

The Dynamics of Managing Undersea Cables: When Solution Becomes The Problem

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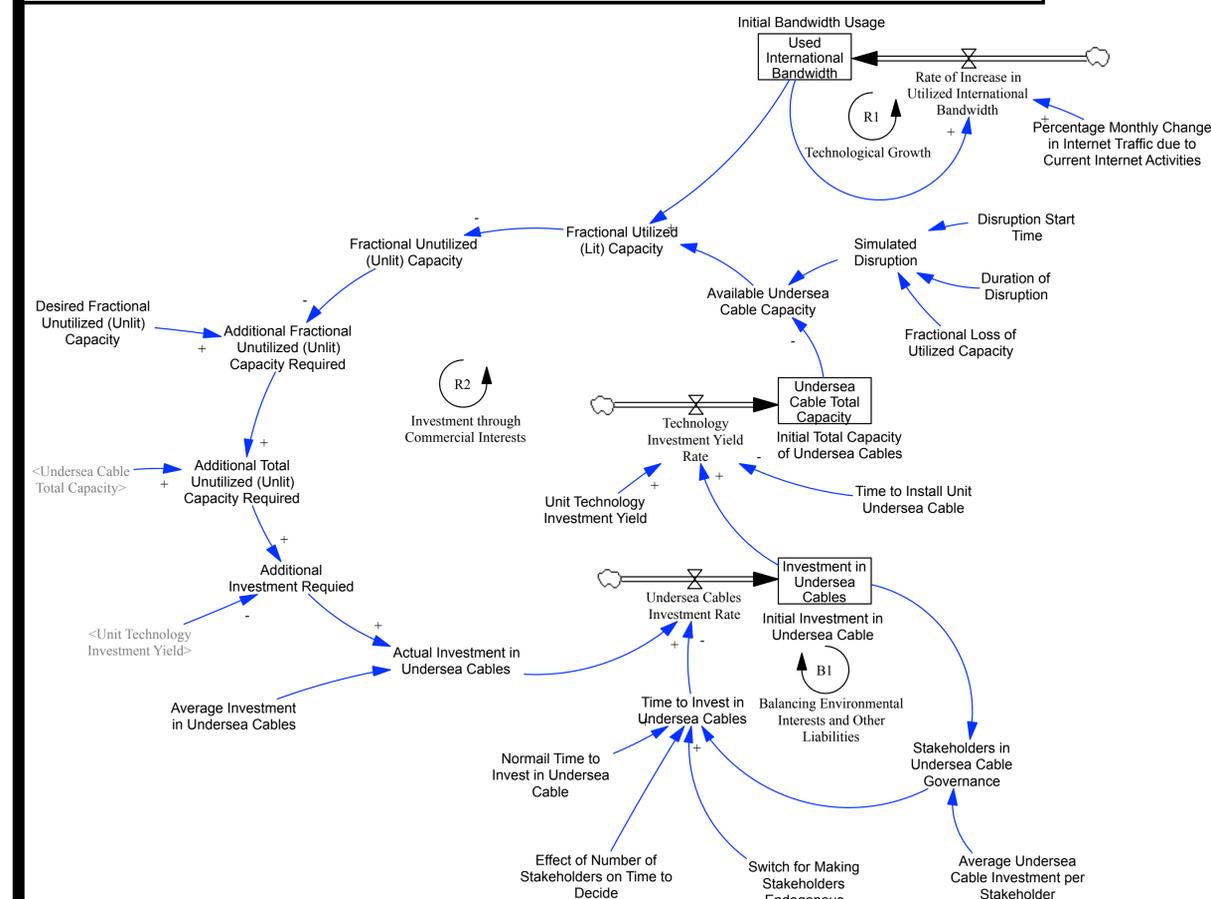
Workshop on
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Problem

In the U.S., approximately 95% of all international Internet and phone traffic travels via undersea cables. Nearly all government traffic, including sensitive diplomatic and military orders, travels these cables to reach officials in the field. The problem, however, is that the undersea cable infrastructure is susceptible to several types of vulnerability, including: rising capacity constraints, increased exposure to disruption from both natural and mad-made sources, and emerging security risks from cable concentration in dense geographical networks (such as New York and New Jersey, and places like Egypt/ Suez Canal.) Moreover, even under normal working conditions, there is a concern whether governance-as-usual can keep up with the future growth of Internet traffic. In this work, we explore the impact of these problems on the dynamics of managing undersea cable infrastructure.

(Publications: Proceedings of International System Dynamics Conference 2012; Included in www.SystemModelBook.org)

Model



Analysis and Results

Analysis of Steady State Error (SSE)

$$\text{Investment } \alpha (\text{Desired Margin} - \text{Actual Margin}) = \text{Steady State Error}$$

$$\text{Actual Margin } \alpha \frac{\text{Capacity}}{\text{Utilization}}$$

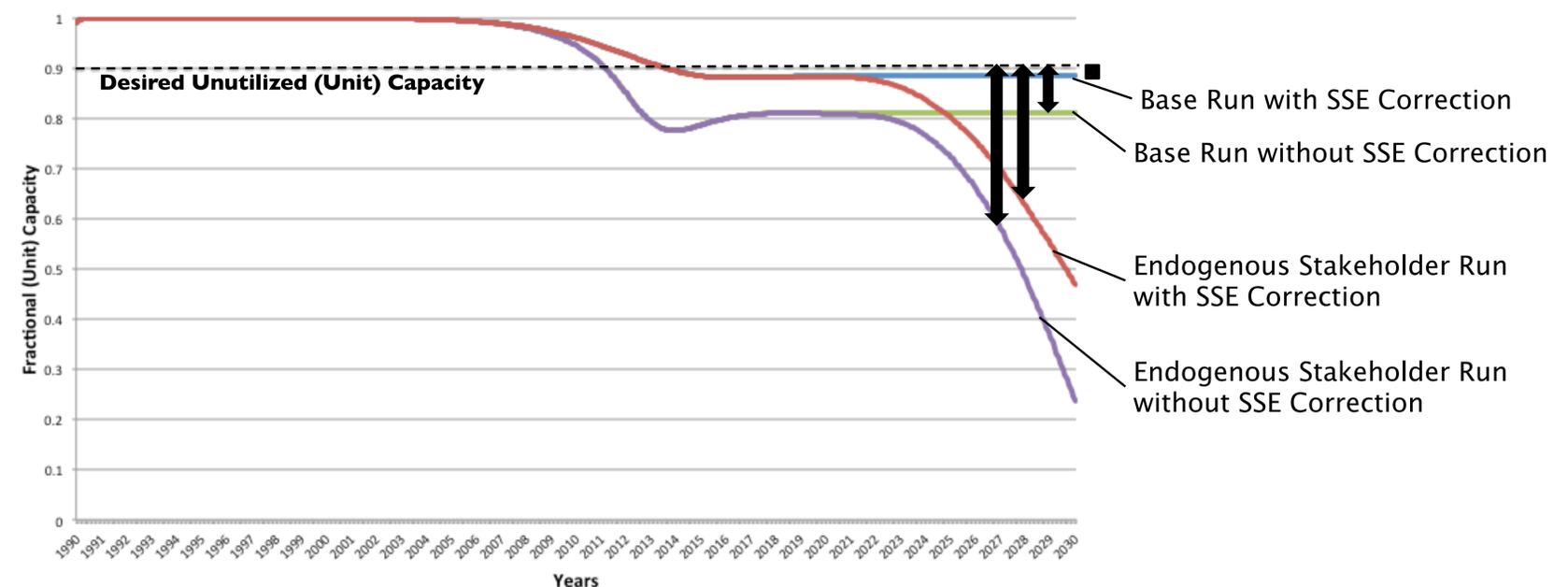
$$\text{Capacity } \alpha \frac{1}{\text{Time to Invest}}$$

$$\text{Time to Invest } \alpha (\# \text{ of Stakeholders})$$

Dynamic Complexities Complicating Decision Making

1. Utilization is rising exponentially
2. Time to investment varies with stakeholders

Steady State Error and its Correction



Conclusions

Policy Lessons

1. Counter to conventional wisdom, it may be more efficient to have fewer than a certain number investors in the undersea infrastructure where possible, to limit investment delays and ensures quick response when there are disruptions.
2. When large number of investors are necessary, public private partnership, being explored by International Cable Protection Committee, may work only when (a) partners participate not just in responding to disruptions but also in capacity planning, and (b) current values of parameters that cause the steady state error (i.e., additional capacity required, time to invest in and build undersea cables) are monitored and socialized with the partners, and efficient action is mandated accordingly.

Policy Alternative

Nations that are connected at their borders via roadways and railways ought to lay fiber connectivity when new road and railway infrastructure is built, to reduce load on undersea cable infrastructure, and improve response to disruptions.