



## Sustainable boating in the Venice Lagoon: plan for sustained conversion to LPG of the pleasure crafts fleet *AGIRE – Venice Energy Agency, Italy*

### Summary

The objective of the project is the promotion of liquefied petroleum gas (LPG) as an alternative motor fuel for outboard and inboard marine engines. A highly sensitive environment like Venice lagoon is the ideal “hotspot” for such initiative of technology dissemination, which is absolutely the first one of this type in Italy. The project develops on a medium-term horizon, aiming at fostering a process of conversion of the ambitious share of 20% of the fleet of pleasure crafts circulating in the channels of Venice historical city centre and in the surrounding lagoon. The fuel shift action will bring about emission reduction of CO<sub>2</sub> and air pollutants (in particular HC, VOC, PAH), as well as the additional environmental benefit of prevention of water pollution which is generated by the chronic petrol spilling from conventional marine engines. Major actions of the project are: the field test of a 10 boat pilot fleet aiming at demonstrating the reliability and the highly favourable cost/benefit ratio of LPG as a nautical fuel; the opening of 4 LPG-dedicated filling stations in crucial locations in the lagoon, the realization of proper awareness-raising, information and training initiatives, a grant scheme to back the conversions.

#### End-user area

- New buildings
- Refurbishment of buildings
- Transport and mobility
- Financial instruments
- Industry
- Legal initiatives (regulations, directives, etc)
- Planning issues
- Sustainable communities
- User behaviour
- Education
- Other

#### Target Audience

- Citizens
- Households
- Property owners
- Schools and universities
- Decision makers
- Local and regional authorities
- Transport companies
- Utilities
- ESCOs
- Architects and engineers
- Financial institutions
- Other

#### Technical

- Energy efficiency
- Heating
- Cooling
- Appliances
- Lighting
- CHP
- District Heating
- Solar energy
- Biomass
- Wind
- Geothermal
- Hydro power
- Other: fuel shift

### Context

There are at present some 20'000 petrol-driven private boats circulating in the Venice lagoon for recreational purposes. Such large fleet is the natural target of an action aimed to shift towards a less carbon intensive and less polluting motor fuel. LPG as a substitute for petrol in both outboard and inboard motors appears to be a technologically mature, reliable and highly cost-effective solution.

Whereas petrol-to-LPG conversion kits as well as factory-made LPG marine engines are becoming now available on the market at a reasonable cost, and despite the strong economic appeal of the use of LPG as a motor fuel, unlike the case of road transport the possibility of adopting such alternative fuel for marine engines is still not known at all in Italy. Main reasons for that are substantial lack of information among final users and the absolute lack of a proper distribution infrastructure, i.e. marine LPG-dedicated filling stations.



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## Objectives

The project will develop on a medium term time span, aiming at fostering the conversion of the ambitious share of 20% (amounting to some 4'000 boats in absolute value) of the fleet of pleasure crafts used by the citizens in the channels of Venice historical city centre and in the surrounding lagoon.

The objectives are a reduction of CO<sub>2</sub> emissions and a strong abatement of polluting emissions, in particular HC, VOC, PAH.

A further environmental side benefit of this fuel shift action – of particular relevance in an extremely sensitive environment like Venice lagoon - is the prevention of water pollution which is generated by the chronic petrol spilling from conventional petrol-fuelled marine engines, especially the two-stroke ones.

## Process

The project is geared on a start-up phase 1, encompassing the field test of some pilot boats aiming at a full demonstration under normal use conditions in the Venice lagoon of the technical reliability, and economic attractiveness, of LPG as a marine fuel. The demonstration boats will be fitted with new bifuel (LPG&petrol) outboard motors or with petrol-to-LPG conversion kits in the case of inboard motors.



▲ Pic. 1 – The first boat of the demonstration fleet fitted with an LPG/petrol bifuel engine circulating in the Venice lagoon

◀ Pic. 2 – Giving the possibility of finding a filling station in a sufficient number of crucial locations in the Venice lagoon is essential for spreading the use of a novel alternative fuel

✔ Pic. 3 – An LPG-dedicated floating filling station

The introduction of the demonstration fleet must be timely combined with the opening of novel LPG-dedicated filling stations. Such stations will be located in strategic sites in Venice historical city centre and in the surrounding lagoon, in order to satisfactorily meet the expected growing demand for alternative fuel, i.e. without imposing to sensitised potential users to cover too long a distance for refuelling their tanks.

Apart from the co-funding provided by the project – to overcome the barrier that private entrepreneurs may not be well disposed at the beginning to take risks on LPG, a fuel that is not yet used for boats anywhere in Italy - the filling stations will have to be managed on a normal market basis, as it happens with any other filling station for road or nautical transport. This condition is essential to guarantee the financial self-reliance of the project, hence the necessary condition of project sustainability in the future.

The phase 2 is the scaling-up of the project, aiming at involving in the fuel shift the 20% target referred to above, i.e. some 4'000 boats to be converted over a period of four years.





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The market deployment of the proposed alternative fuel will be fostered by a diversified set of awareness-raising and information actions, run by Venice Energy Agency in close co-operation with crucial stakeholders like local boating associations and craftsmen associations.

Moreover, inducing behavioural changes among the intended project beneficiaries must be combined with the provision of some incentives to overcome the typical barrier encountered in any energy efficiency, renewables or fuel shift project, i.e. the “*initial cost vs. life-time cost*” barrier. To ease overcoming such psychological barrier, a certain financial incentive must be provided to cover part of the cost of the conversions kit or of the extra cost for a factory-made bifuel engines. On the other hand, in order to avoid financially expensive and market-distorting subsidy schemes, it was decided to manage the grant scheme in the mode of revolving fund.

It is worth noting that the two fundamental policy levers implemented by Venice Energy Agency - i.e. the creation of a demonstration fleet and the opening of a sufficient number of filling stations - combine with the extremely sound economics of the use of LPG, which in Italy costs 50% less than petrol. This will act as a powerful driver of the conversion process. Indeed, the pay-back of the incentive granted as well as of the extra cost borne by the users will be secured by the saving in the running cost made possible by a very cheap fuel.

### Financial resources and partners

The EU Commission recognised the innovation content and the pilot character of this initiative and granted a financial support of about € 90.000,00 in the framework of a comprehensive “*Civitas II*” project for promoting sustainable mobility initiatives in Venice and other European cities, the “*Mobilis*” project. Venice Energy Agency is charged with the complete implementation of the LPG subproject.

Apart from this limited start-up funding, which will be mostly devoted to co-financing the four filling stations, as said above the project has a strong market-oriented approach, relying on the self-incentivating cost/benefit ratio of LPG use.

### Results

Detailed project deliverables are:

1. Daily operation under normal navigation conditions in Venice city centre and lagoon of a pilot fleet with 10 demonstration boats, 5 fitted with new LPG/petrol bifuel engines and 5 with petrol-to-LPG conversion kits;
2. Opening to the general public of 4 novel LPG-dedicated filling stations in crucial locations in the lagoon, to minimize unnecessary mileage for refuelling;
3. Initial awareness raising campaigns for the general public;
4. Accompanying, more long-term, educational programmes in schools;
5. Production of technical information materials for interested final users;
6. Realization of promotional events at the annual sailing exhibition in Venice;
7. Training courses for marine engine installers and other professional target groups;
8. Put in operation of a grant scheme, operated as a revolving fund, to back the conversions of the engines;
9. Assessment of the impact of the tools employed in the scaling-up phase of the project, and proper feedback to project decision-making;
10. Dissemination actions towards similar contexts (lagoon, river and lake sailing), in Italy and in the EU.

The project is currently in its phase 1 of start-up. First results attained are: the transformation of the first 3 demonstrative boats of co-operating private users; the completion of the authorization procedures for the first pilot filling station, its design and commissioning; several on-site surveys for the best possible location of the other 3 stations.

The complete absence of a specific legislation for either LPG use in marine engines or for opening marine filling station, whether installed on hearth or floating, as it is currently the case in Italy, is a situation which requires a lobbying work at the proper legislative levels. These are: the Ministry for industry and energy as regards a general steering policy on motor fuels, the national technical bodies in charge of fuel safety regulations, and the Ministry for Finance as regards a desirable reduction of excise taxation on environmentally friendly fuels. Venice Energy Agency is carrying on such lobbying work in its position of early adopter of marine LPG technology, jointly with *Assogasliquidì*, the Italian national LPG association. Needless to say, such lobbying action is at all preliminary with respect to most of the envisaged project implementation schedule.



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**Lessons learned and repeatability**

It is too early to foresee particular problems which may occur in the implementation of the project, specifically as regards the reactions of the final beneficiaries in terms of actual rate of shift to LPG use. Correspondingly, it is too early to verify if the medium-term target set for the project, i.e. the ambitious 20% conversion share of the private leisure crafts circulating in the Venice lagoon, is too optimistic or not.

Nonetheless, as regards the potential of replicability of the project, it is naturally to envisage since the beginning that it will be higher in similar contexts, i.e. lagoon, lake and river navigation in Italy and throughout the EU. It is in the most ecologically sensitive environments, in fact, that an invaluable “double dividend” effect is associated to this fuel shift action.

For sure a specific factor of success for replication is the existence of a promotional legal framework – or at least the removal of any legal barriers - to the use of LPG in marine engines and to the opening of dedicated filling stations.

Needless to say, a second factor of success for replication is a favourable ratio between the specific local prices of petrol and LPG, as it is the case in the Italian motor fuel market.

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