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Top-level Research Initiative

# Advanced Research Workshop “Triple Net Zero Energy Water and Waste Models Applications” 17-19 February 2015 Sonderborg, Denmark

<http://www.sdu.dk/nato/arw>

Prof. Dr. Michael Evan Goodsite (DK) and  
Prof. Dr. Sirkku Juhola (FI) Co-Directors

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## *Co-Directors and support:*

- ✧ **Prof. Dr. Michael Evan Goodsite**, Professor of Atmospheric Chemistry, Climate and Global Processes and Head of Department of Technology and Innovation at University of Southern Denmark and Director of Nordic Centre of Excellence for Strategic Adaptation Research, Denmark
- ✧ **Prof. Dr. Sirkku Juhola**, Professor of urban environmental policy at University of Helsinki and Aalto University, Chief Scientist of Nordic Center of Excellence for Strategic Adaptation Research, Co-chair of the Climate Panel of the Government of Finland
- ✧ NATO ARW Grant of 50.000 € (SPS Ref. no.: 984778) additional support from University of Southern Denmark (SDU), NCoE NORD-STAR and University of Helsinki

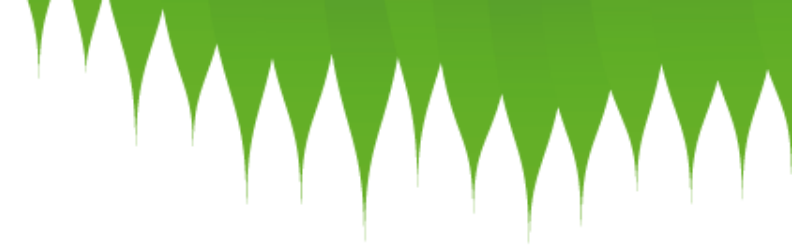


## *Vision* of the workshop:

- ✧ Bases and installations can and should be used as “Green Development Community Laboratories” i.e. as communities where new green technologies that can benefit NATO and host militaries as well as communications and awareness may be tried and developed. Best technology and practice should be exchanged with society
- ✧ Improve the bottom-line for NATO/Host militaries as land-owners, energy users, transporters and citizens
- ✧ If it makes sense for the Military, it will make sense for society. By learning how to create awareness and ownership in the community of soldiers and dependents, we learn how to do this in our own society

## *Aim* of the workshop:

- ✳️ Contribute to existing knowledge of effective resource planning and management in security-related civil science and technology
- ✳️ Learn from and transfer knowledge of civilian initiatives to military compounds (focus on installations...not “camps”) and back again
- ✳️ Span theory, methods, and applications in a holistic approach to energy, water and waste management that could/should be used at military installations
- ✳️ The *focus* for this ARW is on “green installations” i.e. non-mobile installations, rather than “green camps”



## *TripleNetZero:*

- ✧ Net zero energy installation (NZEI) is an installation that produces as much energy on site as it uses
- ✧ Net zero water installation limits the consumption of freshwater resources and returns water back to the same watershed so not to deplete the groundwater and surface water resources of that region (quantity and quality)
- ✧ Net zero waste installation reduces, reuses, and recovers waste streams, converting them to resource values with zero landfill
- ✧ Operational concerns must be top priority – what is in it for the soldier/commander? Awareness and dialog with internal and external stakeholders is key...how to decide and how to create new policy?

## Benefits of TripleNetZero:

- ✧ The approach is comprised of five interrelated steps: reduction, re-purpose, recycling and composting, energy recovery and disposal
- ✧ Assessment of the (US) DoD wide strategy in The Military Engineer March-April 2011 that implementing a balanced triple net strategy has a positive effect on (US) DoD financial, social and ecological interests while supporting operations

<http://www.bioengineering.com/documents/DODNetZeroStrategy-March-Aprilissue.pdf>

## ***Rationale*** for the workshop:

- ✧ After three years since the publication of the planning and assessment guide, actual cases and experience with implementation of triple net zero are limited
- ✧ The US has six triple net zero installations and will most likely require all installations to implement net zero policy
- ✧ NATO does not yet have any “green camps” or “energy efficient” installations – DK is testing three
- ✧ What is holding this back and how may exchange of experiences in urban centres leading in this, such as Sonderborg and other examples, enable the implementation of this strategy?

## *Practical plans*

- ✧ Denmark and Finland are countries that have advanced energy efficient civilian systems implemented in various sizes, ranging from remote villages to medium sized towns
- ✧ We will showcase a town at the size of 10,000 to 50,000 inhabitants that takes into account triple net zero footprints for energy, water and waste, Sonderborg, Denmark.
- ✧ We will examine how these could be transferred to the military with the benefit of reducing fossil fuel consumption and the logistical footprint
- ✧ Aside from the core triple net zero areas, we will examine decision making and policy as well as Awareness and Dialogue



# Green Urban Transition



ProjectZero as an urban transition-catalyst

**Peter Rathje, Managing Director**  
**ProjectZero Company**

# Transitioning Sønderborg (Denmark)

from farming, industry, knowledge to Bright Green Business

- fresh seawater
- great nature
- tourism
- **experience economy**



- farming
- industry
- knowledge
- **Bright Green Business**
- **Danfoss HQ**



- 76.000 citizens
- 440.000 pigs, 250.000 hens
- 500 km2 area
- District heating networks
- Natural Gas pipeline



Copenhagen

Sønderborg

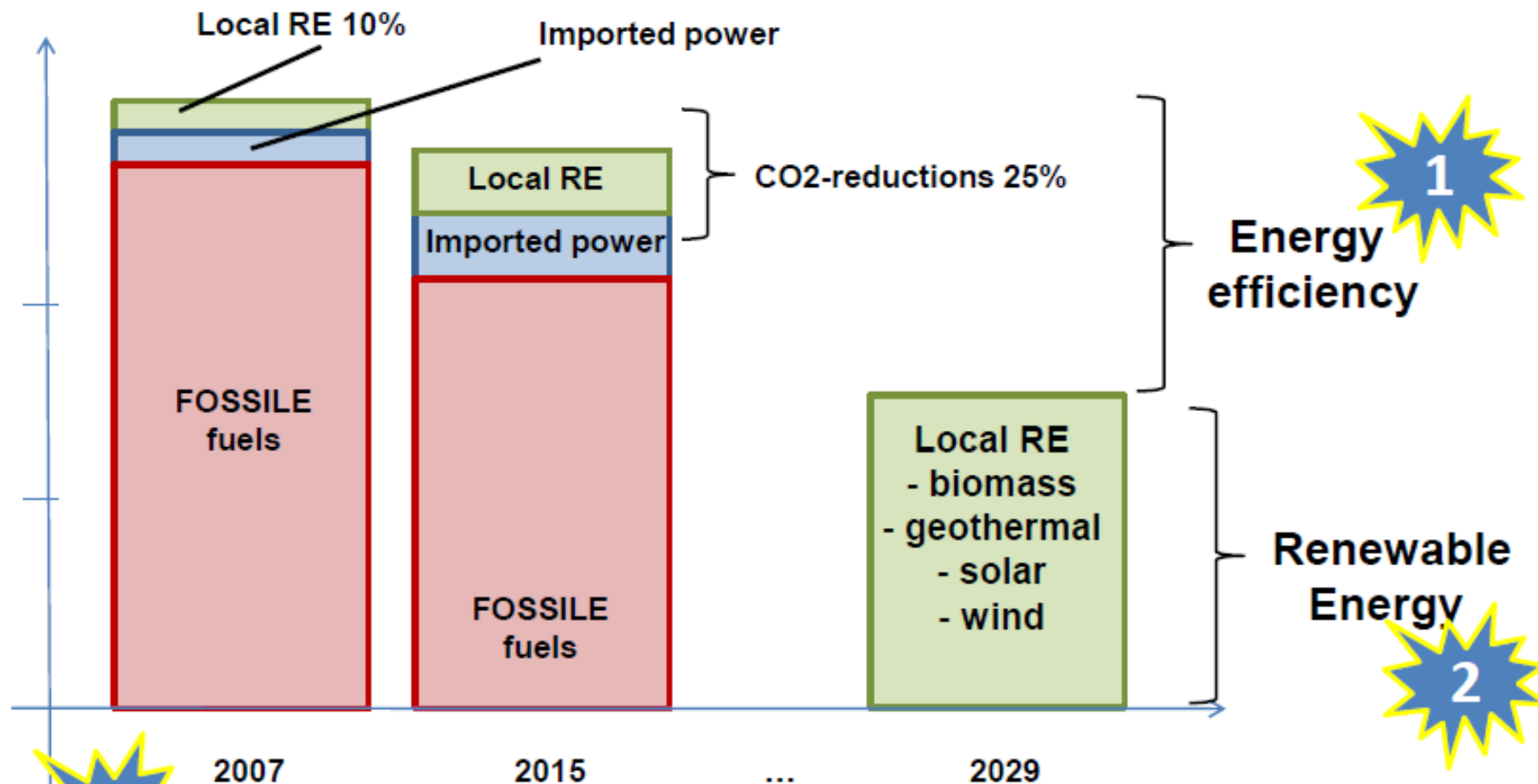


722.000 ton  
of emissions

# Transitioning the energy-system using only step 1 + 2



# Modeling our 2029-solution



Based on the areas own renewable resources

# Our ZEROcarbon masterplan outline directions and how to achieve 50% carbon reduction by 2020

## Energy Efficiency Improvement

- Energy retrofit of houses & buildings including PV cell-production
- Intelligent Heat pumps in rural areas
- Energy retrofit of companies, shops, offices
- Green transportation including electrical cars

## A New Green Energy Infrastructure

- Green District heating in the urban areas
- Wind turbines onshore & coastal near
- Biogas plants processing manure

## A Dynamic Energy system

## Learning and Competencies

## Changing the mindset and thinking





# Major achievements first 5 years

- **22% CO<sub>2</sub>-reduction during 2007 – 2012**
  - Well on our way to achieve 25% reduction in 2015
  - And a 50% reduction by 2020
- **800+ Green Jobs Created**
  - In the construction industry
  - Green district heating
  - Energy consulting
- **Positioning Sønderborg as a leading ZEROcarbon community**
  - Setting a new direction with future common goals to be achieved
  - Enterprises and educations align with the new direction
  - Best practice national and international cooperation



# Scaling in Denmark

- Regional Strategic Energy Planning
  - Region of Southern Denmark
  - 22 Municipalities
  - Energy and utility companies
  - Lean Energy Cluster
  - ProjectZero
- Bright Green Business
  - Sønderborg, Kalundborg, Bornholm, Frederikshavn, Thisted, Samsø
- Copenhagen, Aarhus & Sønderborg
  - Coastal near wind-turbines
  - Green district heating



### *Organization of the workshop:*

- ✧ Six working groups, each containing five or six planned members from academia, the military and objective industry – focused this year on installations rather than bases
  - 1) Net zero carbon/Energy (likely more than 6 participants)
- ✧ 2) Net zero waste water
- ✧ 3) Net zero solid waste
- ✧ 4) Planning
- ✧ 5) Decision making and policy
- ✧ 6) Awareness, Communication and visualization of triple net zero initiatives
- ✧ Participation by invitation only and limited by NATO policy as to who and how many may be supported and by what
- ✧ Press and observers incorporated into plenary events only



## Outcomes/deliverables:

- \* Creation of network of scholars and professionals with similar interests - support to the various “Green Defense” Networks and Initiatives within NATO – knowledge generation instead of industrial innovation – ***we are working with industry, but this is not a place for showcasing industrial solutions***
- \* A policy brief of main findings and guide of “best practices”
- \* The ARW must result in an edited book (edited by the ARW organizers) in the NATO Science Series, as well as planned peer reviewed publications on the same topics in peer reviewed journals in relevant fields. ***Each working group is responsible for delivering at least one chapter!***
- \* We may attempt a special edition of a Journal as well.

## Participating countries (to be determined based on input from Working Group Chairs):

- ✧ NATO: Canada, Denmark, Germany, Greece, Iceland, Lithuania, Norway, Spain, Turkey and the US
- ✧ Partner countries: Australia, Austria, Finland, Ireland, Sweden and Republic of Korea

## *Practical plans:*

- ✳️ Workshop to be held at Mads Clausen Institute at the University of Southern Denmark at Alsion, Sønderborg (Sønderborg) from 17-19 February 2015. Delegates will stay at the Comwell Sønderborg. Travel, lodging and food covered for all active participants (i.e. must give a talk and participate in the book) under NATO travel regulations
- ✳️ Organising committee consists of the co-directors and:
  - ✳️ Director, Peter Rathje, ProjectZero, Denmark
  - ✳️ Dr. Igor Linkov, US Army ERDC, USA
  - ✳️ Dr. James H. Lambert University of Virginia, USA
  - ✳️ Project management from SDU Staff
- ✳️ Working Group Chairs responsible for filling out their own time at the conference and are part of the overall scientific committee
- ✳️ Input from Green Defense stakeholders, and briefing to Danish and other NATO MoD and relevant commands.



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**Thank you for your attention**

**Questions or comments are  
welcome:**

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**<http://www.sdu.dk/nato/arw>**

**For updated information/agenda and participant list**

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