Copyright (C) [2023], LIST

S-MP-OPF: Stochastic Multi-Period Optimal Power Flow For Day-Ahead Ancillary Services Procurement To Manage Distribution System Security.

This software is authored by:

Muhammad Usman and Baraa Mohandes

This program is free software: you can redistribute it and/or modify it under the terms of the European Union Public Licence v1.2 as published by the European Union.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the European Union Public Licence v1.2 for more details.

You should have received a copy of the European Union Public Licence v1.2 along with this program. If not, see https://www.eupl.eu

This program makes use and is distributed with the following libraries:

\* JuMP (<https://jump.dev/JuMP.jl>)

\*OdsIO (<https://juliapackages.com/p/odsio>)

\*MathOptInterface (<https://github.com/jump-dev/MathOptInterface.jl>)

\*Dates (<https://docs.julialang.org/en/v1/stdlib/Dates/>)

\*LinearAlgebra (<https://docs.julialang.org/en/v1/stdlib/LinearAlgebra/>)

\*JLD2 (<https://docs.juliahub.com/JLD2>)

\* IPOPT (<https://github.com/jump-dev/Ipopt.jl>)

\* Juniper ([https://lanl-ansi.github.io/Juniper.jl/](https://lanl-ansi.github.io/Juniper.jl/stable/))

\* Plots (<https://docs.juliaplots.org/>)

\* CPLEX (<https://github.com/jump-dev/CPLEX.jl>)

\* Cbc (<https://github.com/jump-dev/Cbc.jl>)

\* XLSX (<https://felipenoris.github.io/XLSX.jl>)

\* DataFrames (<https://dataframes.juliadata.org/>)

You can reach Luxembourg Institute of Science and Technology (LIST) Valorisation & Transfer Officer (Alain Renault), [alain.renault@list.lu](mailto:alain.renault@list.lu), or 41 Rue du Brill, 4422 Esch-Belval Belvaux Sanem, Luxembourg

If you use  “S-MP-OPF” in a work that leads to a scientific publication, we would appreciate it if you would kindly cite “S-MP-OPF” in your manuscript.

M. Usman and F. Capitanescu, "A Novel Tractable Methodology to Stochastic Multi-Period AC OPF in Active Distribution Systems Using Sequential Linearization Algorithm," in IEEE Transactions on Power Systems, vol. 38, no. 4, pp. 3869-3883, July 2023, doi: 10.1109/TPWRS.2022.3197884

The paper can be found at https://doi.org/10.1109/TPWRS.2022.3197884

EUROPEAN UNION PUBLIC LICENCE v. 1.2

EUPL © the European Union 2007, 2016

This European Union Public Licence (the ‘EUPL’) applies to the Work (as defined

below) which is provided under the terms of this Licence. Any use of the Work,

other than as authorised under this Licence is prohibited (to the extent such

use is covered by a right of the copyright holder of the Work).

The Work is provided under the terms of this Licence when the Licensor (as

defined below) has placed the following notice immediately following the

copyright notice for the Work:

Licensed under the EUPL

or has expressed by any other means his willingness to license under the EUPL.

1. Definitions

In this Licence, the following terms have the following meaning:

- ‘The Licence’: this Licence.

- ‘The Original Work’: the work or software distributed or communicated by the

Licensor under this Licence, available as Source Code and also as Executable

Code as the case may be.

- ‘Derivative Works’: the works or software that could be created by the

Licensee, based upon the Original Work or modifications thereof. This Licence

does not define the extent of modification or dependence on the Original Work

required in order to classify a work as a Derivative Work; this extent is

determined by copyright law applicable in the country mentioned in Article 15.

- ‘The Work’: the Original Work or its Derivative Works.

- ‘The Source Code’: the human-readable form of the Work which is the most

convenient for people to study and modify.

- ‘The Executable Code’: any code which has generally been compiled and which is

meant to be interpreted by a computer as a program.

- ‘The Licensor’: the natural or legal person that distributes or communicates

the Work under the Licence.

- ‘Contributor(s)’: any natural or legal person who modifies the Work under the

Licence, or otherwise contributes to the creation of a Derivative Work.

- ‘The Licensee’ or ‘You’: any natural or legal person who makes any usage of

the Work under the terms of the Licence.

- ‘Distribution’ or ‘Communication’: any act of selling, giving, lending,

renting, distributing, communicating, transmitting, or otherwise making

available, online or offline, copies of the Work or providing access to its

essential functionalities at the disposal of any other natural or legal

person.

2. Scope of the rights granted by the Licence

The Licensor hereby grants You a worldwide, royalty-free, non-exclusive,

sublicensable licence to do the following, for the duration of copyright vested

in the Original Work:

- use the Work in any circumstance and for all usage,

- reproduce the Work,

- modify the Work, and make Derivative Works based upon the Work,

- communicate to the public, including the right to make available or display

the Work or copies thereof to the public and perform publicly, as the case may

be, the Work,

- distribute the Work or copies thereof,

- lend and rent the Work or copies thereof,

- sublicense rights in the Work or copies thereof.

Those rights can be exercised on any media, supports and formats, whether now

known or later invented, as far as the applicable law permits so.

In the countries where moral rights apply, the Licensor waives his right to

exercise his moral right to the extent allowed by law in order to make effective

the licence of the economic rights here above listed.

The Licensor grants to the Licensee royalty-free, non-exclusive usage rights to

any patents held by the Licensor, to the extent necessary to make use of the

rights granted on the Work under this Licence.

3. Communication of the Source Code

The Licensor may provide the Work either in its Source Code form, or as

Executable Code. If the Work is provided as Executable Code, the Licensor

provides in addition a machine-readable copy of the Source Code of the Work

along with each copy of the Work that the Licensor distributes or indicates, in

a notice following the copyright notice attached to the Work, a repository where

the Source Code is easily and freely accessible for as long as the Licensor

continues to distribute or communicate the Work.

4. Limitations on copyright

Nothing in this Licence is intended to deprive the Licensee of the benefits from

any exception or limitation to the exclusive rights of the rights owners in the

Work, of the exhaustion of those rights or of other applicable limitations

thereto.

5. Obligations of the Licensee

The grant of the rights mentioned above is subject to some restrictions and

obligations imposed on the Licensee. Those obligations are the following:

Attribution right: The Licensee shall keep intact all copyright, patent or

trademarks notices and all notices that refer to the Licence and to the

disclaimer of warranties. The Licensee must include a copy of such notices and a

copy of the Licence with every copy of the Work he/she distributes or

communicates. The Licensee must cause any Derivative Work to carry prominent

notices stating that the Work has been modified and the date of modification.

Copyleft clause: If the Licensee distributes or communicates copies of the

Original Works or Derivative Works, this Distribution or Communication will be

done under the terms of this Licence or of a later version of this Licence

unless the Original Work is expressly distributed only under this version of the

Licence — for example by communicating ‘EUPL v. 1.2 only’. The Licensee

(becoming Licensor) cannot offer or impose any additional terms or conditions on

the Work or Derivative Work that alter or restrict the terms of the Licence.

Compatibility clause: If the Licensee Distributes or Communicates Derivative

Works or copies thereof based upon both the Work and another work licensed under

a Compatible Licence, this Distribution or Communication can be done under the

terms of this Compatible Licence. For the sake of this clause, ‘Compatible

Licence’ refers to the licences listed in the appendix attached to this Licence.

Should the Licensee's obligations under the Compatible Licence conflict with

his/her obligations under this Licence, the obligations of the Compatible

Licence shall prevail.

Provision of Source Code: When distributing or communicating copies of the Work,

the Licensee will provide a machine-readable copy of the Source Code or indicate

a repository where this Source will be easily and freely available for as long

as the Licensee continues to distribute or communicate the Work.

Legal Protection: This Licence does not grant permission to use the trade names,

trademarks, service marks, or names of the Licensor, except as required for

reasonable and customary use in describing the origin of the Work and

reproducing the content of the copyright notice.

6. Chain of Authorship

The original Licensor warrants that the copyright in the Original Work granted

hereunder is owned by him/her or licensed to him/her and that he/she has the

power and authority to grant the Licence.

Each Contributor warrants that the copyright in the modifications he/she brings

to the Work are owned by him/her or licensed to him/her and that he/she has the

power and authority to grant the Licence.

Each time You accept the Licence, the original Licensor and subsequent

Contributors grant You a licence to their contributions to the Work, under the

terms of this Licence.

7. Disclaimer of Warranty

The Work is a work in progress, which is continuously improved by numerous

Contributors. It is not a finished work and may therefore contain defects or

‘bugs’ inherent to this type of development.

For the above reason, the Work is provided under the Licence on an ‘as is’ basis

and without warranties of any kind concerning the Work, including without

limitation merchantability, fitness for a particular purpose, absence of defects

or errors, accuracy, non-infringement of intellectual property rights other than

copyright as stated in Article 6 of this Licence.

This disclaimer of warranty is an essential part of the Licence and a condition

for the grant of any rights to the Work.

8. Disclaimer of Liability

Except in the cases of wilful misconduct or damages directly caused to natural

persons, the Licensor will in no event be liable for any direct or indirect,

material or moral, damages of any kind, arising out of the Licence or of the use

of the Work, including without limitation, damages for loss of goodwill, work

stoppage, computer failure or malfunction, loss of data or any commercial

damage, even if the Licensor has been advised of the possibility of such damage.

However, the Licensor will be liable under statutory product liability laws as

far such laws apply to the Work.

9. Additional agreements

While distributing the Work, You may choose to conclude an additional agreement,

defining obligations or services consistent with this Licence. However, if

accepting obligations, You may act only on your own behalf and on your sole

responsibility, not on behalf of the original Licensor or any other Contributor,

and only if You agree to indemnify, defend, and hold each Contributor harmless

for any liability incurred by, or claims asserted against such Contributor by

the fact You have accepted any warranty or additional liability.

10. Acceptance of the Licence

The provisions of this Licence can be accepted by clicking on an icon ‘I agree’

placed under the bottom of a window displaying the text of this Licence or by

affirming consent in any other similar way, in accordance with the rules of

applicable law. Clicking on that icon indicates your clear and irrevocable

acceptance of this Licence and all of its terms and conditions.

Similarly, you irrevocably accept this Licence and all of its terms and

conditions by exercising any rights granted to You by Article 2 of this Licence,

such as the use of the Work, the creation by You of a Derivative Work or the

Distribution or Communication by You of the Work or copies thereof.

11. Information to the public

In case of any Distribution or Communication of the Work by means of electronic

communication by You (for example, by offering to download the Work from a

remote location) the distribution channel or media (for example, a website) must

at least provide to the public the information requested by the applicable law

regarding the Licensor, the Licence and the way it may be accessible, concluded,

stored and reproduced by the Licensee.

12. Termination of the Licence

The Licence and the rights granted hereunder will terminate automatically upon

any breach by the Licensee of the terms of the Licence.

Such a termination will not terminate the licences of any person who has

received the Work from the Licensee under the Licence, provided such persons

remain in full compliance with the Licence.

13. Miscellaneous

Without prejudice of Article 9 above, the Licence represents the complete

agreement between the Parties as to the Work.

If any provision of the Licence is invalid or unenforceable under applicable

law, this will not affect the validity or enforceability of the Licence as a

whole. Such provision will be construed or reformed so as necessary to make it

valid and enforceable.

The European Commission may publish other linguistic versions or new versions of

this Licence or updated versions of the Appendix, so far this is required and

reasonable, without reducing the scope of the rights granted by the Licence. New

versions of the Licence will be published with a unique version number.

All linguistic versions of this Licence, approved by the European Commission,

have identical value. Parties can take advantage of the linguistic version of

their choice.

14. Jurisdiction

Without prejudice to specific agreement between parties,

- any litigation resulting from the interpretation of this License, arising

between the European Union institutions, bodies, offices or agencies, as a

Licensor, and any Licensee, will be subject to the jurisdiction of the Court

of Justice of the European Union, as laid down in article 272 of the Treaty on

the Functioning of the European Union,

- any litigation arising between other parties and resulting from the

interpretation of this License, will be subject to the exclusive jurisdiction

of the competent court where the Licensor resides or conducts its primary

business.

15. Applicable Law

Without prejudice to specific agreement between parties,

- this Licence shall be governed by the law of the European Union Member State

where the Licensor has his seat, resides or has his registered office,

- this licence shall be governed by Belgian law if the Licensor has no seat,

residence or registered office inside a European Union Member State.

Appendix

‘Compatible Licences’ according to Article 5 EUPL are:

- GNU General Public License (GPL) v. 2, v. 3

- GNU Affero General Public License (AGPL) v. 3

- Open Software License (OSL) v. 2.1, v. 3.0

- Eclipse Public License (EPL) v. 1.0

- CeCILL v. 2.0, v. 2.1

- Mozilla Public Licence (MPL) v. 2

- GNU Lesser General Public Licence (LGPL) v. 2.1, v. 3

- Creative Commons Attribution-ShareAlike v. 3.0 Unported (CC BY-SA 3.0) for

works other than software

- European Union Public Licence (EUPL) v. 1.1, v. 1.2

- Québec Free and Open-Source Licence — Reciprocity (LiLiQ-R) or Strong

Reciprocity (LiLiQ-R+).

The European Commission may update this Appendix to later versions of the above

licences without producing a new version of the EUPL, as long as they provide

the rights granted in Article 2 of this Licence and protect the covered Source

Code from exclusive appropriation.

All other changes or additions to this Appendix require the production of a new

EUPL version.