National Weather Service

Science and Technology Roadmap

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Outline

- ✓ Purpose
- ✓ Vision
- ✓ Background
- ✓ Strategy
- ✓ Guiding Principles
- ✓ Links to Societal Benefits
- ✓ Framework
- ✓ Milestones
- ✓ Next Steps

Purpose

To brief Corporate Board on Science and Technology Roadmap approach and solicit feedback

Science and Technology Infusion Vision

A safer, better informed, more productive society through full utilization of proven, cost-effective science and technology

- implemented in vastly improved NWS services and enabling capabilities

- for more effective decision making

Background

- ✓ STIP completed in FY02; updated in 2004 **http://www.nws.noaa.gov/ost/STIP2004.pdf**
  - ✓ Springboard for major product & service improvements
- ✓ Since then:
  - ✓ Paradigm shifts for NWS
  - ✓ Users have additional needs
  - ✓ Major advances in Science and Technology (S&T)
- ✓ Imperative to link enterprise planning to implementation for effective, efficient progress
  - ✓ Key: PPBES, OSIP for managing innovation and transitioning research to operations
- ✓ Vision, Strategic Plan and Framework Teams will guide outputs

Strategy

- ❖ Know and anticipate customer needs
- ✓ Identify and anticipate emerging S&T
- ✓ Plan and program for S&T infusion
  - ✓ Analyze gaps
  - ✓ Analyze alternatives: risk and uncertainty, impacts vs. costs
  - ✓ Promote key solutions
- ✓ Develop targeted S&T to evolve and transform enabling capabilities and products/services
- ❖ Train workforce
- ✓ Deploy proven S&T into operations

❖	**Strategic Plan, in coordination with S&T Roadmap**
✓	**S&T Roadmap, in coordination with Strategic Plan**

Guiding Principles

- ✓ Links goal/target program improvements to societal benefits and impacts, and performance measure-based outcomes
- ✓ Drives PPBES, President's Budget, Annual Operating Plans
- ✓ Analyzes S&T risk and uncertainty and defines "on- and off-ramps" for alternative solutions
- ✓ Leverages full potential of end-to-end enabling capabilities
  - Research to operations (e.g. testbeds)
  - From observations to delivering decision support services
- ✓ Synchronizes improvements of products and services with enabling capabilities
- ✓ Reflects/guides reasonable budget expectations
- ✓ Emphasizes impacts for near-term (2015) and longer-term (2025)

Links to Societal Benefits

Improved Enabling Capabilities

- Observations
- Forecasts
- IT Infrastructure
- Dissemination/Access
- Decision Support
- Verification & Metrics
- Customer Outreach
- Feedback Technologies

Product Improvements	Benefits
Hurricane Track, Intensity and Precipitation Forecasts	Reduce $10 B/yr in hurricane damage
Tornado and Flash Flood Forecasts	Reduce $1 B/yr in damage from severe wx
Aviation, Fire, and Marine Forecasts	Reduce $19 B/yr losses from air traffic delays
Flood and River Predictions	Reduce $4.3B/yr in flood damage
Air Quality Predictions	Reduce mortality from 50,000/yr from poor AQ
Space Weather	Reduce $365M/yr in losses (power industry)
Seasonal Climate Forecasts for Energy, Agriculture, Etc.	Reduce $7B/ yr in losses (drought)

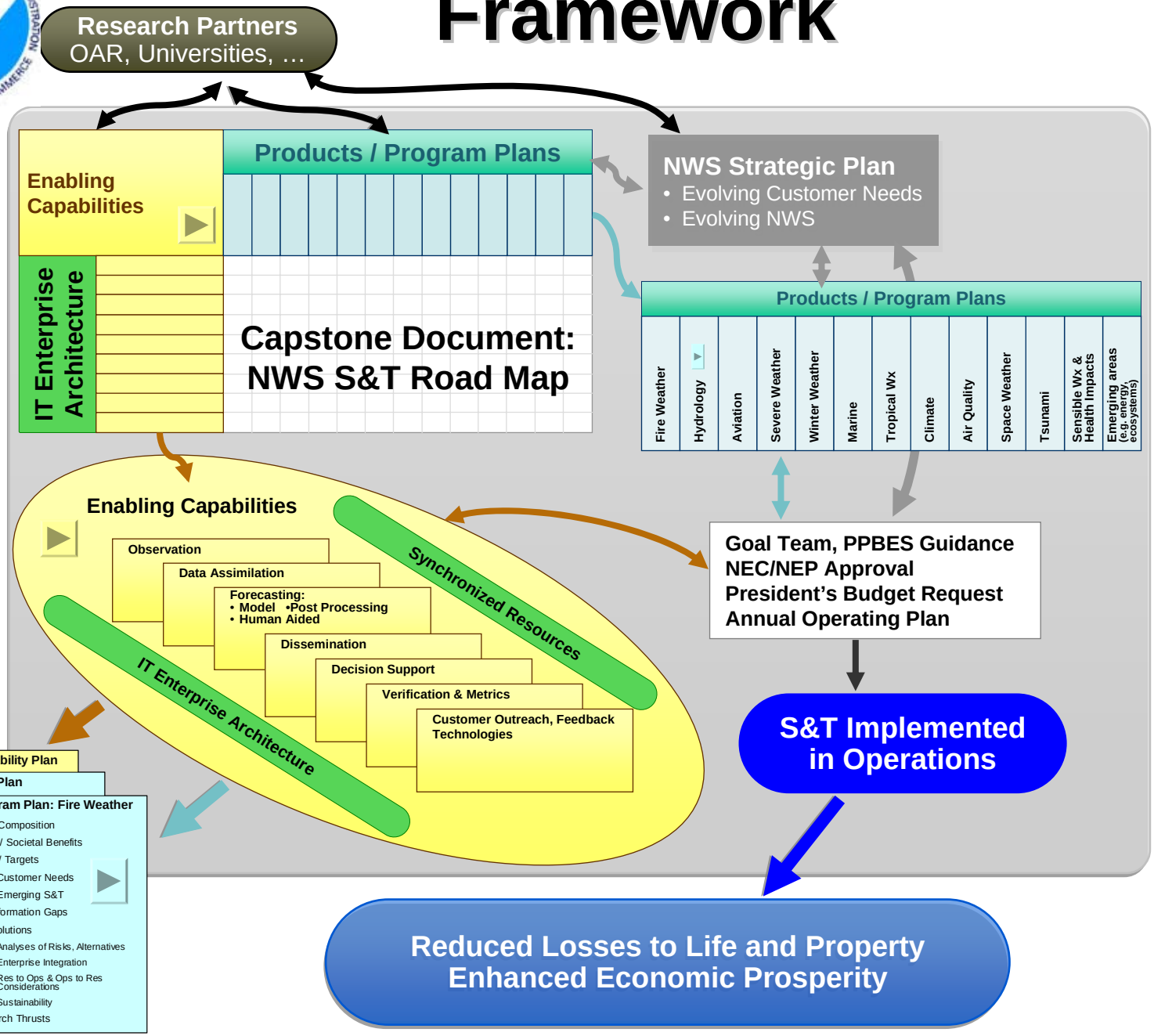
Key 2025 Outcomes

Vastly Improved Forecasts and Warnings in Core and Emerging Service Areas

What these might look like (Notional):

	Current	Vision
Tornado lead time	13 mins	> 60 mins
Hurricanes lead time for track error within 100nm	2 days	> 5days
Hurricane intensity (windspeed) error	10 kt	< 5 kt
Air quality prediction accuracy	90%, ozone	> 95%, ozone, PM & other pollutants
Tsunami warning time interval, following triggering earthquake	10 mins	< 5 mins
Flash Flood lead time	1 hrs	> 3 hrs

Framework


Research Partners
OAR, Universities, …
Enabling Capabilities
Products / Program Plans
IT Enterprise Architecture
Capstone Document:
NWS S&T Road Map
NWS Strategic Plan
• Evolving Customer Needs
• Evolving NWS
Products / Program Plans
Fire Weather
Hydrology
Aviation
Severe Weather
Winter Weather
Marine
Tropical Wx
Climate
Air Quality
Space Weather
Tsunami
Sensible Wx & Health Impacts
Emerging areas (e.g. energy, ecosystems)
Enabling Capabilities
Observation
Data Assimilation
Forecasting:
• Model •Post Processing
• Human Aided
Dissemination
Decision Support
Verification & Metrics
Customer Outreach, Feedback Technologies
Synchronized Resources
IT Enterprise Architecture
Goal Team, PPBES Guidance
NEC/NEP Approval
President's Budget Request
Annual Operating Plan
S&T Implemented in Operations
Enabling Capability Plan
Program Plan
Program Plan: Fire Weather
Team Composition
Vision / Societal Benefits
Goals / Targets
• Customer Needs
• Emerging S&T
Key Information Gaps
Key Solutions
• Analyses of Risks, Alternatives
• Enterprise Integration
• Res to Ops & Ops to Res Considerations
• Sustainability
Research Thrusts
Reduced Losses to Life and Property
Enhanced Economic Prosperity

Framework

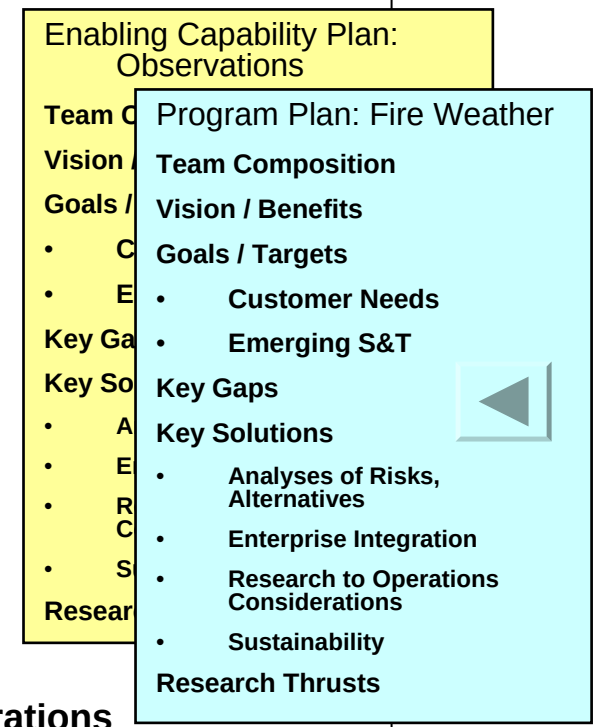
Enabling Capabilities/ End-to-End Forecast Process		Products/Services												
		Fire weather	Hydrology	Aviation	Severe weather	Winter weather	Marine	Tropical wx	Climate	Air quality	Space weather	Tsunami	Sensible wx & health impacts	Emerging areas (e.g. possibly energy, ecosystems)
IT enterprise architecture	Observation													
	Data Assimilation													
	Forecasting:													
	Model													
	Post Processing													
	Human Aided													
	Dissemination													
	Decision Support													
	Verification and Metrics													
	Customer Outreach, Feedback Technologies													

Focus Area Team for each Product & Enabling Capability

Plan Elements (Draft)

Program Plan/ Enabling Capability Plan

- **Team Composition**
- **Vision / Societal Benefits**
- **Goals / Targets**
  - **Customer Needs**
  - **Emerging S&T**
- **Key Gaps**
- **Key Solutions**
  - **Analyses of Risks, Alternatives**
  - **Enterprise Integration**
  - **Research to Operations & Operations to Research Considerations**
  - **Sustainability**
- **Research Thrusts**



Focus Area Teams

- ✓ Comprised of NWS and NWS Partners
  - Synchronize planning and foster teamwork across entire S&T enterprise
  - Connect R&D to operations early, guide PPBES, President's Budget and AOP
  - Relevant NWS LO/Regions:
    - OST, NCEP, OCWWS, OOS, OHD, OCIO, Regional
  - Relevant NOAA partners: OAR, NESDIS, NOS, NOAA GT Program (s):
    - Weather & Water, Commerce & Transportation, Climate, Ecosystem, Mission Support
- ✓ Enabling capabilities teams cross-cut product teams
  - Coordinate improvements in core foundational technologies to drive multiple product advances
    - e.g. observing systems, HPC, NWP, IT architecture & testbeds, …
  - Facilitate more effective dissemination/use of information products:
    - Decision support systems
- ✓ Solicit input on emerging S&T from external stakeholders
  - e.g. other agencies, universities, private sector, AMS, BASC

Milestones

Spiral 1

PHASE I

- Establish Framework Team — 17 Nov 2008
- Framework Brief to Corporate Board — 3 Dec 2008
- Focus Area team membership nominated by ODs/RDs — 21 Dec 2008
- Brief Framework to DUS — late Dec 2008 / early Jan 2009

PHASE II

- Focus Area complete robust outlines (briefings) — Mar 2009
  - Basis for Goal Team/ Program and PPBES updates

Spiral 2

- Briefing for NEP/NEC — Apr 2009

PHASE III

- Stakeholder input compiled — Oct 2009
- Draft Capstone Document — Nov 2009
- Full Documentation of Focus Area Plans (10-14pp each) — Nov 2009

Spiral 3

- All S&T Roadmap documents published — early 2010

Next Steps

Action	Completion
PHASE I	
• Establish framework team	17 Nov 2008
• Support contractors in place	17 Nov 2008
• Brief Corporate Board	10 Dec 2008
• Finalize framework brief for DUS	17 Dec 2008
• Focus Area Team member nominations due	21 Dec 2008
PHASE II	
• Focus Area Team Plenary 1 - Day Workshop	late Jan 2009
– Initiate plan element development	
– Establish cross-links for synchronizing programs and enabling capabilities	
• Focus Area Teams complete robust outlines (briefings):	Mar 2009
– Basis for Goal Team/ Program and PPBES updates	
• Brief Goal Teams	Mar 2009
• Consolidate feedback	1 Apr 2009
• S&T Roadmap briefing for NEP/NEC	Apr 2009
PHASE III	
• Collect stakeholder input (NOAA and external, e.g. AMS, BASC)	Oct 2009
• Focus Area Teams complete full documentation of plans (10-14pp each)	Nov 2009
– Program Plans	
– Enabling Capabilities Plans	
– Maximize Multi-element synchronization	
• Complete draft capstone document	Nov 2009
• Finalize Roadmap capstone document	Dec 2009
• Publish all Roadmap documents	Jan 2010