

Climate Resilience vs. Low-Cost Renewables

Winterwind 2021

Presented By
Rosemary Barnes

April 19 2021



Rosemary Barnes

- Principal consultant at Pardalote
 - Product development for clean energy technologies
 - Technology due diligence for clean energy investors
 - Engineering communication



pardalote

WinterWind 2021



**Previous Winterwinds
looked a little different...**

Climate resilience

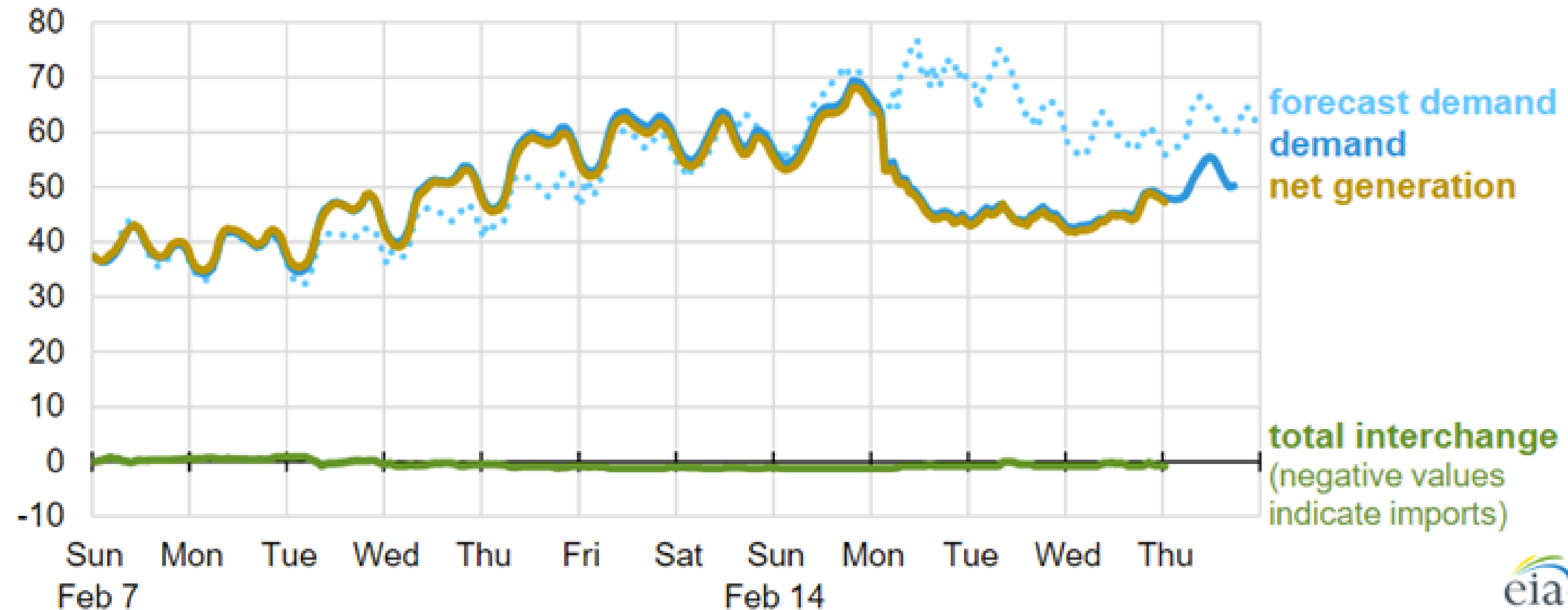


#TexasFreeze

Hourly electricity demand, net generation, and total interchange (Feb 7–Feb 18, 2021)

Electric Reliability Council of Texas, Inc (ERCOT)

gigawatts



Source: U.S. Energy Information Administration, [Hourly Electric Grid Monitor](#) (ERCOT demand, net generation, and interchange)



#TexasFreeze



Houston before and after the storms

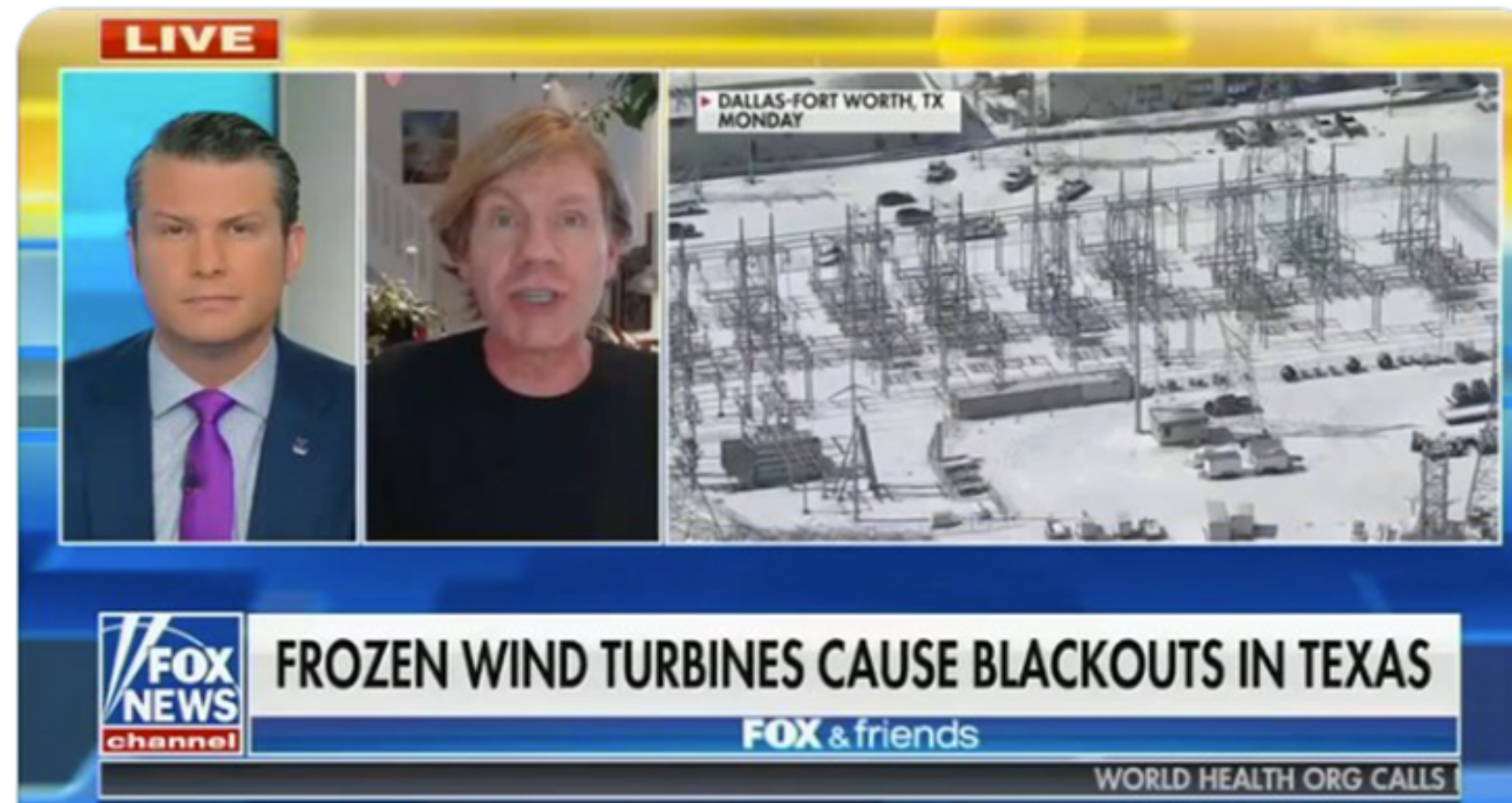
#TexasFreeze



Trains! @OrganizingPow3r · Feb 19



if i owned a **wind turbine** business i would file a defamation suit against Fox. Seems to be the only thing that gets their attention



Fox News and Fox Business falsely blamed renewable energy for Texas blackouts 128 times over two...

mediamatters.org



4



43



220



#TexasFreeze

**Smug Potato #resistance** @PotatoSmug · Feb 28

I just wanted to share this photo of a frozen **wind turbine** in **Texas**, made using fossil fuel, being de-iced by a helicopter powered by fossil fuel, made with fossil fuel, using a solution of...you guessed it...fossil fuel. 🤔



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49

81

**The Dispatch Fact Check** @TheDispatchFC · Feb 19

Did a helicopter use petroleum-based chemicals to de-ice a **Texas wind turbine**?

A viral claim is false for a couple of reasons.

A fact check from @Alex_Dent:



Did a Helicopter Use Petroleum-Based Chemicals to De-Ice a Texas WL...
A viral claim is false for a couple of reasons.
@factcheck.thedispatch.com

5

9

**Fark** @fark · Feb 18

You know that photo of a helicopter de-icing a **wind turbine** prop in **Texas**? Um yeah, about that



Viral Image of Helicopter De-Icing Texas Wind Turbine Is From Sweden
In the midst of a record cold snap where Texas' grid has failed to meet demand, misinformation is running rampant. Among the most ...
@earthergizmodo.com

2

21

31

**James Scott** @jscott1145 · Feb 17

@laurenboebert Proving again how truly ignorant you are.

Viral Image of Helicopter De-Icing **Texas Wind Turbine** from 2016



Viral Image of Helicopter De-Icing Texas Wind Turbine Is From Sweden
In the midst of a record cold snap where Texas' grid has failed to meet demand, misinformation is running rampant. Among the most ...
@earthergizmodo.com

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**Frank Haggerty** @BRCanson2162 · Feb 25

Due to frozen **wind turbine** in **Texas** rates went to 15,000.00. How much did wind farm owners pay for parasitic electricity from the grid?

[theconversation.com/whats-behind-1...](#)



**Climate Corruption** @msroberts0619 · Nov 5, 2019
ENERGY TRANSITIONS: How 100% renewables backfired on a Texas town — "Electric rates are up. Critics are blasting the costs. And the city north of Austin is trying to figure out how to mitigate the situation."
enr.com/stories/106145...

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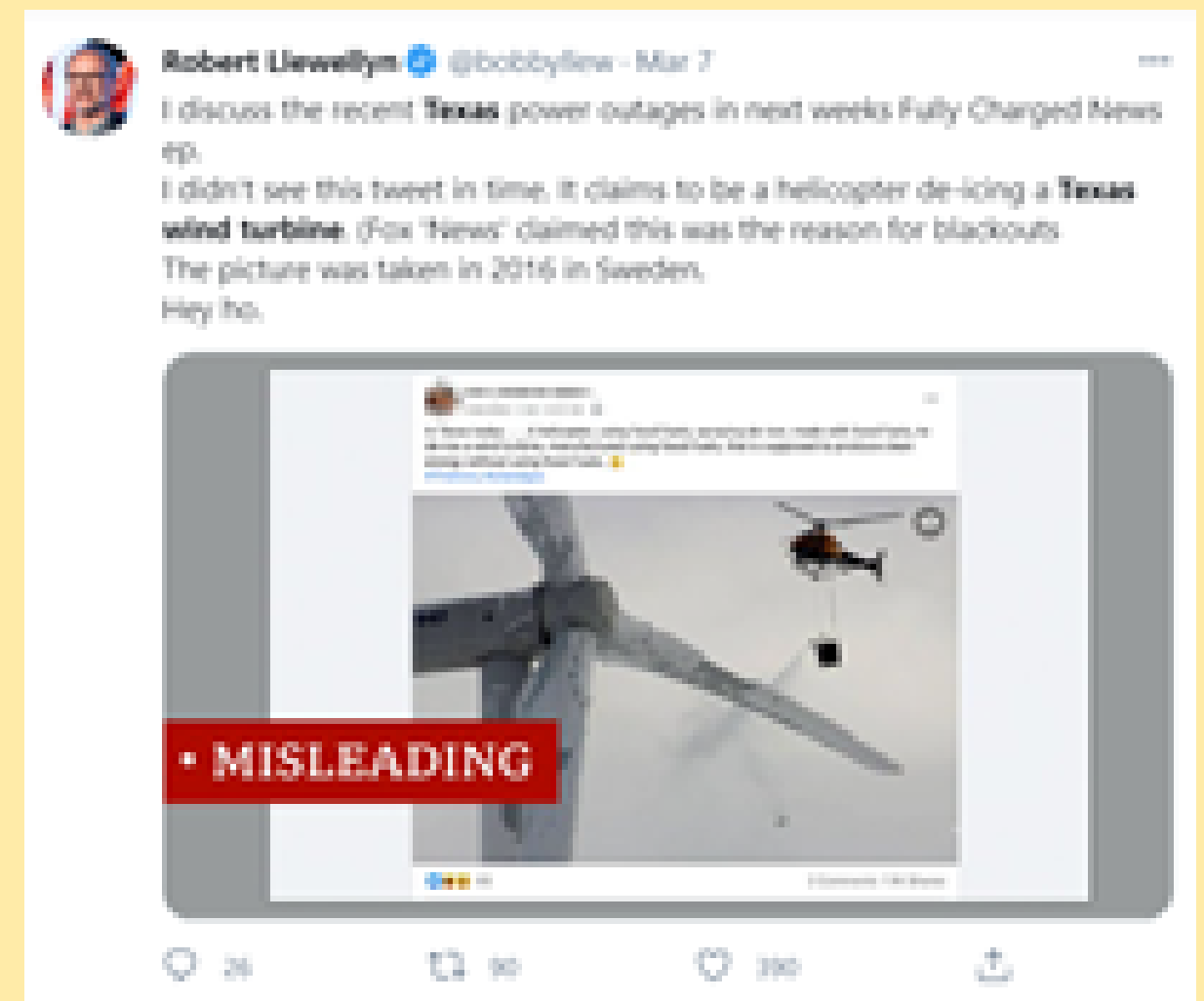
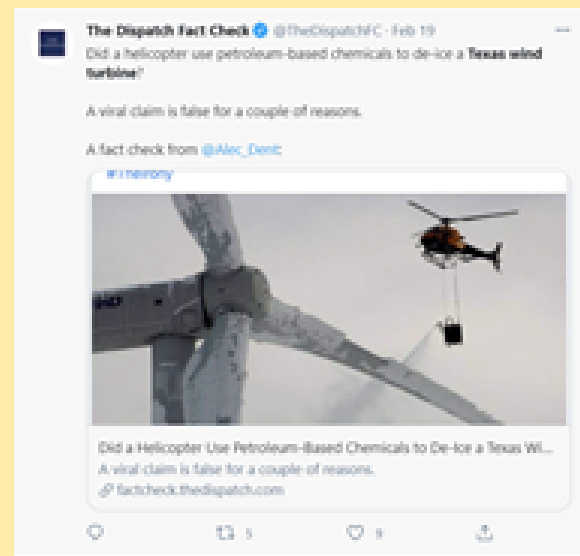


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#TexasFreeze



2.5 AVAILABILITY AND GUIDELINES TO DE-ICING

There is currently only one complete de-icing system ready for use. Time for establishment at site in northern Sweden is estimated at about 24 hours from request until a team is established at site. It should be possible to de-ice about three turbines daily during the darkest period during December and January. During November and February, it should be possible to de-ice a total of four turbines a day when the sun sets later. At the same time, demand for water will increase by approximately 15m³ to cover

3 Results

This project shows that by using this method, costs will be recovered within 48 hours compared to a reduced or no production. From an environmental perspective, this is also a better option than a turbine at standstill where the energy source needs to be replaced with marginal electricity such as coal or gas. As this method is not recommended as a first choice, careful consideration should be made before attempting this process. The project contributes to the development of new services and the profitability will improve for the wind turbine owner.

Helicopter de-icing

AIRBORNE DE-ICING SOLUTIONS FOR WIND TURBINES

REPORT 2016:300



MONDAY APRIL 19

TUESDAY APRIL 20

WEDNESDAY APRIL 21

13:00	<p>OPENING SESSION (1) Moderators: Jeanette Lindeblad & Stefan Gsinger</p> <p>13:05 Wind Power Around the World, Stefan Gsinger, World Wind Energy Association WWEA (45)</p> <p>13:15 Record 2020 masks mounting onshore wind challenges, Isabelle Edwards, Bloomberg, GB (12)</p> <p>13:35 Climate resilience vs. low cost renewables, Rosemary Barnes, Pardalote, AU (43)</p> <p>13:55 Announcements</p>	
14:00	Exhibition break	
14:30	<p>IMPROVEMENTS (2) Chairs: Tove Hamberg & Stefan Bill</p> <p>14:35 Wear resistant multi-composite coating for wind power blades, JUN CHEN, Lulea University of Technology, SE (34)</p> <p>14:50 Yaw optimisation, Thomas van Delft, DNV, UK (17)</p> <p>15:05 Q&A</p>	<p>14:15 – 15:30 STANDARDS & WARRANTIES (3) Chairs: Jenny Longworth & Anders Björck</p> <ul style="list-style-type: none">• IEA Wind Task 19: Standardization of pre-construction icing loss assessment in upcoming IEC 61400-15 standard, Ville Lehtomäki, Kjeller Vindteknikk, FI (23)• Performance warranty guidelines for wind turbines in icing climates, Helena Wickman, Vattenfall, SE (29) <p>5 minute break</p> <p>Panel discussion - Standards & warranties Panel Moderator: Jenny Longworth, KVT AB</p> <p>Panelists: Ville Lehtomäki (KVT Oy), Helena Wickman (Vattenfall) Anders Björck (OX2), Stefan Söderberg (DNV GL)</p> <p>Conclusions</p>
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14:30	<p>DETECTING ICE - SENSORS (10) Chairs: Marianne Rodgers & André Bégin-Drolet</p> <p>14:35 From turbines to farms: Using distributed ice detection to increase safety and accessibility, Theresa Loss, eologix sensor technology, AT (9)</p> <p>14:50 Tackling ice throw risks by using sophisticated algorithms of blade-based ice detection, Bastian Ritter, Wolfel Wind Systems, DE (16)</p> <p>15:05 Q&A</p>	<p>REPAIRS (11) Chairs: Anna Lundsgård & Sven-Erik Thor</p> <p>14:35 Structural blade repair in arctic climate, Resttive Vacuum Infusion, Greger Nilsson, Blade Solutions, SE (19)</p> <p>14:50 Cost effective de-icing blade repairs, Morten Handberg, Wind Power LAB, DK (25)</p> <p>15:05 Q&A</p>
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15:45	<p>MAPPING ICE (12) Chairs: Eva Sjögren & Nils Lesmann</p> <p>15:50 Atmospheric icing on offshore wind farms in Northern Europe – a risk map, Carla Ribetto, Wood Thilsted, UK (1)</p> <p>16:05 Validation of a wind turbine icing model for site assessment, Noemi Tölg, Fraunhofer IEE (Research Institute), DE (31)</p> <p>16:20 Q&A</p>	<p>ICE PROTECTION SYSTEMS (13) Chairs: Melissa Hogueux & Charles Godreau</p> <p>15:50 Innovation concepts for operation and service in cold climates, Sven-Erik Thor, Lindskog Innovation, SE (39)</p> <p>16:05 IPS retrofit for complex blades, Daniela Roepert, Borealis Wind, CA (40)</p> <p>16:20 Q&A</p>
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13:00	<p>INTERESTING ODD TOPICS (15) Chairs: Tanja Tränkle & Michael Moser</p> <p>13:05 Protection and lifetime improvement for bearings and gears by using silicon-based additive technology, Stefan Bill, Croda, DE (38)</p> <p>13:15 Synergies between icing on wind turbines and UAVs, Richard Hann, Norwegian University of Science and Technology (NTNU), NO (11)</p> <p>13:35 Re-use of wind turbine blade for construction and infrastructure applications, Alann André, RISE Research Institutes of Sweden, SE (37)</p> <p>13:55 Q&A</p>	<p>13:15 - 14:15 THE SOCIAL AND ECOLOGICAL ENVIRONMENT (20) Chairs: Sigrid Carstairs & Sebastian Meyer</p> <ul style="list-style-type: none">• A road map for the wind energy industry: taking a proactive approach to the biodiversity challenge, Tove Hågglund and Åsa Abel, Ecogate, SE (41)• Digital business and collaboration platform for local anchoring and collaboration, Charlotte Larson and Oskar Ahlman, Vindkraft-centrum and Umeå University, SE (42)	<p>12:15 - 14:15 WORKSHOP - HSE (16) Chairs: Maria Röske & Michael Henriksson</p> <ul style="list-style-type: none">• Safe turbine operation in icy conditions, Eva Sjögrén, ENERCON GmbH, SE (26)• Return on experience: Working on a wind farm in icing conditions, Charles Godreau, Norgica, CA (14)• Simple rules-of-thumb for ice fall/throw safety distances, Alexander Stöckl, Energiewerkstatt, AT (5) <p>Break, 10 minutes</p> <p>Workshop</p> <p>Conclusions</p>
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14:30	<p>ICING LOSSES (17) Chairs: Theresa Loss & Øyvind Byrkjedal</p> <p>14:35 Modelled icing losses with WICE: A blind test in France, Stefan Söderberg, DNV, SE (30)</p> <p>14:50 Uncertainties of modelled production losses due to icing, Marie Pedersen, EMD International, DK (6)</p> <p>15:05 Q&A</p>	<p>EXPERIENCES OF ICING (18) Chairs: Noemi Tölg & Matthew Wadham-Gagnon</p> <p>14:35 Lesson in winterisation from the UK, David Armour, Natural Power, GB (7)</p> <p>14:50 Skellefteå Kraft's experiences of operating wind turbines in cold climate and the need of a physical testing, Kristian Elverström, Skellefteå Kraft, SE (36)</p> <p>15:05 Q&A</p>	
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Jakob N. Øien @jnoien · Mar 7

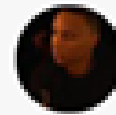
Replying to @bobbyllew

For reference the wind power plant "Raggovidda" in eastern Finnmark (waaay beyond the arctic circle) is the most efficient in Norway, and probably the world. It has around 4200 full power production hours a year. No helicopter de-icing needed.



1

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Frankie Beverly Uncle Headass @frazierapproves · Feb 17

Interesting that **Texas** is too cold for **wind turbine** energy, but somehow Scandinavia isn't. The real problem is the **Texas** didn't winterize its grid; gas-powered, coal-powered, wind...none of it



3

71

220



Winterised wind turbines do exist...



Eric Feigl-Ding @DrEricDing · Feb 16

4 million without power—Texas could have invested in at least 3 things for its frozen wind turbines:

- ✦ water resistant coating on blades
- ✦ more de-icing drones
- ✦ upgrades in heating packages

➡ If they can work atop snow-covered Alps. They can work in Texas. 🇺🇸
#PolarVortex

[Show this thread](#)

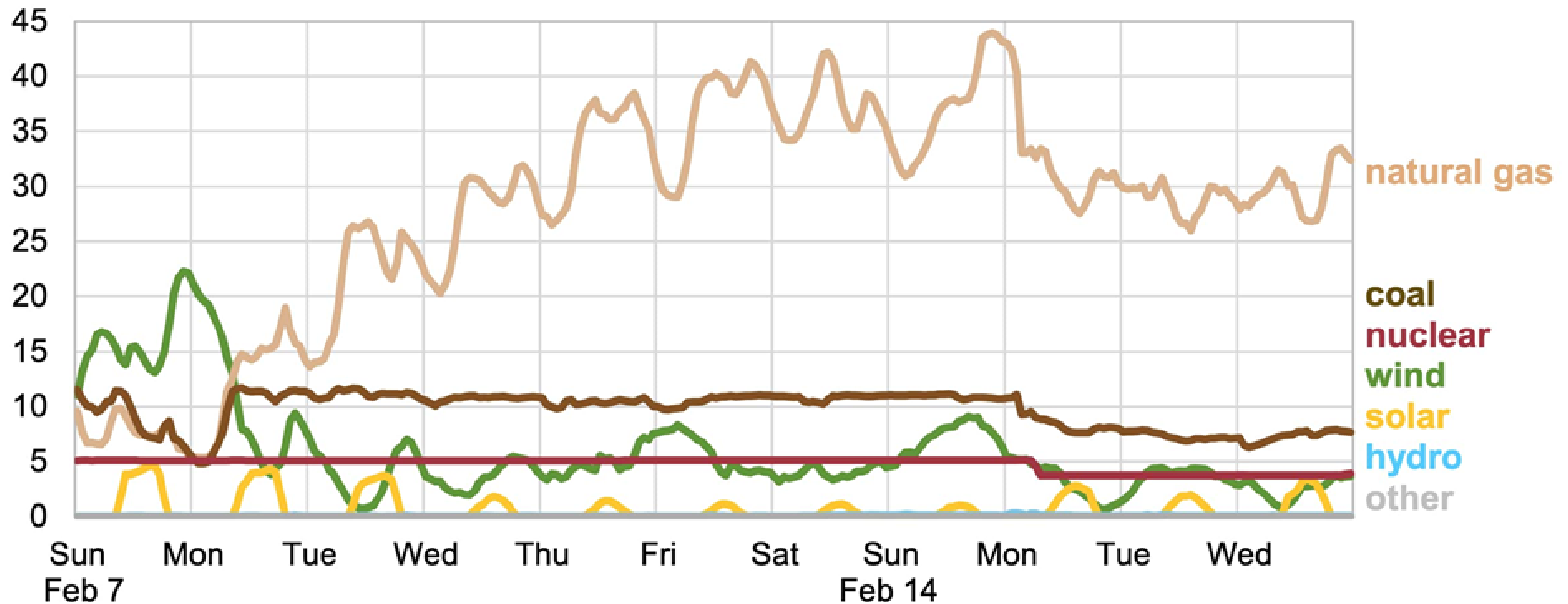


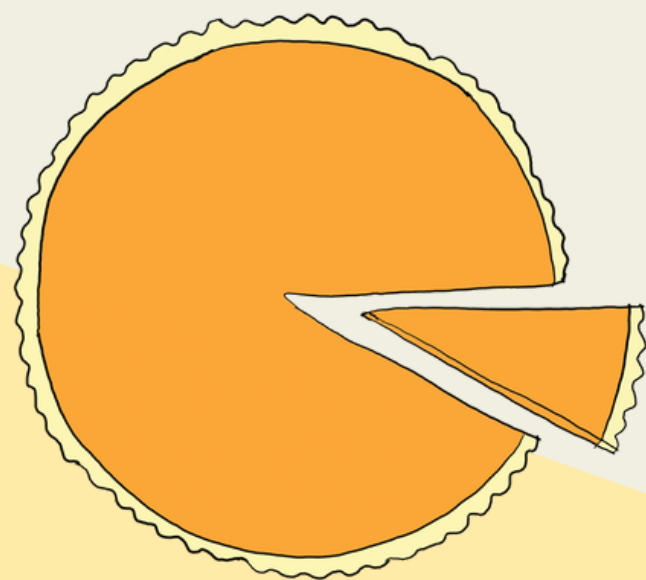
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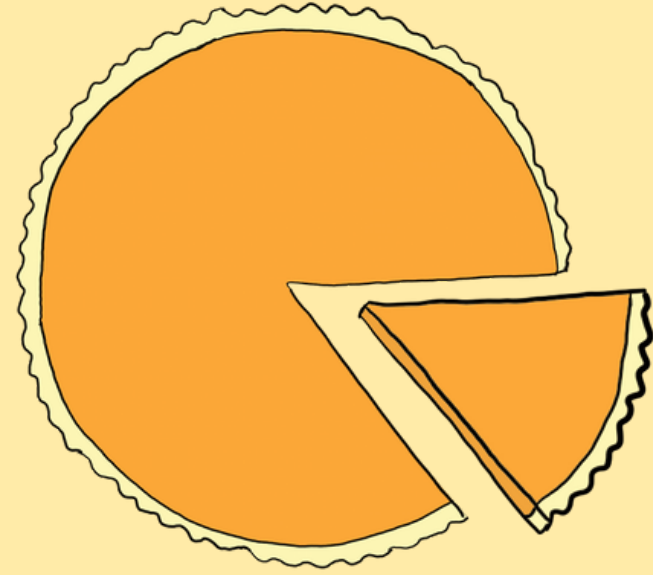
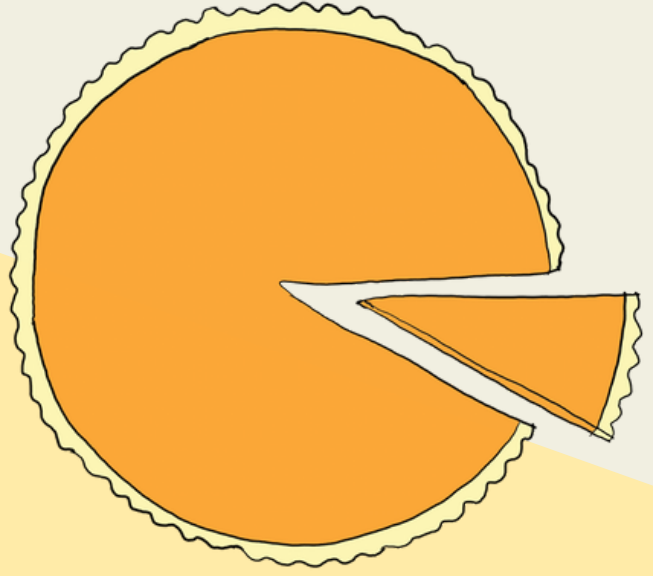
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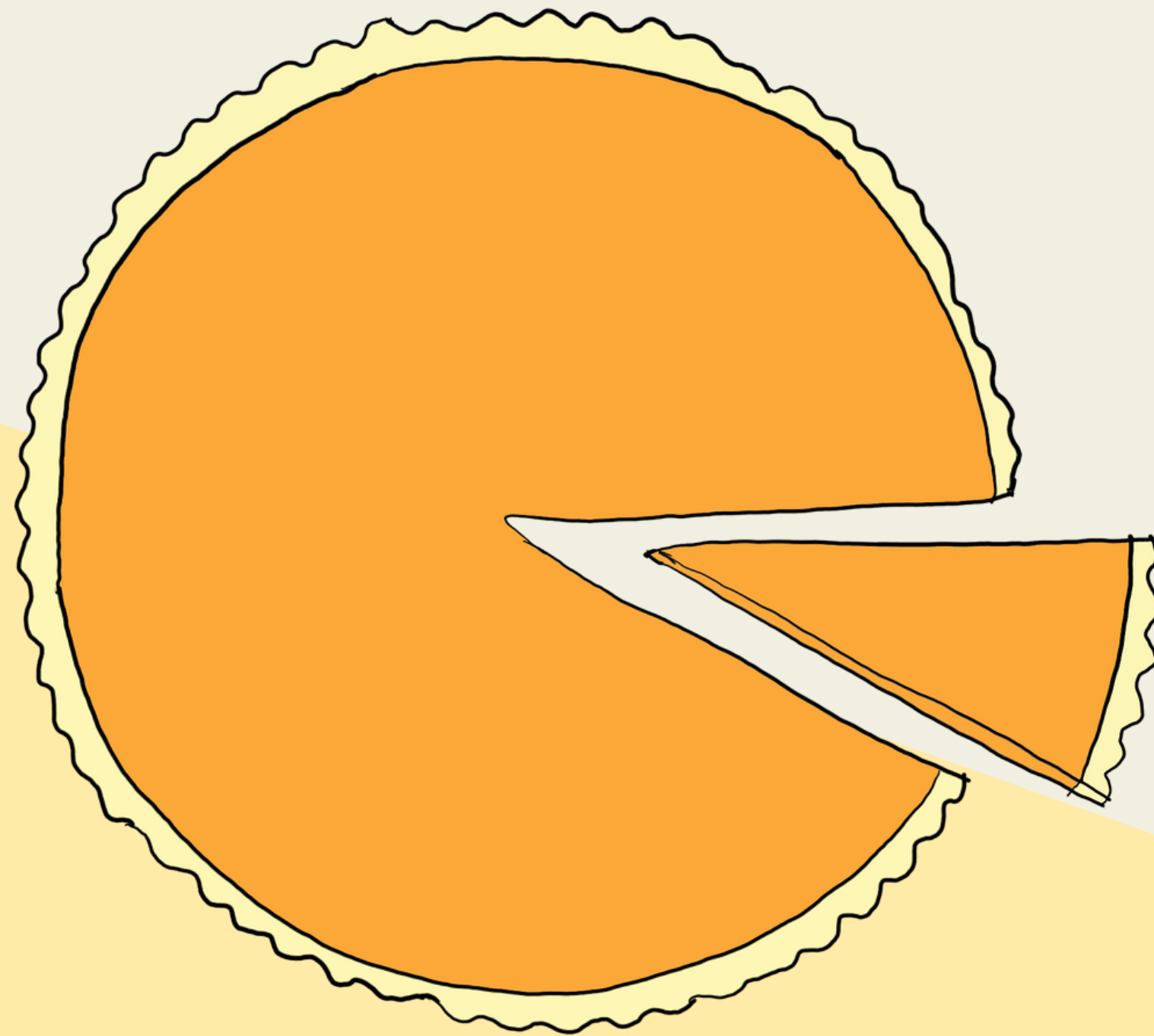
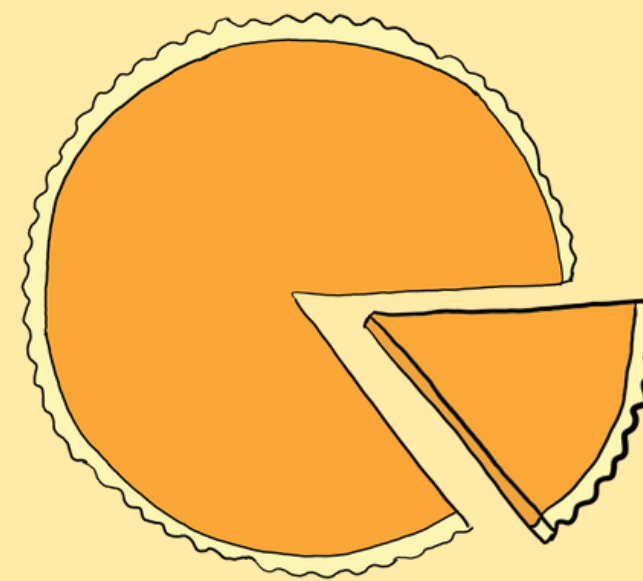
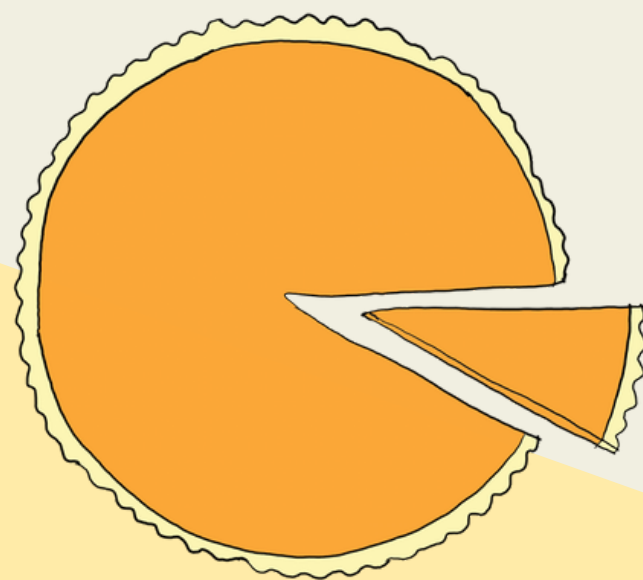


gigawatts









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13:00	<p>SESSION (8) - LOAD CONTROL Chairs: Rosemary Barnes & Richard Sahlberg</p> <p>13:05 6D inertial sensing on the blade surface - know the moves of your blade's surface, Michael Moser, eologix sensor technology, AT (10)</p> <p>13:15 Improving turbine annual energy production (AEP) and reducing O&M costs with real-time blade airflow quality monitoring and quantification under all environmental conditions and levels of blade contamination, John Maris, Martinvent, CA (13)</p> <p>13:35 Blade intelligence - Combined ice measurement and load monitoring, Nils Lesmann, Phoenix Contact, DE (2)</p> <p>13:55 Q&A</p>	<p>12:15 – 14:15 WORKSHOP: RISK OF ICE FALL (9) Chairs: Åsa Elmqvist & Michael Durstewitz</p> <ul style="list-style-type: none"> • TriscoIT, a cloud-based web application for supporting risk-based decisions associated with ice falling from wind turbine blades, Xavier Vanwijck/Bosuyt Otletien, Tractebel, BE (3) • Timeseries-based approach for volume risk assessment, Enrico Sindici, Natural Power, GB (4) • Challenges and opportunities in the communication of risk from Ice Throw, Karl Ove Ingvaldsen, Norconsult, NO (15) <p>Break, 10 minutes</p> <p>Workshop</p> <p>Conclusions</p>
14:00	Exhibition break	
14:30	<p>DETECTING ICE - SENSORS (10) Chairs: Marianne Rodgers & André Bégin-Drolet</p> <p>14:35 From turbines to farms: Using distributed ice detection to increase safety and accessibility, Theresa Loss, eologix sensor technology, AT (9)</p> <p>14:50 Tackling ice throw risks by using sophisticated algorithms of blade-based ice detection, Bastian Ritter, Wolfel Wind Systems, DE (16)</p> <p>15:05 Q&A</p>	<p>REPAIRS (11) Chairs: Anna Lundsgård & Sven-Erik Thor</p> <p>14:35 Structural blade repair in arctic climate, Resttive Vacuum Infusion, Greger Nilsson, Blade Solutions, SE (19)</p> <p>14:50 Cost effective de-icing blade repairs, Morten Handberg, Wind Power LAB, DK (25)</p> <p>15:05 Q&A</p>
15:15	Exhibition break	
15:45	<p>MAPPING ICE (12) Chairs: Eva Sjögren & Nils Lesmann</p> <p>15:50 Atmospheric icing on offshore wind farms in Northern Europe – a risk map, Carla Ribetto, Wood Thilsted, UK (1)</p> <p>16:05 Validation of a wind turbine icing model for site assessment, Noemi Tölg, Fraunhofer IEE (Research Institute), DE (31)</p> <p>16:20 Q&A</p>	<p>ICE PROTECTION SYSTEMS (13) Chairs: Melissa Hogueux & Charles Godreau</p> <p>15:50 Innovation concepts for operation and service in cold climates, Sven-Erik Thor, Lindskog Innovation, SE (39)</p> <p>16:05 IPS retrofit for complex blades, Daniela Roepert, Borealis Wind, CA (40)</p> <p>16:20 Q&A</p>
16:30	Exhibition break	
17:00	<p>KEYNOTE SESSION (14) Moderators: Elektra Kleusberg & Stefan Gsinger</p> <p>17:05 Comparison of four blade-based ice detection systems installed on the same turbine, Paul Froidevaux, Meteotest, CH (18)</p> <p>17:20 IEA Wind Task 19: Cold climate wind market study, Timo Karlsson, VTT Technical Research Centre of Finland, FI (21)</p> <p>17:35 Q&A</p>	
17:45	Exhibition break/Mingle 45 min	
18:30	End of day	

13:00	<p>INTERESTING ODD TOPICS (15) Chairs: Tanja Tränkle & Michael Moser</p> <p>13:05 Protection and lifetime improvement for bearings and gears by using silicon-based additive technology, Stefan Bill, Croda, DE (38)</p> <p>13:15 Synergies between icing on wind turbines and UAVs, Richard Hann, Norwegian University of Science and Technology (NTNU), NO (11)</p> <p>13:35 Re-use of wind turbine blade for construction and infrastructure applications, Alann André, RISE Research Institutes of Sweden, SE (37)</p> <p>13:55 Q&A</p>	<p>13:15 – 14:15 THE SOCIAL AND ECOLOGICAL ENVIRONMENT (20) Chairs: Sigrid Carstairs & Sebastian Meyer</p> <ul style="list-style-type: none">• A road map for the wind energy industry: taking a proactive approach to the biodiversity challenge, Tove Hågglund and Åsa Abel, Ecogain, SE (41)• Digital business and collaboration platform for local anchoring and collaboration, Charlotte Larson and Oskar Ahlman, Vindkraft-centrum and Umeå University, SE (42)	<p>12:15 – 14:15 WORKSHOP - HSE (16) Chairs: Maria Röske & Michael Henriksson</p> <ul style="list-style-type: none">• Safe turbine operation in icy conditions, Eva Sjögren, ENERCON GmbH, SE (26)• Return on experience: Working on a wind farm in icing conditions, Charles Godreau, Nergica, CA (14)• Simple rules-of-thumb for ice fall/throw safety distances, Alexander Stöckl, Energiewerkstatt, AT (5) <p>Break, 10 minutes</p> <p>Workshop</p> <p>Conclusions</p>
14:00	Exhibition break		
14:30	<p>ICING LOSSES (17) Chairs: Theresa Loss & Øyvind Byrkjedal</p> <p>14:35 Modelled icing losses with WICE: A blind test in France, Stefan Söderberg, DNV, SE (30)</p> <p>14:50 Uncertainties of modelled production losses due to icing, Marie Pedersen, EMD International, DK (6)</p> <p>15:05 Q&A</p>	<p>EXPERIENCES OF ICING (18) Chairs: Noemi Tölg & Matthew Wadham-Gagnon</p> <p>14:35 Lesson in winterisation from the UK, David Armour, Natural Power, GB (7)</p> <p>14:50 Skellefteå Kraft's experiences of operating wind turbines in cold climate and the need of a physical testing, Kristian Elverström, Skellefteå Kraft, SE (36)</p> <p>15:05 Q&A</p>	
15:15	Exhibition break		
15:45	<p>FINAL SESSION (19) Moderators: Jeanette Lindeblad & Stefan Gsinger</p> <p>15:50 Combining ensemble icing forecasts with real-time measurements for power line and wind turbine applications, Bjørn Egil Nygaard, Kjeller Vindteknikk, part of Norconsult, NO (22)</p> <p>Wind - Breath of life or kiss of death: Analysis of wind energy fatalities, Paul Gipe, Wind-works, US (44)</p> <p>16:20 Q&A</p>		
16:30	Exhibition break		
17:00	End of conference		

Other issues

Perverse incentives related to financing in the planning process lead to bad technology outcomes

Ice assessment

Low ice class gives favourable finance terms

Changing climate

Will today's ice assessment be relevant in 20 years?

Technology
assessment

Mature technology assessments give favourable finance terms

What are the solutions?

1

WINTERISE EVERYTHING!

Blade heating on every turbine

2

GO BIG!

Interconnectors & storage

3

GO SMALL!

Household batteries

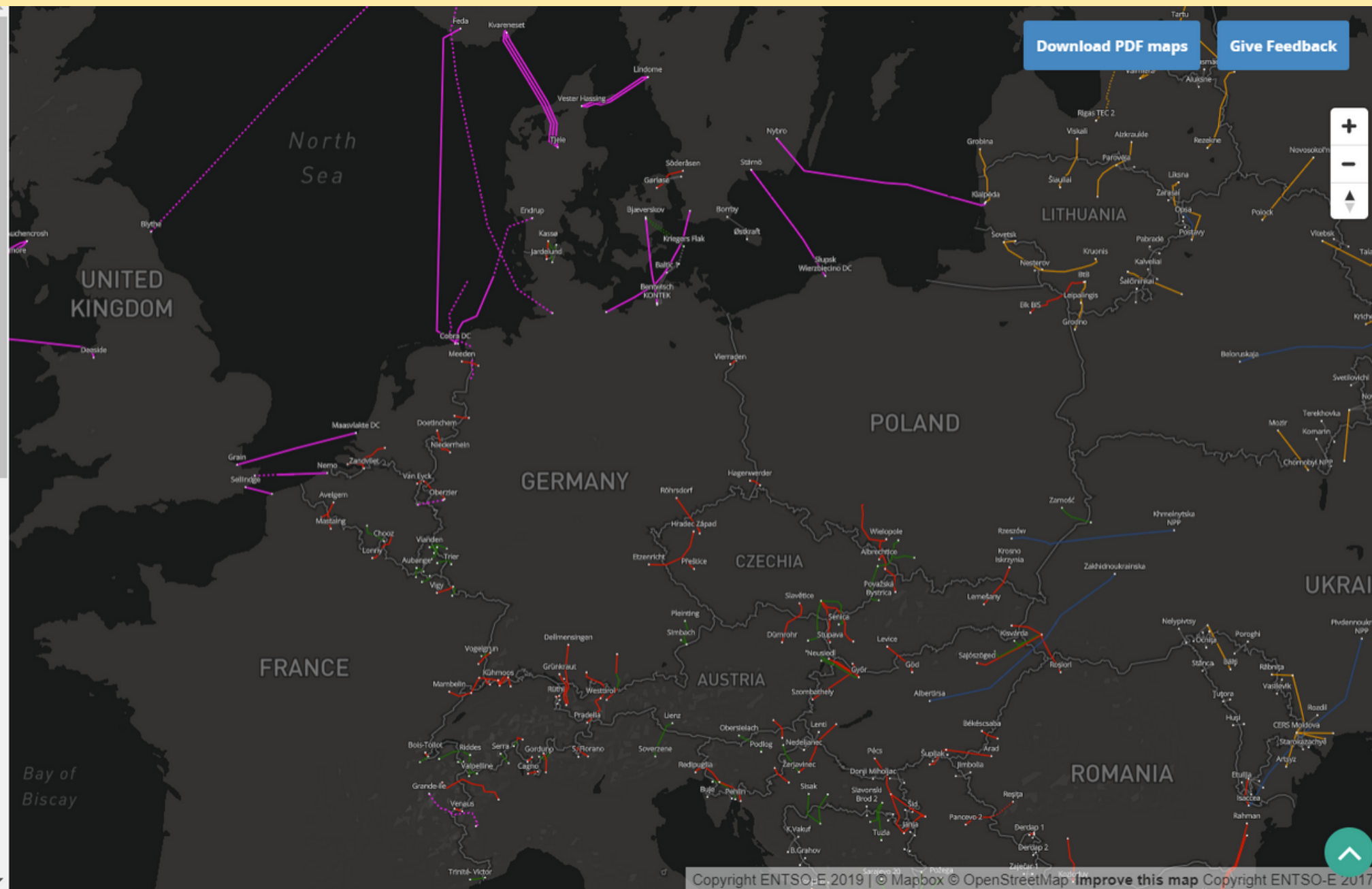
4

MAKE THINGS EASY FOR OURSELVES!

Demand flexibility and energy efficiency

GO BIG!

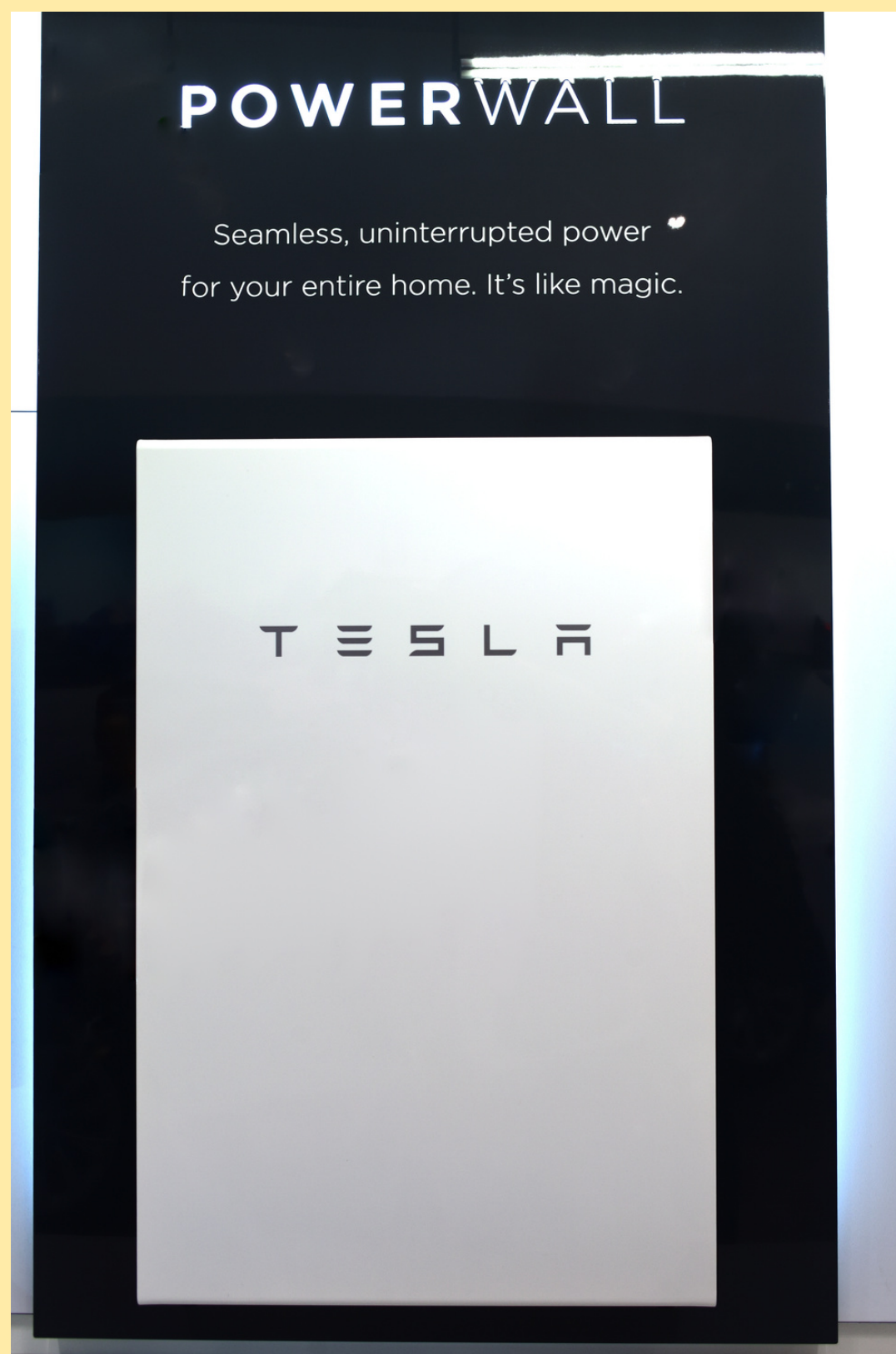
Interconnectors and storage



3

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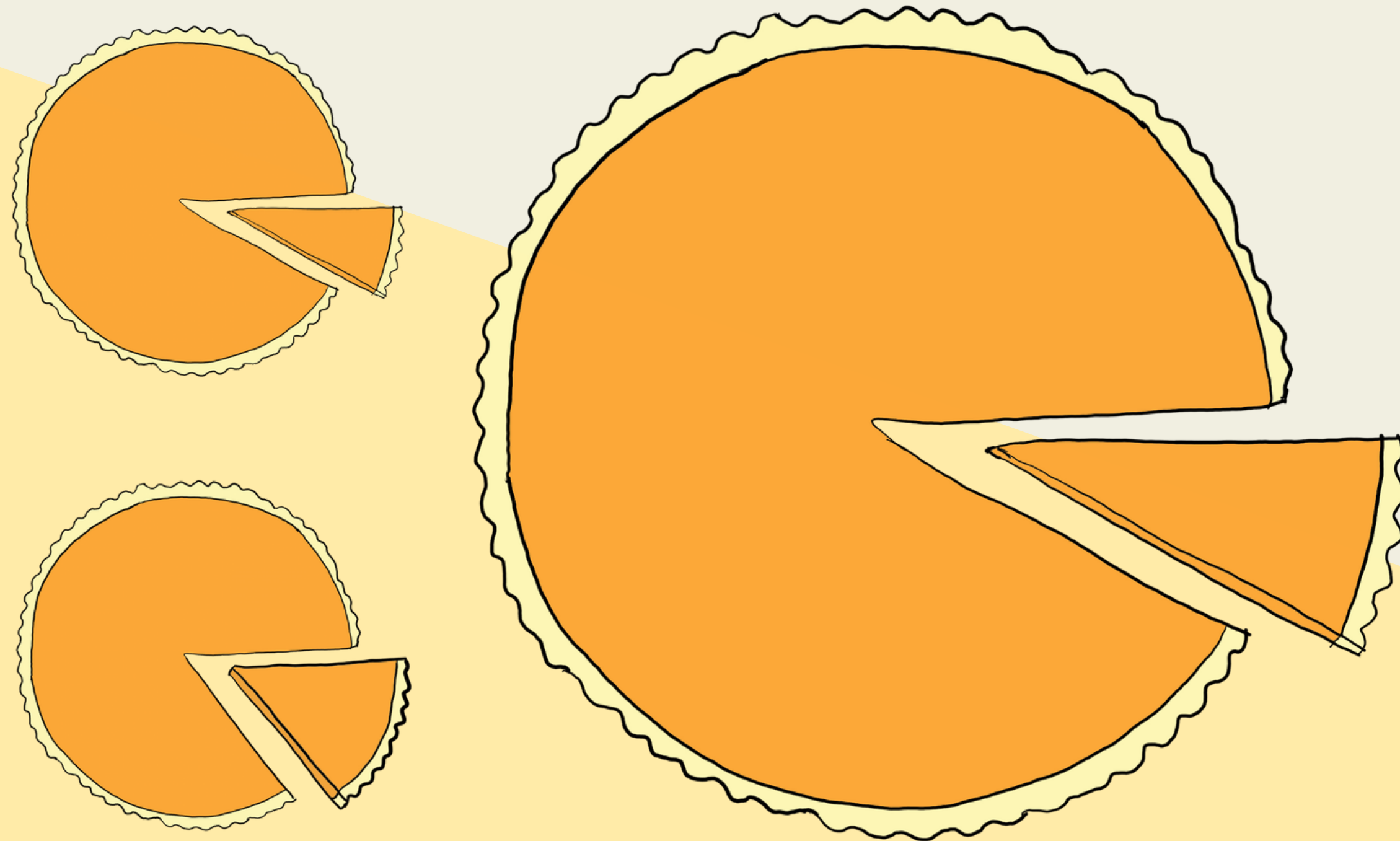
Household batteries

4

MAKE THINGS EASY FOR OURSELVES!

Demand flexibility and energy efficiency

We're going to need to all of these



- Heated blades
 - Anti-icing coatings
 - Ice forecasting forecasting
 - Smart operation
 - Occasional icing solutions
- ...including helicopters



skål