

# **The Food-Energy-Water Nexus 2018**

Topical Conference at the 2018 AIChE Annual Meeting

Pittsburgh, Pennsylvania, USA  
28 October - 2 November 2018

ISBN: 978-1-5108-7634-7

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2018) by AIChE  
All rights reserved.

Printed by Curran Associates, Inc. (2019)

For permission requests, please contact AIChE  
at the address below.

AIChE  
120 Wall Street, FL 23  
New York, NY 10005-4020

Phone: (800) 242-4363  
Fax: (203) 775-5177

[www.aiche.org](http://www.aiche.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

## TABLE OF CONTENTS

<b>(30a) Pittsburgh: Urban Agriculture and the Food-Energy-Water Nexus .....</b>	1
<i>Thomas Tarka</i>	
<b>(30b) Quantifying Virtual Phosphorus Flows in Interstate Food Trade: Implications for Environmental Sustainability .....</b>	<b>2</b>
<i>Nemi Vora, Elaine M Yates, Vikas Khanna</i>	
<b>(30c) Towards a Two-Level Superstructure Optimization Framework for Land Use Based on Food-Energy-Water Nexus .....</b>	<b>3</b>
<i>Yaling Nie, Styliani Avraamidou, Jie Li, Xin Xiao, Stratos Pistikopoulos</i>	
<b>(30d) Land Availability, Utilization, and Intensification for a Solar Powered Economy.....</b>	<b>4</b>
<i>Yiru Li, Rakesh Agrawal</i>	
<b>(30e) Microbial Community Profile Versus Water Quality in Urban Watersheds .....</b>	<b>5</b>
<i>Adrian Low, Matthew J. Rogers, Jianzhong He</i>	
<b>(30f) Mechanisms Whereby Microbes Promote Intermediate Soil Moisture Content .....</b>	<b>6</b>
<i>Yi-Syuan Guo, Jessica M. Furrer, Daniel J. Gage, Yongku Cho, Leslie M. Shor</i>	
<b>(30g) Nitrogen Efficient Fertilizer Materials.....</b>	<b>7</b>
<i>Jonas Baltrusaitis</i>	
<b>(80a) Food-Energy-Water Nexus Systems Engineering.....</b>	<b>8</b>
<i>Efstratios N. Pistikopoulos, Richard Allen, Yaling Nie, Styliani Avraamidou</i>	
<b>(80d) Renewable Carbons from Food Waste for Separation and Catalysis Technologies.....</b>	<b>9</b>
<i>Julia A. Valla, Yu Lei, David P. Gamliel</i>	
<b>(80e) A Computational Framework for Sustainable Waste Management and Simultaneous Recovery of Nutrients and Energy .....</b>	<b>11</b>
<i>Gerardo J. Ruiz-Mercado, Victor M. Zavala, Mariano Martin</i>	
<b>(120b) 2018 Outlook for Energy: A View to 2040 .....</b>	<b>12</b>
<i>Theodore J. Wojnar Jr.</i>	
<b>(120c) Energy Decarbonisation Scenarios .....</b>	<b>13</b>
<i>Kamel Ben Naceur</i>	
<b>(120a) Fundamental Research Needs to Advance Energy Technologies .....</b>	<b>14</b>
<i>Bruce Garrett</i>	
<b>(151b) Electrochemical Conversion of Ammonia and Nitrogen for Sustainable Food-Energy-Water.....</b>	<b>15</b>
<i>Gerardine G. Botte</i>	
<b>(151c) Encapsulation and Nanoparticle Formation for "Non-Standard" Applications .....</b>	<b>16</b>
<i>Robert K. Prud'Homme, Rodney D. Priestley, Leslie M. Shor, Douglas Scott, Jie Feng</i>	
<b>(304a) Energy-Water Nexus Study for a Mushroom Farming Initiative in Nigeria .....</b>	<b>17</b>
<i>Quinta Nwanosike Warren</i>	
<b>(304b) Sustainable Optimal Strategic Planning for Shale Water Management .....</b>	<b>18</b>
<i>Jose A. Caballero, Alba Carrero-Parreno, Viviani C. Onishi, Juan A. Reyes-Labarta, Raquel Salcedo-Diaz, Ruben Ruiz-Femenia, Ignacio E. Grossmann</i>	
<b>(304c) A Multi-Objective Energy-Water Nexus Planning Model: A Case Study of the Power Systems in Texas Edwards Aquifer .....</b>	<b>21</b>
<i>Cory Allen, Yaling Nie, Styliani Avraamidou, Efstratios N. Pistikopoulos, Xin Xiao</i>	
<b>(304d) Optimal Use of Thermal Membrane Distillation (TMD) for Treatment of Flowback Water.....</b>	<b>22</b>
<i>Kaiyu Cao, Priscille I. Etougue, Rajib Mukherjee, Debalina Sengupta, Joseph Sangil Kwon, Mahmoud M. El-Halwagi</i>	
<b>(304e) The Energy-Water Nexus of Thermoelectric Power Generation and Its Impacts in the Muskingum River Watershed in Ohio .....</b>	<b>23</b>
<i>Kyuha Lee, Sami Khanal, Bhavik R. Bakshi</i>	
<b>(304f) Systematic Analysis and Optimization of Water-Energy Nexus .....</b>	<b>24</b>
<i>Spyridon D. Tsolas, M. Nazmul Karim, M. M. Faruque Hasan</i>	
<b>(304g) Thermo-Economic Optimization Based Comparison of Membrane Distillation Vs Mechanical Vapor Recompression for Shale Gas Produced Water Treatment.....</b>	<b>25</b>
<i>Elmira Mohammadi Shamlou, Atoosa Mashayekhi, Radisav Vidic, Vikas Khanna</i>	
<b>(304h) Application of Adsorbate Solid Solution Theory to Design Novel Adsorbents for Arsenic Removal Using Computer-Aided Molecular Design.....</b>	<b>26</b>
<i>Rajat Doshi, Arti A. Rajput, Rajib Mukherjee, Suresh Gupta, Urmila M. Diwekar</i>	
<b>(311a) The Impact of Shale Gas and Oil on the Chemical Industry.....</b>	<b>27</b>
<i>Jeffrey J. Siirola</i>	

<b>(311b) Sustainable Energy and Chemicals: Past, Present, and Future .....</b>	28
<i>Joseph B. Powell</i>	
<b>(311c) Disruptions: What the Future May Hold .....</b>	29
<i>Scott F. Mitchell</i>	
<b>(311d) Geopolitical Factors Influencing the Evolution of the Chemical Industry.....</b>	30
<i>David West</i>	
<b>(311e) Agility &amp; Resilience: How to Maintain Career Competitiveness in the Changing Chemical Industry .....</b>	31
<i>Antonis Papadourakis</i>	
<b>(366a) Analysis of a Circular Economy: From Food Waste to Foods .....</b>	32
<i>Jeremy Taylor, Ross Lee, Tyler Casteel, Alyson Perez, Dan Spracklin, Justinus A. Satrio</i>	
<b>(366b) Re-Wiring the Domestic Food Trade for Reducing Irrigation Impacts in the United States .....</b>	33
<i>Nemi Vora, Colin P Gillen, Oleg A Prokopyev, Vikas Khanna</i>	
<b>(366c) Food, Energy, Fuels and Chemical Feedstocks from Rice Crops: Multi-Objective Optimisation of Multi-Product Value Chains for the Philippines .....</b>	34
<i>Stephen S. Doliente, Sheila Samsatli</i>	
<b>(366d) Modeling the Impacts of International Food Trade on Contaminant Transport and Human Exposure.....</b>	35
<i>Megha Bedi, Carla Ng</i>	
<b>(366e) Using Agricultural Wastes to Recover Rare Earth Elements from End-of-Life Materials.....</b>	36
<i>David W. Reed, Vicki S. Thompson, Yoshiko Fujita, Jacob Fisher, Michael Crain-Zamora, Yongqin Jiao</i>	
<b>(366f) Membranes for Nutrient Concentration, Industrial Separations and Applications Beyond .....</b>	37
<i>Jie Song, Jacob Moen</i>	
<b>Author Index</b>	