

Simulating the Multiple Impacts of Deferred Maintenance

May 25, 2010

DOE Facility Cost Planning Workshop

San Francisco, California

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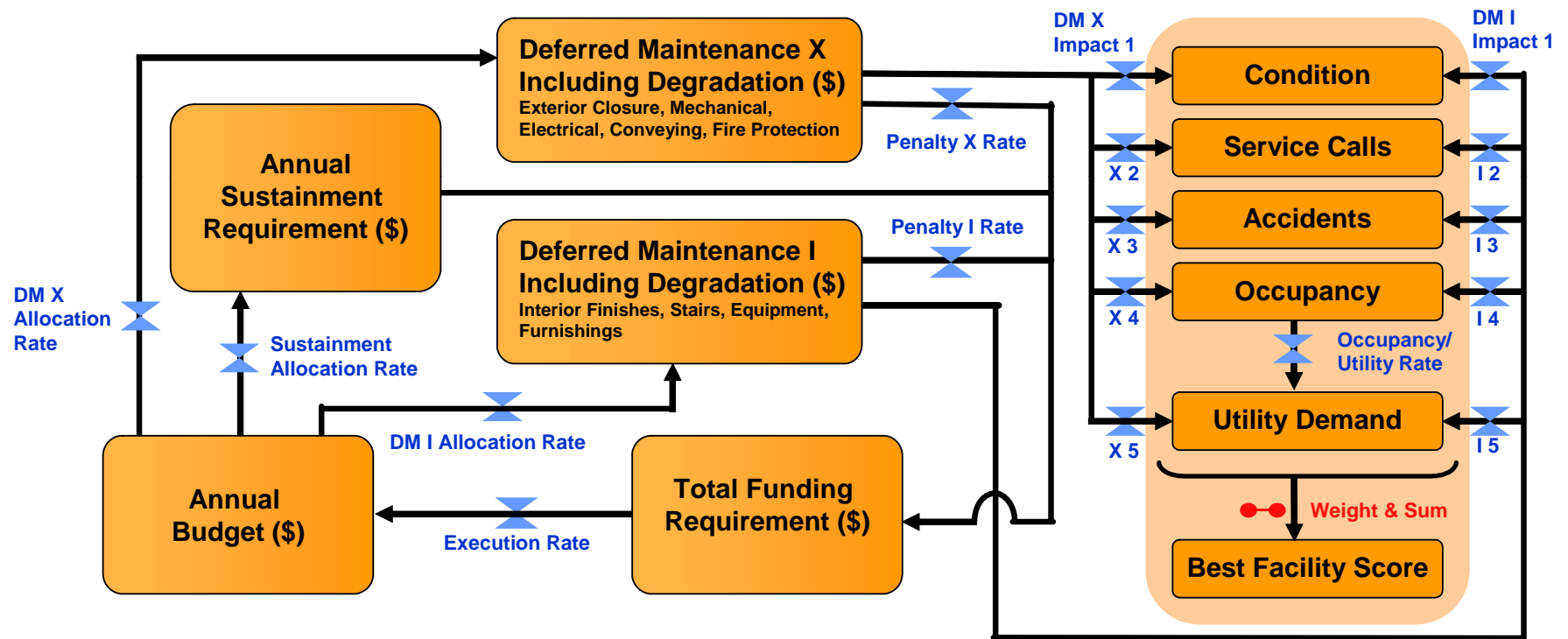
Ohio State

Background

Timeline

- DOE workshop (May 2010): Simulation models and facility budgeting
- PNNL Project: Advisor meeting Denver (Sep 2010)
- Description of M&R simulation model (Feb 2011): final report
- Demonstrate simulation model (May 2011)

M&R Funding and Deferred Maintenance Impact



Previous Modeling Activity

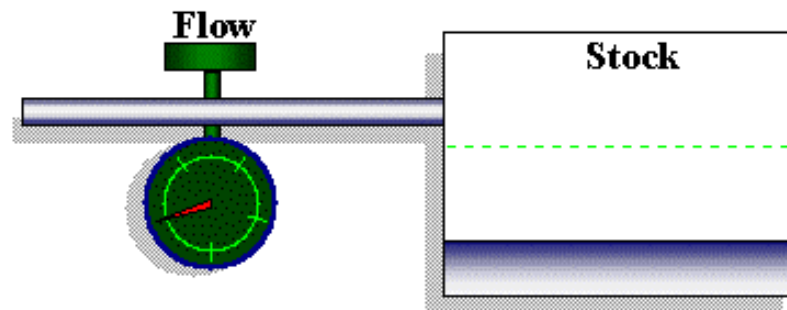
◆ **Rules of Thumb**

◆ **Data Models**

◆ **Exploration: Agent Based Models**

Decision Support

System Dynamics Model



System Dynamics Model

- ◆ Model stocks and flows
- ◆ Develop sub-models to characterize
 - ❖ Rates of flow
 - ❖ Feedback

Slide 6

RH2

Inserts?:

OSU System Dynamics Group Required Reading DoE Intro to System Dynamics (Radzicki and Taylor, 1997;
<http://www.systemdynamics.org/DL-IntroSysDyn/inside.htm>)

Rudy Hightower, 5/22/2011

System Dynamics Model

Recurring Characteristics in Systems

- Problem separated by time and space
 - Current DM decisions constrain future options
- Better to structure to withstand uncertain external shocks than to predict shocks
 - Different decision scenarios
- Disequilibrium and continual change
 - Feedback keeps system out of equilibrium

Slide 7

RH3

Inserts?:

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Rudy Hightower, 5/22/2011

System Dynamics Model

Workshop Feedback

- Validation of the metric concept
- Utility of the simulation
- MARS and PLUTO suitability

System Dynamics Model

Interface:

<http://forio.com/simulate/hightower.23/dm-whitestone-24may11/simulation/>

Management Simulator:

<http://forio.com/simulate/hightower.23/dm-flightsim-24may11/simulation/>

System Dynamics Model

DM MANAGEMENT FLIGHT SIMULATOR v1.0

inflation rate 0.00 4.00 1.00

DM Buydown Graphs Reports

INITIAL CONDITIONS

Start DM Value: 100 (range 0-200)

DM Penalty Rate: 1.01 (range 0.80-2.00)

PRV: 500 (range 400-600)

Sustainment Rate: 0.8 (range 0.6-1.5)

GRAPHS

1: FCI 2: Service Call Score 3: Best Facility Score 4: Min Accept..est Fac Score

Page 1 6:23 PM Mon, May 23, 2011

FCI, Best Facility, and Service Call Score

REPORTS

6:23 PM 5/23/11

Years	Annual Federal Fund
0	100.00
1	100.00
2	100.00
3	100.00
4	100.00
5	100.00
6	100.00
7	100.00
8	100.00
9	100.00
Final	100.00

DECISIONS

OccWgt: 4.0 (range 0.0-4.0)

ESOH Hazard Wgth: 2.0 (range 0.0-4.0)

Serv Call Wgt: 3.0 (range 0.0-4.0)

EnergyEff Wgt: 1.0 (range 0.0-4.0)

ESOH Hazard Exp: 3.0 (range 0.0-5.0)

Service Calls Exp: 1.0 (range 1.0-5.0)

Occupancy Exp: 2.0 (range 1.0-5.0)

EnergyEff Demand Exp: 4.0 (range 0.0-5.0)

Indicator Weighting Adjustments Indicator Weighting Relationships (Exponential)

Contacts

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