



- TELESIS is the game-changing technology that successfully acquires [with ZERO environmental impact] industrial volumes of water from the near off-shore subsurface.
- The water acquired is naturally and efficiently filtered and consequently chemicals-free and contains significant levels of latent energy.
- In capitalising on these natural advantages, we have the engine for a paradigm shift in resilient, affordable and sustainable downstream applications.
- TELESIS uniquely delivers multiple services and utilities in one integrated process.

The worsening availability of natural resources, the unpredictability caused by climate change, the conflicting and competing demands for 'green' solutions that should be sustainable, scalable and affordable so as to serve our expanding populations, all combine to create daunting and apparently unresolvable tasks.

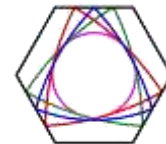
The world is ready and urgently needs to take Nature-Based Solutions to scale.

The holistic and synergistic advantages of multi-utility **TELESIS** provides direct benefits to both people and nature. **TELESIS** significantly contributes to 11 of the UN's 17 SDG's as well as other food, water, energy nexus global challenges.

**COMPOSIUM GROUP LTD**  
**UNIT 8, THE NURSERY, EH18 1BB**  
**07704773567**

<https://www.composium-group.com/>

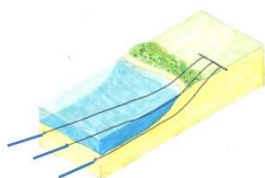




**We transform the socio-economic well-being of coastal communities**, home to over 60% of the planet's population (70% by 2025) with a commercial business that saves the environment.

The platform for everything we do utilises water that is acquired via our 'next generation', innovative subsurface abstraction technology. The water we acquire with ZERO environmental impact, is naturally and efficiently filtered, is chemicals-free (Biocides are redundant as bio-fouling is simply not possible) and is at a year-round constant temperature – see water quality below.

**These properties serve as the engine for many advantageous green, nature-based applications.**



The ultimate slow-sand filter, perpetually maintained by the dynamic actions of waves, tides, currents and storms; **TELESIS** will provide 16 – 160,000m<sup>3</sup>/day of naturally pre-treated subsurface water that contains significant levels of intrinsic latent energy.

By simply and successfully changing the feed-source to sub-surface water, we are able to radically transform the downstream services



**Reliability**  
- **TELESIS** is impervious to all shut-down events

**Sustainability**  
- Utilising a virtually inexhaustible resource in environmentally benign, chemicals-free, low-to-zero CO<sub>2</sub> processes.

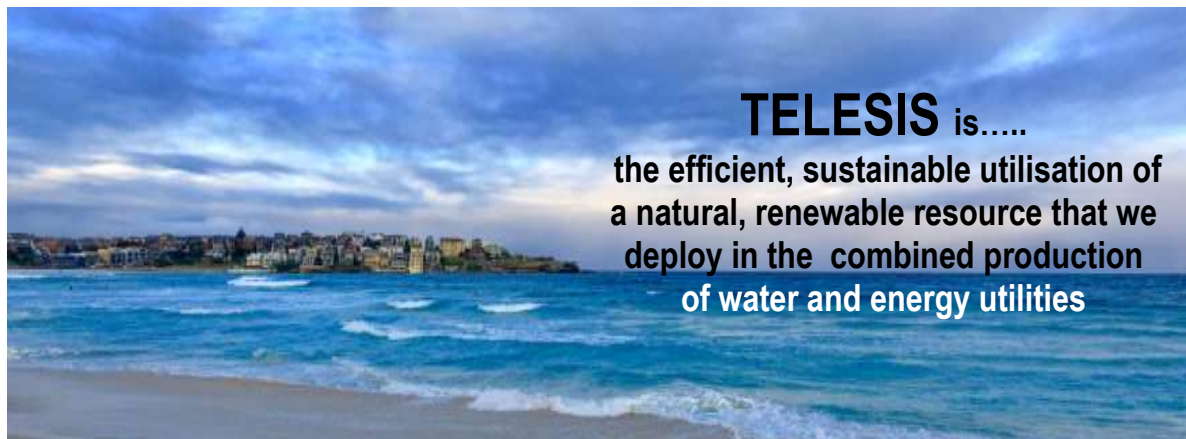
**Affordability**  
- An unparalleled business model is created by capitalising on the advantage of simultaneous utility production, i.e. Heating, Cooling, Desalination and Mineral Recovery [ZLD] all using the same engine; **TELESIS** subsurface water.

### Water quality comparisons

NTU: Nephelometric Turbidity Units

TSS: Total Suspended Solids

	TELESIS	Open-intake
Bacteria Coliforms	0.1	30 - 35
Turbidity (NTU)	1.5	6
TSS	5	40
Temperature	Constant, year-round, 24/7	Diurnal & seasonal variation



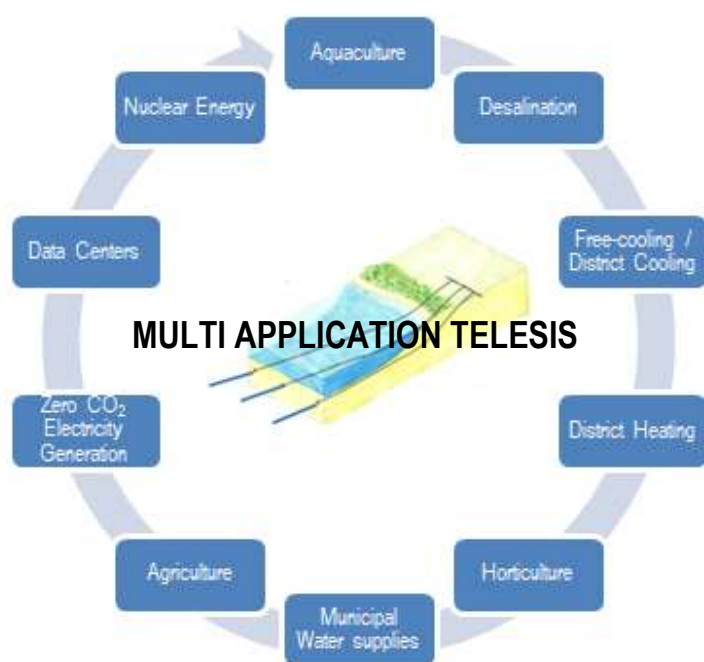
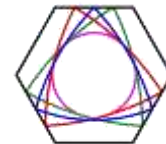
**TELESIS** is.....

**the efficient, sustainable utilisation of a natural, renewable resource that we deploy in the combined production of water and energy utilities**

Although **TELESIS** is limited to coastal applications, this will be home by 2025 to almost 70% of the planet's population. 4 of the world's 5-largest Mega cities, in common with most of the largest cities, are located on the coast and are sinking due to over-abstraction of groundwater. **TELESIS** will facilitate utility production within the heart of coastal communities, discretely and unobtrusively, obviating the reliance on groundwater. This is possible because a) **TELESIS** is invisible (below ground) and b) the spatial requirements of **TELESIS** plant are half that of standard operations and can be easily and discretely accommodated within Basement areas.

**Significantly contributing to 11 the 17 UN Sustainable Development Goal  
Facilities and utilities served and transformed by TELESIS.**





### 1. Aquaculture

We simplify and de-risk Aquaculture fish farming procedures and significantly reduce the prospect (and disastrous consequence) of disease.

### 2. Desalination (and mineral recovery)

Desalination is unaffordable, destructive, discredited. **TELESIS** resolves and reverses each of these problems with game-changing process transformation, reducing production costs  $\geq 50\%$ .

### 3. Free-cooling, District cooling

**TELESIS** renders cooling towers redundant as this water is hotter than **TELESIS** cooling water. Consequently, we enjoy 60% Opex reduction, Capex reduction of 30% - 85% in Northern Latitudes when integrated with a Heat Pump application as Chillers are then also unnecessary / redundant.

### 4. District Heating

**TELESIS** subsurface water is a high-quality heat sink source for Heat Pump applications which facilitates a  $COP \geq 5$ .

### 5. Horticulture

This holistic, synergistic **TELESIS** process free-cools the greenhouse interior, provides ultra-low cost irrigation water plus natural fertilizers and reduces produce storage costs and consequently contributes towards food waste prevention.

### 6. Municipal water supplies

Many of our Lakes and Rivers are severely polluted or suffer periodic issues that interrupt municipal supplies. **TELESIS** acquires water, effectively from the same source but as our abstraction method is impervious to close-down events, we accomplish security of municipal supplies.

### 7. Agriculture

Produced water is too expensive to serve all of Agriculture's needs. However, a supply which serves as the security against crop loss in the face of unpredictable but evermore frequent and extended droughts, provides the level of risk mitigation that could make the difference between investing in this critically required food production process, or not. It might also bring marginal land back to arable production. **FILLING THE GAP** between "rain-fed agriculture" and the irrigation water quantity so as to de-risk Agriculture and contribute to accomplishing Food security.

### 8. Zero CO<sub>2</sub> Electricity Generation

There is a current and marked growing preference for decentralised, off-grid utility generation. **TELESIS** can serve as the crucially important cold-sink in thermodynamic processes (e.g. Thermal Generators) which can provide the electricity to deliver other **TELESIS** utilities, e.g. cooling or desalination. This holistic, synergistic process provides **NET ZERO CO<sub>2</sub>** socio-economic security and growth for coastal communities, home to over 60% of the planet's population - 70% by 2025.

### 9. Data Centers

As data centre productivity increases in magnitude of order, so too does the internal heat gains. **In an age of water poverty**, this heat load increase coincides with increasingly discussed and criticised awareness of the vast volumes of **water lost** while cooling Data Centers.

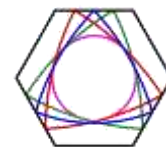
As referenced above, **TELESIS** does not use cooling Towers and, therefore, there can be no water loss. Furthermore, we can 'Free-cool' data centres and this combined with low cost water production transforms a process that is presently consuming millions of m<sup>3</sup>/day into a **holistic, synergistic net water provider**.

### 10. Nuclear energy

**TELESIS** simply improves both the resiliency (safety) and the efficiency of Nuclear Power generation.







### Aquaculture

Large exchanges of water provide better breeding results but also one significant risk: the increased exposure to (and staggering consequences of) environmental borne disease. Large water exchange rates increase treatment costs by magnitudes of order. **TELESIS** is a single-pass, large volume supply of naturally purified, optimally oxygenated water that does not require treatment. Naturally superior **TELESIS** water is constant temperature, free of disease and parasite infestation and consequently, a paradigm shift in mortality event prevention.

THE CASE FOR FISHERIES	THE PROBLEM WITH FISHERIES
<p>In principle, aquaculture shows great potential for sustainably and efficiently providing protein and making a great contribution as a food source for the 21st century.</p> <p>Of all farmed animals, fish demonstrate the highest conversion ratios; feed &lt; 2 kg to a 1 kg gain in live weight.</p> <p>Until recently, the rate of growth in output from aquaculture [much of this increase in China] was little short of extraordinary.</p>	<p>Growth in aquaculture appears to be showing some signs of slowing down. One real and potential constraint to aquaculture is the vulnerability of intensive aquaculture sites to disease.</p> <p>The most successful Aquaculture operations expend considerable sums in the continual and interminable attempts to counter the devastating consequences of disease.</p>
THE SOLUTION FOR FISHERIES	
TELESIS: Environmentally harmless, sustainable, off-shore, sub seabed seawater abstraction	
<ul style="list-style-type: none"><li>• Parasite and infection-free, naturally and effectively filtered, chemicals-free water</li><li>• The TELESIS system is discrete, invisible<ul style="list-style-type: none"><li>• Ultra-low operational costs</li><li>• Exceptional investment pay-back</li><li>• Resilient, zero down-time</li></ul></li><li>• 24/7, year-round constant temperature</li><li>• Life-cycle measured in 'hundreds of years'</li></ul>	<p><b>TELESIS Aquaculture Water Supply.</b></p> <p>TELESIS eliminates the need for (and the costs of) water treatment systems and products. We also significantly reduce operational overheads in the delivery of the finest, <u>naturally pre-filtered</u> seawater for land-based aquaculture facilities.</p>



#### Sustainable aquaculture

**TELESIS** transforms the business of raising healthy, consumer-safe, and market-ready seafood and enables sustainable increases in livelihoods from aquaculture production without creating adverse socio-economic or environmental impacts.

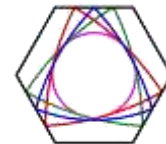
#### Resilient.

Completely impervious to and protected from unfavourable weather and climate change, just one advantage of which is - more efficient growth of natural food production of phytoplankton and zooplankton.

#### Economic.

- Greater yield
- Simplified effluent management
- The **temperature control** necessary to nurture the physiological well-being of the fry, fingerling or juveniles being farmed is unnecessary, redundant.
- **TELESIS** will bring about a general reduction in operational routines and consumables.





### Desalination (and mineral recovery)

#### Challenges

Water scarcity will be exacerbated as rapidly growing urban areas place heavy pressure on neighbouring water resources. Climate change and bio-energy demands are also expected to amplify the already complex relationship between world development and water demand.

#### Facts and figures

- Over 2 billion people live in countries experiencing high water stress. ([UN, 2018](#))
- It is estimated that by 2040, one in four of the world's children under 18 – some 600 million in all – will be living in areas of extremely high water stress. ([UNICEF, 2017](#))
- 700 million people worldwide could be displaced by intense water scarcity by 2030. ([Global Water Institute, 2013](#))
- About 4 billion people, representing nearly two-thirds of the world population, experience severe water scarcity during at least one month of the year ([Mekonnen and Hoekstra, 2016](#))
- With the existing climate change scenario, by 2030, water scarcity in some arid and semi-arid places will displace between 24 million and 700 million people. ([UNESCO, 2009](#)).
- A third of the world's biggest groundwater systems are already in distress ([Richey et al., 2015](#))...and groundwater is where 50% of all drinking water comes from.
- Nearly half the global population are already living in potential waterscarce areas at least one month per year and this could increase to some 4.8–5.7 billion in 2050. About 73% of the affected people live in Asia (69% by 2050) ([Burek et al., 2016](#)).

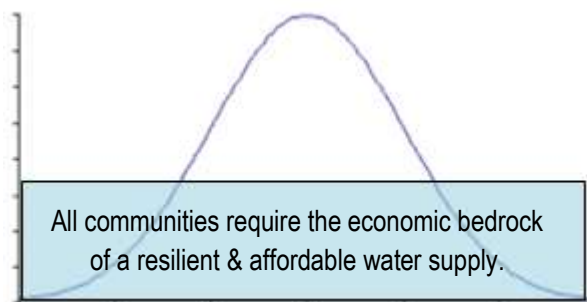
#### Opportunities

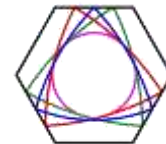
There is not a global water shortage as such, but individual countries and regions need to urgently tackle the critical problems presented by water stress. Water has to be treated as a scarce resource.

While managing demand and re-cycling measures will alleviate the problems, these actions are not of the scale of response required.

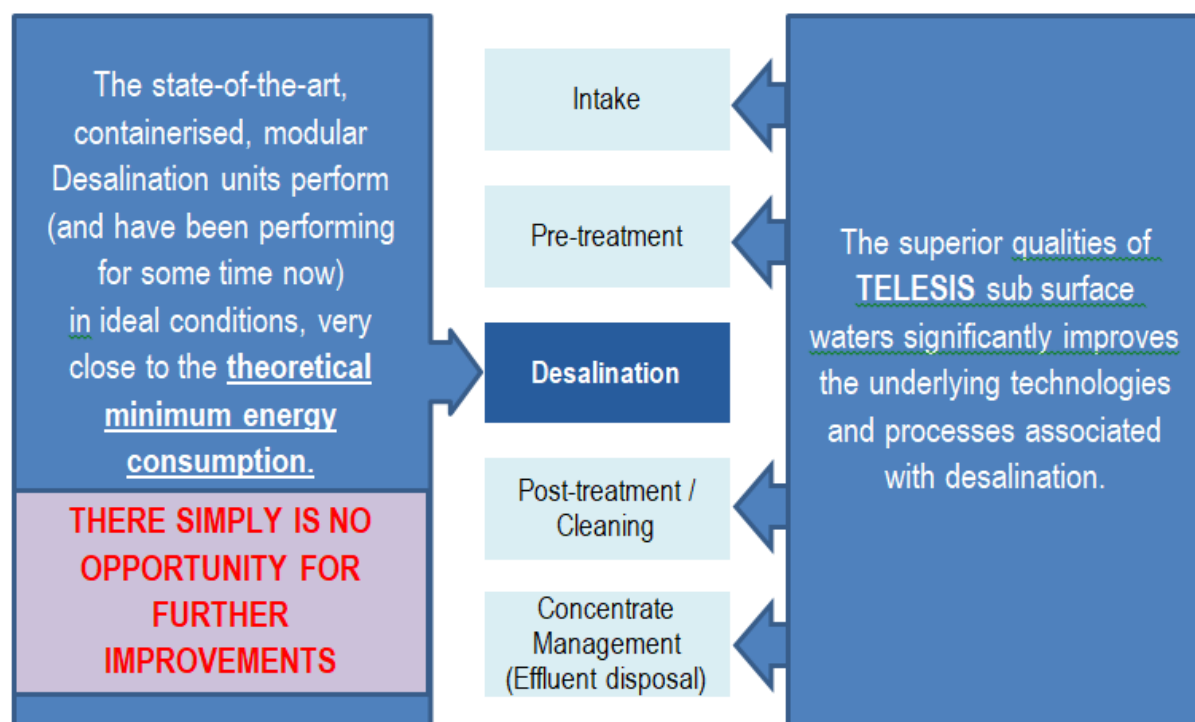
For supply to approximate to demand, we MUST produce more water. There is really only one option on the table of adequate opportunity, scalability and resilience and that is desalination. **However, desalination is discredited (unpopular, open intakes were banned in California, 2015) destructive (both at the intake and at the outfall (toxic, carcinogenic effluent) and unaffordable, largely due to the levels of energy consumed in the overall process.**

**TELESIS DESALINATION IS BOTH HARMLESS AND AFFORDABLE.**





Sub surface water abstraction has the potential to deliver **THE BIGGEST GAME CHANGING IMPROVEMENT TO DESALINATION IN DECADES.** The critically needed paradigm shift is accomplished by simply (and with TELESIS, very successfully) changing the method by which the feed-source is acquired.



**Significantly contributing to 11 the 17 UN Sustainable Development Goals**

### 16-Desalination process improvements & economies facilitated by TELESIS

The need for entrained bio-mass removal is redundant.	Part of <b>multi-utility</b> production ∴ economies of scale	Reduced cleaning increases life of membranes	Life-cycle increase results in reduction in Amortisation.
Zero environmental impact compensation, reduced Permit application costs	Increased resilience and production time	Brine management simplification	Fewer consumables (e.g. Biocides)
≥30% less energy	Reduced maintenance	~ 50% less land	Reduced Capex & Capex payback ~ 2-years
▲ Concomitant CO <sub>2</sub> reductions ▲	Optimum uptime and avoidance of PENALTIES AND FINES	Increased yield, product water quantity for sale	Chemicals-free ∴ High quality water product

The aggregate value of the improvements and economies above is that.....  
**TELESIS** Desalination production costs are ≥50% lower than the next best available option; no Capex premium.



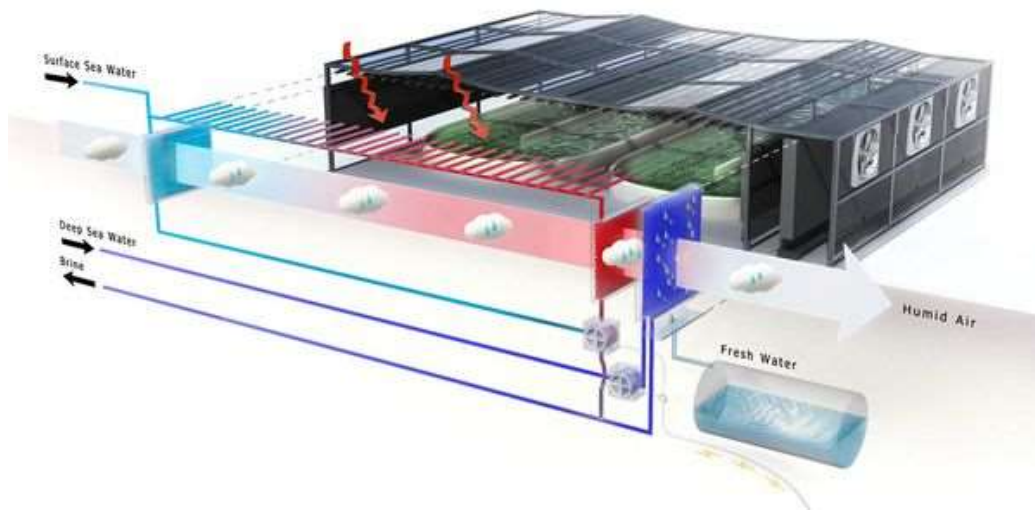


### Free-cooling, District cooling

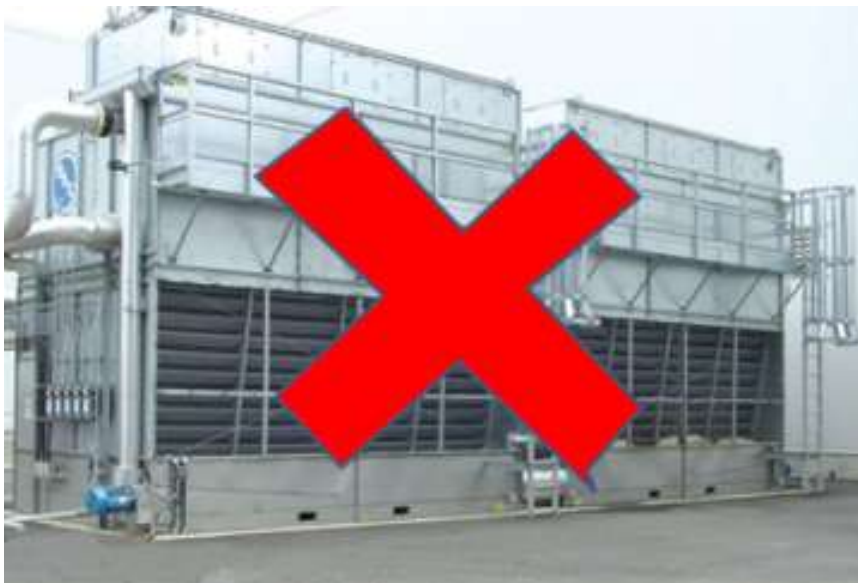
In sub-tropical and warmer climates, the temperature of the water we abstract is typically lower than the wet-bulb temperature of the ambient air. This means **TELESIS** water is colder than water available from a cooling tower. To put it another way our water is not only superior to cooling tower condenser water; it renders the need for cooling towers redundant, hence, no noise and no pollution but [most importantly in arid climates in this age of global water poverty] no evaporation and no make-up water requirements. There are many prospects for beneficially utilising **TELESIS** water but there are two applications that are the most obvious and prominent.

#### Free-cooling

By circulating **TELESIS** water through air - water exchanger coils we can cool air being delivered as Fresh air for human occupation in Hotels, offices, shopping Malls, etc. or Greenhouses. This is what is known in the HVAC<sup>1</sup> world as 'Free-cooling'



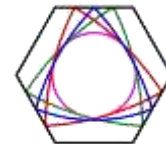
#### District-cooling



<sup>1</sup> Heating, Ventilating and Air Conditioning







### TELESIS District-cooling (with renewable energy) less than 2-years investment payback and Real estate benefits.

**TELESIS creates a 30% reduction in District Cooling Capex and a 60% overall reduction in Opex.**

Take a hypothetical built environment with an area 1,200,000 m<sup>2</sup>. This will require approximately 120,000kW of cooling. The most effective method to provide this is via Water Cooled Chillers, the District Cooling standard service.

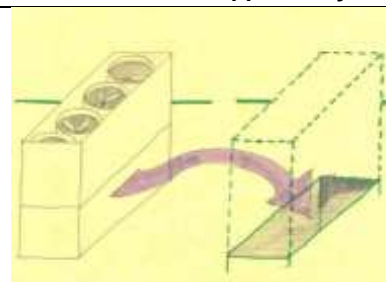
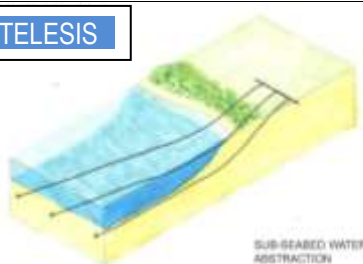
This hypothetical (but typical) cooling load would be served by 15 No. 2,450 ton Water Cooled Chillers. The total volume of condenser water required to service 15 such Water Cooled Chillers can be provided by just one **TELESIS** system delivering 100,000 m<sup>3</sup>/day of constant temperature, naturally-filtered water.

**Cooling Towers are not required** when **TELESIS** is the source of the condenser water for water cooled chillers. A real estate opportunity arises by re-allocating the space otherwise occupied by the (now unnecessary) Cooling Towers and placing the chillers below grade.

**Un-utilised space =  
Real Estate opportunity**



TELESIS



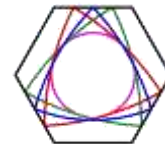
**TELESIS District cooling has a Capex reduction of 30% and a reduction in Opex of 60%**

	Option 'A' TSE's	Option 'B' (Open intakes)	Option 'C' TELESIS
Abstraction	N/A	<b>Destruction of all levels of marine ecology</b>	Benign, harmless
Purchase of Make-up water	<b>Can cost \$1 per cu. m</b>	No-cost	No-cost
Filtration	<b>30-35% of all energy consumed</b>		Not required
Storage and use of Chemicals in treatment	<b>Hazardous</b> , specialist process with storage and safety issues		Not required
Maintenance and operation	<b>Intense, costly 24/7 activity</b>		Zero-Minimal
Blowdown Discharge issues	<b>Environmentally controversial and very problematic</b>		Not an issue
Air pollution	<b>Legionnaires Disease and numerous other toxic water vapour issues</b>		Not an issue
Make-up water	Extremely unpopular, discredited, banned in California Costly storage, treatment, pumps, pipes and controls		Not required
Cooling Towers	Costly, visually indiscreet and spatially demanding, lost real estate opportunities		Not required

**NB: TELESIS payback is ~ 3-years**







### District Heating

One concept that is attracting widespread and growing interest in the pursuit of decarbonising space heating and cooling is Aquifer thermal energy storage (ATES).

#### FUNDAMENTALS

**Earth** (or, ground-coupled) heat exchanger systems in general [ground source heat pump systems (GSHP) in particular] are deployed by capitalising on the **constant temperature, latent energy** of the earth subsurface to facilitate downstream, low energy production of heating and cooling.

The acquisition of ground source water (the 'coupling') is accomplished by using either vertical or horizontal wells. To date, vertical wells are the ubiquitous (and virtually only) option used. **This piece presents the view that this is a material error.**

There are two fundamental flaws with attempts-to-date to provide municipal, industrial scale ATES utilities.

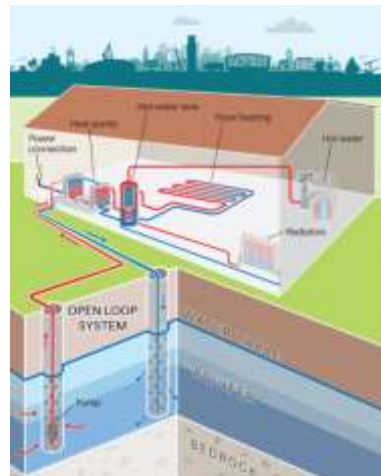
#### 1. **Borehole selection.**

Almost all attempts to capitalise on ATES deploy vertical wells.

Vertical wells have limited abstraction water volumes and expose the operation to complex, detrimental and unpredictable influences.

1.1 Vertical boreholes usually cross or traverse several geological layers. These multilayers (stratum) often introduce complex transient dynamics that influence and vary the Aquifer conditions, whereas, steady state conditions are the sought after, beneficial and favoured platform for any reliable **ground-coupled heat exchanger project.**

1.2 The groundwater from vertical wells is often contaminated, especially with Chlorinated volatile organic compounds (CVOCs). Historically, several vertical well systems [in most cases, utilised to serve feed source water for desalination projects] experienced changes in the aquifer geochemical conditions which can (and often have) developed just a little while after commencing operations. These changes in water quality, exacerbated by 'migration of fines', rendered these projects critically unviable.



#### 2. **Vertical Borehole reliability [Risk assessment and Life-cycle certainty].**

The Capital Expenditure of an ATES deploying vertical wells is not a minor, insignificant investment and project risk analysis must, therefore, produce results that establish Thermal recovery efficiency, stability and longevity **are assured.** **The British Geological Survey assessment of the Groundwater heat pump operations in Cardiff (using vertical wells to access shallow urban aquifers) demonstrates this is far from being the case.**

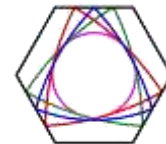
- What is the remedy when the well water suffers from **temperature degradation** and/or 'Seasonal GW **Temperature Variation**'?
- What is the remedy when **hazardous geo-chemicals** have been induced or transferred from any one (or all) of the strata the vertical well traverses?

Any future civil engineering projects located within the footprint or zone of influence of the project Aquifer could **jeopardise the yield** of the vertical wells deployed within that footprint.

Any of the above are potentially **shut-down events** ranging from 24-hours to many months and utility non-delivery usually carries with it significant penalties.

**Unlike TELESIS horizontal wells**, vertical wells are susceptible to severe risks which are highly probable to occur and extremely difficult to resolve.





This particular introduction is customised to explain the effect of **TELESIS** when deployed in District Heating (and Cooling) services and how we can play a very significant part in de-carbonising the UK.

- **One-third of all energy used in the UK is spent on heating<sup>2</sup>.**
- **16% of all energy used in the UK is spent on cooling<sup>3</sup>.**

There is increasing interest in exploiting Geothermal Energy for economic reasons and to assist with objectives in Carbon reduction targets **associated with heating and cooling utilities.**

**Capitalising on the latent geothermal energy from the near off-shore is an innovative, affordable, resilient and practical solution to one of the big challenges facing the economy – decarbonising heat supplies.** The near off-shore subsurface water around the UK presents an enormous opportunity as a source of geothermal energy, a low carbon, sustainable heat source, which under the right conditions can out-perform public supply gas prices.

**"I believe we should leapfrog over gas-powered combined heat and power [CHP] and go directly for heat pumps", Professor Sir David MacKay.**

The chart below provides an example of how, by capitalising on the geothermal qualities of near off-shore subsurface water, **TELESIS will beneficially transform Heat Pump performance.** Using a representative UK temperature as advised by British Geological Survey, Heat Pump Manufacturers - Star Renewables - kindly provided the corresponding performance data below.

Performance criteria for a hypothetical project located 55° North, Inlet temp 11°C

	Scenario	Heat pump performance
Requirements	Heating Flow Temperature (°C)	70
	Heating Return temperature (°C)	40
	Source Inlet Temperature (°C)	11
	Source Outlet Temperature (°C)	6
Total output for 3 No. heat pumps	Heat Capacity (kW) (+/- 5%)	17561
	Cooling Capacity (kW) (+/- 5%)	12664
	Shaft Power Required (kW) (+/- 5%)	4897
	Motor with electrical losses (+/- 5%)	5044
	Shaft COP <sub>h</sub> (+/- 10%)	3.59
	Absorbed COP <sub>h</sub> (+/- 10%)	3.48
	Shaft COP <sub>c</sub> (+/- 10%)	2.59
	Absorbed COP <sub>c</sub> (+/- 10%)	2.51
	Shaft Combined COP (+/- 10%)	6.172
	Combined COP inc motor losses (+/- 10%)	5.99
	Heating Water Flow (kg/s) (+/- 5%)	139.77
	Source Water Flow (kg/s) (+/- 5%)	602.74
	Source Water Flow (m <sup>3</sup> /day) (+/- 5%)	52,100
	Number Of Units Running	3
	rpm	2950

**IMPORTANT NOTE 1:** The source water flow of **52,100m<sup>3</sup>/day** lies in the low to mid-range of one **TELESIS** system.  
The **TELESIS** system range extends from **16,000 - to- 160,000m<sup>3</sup>/day.**

**IMPORTANT NOTE 2:** The **6°C stream** is perfect for Free-cooling applications.  
Microsoft are currently running experiments in Scotland (submarines, the Orkneys?) trying to find low cost, environmentally benign ways of cooling Data Centres.  
**We accomplish this outcome by delivering a considerably more pragmatic land-based solution and bringing the 'Coolth' of the seas on-shore, achieving 85% Capex reductions, 60% Opex reductions.**

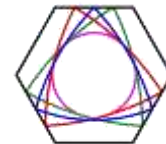
<sup>2</sup> Of the heat total over half (64%) is used on space heating. This is followed by water and process use (14% each). The remaining 8% is split between cooking/catering (5%) and drying/separation (3%).

<sup>3</sup> THE BIRMINGHAM ENERGY INSTITUTE, Doing cold smarter





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## TELESIS, nature's future proof supply of water & energy.

The example above demonstrates that with an abstraction process that draws 50,000m<sup>3</sup>/day [600L/s] from below the off-shore seabed there is a potential **17.5MW** of low cost, low carbon sustainable energy available for local space heating and **12.7MW** of Free-cooling.

Abstracting 50,000m<sup>3</sup>/day from the constantly replenishing (virtually inexhaustible) water that **TELESIS** obtains from the saturated sands of the near off-shore of Edinburgh or Glasgow (approximately 56°North) will provide all of the heating and cooling requirements for any large built environment within viable vicinity of the coast and up to around 120,000m<sup>2</sup> in size.

- One **TELESIS** system can be configured to provide volumes of water ranging from 16 – 160,000m<sup>3</sup>/day
- **Over 60% of Scotland's population are in vicinity of the coast.**

The UK near off-shore geology possesses a renewable resource that provides a continuous supply of water at stable year-round temperatures, **unaffected by seasonal variations**. An indication of the temperature of water available around the UK is shown on the map provided over.

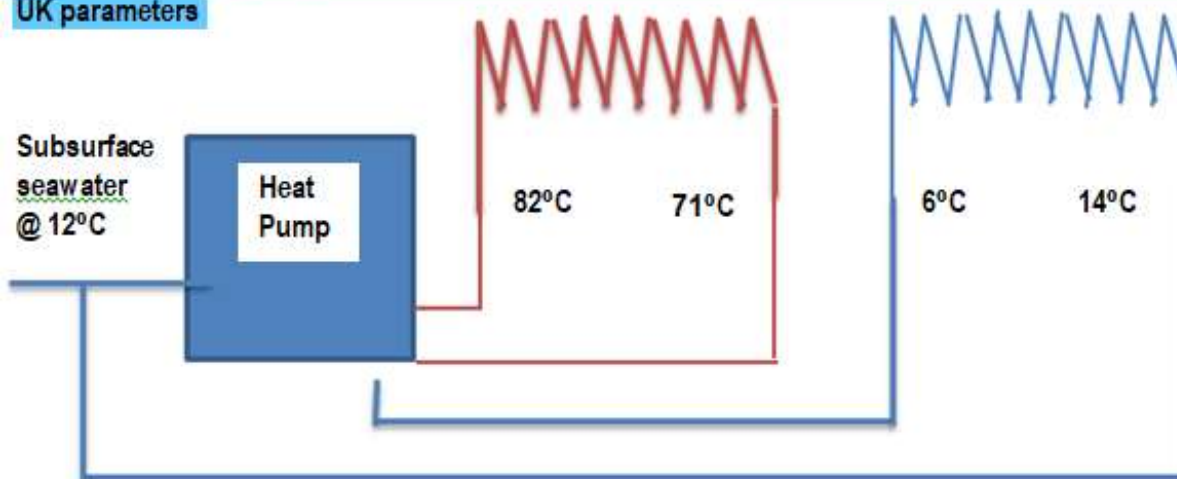
The open-loop **TELESIS** heat sink is incapable of short-circuiting whereby the return temperature influences the intake (or flow).

As the **TELESIS** system is entirely below ground, invisible, it is able to discretely supply utility services adjacent to (or in the midst of) coastal urban conurbations without fear of objections on the grounds of aesthetics.



**Energy productivity is the ratio of economic output to energy consumption – so improving energy productivity means getting more economic output out of every unit of energy consumed.**

### UK parameters



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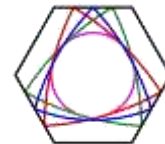


[ron.daniel@composium-group.com](mailto:ron.daniel@composium-group.com)



<https://www.composium-group.com/>





### Horticulture

The optimum **TELESIS** service **in connection with Horticulture in sub-tropical climates** is the nature-based production of two critically important utilities, both for less than the price of one.

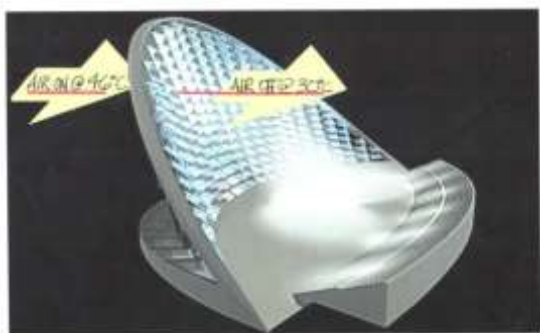
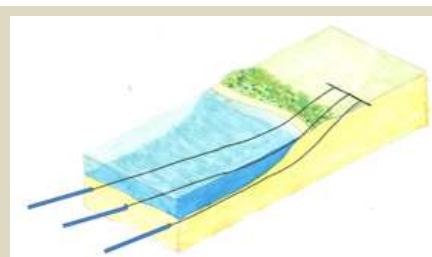
- A. Climate control of the Greenhouse. We deliver year-round, nature-based cooling that is low CO<sub>2</sub>, low cost and facilitates temperature control that is conducive to optimum productivity and yield **PLUS**
- B. Resilient and abundant water supplies. The first Water supply is obtained from the condensate that is a by-product of the cooled air supplied to the Greenhouses. If the condensate water is insufficient, a second, supplementary supply is provided from our **TELESIS** desalination process that, in comparison to the next best available option, has an unparalleled  $\geq 50\%$  reduction in production costs.

#### TELESIS NATURE-BASED HORTICULTURE

We harmlessly and efficiently collect water from below the seabed off-shore of Abu Dhabi (as an example).

This water is naturally filtered and makes an ideal, 'naturally pre-treated' feed source for desalination. This water is also **23.7°C every day**<sup>1</sup> of the year, making an ideal free-cooling resource.

<sup>1</sup> The temperature 23.7°C is in connection with projects in the Arabian Gulf. In the Mediterranean, for example, this temp is 20°C

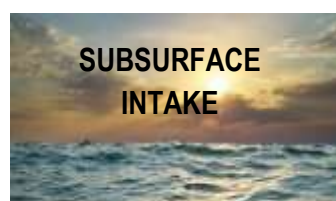


The first benefit from the consistent, low temperature of our abstracted water (23.7°C) is by circulating the water through air - water exchanger coils.

The Greenhouse air supply that passes over these coils can be **free-cooled** from a typical summer temperature of 46°C down to a much more comfortable 30°C. Large quantities of condensate is collected from the Cooling coils and sent to the Irrigation water system.

If more water is required than is provided from the Air cooling condensate supply, **TELESIS** desalination provides numerous economies that in aggregate result in a  **$\geq 50\%$  overall reduction** in production costs when compared to the next best option, no capex premium.

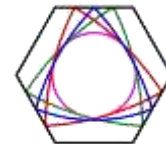
**TELESIS** desalination uses standard RO modules to process the Feed-source water and it is by radically improving the pre-treatment and post treatment either side of the desalination, we accomplish our cost reductions.



This synergistic, multi-utility combination is uniquely available with **TELESIS**. Dependable, sustainable, eco-friendly **TELESIS** delivers incomparably low utility production costs.







### Municipal water supplies

Many of our Lakes and Rivers are severely polluted or suffer periodic issues that prevent uninterrupted municipal supplies.

Climate change threatens drinking water quality across the Great Lakes.

theconversation.com, April 29, 2020

Warmer waters, heavier storms and nutrient pollution are a triple threat to Great Lakes cities' drinking water.

The Great Lakes contain one-fifth of the world's fresh surface water and supply water for **more than 48 million people in the U.S. and Canada.**



Lake Erie supplies water for 11 million people who live near the lake and in 2009 parts of that supply had to be shut down due to toxins found at a Toledo city water treatment plant.

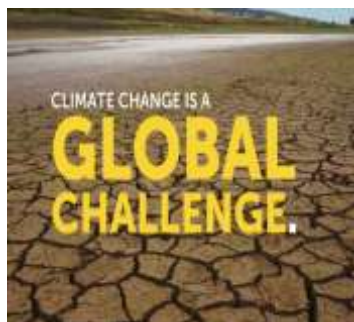
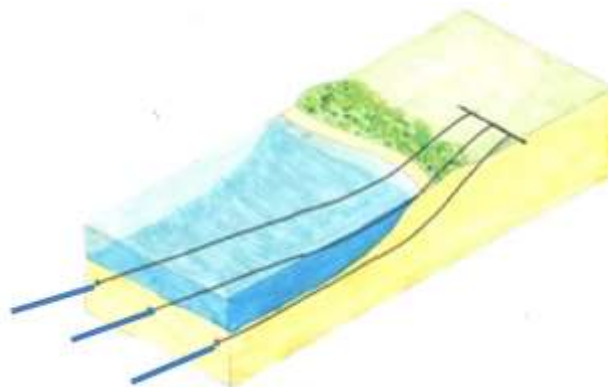
500,000 residents of Toledo served by the city's water system were instructed to stop using tap water and this state of affairs lasted for several days while the source of the problem, Harmful Algal Blooms (HAB's) were cleaned out.



HAB's are not the only event which jeopardises water supplies. Globally, throughout many water bodies but famously in Lake Ontario, the growth of alien, non-indigenous Zebra Mussels caused the blockage of water supplies to Toronto's Air Conditioning systems [see **Data Centers** below].

The method of obviating these and any other issues (e.g. accidental spillages) is to use the lake bed geology as a natural barrier, an extremely effective filter, separating high quality water from whatever contaminants might jeopardise that supply.

**TELESIS** acquires water, effectively from the same source but as our abstraction method is impervious to close-down events, we can ensure the security of municipal supplies.

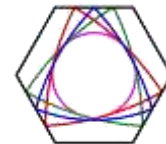


**TELESIS, significantly superior**

**Chemicals-free, passive, environmentally benign,  
Zero maintenance life-cycle 50+-years**

Climate change is a Global challenge and the benefits **TELESIS** would bring in providing a robust, purified water supply to the communities around the Great Lakes can be replicated in a multitude of locations around the planet experiencing similar jeopardy.





### Agriculture

The problem of land loss and degradation has not been much in the limelight of public attention but has become a severe global challenge nevertheless.

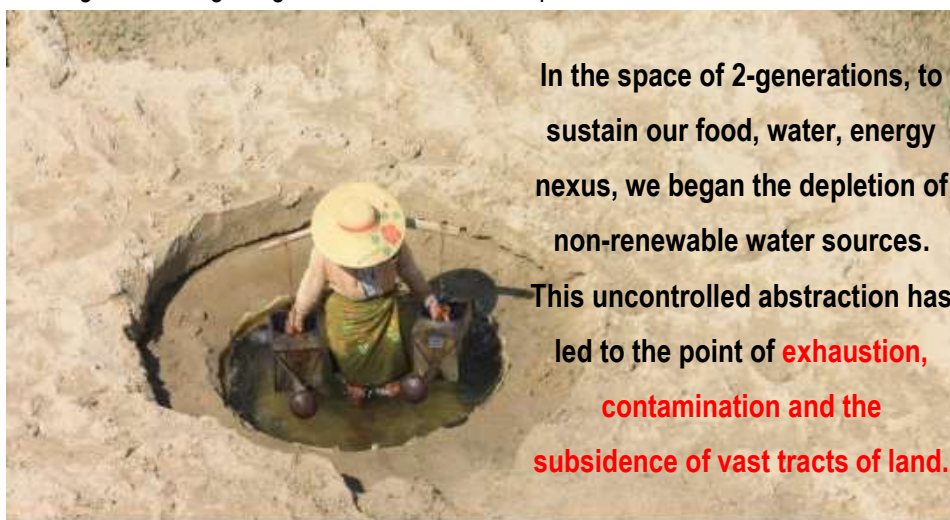
At a time when demand for food production has never been greater, never been more challenged or complicated, we are losing arable land through desertification and soil erosion.

We are also losing arable land due to salinization.

**Exhausted or poisoned.** We are about to lose a great deal more arable land as ever increasing numbers of Aquifers become either exhausted or [due to diminishing water levels and consequent land subsidence] poisoned by concentrates of liquids that fill the voids where the water previously was (e.g. Arsenic)

Produced water is too expensive to serve all of Agriculture's needs. However, a supply which serves as the security against crop loss in the face of unpredictable but evermore frequent and extended droughts, provides the level of **risk mitigation** that could make the difference between investing in this critically required food production process, or not. It might also bring marginal land back to arable production.

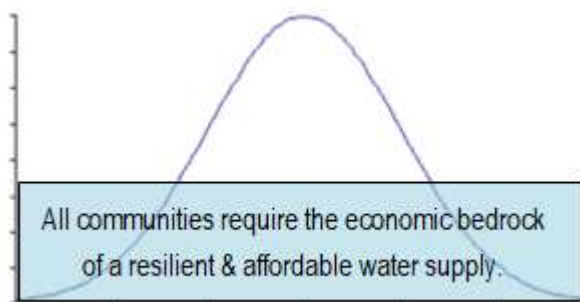
There are numerous indicators that suggest global water availability is on the cusp of experiencing a dramatic worsening of it's already perilously challenged quality & quantity status.



Whereas water for horticulture can be well managed, possibly even re-cycled, water for agriculture, no matter how well managed, simply cannot be re-cycled in any meaningful way. The only solution then, to alleviate this problem, is to produce water to **FILL-THE-GAP** between "rain-fed agriculture" and the irrigation water quantity required to successfully deliver a crop.

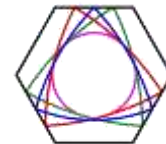
TELESIS in this context should be viewed as a low cost risk reducer.

**TELESIS is impervious to climate change impacts, precludes the abstraction of groundwater, facilitates the restoration of ecosystems and provides highest quality water.**



**Overcoming Food Insecurity with TELESIS™**





### Electricity Generation

There is a growing support for decentralising utility services. Go too far off-grid, however, and you will need to find alternate ways to secure a supply of electricity.

There is a trend, a growing preference for decentralised, off-grid utility generation. **TELESIS** can serve as the crucially important cold-sink in thermodynamic processes (e.g. Thermal Generators) which can then be deployed in the delivery of other **TELESIS** utilities, e.g. cooling or desalination, providing **NET ZERO CO<sub>2</sub>** socio-economic security and growth for coastal communities, home to over 60% of the planet's population - 70% by 2025.

The crucial aspect to operating any thermo-dynamic process [e.g. ORC Generators] is finding a cold-sink.

Electricity is produced by using the differential between **TELESIS** sub surface, constant temperature water and heat taken from a Thermal store which is charged from solar or/and industrial sources.

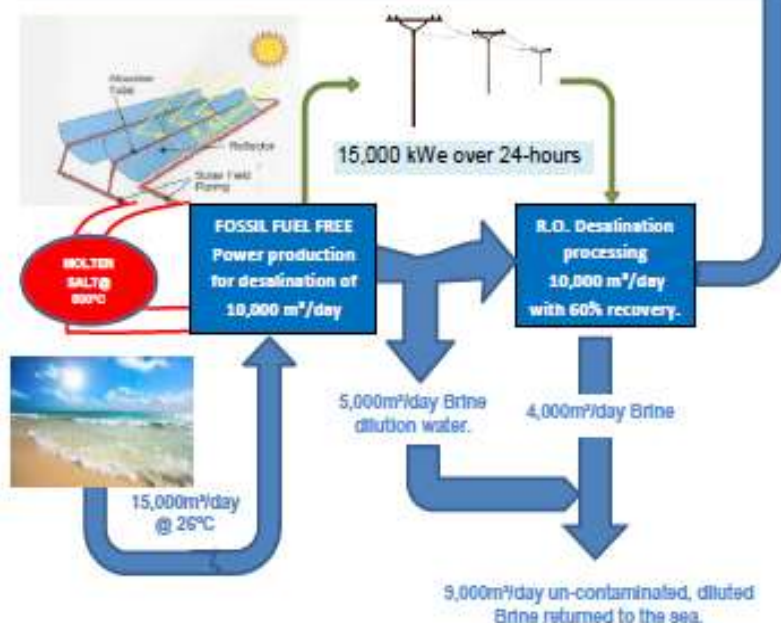
#### • Why are energy consumption levels in-the-field still 4 (or more) kWhrs / m<sup>3</sup>?

Considerable cost is expended (equipment, attendance and energy) in attempts to achieve the necessary and important, constant and consistent feed-water conditions necessary for R.O. Desalination, conditions which are the naturally accomplished qualities of **TELESIS**.

Fossil-fuel free production of six-thousand cubic metres of potable water every 24-hours.

#### • Where then will further, significant energy and cost savings come from?

**TELESIS** is the mechanism that facilitates the reduction of the desalination energy consumption, first from 4 - 5 kWhrs to 2.8 kWhrs per cubic metre. And then, with the process below (only possible with **TELESIS**) **ZERO ENERGY CONSUMPTION** is made possible.



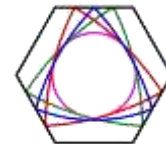
**TELESIS** desalination energy requirement is reduced from typically ~ 4.5kWhrs/m<sup>3</sup> down to 3 kWhrs/m<sup>3</sup> as a result of the pre-treated qualities of **TELESIS** waters.

The remaining energy requirement ~ 3 kWhrs/m<sup>3</sup> can be provided by ORC Generators, also serviced with **TELESIS** waters, this time contributing as a thermos-dynamic cold sink prior to being directed to the desalination process.

**WE NOW HAVE A NET ZERO CO<sub>2</sub> DESALINATION SERVICE**







### Data Centers

There is growing awareness, in this age of global water poverty, of the vast quantities of water lost through evaporative cooling systems deployed to climate control Data Centers through Air Conditioning.

Data Centers are now required to process magnitude of order increases in computational capacity [5G, Cloud, Edge] bringing concomitant increases in heat gain levels and associated infrastructure, exacerbating and increasing water loss. To satisfy these conflicting needs, there has been something of a recent trend for large facilities to be built in remote locations (e.g. northern parts of Scandinavia) because of the availability there of low energy costs and climates that allow for free-air cooling.

**TELESIS** is an innovative, validated, nature-based technological solution that will service Data centers, at any coastal location in the world, with low energy costs and free-cooling, as just one part of an integrated, holistic, multi-utility service. The need for Cooling Towers becomes redundant when **TELESIS** is involved and hence, we do not suffer the need to resource and purchase make-up water. In fact, we transform a potentially water guzzling operation into a net provider of water, enhancing the reputation of our Data Centre client.

**TELESIS** additionally provides all the benefits listed below.

#### **Scale**

Our service is scalable, virtually inexhaustible and improves the lifespan of Datacenters.

#### **Infrastructure**

The required **TELESIS** cooling facility, in comparison to the next best option, will have a reduced Capex [85 - 30%, depending on whether Chillers are required, or not] and Opex [60%].

**TELESIS** occupies less than 50% of the footprint of conventional cooling solutions deploying Cooling Towers.

#### **Resiliency**

**TELESIS** is impervious to all shut-down events

#### **Efficiency**

**TELESIS** delivers the optimum, massively improved PUE while also accomplishing optimum sustainability and carbon reduction. In retro-fits, we resolve issues with lack of floor space or power capacity.

#### **Geography and Distribution**

The attributes and benefits of utilising centralized metro sites are self-evident. **TELESIS** delivers free-cooling adjacent to, or even in the midst of major conurbations and smaller urban areas. We are able to accomplish this because our service is sub surface and we dispense with the need for Cooling Towers. Consequently, our service is discrete, invisible.

#### **Business Models**

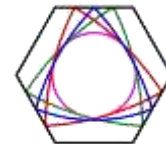
The aggregate effect of the attributes above is that we create Business models that deliver robust, unparalleled financial performance.

### Note

Water abstracted from the subsurface is the engine that accomplishes the above and (depending on the location of the project) will have either first served a Heat pump application [Northern latitudes] or will go on to serve as the feed-source for ultra-low cost desalination with production costs  $\geq 50\%$  lower than the next best option, no Capex premium [sub-tropical, tropical latitudes].







### Nuclear Energy

TELESIS transforms the resilience of nuclear energy generation processes.

- Cooling water scarcity during recent warm, dry summers led several thermal (nuclear and fossil-fuelled) power plants in Europe and the south-eastern USA to **reduce production**.
- An increase in and spread of water scarcity and stress is predicted to affect about half the river basins in the EU by 2030 which illustrates **the vulnerability of energy generation** to changing weather and climatic conditions.
- **6-10 degrees Celsius**. The amount that temperatures in the Nordic region have been above seasonal averages this summer [2019]. The heat has depleted the country's hydropower reservoirs, and is now **disrupting nuclear power plants** as warm seawater forces several nuclear reactors to shut down.

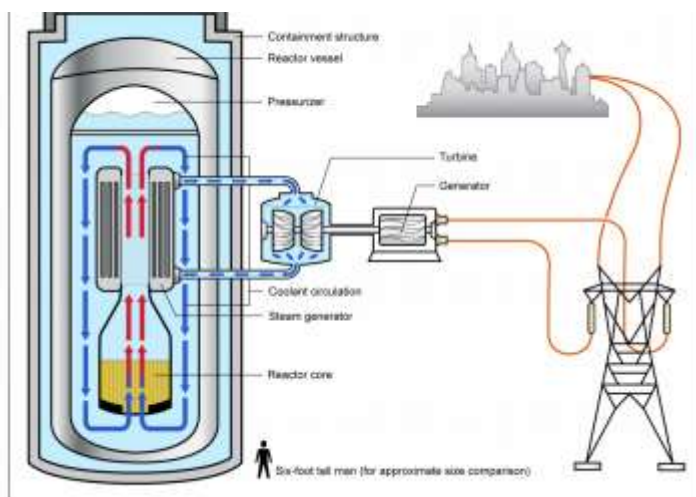
### REASONS FOR INVESTING IN TELESIS

1. Constantly available water supply @ a constant 24/7 temperature
2. In warmer, subtropical latitudes, our cooler, constant temperature will improve the nuclear operation efficiency and productivity by 4-7%
3. The fact that TELESIS is impervious to shut-down events improves the overall resilience, raising the 'Up-time' towards 5-nines,
4. TELESIS once-through wet cooling is superior to recirculated.

SMR image from July 2015 GAO Report

There is a trend currently that favours small modular reactors (SMR's) technology. All developed nations and most of the major industrialists are involved (Rolls Royce, Siemens GE, etc). Combining **TELESIS** with any of the products of the various competing entities would provide them with a very significant advantage in both quality and economy.

Further reading: <https://www.twi-global.com/technical-knowledge/faqs/small-modular-reactor>

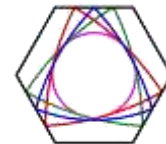


Source: GAO, based on Department of Energy documentation | GAO-15-052

France currently generates approximately 72% of its electricity needs via atomic means. **This is how France offers the cheapest domestic electricity prices in Western Europe, plus exports its surplus to a number of its neighbours, earning ~ €3 billion per annum.**

This is the only way to achieve carbon emission reductions and maintain levels and qualities of energy supplies. It is time for the rest to catch on and catch up.





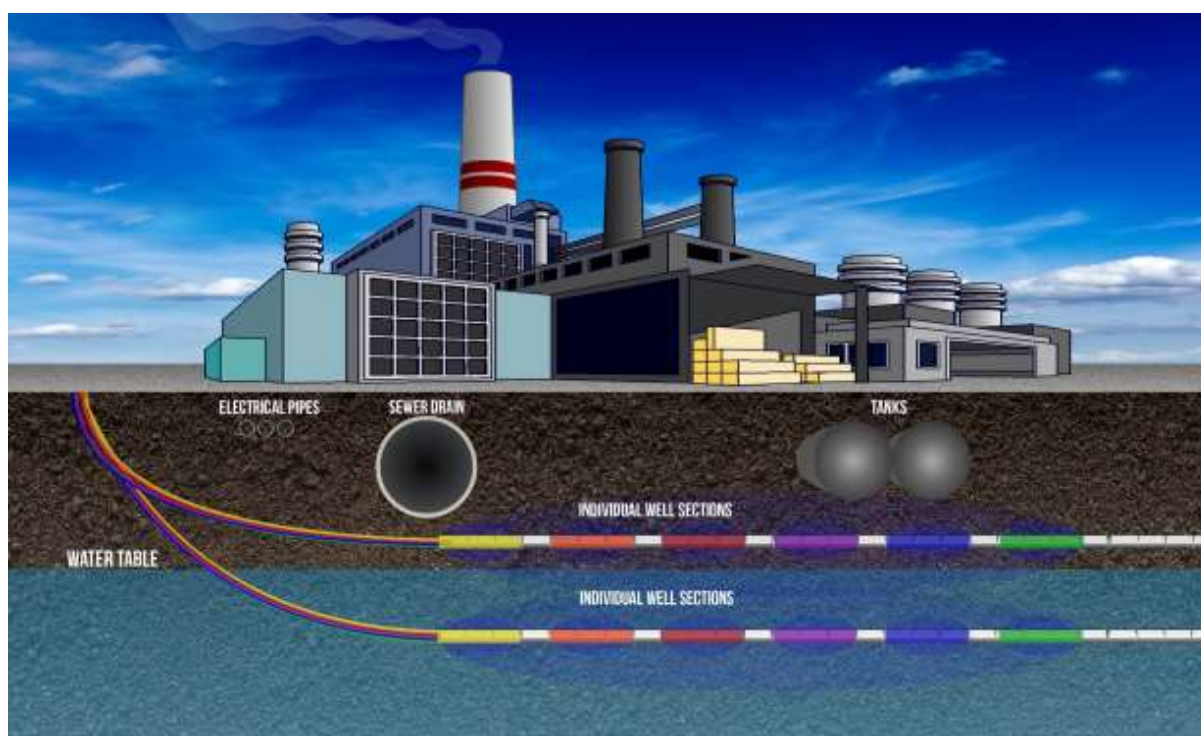
## Rehabilitation of Contaminated Ground

**TELESIS** ground contamination rehabilitation methodology places it within a select sub-division which utilise horizontal drains placed in positioned by using Horizontal Directional Drilling techniques

**TELESIS** has only one distinction within this small group - but it is a significant distinction.

In common with other providers of Horizontal Remediation Wells, our system can provide the following

- Casing while drilling. Pushing casings with a drill bit into the soil and precluding the need for borehole stabilising fluids (drilling "mud").
- If required due to site limitations, Blind Hole drilling methods are easily accomplished,
- Detect and analyse contamination **while Horizontal drilling**.
- Wells screened across contaminated areas only; no interface with or impact on any uncontaminated areas.
- Avoidance of contamination of naturally protected saturated zones



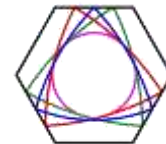
The **TELESIS** distinction is the uniformity in abstraction pressure of our sub surface drains.

This unique feature increases the efficiency of our ground remediation operations such that the quality of remediation provided by **TELESIS** is superior to all other methods.

There is no technology, no options which will deliver superior contamination clearance.

- We accomplish the objective ground condition in the shortest duration
- By optimising the abstraction zones, our remediation achieves greater uniformity across that contamination zone.
- Our operation costs are reduced as the quantity of 'Controlled release materials' is reduced and a greater quotient is recovered





### Multi-utility, Multiple revenue

**TELESIS** is the next generation version of subsurface water abstraction technology that resolves the issues that challenged the viability of precursor attempts to abstract subsurface water. Having succeeded in that objective, it is now incumbent on us, for the socio-economic well-being of coastal communities, over 60% of the planet's population, to harmlessly capitalise on all of the natural benefits of this resource.

**TELESIS** creates real global opportunities that not only make things a great deal better for a great many people but also, facilitate reversal of the harm we have done to our environment.

The delivery of each of the 11-services described above is not all mutually exclusive. The water we acquire is naturally purified and contains sufficient latent energy, two qualities that are the engine for multiple functions. Many of the utilities we serve, or provide are (unique to **TELESIS**) available in combined, multi-utility productions and consequently, we deliver unparalleled affordability.

The cost of **TELESIS** is entirely down to getting the water out from the saturated sand sandwiched between the bedrock below and the sea above. Once this water is obtained, there is no processing required before we can deliver it to serve the first utility followed by the second and even a third, each produced with unparalleled significant economics, however.....

**TELESIS uniquely facilitates the simultaneous production of utilities in combinations. The economics are, consequently, on an even higher magnitude of order, greater than the sum of the parts without a pay-back of typically 3-years.**

We might, for example have a project in the Mediterranean, perhaps on the Egyptian coast or the Levant or the southern Turquoise coast of Turkey.

**REVENUE STREAM 1** We might first deliver a Climate control cooling service [30% reduction in Capex, 60% reduction in Opex] to any built environment in the vicinity of the project (Hotel, Data Centre, Mall, etc.)

**REVENUE STREAM 2** The single pass condenser water will then be directed to a R.O desalination plant [≥50% Opex reduction] to produce high-quality freshwater

**REVENUE STREAM 3** comes from recovering valuable minerals [common salt, fertilisers and metals (e.g. Lithium)]. This opportunity is made commercially viable because **TELESIS** is a 'Chemicals-free' process that produces a brine (the feed-source for our Mineral recovery) which is equally 'Chemicals-free', uncontaminated.

*"The era of procrastination, of half measures, of soothing and baffling expedients of delay are coming to a close. In its place, we are entering a period of consequences." Winston Churchill*

**TELESIS, making a business out of saving the environment.**

