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Reykjavík, 17. júlí 2017
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Borgarráð

Úthlutun lóðar að Norðurgrund 3.

Óskað er samþykkis borgarráðs fyrir úthlutun lóðarinnar Norðurgrundar 3 til Sprotamiðstöðvar Íslands ehf kt. 560311- 0790. Gert er ráð fyrir að lóðinni verði úthlutað á gatnagerðargjöldum. Jafnframt að félagið geti ekki framselt lóðina en ef að afnotum er hætt þá verði öll mannvirki fjarlægð og lóðinni skilað til Reykjavíkurborgar gegn endurgreiðslu gatnagerðargjalda. Lóðarhafi greiðir öll tengigjöld til Veitna og fást þau ekki endurgreidd við skil á lóðinni. Lóðinni er úthlutað með fyrirvara um að skipulag svæðisins leyfi þá byggingu sem að félagið hyggst reisa á lóðinni.

Greinargerð

Um er að ræða samfélags- og nýsköpunarverkefni. Er því lýst þannig í umsókn félagsins „Hjá Life pod eins og verkefnið heitir verða gerðar tilraunir, rannsóknir og þróunarstarf unnið í tengslum við sjálfbærar lausnir sem m.a. grundvallast á byltingarkenndri byggingatækni og hönnun fjölda kerfa og ferla tengdri sjálfbærri matvælaframleiðslu, þörungarækt og framleiðslu líforku úr lífrænum úrgangi.

Hrólfur Jónsson

Hjálagt:
Erindi Sprotamiðstöðvar dags. 12 júlí 2017.
Deiliskipulag fyrir iðnarlóðir í Grundahverfi dags. mars 2013.

SolaRoof POD hús - Lokuð sjálfbær vistkerfi

PODnet
Global Cooperative Organization

solarroof
CCEE
Closed Controlled Ecological Environment

Tilraunaverkefni tengd rannsóknum og þróun á byggingartækni og lokuðum kerfum sem spara mikla orku og lágmarkar kolefnisfótspor

PODnet á Íslandi
LifePOD

The Start-Up Center
Social Innovation, Tehnology & Entrepreneur Center of Iceland

Social Project hus
VAXANDI
Smart Sustainable Eco-Buildings

Lóðin Norðurgrund 3 undir samfélagslegt nýsköpunar verkefni

PODnetið á Íslandi óskar eftir því að fá lóðina Norðurgrund 3 að fyrsta kosti eða Norðurgrund 5 að öðrum kosti. Til stendur að setja upp rúmlega 200 fermetra SolaRoof POD hús sem nefnt er LifePOD. Í LifePOD verða gerðar tilraunir, rannsóknir og þróunarstarf unnið í tengslum við sjálfbærar lausnir sem m.a. grundvallast í byltingakenndri byggingatækni og hönnun fjölda kerfa og ferla tengdri sjálfbærri matvælaframleiðslu, þörungarækt og framleiðslu líforku úr lífrænum úrgangi.

Byggingin er á 3 hæðum þar sem lagt er upp með að vera með lífrænt fiskeldi á landi og lóðrétt ræktunarkerfi til að framleiða hágæða grænmeti og ávexti. Lofthæð á hverri hæð er rúmir 3 metrar og byggingin er því um 9 metra há. 1 hæð er 80 fermetrar, önnur hæð 80 fermetrar og loftið er 40 fermetrar.

Samhliða verkefni eru m.a. áætluð í Noregi, Kanada og Bandaríkjunum og mun aðgangur af gögnum úr þeim verkefnum verða opin. Við munum vinna verkefnið í alþjóðlegu og innlendu samstarfi með opinberum og einka aðilum sem starfa í iðnaði tengdum þeim tilraunum og þróunarstarfi sem unnið verður með í verkefninu.

Verkefnið tekur á öllum helstu markmiðum Sameinuðu Þjóðanna um sjálfbæra þróun á Jörðinni. Um er að ræða alþjóðlegt „open source" frumkvöðla og samfélags verkefni þar sem verkefnið snýst í grunninn um að þróa vandaðar og um leið ódýrar lausnir til að starfrækja lokuð sjálfvirk vistkerfi sem eru sjálfbær á hreina staðbundna fæðu, orku og vatn.

POC (Proof Of Concept) verkefni á Íslandi munu njóta alþjóðlegrar athygli þar sem verkefni er unnið í víðtæku samstarfi tengdu PODnetinu sem verður til framtíðar með höfuðstöðvar skráðar á Íslandi. Sveitafélög á Íslandi fá nú tækifæri til þess að vera með í innleiðingu snjallra og vistvænna lausna þar sem sjálfvæðing spilar stóran þátt í framleiðsluferlum.

Stefnan er að vera í fararbroddi á næstu árum og áratugum í innleiðingu umhverfisvænnar tækni sem getur vegið þungt þegar kemur að kolefnisjöfnun þar sem áhersla er lögð á að framleiða staðbundin matvæli.

PODnetið fer með alþjóðlegar leyfisveitingar fyrir SolaRoof og tengdar lausnir. Birgðakeðjur eru þegar að verða til í nokkrum löndum og Ísland er vel í stakk búið til að taka þátt í framleiðslu þar sem lagt er upp með að framleiða SolaRoof byggingar.

Með tilkomu PODnetsins verða til fjölmörg tækifæri:

- Verkefnið stuðlar að bættri lýðheilsu með betra matarræði og heilbrigðari lífstíl
- Jöfn og stöðug framleiðsla lífrænna matvæla á Íslandi allan ársins hring
- Aukið aðgengi og lægra verð á hágæða matvælum fyrir heilsuna
- Vel launuð og skemmtileg störf byggð á sjálfvæddri starfsemi
- Ísland sem leiðandi afl í framleiðslu og rekstri SolaRoof POD húsa
- Víðtæk uppbygging á vistvænum byggingum bæði fyrir búsetu og framleiðslu
- Minni sóun þar sem lífrænn úrgangur verður að verðmætum afurðum
- SolaRoof CCEE vistkerfi eru snjallar lausnir sem færa sjálfbæra framtíð inn í nútíðina
- Fjölmörg tækifæri til samstarfs fyrir opinbera og einkaaðila til að skapa verðmæti

Verkefnið er áfangi í víðtækri uppbyggingu lausna á borð við LifePOD, AgriPOD og CityPOD, þar sem stefnan er að byggja í (PPP) samstarfi við opinbera og einkaaðila um allt Ísland þar sem bæði verða settar upp stakar SolaRoof POD byggingar og POD klasar sem mynda sjálfbær vistvæn þorp.

PODnet vinnur að þróun alhliða lausna allt frá framleiðslu bygginga og kerfa til fjármögnunar heildstæðra verkefna pakka.

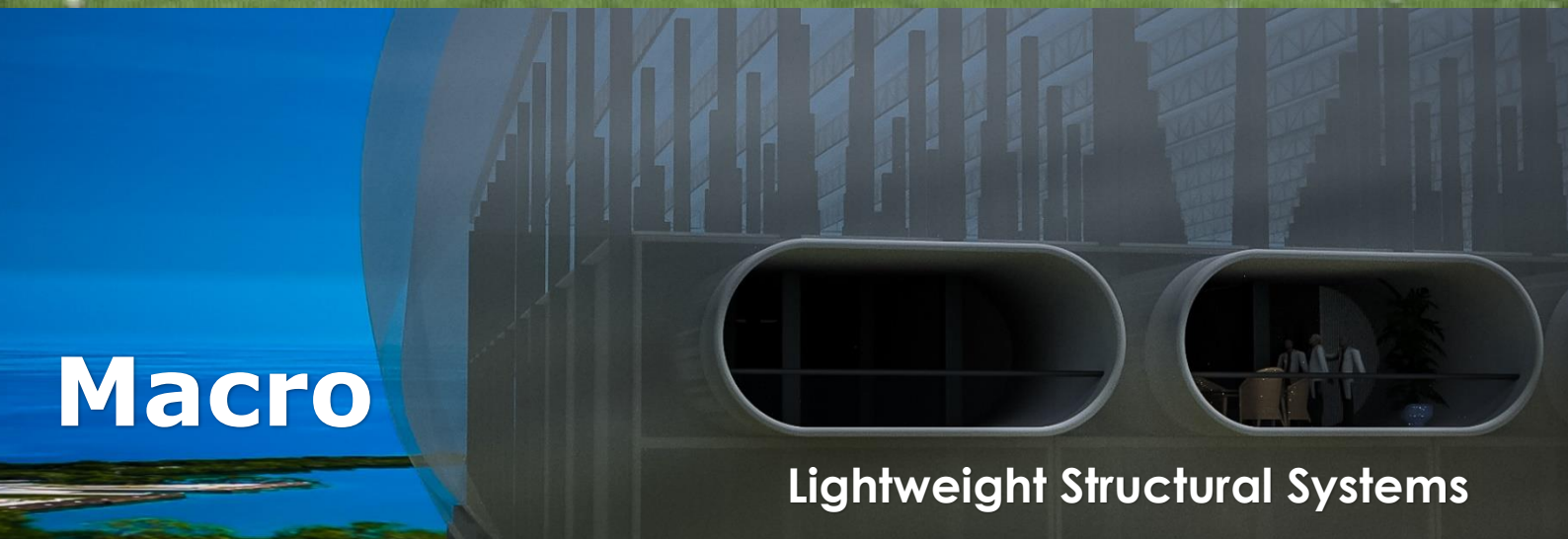
Ríkarður Leó Guðmundsson
Sprotamiðstöð Íslands ehf – 560311-0790

Viðhengi til
upplýsingar

solarroof

CCEE

Closed Controlled Ecological Environment



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Users have FREE access and use of Sola Roof technology while still being obligated to respect our conditions of: attribution and share-alike. Other FREE use is granted to the education, research and humanitarian sectors. We ask of our non-commercial users a completely voluntary participation and contribution to support Pay It Forward humanitarian projects.

As Richard is the inventor of the Sola Roof technology, his IP together with the knowhow and experience of the open source SolaRoof community and our PODnet members, which has and will continue to be published and aggregated here, is made openly accessible to commercial suppliers to the designated FREE use sectors, including the DIY, and these commercial suppliers are required to respect our Creative Commons Public License (CCPL) and conditions set for such commercial supply. This CCPL calls for 1) attribution 2) share-alike and reserves rights to commercial use only for those who meet additional minimum conditions required for commercial use. The minimum conditions now established for suppliers to FREE use sectors is observance of the first two mentioned above plus a *Pay It Forward* ***honor payment or support in kind to our*** *DIY Food* ***humanitarian projects***. The amount of the

honor payment requested is 1% of related sales or more. Sola Roof **commercial users and commercial suppliers** of services, material and products are **all required to formalize a commitment** to Sola Roof to honor the Sola Roof Community's values and objectives to establish Pay It Forward humanitarian projects.

Making such a commitment entitles your business to be an authorized sponsor/partner of Sola Roof and to use our brand name and have fullest interaction and support and PR recognition from Sola Roof. Richards general support to authorized commercial users and suppliers is available on a consulting basis as is the expertise of any experienced members of our community who are willing to provide Sola Roof knowhow. Such knowhow and any derivative works and technology improvements directly related to Sola Roof are, in principle, agreed to be published and shared as Open Source information by both non-commercial and commercial users.

By following these precepts it is anticipated that several Open Standards of use will emerge for Sola Roof technology applications. Both suppliers and users will benefit from working at the pinnacle of advancements - to the extent they wish to be pioneers. The large majority of users will be very satisfied to apply well proven and robust solutions that get good results for minimum cost and energy. At the base of this pyramid are the DIY users who as craft-builders will be empowered for self-reliant, sustainable living. This is a broad and strong foundation for the Sola Roof knowledge-base development and educational/learning activity that will be transformational at a personal level and from which will emerge the anticipated global village and an era of sustainable living bringing restoration and health to people and planet.

LifePOD transforms waste to clean food, energy & water

This project will build a demonstration of LifePOD which is a industrial pre-engineered, modular & prefabricated structure

The PODnet projects are based on social enterprise operation that regeneratively grows substantially all of the food served to residents and guests. The focus is on growing fresh, organic food, while producing a surplus of clean energy, and regenerating pure water to meet or exceed consumption. We intend to demonstrate production and consumption "in-house" that is CO2 negative, reducing the carbon footprint

Studies leading up to our demonstration include several Pilot Projects implementing a small-scale "vertical farming" product called "POD" that shows success with some of the same regenerative ecological systems for growing local food.

In many areas of Europe, greenhouse production is a very important factor in the primary sector of the food supply chain, providing about 60% of fresh (table) vegetables. But this form of agriculture has major climate challenges because the carbon footprint is an order of magnitude higher (per Kg) than for food coming from afar, by truck or boat - even air freight delivers food at a lower carbon cost than greenhouse production. The idea of W2FEW is to combine the growing methods and skills from the greenhouse industry, the expertise and resources from the waste treatment industry, within a energy efficient SolaRoof structure. Enhancing our proposal further is an innovative integration of Biodigester technology that runs a Combined Heat and Power (CHP) generator on BioMethane, with the purpose of operating a totally emission-free aquaculture cycle - producing organic food with no water or air pollution. The result is an area and energy efficient way to produce nutritious food, clean energy and pure water while achieving total utilisation of all nutrients, including CO2 and the nitrogen and phosphate rich liquid effluent from the Biodigester for growing organic produce. A Biodigester, based on the proven technologies of anaerobic composting, will produce liquid digestate for plant and algae cultivation in the POD. BioGas combustion prevents release of BioMethane, and the CO2 and H2O combustion products are captured and contained for enriched atmosphere culture of plants and algae, making for a complete cycle of Carbon Capture and Reuse (CCR) as an alternative to current Carbon Capture & Sequestration. The zero GHG release from the POD is assured by the closed atmosphere growing that is enabled by SolaRoof and at the same time waste water is cleaned and pure water from air is generated in large quantities: This advancement is referred to as W2FEW.

A SolaRoof structure achieves the requisite high performance by generating and controlling Liquid Bubble Insulation blown from soap solution within a sealed, double layer, and transparent roof, to increase the insulation value of the envelope envelope, reduce energy loss or gain, reduce CO2 leakage. The complementary Liquid Solar process for closed/controlled environment additionally condenses large quantities of water transpired by the living leaf canopy beneath the SolaRoof enclosure, which is a special breakthrough for global water supply challenges. This system thus works well in the cold north (capturing heat to storage in liquid thermal mass) or in southern, hot arid or humid climates (where excess heat is removed and rejected). Conventional heating and air-conditioning processes are replaced by the

SolaRoof climate control processes that effectively use ambient, free heat source (the sun) and heat sink (Cold Water Resources). Further, the use of pesticides can be eliminated; CO2 is contained and utilised, CHP produces electricity and heat when needed (in the dark winter months); while the liquid digestate from anaerobic digesters will supply organic nutrients for plant and algae culture - thereby taking up a large portion of the nutrients that are normally released (post-treatment) and cause pollution of the water table and the eutrophication of water ways and coastal waters.

The application is technically demonstrated by a first POD Proof of Concept developed and implemented by LifeSynthesis (Nelson's consulting enterprise) at Lindum (a waste treatment company owned by the City of Drammen, Oslo) and will be further developed in a CCPL collaborative that includes business, community & academic and governments (local to national) as partners enlisted in the global PODnet Public Private Partnership. The LifePOD will be an exemplar project, demonstrating:

- Use of food waste and "green waste" as input for food regeneration
- SolaRoof - to provide controlled environment to all bioprocesses
- BioDigester housed within the SolaRoof structure
- Use of digester effluent from human and animal waste for algae & feed crops
- Algae and feed crops grow fish, shrimp and krill with Aquaponic systems
- live, continuous harvest of food/feed for super-nutritional value
- Use of solid digestate for mushroom production and worm culture
- Use of CHP powered by biogas for heating, electricity (lighting), transport
- Use of all CO2 in flue gas from CHP for closed atmosphere growing
- Oil from algae is extracted and processed to BioDiesel

BioDigester

The integrated BioDigester is a part of the SolaRoof technology innovation, and produces:

- organic solids used for mushroom production, not landfill
- liquid digestate used as fertiliser for organic food production or for biomass for energy, therefore digestate is not released as effluent that is a powerful factor in lake eutrophication and coastal dead zones
- CO2 will be totally contained and absorbed in the growth vegetables and other crops, including algae and feed crops, and not released as a GHG
- Combined Heating Power (electricity generation) is fueled by the BioGas or the BioDiesel from the oil from integrated algae culture - this "flex-fuel" option enhances the profitability of our CHP that supplies electricity as needed for the use of grow-lamps during in the short winter days - this is effective seasonal energy storage.
- Compression of BioMethane or, reformation of the methane to hydrogen or methanol, for use in fuel cells or for clean transportation fuels is an objective.

We treat organic waste in a Biodigester to optimise the utilisation of this bio-resource, so that it may no longer be considered "waste". With current BioDigester methods this can be problematic, because the organic compounds can be too dry for these systems. We solved the problem of the washing out of nutrients, by separation of the liquid and solid fractions of the digestate. But the release of liquid digestate can be a form of pollution, since these colloidal material is very miscible and moves easily

through the water table, and being rich with nitrogen and phosphate nutrients, these "treated effluents" when released are a serious source of contamination and/or coastal water dead zones (eutrophication). In SolaRoof POD projects we solve this challenge by using the digestate for continuous, all season food and feed production that provides a closed cycle nutrient uptake. That means that future adoption of the technology can localise intensive food production in a distributed Eco community. Our work in this project is pioneering ecological designs for "living structures" (as in the concept of Arcology for eco-cities) and working on the pattern of LifePOD, then the social and financial cost of central "waste treatment" (and other city-wide utilities) is alleviated. In the distributed concept waste is not collected and delivered to treatment centres, rather each social enterprise demonstrate a new paradigm that no longer sees "waste" but rather values the available "bio-resources" because we have the technology to thrive with but not "exhaust" the FEW essentials and with the benefit that such "waste" inputs, although very valuable to us, have no "cost".

Goals and relevance for Eco-Innovation

The project supports the following sustainable developments:

- Food and drink sector: Cleaner and innovative products, processes and services aiming at a reduction of waste and greenhouse gas emissions, or/and increasing recycling and recovery. Improved efficiency in the water consumption of a process or improved eco-efficiency of water management.

We also have connections to:

- Materials recycling: Business innovations to strengthen the competitiveness of recycling industries, such as new market structures for recycling products, supply chains or harmonised manufacturing and recycling processes.
- Sustainable building products: Construction products and related processes that reduce consumption of resources, embodied carbon and production of by-product wastes. This covers the use of more environmentally friendly construction materials, reduced use of raw material, and innovative manufacturing processes which greatly reduce the environmental impact of construction.
- Greening business: Substitution of materials with reduced environmental impacts and higher resource efficiency (e.g. bio-based products) as well as substitution of scarce materials and increased use of secondary raw material. Substitution may be applied at the product level or at the process level.
- Smart purchasing: Greening of production and clean production processes supporting environmental, innovative processes with a high replication factor. Actions could also include industrial symbiosis, i.e. by-product resources or waste as new raw material in order to improve the environmental impacts of industrial production

Connection to business and strategical planning

This project will be a breakthrough with implementation of the alpha and the related POD Pioneer project and POD Works Hub. The LifePOD is a challenging but very doable Demonstration of new Ecomimicry Architecture (or, Arcology) which is a further potential that SolaRoof can enable and thereby infuse the built environment

with living ecological systems in market sectors that have urgent needs for innovation. The LifePOD is an example of such opportunities for innovation that delivers low-cost, low-energy cooling or heating for different climate regimes. The LifePOD, AgriPOD and CityPOD concepts connect very well with the opportunity for Iceland to be a global market leader and build on the knowledge and capacity established by Iceland as a leader in the PODnet community.

Anticipated Benefits

Our technology development partners and use by proposed early adopters and other members of the PODnet will demonstrate profitable operations of W2FEW projects and this will lead to rapid expansion of sales on global markets. Our goal is to sustain profitable business expansion as we serve public and private partners, PODworks hubs and PODpioneers.

Each W2FEW project that is implemented will contribute to:

- elimination of air pollution and zero carbon living in connection with our localisation of food and energy production in closed-cycle, regenerative systems of production within the human habitat of the LifePOD
- elimination of water pollution in connection with organic waste treatment, which typically is a source of Nitrate and Phosphate pollution of ground and surface water, which now is a cause of "dead zones" in many EU coastal waters
- elimination of consumption of water for crop production by intensive greenhouse use, which now is a drain on the water table in regions like Almeria, Spain
- demonstration of water cleaning and pure condensate production that reduces competition for available fresh water and makes available a new source of high quality water for human consumption
- localisation of essential food, water and energy supply builds resilient communities
- proliferation of new clean/green skills and technology builds economy through creation of millions of new jobs as our business expands

While it is known that untreated organic wastes are often released, both from rural and urban tourist operations and from farm operations supplying food to the tourism sector, it is also true that <u>treated waste remain a disposal problem</u> due to the concentration of nutrients in the effluents, which are also released to the environment. Organic waste treatment by Biodigester systems result in a maximum concentration of water miscible organic nutrients in the liquid leachate, which is normally an effluent and so, the treatment while important for many other benefits is not specifically an answer to the heavy overloading of ground and surface waters with these highly biologically active discharges that are causing "eutrophication" of lakes and coastal waters. Our intensive biomass production, with intensive and continuous growing of both plant and algae cultures (for food and feed) will put a complete stop to this damage by retention of the nutrients within our closed-cycle regeneration of biomass, and with our technique for retention of the nutrients, which are not released but remain concentrated - for regenerative biomass production - and additionally, can be processed to create marketable soil conditioner products that can restore nutrient depleted soils. Our answers to these critical issues will be well received due to the profitable operations of PODnet models as we establish a vast network of community based social enterprises and cooperatives.

CCEE Building Technology

Closed Controlled Ecological Environment

SolaRoof technology is applied to create Closed Controlled Ecological Environment (CCEE) applications, including Farm-scale AgriPOD, and Mega-scale CityPOD which produce sustainable food+energy+water regenerative resources that address three of the main environmental issues of our time: 1) energy; 2) carbon footprint; 3) fresh water crisis - while growing local, abundant food in any climate.

The SolaRoof bubble insulation and shading technology has been tested and proven to work in virtually any climate. SolaRoof bubble buildings can be built from scratch, DIY-style with recycled material, as well as from high quality modular building kits that can be bought from any supply chain connected to the POD Enterprise Network.

Through crowdsourcing efforts there are multiple SolaRoof designs being made, examples of kits are LifePOD that is a homeowner and family scale unit, the AgriPOD that is local community enterprise size and the CityPOD, a large scale unit for large communities.

The SolaRoof system is an integrative use of life-science for a new type of closed cycle energy production system with the potential to revolutionize the way sustainable food production is approached and how human habitat can reduce the carbon footprint of 8 to 12 billion people. The SolaRoof system uses the science of photosynthesis from plant biology, heat transfer from engineering thermodynamics and modern materials science. Together, the SolaRoof system is able to create a Closed Controlled Ecological Environment that suits both agriculture and human habitation.

In its basic form, a SolaRoof is conceived that uses a dynamic process of 1) Liquid Bubble technology that is used for shade (daytime) or for its insulating properties (nighttime); and 2) a thin liquid film (of water + soap), the Liquid Solar technology, is a cooling liquid flow on or within the inner transparent cover of the SolaRoof. This dynamic flowing liquid film serves to provide: for heat transfer, for algae culture (maximising photosynthesis), and for precipitation of condensation of plant transpired moisture from the Closed Atmosphere of the roof garden. Our system emulates many of the processes found in nature, and applies them to benefit the human society and the environment together rather than merely to give benefit to one at the expense of the other. Taken as a whole, the SolaRoof CCEE will reduce energy use by more than 90% over conventional construction without harmful pollution and environmental damage, including deforestation and soil degradation.

But even more significant is the energy capture and conversion that will produce abundance of essential "life support" resources through closed cycle processes that greatly reduce input costs.

SolaRoof CCEE are ideal for CO_2 mitigation and enables a comprehensive integrated sequestration using a closed atmosphere system. In the typical modern greenhouse that does not employ the SolaRoof concepts there are many issues to be addressed; among them: With respect to CO_2 an ideal enrichment of 1000 ppm CO_2 is never sustained continuously in practice and 60% or more of the added CO_2 is lost through ventilation.

Today, heating using with fossil fuel represents at least 50% of overall costs of greenhouse operations, and as fuel prices escalate due to "End-of-Oil" the result is food (including field grown grains) that is priced, as a commodity, out of reach of half of the world's population. Greenhouses are therefore forced to locate in warmer areas, often a great distance from the consumer markets with associated high transportation costs. Natural gas is commonly used to heat greenhouses and to produce CO_2 enriched atmosphere, but with conventional greenhouses most CO_2 generated is lost to the outside atmosphere via venting. Each part of the heating process is inefficient and produces CO_2 whether it is fuel burnt in the greenhouse or fuel burnt at the power station.

Cooling and humidity control is also inefficient. Currently, the most common way to cool is by venting which releases 60% of added CO_2. Humidity is controlled by 'burst' heating then venting which creates a heating / cooling seesaw effect and is very energy intensive. In arid-lands and regions of drought and water crisis greenhouses are consuming large quantities of water through the losses (to ventilation) of the transpired water of the plant canopy and losses of evaporative cooling systems. The CCEE eliminates these losses and creates a large quantity of pure (water-from-air) condensate water every day which can be consumed first as potable, drinking and household use and cycled back to the plant crops as grey water. The standard AgriPOD produces 5 tons of pure transpired condensate per day. Pure water generation alone is sufficient to quickly return the capital investment in the AgriPOD.

Closed greenhouses have been the subject of much research over the last 30 years. One of the recent Dutch research project is Innogrow that offers several benefits to the users. Low temperature groundwater is used as a coolant or heat sink for the mechanical heat-pump cooling system, with heated coolant returned to a second groundwater site to store as low temperature heat, with reverse circulation in winter for input to heat-pump heating system. The humidity can be maintained at 70 – 90%, the CO_2 at 1000 ppm with the use of 40 – 50% less energy and getting 20% or more higher yields. But the Innogrow system still uses highly inefficient glasshouses with no insulation properties, the use of groundwater depends very much on the specifics of the site, and using heat-pump mechanical system is significantly more expensive to build and maintain than a standard greenhouse. The control of humidity is difficult and climate sensitive. Essentially, Innogrow is an attempt at using expensive heat-pump system and technology developed for commercial and industrial buildings within an inefficient glasshouse structure.

SolaRoof has succeeded in moving beyond this stage of development to a system that is closer to the ideal sustainable closed greenhouse. The ideal system collects

solar radiant heat and stores it until needed. Heating is obtained without using fossil fuels and cooling without the need for expensive engineering. An ideal system would retain all transpired water, and be readily adaptable to any climate. There would be no release of CO_2 to atmosphere. The ideal is to be "greener than a greenhouse".

The SolaRoof gets to this ideal by creating an "EcoDynamic" system that controls the building envelope so that it provides a dynamic environment control rather than merely being a passive building component. SolaRoof uses the largest surface area, the roof to control the environment dynamically: 1) using nighttime insulating Liquid Bubble technology, which is 30 times better insulation value than glass; 2) using daytime Liquid Cooling to remove solar heat and cool the internal environment, and collect pure condensate water; and, 3) using, as needed, daytime Liquid Bubble Shading in very hot regions. An AgriPOD vertical farm demonstrates controlled temperature and humidity by utilizing the plants own powerful processes of transpiration and the latent heat of evaporation. In peak radiative loads, the insulating bubbles may be used as dynamic shading. Diurnal heat requirements can be supplemented on occasion by low energy heat pump system or with geothermal sources, which are abundant in Iceland.

The energy savings with the CCEE operations applies to both heating and cooling of a quality that is equivalent to mechanical heatpump systems - a standard that regulates accurately both the temperature and humidity - is a value of about $30 to $50 per m^2 per year - the AgriPOD has about 1000 m^2 of building envelope and the savings are projected at as much as $50,000/year. This energy saving increases profitability of operations significantly, however there is additionally the contribution of the Biofuels produced daily from photosynthesis. Energy cost is reduced but there is a net energy of 10 metric Tons of Oil Equivalent (TOE) from the Algae, which is an electric power of roughly 120,000 kWh. Operational consumption is only about half of this projected clean energy resource. The Biogas production will approximately double this electrical energy generation for a total resource of the order of 240,000 kWh per year.

This "EcoDynamic" CCEE is adaptable to any climatic conditions, and enables viable artificial lighting with CO_2 enrichment that can increase yields more than 150% higher than other advanced greenhouses, producing up to 150 Kg/m^2/year for top growers. The SolaRoof Garden, at the rooftop level (of any building), is also referred as the Green Zone and is supplemented in food yield by the Blue Zone which is located in the subfloor level of the BlueGreen building design, where we have pools and tanks of water for purpose of fish, krill, shrimp, Algae and other Aquaculture operations. The integration of the (Blue) Aquaculture and the (Green) Vertical Farm is commonly referred to as Aquaponics operations, which reflects a synergy between the Blue and the Green. The BlueGreen concept that we deliver goes farther than the typical Aquaponics operations by inclusion of a complete microbiotic system consisting of Fungi, Algae, and Bacteria (both anaerobic and aerobic), which work together with the macrobiotic level (of plants and animals) to make our design fully regenerative.

Research from our several Proof Of Concept (POC) projects in Canada and in Norway demonstrate that there can be more than a 90% reduction of energy use, the system can operate for a 12 month growing season and attract out of season premium prices as well as increasing yield by more than 50%. Capital costs are

competitive to other buildings of similar engineering specification; equivalent to current glasshouse costs but with much better performance.

A sealed greenhouse needs a source of CO_2 which is normally adequately supplied from standard heating systems, but can be obtained in the SolaRoof system using the Biogas from Anaerobic Digestion (AD). Biomass produced can be doubled by using fast growing algae species grown in the SolaRoof with the bloom, or multiplication phase, in the liquid thermal mass tanks with maximum CO_2 enrichment.

The SolaRoof system is applied to maximize output of Biofuel crops. Together with maximum plant yields and CO_2 uptake, algae becomes viable as a supplemental energy source. CO_2 is used in a 'closed' cycle, and containment and uptake is so effective that it could be classed as CO_2 sequestration process and attract Carbon Credits. As an integrated part of a bio-energy production plant, SolaRoof CCEE offers the ability to maximize crop growth even in non agricultural settings – and exploit plant types unused to date which are far superior to current biofuels crops.

The SolaRoof CCEE technology has many markets. It can be adapted for use as a bio-chiller and used in power stations to reduce the use of tower chillers with their high consumption of water and wasted energy. The SolaRoof technology also serves in an integrated bio-energy production plant to maximise water conservation - even generate water surplus in arid land regions - and exploits an evaporative cooling system that regenerates pure water rather than consuming fresh water resources.

SolaRoof Closed Controlled Ecological Environment

The SolaRoof Liquid Solar component makes use of a water thermal mass in connection with a transparent, thin-liquid-film solar energy collector formed over the interior roof layer which, while absorbing excess solar gain also controls the building climate. The absorber, a thin Liquid film, is transparent to the solar visible (and PAR spectrum) but opaque to the re-radiative thermal and solar infrared and provides a "radiative filter". The system includes a heat rejection process within a "chiller cavity" space in the building envelope where the thin Liquid film "rejects" energy in the form of evaporative losses. The evaporative "chiller process" produces a colder thermal mass and the extracted latent heat is then stored in the cold thermal mass that functions as a heat sink.

Liquid Bubble Insulation & Shading System

The dynamic Liquid Bubble Insulation system uses the "BubbleTech" insulation process in a modular re-circulating duct-like cavity space within a building envelope. The process assures the complete filling, regeneration or destruction of Liquid Bubbles in a roof or wall cavity. This innovation is a breakthrough technology that facilitates the control of an environment using dynamic control.

Transparent Cover and modular components for SolaRoof structure

The SolaRoof canopy system for a building structure has great simplicity that combines functionality with strength at a least lifetime cost. SolaRoof is developing a set of elements to make up a "standard modular system" of construction that can be adapted to a wide variety of applications worldwide. The first conceptual designs offer is a package for rural vertical farming, AgriPOD and a larger urban concept with integrated human habitat called CityPOD. AgriPOD development and demonstration is well underway with PODnet, a global COOP established with

leadership from Iceland. The CityPOD is moving forward as a joint development by SolaRoof International and UrbanFeed of Norway.

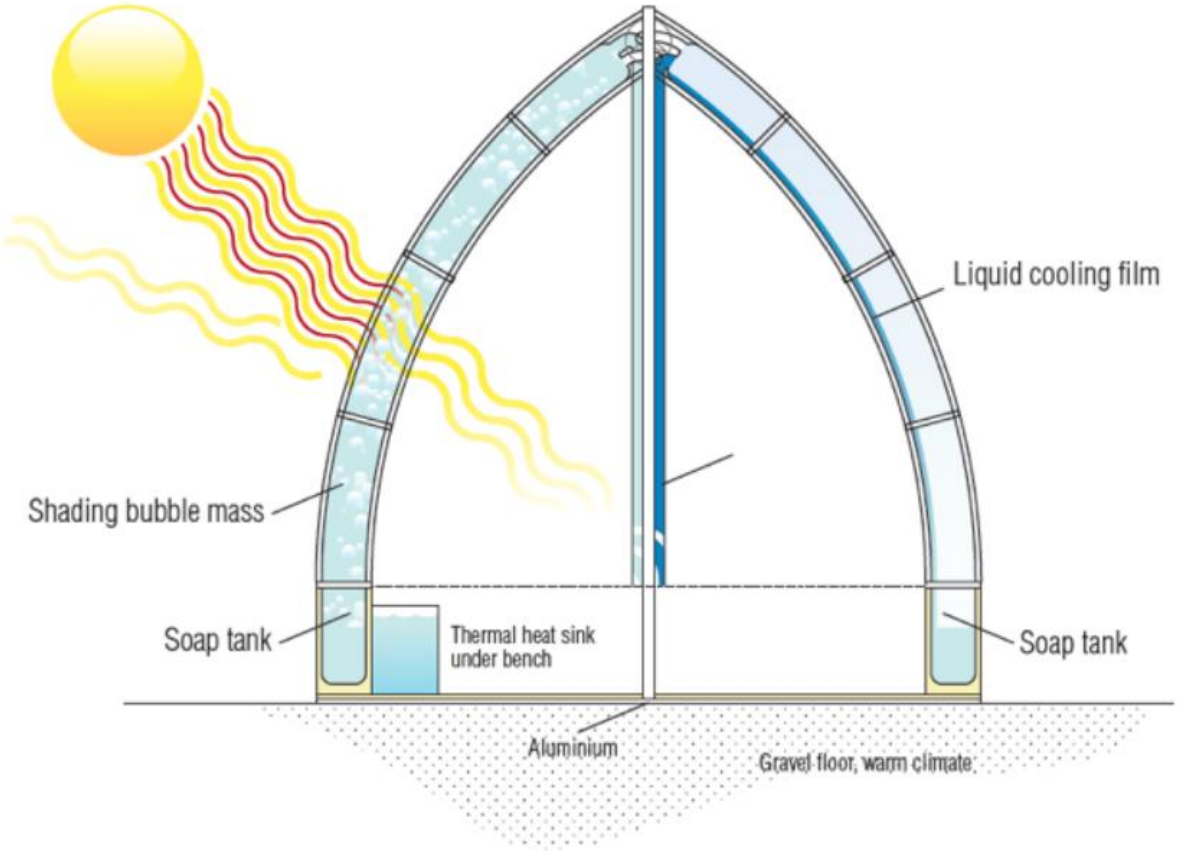
Mechanical, electrical and electronic control/automation kits

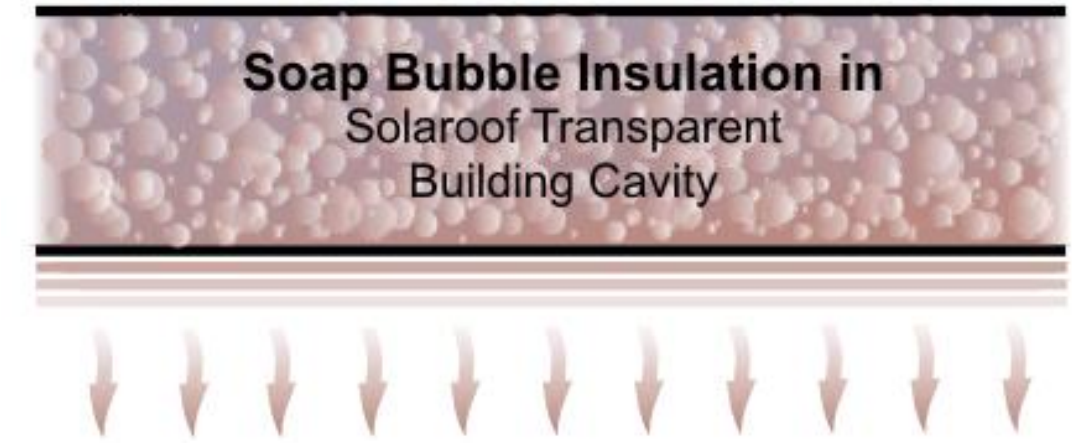
The SolaRoof system is a complete system that uses solar energy dynamically to produce an optimum environment with the least consumption and waste of energy. This requires electrical and mechanical components as part of the overall system. These components can be obtained in either a SolaRoof kit form, or through local purchase using SolaRoof standard OpenSource specifications.

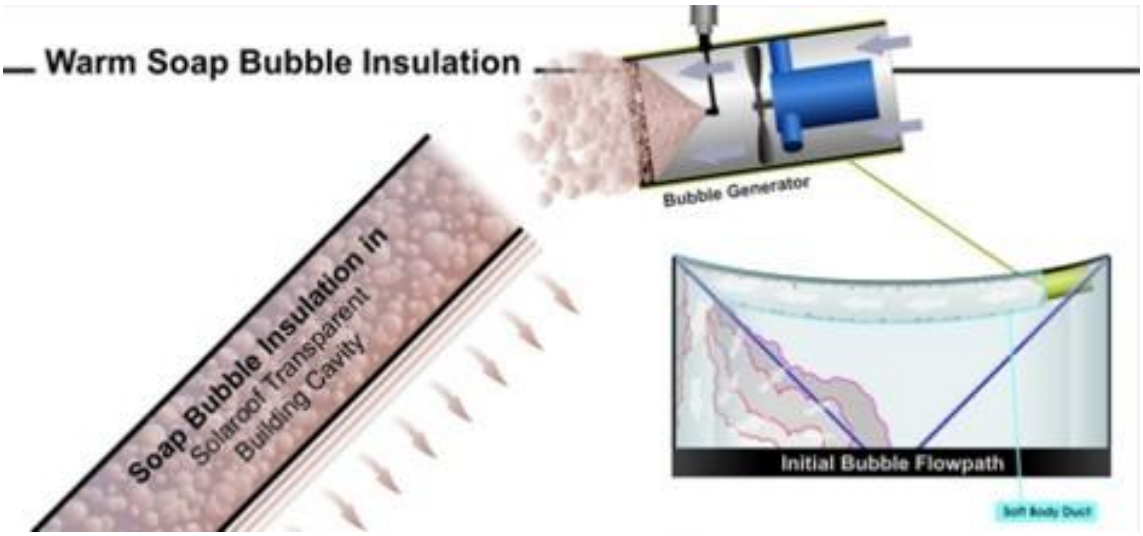
Composite Materials for building envelope systems

SolaRoof has developed a process for manufacturing "SolaFabric" with a coating material of an advanced, resistant composition so that the various dynamic building envelope systems can operate successfully without significant deterioration or damage due to extreme climate events (wind, hail, snow, flood, etc). This technology is fundamental to the creation of cost effective Architectural Fabric building envelopes and ongoing improvements offer the means for reduction in the cost of the material and an ability to prefabricate advanced, durable transparent building envelopes.

Knowledge of the SolaRoof science has been made available in the Open Knowledge arena because of its societal value and importance as a foundation for a very much more energy efficient society. There is a growing community of scientists and other professionals that now have knowledge of the available SolaRoof science and how it can be used to improve energy efficiency. This is evolving into a SolaRoof movement, with the example of the POD Enterprise Network, or PODnet, that is a COOP bringing the technology to the attention of a broad public who see the actions of our PODpioneers.


Liquid cooling film
Shading bubble mass
Soap tank
Thermal heat sink
under bench
Soap tank
Aluminium
Gravel floor, warm climate


Soap Bubble Insulation in
Solaroof Transparent
Building Cavity


Warm Soap Bubble Insulation
Bubble Generator
Soap Bubble Insulation in
Solaroof Transparent
Building Cavity
Initial Bubble Flowpath

WINDOW

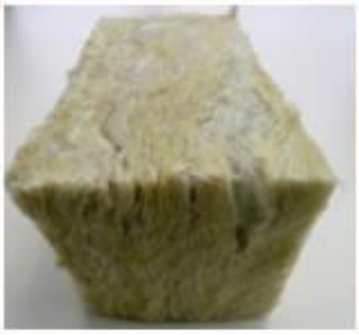
Thickness: Varied

U-value:
0.25–1.25
(Overall heat transfer coefficient)

LT:
0.30–0.80
(Light Transmittance)

STATIC PROPERTIES

ROCKWOOL



Thickness: 20cm
U-value: 0.225
LT: 0

STRAW

Thickness: 50cm
U-value: 0.12
LT : 0

SOLAROOF

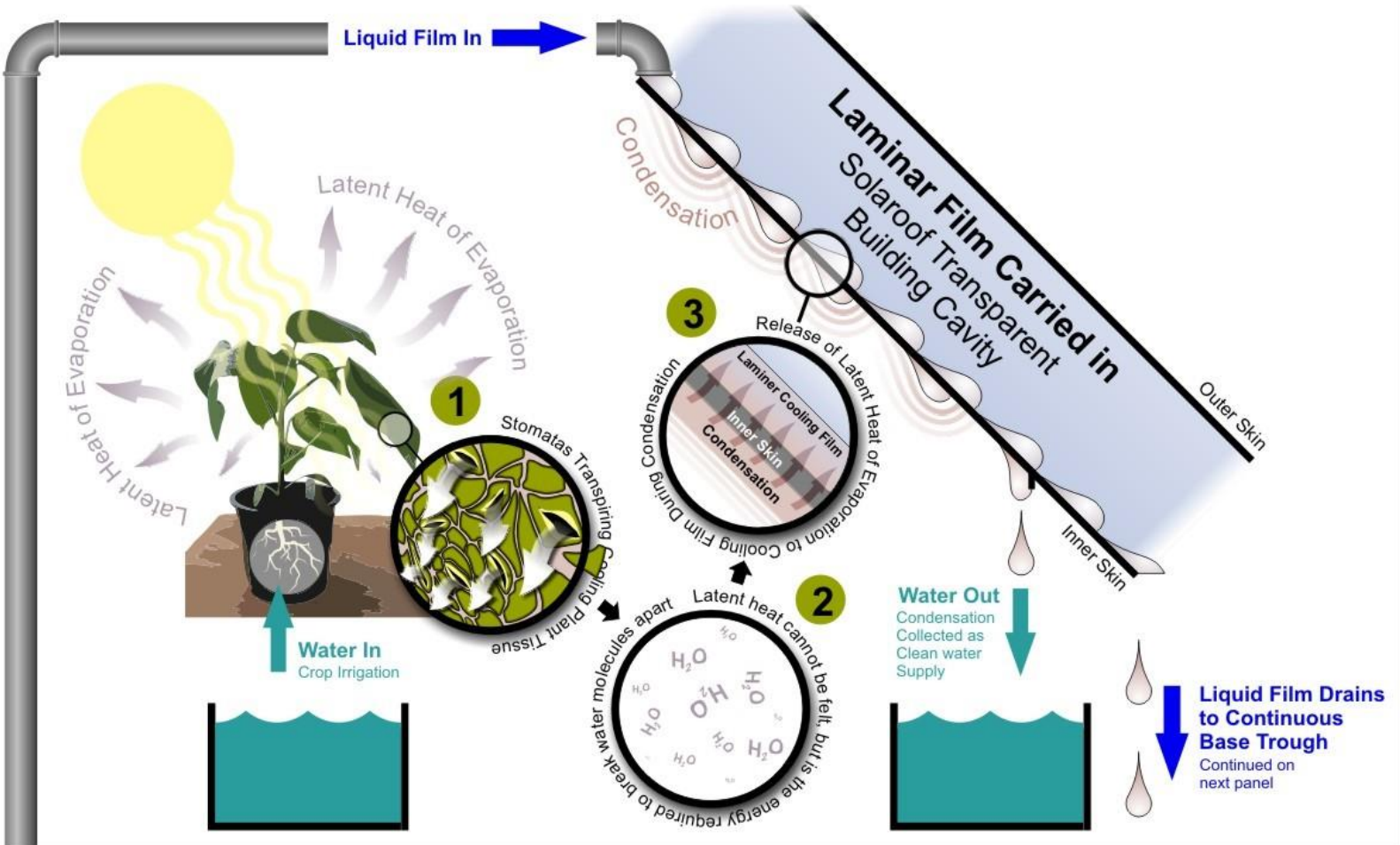
DYNAMIC PROPERTIES

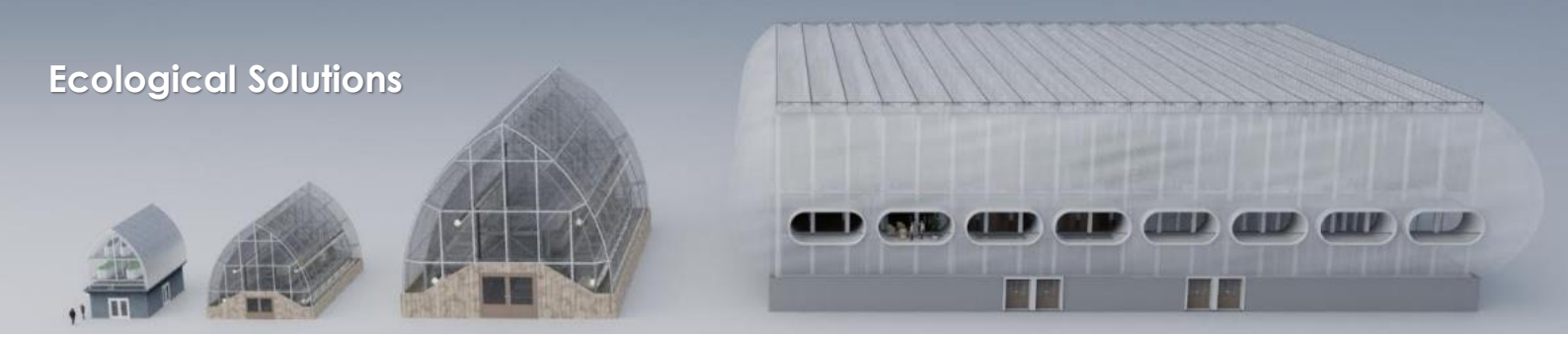
Thickness: 100cm

U-value:
With bubbles: 0.025
No bubbles: 0.50

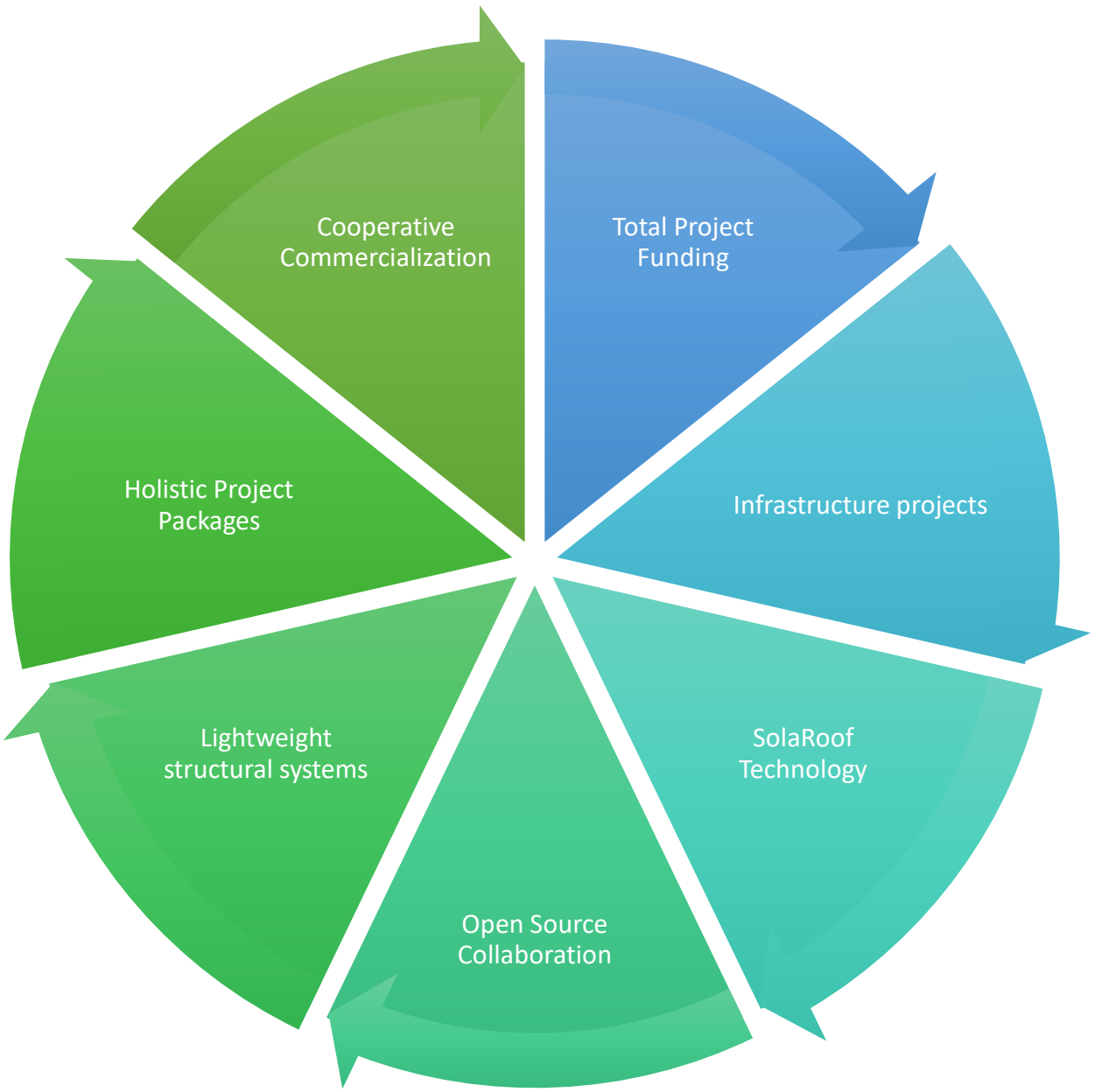
LT:
With bubbles: 0–0.50
(Typical value: 0.050)
No bubbles: 0–0.90
(0.90 with Flourocarbon
other plastics approx. 0.80)

Cooling and Solar Energy Collection





solaroof
Closed Controlled Ecological Environment



PODnet

Solving world biggest problems

1. Outdated greenhouse technology: Conventional greenhouses take too much energy and have high carbon footprint
2. Polluted food: In general there is always getting harder to have reliable source of clean fresh food that you can trust to be healthy for you.
3. Corrupted food system:The mainstream food system is producing low quality food that needs to be shipped long distances and has therefore high carbon footprint and is priced out of proportion.
4. Global hunger crisis: The mainstream food system is becoming ever more unreliable and unstable due to problems caused both by man and nature.
5. Limited land resources: We have a vertical farming product that is "greener than a greenhouse".
6. Global water crisis: In a world heating up with Global Warming we have a completely closed atmosphere enabling recovery of transpired water and complete containment of GHG, especially CO2. This ends the conflict between agriculture and urban populations for available fresh water.
7. Climate Change adaptation: Communities adopting SolaRoof will be resilient and not exposed to disruptions nor high energy costs; we operate fossil fuel free since operations generate a surplus of biofuels (Biogas & Oil from Algae)

Cutting edge building solutions and regenerative systems

- Next generation POD´s, vertical farming that is "greener than greenhouses".
- Our first standardized key products are AgriPOD for the family farm and CityPOD for urban farming.
- Our products are prefabricated modular building kits that are based on the SolaRoof technology
- Our service is based on building global cooperative that enables and serves local coop´s and social enterprises that replicate, share and adapt blueprints and models for regenerative local food, energy and water.

Unique solutions

- The basic function that makes our building technology solution outstanding are two key features, that is soap bubble insulation and shading, as well as liquid cooling within a closed atmosphere controlled system.
- POD´s are Closed Ecological Environments that enable complete climate control and adaption to any climate.
- The product, a DIY building kit is delivered in shipping containers and can easily been setup and relocated.

PODnet and SolaRoof provide holistic solutions

Addressing Global Goals For Sustainable Development

With PODnet – SolaRoof solutions we do in one way or another have effect of most if not all of the Global Goals For Sustainable Development. Specially our solutions can have impact on goals:

- Goal 1: End poverty in all its forms everywhere
- Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 3: Ensure healthy lives and promote well-being for all at all ages
- Goal 6: Ensure availability and sustainable management of water and sanitation for all
- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable
- Goal 12: Ensure sustainable consumption and production patterns
- Goal 13: Take urgent action to combat climate change and its impacts
- Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all level
- Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Developmen

PODnet

Global Cooperative Organization

solarroof

CCEE

Closed Controlled Ecological Environment

The Start-Up Center

Social Innovation, Tehnology & Entrepreneur Center of Iceland

Social Project hus

VAXANDI

Smart Sustainable Eco-Buildings

Reykjavíkurborg - Grundarhverfi, deiliskipulagsbreyting vegna atvinnulóða við Norðurgrund 1-7

Hluti af gildandi deiliskipulagi Grundarhverfis

Samþykkt á fundi Hreppsnefndar Kjalarneshrepps 26.02.1998

Mkv. 1:2000

Tillaga að breytingu á deiliskipulagi

Mkv. 1:2000

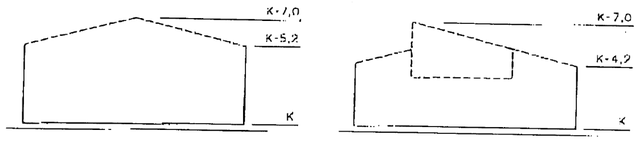
Greinargerð

Í gildi er deiliskipulag fyrir Grundarhverfi á Kjalarnesi samþykkt 26.02.1998 m.s.br. Við Norðurgrund eru skipulagðar atvinnulóðir sem eru ætlaðar fyrir lítil eða meðalstór fyrirtæki, og eru lóðirnar m.a. taldar heppilegar fyrir eftirtalda starfsemi: Smáiðnað og/eða framleiðslu, verkstæði, skrifstofur, heildverslun. Af þeim fjórum atvinnulóðum sem eru skipulagðar þá hefur aðeins einni þeirra verið úthlutað og byggt á hluta af gildandi heimildum, þ.e. Norðurgrund 1. Í deiliskipulagi er það sýnt sem áhaldahús.

Sjá töflu að neðan fyrir stærðir og gildandi heimildir byggingarmagn og nýtingarhlutfall. Í greinargerð með gildandi deiliskipulagi (kafli3 fyrir atvinnulóðir) eru skilgreindir skipulagsskilmálar fyrir lóðirnar við Norðurgrund og nánari útfærslur fyrir ýmis atriði.

Afmörkun byggingareita og kvaðir um bílastæði eru sýnd á deiliskipulagi og á mæliblaði. Reikna skal með að lágmarki einu bílastæði fyrir hverja 50 m^2 gólffflatar. Ekki má telja sem bílastæði svæði framan við lager– eða innaksturshurðir. Kvöð er um gróðurbelti nyrst á lóðunum.

Athafnasvæði á lóðum skulu að jafnaði vera meðfram baklóðamörkum, m.a. ætluð fyrir vörugáma og vörulagera. Áfangaskipting bygginga er háð samþykki byggingarnefndar. Gera skal grein fyrir þeirri starfsemi sem fyrirhuguð er í húsi og á lóð, og einnig þeim búnaði og tækjum utan húss sem nauðsynleg kunna að vera. Gera skal grein fyrir hugsanlegri mengun (hávaða, lykt, reyk, óþrifum, úrgangi) sem fylgja kann fyrirhugaðri starfsemi og þeim vörunum sem fyrirhugaðar eru af þeim sökum.



Skýringarmynd sem sýnir mögulegar útfærslur á húsgerðum skv. gildandi skilmálum. Uppgefnar eru hámarkshæðir.

Tillaga

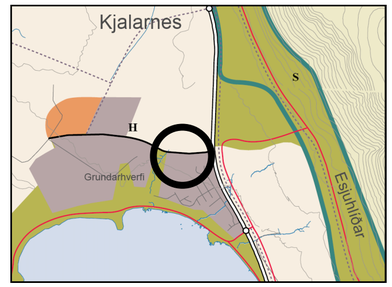
Í deiliskipulaginu er gerð tillaga að breyttu skipulagi fyrir atvinnulóðirnar að Norðurgrund 1-7. Lega byggingareits lóðanna við Norðurgrund 3-7 er breytt þannig að reitirnir eru rýmkaðir / stækkaðir til vesturs- mismikið þó. Ný afmörkun byggingareita eru sýndir á uppdrætti. Með þessu er verið að koma til móts við óskir um uppbyggingu á lóð. Nýtingarhlutfall og byggingarmagn (minnsta heimilaða og hámarks á lóð) breytist ekkert. Aðkoma að lóðunum færist til eftir þörfum utan byggingareita og verður það útfært nánar í mæliblaði. Bílastæðaröðun innan lóða er frjáls, en áfram skal reikna með að lágmarki einu bílastæði fyrir hverja 50 m^2 gólffflatar.

Einnig verður heimilt að breyta húsgerð á öllum atvinnulóðum, þannig að einhallandi þakgerð verður leyfilegt og bætist þá við mögulegar útfærslur á þeim húsgerðum sem eru leyfilegar í dag. Hæðarkótar breytast þó ekki og er hámarkshæð 7,0 metra yfir gólfkóta, sbr. skýringarmynd á uppdrætti.

Að öðru leyti gilda eldri samþykktir skilmálar fyrir atvinnulóðirnar við Norðurgrund 1-7. Bent er á að kvaðir OR um legu jarðstrengja, holræsi og háspennulína gilda enn sbr. það sem kemur fram á mæliblöðum.

Tillögur að nýjum byggingareitum eru sýndir sem svört lína á uppdrætti. Áfram er gert ráð fyrir kvöð um gróðurbelti nyrst á lóðunum.

Heiti lóðar	Stærð lóðar	Nýtingarhlutfall	Minnsta heimilaða byggingarmagn á lóð	Hámarks heimilt byggingarmagn á lóð
Norðurgrund 1 (N1)	2.430 m^2	0,1 - 0,3	243 m^2	729 m^2
Norðurgrund 3 (N3)	2.544 m^2	0,1 - 0,3	254 m^2	763 m^2
Norðurgrund 5 (N5)	2.544 m^2	0,1 - 0,3	254 m^2	763 m^2
Norðurgrund 7 (N7)	2.436 m^2	0,1 - 0,3	244 m^2	731 m^2



Yfirlitsmynd úr AR 2001-2024 (ekki í kvarða)

Yfirlitsmynd - loftmynd tekin af Grundarhverfi 2012

Deiliskipulagsbreyting þessi sem fengið hefur meðferð í samræmi við ákvæði 1. mgr. 43. gr. skipulagslaga nr. 123/2010 var samþykkt í _____ þann _____ 20__ og í _____ þann _____ 20__.

Tillagan var auglýst frá _____ 20__ með athugasemdafresti til _____ 20__.

Auglýsing um gildistöku breytingarinnar var birt í B-deild Stjórnartíðinda þann _____ 20_.

Grundarhverfi

Breyting á deiliskipulagi, Norðurgrund 1-7

Dags: 27.03.2013 mkv: 1:2000

Björn Ingi Edvardsson, landslagsarkitekt

Reykjavíkurborg
Umhverfis- og skipulagssvið

Borgartúni 12-14, 105 Reykjavík, s. 411-1111