Alex Zolan

size and mix, and the assignment of wash crews to heliostats to minimize the sum of 1. revenues lost due to heliostat soiling; 2. the costs of hiring wash crews and operating the vehicles; and 3. the costs of purchasing wash vehicles. They establish conditions for convexity of the objective function, and then propose a decomposition method that enables near-optimal solutions to the wash vehicle sizing and assignment problem on the order of a couple of minutes.

The proposed model recommends more wash vehicles when electricity pricing and average soiling rates are higher and when washing costs are lower. These solutions yield hundreds of thousands of dollars in savings per year over current industry practices.

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Dynamic inventory allocation for fashion apparel rentals and sales

There is a growing trend toward renting rather than permanent ownership of various product categories such as designer clothes and accessories. A major driver of this trend in the apparel industry is the behavior of fashion-conscious customers seeking variety.

Although the industry started with pure renters who are renting products at a fraction of the retail price, many apparel retailers now are simultaneously renting and selling their product line. In particular, there are retailers primarily known as renters who are selling on the side and those who are primarily sellers but renting on the side.

Retailers that offer the same product for sales and rentals need to effectively manage their inventory. It is important to note that once a unit is sold, the firm forgoes potential rental revenues from that unit during the remaining part of the season. Therefore, it is critical for a retailer to dynamically decide how much of its inventory to allocate for sales and rentals over time.

In their paper, "Optimal Dynamic Allocation of Rental and Sales Inventory for Fashion Apparel Products," Mehmet Sekip Altug from George Mason University and Oben Ceryan from City, University of London, first develop a consumer choice model that determines the fraction of the market that chooses renting over purchasing. They characterize the optimal inventory allocation policy and explore how market characteristics and prices impact inventory allocation.

The authors then discuss the value of dynamic allocation and observe that the profit improvement can be substantial. In addition, they propose a simple and efficient heuristic policy. Finally, they extend their analysis to study the optimal allocation policies for various business models with different prioritization schemes between sales and rental demand.

Mehmet Sekip Altug

Oben Ceryan

Overall, the authors believe retailers that simultaneously rent and sell can increase their profits by doing a dynamic allocation of sales and rental inventory throughout the season. In an industry with notoriously slim margins, this approach can make a meaningful difference.

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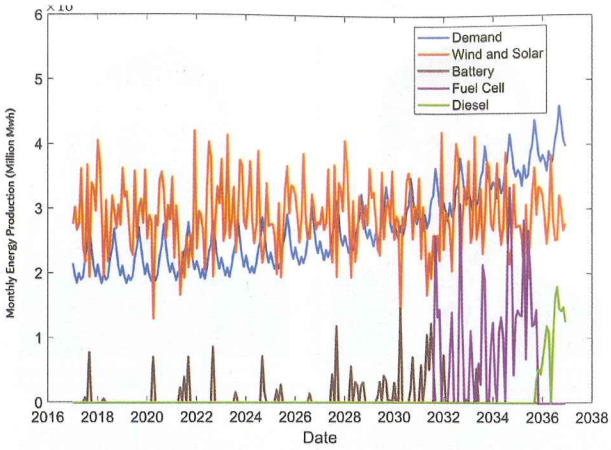
This month we highlight an article from *The Engineering Economist* (Volume 67, No. 1). The authors developed a decision-making framework to design flexible engineering systems, in this case for hybrid renewable energy systems. They measure simulated demand scenarios over a 20-year period to control total costs with the capability to respond to future changes.

A flexible design framework for renewable energy systems

Engineering systems often operate for a long period of time under varying conditions. When an engineering system is designed, there may be great uncertainty about the future, making decisions about how best to design the system difficult. Since engineered systems frequently face changes and unpredictability in their environments, these systems should be designed with the capability to respond to future changes.

The article, "Optimizing the Flexible Design of Hybrid Renewable Energy Systems," by Ramin Giahi, Cameron MacKenzie and Chao Hu at Iowa State University proposes a decision-making framework to design engineered systems with flexibility. With support from the Center for e-Design, the au-



A chart shows the projected output of various types of energy over a 20-year simulation.

Ramin Giahi

Cameron MacKenzie

Chao Hu

thors measure the value of expanding capacity in the future or the value of flexibility in complex engineered systems that require computationally expensive simulations to evaluate the objective function.

The framework is applied to solve a multistage decision-making problem for a hybrid renewable energy system (HRES) under highly variable demand over a 20-year planning horizon. The HRES in this article consists of electricity generated and stored by solar panels, wind turbines, electrolyzers, batteries, hydrogen tanks, fuel cells and diesel.

Different demand scenarios are simulated over the 20-year timeframe. The picture shows the performance of an HRES design under a high demand scenario. Solar and wind power can largely satisfy demand in the years 2017 to 2030. The HRES supplements solar and wind with the fuel cell and finally uses diesel as demand further increases in 2031-2037.

The team finds that if designers can wait and expand capacity later in the future, they can lower their overall costs. The value of expanding capacity is measured by comparing the total discounted cost without capacity expansion and the total discounted cost with capacity expansion. Enabling capacity expansion for the HRES 10 or 15 years after the system is initially designed can reduce total discounted costs by more than 33%.

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Call for papers for special issue on healthcare digital

IISE Transactions on Healthcare Systems Engineering is seeking paper submissions for a special issue focused on digital healthcare in early 2023. Potential topics include, but are not limited to, two categories: implementation science of digital transformation and innovation of digital healthcare solutions.

All papers should be submitted through the journal's ScholarOne website, *mc.manuscriptcentral.com/uhse*. In the submission process, please indicate it is for the special issue in the website prompt.

The deadline for submissions is June 15. Publication is scheduled for March 2023. For more information, contact editors Jennifer Percival at jennifer_percival@uml.edu or Tarun Mohan Lal at tarun.mohanlal@atriumhealth.org.