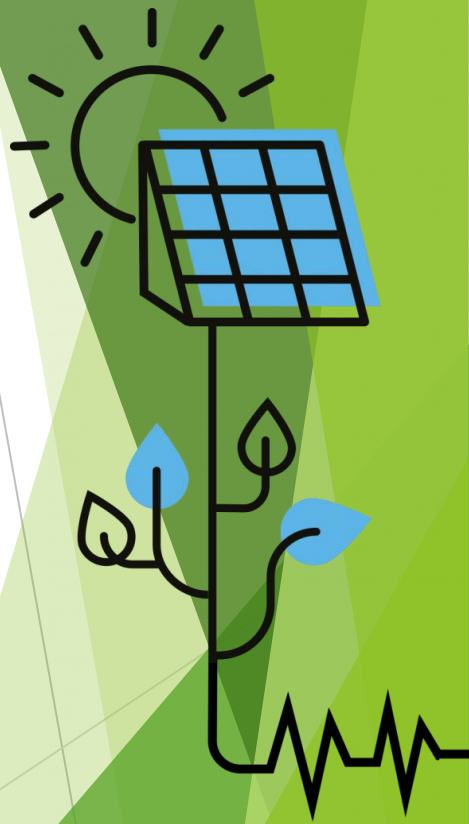
Iceland Liechtenstein Norway grants

EIHP
Energetski institut Hrvoje Požar

REPUBLIKA HRVATSKA
Ministarstvo regionalnoga razvoja i fondova Europske unije



Examples of good practice in the implementation, construction, and maintenance of photovoltaic panels on public buildings in Norway, with the indication of possible problems and ways to solve them.

Solarization of Institutions of the City of Zagreb - SOLIZAG
1st project workshop, Grad Zagreb, March 2nd 2023

Erik Eid Hohle
Manager
Energigården - EFIF

THE ENERGY FARM INTERNATIONAL FOUNDATION

“

Energigården

The Energy Farm

CENTRE FOR BIO- AND SOLAR ENERGY

www.energigarden.no

Our target groups are:

Energy companies, energy authorities,
agro- and forestry sector, environment NGO's
R&D-institutions, schools and universities, general public,
media, bio- and solar energy stake holders in general

Our activities include:

Courses, training programs, study tours, education, reseteaching, exercises
Consulting, engineering and consultancy services
Research and development projects
Guided tours and demonstrations
Production of information material, textbooks, etc.
Head office of the Energy Farm International Foundation
Production, processing and use of bioenergy and solar energy

Almost fossil-free for 30 years

Eidsalm gård - 2760 Brandbu – Norway tel +4761336090

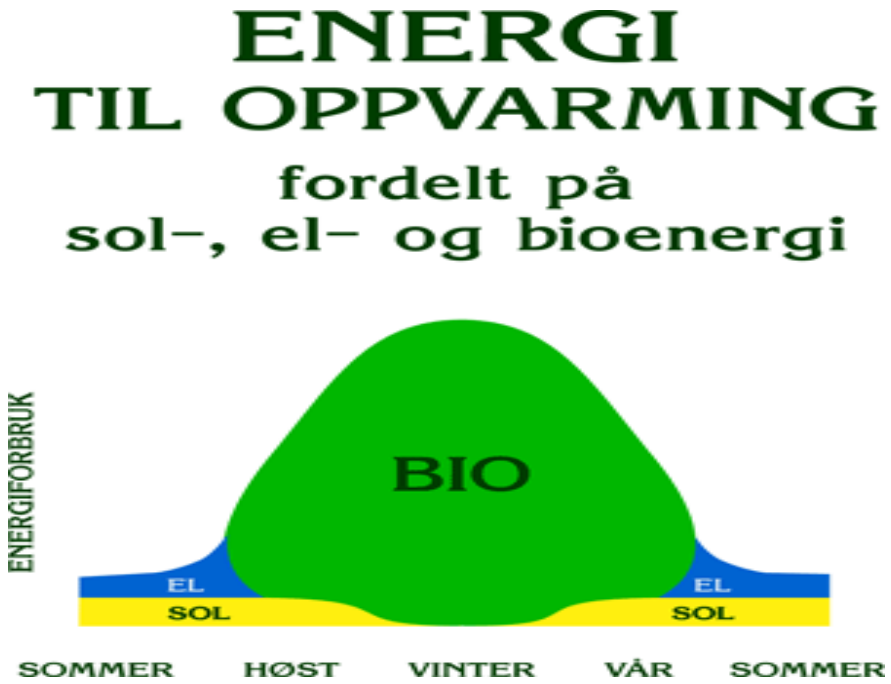
The Energy Farm

.... is self-supported with 85-90 % of its direct energy use:

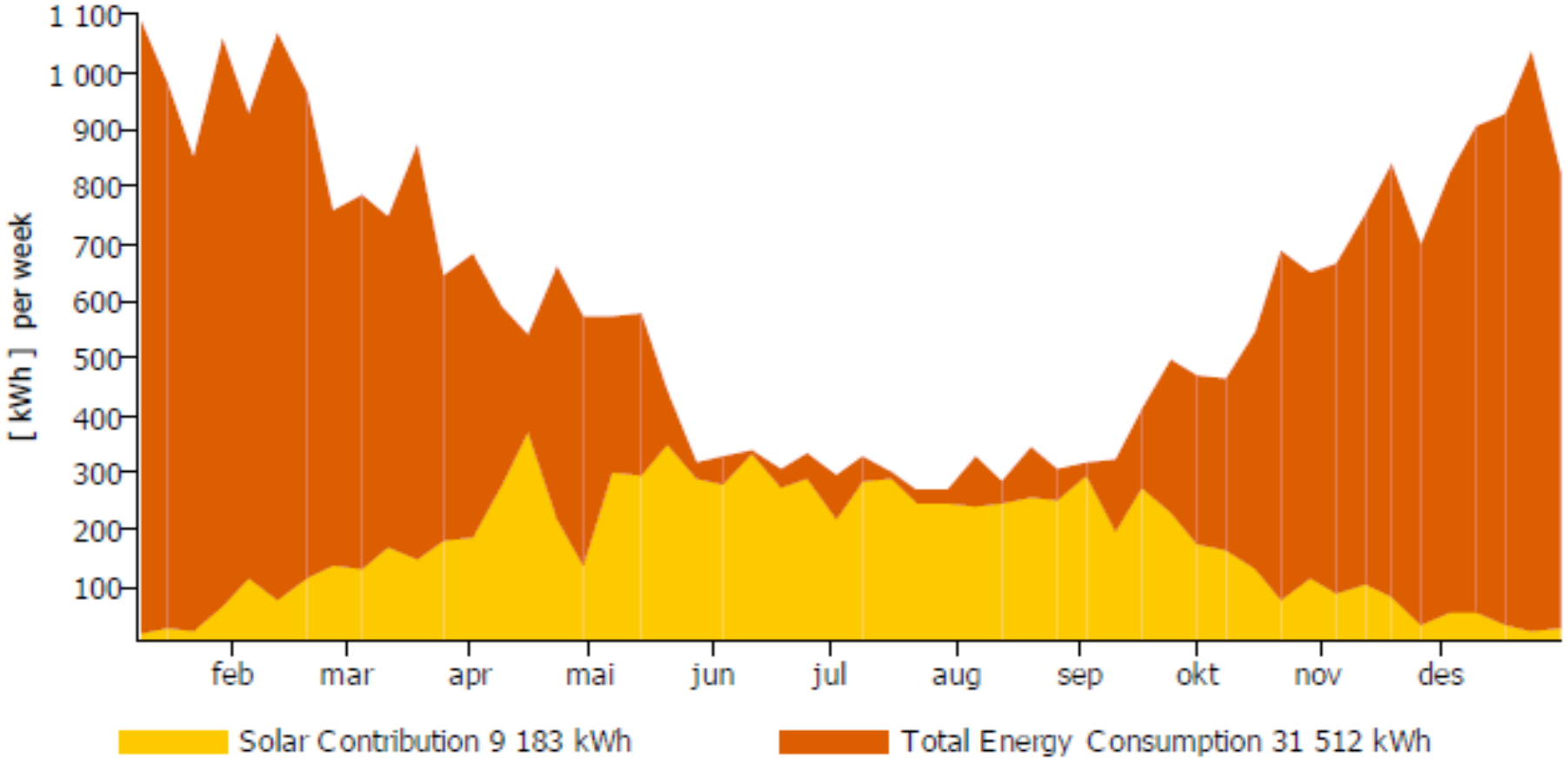
- Heat production using wood chips from own forest
- Solar heat production
- Liquid biofuels for transportation

At the Energy Farm solar energy currently cover

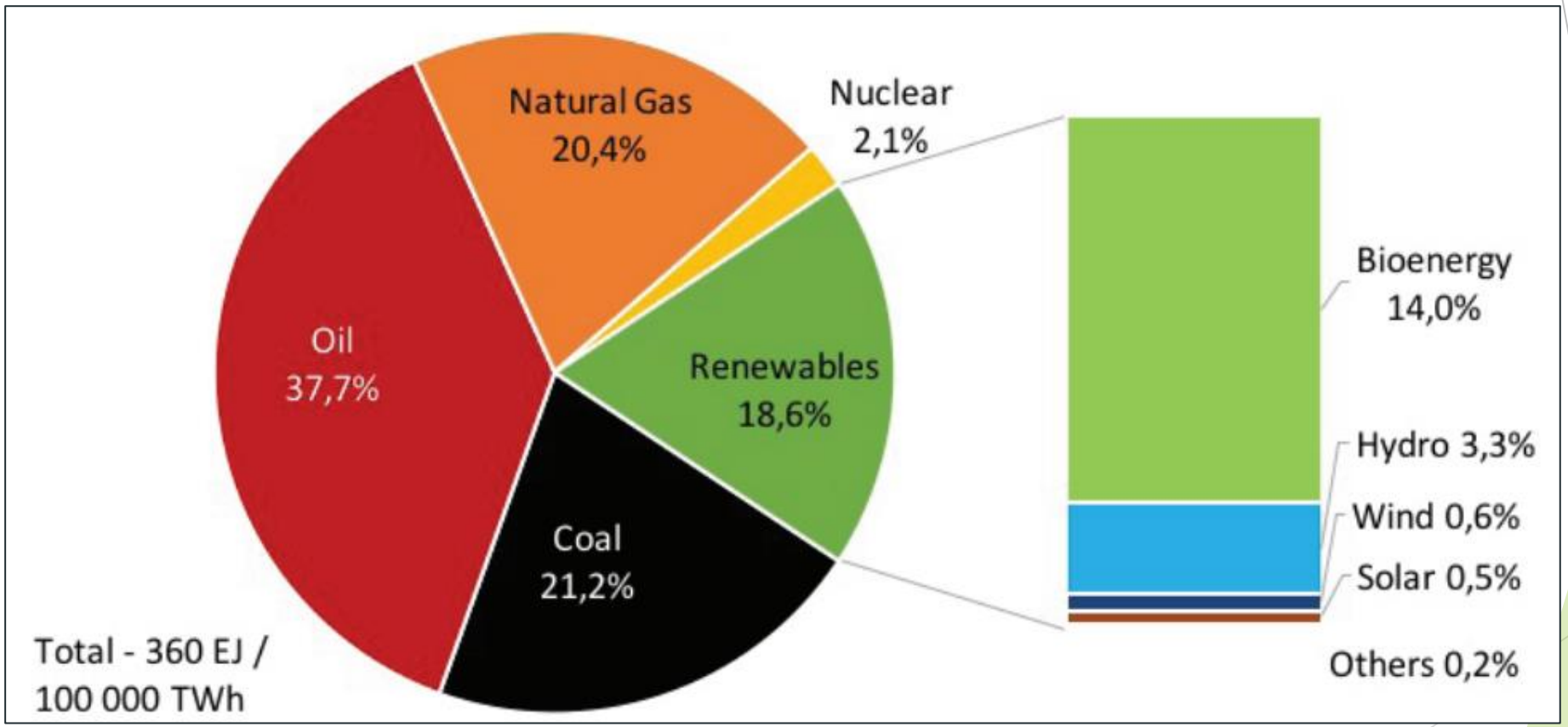
Approx. 40% of the energy requirement of domestic hot water
Approx. 5% of the room heating requirement
Approx. 70% of the energy requirement for drying grain, wood chips and hay
Approx. 20% of total thermal energy demand



Solar energy's share of the total annual heat demand for tap water and room heating in a building will under our conditions be up to 30%

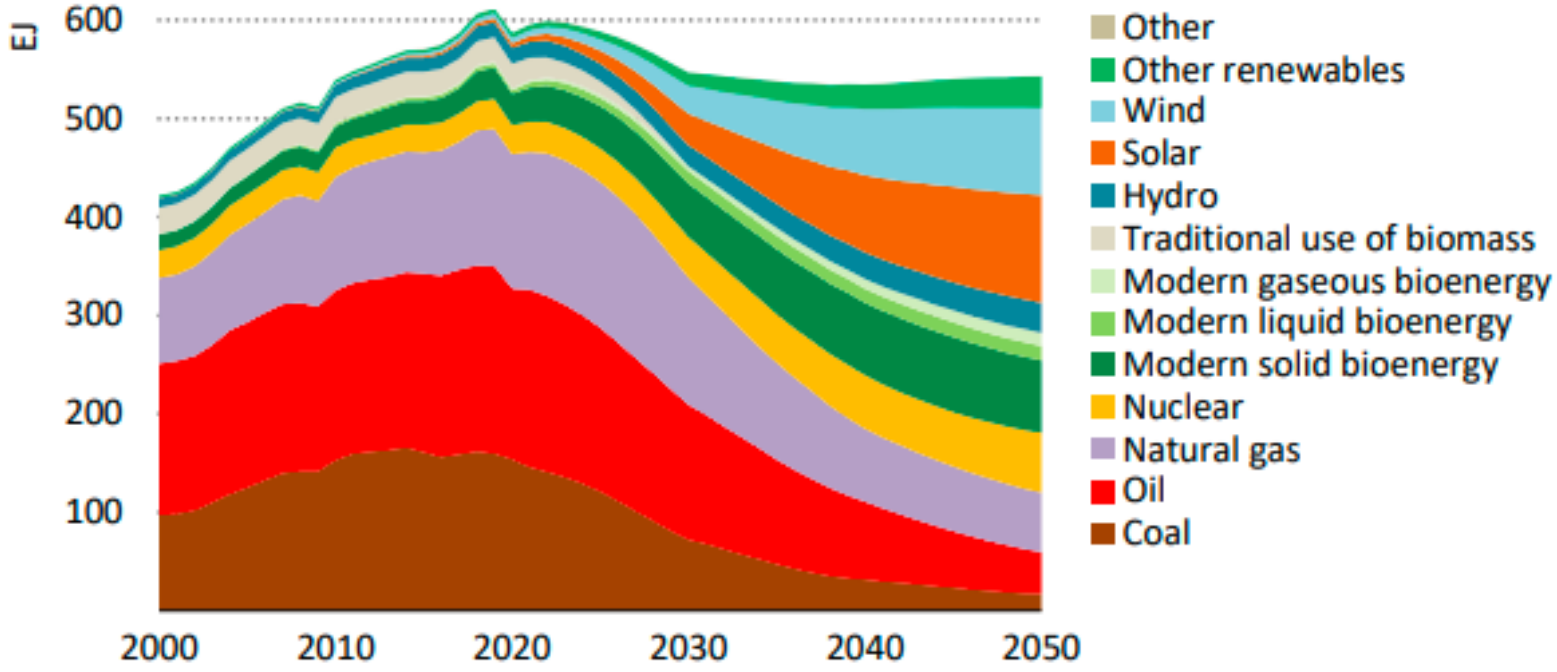


Global energy use



Net Zero by 2050 - A Roadmap for the Global Energy Sector

Figure 2.5 ▷ Total energy supply in the NZE



Solar electricity with focus on status and potentials in Norway

Todays production and technical potential of solar electricity on buildings in Norway.

TWh/year.

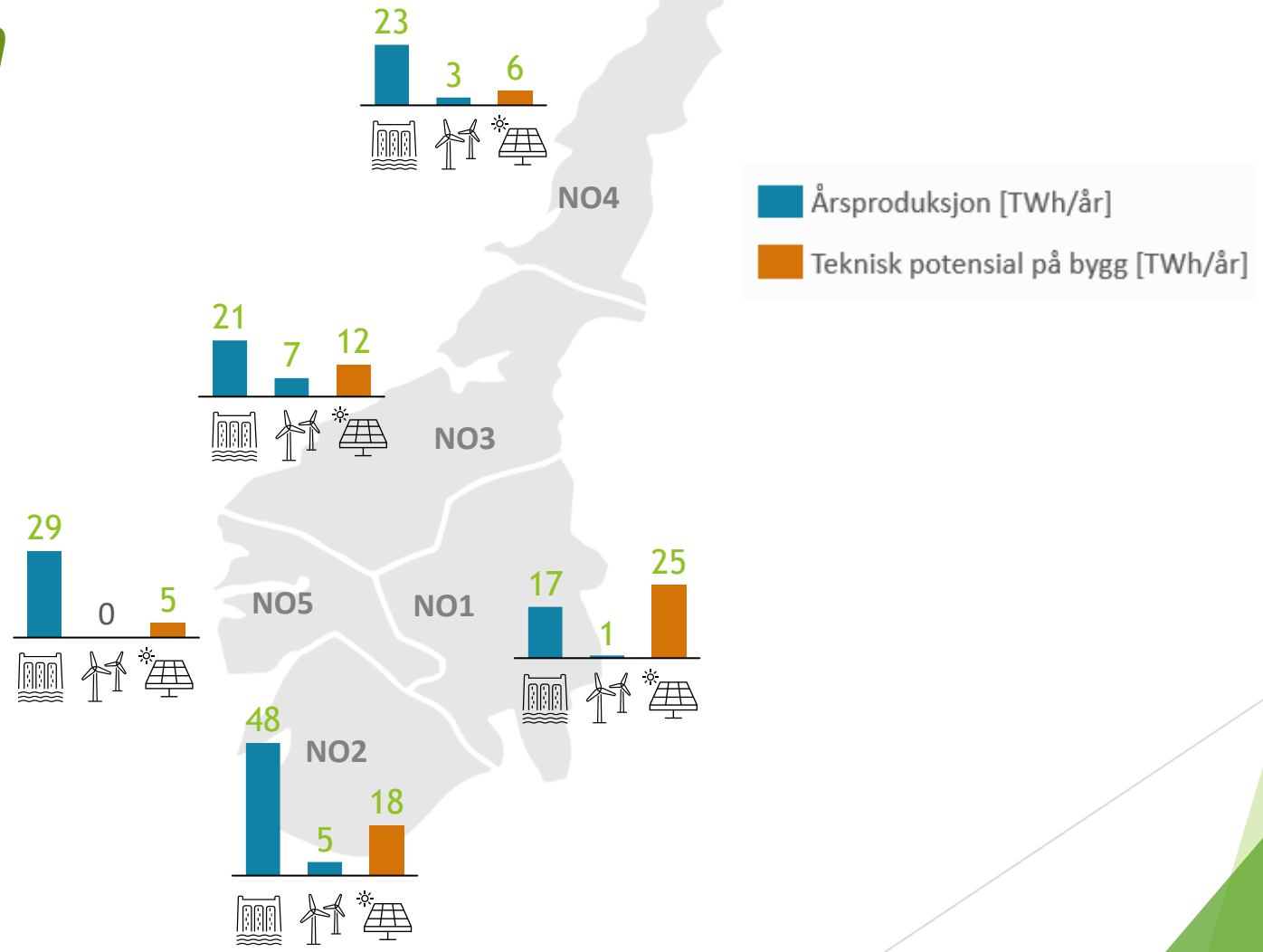
Renewable electricity production in Norway today, TWh

-Hydro

-Wind

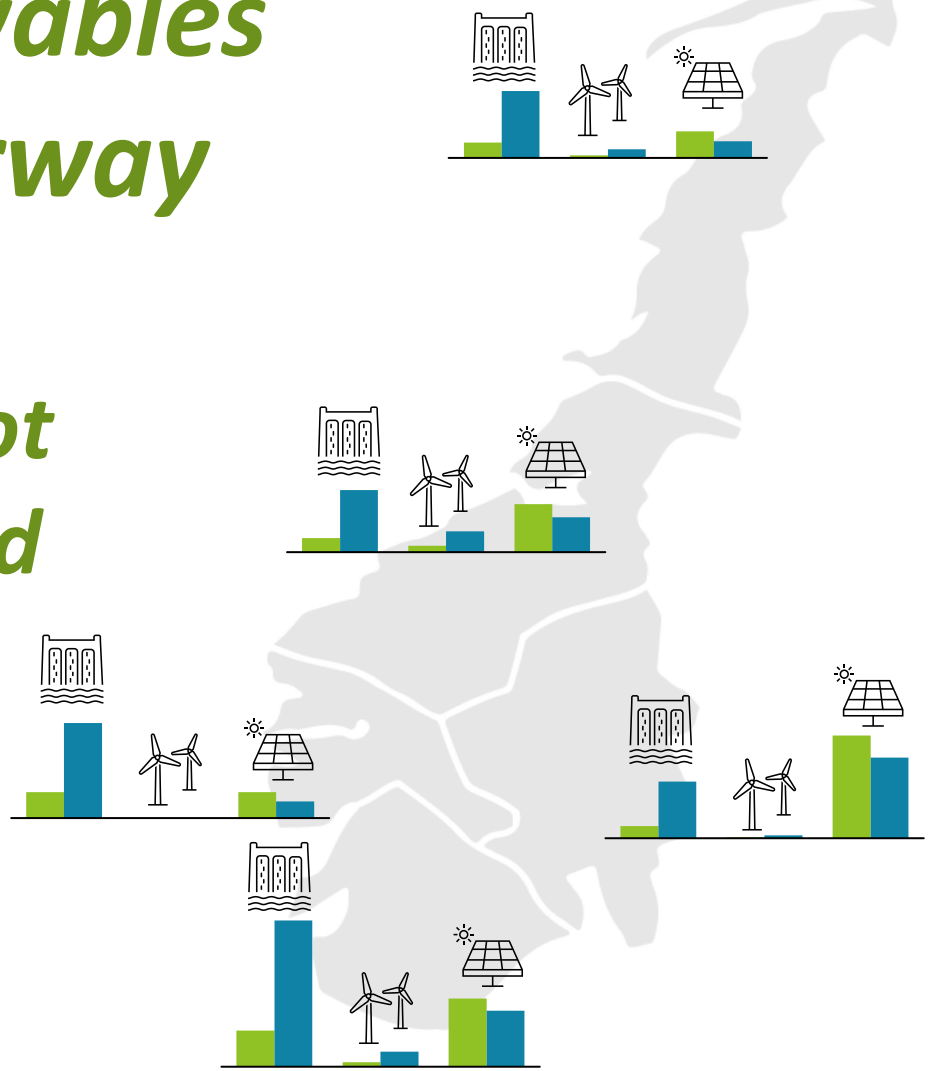
-Solar

Heat not included



Power and electricity production from renewables in Norway

Heat not included



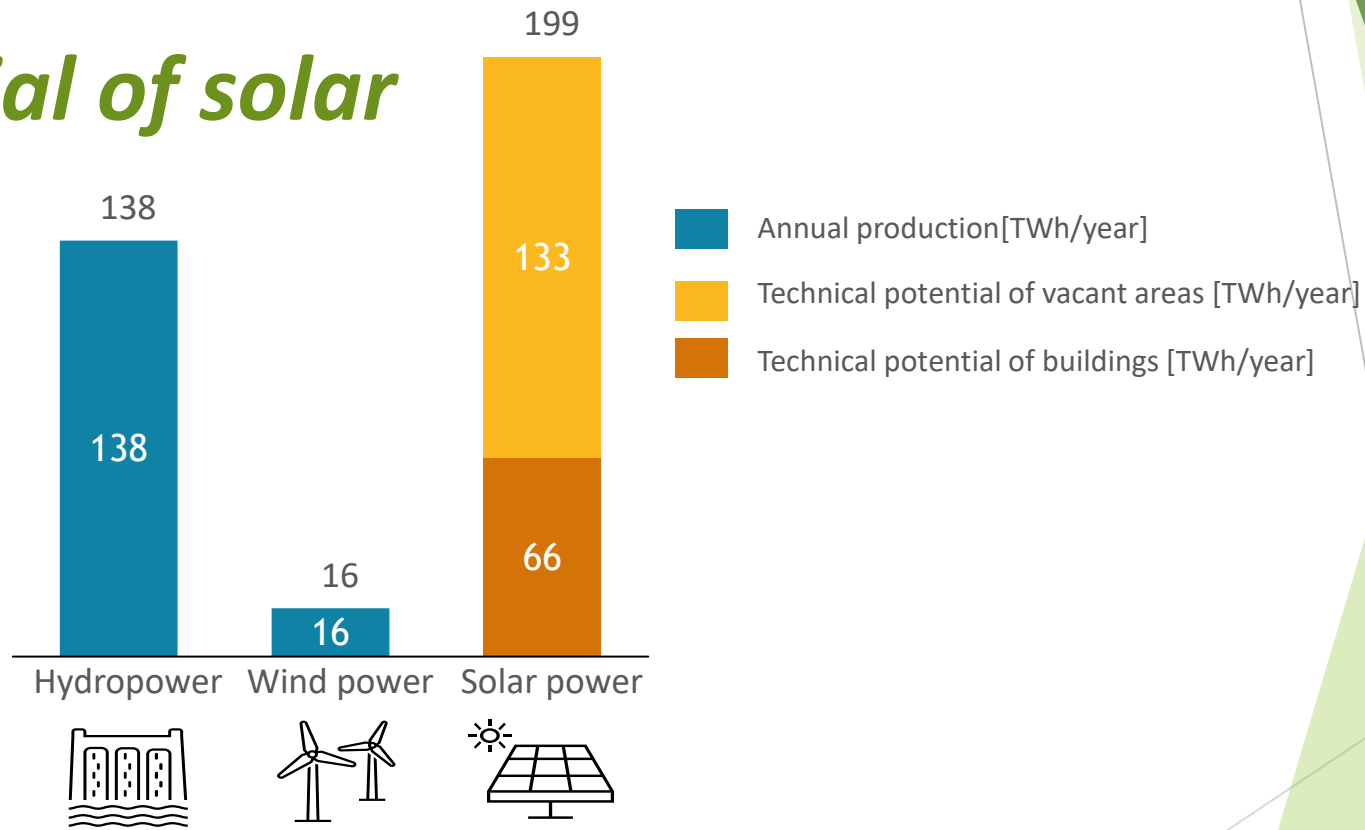
Power [GW]
Production [TWh/year]

Effekt	Vann	Vind	Sol
NO1	3,8	0,3	31,6
NO2	11,7	1,4	22,2
NO3	4,8	2,1	16,3
NO4	5,3	0,9	9,1
NO5	7,9	0,0	7,9
Totalt (GW)	**33,5**	**4,8**	**87,1**

Produksjon	Vann	Vind	Sol
NO1	17,4	0,9	24,8
NO2	47,6	4,9	18,2
NO3	21,2	7,0	11,9
NO4	22,9	3,0	5,7
NO5	29,2	0,0	5,1
Totalt (TWh)	**138,3**	**15,8**	**65,6**

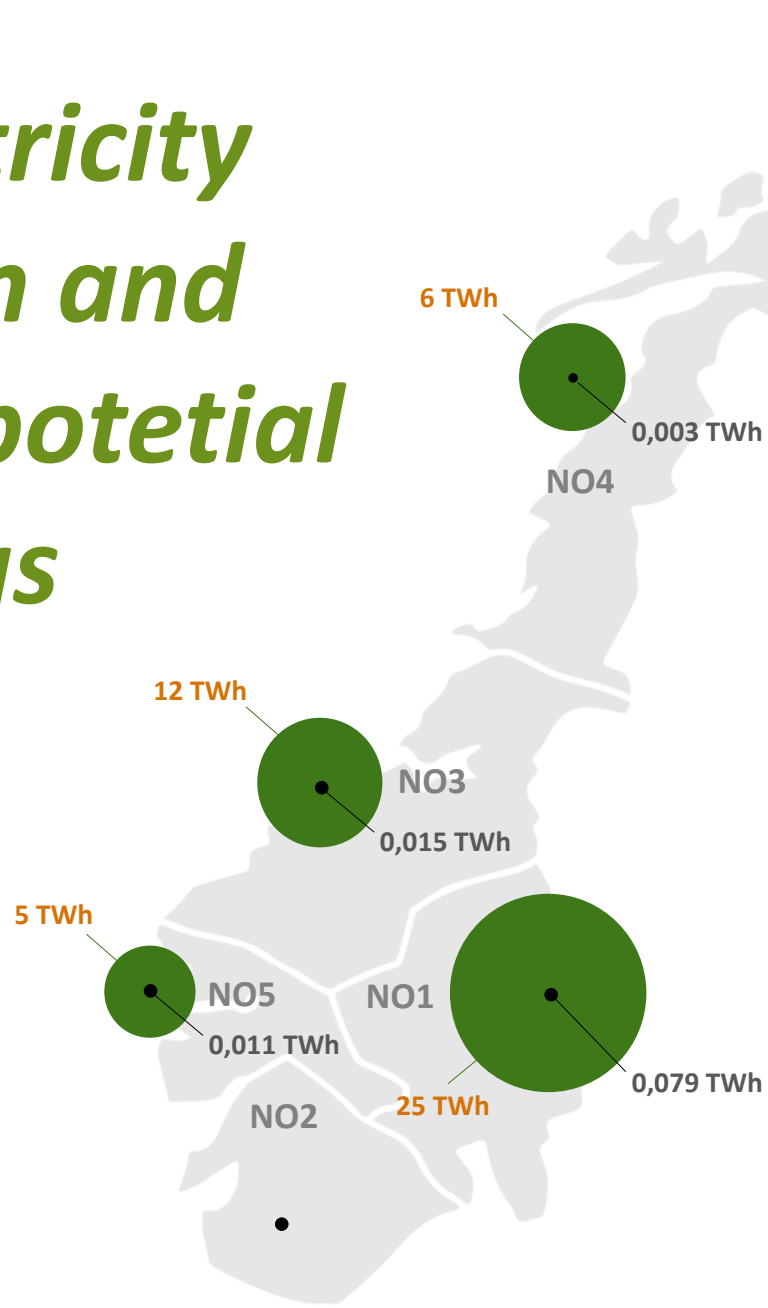
Annual production of hydro, wind and solar electricity in TWh/year.

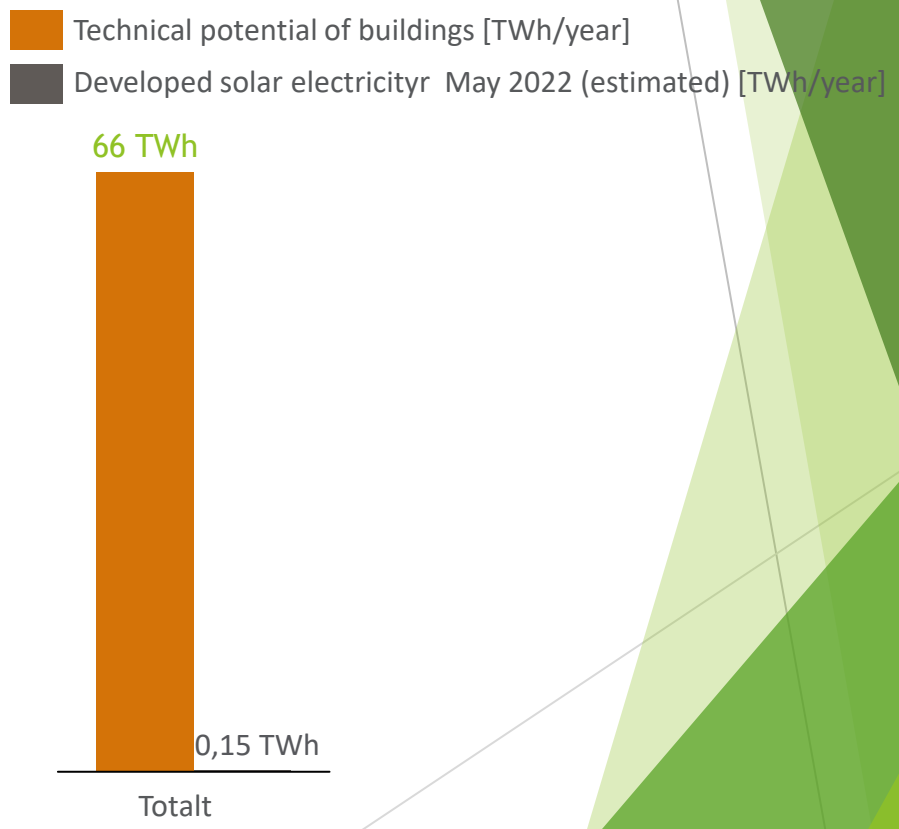
Technical potetial of solar electricity in Buildings in Norway



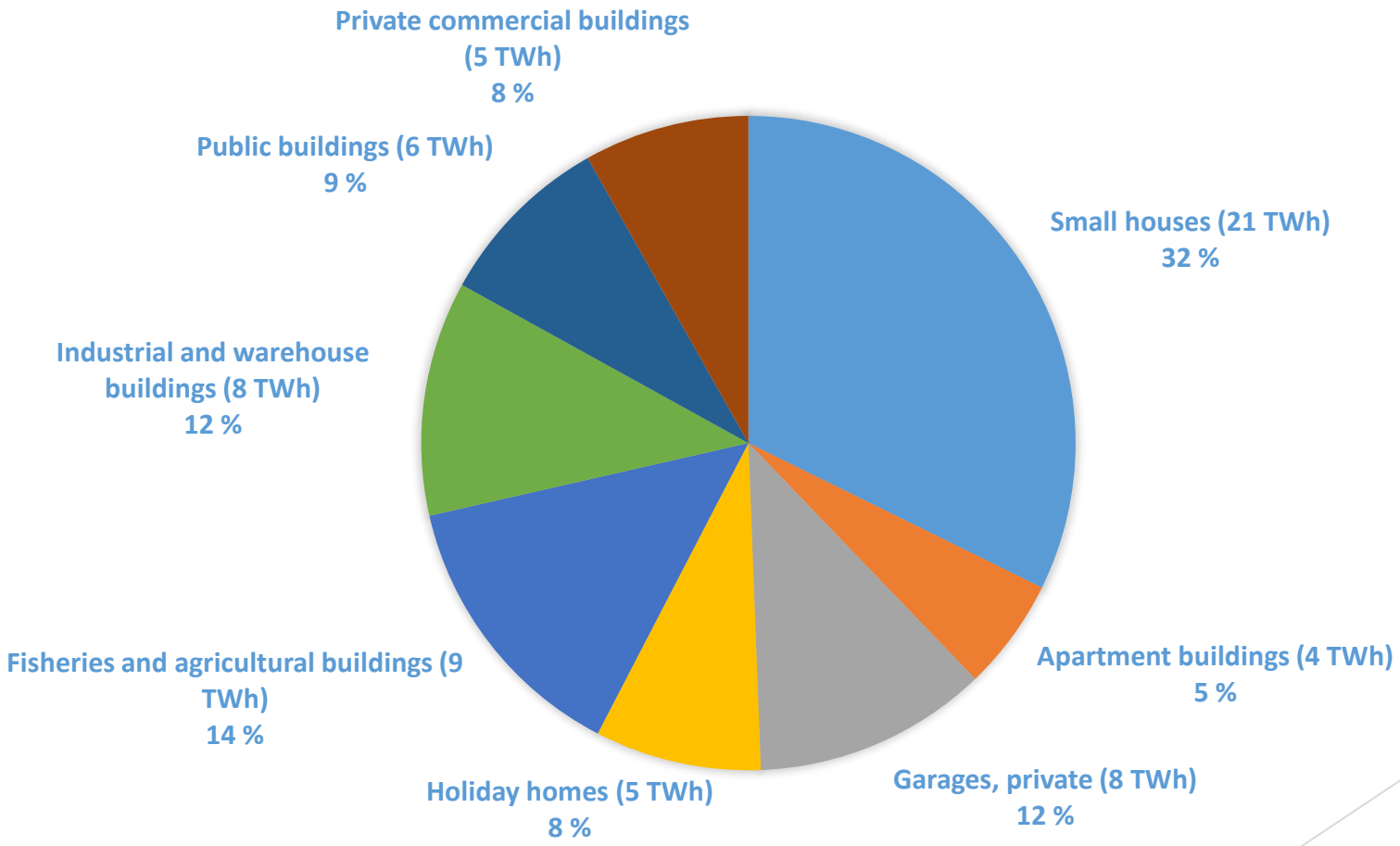
Solar electricity production and technical potetial in buildings Norway

Heat not included





TECHNICAL POTENTIAL FOR SOLAR POWER ON BUILDINGS IN NORWAY



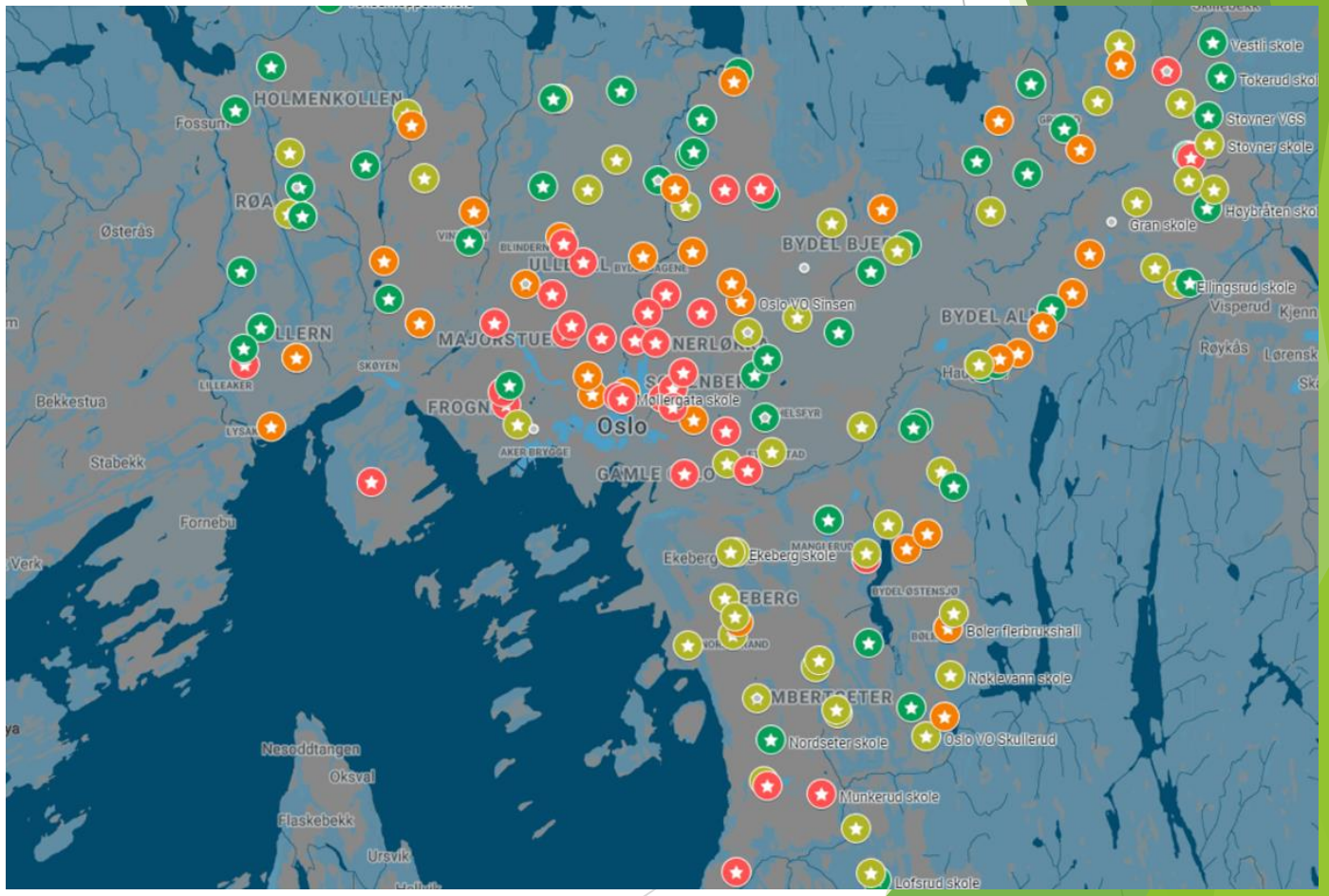
Solar electricity on public buildings in Norway - examples from cities and smaller municipalities

Solarmap from Oslo city's administration

Solar energy in schools in Oslo city
Survey of potentials

208 units, i.e. schools and sports halls, have been included in the survey.

The map shows schools that are
-very suitable,
-suitable under given conditions
or
-not suitable



Oslo city - 700.000 inhabitants
Mapping of solar electricity potensials on public buildings

72 of the mapped 208 Oslo schools are suitable for solar cells

The conclusion of the work is that more than 70 schools and sports buildings in Oslo are suitable for solar cells. If all the opportunities are exploited, it will be possible to produce approximately 4.5 million kWh per year in solar energy at these buildings. We have estimated that the municipality can save a total of about 20,000 tonnes in greenhouse gas emissions by building the recommended photovoltaic systems.

Estimated costs for produced solar energy over its lifetime ("LCoE" - Levelized Cost of Electricity) for the facilities recommended for educational buildings range from approx. € 0,05 / kWh and up to approx. € 0,09 / kWh.

In Norway, most public procurements will go out to *tender* to get a fair price.

Examples of solar electricity on public buildings in some Norwegian cities and smaller municipalities

Tvedestrand municipalitiy's High School

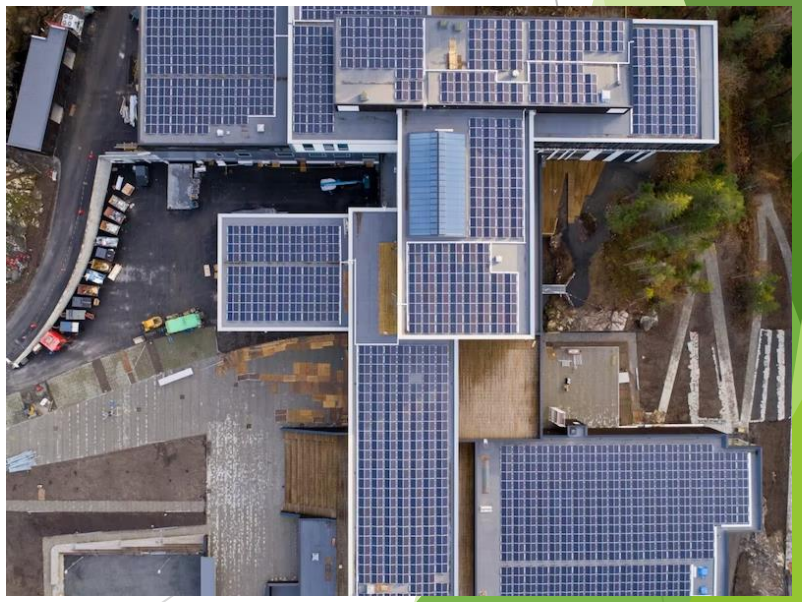
4.400 m2 solar cell on roof, used Nissan Leaf batteries as storage,
10.000 per year on eletricity bills.

June-July '22: Received € 13.000 from sales of solar electricity

Lillestrøm municipality

List plans for 241 public buildings, invests € 2,5 million per year on setting up solar cells.

Prioritizes health and care buildings first due to their 24 hours of operation



Våler municipality

Invested € 2,5 million solar cells in 2021. This has already been repaid I

n saved electricity bills in 2022

Solar cells in the municipality Aurskog-Høland

Aurskog-Høland municipality has three solar cell systems of its own.

Roughly estimated", they produce 150,000 kWh of solar power a year.

One of these is the solar plant that produces electricity for Bjørkebadet swimming hall and for the electric car chargers outside.

"This plant will produce about 100,000 kWh of solar power a year. This will reduce electricity costs for Bjørkebadet correspondingly, says environmental advisor in Aurskog-Høland municipality, Ole-Christian Østreng.

Since the plant was commissioned at the beginning of May 2020, solar energy has saved the equivalent of 1,800 litres of heating oil. The plant has cost around NOK 1.5 million, including electrical works with connection.

"This investment will be recouped within nine years. Some additional costs are incurred in connection with preparatory work and evaluation of tenders in the tender phase," says Østreng.

Drammen city

Solar heat collector and storage

Illustration to explain how the energy from the sun and air is stored for the side and is used to heat the buildings.

What kind of public buildings can have solar panels?

From a manual for municipalities:

“There is no exception here, the vast majority of public buildings can get solar panels.

Examples of typical buildings that may have solar panels in the future are:

-Town hall

-Libraries

-Hospitals

-Schools

-Nurseries

There are some local conditions that can make a public building not suitable for solar panels. It may be that there is little light there or that it will be too costly to install on current buildings. Until now, it has been very common to install solar panels on new public buildings, but we now see that older properties are often upgraded with solar panels.”

Risk-reducing measures when investing in photovoltaic systems in schools

Consideretions made by Oslo city's administration

- Photovoltaic systems complicate building maintenance
- Schools are often prone to vandalism
- Uncertain income and savings
- Snow
- Lifetime of photovoltaic systems and buildings
- Fire
- Inspection and service
- 100 kW limit for sales to the grid and sales licences
- Policy changes and regulations
-

Among well-known public buildings that have solar panels is the City Hall in Oslo. The city want to show examples of public buildings where it will have a great symbolic value to use solar energy.

Thank you for your attention!