Skydd av trähus vid skogsbrand. En del av forskningsprojektet TREEADS

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RISE Fire Research

TREEADS has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036926.

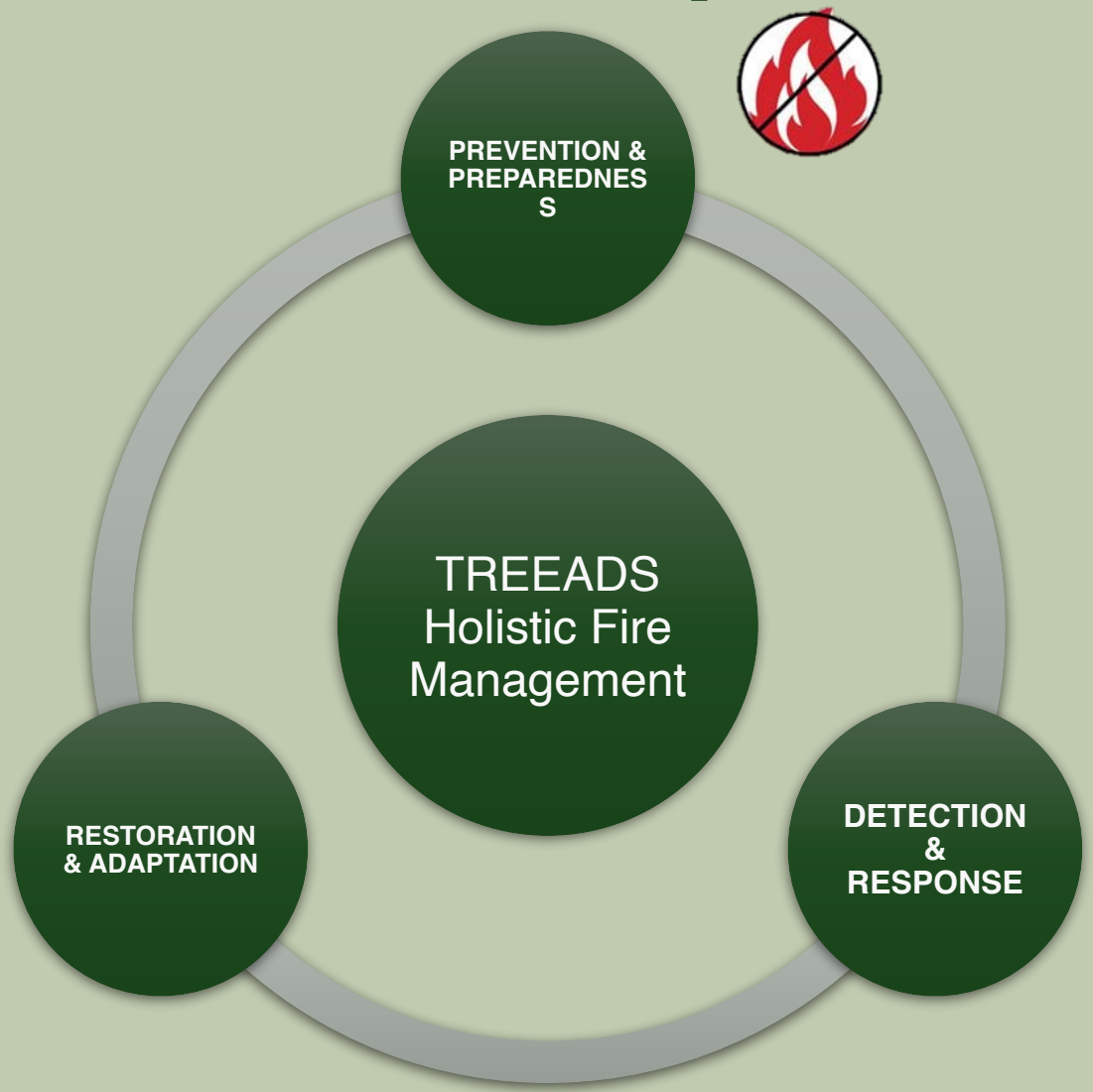
Agenda

✓ The EU-project TREEADS
- Concept and consortium description

✓ The Norwegian pilot
- Characterise wildland fires
- Protection of infrastructure and wooden buildings
- Guidelines towards improved Wildlife Urban Interface (WUI) fire safety.

✓ Fire-resilient wood facades
- Why?
- How do WUI-fires threaten Scandinavian buildings?
- How to evaluate? Appropriate test methods?
- Can fire retardant measures be of relevance in a Scandinavian WUI fire content?

TREEADS Concept



TREEADS Pilot Sites

- ✓47 partners
- ✓14 EU countries (and Taiwan)

TREEADS Factsheet

TREEADS	A Holistic Fire Management Ecosystem for Prevention, Detection and Restoration of Environmental Disasters
Project Number	101036926
Starting Date	1 December 2021
Project Duration	42-months
Call (part) Identifier	LC-GD-1-1-2020
Topic	Preventing and fighting extreme wildfires with the integration and demonstration of innovative means
Budget	€ 20M

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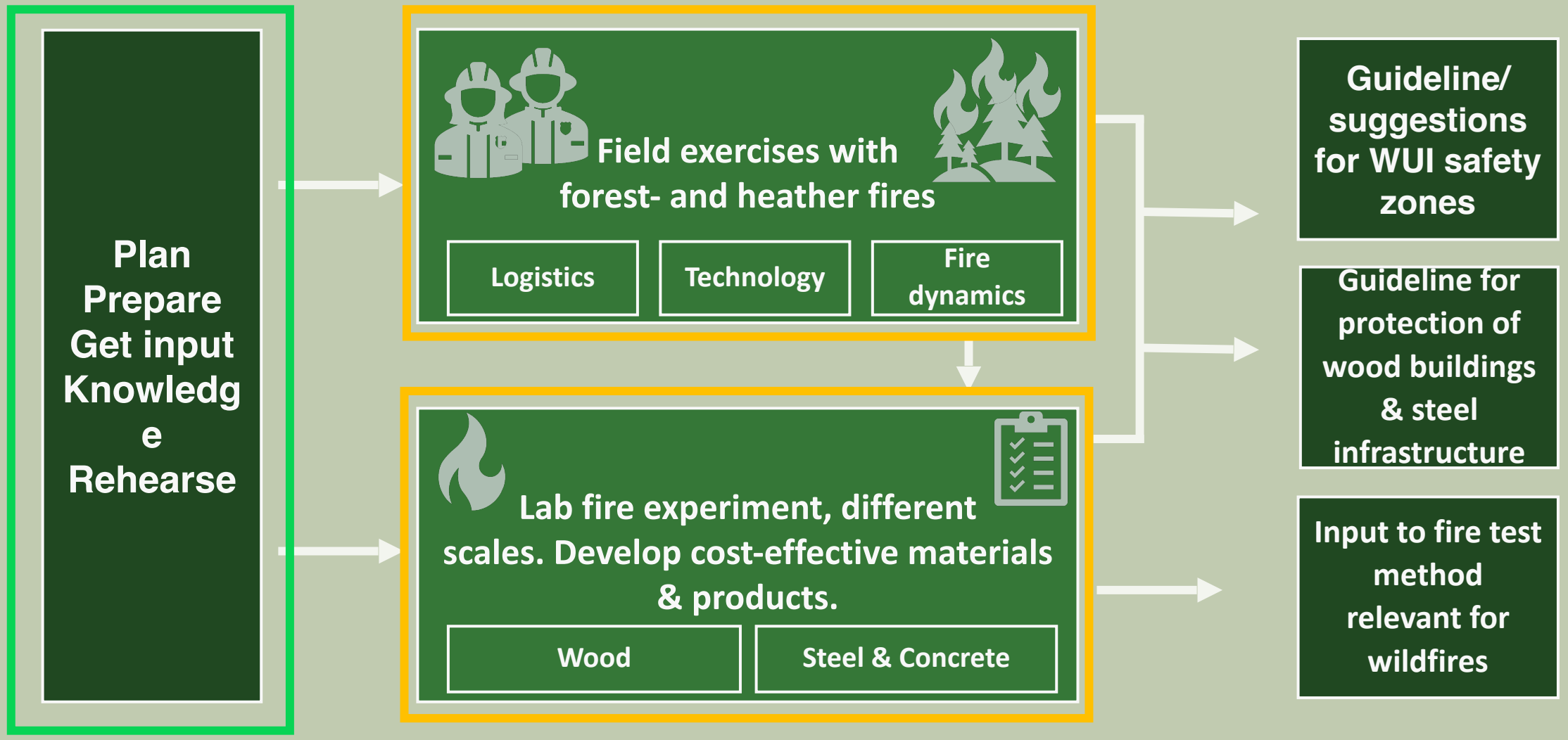
02 The Norwegian Pilot

Norwegian Pilot Aims

- ✓How does Norwegian (Scandinavian) wildlife burn?
- ✓How can we take a wildlife fire indoors?
- ✓Define suitable test criteria for our conditions
- ✓Develop fire resilient materials and evaluate them in relevant and controlled conditions.
- ✓Guidelines for improved WUI fire safety.

THE NORWEGIAN PILOT CAMPAIGN
FOREST AND HEATHER FIRES, NORWEGIAN CONDITIONS



Characterize wildland fires

Large differences in:

✓ Fire dynamics of juniper, grass, heather, fores

✓ Coast and inland

✓ Spread mode wildfire vs WUI

Photo by NRK:
https://www.nrk.no/trondelag/lyngbrann-og-straumstans-pa-froya-1.16402689

How do Scandinavian wildlife fires mitigate to buildings?

- ✓Radiation, flying embers or flame impingement?
- ✓Analysis of Swedish WUI fires 1996-2022* reveals
  - 88% building ignition at façade
  - 12% at roof eaves (takfot)
  - Data from 237 (out of 738) incidents where the origin of ignition was documented.
- ✓Pineland residence time 1min on average. Up to 5min.

*Vermina Plathner, F. What causes building ignition in Swedish wildfires? *Manuscript in writing.*

Develop realistic test methods

- *Objective: Develop a realistic test method and perform controlled tests to evaluate the performance of passive fire protection products for wooden buildings and key steel and concrete infrastructure exposed to wildland fires.*

✓Small scale: task 4-7

✓Medium scale: Planning initiated

✓Large scale: First series complete

Large scale experiments, 2.5 x 4 meters

Med. scale reaction to fire, wood:

Develop practical test methods

- *Objective: Develop a realistic test method and perform controlled tests to evaluate the performance of passive fire protection products for wooden buildings and key steel and concrete infrastructure exposed to wildland fires.*

✓Small scale: task 4-7

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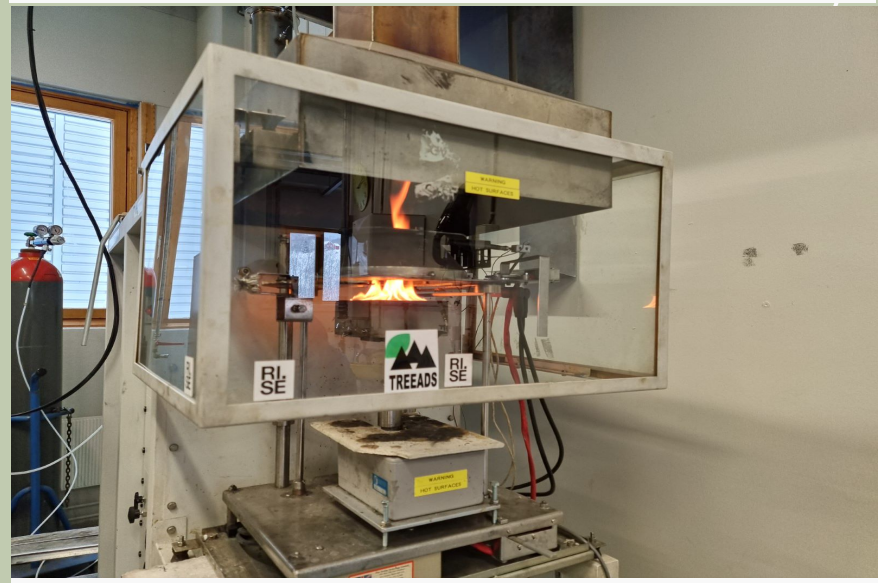
Small scale reaction to fire, wood:



During spread of flame test, rubber:

Cost-effective protection of infrastructure & wooden buildings

Objective: Develop cost-effective methods to protect key infrastructures & residential buildings in areas with a high risk of wildland fires.

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Barricade Fire Blocking Gel For Wildfire Structure Protection. https://www.primosupply.com/Barricade-II-Fire-Protection-Gel/products/29/. Ref [11]

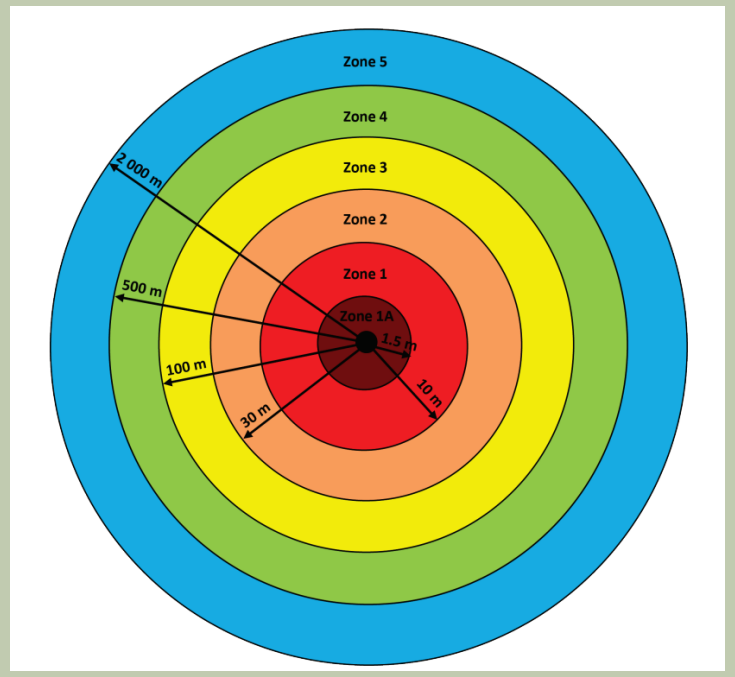
https://genicsinc.com/product/genics-fire-mesh-3x50-ft-roll/# ref[4]

Photo: https://www.woodify.se/

Guideline: Safety zones & WUI

Objective: Provide suggestions and guidelines regarding necessary safety zones around critical infrastructure and WUI areas based on Norwegian conditions.

✓Literature review on existing guidelines



Safety zones

How fires spread to structures

Spotting *Flame contact* *Radiation*

Safety zones., National guide for wildland-urban-interface fires. National research council of Canada, 2021

Guideline: Safety zones & WUI

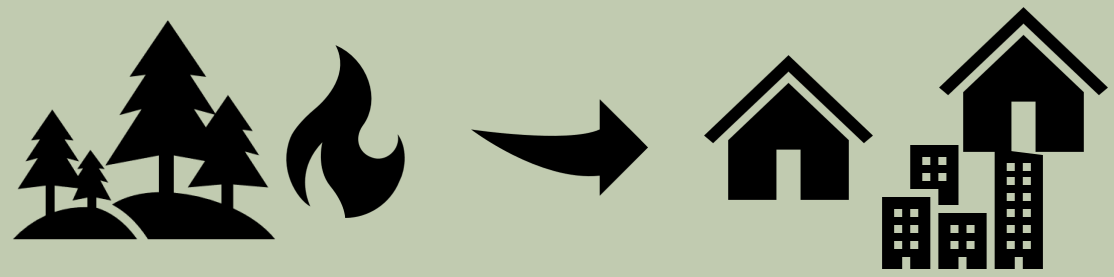
Objective: Provide suggestions and guidelines regarding necessary safety zones around critical infrastructure and WUI areas based on Norwegian conditions.

✓Data collection of relevant WUI fires in Norway:

Could be large differences in how wildfires ignite houses in Norway compared to other climates

✓Input from stakeholders in Norway:

What is relevant and what is important?



Examples of WUI (Wildlife Urban Interface)

Risk awareness

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03 Fire-resilient wood facades

Background

✓The climate gets warmer

- Risk of increasingly larger wild fires
- Wild fire risk zone expands to new areas.

✓Expectations on a greener building sector

- UN Environment Programme
- European Green Deal / Fit for 55

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UN Environment programme

- Direct building CO_2 emissions need to halve by 2030 to get on track for net zero carbon building stock by 2050
- **We need to challenge the incumbency of steel and concrete (Nigel Topping, UK)**

Extended use of wood in construction gives

+ CO_2 –reduction (wood binds CO_2)
+ Lighter buildings (transport, new development possibilities)
- Larger risk as we add more fuel to buildings.
- New and enhanced risks of fire in general.

✓**How do we know if our construction materials are safe enough in case of Wildlife Urban Interface fires?**

Building regulations - Wildfires

✓USA. Fire-retardant-treated wood

- Test method ASTM E84 for façades. Steiner tunnel.
- Specific test method for decking products

✓Australia. Bushfire Attack Level (BAL).

- BAL<29kW/m^2. Cone-calorie test. 25kW/m^2. Max HRR<100kW/m^2. Average <60kW/m^2 10min after ignition. NB! Test after ageing!
- BAL <40kW/m^2. 3x3m radiation panel test.

✓No WUI-fire considerations in European regulations.

- Northern Europe: Acceptable risk?
- Southern Europe. Stone or concrete!

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Steiner tunnel

Fire spread in 7,5m long tunnel.

Burner to the right, test bodies in the roof.

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Australia
BAL <29kW/m²

Small-scale conecalorie test.

Test body 10x10cm

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Australia
BAL<40kW/m²

Larger scale radiation panel 3x3m

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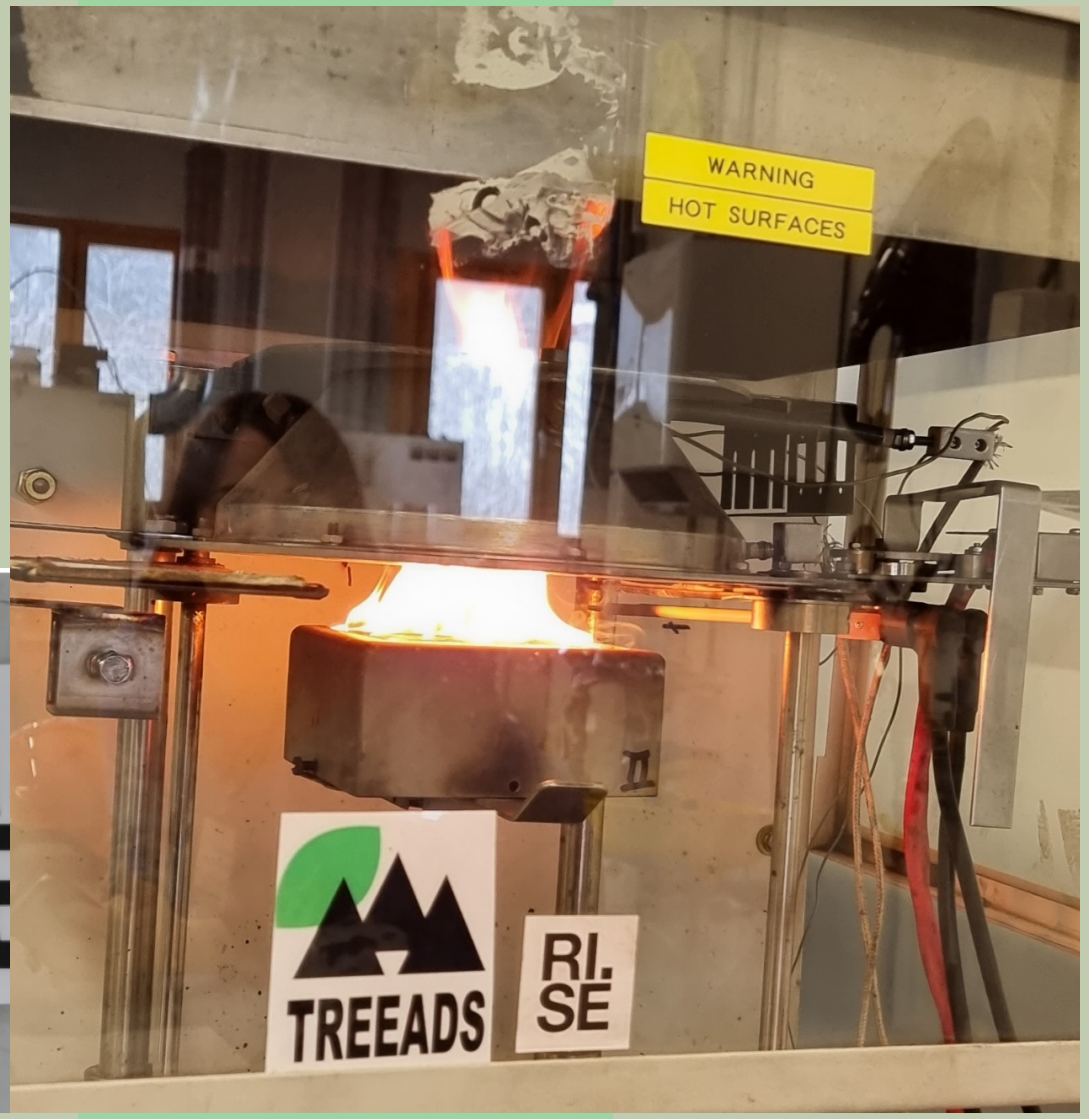
Small-scale cone calorie tests.



Measured parameters that may be relevant for WUI fires

- ✓Time to ignition
- ✓Peak heat release rate
- ✓Average heat release rate after ignition

Test and product parameters that may be important

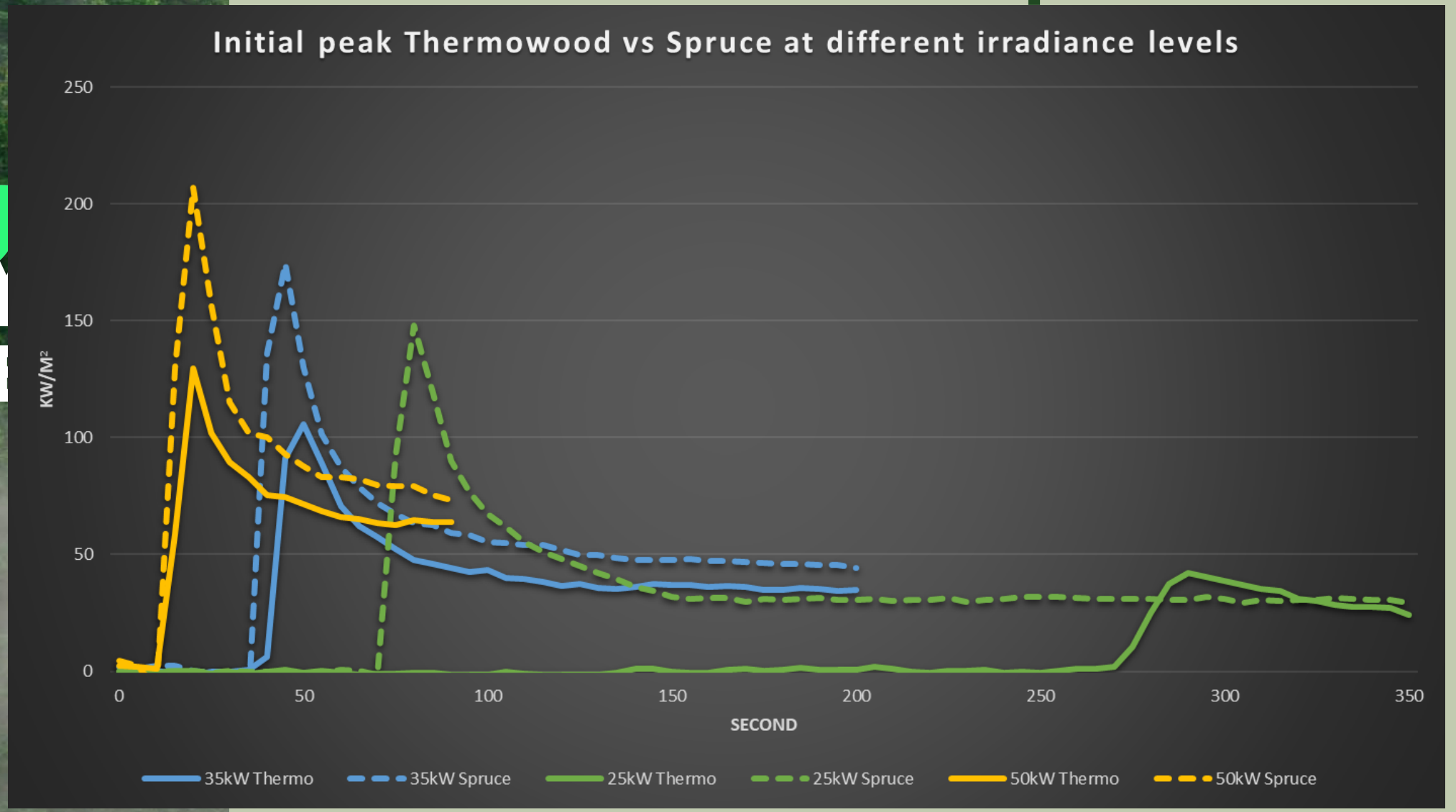
- ✓Fire retardant uptake
- ✓Surface treatment system
- ✓Heat source intensity
- ✓Wood species
- ✓Wood density
- ✓Wood ageing

Products tested: Test series 1

✓Spruce w/wo 2-layer paint system

✓Thermowood w/wo stain

Thermowood vs Spruce



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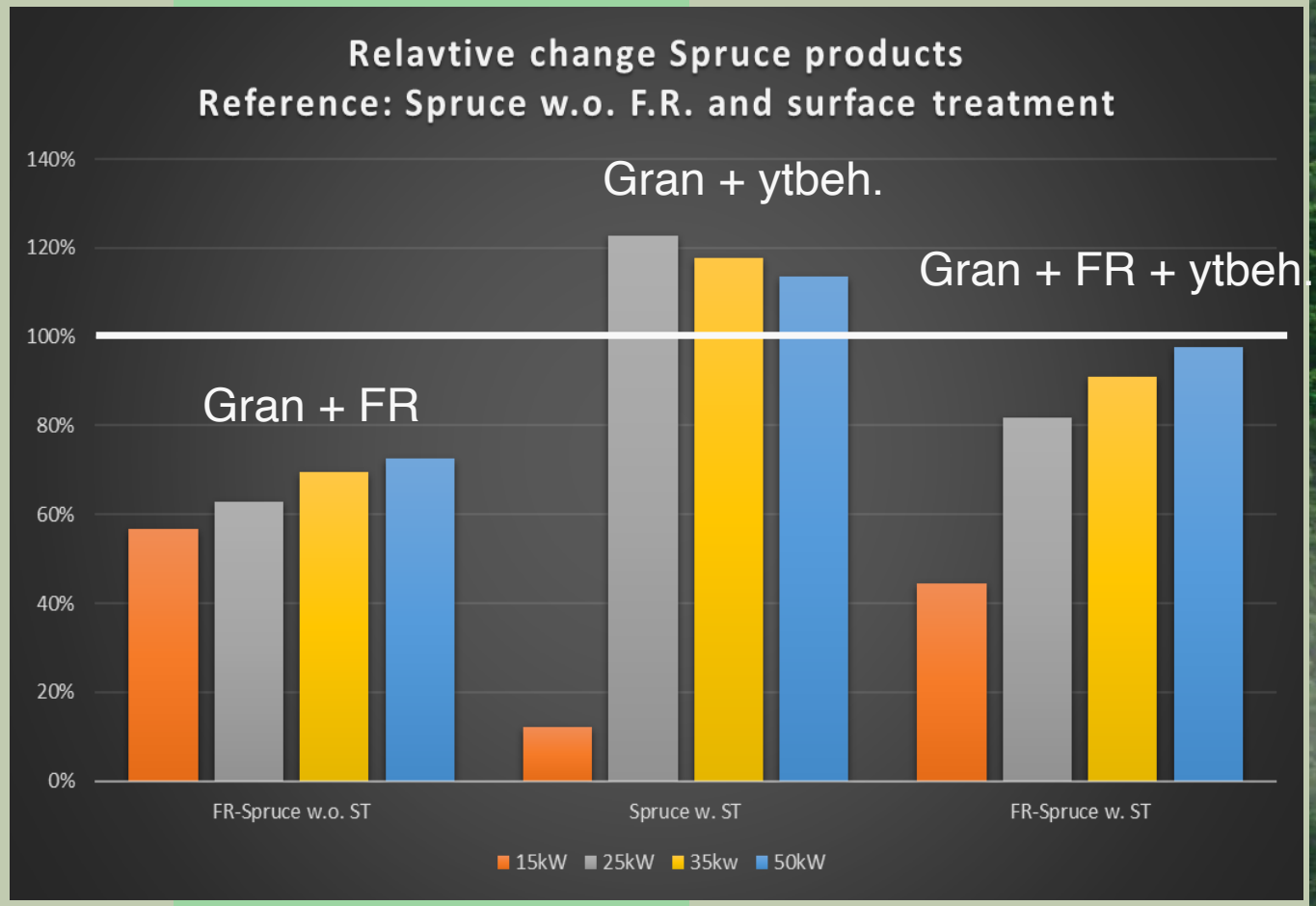
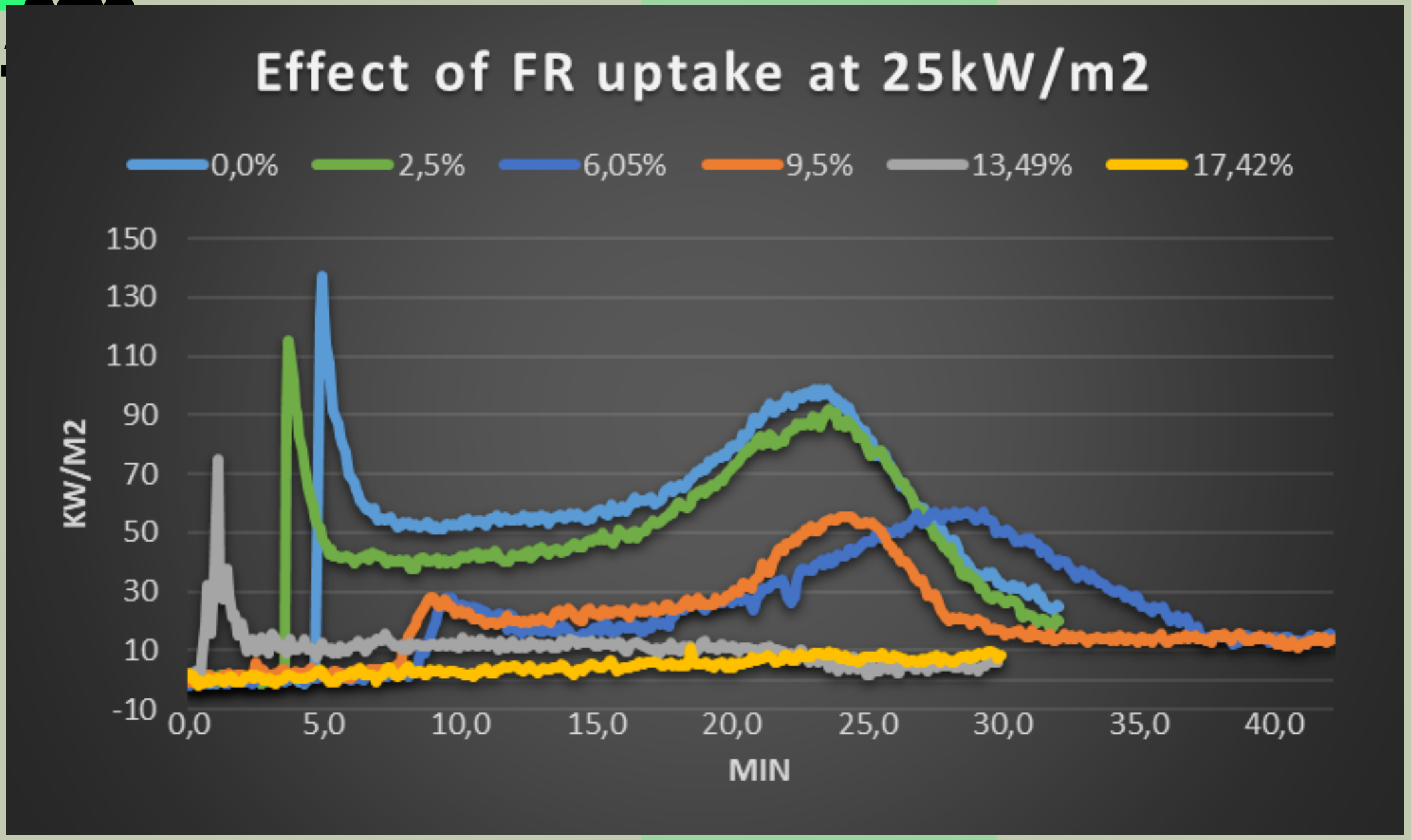
Peak HRR spruce

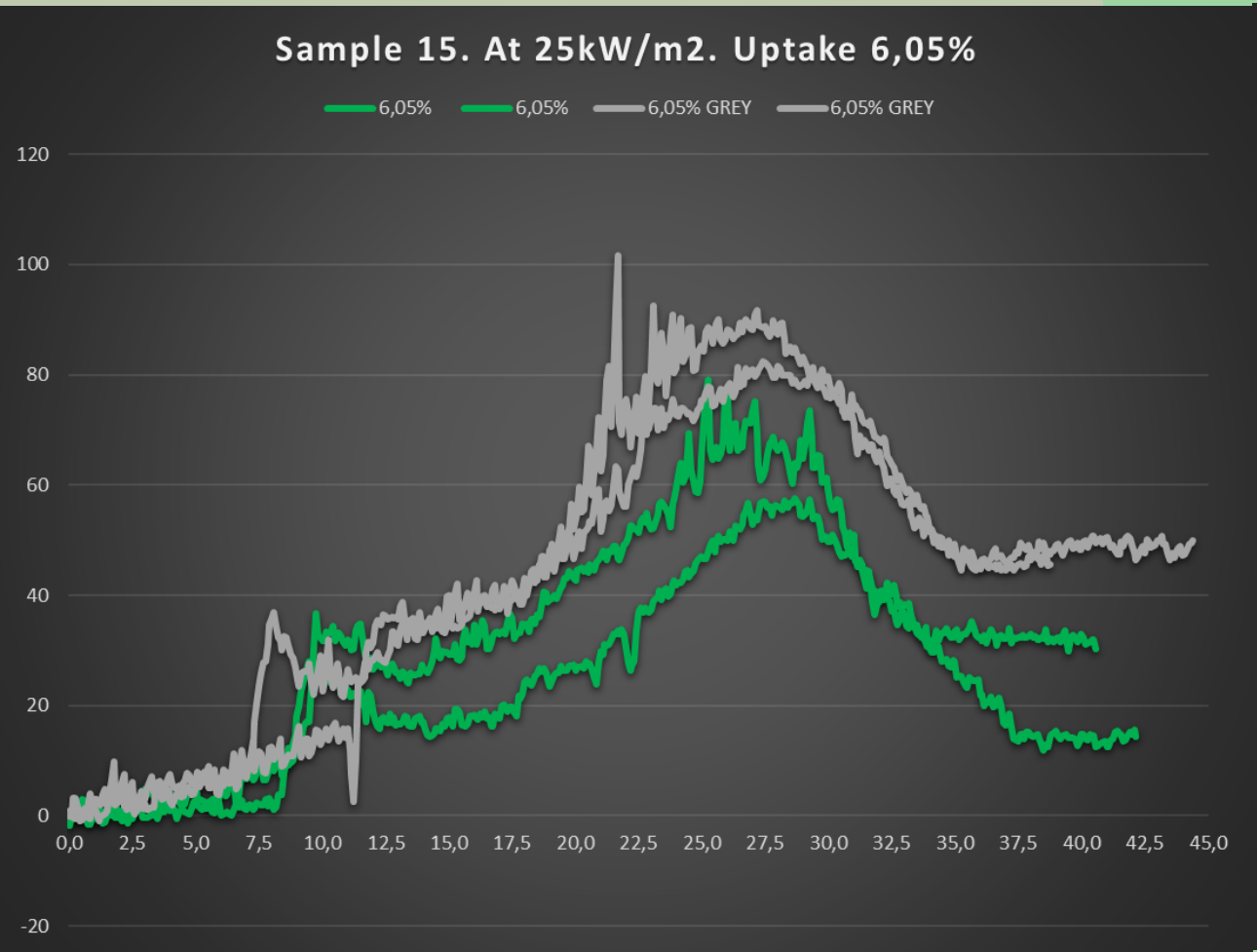
Tests shows that a positive effect of fire retardant is adversed by paint system.

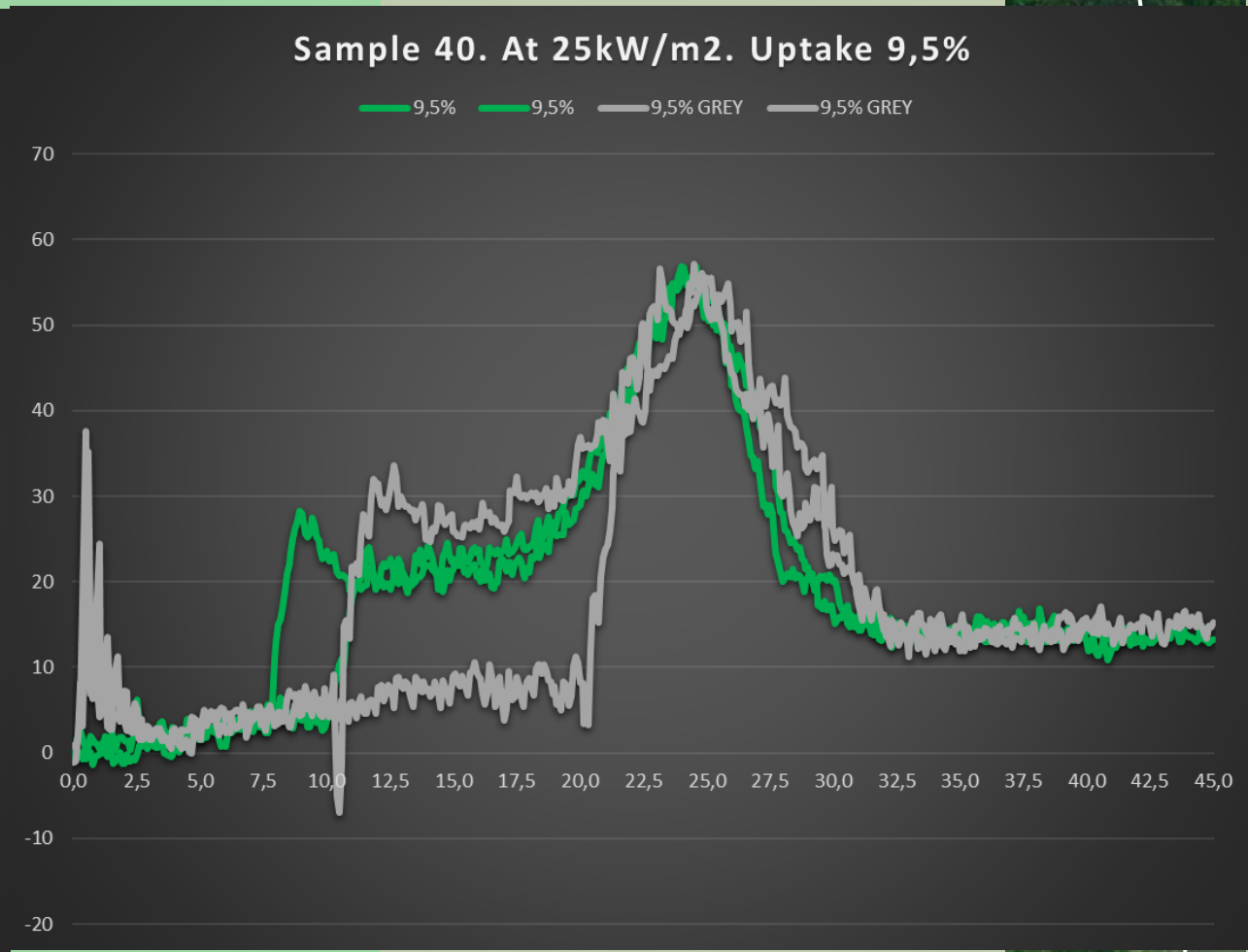
At low irradiance levels, 15kW/m², surface treatment helps! The product doesn't ignite.




Effect of FR uptake at 25kW/m2
0,0%
2,5%
6,05%
9,5%
13,49%
17,42%
150
130
110
90
70
50
30
10
-10
KW/M2
0,0
5,0
10,0
15,0
20,0
25,0
30,0
35,0
40,0
MIN

Effect of staining. Repeatability





Summary small scale testing

- ✓Results suggest that two-layer paint systems have a negative effect
- ✓FR treated Thermowood performs the best
- ✓Density has an impact
- ✓Some large spreads in test of the same product. Repeatability is an issue.
- ✓Both surface treatment and small FR uptake levels may reduce time to ignition.
- ✓At high heatloads the effect of FR treatment reduces

Upcoming activities

✓Medium-scale testing (SBI)

- Are small-scale results relevant when scaling up test method?
- Less spread in data?

✓Large-scale testing

- How do our best candidates perform under realistic conditions?
- What is a typical Scandinavian wildfire heat load?

✓Establishing guidelines

✓Test method recommendations

Thank you!

Do you have any questions?

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www.treeads-project.eu

@treeads-h2020

@TREEADSH2020

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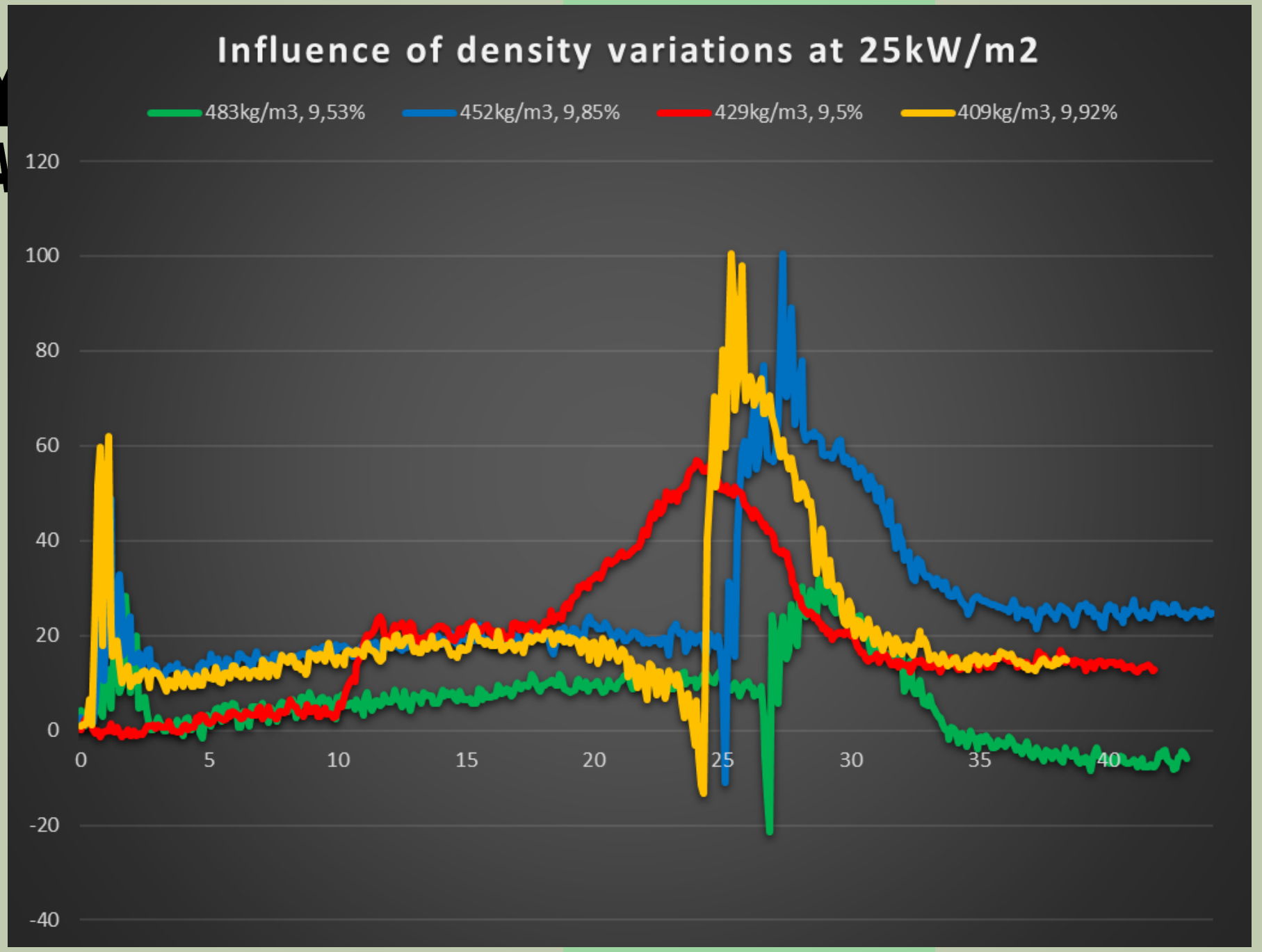
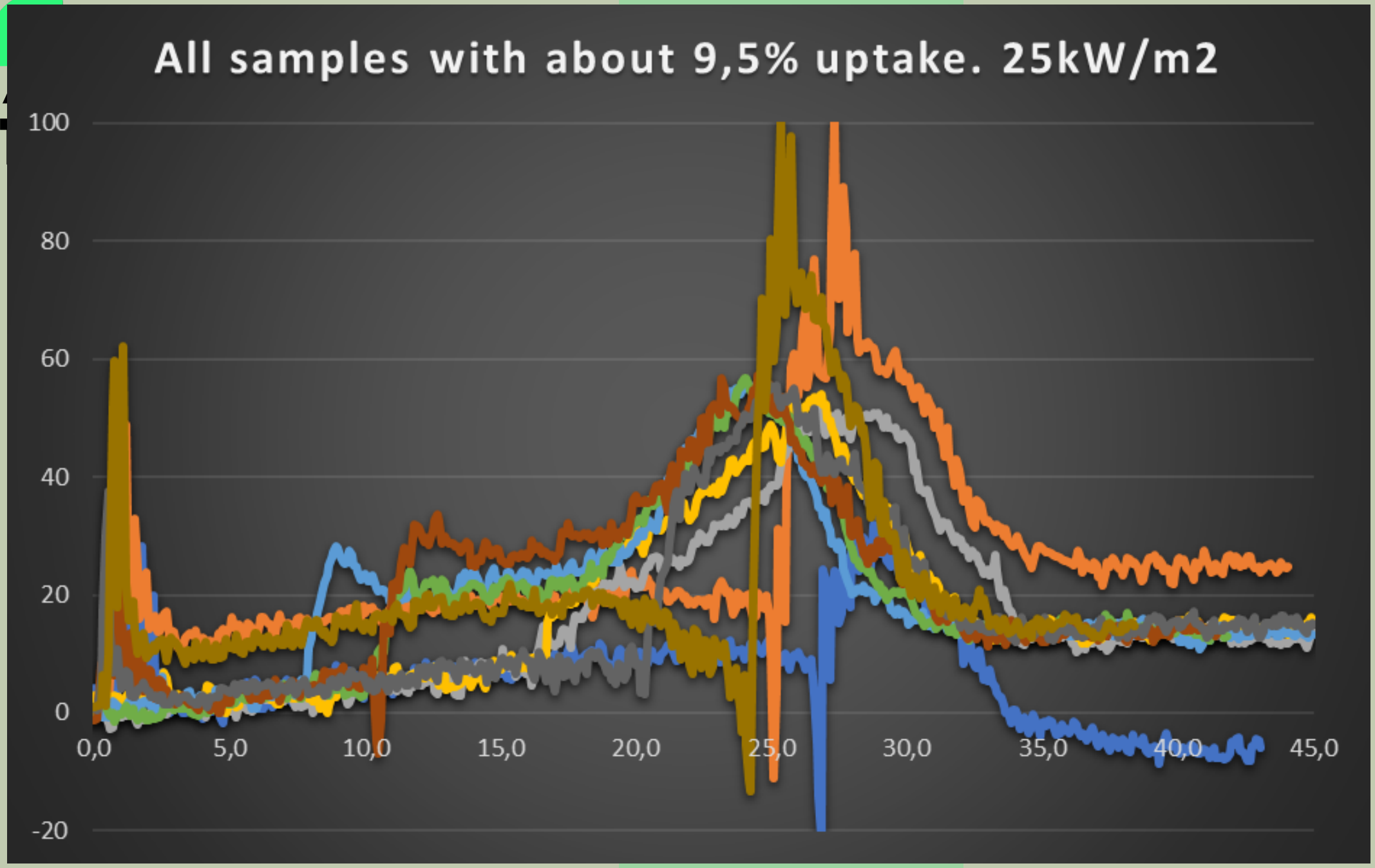
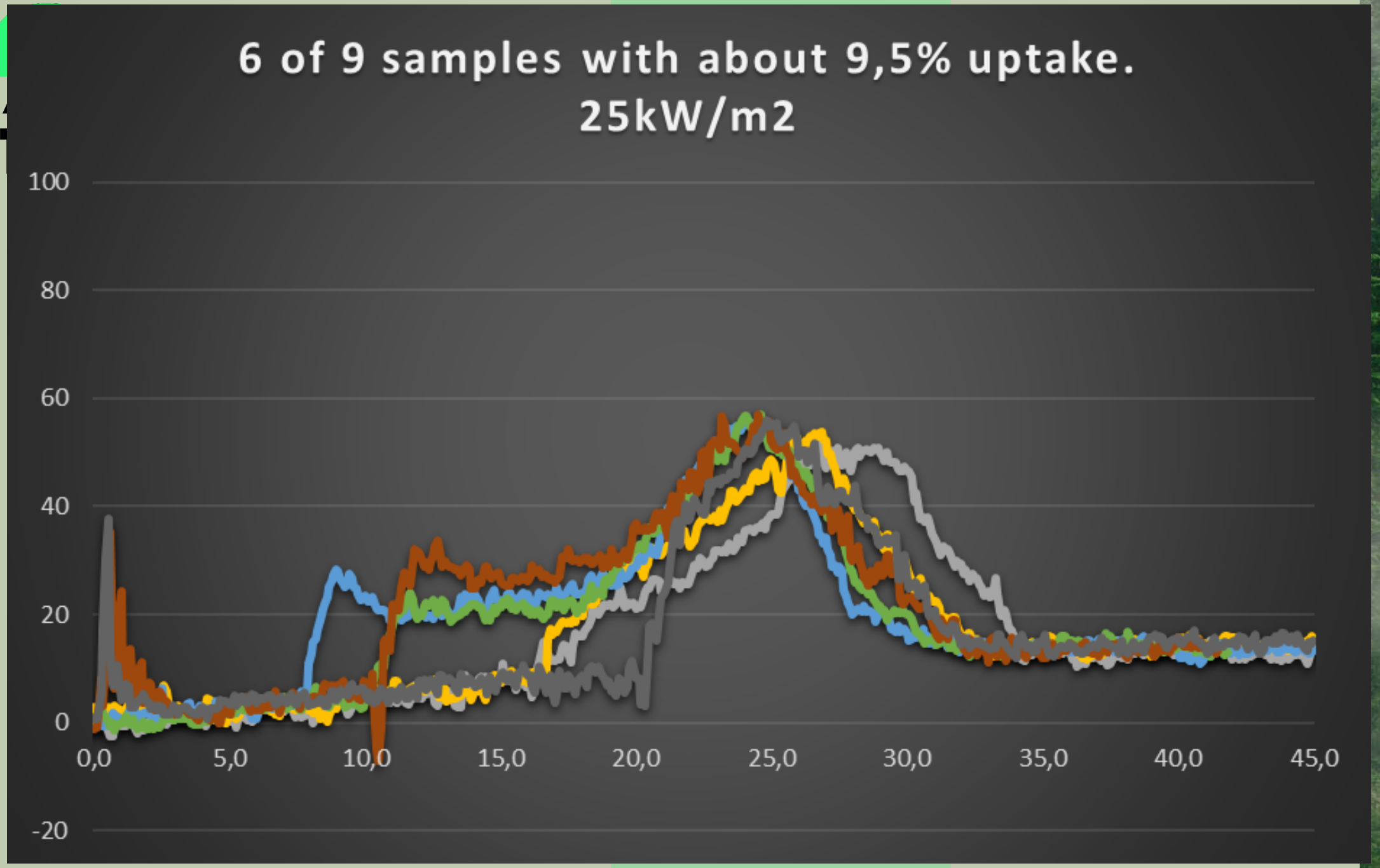

Influence of density variations at 25kW/m2
483kg/m3, 9,53%
452kg/m3, 9,85%
429kg/m3, 9,5%
409kg/m3, 9,92%
120
100
80
60
40
20
0
-20
-40
0
5
10
15
20
25
30
35
40


All samples with about 9,5% uptake. 25kW/m2
100
80
60
40
20
0
-20
0,0
5,0
10,0
15,0
20,0
25,0
30,0
35,0
40,0
45,0


6 of 9 samples with about 9,5% uptake.
25kW/m2
100
80
60
40
20
0
-20
0,0
5,0
10,0
15,0
20,0
25,0
30,0
35,0
40,0
45,0