Clean Nuclear Energy for Industry: The Case for SMRs and Microreactors in Puerto Rico

Presented by: Shannon Bragg-Sitton Luis Reyes Eddie M. Guerra Ivan Lugo







GAIN Clean Nuclear Energy for Industry Webinar Series highlights the innovations in nuclear energy and associated integrated-energy options that may be beneficial to a wide range of industrial applications.

The intent is to develop connections between the nuclear community and the energy end-use community to communicate the benefits of **clean, reliable, and resilient nuclear energy**.







Shannon M. Bragg-Sitton, PhD

Lead, Integrated Energy Systems Idaho National Laboratory

Objective of the Clean Nuclear Energy for Industry Webinar Series

• Objective:

The GAIN Clean Nuclear Energy for Industry Webinar Series highlights the innovations in nuclear energy and associated integrated-energy options that may be beneficial to a wide range of industrial energy applications.

The intent is to develop connections between the nuclear community and the energy end-use community to communicate the benefits of clean, reliable, and resilient nuclear energy, allowing a discussion on requirements, considerations and concerns for energy system planning at "end use" facilities.







Past Webinars

• Part 1: Kick-off

April 16, 2020

- Introduces innovations in nuclear energy and associated integratedenergy options that may be beneficial to industrial energy applications
- Focuses on near-term demonstrations of nuclear integration with hydrogen production at existing nuclear plants ongoing projects

• Part 2: Advanced Nuclear Technologies May 29, 2020

 Features high-level presentations on the unique capabilities of advanced reactor technology concepts, highlighting key operational features, options to support industrial users, and potential deployment timelines.

• See https://gain.inl.gov/SitePages/GAINWebinarSeries.aspx for slides, webinar recordings and Q&A.













DESIGNING FUTURE ENERGY SYSTEMS

What goals are we trying to achieve?

How will energy be used?

What role(s) can each energy source fill?









IES: Using Energy Effectively and Efficiently





IES: Using Energy Effectively and Efficiently



Example: Hydrogen Production via Electrolysis



Why support multiple processes/products beyond electricity?

- 1) Provides second source of revenue
- 2) Provides energy storage, for electricity production or hydrogen user (e.g., chemicals and fuels synthesis, steel manufacturing, ammonia-based fertilizers)
- 3) Provides opportunity for grid services, including reserves and grid regulation



Nuclear Innovation: Clean Energy Future (NICE Future) — an initiative of the Clean Energy Ministerial



Initiatives under CEM are a country-led and opt-in partnership. The NICE Future initiative explores the potential for nuclear energy uses, innovations, and greater systems integration to accelerate progress toward clean energy goals.





International Energy Agency

External Partners

International Energy Agency **OECD** Nuclear Energy Agency International Atomic Energy Agency International Framework for Nuclear **Energy Cooperation** Generation IV International Forum ClearPath Third Way Energy for Humanity Energy Options Network Women in Nuclear Global International Youth Nuclear Congress Nuclear Industry Council Nuclear Energy Institute World Nuclear Association American Nuclear Society Electricite de France

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The CEM NICE Future initiative envisions a world in which nuclear energy innovations and applications advance clean energy goals. The initiative recognizes there is no one-size-fits-all solution to energy and fosters collaboration among clean energy supporters in exploring diverse solutions, including nuclear energy technology solutions, both electric and non-electric, for clean, integrated, and reliable systems of the future.





How do you envision meeting future **CLEAN** energy needs?





Image courtesy of GAIN and ThirdWay, inspired by *Nuclear Energy Reimagined* concept led by INL.

Download this and other energy park concept images at: https://www.flickr.com/photos/thirdwaythinktank/sets/72157665372889289/







Luis Reyes

Chair, Technical Advisory Board Nuclear Alternative Project

Former, Executive Director of Operations U.S. Nuclear Regulatory Commission







Eddie M. Guerra, P.E.

Co-Founder Nuclear Alternative Project

Senior Engineer **Arup**













Ivan Lugo-Montes

Executive Director **INDUNIV**

Part 1

Puerto Rico's Rich History in the Nuclear Field

1946 Atomic Energy Act Establishes the Atomic Energy Commission (AEC)



1957 University of Puerto Rico (UPR) signs contract with AEC





VIEW OF P.R.N.C. POOL REACTOR LOOKING TOWARD BRIDGE WITH CONTROL ROOM VISIBLE IN THE REAR

1960 Bonus Reactor Construction Starts



1970 Nuclear Engineering Dept established at UPR Mayaguez Campus



Construction Application to USNRC for a 600 MW Pressurized Water Reactor (NORCO PROJECT)



1980 National Academy of Sciences Study

Interim Report of the

Committee on Future Energy Alternatives for Puerto Rico

poned indefinitely in 1975. At this stage of its deliberations, the Committee believes that it would be advisable to preserve the nuclear option as a possible component of Puerto Rico's future electric power system, but for the next major addition to generating capacity, considerations of both scale and timing rule it out. A plant of over 600, megawatts' capacity (approximately the minimum economic size for a nuclear plant) would be undesirably large in relation to the total capacity of the WRA system. Unless economical small nuclear plants become available, it will be at least two decades before the Puerto Rico system becomes large enough to accommodate a nuclear unit. Furthermore, a: a practical matter, it would probably be impossible to complete a nucleur power plant by 1990. In addition, the relevance of the nuclear option to Puerto Rico is likely to depend on the clarification of national policy in several respects, notably the procedures for siting and licensing plants, ensuring safety, and providing for spent fuel management and waste disposal.

For these reasons and those set forth in Section TV

Energy Engineering Board Assembly of Engineering



2006 Grants Provided to UPR for Nuclear Engineering related course development and Instructors training



institutions in 28 jurisdictions to boost nuclear education and expand the workforce for nuclear energy. Congress provided NRC with \$15 million to supplement NRC's grant program.

The 88 grants are for faculty development (\$7.8 million), education scholarships and graduate fellowships (\$6.4 million), university curriculum development (\$4.7 million), and trade school scholarships (\$.75 million). Recipients included Minority Serving Institutions and Historically Black Colleges and Universities. They are located in 26 states, the District of Columbia and Puerto Rico.

2015 Puerto Rican Engineers in the U.S. Nuclear Industry Launch The Nuclear Alternative Project



Interest from Leadership in Puerto Rico



2010 Senate Energy Commission Larry Seilhammer Senate Resolution 890 Called to study feasibility of large nuclear plants



2016 CIAPR President Ralph Kreil Rivera (Now Chairman of PREPA Board of Directors) Proposed SMRs as an option to Puerto Rico's energy needs

2018 House Speaker Gabriel Rodriguez-Aguilo Resolution 1189 to study the feasibility of SMRs and Microreactors

	en la votación número 1 efectuada el m Generado el miércoles, 7	ión para la Medida 39 Informe X13 Aprobada iéreoles, 7 de noviembre de 2018 de noviembre de 2018	
Rep	resentante	Voto	
	se Vega, Néslor A.	A favor	
App	ite Dalmau, Javier	Ausonto	
Apa	ite Hemández, José F.	Ausonta	
Ban	hs Alemán , José A.	A favor	
Bion	chi Anglero, Carlos rin Ramoo, Árigol	A favor A favor	
Cha	hin Ramos, Angol bonier Chines, Eddle	A favor A favor	
Cha	bonier Laureano, María Milagros	Ausonto	
	dio Rodriguez, Manuel O.	A favor	
	Burgos, Ramón Luis /elle Colón, Nelson	A favor	
Dia	Collezo, José Anibal	A favor	
Fran	asi Atiles, Joel I.	A favor	
Gon	allez Mercado, José O.	A favor	
Herr	ández Alvarado, Urayoán	A tavor	
Hem	ández Montañez, Ratael alle Toro, Félix G.	A favor	
Labo	ine foro, Peak G. In Rodriguez, Yashira	A favor A favor	
Lópe	z Do Arrarán, Brenda	A favor	
Márc	uaz Labrón, Denis	En contra	
	Rodriguez, Maricarmen	A favor	
	s Garcia, Ángel ndez Ortiz, José Enrique	Ausente	
Maie	lez Nuñéz, Carlos J.	Ausente A favor	
Móni	lez Silve, Lydia	A tavor Ausente	
Mirai	ida Rivera , Guillermo	A favor	
Mora	les Rodríguez , Juan O.	A favor	
Nota	Albelo, Manuel A. mo Súarez, Jorge L.	Ausente	
Nava	rro Súarez, Jorge L. González, Jesús Manuel	A favor Ausento	
Ortiz	Lupo, Luis R.	Aucente A favor	
Paré	s Otero, Victor L.	A favor	
Poñe	Ramiroz, Ángel R.	Ausente	
	t Certiero, José J. r Ortiz, Luis	A favor	
	r Ortiz, Luis ones Irizarry, Michael Abici	A favor A favor	
Ram	os Rivera, María de Lourdes	A favor	
River	a Ortega, Refeel	Ausente	
Rivar	a Ruiz de Porras, Roberto	A favor	
Rodr	guez Aguiló, Gabriel guez Herrdindez, Jacqueline	A favor A favor	
Rom	guez Hernandez, Jacqueline ân López, Wilson J.	A favor A favor	
Sent	Rodríguez, Jesús	A favor	
Danti	ago Guzman, Pedro Julio	A favor	
Soto	Torros, Antonio L.	Ausente	
	s Cruz, Luis Raút s González - Victor M.	A favor A favor	
Torre	s Zamora, José E.	A favor	
	a Femández, José M.	A favor	
Varg	is Rodríguez, Reinaldo Ramos, Luis R.	Ausente	
Eliza	Certifico correcto conforme a nu conforma a nu peth Stuart Villanuava retaria de la Cámara	estro mejor conocimiento. Urbano Trinidad Hernández Secretario en Funciones	
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	GOBIERNO DE	PUERTO RICO 4ta. Sesión Ordinaria	
	GOBIERNO DE	PUERTO RICO 4ta. Sesión Ordinaria PRESENTANTES C. 1189	

Cámara de Representantes de Puerto Rice

6 de noviembre de 2018

A LA CÁMARA DE REPRESENTANTES DE PUERTO RICO:

La Comisión de Asuntos Internos de la Cámara de Representantes de Puerto Rico, previo estudio y consideración de la R. de la C. 1189, de la autoría del representante Rodríguez Aguiló, tiene a bien someter su informe recomendando la aprobación de la medida, con las enmiendas incluidas en el entiritilado electrónico que se acompaña, y cuyo titulo lee:

"Para ordenar a la Consisión de Gobierno de la Cámara de Representantes de Puerto Rico, realizar una investigación sobre la conveniencia y necesidad de establicer en Puerto Rico plantas nucleares para producir energia; las nuevas tecnologías modulares para el diseño y operación de las mismas sus características de seguridad, y para otros fines relacionados."

ALCANCE Y ANÁLISIS DE LA MEDIDA

La Resolución de la Cámara Núm. 1189, tiene el propósito de realizar una investigación sobre la conveniencia y necesidad de establecer en Puerto Rico plantas nucleares para producir energía; las nuevas tecnologias modulares para el diseño y operación de las mismas; sus características de seguridad; y para otros fines relacionados.

2019 DOE awards The Nuclear Alternative Project funds to study advanced reactors in Puerto Rico



Part 2

Feasibility Study for Advanced Reactors for Puerto Rico

Our Study: What we covered?



Our Study: The Team



Our Study: The Team

Technical Advisory Board



Luis Reyes Chair of the Board (Former Nuclear Regulatory Commission Executive Director of Operations)



Jeffrey Harper Vice President Strategy and Business Development





Dr. Jose Reyes Co-Founder and Chief Technology Officer





Dr. Abdul Dulloo Director, Plant Technologies & Product Development





David Sledzik Senior Vice President Sales & Commercial Operations





Marcus Nichols Director, New Reactor Deployment





Dr. Amr Elnashai Vice Chancellor Research and Technology Transfer



What we found? Need for baseload power

- Our study reviewed the June 2019 Version of the PREPA IRP.
- Puerto Rico is in urgent need for <u>new</u> <u>generation</u>, more specifically <u>base load</u> generation.
- 3,600MW planned retirements by 2030
- Current: operational 3,200MW installed capacity with 700MW reserves
- Expecting 3,000MW of peak demand for this summer
- To meet current RPS requirement of 40% renewable, IRP plans to install 1,800MW of PV and 900MW of battery by 2025 at a cost of about \$3.6 billion.



What we found? Need for baseload power

 Puerto Rico's daily electricity demand peaks at approximately 10% from average and utilization rates (load factors) in the range of 75%.





1.20





Energy and Economic Forecasts used in the IRP to justify PREPAs Plan for the next 20 years



Historical Correlation of Energy Demand and Economic Performance in Puerto Rico



For many years, local leadership thought that people were opposed or afraid of nuclear...that's not what we found



Figure 5-1: Municipalities of Interviewed Puerto Rician Residents
For many years, nuclear energy was deemed unfeasible due to the size and reserve margin requirements for an isolated grid like Puerto Rico. We found that SMRs and Microreactors fit Puerto Rico's planned grid.

Minigrids and microgrids: Proposed temporary (weeks to 1 month) partitioning of the Puerto Rican grid





Figure 4-4: Geographic Location of Minigrids 116.

The IRP calls for 1,800MW of solar PV for the next 5 years. This presents strict flexibility requirements for <u>ANY</u> generation source in Puerto Rico. Our study found that SMRs and Microreactors are designed for such conditions.



ESTADO LIBRE ASOCIADO DE PUERTO RICO LA FORTALEZA SAN JUAN, PUERTO RICO

Boletín Administrativo Núm. <u>OE-</u>1993-57

ORDEN EJECUTIVA DEL GOBERNADOR DEL ESTADO LIBRE ASOCIADO DE PUERTO RICO

PARA DECLARAR LA POLITICA PUBLICA ENERGETICA DE PUERTO RICO; ORDENAR A LAS DEPENDENCIAS GUBERNAMENTALES A LLEVAR A CABO SUS FUNCIONES DE MANERA CONSONA CON LA POLITICA PUBLICA ENERGETICA; ORDENAR AL DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES OFRECER UN PROCESO DE PARTICIPACION CIUDADANA PARA RECIBIR COMENTARIOS SOBRE EL PLAN DE IMPLANTACION DE LOS OBJETIVOS Y ESTRATEGIAS DE LA POLITICA PUBLICA ENERGETICA. A common misconception was that nuclear was prohibited due to a 1993 executive order. This is not the case.

CUARTO: Al considerar fuentes alternas para generar energía eléctrica, serán prioritarias las consideraciones ambientales, de salud y seguridad pública además de las consideraciones económicas, por lo cual actualmente la energía nuclear no luce como una fuente alterna viable;

In fact, the public service act allows nuclear generation companies to do business in Puerto Rico. A Variety of Applications Identified in Puerto Rico: Strong Focus on Distributed Generation and Microgrid Integration – Hospitals, military, energy-intensive industries, pharma, medical device and manufacturing, municipality consortiums.



Part 3

Puerto Rico's Pharmaceutical Industry



WHY PUERTO RICO





WHY PUERTO RICO

PUERTO RICO SPAI INNOVATION **B**TOP15 OVER 50 BIOPHARMACEUTICAL PRODUCTS MANUFACTURED

ТОР

OF THE 20

YEARS OF EXPERIENCE BIO-PHARMACEUTICAL AND MEDICAL DEVICE MANUFACTURING

- 70 MEDICAL DEVICES PLANTS
 - **46 BIOPHARMA PLANTS**
 - **10 AGBIO STATIONS**

MEDICAL DEVICE





WHY PUERTO RICO

PUERTO RICO BIOSCIENCE DESTINATION

MEDICAL

MEDICAL

DEVICES



BY LIFE SCIENCES

REPRESENTED

45% OF INDUSTRIAL JOBS REPRESENTED BY BIOSIENCE SECTOR



68% EXPORTS TO OVER 85 COUNTRIES

AUDITED BY ·USFDA ·GLOBAL REGULATORY AGENCIES

and the second State

SPECIALIZED

Energy needs of industry in Puerto Rico

- **Cost:** Attracting manufacturing to Puerto Rico will depend on competitive cost of electricity for energy-intensive industries.
- **Reliability:** risk of disrupting supply of fuel imports and exposure to extreme natural events



Current Alternatives Being Considered within the Industry





Puerto Rico Reshoring Pharmaceutical Manufacturing From Asia In Support of U.S. National Security

CONTACT

U.S. CONGRESSWOMAN JENNIFFER GONZÁLEZ-COLÓN REPRESENTING PUERTO RICO IN CONGRESS

ABOUT SERVICES MEDIA CORONAVIRUS CENSUS PUERTO RICO WEBINARS

Home » Media » Press Releases

Puerto Rico's Resident Commissioner leads bipartisan legislation that would secure the National Supply Chain



April 5, 2020 | Press Release

Washington, D.C.- Puerto Rico's Resident Commissioner, Jenniffer González-Colón introduced bipartisan leg jurisdictions, which poses a risk to U.S. supply chain as evidenced by the pandemic caused by Covid-19.

H.R. 6443, Securing the National Supply Chain Act of 2020, would secure the national stockpile supply cha States, including the territories. This initiative would help drive the consolidation of the manufacturing ind

Washington — Examiner

Peter Navarro calls on Congress to 'bring

home' manufacturing to Puerto Rico

by Katherine Doyle, White House Correspondent | 🔤 | May 28, 2020 12:00 AM

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Reliable Power is One of the Key **Enablers in Support** of The U.S. National Pharmaceutical Manufacturing Strategy



What's next?

Proposal to be submitted to U.S. DOE Site Suitability per U.S. NRC Reg Guide 4.7 for Various Regions in Puerto Rico



U.S. NUCLEAR REGULATORY COMMISSION OFFICE OF NUCLEAR REGULATORY RESEARCH **REGULATORY GUIDE** March 2014 Revision 3 Technical Lead Jacob Philip

REGULATORY GUIDE 4.7 (Draft was issued as DG-4021 on December 30, 2011)

GENERAL SITE SUITABILITY CRITERIA FOR NUCLEAR POWER STATIONS

A fully integrated approach to site suitability

I Di			_				energy	X Energy, LLC 801 Thompson Avenue	
GOBIERNO DE PU		Board of Directors 2020 President Derces Lepez-Lepez 2045		tour					
Negociado de Energía de Pue	Gabriel F. Rodríguez Aguiló Portavoz de la Mayoría Remementante Distrito 13 (Arecibe - Barceloneta - Clajes - Flor	Vice President Dr. Jorge Haddock University of FE System	February 27, 2020	teva		Westinghouse Non-Propriet	ury Cli June 10, 2020	🛞 HITACHI	GE Hitachi Nuclear Energy
January 28, 2019	Presidente o Distrito 13 CArecho - barceloneta - Claies - Ho Presidente de la Comisión de Calendarios y Reglas Especiales	Secretary Eric Sanchen Johnnen it Johnnen	Ms. Valarie Lugo Chief Operating Officer The Nuclear Alternative Proj	Teva Puerto Rico LLC P. O. Box 1005	February 24, 2020	(W) Westinghouse	Valerie Lugo		David T. Sledzik Serior Vice President, Sales / Joint Venture Alliance Leader
	February 24, 2020	Townsor Gustevo Hermida CEC Ceretruction Group	5826 New Tecritory Blvd #10 Sugar Land, TX 77479 valerie@nuclearalternativepr	Union St. 195 Km. 2.1 Fajardo, PR 00738-1005	Ms. Valerie Lugo The Nuclear Alternative Project (NAP)		Chief Operations Officer The Nuclear Alternative Project Inc. 5826 New Territory Blvd #1038	June 12, 2020	3901 Castle Heyne Roed, M/CA60 Wilmington, NC28401 USA
Eddie M. Guerra, P.E. The Nuclear Alternative Project Inc	Ms. Valerie Lugo	Jose E. Vidal. Past Freedomt	Ms. Lugo,	Date: February 21, 2020	Subject: Commitment Letter for Cost Sh	Valerie Lugo Chief Operations Officer	Direct Sugar Land, Texas 77479 USA	Valerie Lugo	T +1-910-819-6539 C 41-910-547-2764
9018 Carriage Point Dr Sugar Land, TX 77479	Chief Operating Officer The Nuclear Alternative Project	Directors: Manuel Laber-Victor Meecod DDDC /PEDCO	The pharmaceutical and medi crossroads and energy reliabi	Ms. Valerie Lugo	Project, Phase 2 of the Puerto Rico SMR DOE FOA-0001817.	Nuclear Alternative Project 5826 New Territory Bivd #1038	e-mai Subject: Letter of Intent regarding the Nuclear Alt	Chief Operations Officer The Nuclear Alternative Project Inc.	devid.sledzik@ge.com
United States of America	5826 New Territory Blvd #1038 Sugar Land, TX 77479	DDBC /FEDCO Lacy Crappe - E. Varela PERITE Total	constitutes the most ubrant is industry sector that represent	Chief Operating Officer The Nuclear Alternative Project	Dear Ms. Lugo,	Sugar Land, Texas 77479 USA	Our n study on the deployment of small modular reactor		
Dear Mr. Guerra:	valerie@nucleanalternativeproject.org	Wards Malderado	seek alternative sources of en with the potential to address	5826 New Territory Blvd #1038 Sugar Land, TX 77479	NuScale Power is pleased to provide this of		Dear Ms. Lugo:	Sugar Land, relias 77475 034	
Further to our conversations with (NAP) with respect to an unsolicit	Dear Ms. Luzo.	Healthcare Council Healthcare Council Herces Cebellere	The INDUNIV Board of Dire	valerie@nuclearalternativeproject.org	SMR & Micro-reactor Feasibility Study," pro (DOE) Fiscal Year 2020 announcement DE	Subject: Letter of commitment in support of the prope Project for the second phase of a feasibility study on th		Subject: Letter of commitment in support of the proposal second phase of a feasibility study on the deploy	
study the feasibility of advanced n (PREB) hereby expresses its interest		statur Sandra Rodriguez	NAP and DoE on January 27, providing Paarto Rico the op fael diversification. The Phas	Dear Ms. Lugo.	proposal to move forward with the feasibility advanced nuclear reactors in Puerto Rico in	reactor and micro-reactor technologies in Puerto Rico		technologies in Puerto Rico	
As part of our mission, the PREB is	Congratulations on the results of the Phase 1 of your Feasibility Stud see that the people of Puerto Rico are receptive to this new energy alte	Juan Seez.	group to better understand the that the collaboration between	It is the interest of the TEVA Falardo P.R. site managemen	Commission (USNRC) regulations.	Dear Ms. Lugo:	deployment of small modular reactor and micro-re	Dear Ms. Lugo,	
timely and reliable information or energy, whether by using fossil fue	see and an prope of reasoning output to and sen energy and	Jensica Sargiurjo Lille Cariba	bring great things, improving	Nuclear Technology Development Project by donating our time data in Phase 2 development. As a third party contributor we	Our unique SMR technology offers a new le suited for Puerto Rico. NuScale is currently	Westinghouse would like to express its support for the proposi is planning to submit to the U.S. Department of Energy F	a that: X-energy is the promoter, owner and developer of unding associated technologies including TRISO fuel.	GE Hitachi would like to express its support for the proposal	
or technology that may be used as a and reliable information includes	I must say, however, that Phase 2 of your study will be crucial. In Resolution and Public Hearings on this topic, we need Phase 2 to run st	Malia Garris- C. Martinez Avara	In order to supplement the Ph group, we encourage the appr	200 hrs from our engineering staff at an average rate of \$50 a total of \$ 10.000 to share the costs of data collection	undergoing USNRC design certification rev	Industry Opportunities for Advanced Nuclear Technology proposal seeks to complete the second phase of a feasibility	Deve	planning to submit to the U.S. Department of Energy Fundin opportunities for Advanced Nuclear Technology Developmer	it" (DE-FOA-0001817). The proposal seeks to
advances have led to the design of s	reliable and positive results as well. We are interested and willing to en	Grind Quiles BD Biasciences	NAP will evaluate the econor to deploy advanced reactors.	viability of this project.	development, testing and licensing, our SM deployment. We are pleased to inform you	reactor and micro-reactor technologies in Puerto Rico.	contribution not to exceed \$30,000. This in-kind co	complete the second phase of a feasibility study on the deple technologies in Puerto Rico.	oyment of small modular reactor and micro-reactor
This letter does not represent an e stating our openness and interest	2 of your study. I also plan to schedule the public hearings for Resolu study.	Millie Rivers Merck & Co.	scanario that could suppleme educational strategy.	Keep up the good work and please advise if you need anythin this project.	will culminate in a Final Safety Evaluation R year.	Westinghouse is currently developing the eVinci ²⁴ Micro-Re market consisting of remote communities, remote mines,	critica on the proposal but prefer our company name be w	GE Hitachi is currently developing the BWRX-300, a 300MW	
mission to gather and analyze in technologies and their potential to	suuy.	Migael Pervice Bayw	The Industry University Rese	and project.	NuScale is committed to providing up to \$4	Westinghourse has a basen interest in exploring the potential of Reactor, including the distributed energy needs of islands proposed by NAP therefore sligns well with the interest of V	such a	safety systems. It is the tenth evolution of our boiling water since GE began developing reactors in 1955. The BWRX-300	
We wish you well in your propor	I am sare you are already allocating your resources and efforts on this.	Earen Geratilez UNET	501c3 organization could ass medical device cluster in Pas and yield concrete, reliable as	Sincerely,	hours as needed to respond to information commitment is subject to the availability of it	the development of advanced micro-reactor technology.	Sincerely,	other renewables, and it's small, compact footprint makes it	an ideal solution for Puerto Rico.
alternate sources of power generat	to keep the conversation and achieve a greater understanding of the ge of using this type of power generation.	Carlos Bivers Velez STRYEER / MD Cluster Recald Pachece	Keep up the good work and p	Approved by:	We are excited by the groundbreaking work	Should the proposal be successful, Westinghouse will be wil contribution not to exceed \$37,000. This in-kind contribution	ne will Jeff Harper	Should the proposal be successful, GE Hitachi will be willing t not to exceed \$45,000 USD. This in-kind contribution will be	in the form of engineering labor hours dedicated to
Regards,	Keep up the good work and please let us know if you need anything fre	Validation & Eng. Group Carlos Ceines		101	with you to bring clean reliable energy to PL	hours dedicated to addressing requests for information receiv. We wish the NAP team success on the proposal. Should you		addressing requests for information received from the project	
04/1/h	assist on this study.	Principia Bene Di Cristina BLDM	Sincerely,	All 02.26.20 June		not heritate to contact me.	Vice President, Business Development & Strategy X Energy, LLC	We wish the NAP team success on the proposal. Should you hesitate to contact me.	need any additional information, please do not
Edison Aviles Delie Chairman	Sincerely,	Lifty Endrigners VOCES	Deter	Hector J. Rivera Juan Polanco	Best Regards, Reye, Ja.	Sincerely,	jharper@x-energy.com (301) 641-7906	If you have any questions, please feel free to contact me at y	our convenience.
	Hon. Gabriel Rodriguez Aguido	Executive Director Inin Lugo	Ivan Lugo-Montes Executive Director	Associate Engineering Director General Manag TEVA P.R. LTD TEVA P.R. LTD	José N. Reyes, Ph.D.			Kind Regards,	
C	Hon. Gabriel Rodriguez Aguilo	Director Scientific Affairs : Carlos Tollinche			Chief Technology Officer and Co-founder	Abdul R. Dulloo Director, Plant Technologies & Product Development Westinghouse Electric Company LLC			
Edificio World Plaza, 268 Avc. Muf Tel, 787.5	House of Representatives of Puerto Rico	ENDERFY Partners : BIO	1042 Tail. 787-77		José N. Reyes, Ph.D Chi 1100 NE Circle Blid., Sale 200, C	Phone: +1 (412) 374-4464 Mobile: +1 (412) 378-9074		(Let ge	
	El Capitolio, Apartodo S	PIA PIRMA PIRCC			COPYRIGHT 6 2019 NUSCALE POWE	Email: dullocar@westinghouse.com	www.x-e	David Sledzik Senior Vice President, Sales / Joint Venture Alliance Leader	
	II Capitolio, Apertodo 9 1, 787-5	100407 187 0224886 * 1-78	1044-3300			© 2020 Westinghouse Electric Com All Rights Reserved	any LLC		

Community + Industry + Government + Technology

Figure 9-1: Timeline for Earliest Case Scenario Deployment in Puerto Rico

020	2021	2022	2023	2024	2025	
		Work	in Puerto Rico			
Communi	ity educational campaign for adva	nced reactors				
Private se	ector, biopharma and manufacturi	ng industry engagement				
	Economic impact analysis					
	General site suitability assessment per Reg Guide 4.7	Site Characterization & Environmental Impact Assessment NRC ESP or COL application				
Participate IRP review process	Grid analysis	University of Puerto Rico rein courses in nuclear engineerin				
		Establishment of vocational to courses	raining			
	oublic hearings for House	IRP revision process				
Resolutio	n 1189	Revision of key statutes and e	energy law			
	Pro	ojections for U.S. Advanc	ed Reactor Deployment	t in the U.S.		
NRC issue	es first SMR design certification	UAMPS COL Application for IN	IL Site	UAMPS start construction at INL S	ite	
*	US DOE selection for demon projects	stration				
	Microreactor NRC COL appli	cation				

Figure 9-1: Timeline for Earliest Case Scenario Deployment in Puerto Rico

020	2021	2022	2023	2024	2025	
		Worl	< in Puerto Rico			
Commun	nity educational campaign for adva	anced reactors				
Private s	sector, biopharma and manufactur	ing industry engagem				
	Economic impact analysis					
	General site suitability assessment per Reg Guide 4.7		ronmental Impact Assessment	NRC ESP or COL application		
Participa	Grid analysis	University of Puerto Rico re courses in nuclear engineer				
IRP revie process		Establishment of vocational courses	training			
	public hearings for House	revision process				
Resolutio	on 1189	- nevision of key statutes and	energy law			
	Pi	ojections for U.S. Advar	nced Reactor Deployment i	in the U.S.		
NRC issu	es first SMR design certification	UAMPS COL Application for	INL Site	UAMPS start construction at INL Site		
*	US DOE selection for demo projects	nstration				
	Microreactor NRC COL appl	ication				

¡Gracias!

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www.NuclearAlternativeProject.org

Knowledge Is **Power.** Conocimiento Es **Poder.**



Questions?







ANS Young Members Group upcoming events:

- July 1: Spotlight on National Labs: Pacific Northwest National Lab
- July 2: Virtual Happy Hour Networking
- July 15: Spotlight on National Labs: Lawrence Livermore National Lab
- July 21: Virtual Trivia
- July 28: Spotlight on National Labs: Oak Ridge National Lab

Learn more and register at **ans.org**.