FLEXIBILITY

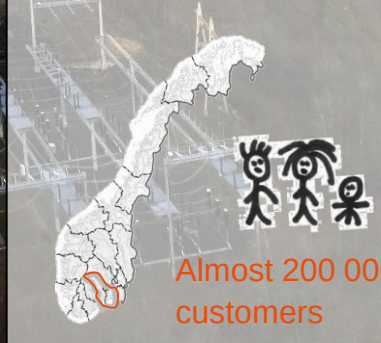
seen from a DSO perspective (demand-side)

FME CINELDI Future Electricity Distribution Grid R&D

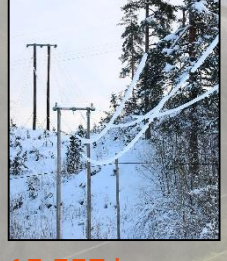
Eivind Gramme, Trondheim 9/4-2019

Skagerak Energi

Skagerak Nett



Almost 200 000 customers



15 557 km

1 390 km

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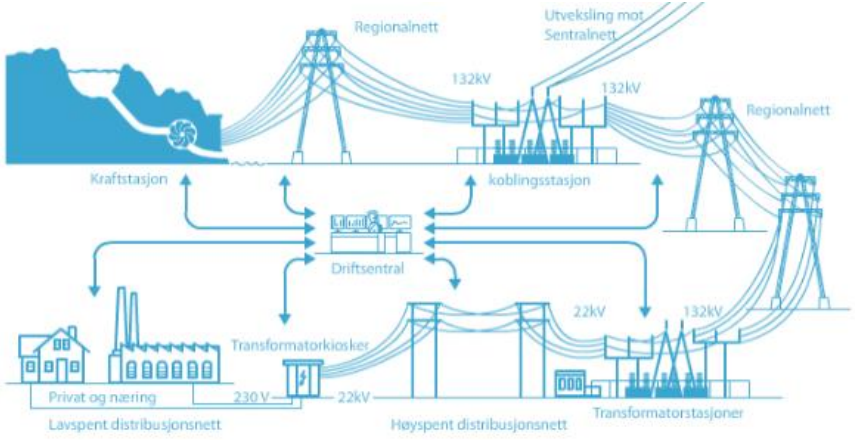
Agenda

- A vision for tomorrow’s power system
- Alternatives when new loads are added to the power system
- Incentives and barriers for flexibility
- Going forward



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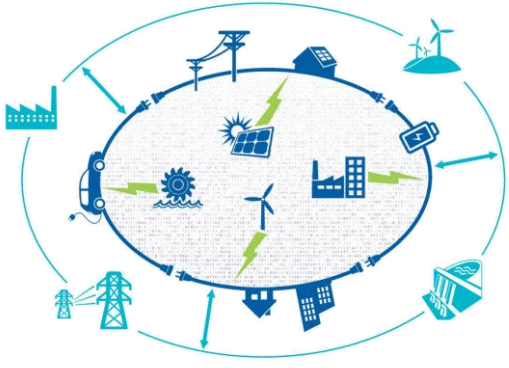
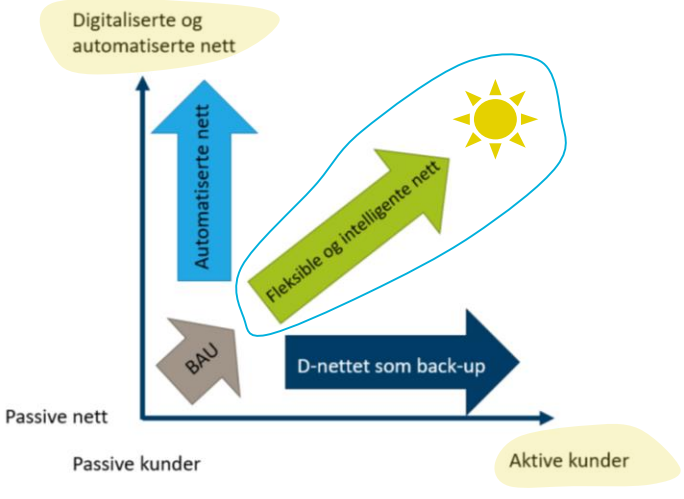
A vision for tomorrow's power system

- An active, automated, digitized and asset light power system enabling further electrification of society



Flexibility

CINELDI
Centre for intelligent electricity distribution
- to empower the future Smart Grid



WP6 Smart grid scenarios and transition strategies

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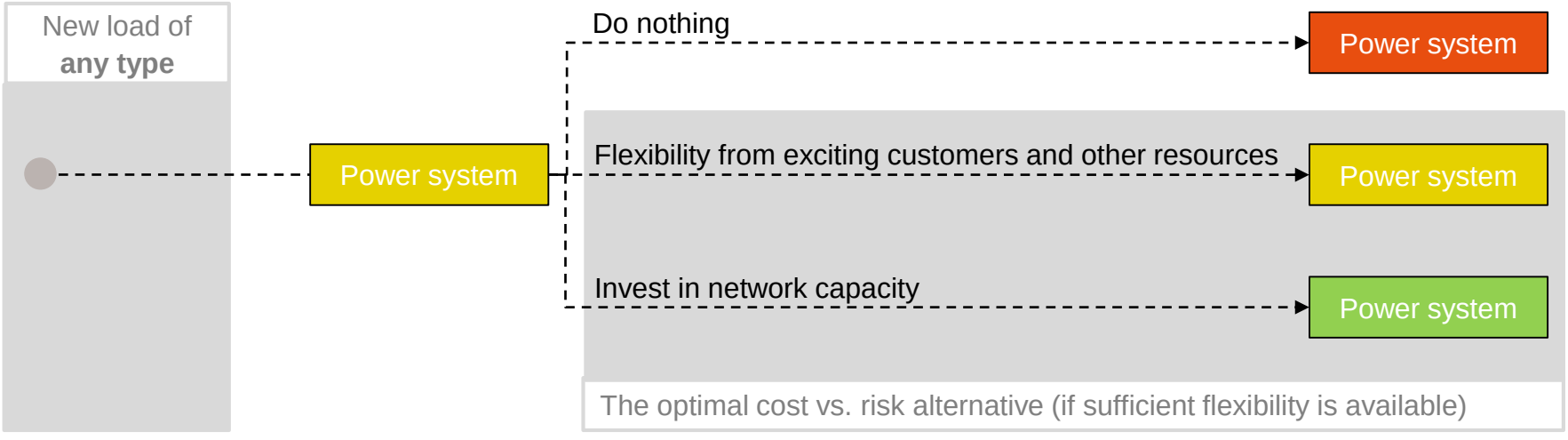
1. Alternatives when new loads are added to the power system

New load



- Beyond operational criteria
- Heavily loaded network close to operational criteria / dependant of available flexibility
- Good margins to operational criteria

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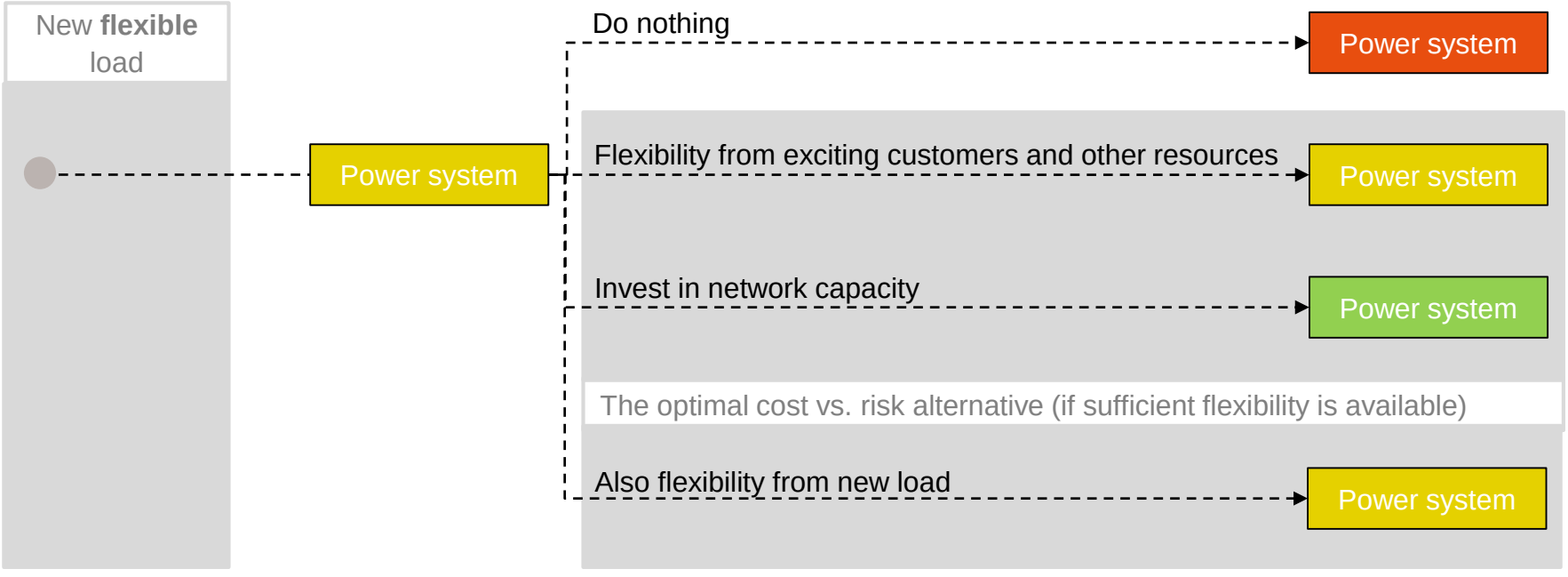
New flexible load



- Beyond operational criteria
- Heavily loaded network close to operational criteria / dependant of available flexibility
- Good margins to operational criteria

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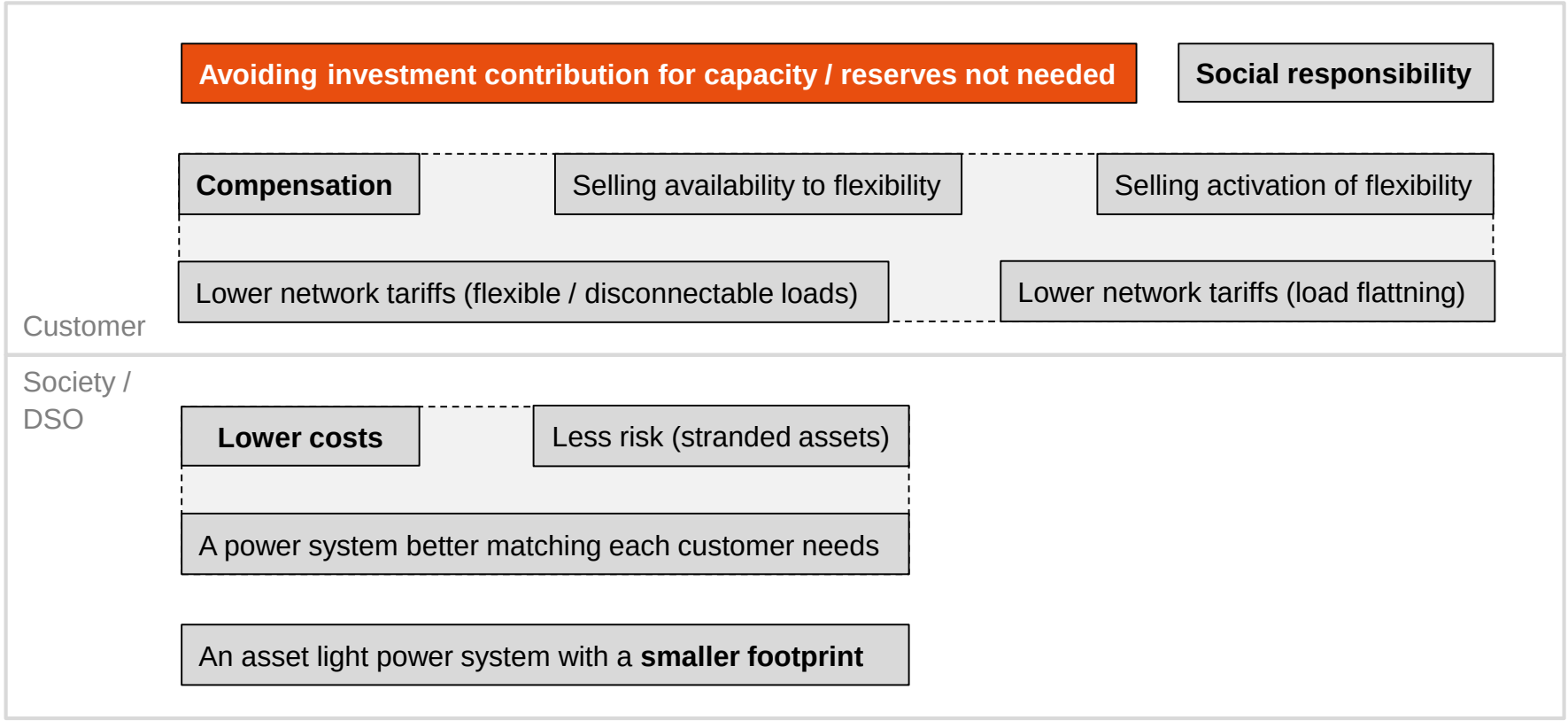
2. Which incentives and barriers are there for using flexibility?

Incentives for flexibility



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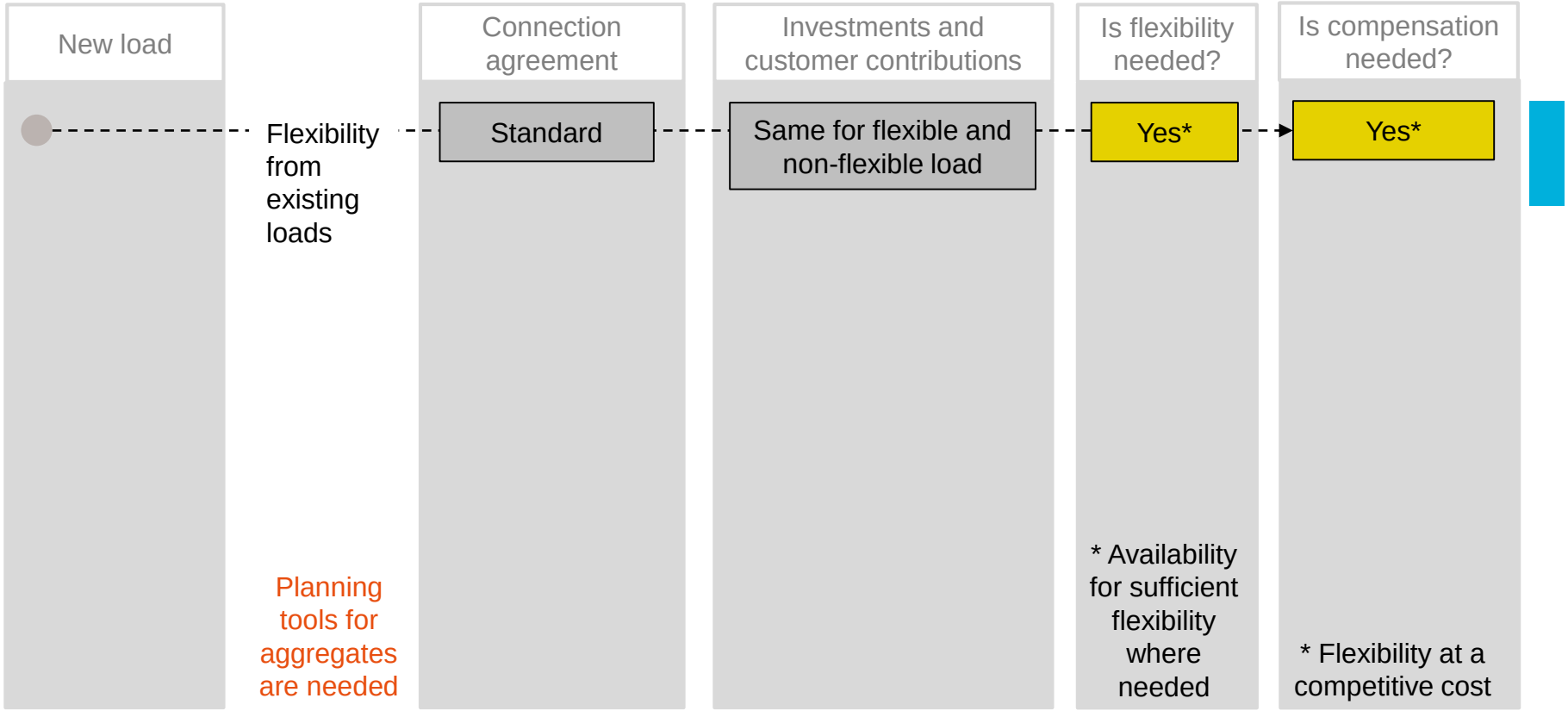
Applied to regular loads

Barriers

New load in combination with a power grid close to e.g. N-X criteria. Flexibility from excising loads makes connection / capacity increase possible.



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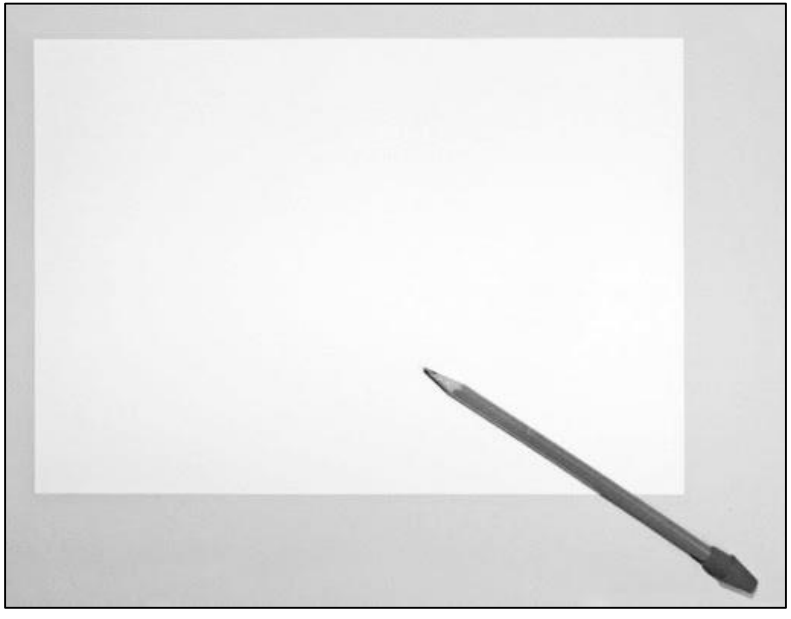
Planning tools

- Which flexibility is available from an aggregate with different flexible resources?
  - Volume vs. duration vs. security
  - When customers already are flattening their load because of network tariff incentives
- Taking load, flexible resources and production into conidiation, which network capacity is sufficient for supplying an area?
- For a flexibility based alternative to network investment, what is the future need for activation of flexibility?

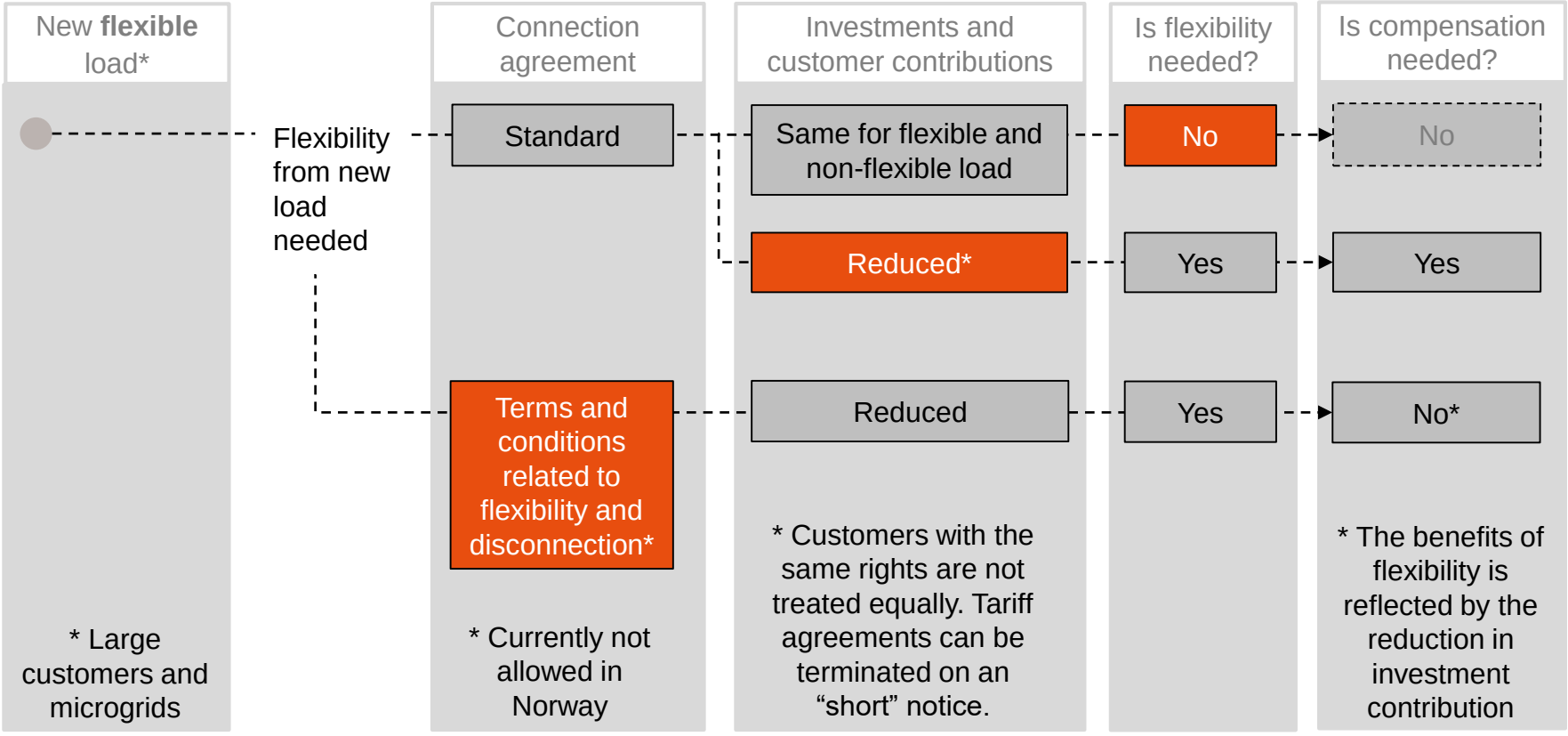
- Risk assessment of flexibility based alternatives to network investments



Applied to regular loads

Barriers

New flexible load in combination with a power grid close to e.g. N-X criteria. Flexibility from the new load makes connection / capacity increase possible.



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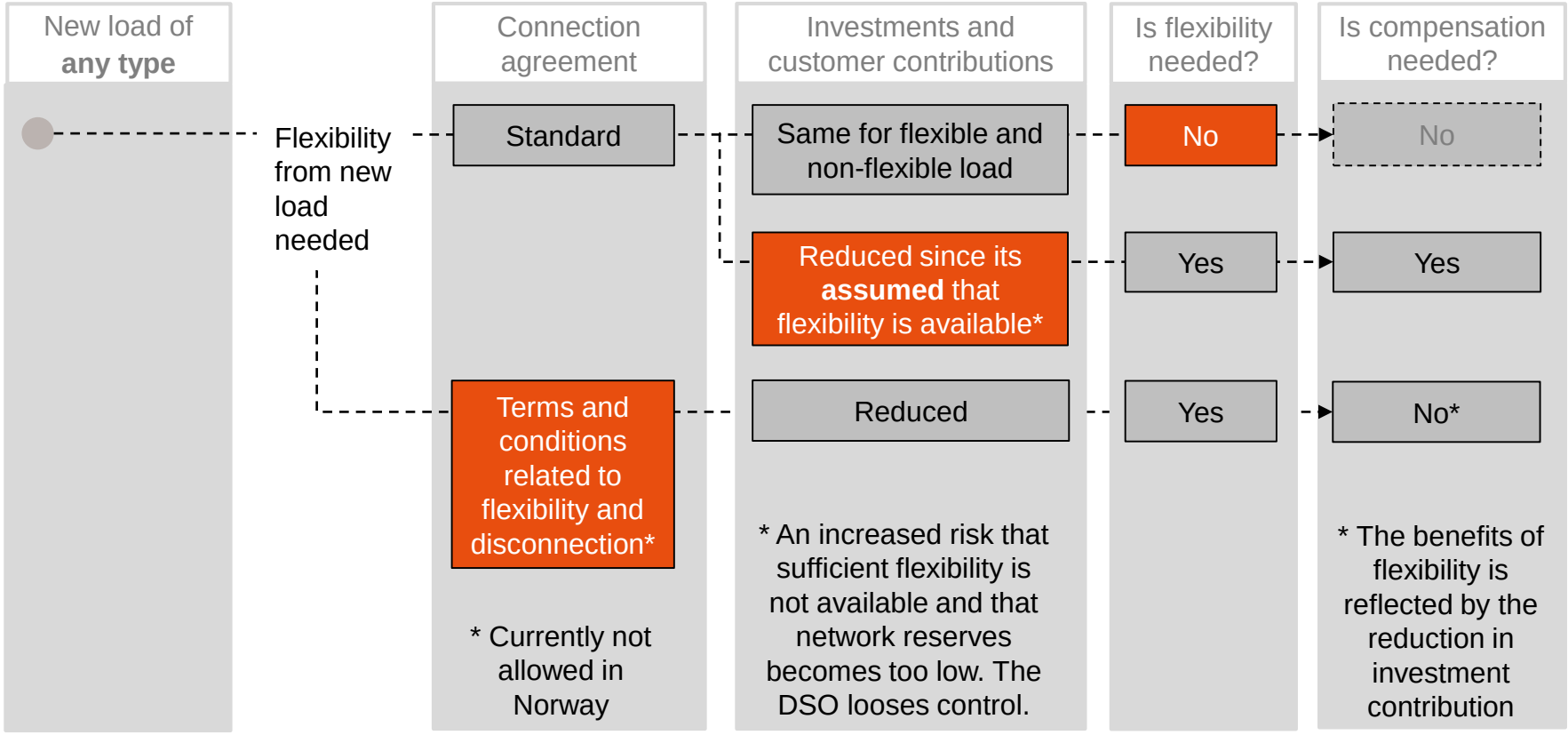
Applied to regular loads

Barriers

New load in combination with a power grid close to e.g. N-X criteria. Flexibility from new load is needed to prevent an unacceptable reserve capacity.



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Recent examples from our area illustrating possible benefits

- Increased capacity to an partly flexible industrial customer
  - Use network reserves needed for other customers in contingency situations: 1 mill. NOK (terms and conditions related to flexibility and disconnection in the connection agreement)
  - More limited industrial expansion matching current grid capacity: 1 mill. NOK
  - Establish new capacity in the MV and HV grid: 19 mill. NOK

132/22 kV power transformer etc.

22 kV cables

- Electrification of transportation
  - Use network reserves needed for other customers in contingency situations: 0,7 mill. NOK (terms and conditions related to flexibility and disconnection in the connection agreement)
  - Establish new capacity in the MV grid: 7,3 mill. NOK

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3. Going forward

Hurdles to pass

- Traditional approach to planning
  - New tools and thinking are needed
- There is limited need for flexibility until one starts to use it as an alternative to network investments
- **Connection agreements with terms and conditions related to flexibility and disconnection is currently not allowed**
- Inexpensive local availability of flexibility

Photo: Liz Roll, 14 January 2017 (FEMA Photo Library).

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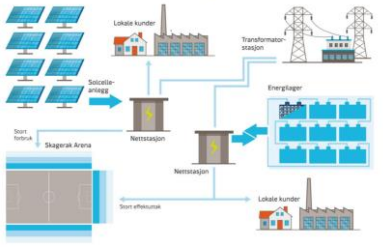
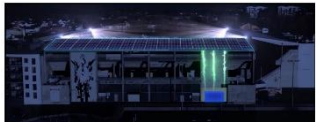
Our larger pilots

- Skagerak Energilab
  - “Test area for future technology”
  - Installation with PV and an energy storage at a stadium with local load designed for research.
- “Large-scale testing of demand side flexibility as a resource for efficient utilization of existing power grids”
  - Different customers with control systems incl. some with DER (optimization con-sumption with regard to needs and cost)
  - Across customers (benefits for the power system through coordinated control)

ODD 1894 · Skagerak Nett · Skagerak Kraft · KONTORBYGG as · ENOVA





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E-REGIO

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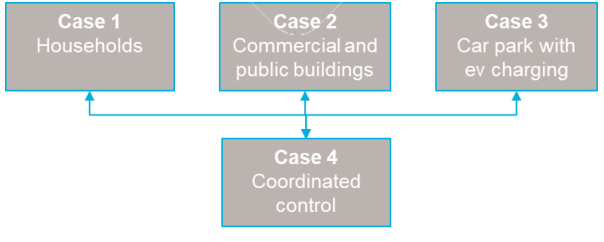
FME Cineldi
KPN Flexeffect
ForTa



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THANK YOU

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