



"It has never been more urgent to confront the global climate crisis and accelerate the transition to reliable, accessible, and affordable carbonfree energy. This means that large electricity systems – including cities - must transition from centralised, fossil-fuel reliant power grids to more flexible, decentralised systems that are entirely powered by carbon-free energy assets".

## What if...

- ...the city could produce a significant share of its energy consumption from solar rooftops?
- ...citizens could invest in shared solar PV and batteries on better terms?
- ...prosumers could sell their solar surplus within the city at a premium price?
- ...local companies and institutions could turn energy bills into a competitive advantage?

## Problem

How can cities assess the potential and massively scale solar in the city - while ensuring all citizens are included?

# **Solar Surplus Predictor (SSP)**

Solar Surplus Predictor (SSP) is an AI-powered Cloud-based platform helping municipalities, energy companies and energy consumers to assess the potential for solar production and surplus throughout the city, and simulate alternative deployment scenarios and their impact on CO2 emissions.



### Key features:

- Visualisation, charts and key numbers per building types
- Prediction of consumption, rooftop solar production and surplus potential, down to hourly granularity
- Comparison between currently installed solar PVs and predicted potential
- Anonymised AI model combining open data with energy metering data
- Powerful tools to identify, optimize, evaluate and rank pre-defined and custom solar surplus cases
- Estimation of CO2 emission reduction potential

### Zoom in on the Copenhagen Case

Developed through the Al4cities EU program, our solutions were tested in summer 2022 together with Copenhagen. The municipality uses HOLONI to understand the potential of urban solar, and tests digital solutions to incentivize and buy verified green energy directly from its own citizens' solar rooftops.

	Existing solar installations				Estimated	tion potential		
	21,203 MWh Produ	ction				360	),974 MWh	
	9,748 MWh Surplus	3				250	),208 MWh	
	3,541 tCO2e					60,	282 tCO2e	
Value ↓   Type →	Kolonihavehus	Mixed	Other	Residence (Single)	Commercial	Public	Residence (Multi)	Aggregated
Surplus [MWh]	4,785	12,451	0	39,814	27,241	14,997	150,918	250,208
Production [MWh]	6,041	20,268	0	55,510	72,882	39,010	167,260	360,974
Consumption [MWh]	6,041	506,987	0	60,671	1,039,262	729,085	71,430	2,413,478
CO2 Equivalent [tonnes]	1,008	3,384	0	9,270	12,171	6,514	27,932	60,282
#Prosumers	4326	1035	1825	14611	3685	2055	19082	46619

Typical results from Solar Surplus Predictor in Copenhagen





### **Advanced analytics of the Solar Surplus Predictor**

#### # 1: Ranking Districts and Buildings according to Surplus potential

		* Addres	# Address Targlus Potential Royhysard	Putertial Putrola	Putertial Publish	Putertial Pu/Total	Potential Po/Total	Potential Pu/Total
	1	1 9/vg1.200			1 5/41.200 41018567 100		1 5/wi 1.200 49/18567 100 202 dispring til forsering: og energidstributor), 220 Meden Amager	1 5-Vel 1.200 AVE105-67 100 232 (Reprint II forcering: og energiskethudion), 220 (Ander: Amager 1996
	5	2 Vinderafilovaj 40. 2000			2280 Aphalt composition	2000 Appliel Unpoint Undorphilip 24 (Uppring 11 Andremp at a Mad composition, og opidevand), 229 (ander bygning 11 elemptoduktion og	2000 Aphati Biygning ti sectorepring; 224 (Apping ti Mactering at Affaid Dir composition, og spilakvant; 239 (ander bygning ti eergiproduktion og -	2200 Aphatt Bygoing Si vacdiorpring; 224 (bygoing Si händsrung af affald composition, og quidevand; 238 (braden bygoing Si exergipinduktion og -
	3	5 Xiathaelovej 28. 2500, Krathaelovej 27, 2300	2500. Kraftværkovej	2500. Rothweitzvej	2500. Redroentowj 27, 2300 Concrete	2500. Kraftværksvaj composition, effentlig administration), 510 (2004/555) Transport- og	2500, forshweltong composition, critering administration, 310 31054355 hempert- og Dot. 27, 3300 consver garaganaleg fragmandrad, lufthenskypring benegistrativering, geteringshing, geteringshing, geteringshing, forsøg med plats til et eller.	2500. Krathwetowij zmipostkow, offentlig administratici, 333 310 505 Stampert- og Dat 27, 3380 Consens bewegintligeringer fragmandratu Untervensigeringer bewegintligeringer om der påret til et eller
4		Lembergpade 18, 2200			Lembergpale 18, 287425.05 100 Apphall	Lemberggade 18, 287425.05 100 Aug/half 321 (Spyring billiontoc)	Lemberggade 18, 201425-05 100 Augulat 321 (Spyring II Aurolo) Amager	Lemberggade 10, 207425.05 100 Apphalt 521 (Septing Elitentic) Amager 1998
	5	5 Seforting 11,2300	5 Seforing 11,2300 185730-6	5 Seforting 11, 2300 1857366 100				5 Seforting 11, 2300 1857366 100 323 (Sygning til leget), 231 (Sygning til energiprotektor) Ameger 1970
	5	6 Uptweingender 20, 2000	5 (phwiegarie 20, 2300 178057.31	6 Upbwirgarde 30, 2000 178057,31 100	6 (ybwirgarle 20, 2000 178057,31 100 Asphalt composition			
	7	7 O-Vej 7, 2900	7 0-Vej 7, 2000 181476-67	7 O'Wj 7, 2000 181476-67 100	7 0-Vej 7, 2000 181476-67 100	7 0-14j 7, 2000 191476-67 100 523 (Rypning Hillager)	7 0-vij 7, 2000 14347647 100 333 (Dyping Milaget) Amager Dat	
	8	8 5-Vij 4, 2000	8 5-16 4 2000 155303.79	8 5-4g-4, 2000 155503,79 100		composition, transportanilegi, 229 Meden bygning til produktioni	composition, transportanlegi, 229 (Ander Sygning til produktion) Dat	composition, transportanilegi, 220 kinden bigining til produktion). Dot
	1	9 Uplandsgade 52, 2300			Uplandsgade 52, 154802.45 100 Aphatt composition, Control to	2380 composition, integrant produktionsapparate, 223 (variation)	2100 composition, integrant produktionapparat, 223 (Werksted) Bit	2100 composition, integrant produktionapparat, 222 (varkated) that
	10						10 Hedegandovej BI, 151282.00 100 Olive, Japhali 122 (CERLIN) Ryping U Andur, Nardel, Tape Henunier Anager celesting administration; 350 Prilippende evendekring Dot.	

Comparing the solar surplus potential of districts and buildings throughout the city

#### # 2: Local green sourcing scenarios





Matching the consumption of one building with nearby collective surplus potential

#### # 3: Solar surplus potential and buildings' economics

Prediction	Cost Savings Estimation				
Monthly potential surplus for Amager Øst [kWh]	Input Parameters		Results		
	Spot Price (€/MWh)	1000			
1.5M-	Taxes [96]	200	Self-consumption savings: 14,766,778 €		
	Surplus Price (€/MWh)	2000	Surplus income: 24,915,384 €		
January Rebriary March April May June July August September October Woverber	CAPEX PV Cost (€/kWp]	1000	PV cost: -42,691,580 €		
Month	Total (€)	-3.0	009.418 €		

Estimating the value and cost savings of deploying solar at scale throughout a building portfolio

## Part of a suite of HOLONI Solutions for Cities

Solar Surplus Predictor (SSP) is part of a broader suite of solutions for municipal entities depending on the role they play in the energy transition and city solar deployment.

CITY AS				
URBAN PLANNER	MARKET CATALYST	ENERGY CONSUMER	PROSUMER	
<ul> <li>We provide the Solar Surplus Predictor to assess the potential for solar production and surplus throughout the city</li> <li>Visualisation, charts and key numbers per building types</li> <li>Powerful analytics</li> <li>Simulate alternative deployment scenarios</li> <li>Instantly see impact on CO2 emissions</li> </ul>	<ul> <li>We provide a digital enabled public incentive scheme for city solar prosumers</li> <li>Rewards solar surplus based on certified green surplus</li> <li>Automated digital processing and transactions</li> <li>Rewards: digital vouchers or stable digital currency</li> <li>Trustworthy audit trail</li> </ul>	<ul> <li>We help procurement managers to source and certify local green energy from nearby prosumers</li> <li>Assess how much solar surplus could come from nearby prosumers</li> <li>Verifies the origin of the energy you consume hour by hour</li> <li>Automate accounting, billing and payments</li> <li>Trustworthy audit trail</li> </ul>	<ul> <li>We help public building managers design and invest in rooftop solar beyond self consumption</li> <li>Predict solar surplus potential of your building</li> <li>Team up with other prosumers to aggregate and sell collective surplus</li> <li>Take part in innovative collective self consumption initiatives</li> </ul>	





# HOLONI's 3 Core Technological Innovations

می بری ARTIFICIAL INTELLIGENCE	We use Artificial Intelligence to predict energy <u>surplus</u> for individual buildings throughout the city and process advanced analytics to generate unique insights for urban planning, solar deployment strategies and local energy procurement. "Surplus" = "Production" minus "Consumption" We predict separately Solar Production and Building Consumption and combine and visualize outcomes through our cloud solution. Our AI and Big Data models are trained using both open and proprietary data from global and city-specific sources.			
BLOCKCHAIN ENABLED DIGITAL ENERGY PLATFORM	<ul> <li>We leverage a blockchain-enabled digital energy placomplementary solutions to HOLONI's Solar Surplus</li> <li>Access to off-the-shelf software applications &amp; frameworks</li> <li>Automated, Low cost accounting, billing &amp; transactions</li> <li>Interoperability through API gateways for third party data sources, share energy assets and Prosumer solutions</li> <li>Security &amp; Privacy-preserving data sharing architecture and data governance and Self Sovereign Identity</li> </ul>			
	Our Solutions and Digital Energy Platform integrate solution developed by Energinet and other European (TSO) to track and trace, on an hourly basis, the car Through HOLONI, Energinet enables the tracking of Contribute to climate neutral cities Enable local green energy procurement Empower solar prosumers	n Transmission System Operators bon-free origin of energy consumed.		

# **Strategy Advisory & Innovation Services**

### #1 Strategic Advisory Services

The HOLONI team and associated partners deliver for municipalities and other stakeholders strategic projects and consulting engagement customised to the City context. For examples:

CITY SOLAR STRATEGY	MUNICIPAL SOLAR ASSETS	FINANCING NET ZERO ENERGY
What is the true value of solar for the city ecosystem? How can policy, finance and market come together to reach your solar targets? What are the new roles and ecosystem play required from the municipality?	<ul> <li>Should / How can Municipality owned buildings:</li> <li>deploy rooftop solar</li> <li>sell surplus to local energy consumers</li> <li>buy local green energy from the city prosumers</li> </ul>	How can the municipality, its citizens and local businesses leverage sustainable finance, crowdfunding and fintech innovation to democratise and accelerate investments in shared energy assets and infrastructure?

Together with partners, we combine our expertise in energy markets, smart cities, sustainability, business model and social innovation with Solar Surplus Predictor (SSP) to generate unique data driven insights and visualisation.







### #2 Innovation Services

HOLONI helps municipalities, energy suppliers, enterprise energy consumers and solution providers design and develop prosumer-centric software solutions and frameworks - with ease, speed and lower cost without compromising on cybersecurity and e-privacy.

DESIGN	BUILD	PILOT
Use case co creation	Customised analytics	Living Lab demonstration
Minimal Viable Ecosystem	Proof of Concept & MVPs	Business Model Innovation

Together with partners, we combine capabilities in co-creation, business model innovation with digital product development. HOLONI's Solutions and underlying blockchain enabled digital energy platform are leveraged as a service to ease the product development process and streamline implementation.

## **Impact & Benefits**

REDUCE CO2 EMISSION	We displace carbon emission from conventional centralised power generation with local solar energy and enable its scaling by incentivising city collective self consumption.
SCALE ROOFTOP SOLAR	We provide solar insights, enable portfolio development and portfolio-based financing, result-based incentive schemes and facilitate local solar energy sharing to bring more value to solar prosumers and unlock collective self consumption.
EMPOWER PROSUMERS	We accelerate the development of innovative solutions and collective actions bringing more value to prosumers such as Local green-certified energy sharing, Demand-side flexibility solutions or Shared Asset Crowdfunding

We contribute to achieving UN Sustainable Development Goals



# Onboarding, maintenance and support provided after deployment

- Case to case city onboarding to assess and acquire necessary data
- Direct access to cloud-based portal for registered users
- Support service for on-demand advanced analytics and the development of new solutions

# **Get in Touch**

Please get in touch to explore partnerships or inquire about our products & services

> Alpha Venturi AS | HOLONI Holoni@alpha-venturi.com +47 92 20 29 18 Norway

