TRANSNATIONAL ACCESS
USER PROJECT FACT SHEET

USER PROJECT	
Acronym	**D-POVERED**
Title	**D-POVERED: Dynamic Performance assessment Of Variable Electricity Renewable-based generation units in Distribution systems**
ERIGrid Reference	**04.014-2018**
TA Call No.	**4**

HOST RESEARCH INFRASTRUCTURE			
Name	**D-NAP**		
Country	**United Kingdom**		
Start date	**January 28, 2018**	**Nº of Access days**	**25**
End date	**April 1, 2020**	**Nº of Stay days**	**17**

USER GROUP	
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Organization (Leader)	**Virginia Tech (formerly Washington State University)**
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1. USER PROJECT SUMMARY (objectives, set-up, methodology, approach, motivation)

This work proposed, implemented, and bettered a control strategy dubbed set point automatic adjustment with correction enabled (SPAACE) as an add-on strategy to improve the performance of an existing controller when the controller itself is black boxed---a common scenario with inverters associated with utility-installed renewable systems. This work implements a smooth variant of SPAACE in an experimental test bed to evaluate the performance of a proposed linear prediction strategy in several scenarios. This new strategy allows for simpler and faster implementation of SPAACE in practical systems as shown in Fig. 1.

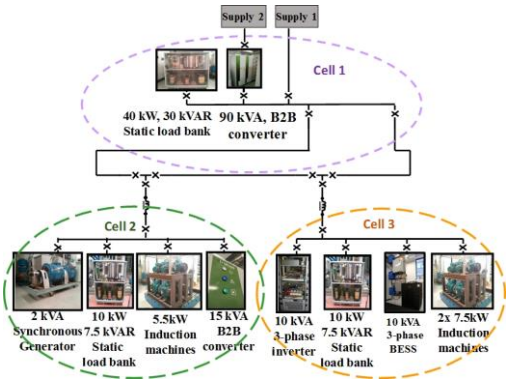
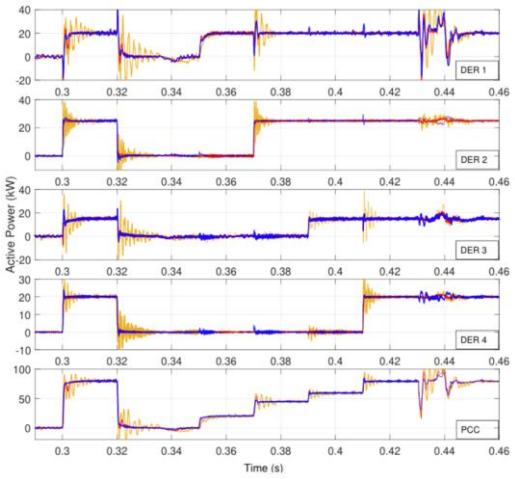


Figure 1. Setup schematic diagram

2. MAIN ACHIEVEMENTS (results, conclusions, lessons learned)

We have created an add-on function to improve the performance of existing controllers when the system characteristics changes and the controlled unit is sensitive to overvoltages and overcurrents. This add-on controller, referred to as SPAACE, uses prediction of the system response to modulate its set point to achieve the desired response trajectory. This work presents a smooth modulation strategy for SPAACE and discusses the performance of different prediction strategies, as validated based on a hardware test bed. Our extensive case studies show the superior performance of a simple, linear-based prediction law in appreciably improving the dynamic response characteristics, e.g., settling time, overshoot, and tracking error, of a DER interfaced by inverters.



3. PLANNED DISSEMINATION OF RESULTS (journals, conferences, others)

1. M. H. Syed, E. Guillo-Sansano, A. Mehrizi-Sani, and G. M. Burt, “Prediction strategies for smooth set point modulation to improve sensitive DER response,” in IEEE PES General Meeting, Montreal, QC, Aug. 2020.
2. M. H. Syed, E. Guillo-Sansano, A. Mehrizi-Sani, and G. M. Burt, “Facilitating the transition to an inverter-dominated power system: Experimental evaluation of an integrated predictive controller,” IEEE Access, Apr. 2020, submitted for review (first revision).
3. M. H. Syed, E. Guillo-Sansano, A. Mehrizi-Sani, and G. M. Burt, “Load frequency control in variable inertia systems: Architecturally flexible set point modulation,” IEEE Power Eng. Lett., Dec. 2019, submitted for review (PESL-00306-2019.R1).
4. M. H. Syed, E. Guillo-Sansano, D. Wang, A. Mehrizi-Sani, G. M. Burt, and Y. Xu, “Coordinated predictive control of distributed energy resources for dynamically robust regulation as a virtual power plant,” in IEEE Int. Conf. Ind. Inform. (INDIN), Guangzhou, China, Jul. 2020.
5. A talk was planned at the University of Strathclyde in March 2020 but the trip was cancelled due to COVID-19. We hope to be able to reschedule this trip at a later time.