

ESS in iFAST

Anders Sunesson WP 17

Marko Kalafatic WP 17 leader

Mamad Eshraqi Beam Physics GL

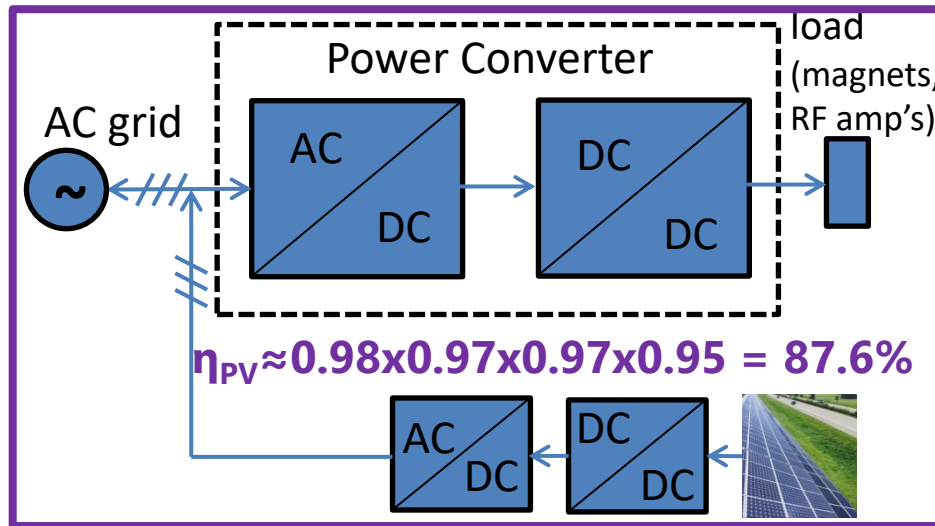
www.europeanspallationsource.se

April 2023

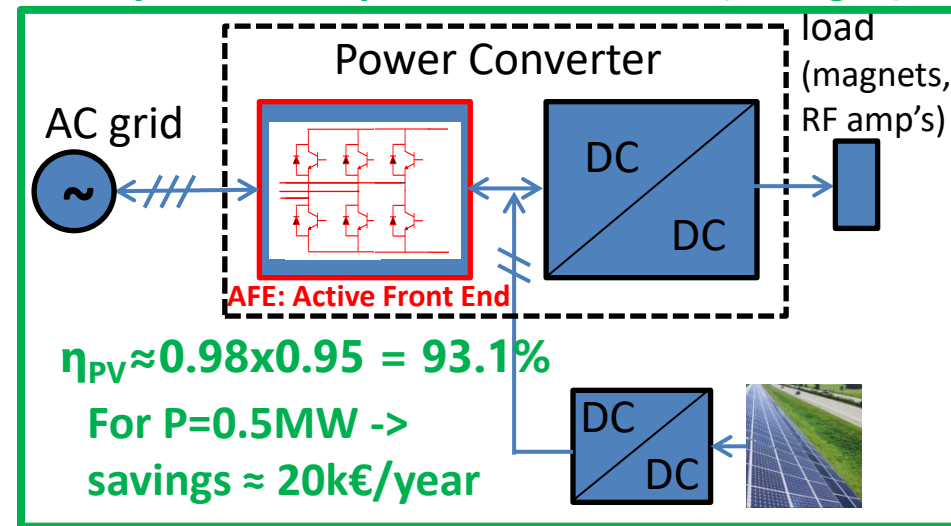
- Sustainability in accelerator operation:
 - PV installation to supplement the grid – considerable savings possible
 - More efficient DC/DC converter to directly power equipment (in fact, most electronics is powered by DC!), for example to 1.1 kV voltage, which would allow direct powering of HV modulators with higher efficiency
- Improved power converters in general using active frontends – less need for compensation for flicker etc
- Workshop 2023 moved to 2024. Suggested focus Efficient Power converters and solar power generation optimization
- ESS co-applicant to HORIZON 2023 program FlexRICAN geared towards sustainability and flexibility in how you power facilities

Alternatives

Alternative 1:
PV injected into the AC grid (4 stages)

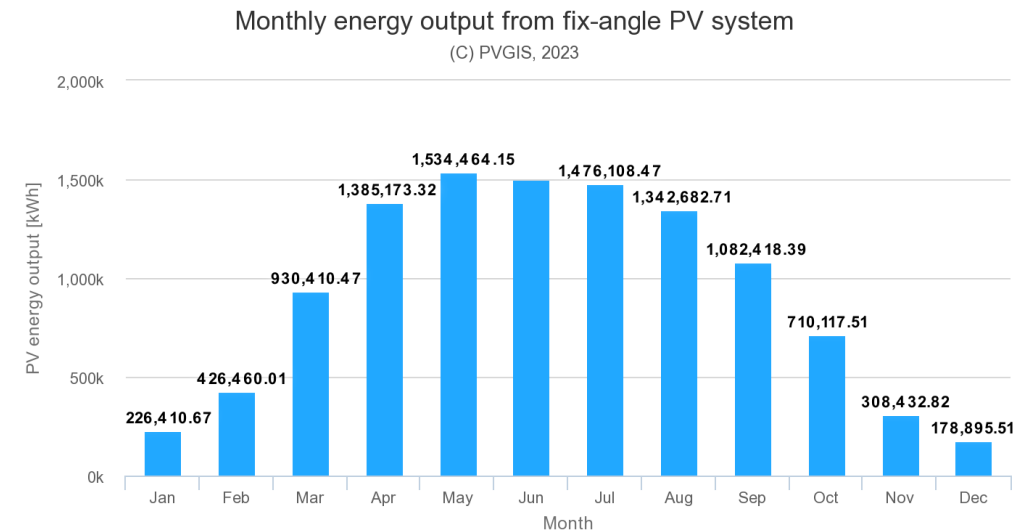


Alternative 2:
PV injected into power converters (2 stages)



Possible power savings using PV

- Using public websites, ESS can quite easily cover enough ground on the site to install more than 10 MW of solar power
- From PVGIS, this area would allow generation of 11 GWh per year
- Combining with HV Power need for ESS 2 MW linac, savings of ca 1 M€/year possible
- DC/DC feeding would add ca 50 kEuro

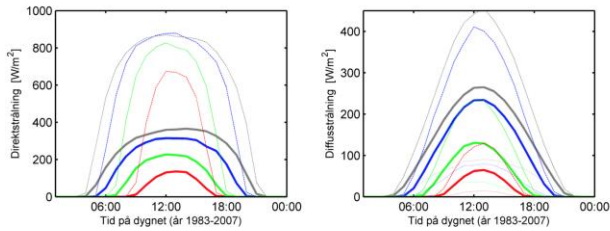
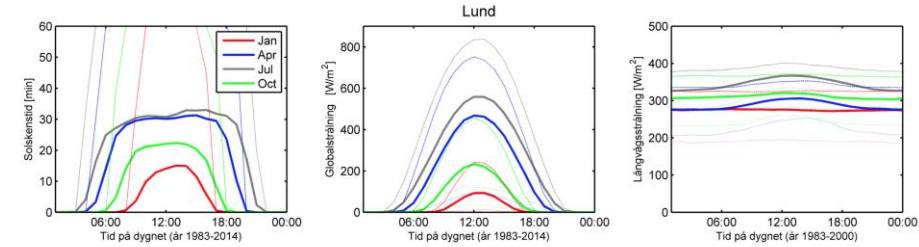


FlexRICAN application highlights

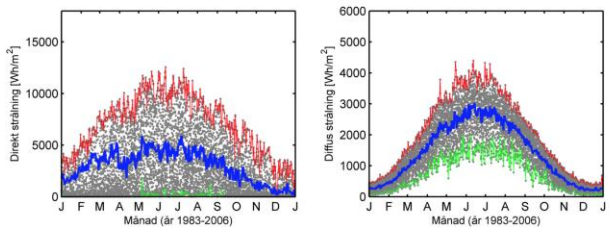
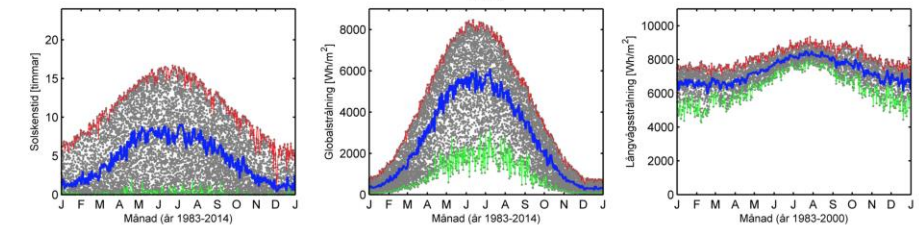
- Flexibility in powering Research Infrastructures
- Optimising solar power set-ups
 - Validate models for solar irradiation and how they work over time in a pilot set-up
 - Actually design DC/DC converters and the system to employ them
- Develop efficient energy storage systems
 - Employ batteries to “even out” variations in sustainable sources power delivery and stabilise the grid
- Recover excess heat
 - Use warm cooling water in district heating that otherwise would have gone to waste
 - Use also lower grade water (possible for some installations)

SOLAR CELLS POWERING THE NEUTRON SOURCE

- Panels are 1.1 x 1.75 m, each rated at 410 W
 - With ~34k panels the installed capacity is ~14 MW, total cost (incl VAT): 154 MSEK



Daily variations



Annual variations



	Direktbetalning	Leasing
Solpaneler	191 945 536 kr	
Månadsavgift	0 kr	
Avdrag för grön teknik	-37 237 434kr	
Din investering	154 708 102 kr	
Uppskattad årsbesparing	30 515 619 kr	
Återbetalningstid	4 år	

	Direktbetalning	Leasing
Solpaneler		0 kr
Månadsavgift		1 439 592 kr
ROT-avdrag		-359 898 kr
Din månadskostnad		1 079 694 kr
Uppskattad månadsbesparing		2 542 968 kr