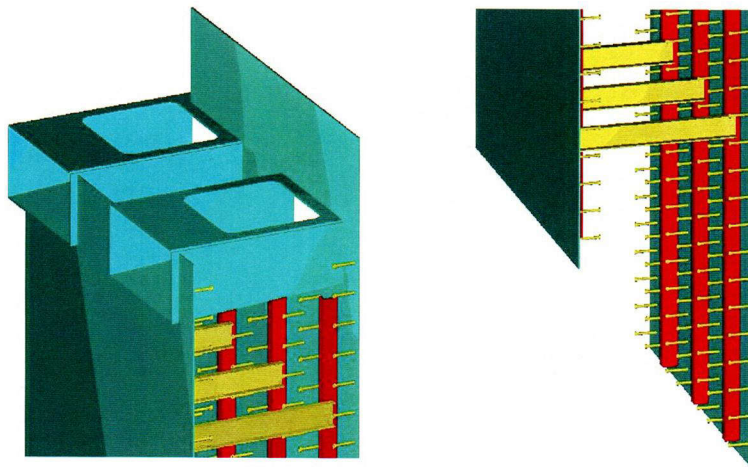
## CA01 Submodule



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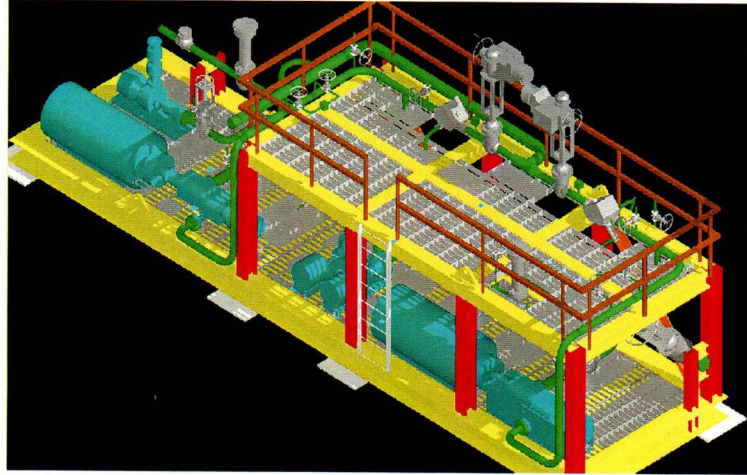
## CA01 Submodule Details



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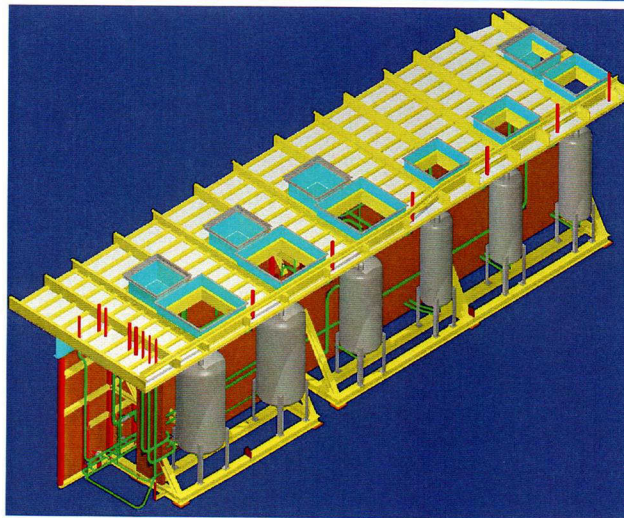
## Startup Feedwater Pump Module



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## Integration Three Waste Modules

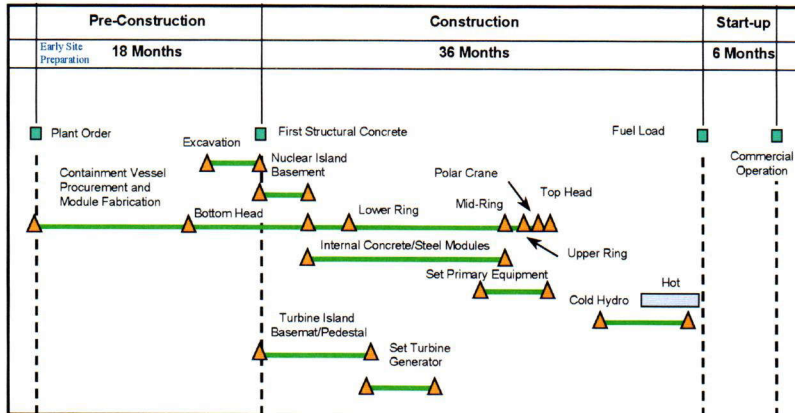


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## 36 Months Construction Schedule



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## AP1000 Plant Design in 3D

- Intergraph PDS
- Intergraph Smart Plant Review
- Entire AP600 in 3D
- AP1000 is the same (almost) as AP1000
- Entire AP1000 is in 3D
- Nuclear island is used for 4D - Critical Path

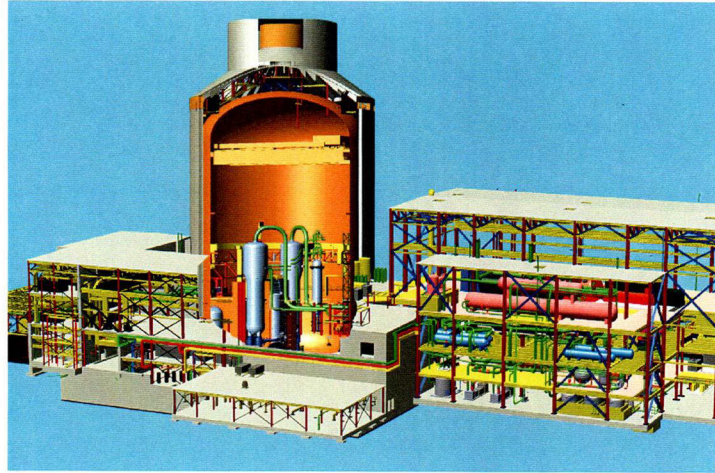


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## AP1000 – 3D Model

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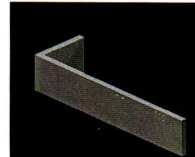
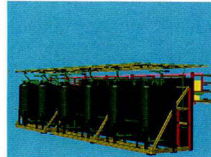
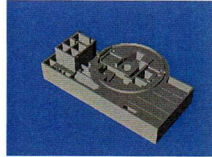
## AP1000 Virtual Construction

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- **Intergraph Smart Plant Review**
- **Schedule Accessory**
- **PDS or MicroStation models are attached to selected activities from the Primavera schedule**

## Schedule & Model Integration

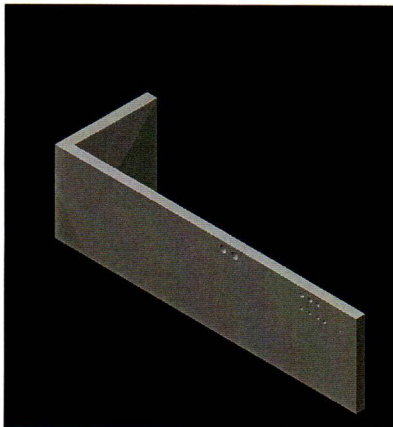
Intergraph Smart Plant Review product  
 Primavera Project Planner  
 Continuing interactions with software vendor  
 PDS model boundaries modified to match schedule activities  
 Link 3D model to schedule activity  
 Activity construction durations maintained  
 Schedule improvements by logic changes only  
 Visualization capability for changing activity sequences



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## Model Linked to Schedule

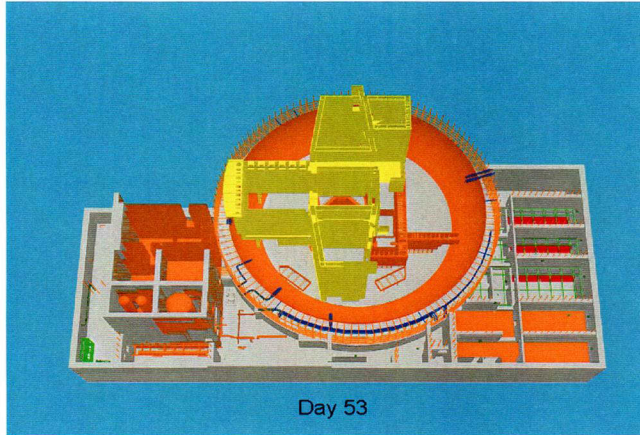


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10000002	INSTALLATION OF THE REACTOR	01/01/00	01/01/00	0		
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10000005	INSTALLATION OF THE REACTOR	01/01/00	01/01/00	0		
10000006	INSTALLATION OF THE REACTOR	01/01/00	01/01/00	0		
10000007	INSTALLATION OF THE REACTOR	01/01/00	01/01/00	0		
10000008	INSTALLATION OF THE REACTOR	01/01/00	01/01/00	0		
10000009	INSTALLATION OF THE REACTOR	01/01/00	01/01/00	0		
10000010	INSTALLATION OF THE REACTOR	01/01/00	01/01/00	0		
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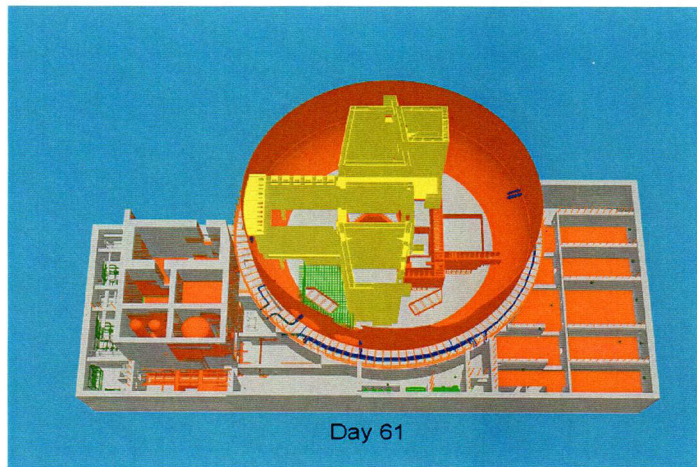




Day 53



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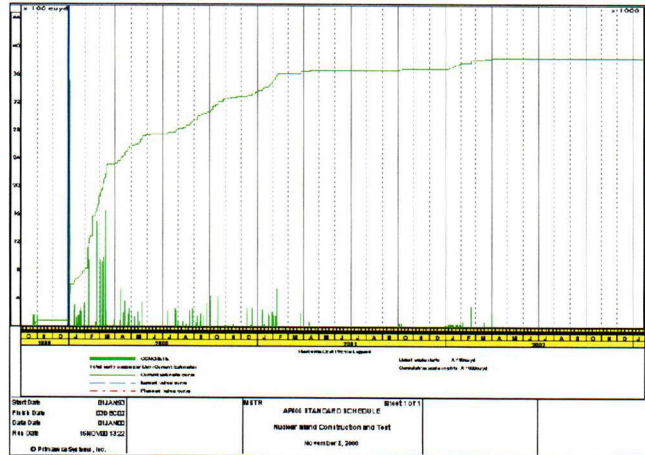
Day 61



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## Nuclear Island Concrete Placement



## Other Benefits for the Designer/Constructor

- **In addition to sequence review we can review:**
  - activity environment
  - lifting and handing constraints
  - crane assignments
  - physical interactions between activities
  - general worker flow

## Regulatory Interface

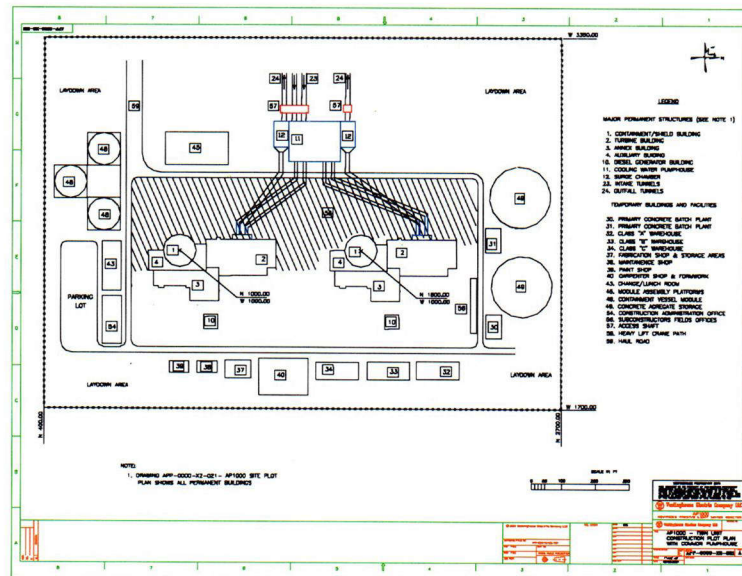
- Modularization changes the interface and schedule of activities between NRC and the applicant/constructor
- 4D changes our perception of the interface
- The new interface must be discussed:
  - provide efficient review
  - protect detailed vendor information
  - enhance common understanding of goals and limits
  - minimize duplication of information and software
- For AP1000 3D model is a design tool — not a design deliverable



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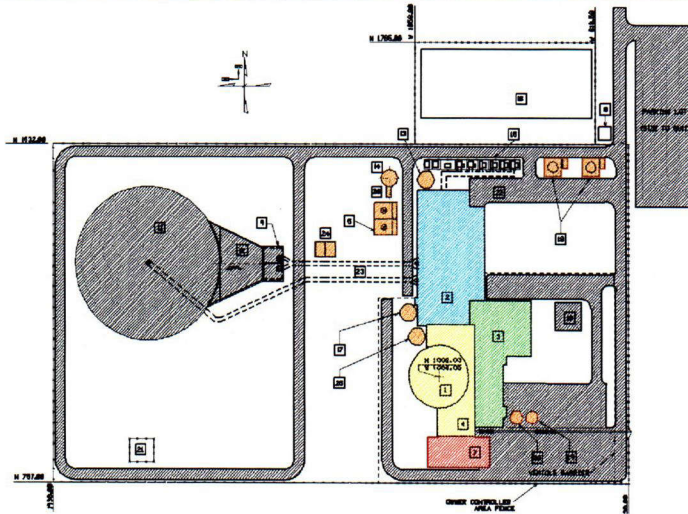
## GENERAL CONSTRUCTION PLAN



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# AP1000 Plot Plan

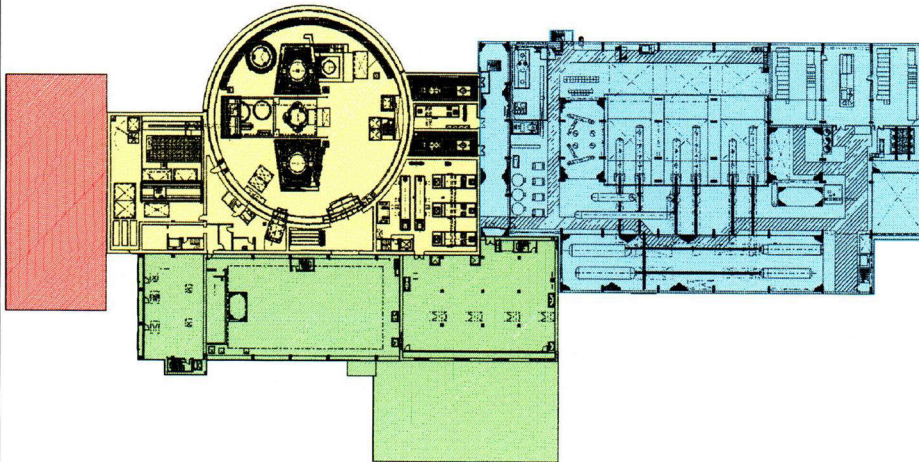


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# AP1000 Plant General Arrangement

Plant Elevation 135'-3"



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