

# VRTAC- whitepaper on research

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## **Two thrusts:**

- Biomedical and imaging (as outlined by Dennis)
- Modeling and simulation of highly nonlinear processes

## **Expectations:**

Given the state budget climate, immediate funding is unlikely - we are “priming the pump” for future funding

# The Role of Modeling and Simulation in Hampton Roads

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## **Business impact**

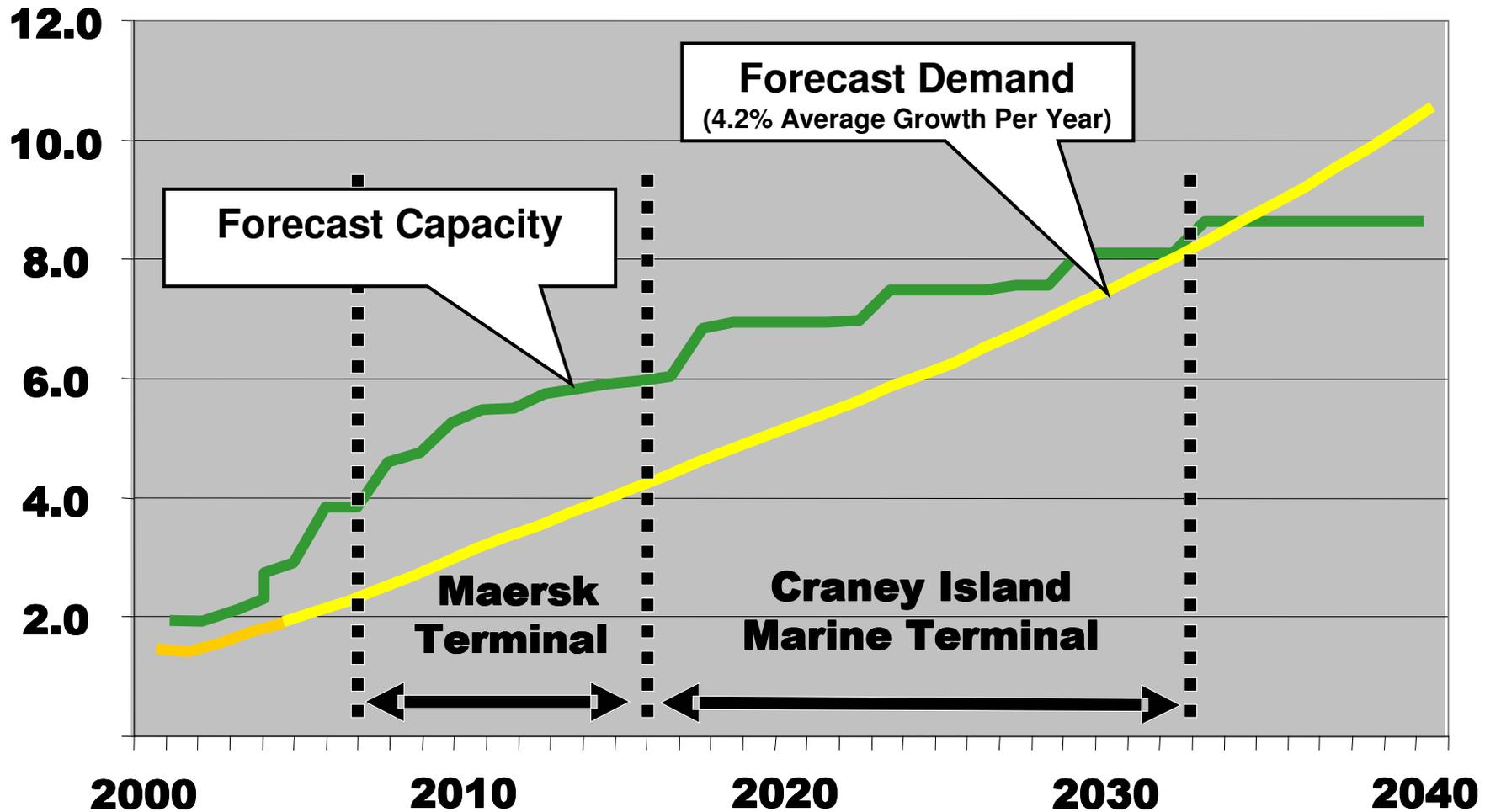
- \$450M/year business activity, expected to grow to \$800M/year in 5 years
- Second leading location for M&S (after Orlando)

## **Need for M&S:**

- Container traffic in Hampton Roads is expected to quadruple by 2030
- Vulnerability of Hampton Roads to hurricane and terrorist threats (M&S of traffic, emergency access, evacuation, supply-chain disruption, ...)
- Biomedical applications
- War games, hurricane models, ...

# Forecasted Growth at The Port of Virginia

(courtesy of Bob Sharak of HRP)



# M/S EMMA MÆRSK *Circa 2007*



**MÆRSK**



*Godspeed Brigantine, Circa 1607*

# M&S Expertise at William and Mary

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## **Human side of military simulation**

- (PMESSII, Anthropology)

## **Traffic and supply chain modeling:**

- Computational operations research program
- Business school

## **Hurricane probabilities and storm surge**

- VIMS researchers (H. Wang, J. Shen, ...)

## **Highly nonlinear processes**

- Theoretical analysis of highly non-linear processes (E. R. Tracy, J. van Rosendale, N. Zobin)

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# Theoretical Issues

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Need improved methods to predict the likelihood of 'extreme events' due to wind-driven waves.

These methods should include:

- Wave-kinetic models that include nonlinear effects (solitonic behavior and instabilities).
- Better treatment of the passage from deep to shallow water.
- Effects of bottom topography and obstacles on surface waves.
- *Nonlinear* wind-wave forcing.