Workforce Size, Attributes and Skills

Aldo A. Zagonel and Stephen H. Conrad

Screeners and Skills Modules

TSA Project Meeting

Sandia National Laboratories

July 21-22, 2009

Sandia National Laboratories

Outline: Screeners and Skills Modules

- **A bird's-eye view**
- **Transient dynamics**
  - Workforce
  - Attributes
  - Skills
- **"Equilibrium" run**
- **Scenario runs**
  - Economic downturn reduces air travel (temporarily)
  - Sustained reduction in attrition
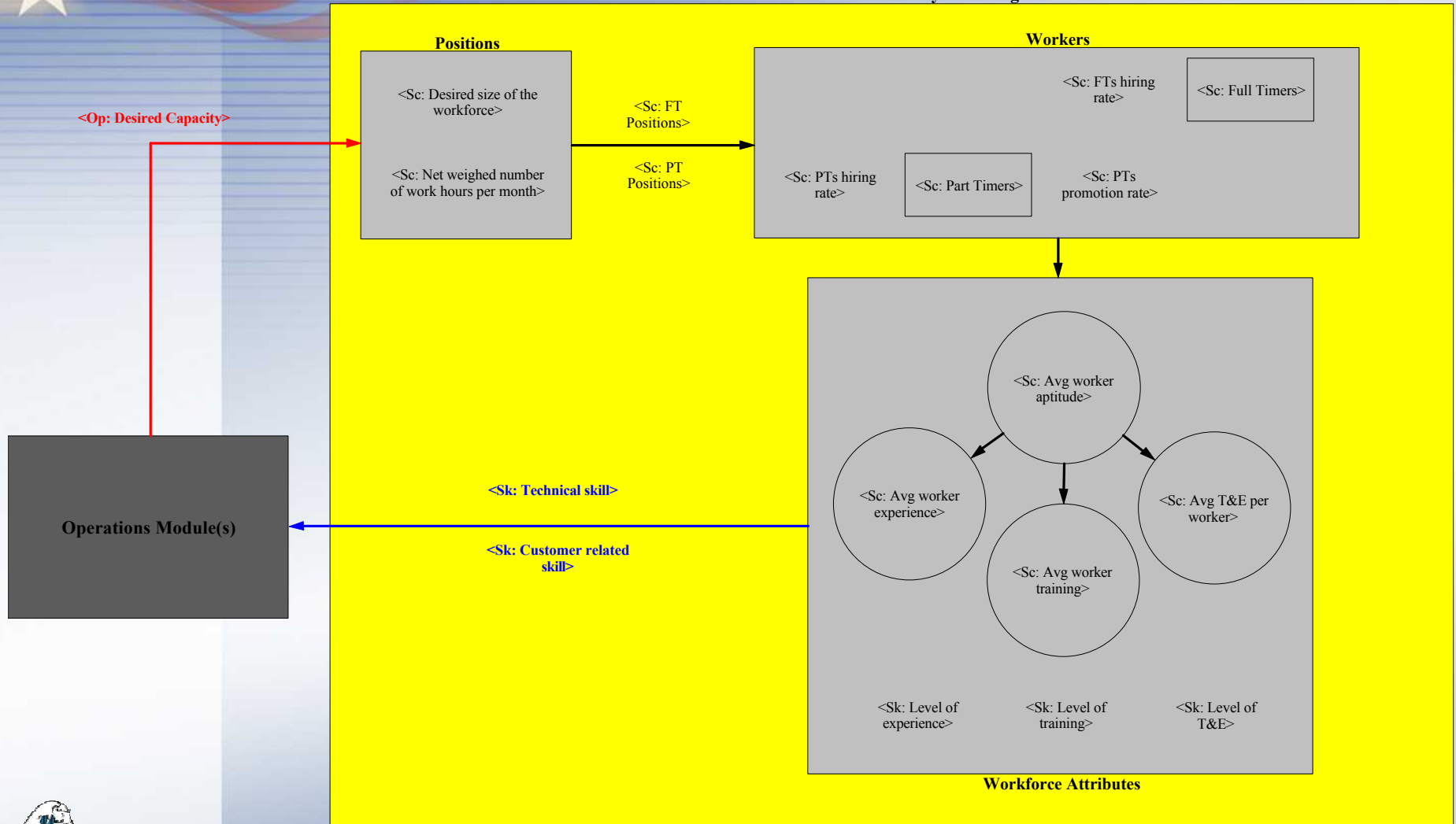- **Policy runs**
  - Full-timer with split shifts

SEA

Sandia National Laboratories

A bird's eye view

- Subsystem diagram
- Model boundary chart

Sandia National Laboratories

Subsystem Diagram
Screeners and Skills Modules

Human Resources Sub-System Diagram

Positions

<Sc: Desired size of the workforce>

<Sc: Net weighed number of work hours per month>

<Op: Desired Capacity>

<Sc: FT Positions>

<Sc: PT Positions>

Workers

<Sc: FTs hiring rate>

<Sc: Full Timers>

<Sc: PTs hiring rate>

<Sc: Part Timers>

<Sc: PTs promotion rate>

<Sc: Avg worker aptitude>

<Sc: Avg worker experience>

<Sc: Avg worker training>

<Sc: Avg T&E per worker>

Operations Module(s)

<Sk: Technical skill>

<Sk: Customer related skill>

<Sk: Level of experience>

<Sk: Level of training>

<Sk: Level of T&E>

Workforce Attributes

SEA

Sandia National Laboratories

Model Boundary Chart
Screeners and Skills Modules

Endogenous	Exogenous	Excluded
• Number of positions • Number of vacancies • Hiring rate • Number of workers • Worker aptitude • Worker experience • Level of training • Level of T&E • Technical skill • Customer-related skill	• Desired capacity • Fraction of part timers • Mandatory training • Annual attrition rate • Promotion rate • Aptitude of new hires • Frequency of testing	• Absenteeism • Fatigue • Efficiency/ productivity • Morale

Blue – Output to other modules

Red – Input from other modules

SEA

Sandia National Laboratories

Transient dynamics

- Workforce
- Attributes
- Skills

Transient Dynamics:
Reference Behavior for Workforce Size (1)

Workforce Size (SAM)

Transient Dynamics:
Reference Behavior for Workforce Size (2)

Workers on Payroll & SAM Headcount

|	
Min	38,557
Max	44,228

Min	45,550
Max	50,000

+15%?

?

?

Number
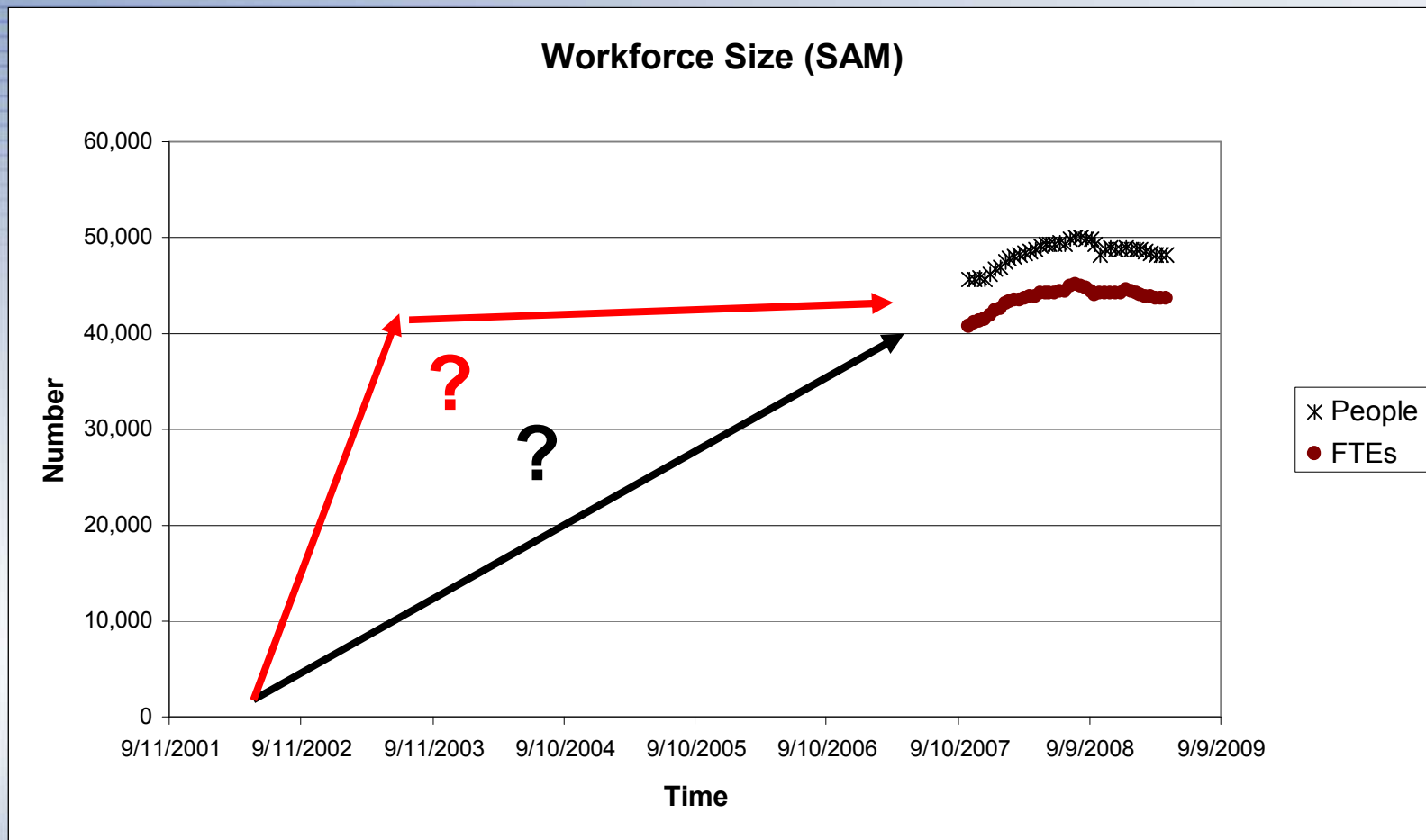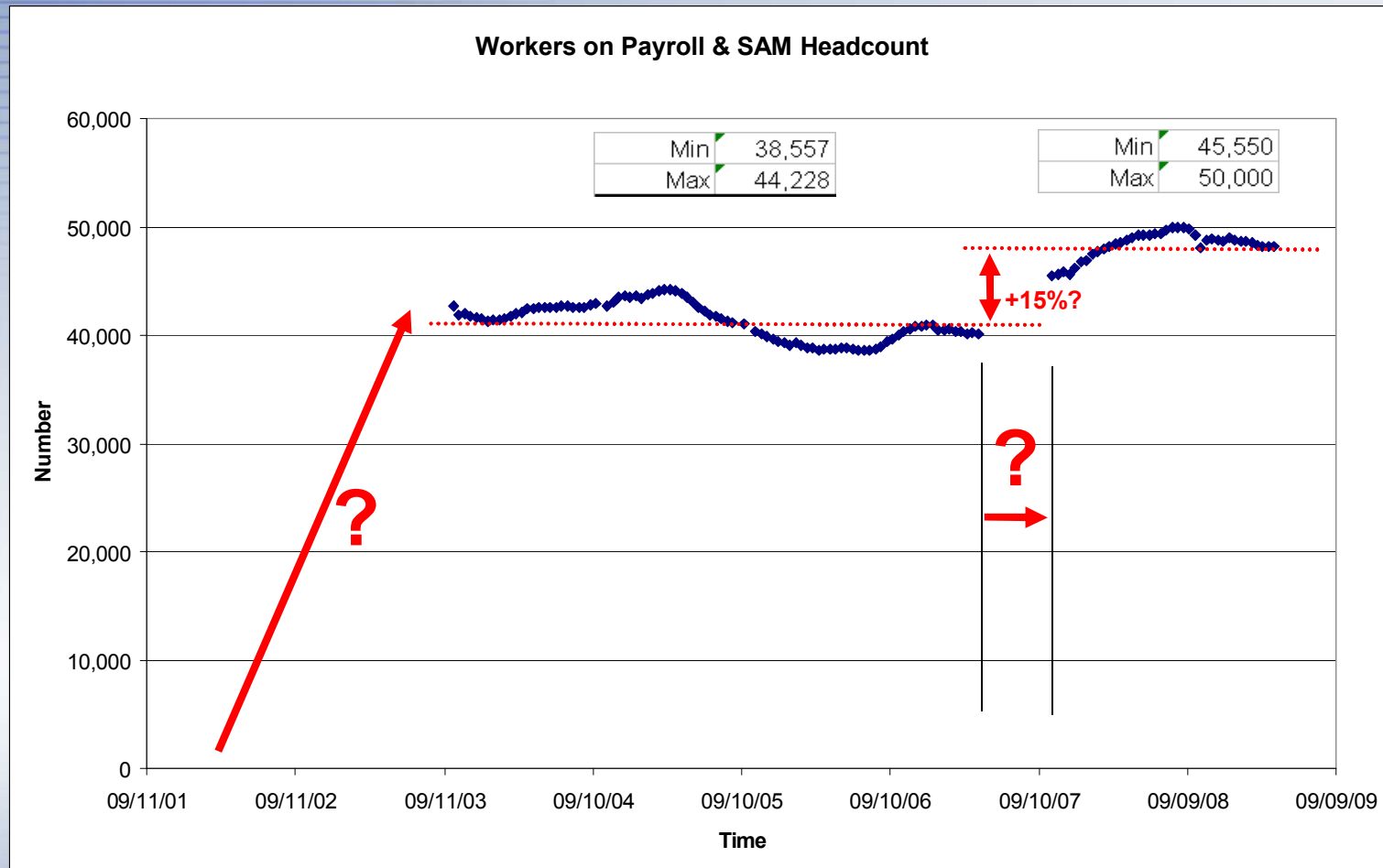
Time

Transient Dynamics: Simulated Behavior

FTEs vs. Bellybuttons

Legend:
- "Op: Desired Capacity" : transition — Hour/Month (blue)
- "Sc: Desired fr of PTs to FTs" : transition — Dmnl (red)
- "Sc: Workforce size in FTEs" : transition — Person (green)
- "Sc: Workforce size in bellybuttons" : transition — Person (gray)
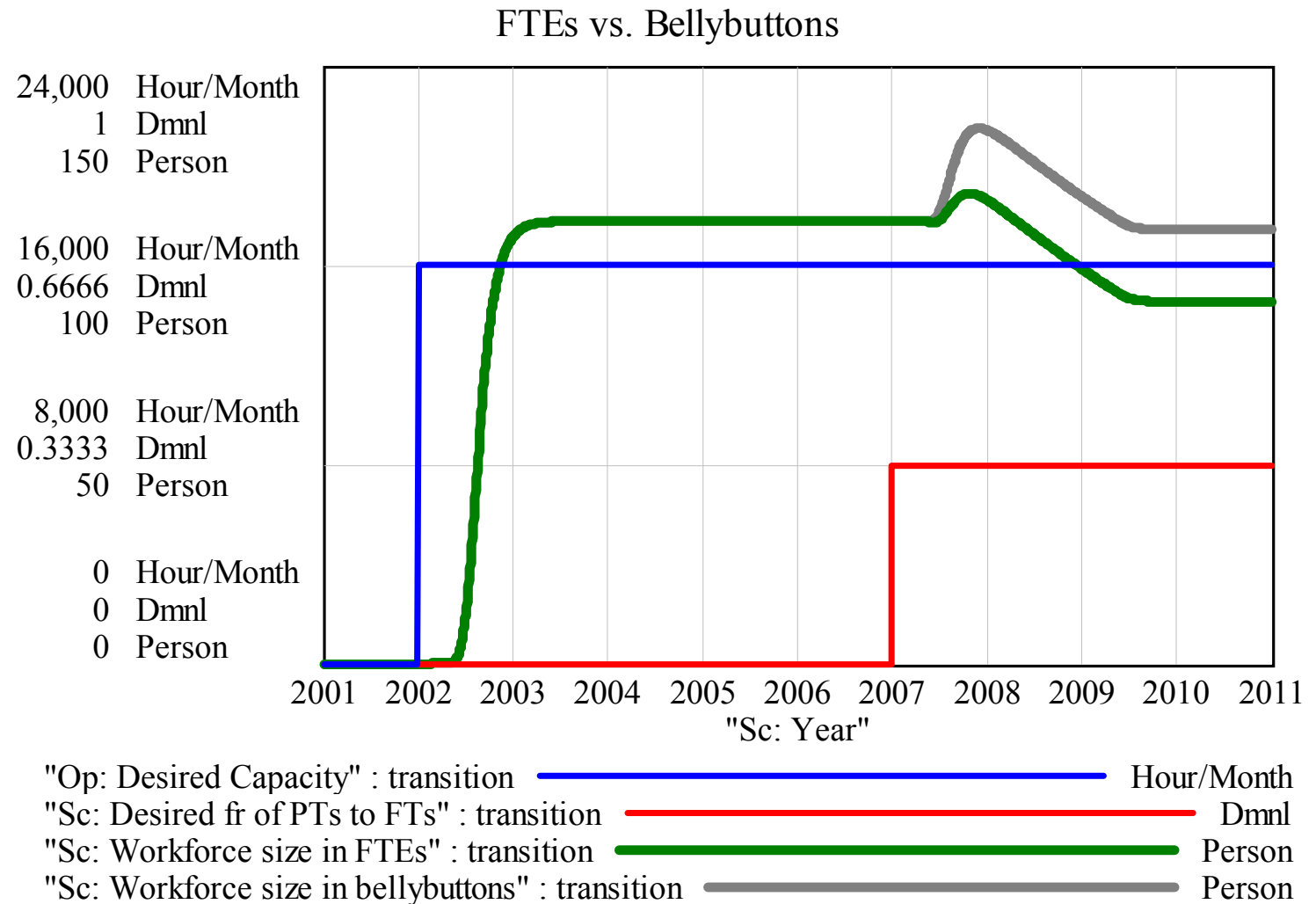
Workforce Positions
f (Desired Capacity, Desired Fraction of Part Timers, Training Per Worker)
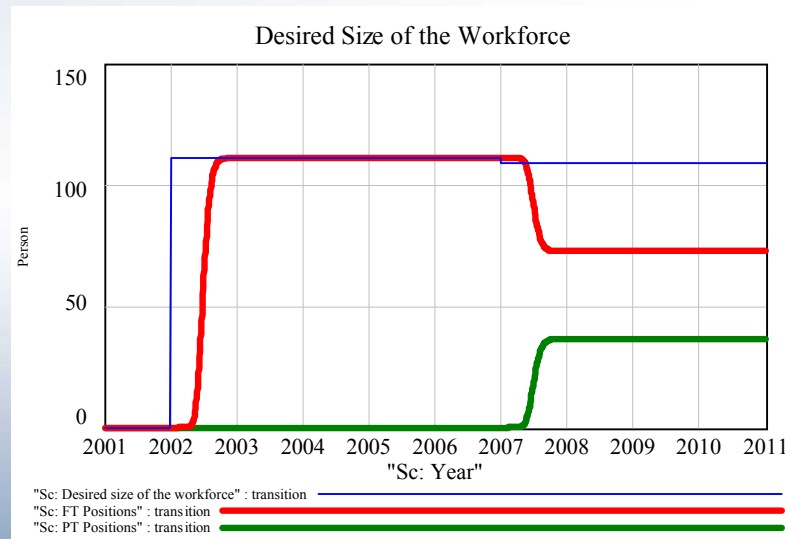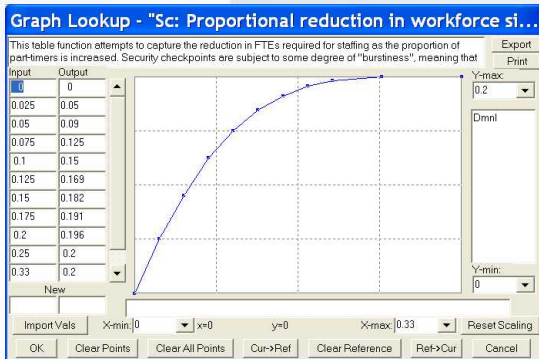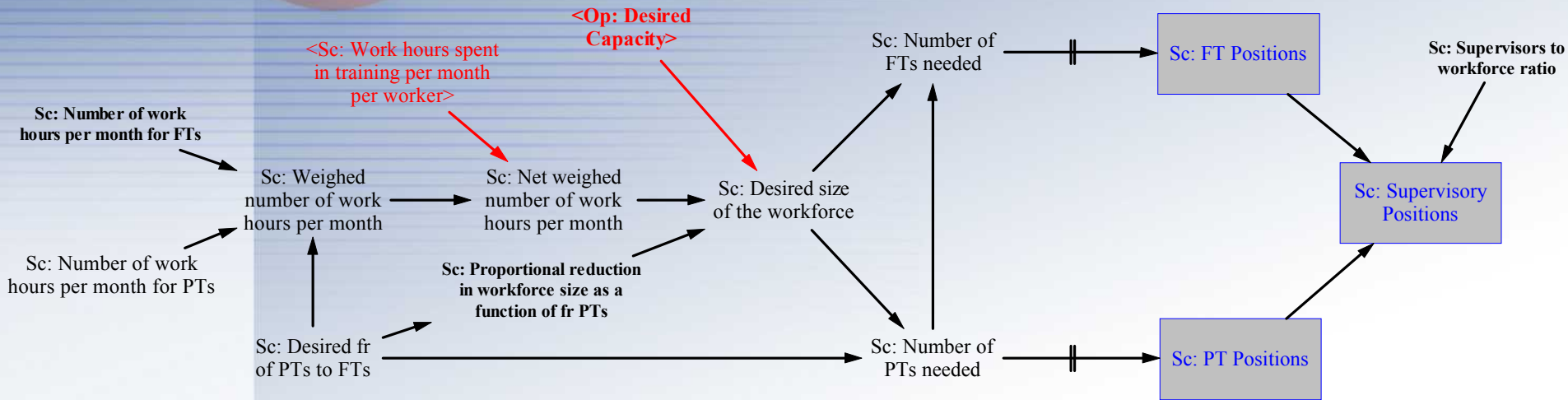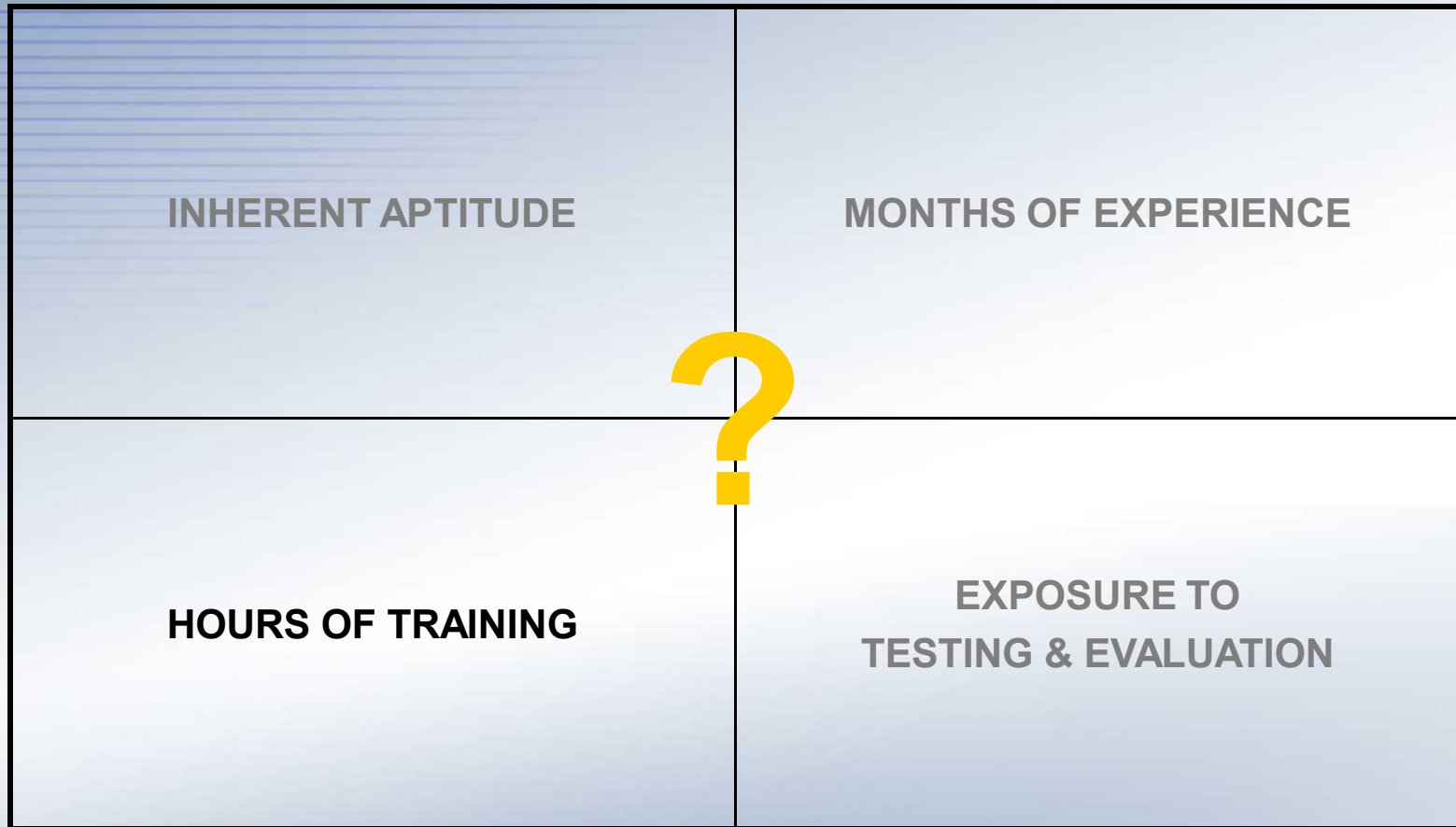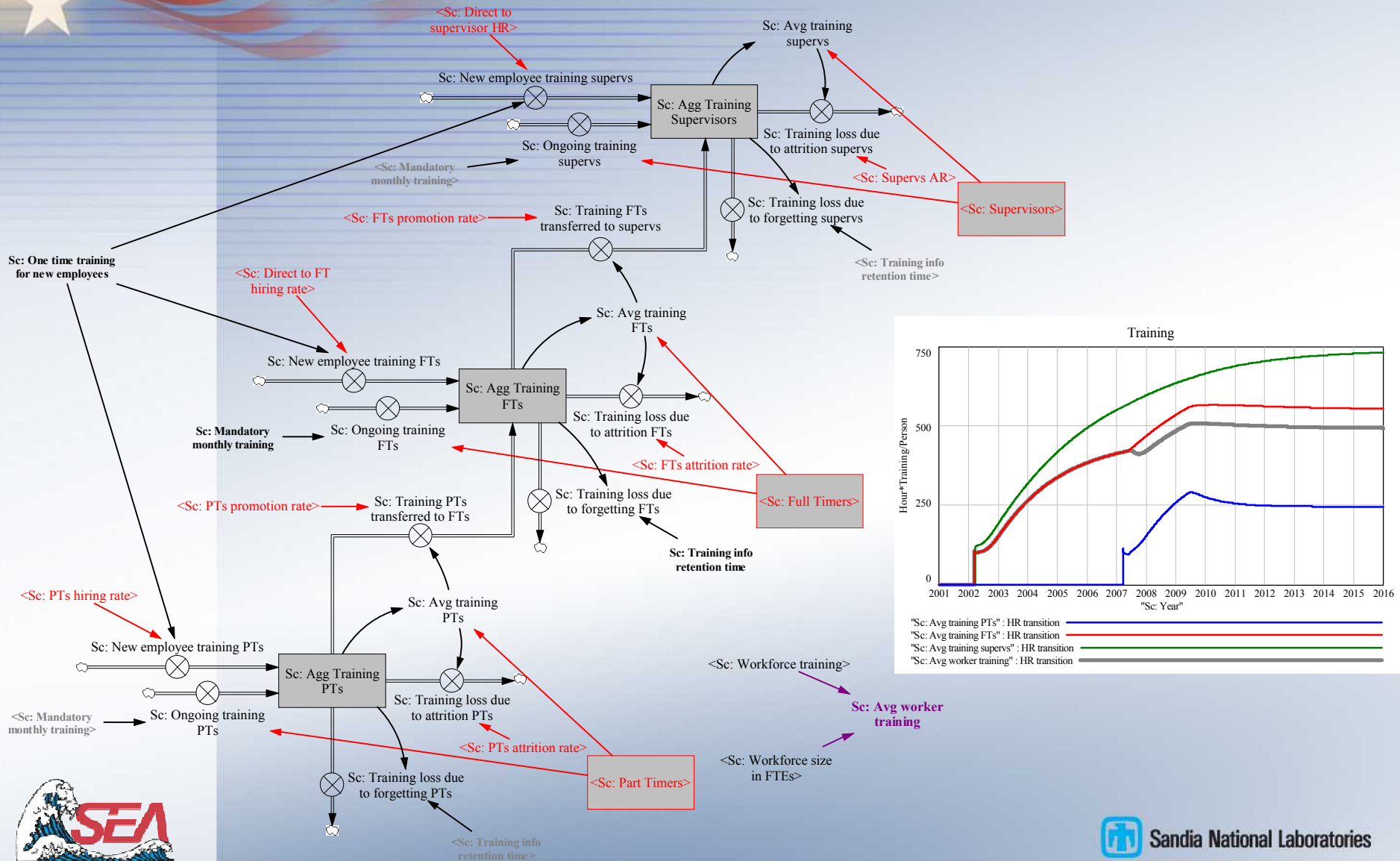
Hiring Process

Labor Supply Chain
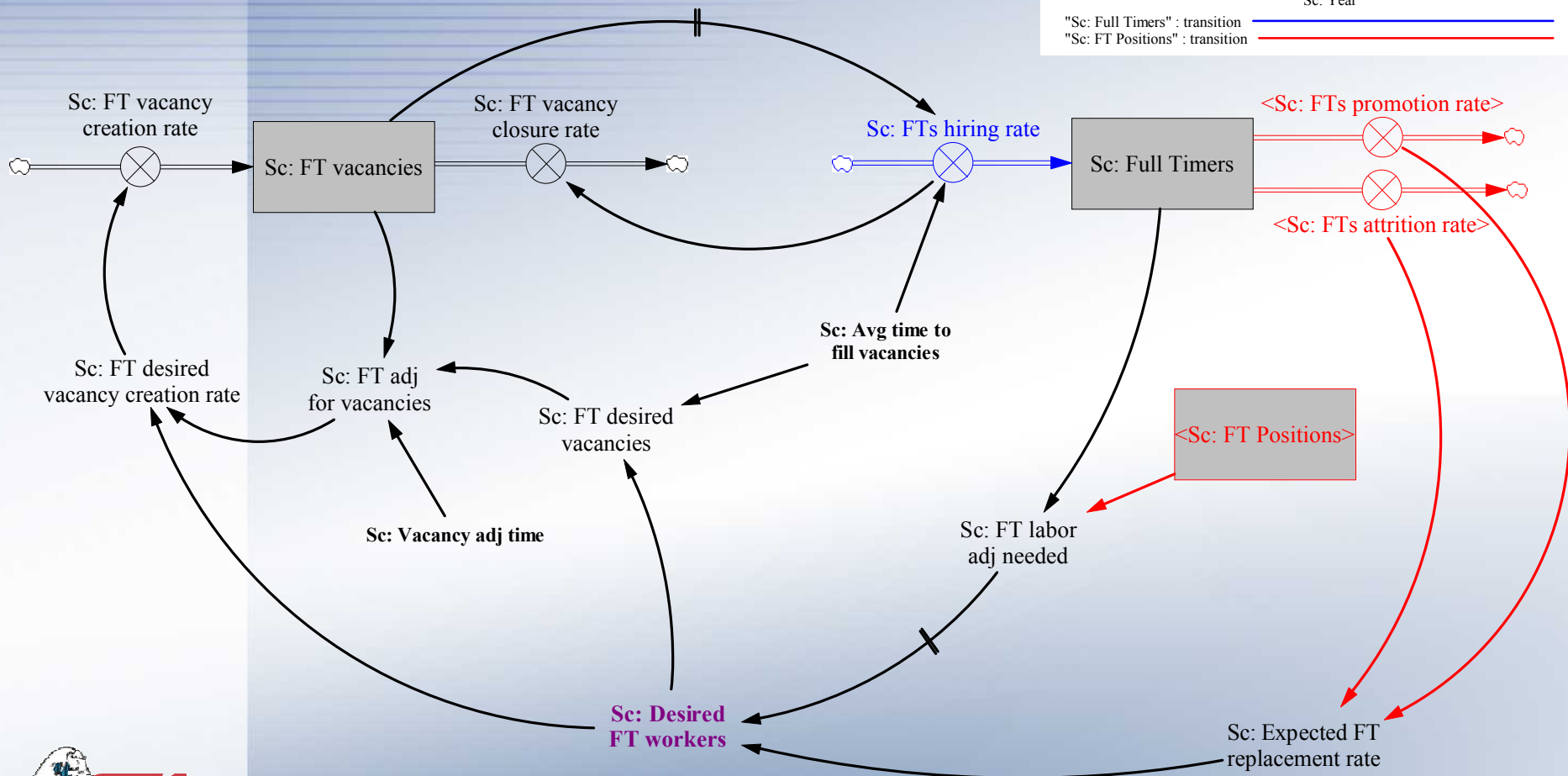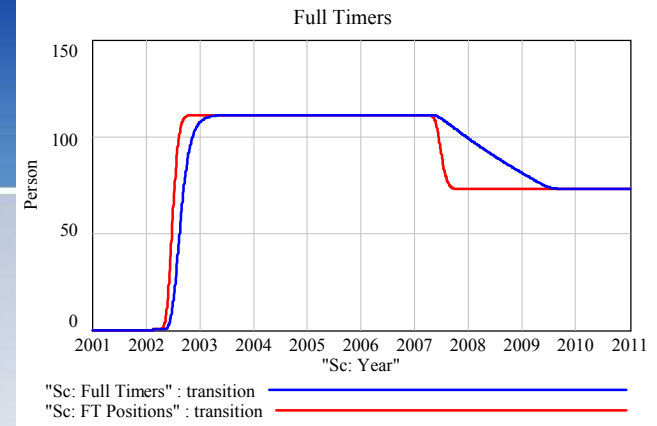
Labor Supply Chain (STACKED)
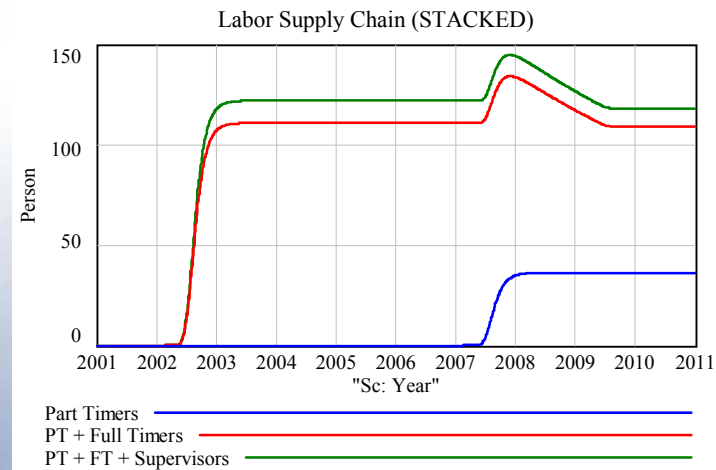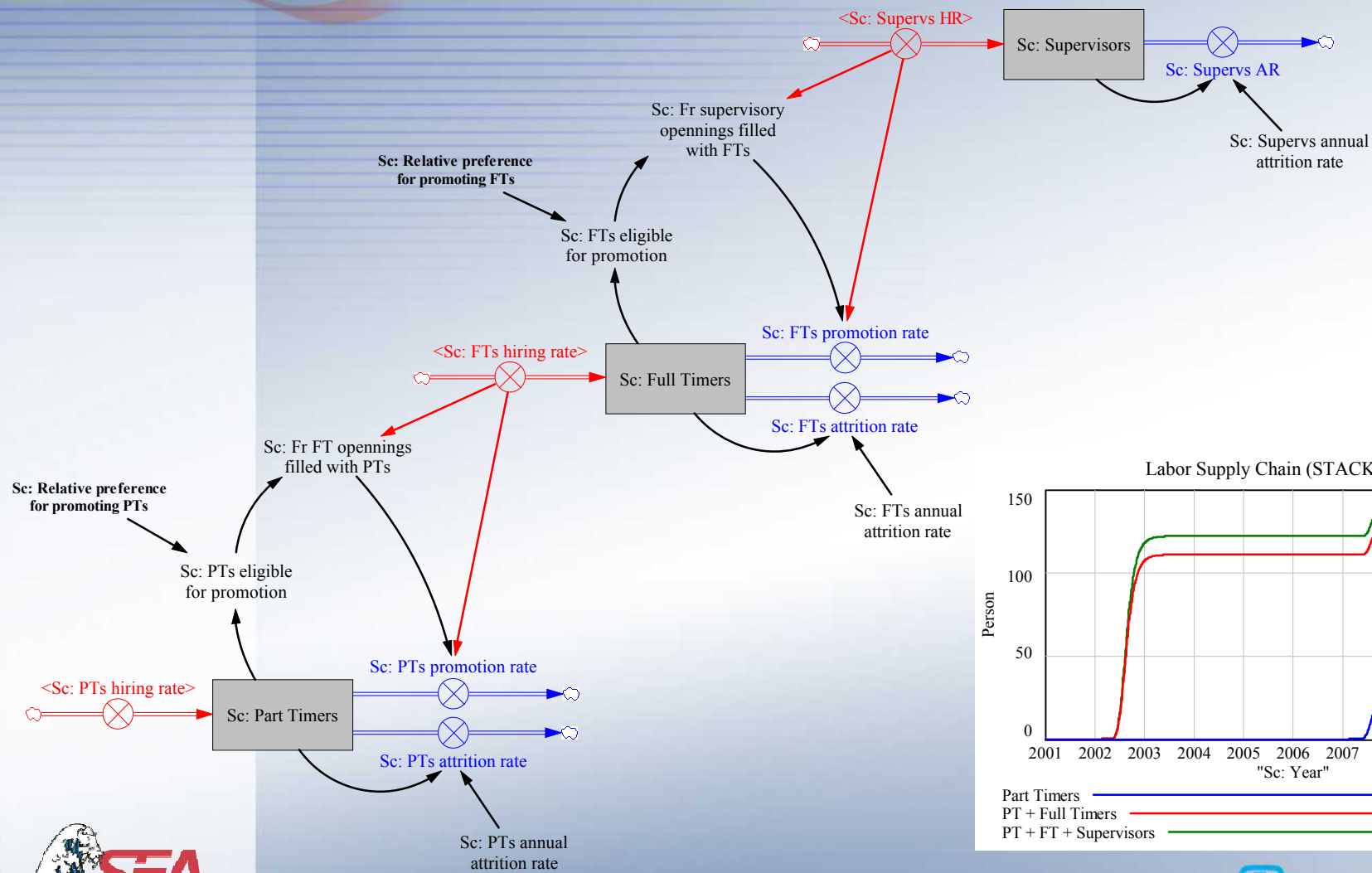
Transient Dynamics:
Reference Behavior for Workforce Attributes

INHERENT APTITUDE	**MONTHS OF EXPERIENCE**
HOURS OF TRAINING	**EXPOSURE TO TESTING & EVALUATION**

?

Simulating Attributes: E.g., Training

Workforce Attributes: Simulated

Workforce Attributes
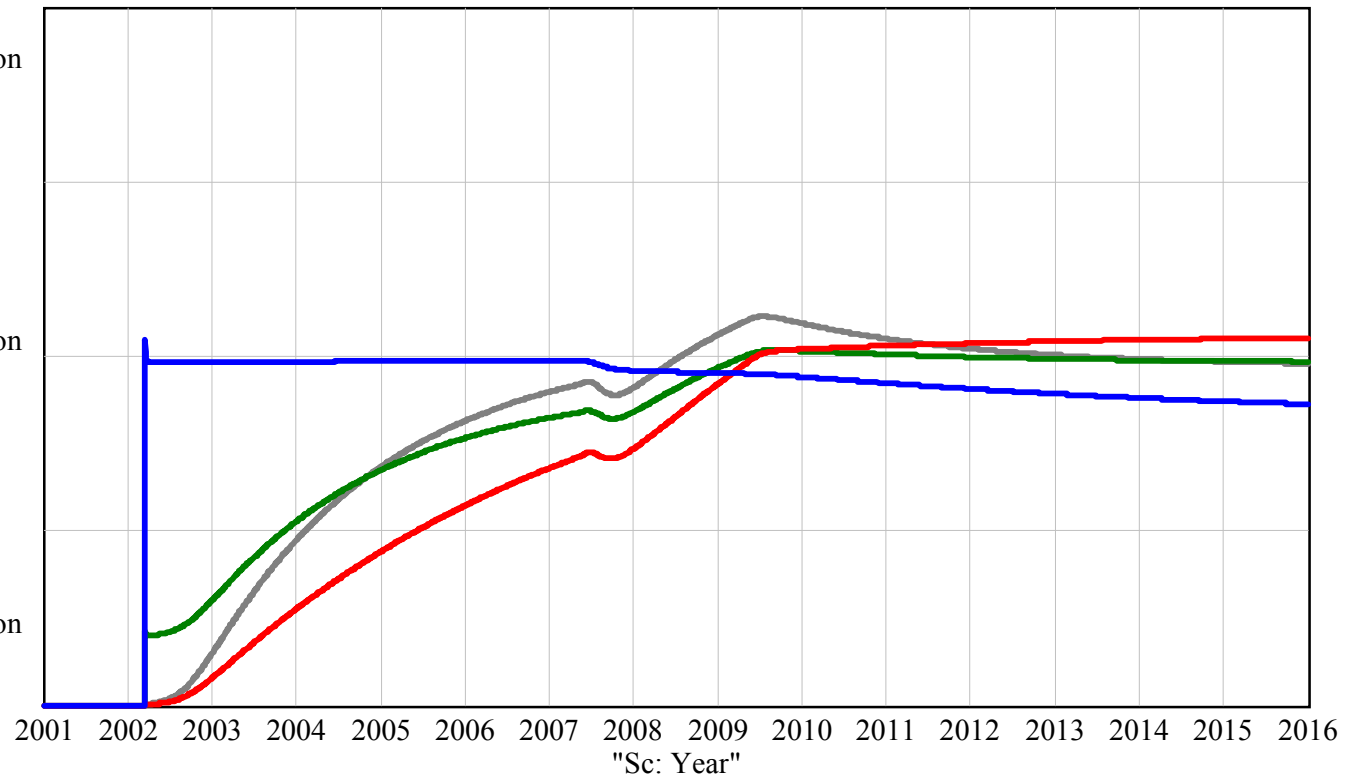
Attributes Per Employee Job Status
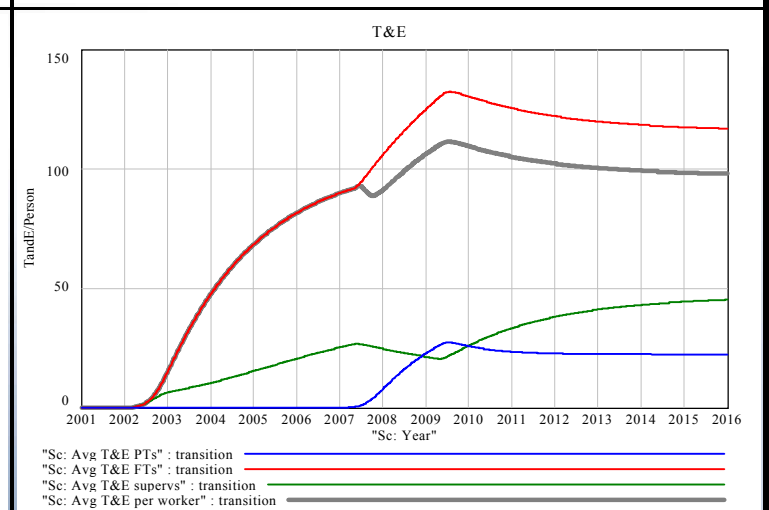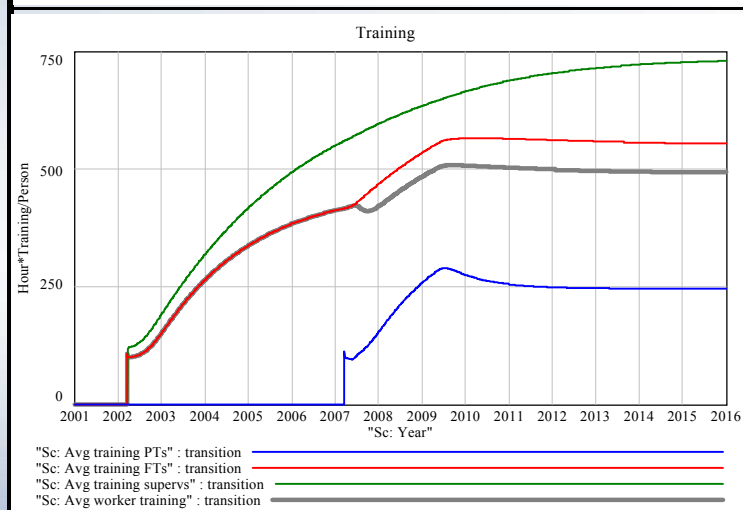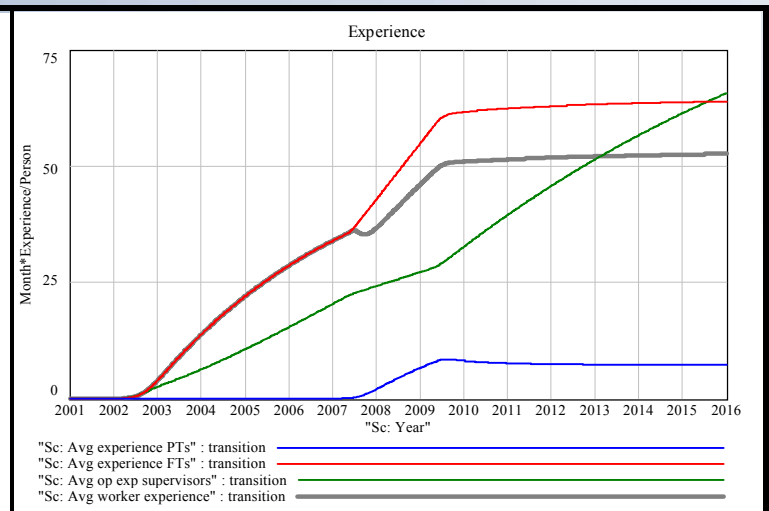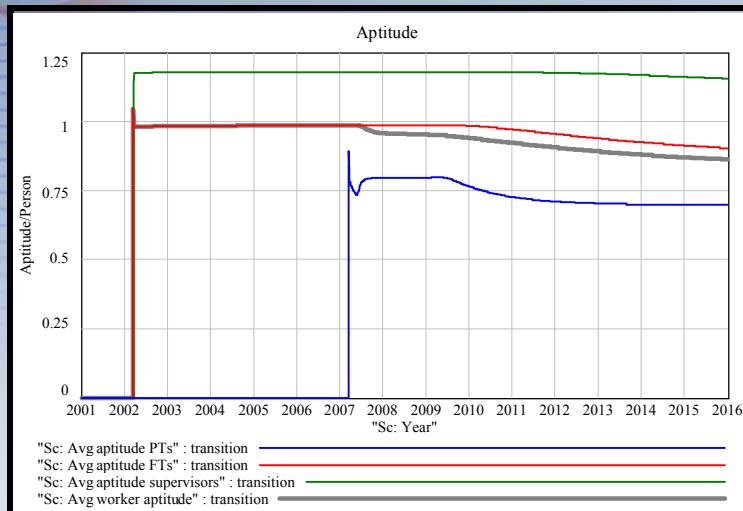
Transient Dynamics:
Reference Behavior for Technical Skill

Threat Image Projections (TIPs) Detected
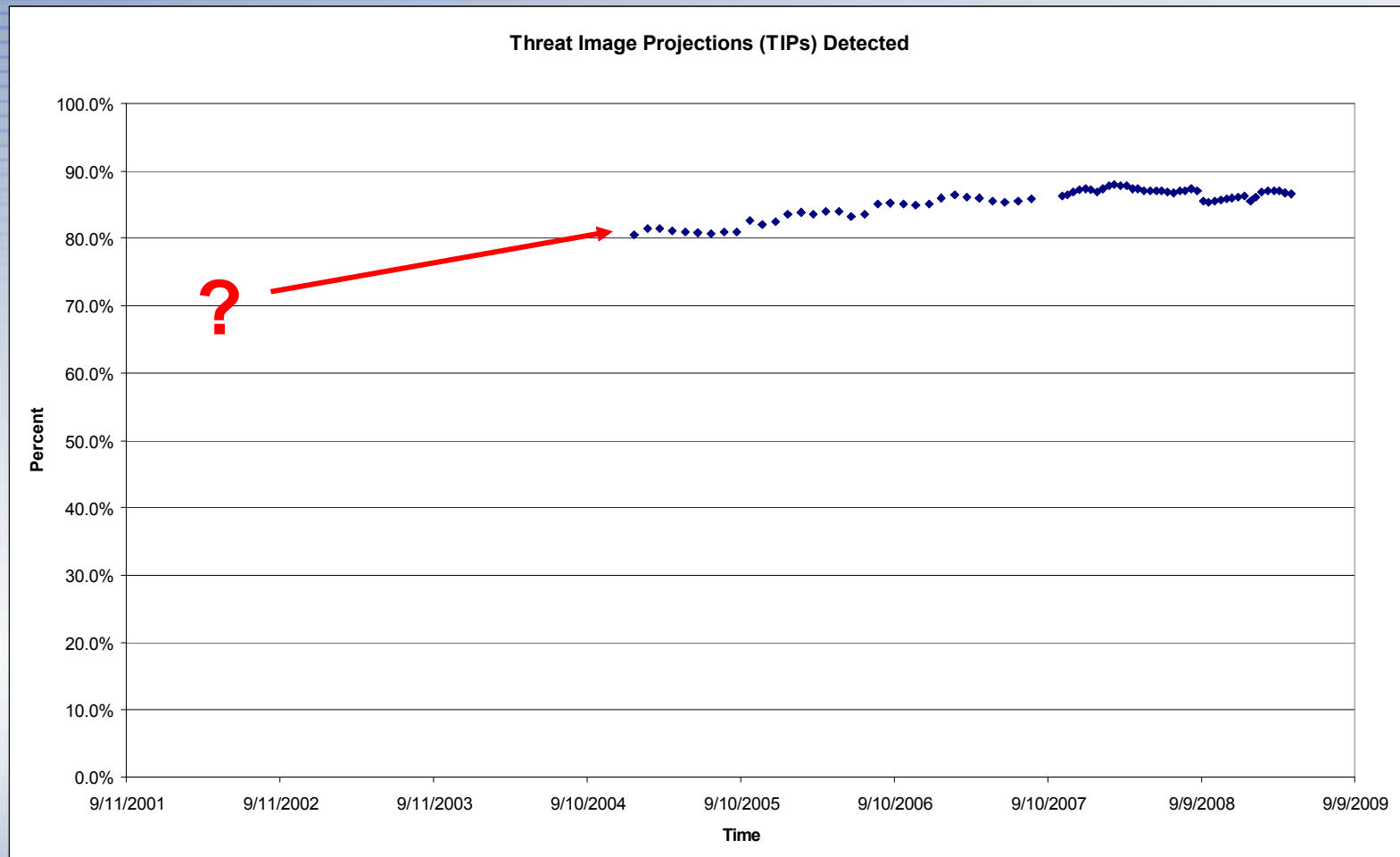
Technical Skill: Simulated (until 2009)
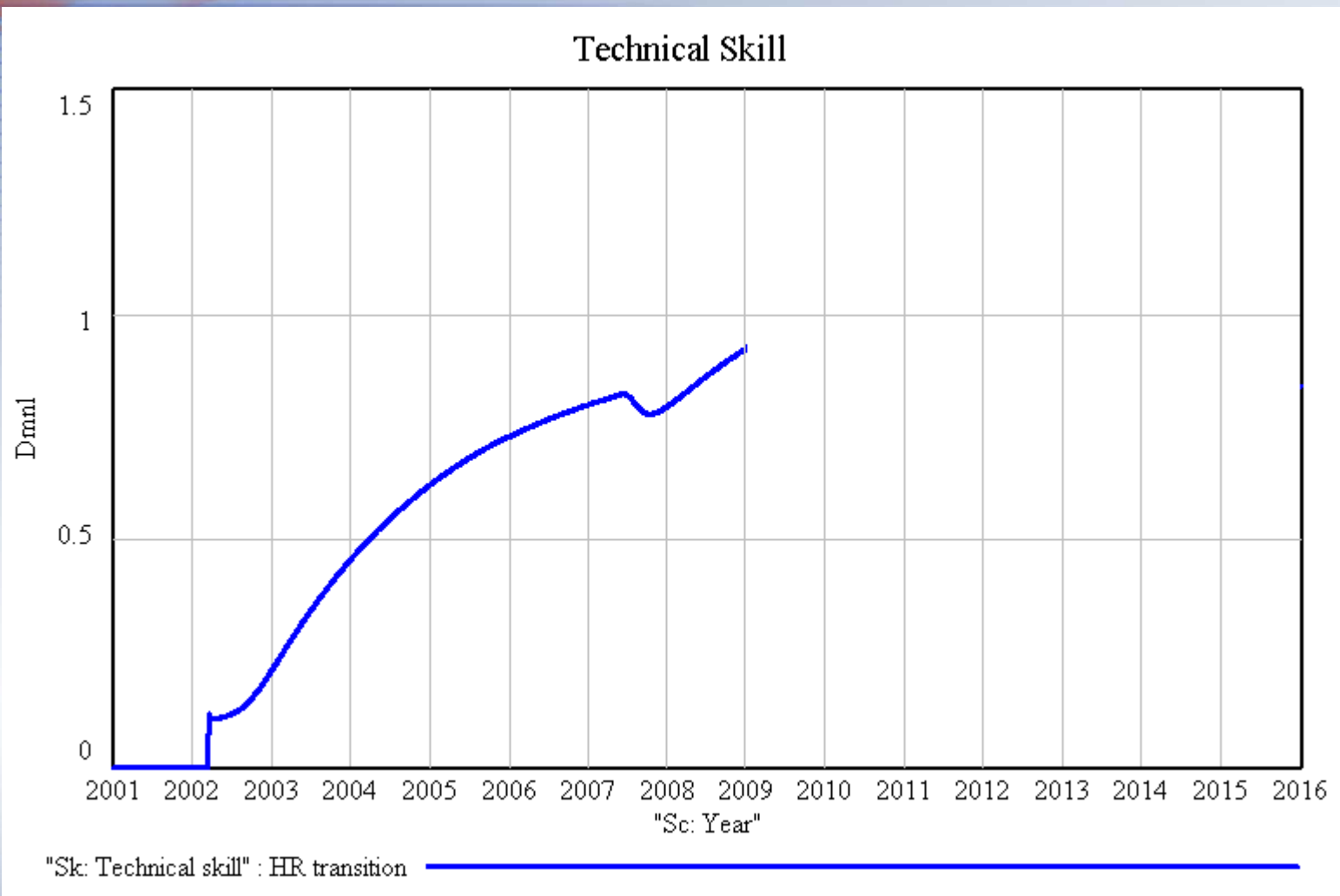
Technical Skill: Simulated (beyond 2009)
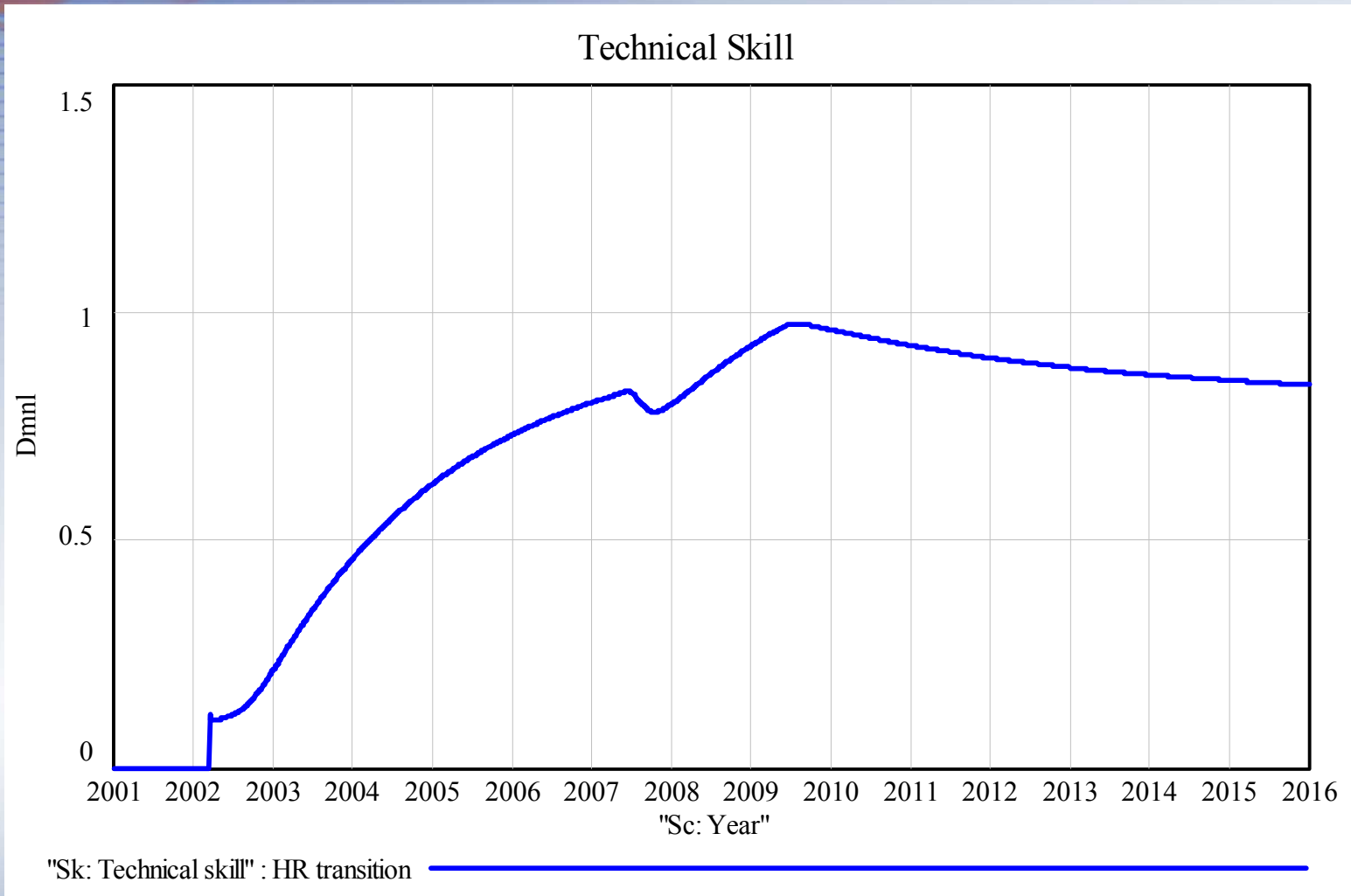
"Equilibrium" run
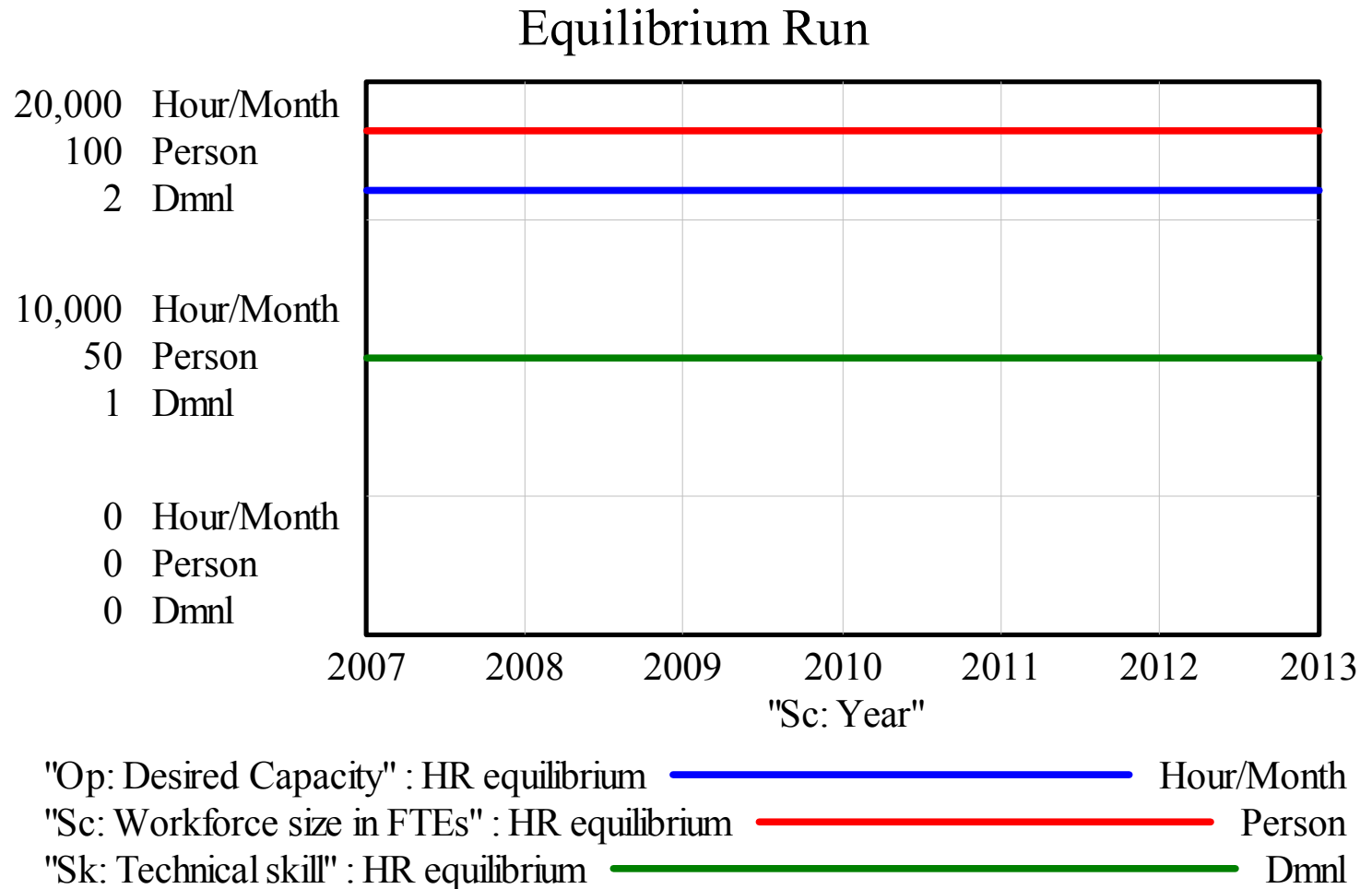
Equilibrium Run

Value	Unit
20,000	Hour/Month
100	Person
2	Dmnl
10,000	Hour/Month
50	Person
1	Dmnl
0	Hour/Month
0	Person
0	Dmnl

X-axis: 2007 2008 2009 2010 2011 2012 2013
"Sc: Year"

"Op: Desired Capacity" : HR equilibrium — Hour/Month
"Sc: Workforce size in FTEs" : HR equilibrium — Person
"Sk: Technical skill" : HR equilibrium — Dmnl

Sandia National Laboratories

Scenario runs

- Economic downturn reduces air travel (temporarily)
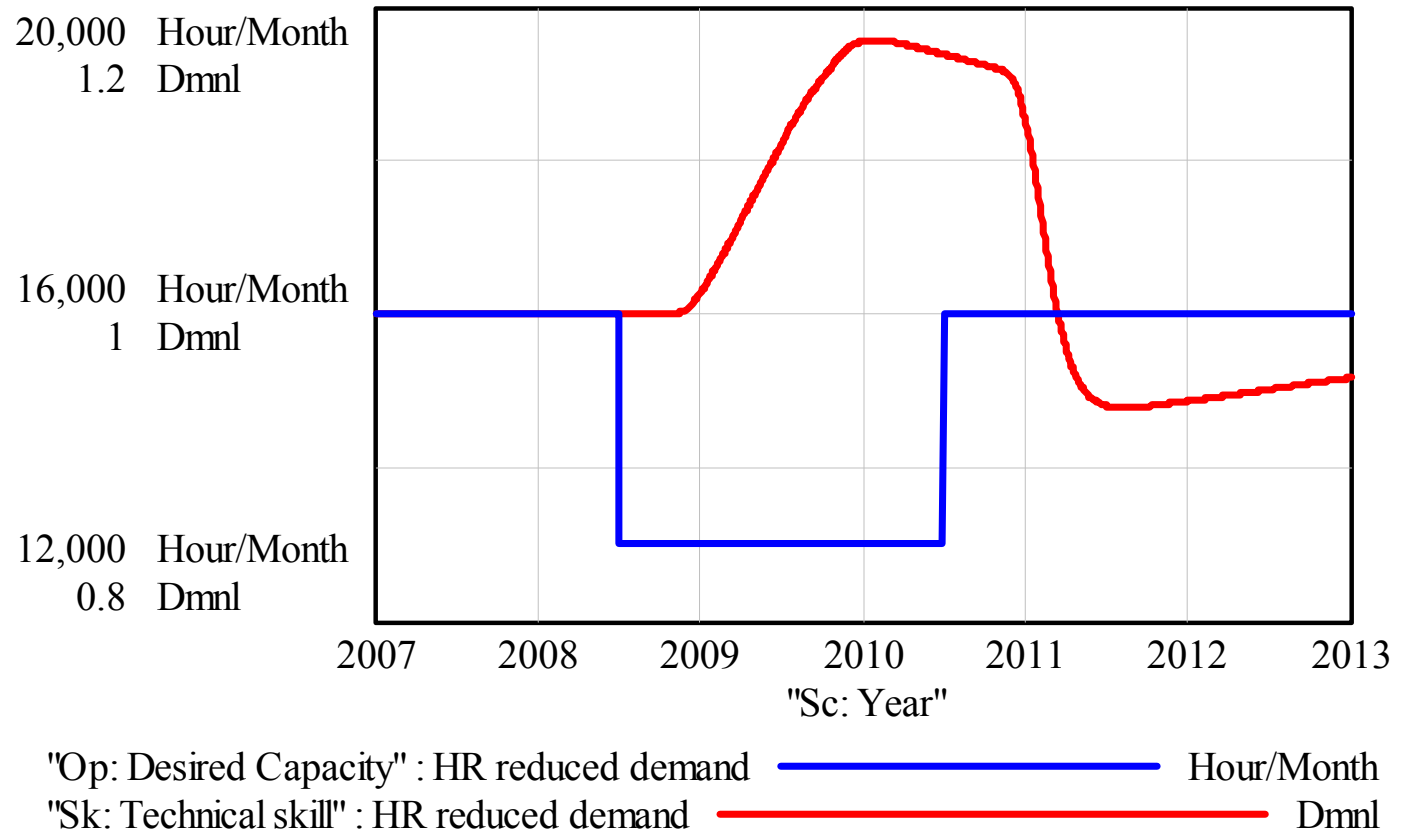- Sustained reduction in attrition

Sandia National Laboratories

Economic downturn reduces air travel (temporarily)

Temporary Reduction in Desired (Screening) Capacity

Economic downturn reduces air travel (temporarily)

Temporary Reduction in Desired (Screening) Capacity

"Op: Desired Capacity" : HR reduced demand —————— Hour/Month
"Sk: Technical skill" : HR reduced demand —————— Dmnl

(Sustained) Reduction in Attrition

(Sustained) Reduction in Attrition

Sustained Reduction in Attrition

"Sc: FTs attrition rate" : HR reduced attrition ————— Person/Month
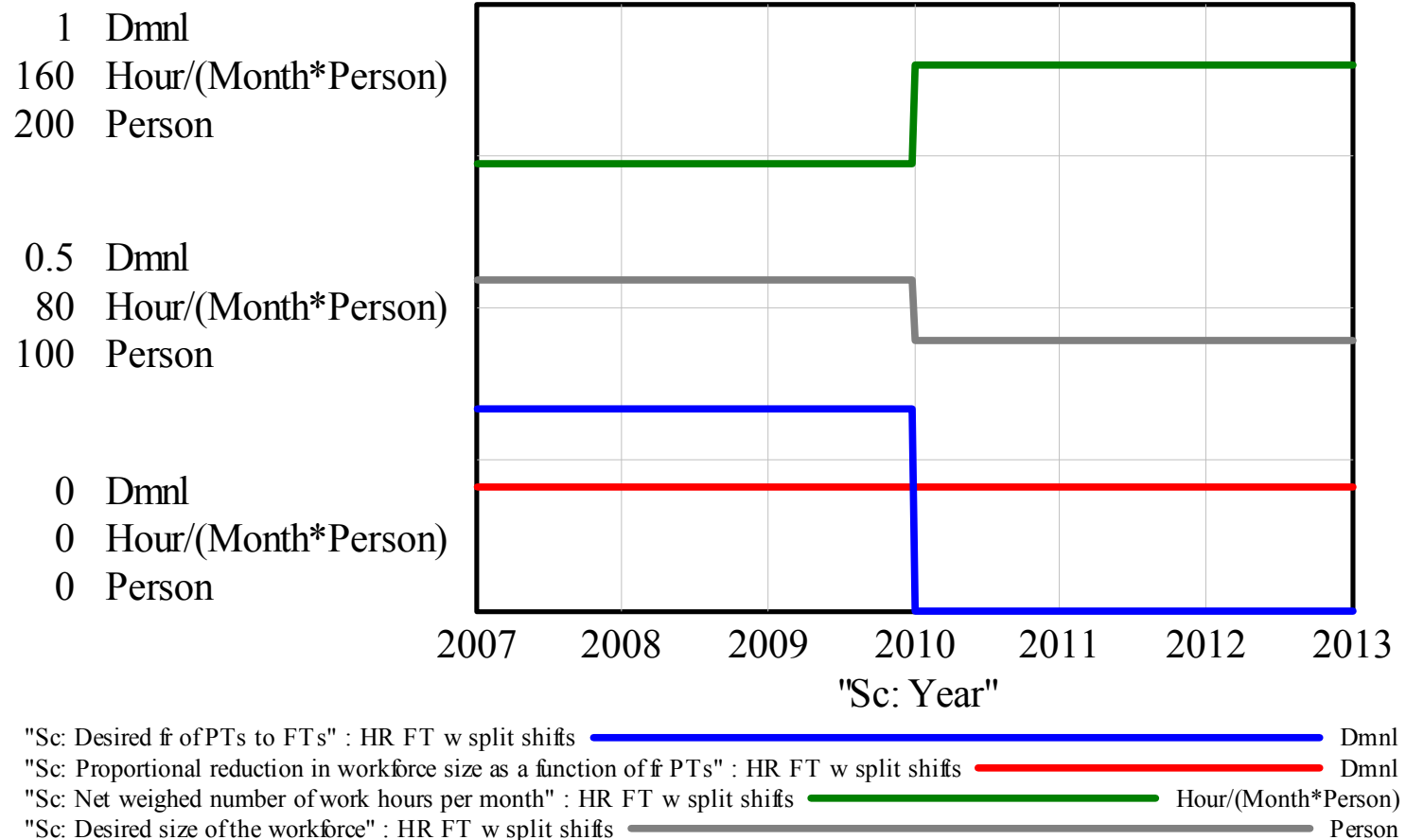"Sk: Technical skill" : HR reduced attrition ————— Dmnl
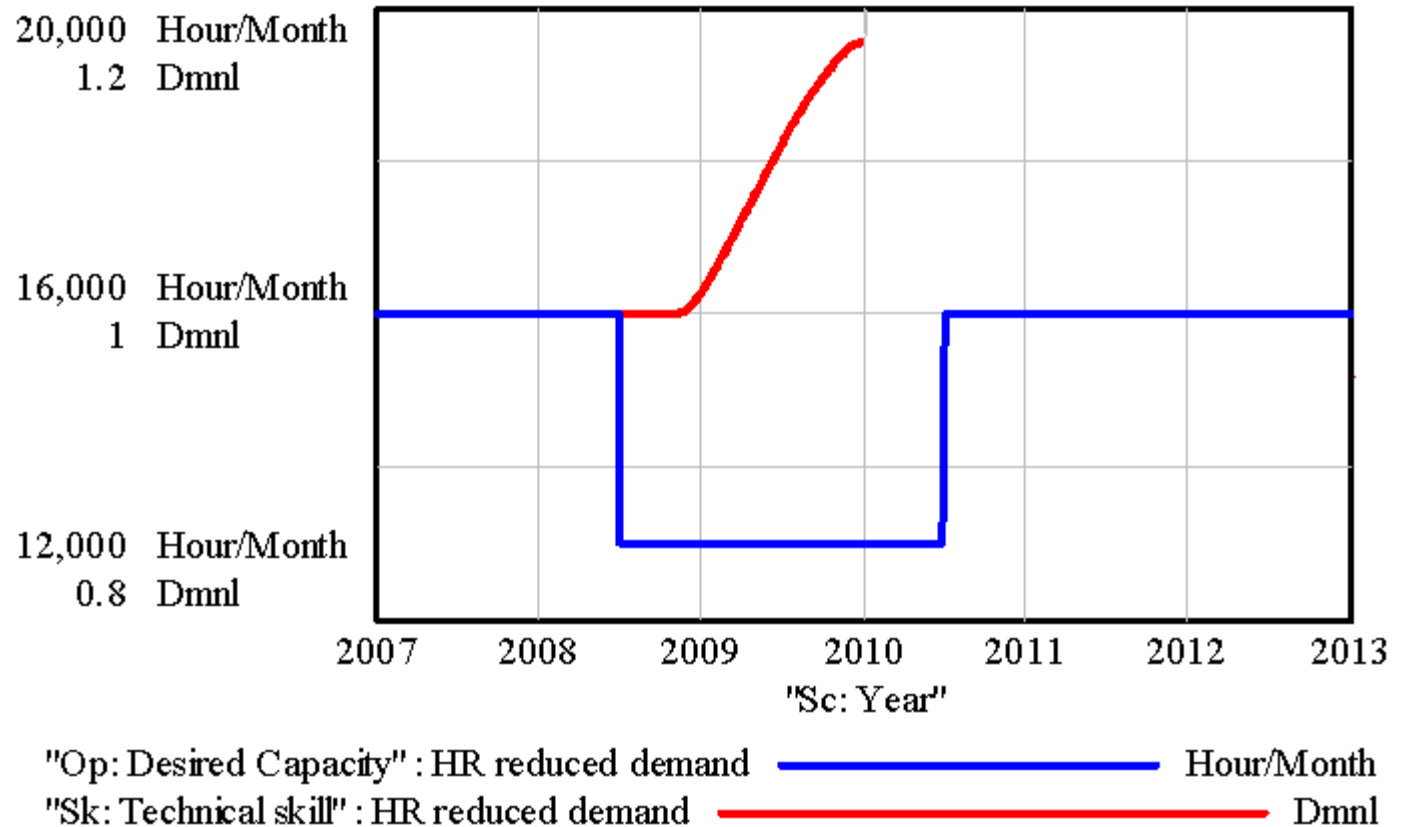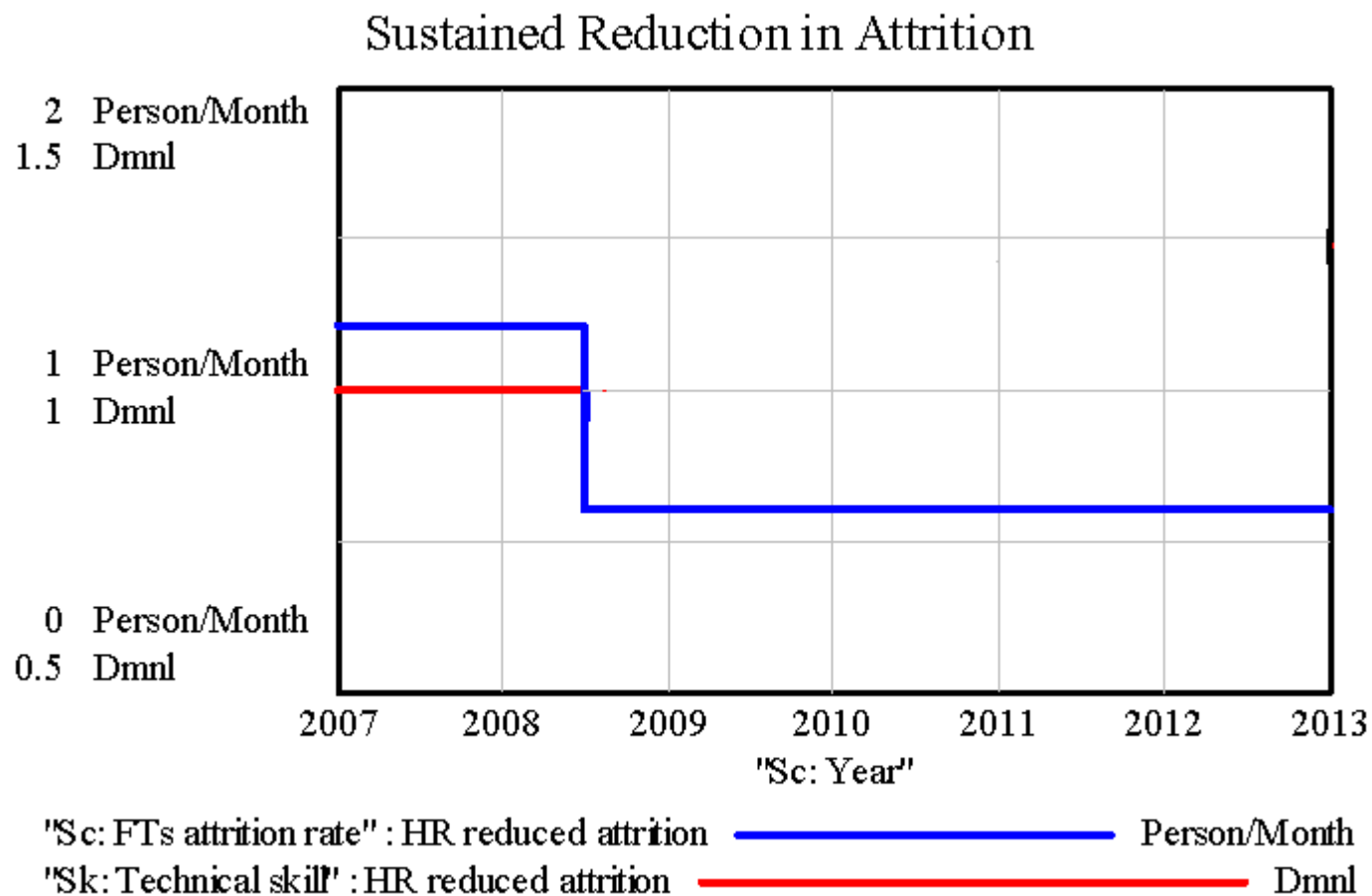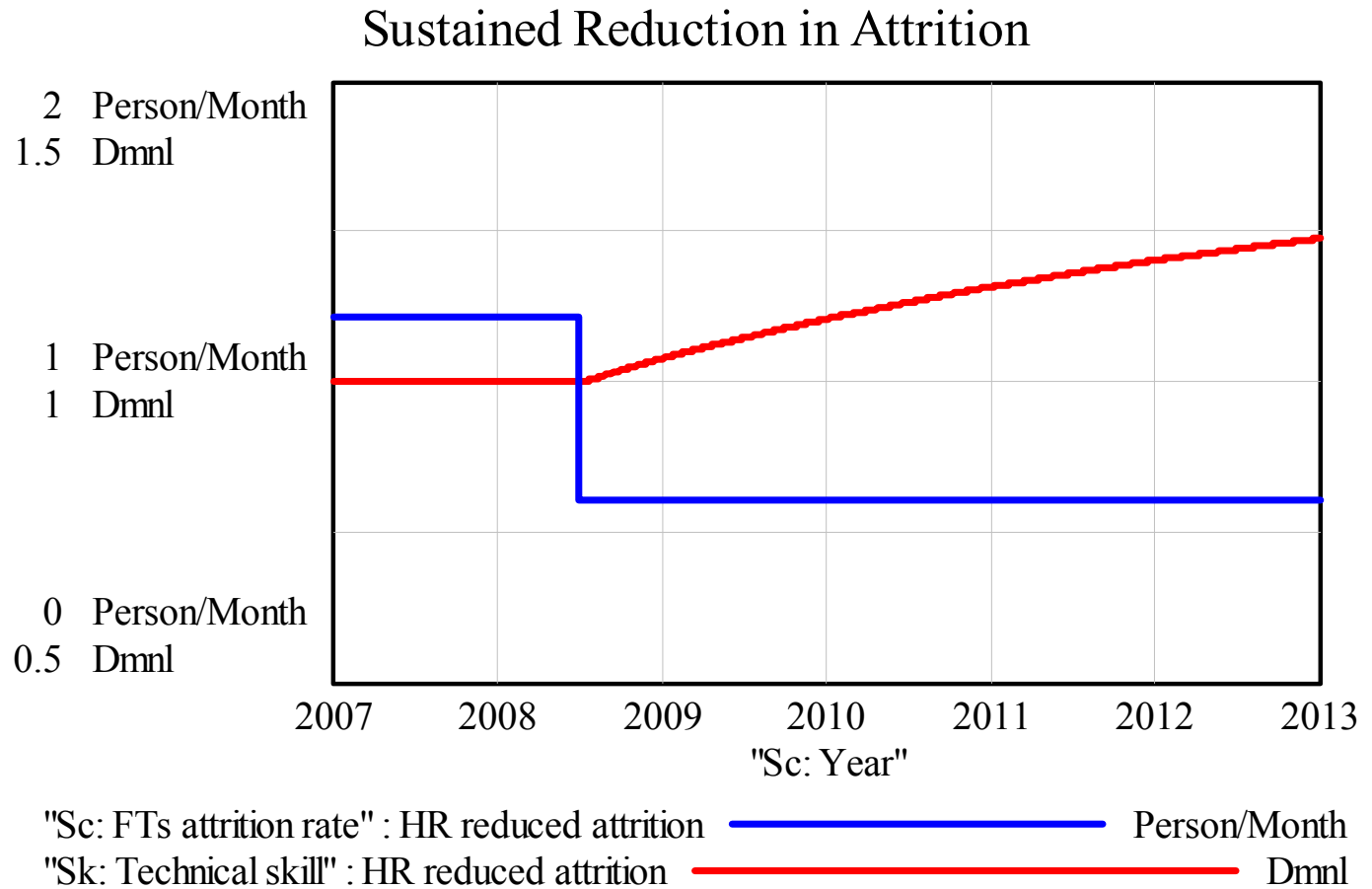
Policy runs

- Full-timer with split shifts

(Only) Full Timers Working Split Shifts
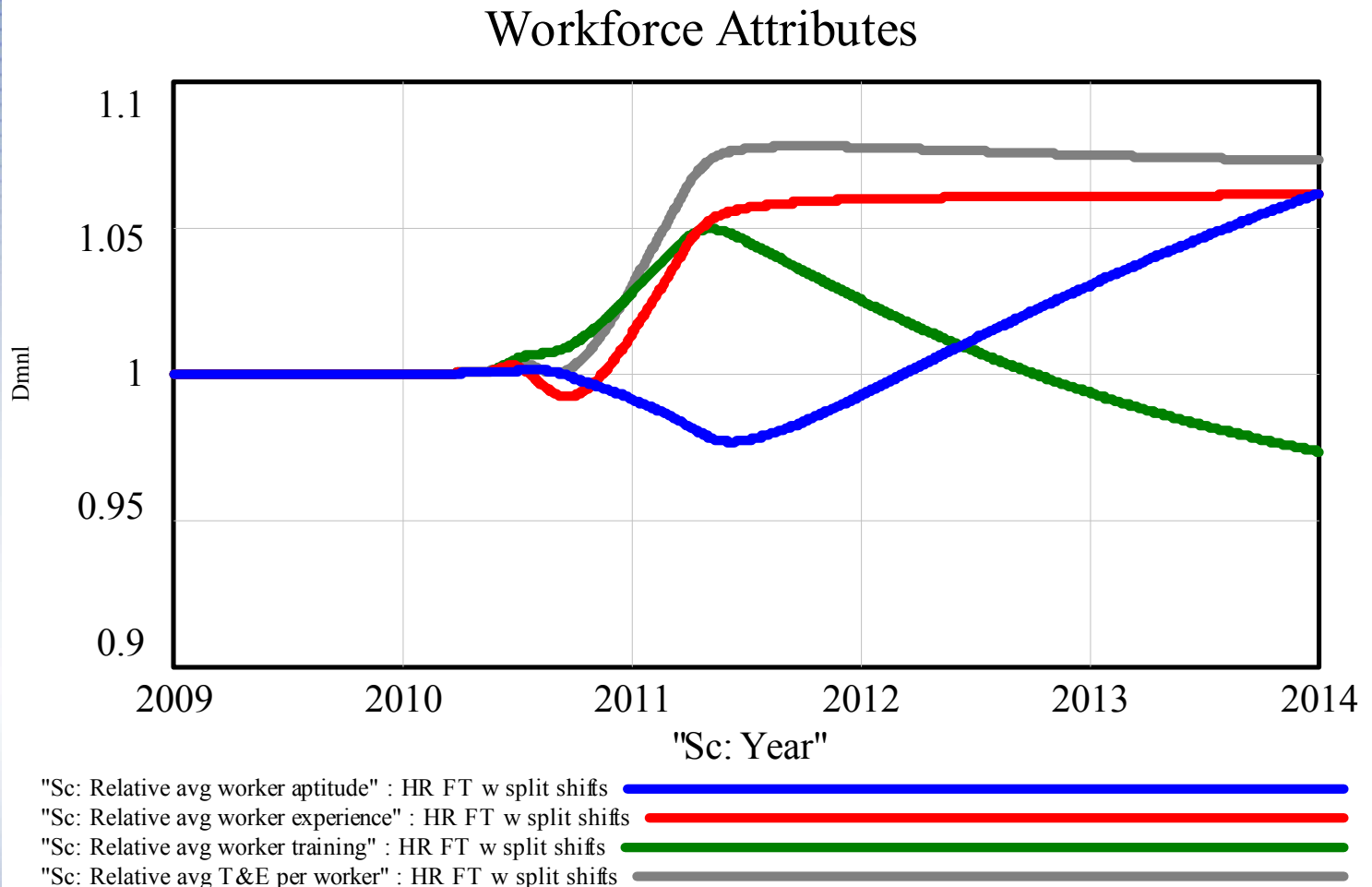

Full Timers Working Split Shifts

1	Dmnl
160	Hour/(Month*Person)
200	Person

0.5	Dmnl
80	Hour/(Month*Person)
100	Person

0	Dmnl
0	Hour/(Month*Person)
0	Person

"Sc: Year"

"Sc: Desired fr of PTs to FTs" : HR FT w split shifts	Dmnl
"Sc: Proportional reduction in workforce size as a function of fr PTs" : HR FT w split shifts	Dmnl
"Sc: Net weighed number of work hours per month" : HR FT w split shifts	Hour/(Month*Person)
"Sc: Desired size of the workforce" : HR FT w split shifts	Person

Sandia National Laboratories

FTs Working Split Shifts (Workforce)

Workforce Attributes

FTWSS: Technical Skill

Technical Skill

"Sk: Technical skill" : HR FT w split shifts